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Strategic Implications of Consumer Food Safety Preferences

Abstract: This study examines the tradeoffs consumers are willing to make relative to food safety attributes and other product attributes, such as quality and price, and develops implications for both the government and private sector firms. Conjoint analysis was used to elicit consumers' preferences for fresh Red Delicious apples. The attributes studied include price, product quality as depicted by the level of defects, a variable representing the level of pesticide usage and the associated cancer risk, and a variable representing different levels of government inspection.

The results indicated that most consumers have a strong preference for increased food safety. Government policy options that are explored include stricter production standards, improved regulatory monitoring, and government-defined labels. Private industry options that are examined include grower labels, retailer labels, and third party labels.

Introduction

The issue of consumer preferences for food safety has proved to be somewhat of a conundrum. Research on the subject has yielded conflicting results and empirical data are scarce. The matter is further complicated because media coverage of food safety issues tends to give consumers a highly slanted view by focusing on relatively infrequent, but highly sensational incidents. For example, the 1989 alar scare or the 1996 E. coli contamination of Odwalla products received front page newspaper coverage. On the other hand, issues that have

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widespread and long-lasting implications for the safety of the food supply, such as major changes in food safety laws, often receive only minor media coverage. Senauer, Asp, and Kinsey characterized consumer concern for food safety as growing, but at most times largely latent (Senauer, Asp, and Kinsey, 1991).

Empirical research is hampered by the limited variation in food safety levels found in most products conveniently available to consumers. For example, fresh produce may offer consumers the greatest array of food safety options with product alternatives that include conventionally produced produce, produce with no detectable pesticide residues, and organic produce. However, conducting empirical research is complicated because alternatives to conventionally produced produce may be available only in specialty grocery stores, offered sporadically throughout the year, or sold without labels that clearly indicate the quality standard.

Previous research has done little to settle the debate over whether and how much consumers are willing to pay for enhanced food safety. Most of the consumer food safety research conducted to date has consisted of surveys regarding consumers' attitudes toward food safety or consumers' intentions to buy hypothetical products. At one end of the spectrum, several studies have found that consumers are willing to pay very little, if anything, for increased food safety. Ott found in a study of Georgia shoppers that one-third of the respondents were not willing to pay any premium for pesticide residue-free produce, and that slightly less than 10% of his sample was willing to pay as much as a 10% premium (Ott, 1990). A similar study of Pennsylvania consumers indicated that only 26% of the sample was willing to pay a premium of more than 15% for chemical pesticide residue-free tomatoes (Weaver, Evans, and Luloff, 1992). At the other end of the spectrum, several studies have found that consumers have indicated a willingness to pay substantial premiums for safer produce. In a study of North Carolina shoppers, Eom found that 65% of respondents were willing to pay, on average, $0.35 per pound more for produce that was screened for pesticides than for unscreened produce (Eom, 1994). In yet another study, Van Ravenswaay and Hoehn estimated that consumers were willing to pay an additional $0.313 per pound to avoid Alar in fresh apples (Van Ravenswaay and Hoehn, 1991).

The mixed messages generated by the consumer research leave many important questions unanswered. How much are consumers actually willing to pay for enhanced food safety attributes? In the case of pesticides, do consumers desire a lower level of risk from exposure to pesticides? Or would they prefer greater assurance that established safety regulations are being followed? If increased food safety is called for, should it be provided by a government agency or the private sector?

The objectives of this study are two-fold. The first objective is to develop a clearer understanding of American consumers' preferences for food safety and the kind of tradeoffs they make relative to factors such as price and quality. This will

be accomplished by using a simulated market approach in an attempt to elicit realistic responses from consumers. The second objective is to analyze the various alternatives that policy makers and private sector firms might consider to address consumer food safety preferences.

