



NE-165

**PRIVATE STRATEGIES, PUBLIC POLICIES
& FOOD SYSTEM PERFORMANCE**

**Using Informational Labeling to Influence the
Market for Quality in Food Products**

by
Julie A. Caswell and Eliza M. Mojduszka

Working Paper #43

July 1996

WORKING PAPER SERIES

A Joint USDA Land Grant University Research Project

USING INFORMATIONAL LABELING TO INFLUENCE THE MARKET FOR QUALITY IN FOOD PRODUCTS

Julie A. Caswell*
Department of Resource Economics
303 Draper Hall
University of Massachusetts
Amherst, MA 01003
(413) 545-5735
(413) 545-5853 FAX
caswell@resecon.umass.edu

and

Eliza M. Mojduszka*
Department of Resource Economics
217 Draper Hall
University of Massachusetts
Amherst, MA 01003
elizam@oitvms.oit.umass.edu

Keywords: Food labeling, food quality, food safety, information

Abstract: In the United States, the federal government is increasingly using requirements for informational labeling on food products to influence 1) consumers' knowledge and purchasing patterns and 2) manufacturers' product offerings and marketing practices. We discuss the economic rationale behind these regulations and issues related to judging their success or failure.

*Julie A. Caswell is Professor and Eliza M. Mojduszka is Research Assistant, Department of Resource Economics, University of Massachusetts at Amherst. This research is funded by a USDA Cooperative State Research, Education, and Extension Service (CSREES) Special Grant to the Food Marketing Policy Center, Universities of Connecticut and Massachusetts. This paper was presented as a Principal Paper at the AAEA Meetings, July 29, 1996, San Antonio, Texas and is forthcoming in the *American Journal of Agricultural Economics*.

USING INFORMATIONAL LABELING TO INFLUENCE THE MARKET FOR QUALITY IN FOOD PRODUCTS

New technologies, scientific discoveries, information about linkages between diet and health, and the mass communication of this knowledge to consumers leads to increased demand for higher quality foods, especially in higher income countries. Food producers and retailers have responded to these changes in consumer demand by modifying and extending the variety of foods offered for sale. They are also engaging in more intensive marketing of particular attributes of food products, especially nutritional attributes; the marketing of safety attributes is also beginning to develop.

Government policies and regulations on labeling, in conjunction with input, process, and performance standards for food products, significantly influence how markets for food quality function and develop. In the United States, the federal government is increasingly using informational labeling as a means of shaping 1) consumers' knowledge, purchasing patterns, and use practices and 2) manufacturers' product offerings and marketing practices. Prominent examples are mandatory nutrition labels on all food products and safe handling labels for fresh meat and poultry. Our discussion here focuses on economic rationales for labeling policies and issues related to how the success or failure of these policies should be judged.

Food Product Quality

Product quality is usefully described, using Lancaster's approach, as a bundle of characteristics (attributes) that determine the product's performance. Major categories of food product quality attributes include food safety (e.g., levels of microbial pathogens, residues), nutritional, value (e.g., compositional integrity, taste), package, and process (e.g., animal welfare, environmental impact) attributes (Hooker and Caswell). Food quality attributes can be regarded

as having a demand and supply that interact to determine a market clearing price. The demand for food safety for example, is determined by consumers' willingness to pay for additional safety, reflecting the value placed upon the benefits that they derive. As with other goods, it is assumed that consumers are willing to pay less for each additional unit of safety (Swinbank).

In real world situations, consumers choose foods within the context of a total diet in order to obtain greater expected utility from their food. Part of that utility derives from using food to maintain or improve health status (van Ravenswaay). Consumers with different risk preferences rationally choose different bundles of foods. However, if their perceptions of the quality attributes of foods are incorrect, consumers lose utility. For example, if their perceptions of the risks or hazards associated with foods are incorrect, consumers either take more risks than they would ideally like or pay more than they should for a higher than optimal level of food safety.

Food producers will supply food quality if it is profitable for them or if they are required to do so. The contribution to profitability may stem from increased product differentiation, sales, and perhaps prices, or from avoidance of costly events such as a foodborne illness outbreak with associated tort liability. In general, the marginal cost of additional units of food quality is likely to rise. Thus the market for food quality is characterized by a rising supply (marginal cost) curve and a falling demand (marginal benefit) curve (Kinsey; Henson and Traill; Viscusi, Vernon, and Harrington). For example, the supply of safety is determined by the cost of producing incremental reductions in risk. The level of safety supplied by the market interaction of demand and supply reflects a level of risks which are acceptable, not necessarily zero. Under perfect market conditions, these curves intersect at a particular market clearing price providing the optimum level of food safety.

The above scenario assumes that all market participants are fully informed about the nature of the product, that both buyers and sellers are price takers, and finally that market prices fully reflect all the costs borne