Research Method

Conjoint analysis was used to elicit consumer preferences for food safety attributes in a nationwide study. Conjoint analysis is a standard marketing tool used to measure consumer preferences for product attributes as well as evaluate potential new products (Hair, 1992). It is particularly useful in assessing consumer preferences for nonmarket goods and in evaluating products or attributes that do not yet exist in the marketplace. The major benefit of conjoint analysis is that consumers are given a task that is as realistic as possible, given the experimental setting. They are asked to rate (or rank) several alternative products in much the same fashion that they would choose between several products in any shopping experience. Conjoint analysis is therefore ideal for circumstances where it is necessary to realistically assess consumer preferences when such preferences cannot be empirically observed. Conjoint analysis has been used in several food industry studies,[1] and was used in the pilot project on which this study is based (Baker and Crosbie, 1994).

The conjoint analysis method is designed to present respondents with choices similar to those that they would make in a market setting. It is necessary to choose a product and adequately define the product by selecting key product attributes and attribute levels. In most instances researchers use a commercially available software package to generate the experimental design (the combinations of product attribute levels) that consumers then rate or rank. The responses are analyzed to determine the value that individual consumers place on each attribute. For a more detailed description of conjoint analysis see Hair (1992).

Red Delicious apples were chosen as the product, because most consumers have a high degree of familiarity with this fruit. Four product attributes were determined to be the most salient features, based on either their importance to consumers or their relevance to this study. These attributes included price, quality as indicated by the level of defects, level of pesticide usage/cancer risk, and government oversight.

Price was chosen as a variable because of its obvious importance to consumers. The three price levels, $0.69, $0.99, and $1.29 per pound, were chosen because they were felt to represent a reasonable price range, consistent with the other attribute levels and recent market conditions. During the 1994-95 production season, the U.S. average price for Red Delicious apples ranged from $0.72 to $0.92 (Bureau of Labor Studies, 1998).

Like price, quality of produce is an important element in consumer choice. There are many aspects of quality, including appearance, size, color, and maturity. While all of these aspects may be important to consumers, it would be impossible to include all of these aspects in the model, because it would greatly increase the complexity of the respondent's task. For this reason, the aspect of quality that was thought to be most highly affected by the use of pesticides, the level of defects, was chosen as a proxy for overall quality. Three levels of quality were represented in the model by photographs showing apples with visible defects of 0.0, 1.6, and 3.4%.

The two remaining attributes were chosen because of their relevance to the theme of the study, food safety preference. One attribute represented the type of pesticide policy and reflected different levels of pesticide usage and the level of cancer risk associated with each pesticide policy. Conventional pesticide usage, reduced pesticide usage, and very limited pesticide usage were described as yielding increased lifetime cancer risks of 1 in 1,000, 1 in 10,000, and 1 in 100,000, respectively. The upper bound on the cancer risk estimate of 1 in 1,000 was based on the results of EPA studies and estimates of the National Academy of Sciences (National Academy of Sciences, 1987).

The last variable represented the type of government program for assuring compliance with established food safety standards. The first level of the attribute represented the current system whereby approximately 1% of all produce shipments would be tested to assure compliance with existing standards. A second level of this variable represented a certification system whereby all produce shipments would be inspected and certified as complying with established safety standards before shipment to the retailer.

The attributes and attribute levels were used to develop 11 hypothetical products. Each product was comprised of one attribute level for each of the four attributes. For example, one hypothetical Red Delicious apple product was described as priced at $1.29 per pound, with moderate damage, produced under a policy of reduced pesticide use (medium cancer risk), and inspected under a system of government monitoring. These 11 alternative products were generated using the Bretton-Clark Conjoint Designer (Bretton-Clark, 1990). Together, these 11 hypothetical products were thought to realistically represent the range of alternatives that consumers would face under the policy alternatives considered in this study.

A national sample of 1,850 individuals was randomly selected by purchasing a mailing list from a company which maintains addresses of over 90 million U.S. households. In early 1996, each person in the sample was mailed a packet that included a cover letter, the survey, a $1 incentive payment and a postage paid return envelope.

The cover letter was brief and simply asked for the individual's cooperation and input. No information concerning the purpose of the study was provided so

as not to bias the responses. The letter indicated that the $1 was included as a small token of the researcher's appreciation. The survey forms included an instruction sheet, a page describing the product attributes, and a product rating form on which participants were asked to rate the 11 hypothetical products on a scale of 1 to 11.

To maximize the response rate, follow-up post cards were mailed to all non-respondents one month and two months after the initial mailing. A total of 557 responses were obtained. This resulted in a response rate of 33.2% after accounting for those surveys which were undeliverable. After eliminating those responses which were unusable, 510 usable responses remained.

Results and Discussion

Responses were analyzed with the SAS TRANSREG procedure (SAS Institute Inc., 1992). For each individual, the analysis generated a series of part-worth coefficients for each variable. The part-worth scores indicate the impact of each variable on each individual's utility. The individual part-worth scores were averaged across all individuals to generate an aggregate utility function. The aggregate part-worth scores were then converted into percentages, termed relative factor importance scores, to show the impact of each variable on the total variation in the aggregate utility function. It is the relative factor importance scores that are reported in this paper.

The results of the statistical analysis are shown in Figure 1. By far the most important attribute influencing consumers' purchase decisions was the pesticide policy and associated cancer risk with a relative factor importance score of 61%. The other three factors, price, level of defects, and certification program, had relative factor importance scores of 15, 14, and 10 percent, respectively. The interpretation of these results is that when consumers were presented with product choices reflecting price, level of defects, different levels of pesticide usage, and certification program, the primary factor influencing their intention to purchase was the level of pesticide usage. Consumers in this study also clearly preferred a real reduction in pesticide usage over a program that would provide greater certainty of compliance with established safety standards.

The results of this study, which indicate a strong consumer preference for increased safety margins in the use of pesticides, raise important questions such as, who should be responsible for providing enhanced product safety? Should consumers have alternatives regarding the level of safety in produce? Who should pay for enhanced food safety? The discussion that follows provides a framework for answering these and other questions.

The analysis will address how the principal participants in the food distribution system, including producers, retailers, and government regulators might pursue

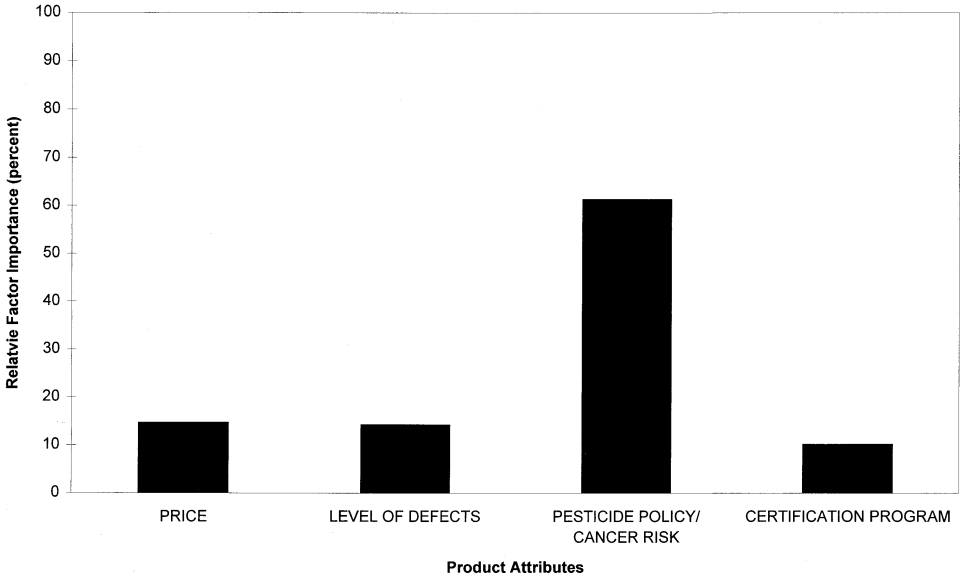

Figure 1. Consumer Preferences for Food Safety Attributes

alternatives that have the potential to reduce the risk that pesticides in fresh produce pose to consumers. The analysis will also focus on how participants in the system may address three important factors that influence the level of risk, or the perception of that risk, to which consumers are exposed. These factors are production standards, the level of assurance that established standards are met, and dissemination of information regarding product safety to various participants in the system. To avoid being unnecessarily wordy, in the remainder of this article the term "food safety" will be used to refer to the safety of fresh produce relative to the health risks posed by pesticides.

Government Policy Options

The first government option to be explored is the possibility of tighter government standards. While the government could act in many ways to reduce the risk of consumer exposure to pesticides, including directly regulating production methods, recent history would indicate that the most likely approach would be a modification of the existing framework. In August of 1996, years of debate over how pesticides in the food supply should be regulated culminated in the passage by Congress of the Food Quality Protection Act of 1996 (FQPA). Some of the major changes mandated by this law were:

- A single health-based standard will be used to establish pesticide tolerances in raw and processed foods. Previously, pesticide residues in processed foods were subject to more stringent regulation under the Delaney Clause than were pesticide residues in raw products.
- Pesticide tolerances must be set at "safe" levels to provide "a reasonable certainty that no harm will result from aggregate exposure to the pesticide chemical residue." The previous law required that tolerances be established that would "protect the public health," and did not account for the effects of exposure to pesticides from multiple sources.
- Special consideration must be given to the risks to infants and children in establishing pesticide tolerances, whereas, previously such risks were not specifically addressed.

Overall, the FQPA strengthened the safety of the food supply by imposing more stringent standards on pesticide residues, by ensuring greater consistency in the application of the standards, and by eliminating some exceptions allowed under previous regulations.

Stricter Production Standards

To further strengthen the safety of the food supply the government could take an approach similar to that used in developing the FQPA. Provisions might accomplish this end by mandating that:

- the definition of "safe" be rewritten to provide an additional margin of safety.
- the use of carcinogens be completely prohibited.
- improved testing procedures be adopted that would ensure that the effects of long-term exposure to pesticides be more thoroughly evaluated.
- the establishment of pesticide tolerances more thoroughly account for the harmful effects of the interaction among various chemicals.

The major advantage of this policy alternative is that it assures uniformity and improved food safety for all consumers. Such an action is especially appropriate when based on scientifically-grounded, health-based criteria. However, overly stringent standards may have several adverse impacts. They increase the cost of produce to consumers and may actually be detrimental to consumer health. Low income consumers, in particular, may consume less produce in response to higher prices, and therefore be deprived of the beneficial health effects attributed to fresh fruits and vegetables. Extremely low pesticide tolerances, which are not health-based, may also be viewed by countries that export produce to the U.S. as a means of limiting the import of foreign produce and therefore an illegal barrier to free trade.

Improved Regulatory Monitoring

An alternative to more rigid standards is better enforcement of established food safety regulations. Under the current system of regulatory monitoring, the FDA samples individual lots of both domestically produced and imported produce. Most samples collected under this program are "surveillance" samples, meaning that there is no prior indication that the produce shipment contains an illegal pesticide residue. "Compliance" samples are also collected to follow up on findings of an illegal residue or when other evidence of a potential pesticide residue violation exists. The FDA reported that it collected a total of 4,501 domestic and 5,432 import samples in 1997. Of these, 4,429 domestic samples and 5,223 import samples were surveillance samples (Food and Drug Administration, 1998).

The FDA analyzes produce samples using two types of tests. Multiresidue tests can detect about one-half of the approximately 400 pesticides approved for use by the EPA. Single residue tests or selective multiresidue tests are used to detect the presence of one or a select few pesticides, respectively. The FDA considers many factors including past pesticide residue data, regional intelligence on pesticide usage, and the toxicity of various pesticides in determining the number of samples and the methods of analysis it utilizes.

The current system of regulatory monitoring has been criticized by a host of environmental and consumer advocate groups. The major criticisms are that:

- inadequate sampling fails to detect high rates of pesticide residue violations.
- sampling of imported produce is inadequate, because imported produce is consistently found to have a higher rate of pesticide residue violations than domestic produce.
- inadequate analysis of samples fails to detect many violations because most analyses screen for only a limited number of chemicals.
- slow analysis of samples results in the failure to remove shipments found to be in violation of established standards from the food supply.

Reform of the regulatory monitoring system should contain several key elements:

- mandatory record keeping by growers of all chemicals used on a crop.
- use of a more targeted sampling process.
- more thorough and faster analysis of samples.
- enhanced enforcement powers for the FDA.
- stiff civil penalties for violations.

Such a multi-pronged approach is necessary to reform the system, because a simple reform of the system would not address the fundamental problems and would be very costly. There are simply too many chemicals in use, the number of shipments is too large, and the cost of analyzing for every possible chemical is too high for a system that relies primarily on random sampling to work effectively.

The targeted system proposed above relies heavily on the use of information to help focus the limited resources of the monitoring agency as well as a strong deterrent to discourage would-be violators. By requiring that growers maintain and make available to the FDA detailed records on pesticide application by crop, the FDA could greatly increase its knowledge of pesticide usage patterns and more effectively focus its efforts on likely problem areas. Uses of alternative sources of intelligence, such as the analysis of sales records by pesticide distributors could be used to detect the use of unreported chemicals. Occasional comprehensive testing of produce shipments would also be required to ensure that the system was in fact working effectively and to detect violators who may attempt to circumvent the system's controls. Such a targeted system represents a substantial departure from current regulatory monitoring by shifting some of the burden from the government to growers. However, this would seem to be justified, since it is the growers' responsibility to comply with food safety regulations and it is in the industry's best interest to foster greater consumer confidence in the food safety system.

Government-Defined Labels

A third approach that the government could pursue is to use its regulatory powers to determine the standards that must be met in order to use government defined labels. In this way the government could shape the options available to private sector firms, without mandating stricter across the board standards.

Two examples serve to highlight the principal features of this option. In the first example, the government could establish production standards for produce grown with no chemical pesticides. Such a policy would be similar to the organic standards that are currently being developed. It would most likely include provisions for labeling such produce as well as third party certification to ensure compliance with the standards.

A similar approach could be used to regulate reporting of pesticide residue data to consumers. For example, the government could define a label such as "no detectable pesticide residues," the standards associated with usage of such a label, and the method required to certify compliance with the label's standards. To encourage the use of new standards or labels by the produce industry the government could choose to proactively pursue the above options. Alternatively, the government may choose to pursue more of a watchdog role and act only when industry is pursuing options it perceives as not being in the best interest of

consumers. In the latter case, the government would likely respond to industry efforts that it perceived as misleading or adding to consumer confusion. Recent examples of such government action include the legal definition of terms such as "low-fat" or "lite," and the FDA's action to prevent food manufacturers from using the American Heart Association's HeartGuide seal. Because of the risk involved in investing in the development of a standard or label that the government might later find unacceptable, it may be advisable for private industry to work with the appropriate government agency to ensure that its plans will meet with government approval.

Private Industry Options

Analysis of the options that private industry may pursue is complex because the participants are numerous and varied. Like the government, private firms may establish production standards, certify that established standards are met, and disseminate product safety information. Growers, handlers, distributors and retailers all play a role in the production and distribution of fresh produce and have an interest in providing consumers with the assurance that the produce they purchase is safe. Because it would be impossible to address all of the potential ways in which private firms may respond to the demand for increased food safety, several of the most likely scenarios are discussed below.

Grower Labels

Growers or grower groups may attempt to differentiate their product on the basis of production standards that enhance food safety. Such standards may include the use of no chemical pesticides, limited pesticide use, or the application of integrated pest management techniques. An example of such a program is the Stemilt Growers Cooperative's Responsible Choice program. Stemilt's is a fruit packer serving over 200 growers in Washington, Oregon, and British Columbia. Participating growers must document their Integrated Pest Mangement (IPM) and Integrated Crop Management (ICM) practices. In return their fruit is labeled with Stemilt's "ladybug logo."

Another example of a grower label is California Clean. Growers participating in this program are certified by the California Clean Growers Association and adhere to strict limits on the kinds of pesticides they use and the sustainable farming practices they employ. With certain exceptions the use of carcinogenic and acutely toxic pesticides is prohibited. California Clean produce is marketed primarily in California.

Both of the above examples are representative of the relatively few grower labels currently in use. They tend to be relatively small scale regional efforts by growers and/or packers. This is probably indicative of the relatively high costs of

establishing a successful brand in the produce industry. Some of the principal costs include development of production standards, label development, record keeping and certification, gaining access to distribution channels, and consumer promotion and education. Individual and even groups of growers may also lack the necessary scale for cost effective branding because they grow relatively few items and their products may be present in the market for only a few months out of each year.

Retailer Labels

At the other end of the spectrum is retailer labels. Retailers have many inherent advantages over growers in the establishment of produce labels. They have an established reputation with consumers, they control the allocation of space in the produce section, and they have a keen understanding of the consumer and consumer purchasing behavior. Furthermore, they can work with and influence many downstream providers to ensure that they have a broad array of produce that meets their quality specifications throughout the year.

Wegmans, a Rochester, New York retail supermarket chain, offers one of the few examples in the U.S. of a retail supermarket that has developed a retail label signifying safer produce. The Wegmans IPM label is used on produce from growers who certify that they have adhered to the IPM practices recommended by land-grant universities in growing the crop. Wegmans relies primarily on the farmers themselves to certify compliance with the program's standards, although it also has the farmers' records inspected by an agricultural specialist.

Third Party Labels

The use of third party labels may be used to assure consumers that the food they purchase meets some minimum safety standards. Certification could be given to attributes of the production method, attributes of the final product, such as pesticide residue levels, or both. The major advantage of using a third party to certify compliance with food safety standards is that organizations without an economic interest in the outcome of the certification process may be perceived by consumers as more credible than firms, such as growers, that have an economic interest in the outcome. Furthermore, certification labels provided by third party groups may benefit from the groups'established reputation and consumer goodwill.

Oakland, California-based Scientific Certification Systems (SCS), which certifies products under the NutriClean label, is an example of a third party that certifies produce meeting its standards for pesticide residues. The standard used by SCS is "no detected residue," using a detection limit of 0.05 parts per million (SCS, 1998). Both growers and retailers use the SCS service. While some retailers may use the certification service solely as a quality assurance measure, most

retailers using the service also use the NutriClean label to differentiate their produce as having an added measure of safety.

Third party groups may also develop their own standards and labels as a means of influencing production methods and expanding the choices available to consumers. In this way, independent interest groups may use their organizations' established reputation and goodwill to foster their organizational goals. Grower groups may want to collaborate with groups that share a common interest in promoting food safety. Partnering with a group that has established name recognition may provide easier access to distribution channels and lower the cost of promoting the label.

An example of an organization that has used this model is the Portland, Oregon-based group, The Food Alliance (TFA). This independent organization endorses farms and farm products grown under practices that protect consumers, farm workers and the environment. Growers must meet TFA's strict requirements for pest and disease management, soil and water conservation, and human resource development in order to promote their products using The Food Alliance seal of approval. Consumer research by TFA indicated that one of the primary reasons shoppers chose TFA-Approved produce was the third party endorsement (The Food Alliance, 1998).

Concluding Remarks

The results reported in this study indicate that consumers have a strong desire for enhanced food safety in fresh produce. Consumers, in expressing their product preferences, indicated that they were both willing to pay for a reduction in pesticide usage as well as accept some deterioration in produce quality. One wonders, if this is the case, why there is such a paucity of products and labels in the fresh produce industry that promote such attributes. Is it that consumers' responses reflect their fears but not their purchase intentions? Possibly, consumers' preferences for food safety attributes are largely latent, and will only be expressed when triggered by events such as the alar or cyclospora crises. On the other hand, the lack of successful products addressing this consumer need may indicate that food marketers have not yet developed the right product, that is properly priced, adequately promoted, and conveniently available to most consumers.

The above discussion addresses possible responses by both government and private industry to consumers' food safety concerns. While the proposed government actions would address many consumers concerns, I think such action is unlikely, particularly given that both the U.S. food safety and food labeling laws have been recently overhauled after a period of long debate. Furthermore, since consumer food safety concerns are complex and varied, the flexibility and

creativity of the private sector is much better suited to addressing these concerns than the uniform, science-based approach typically taken by government. While it is never a foregone conclusion that a product or product category will be successful, the growing number of product labels reflecting enhanced food safety attributes are indicative of a market in the early stages of development. The fragmented nature of the market means that there is ample opportunity for experimentation, with all of the risks and rewards inherent in new product development.

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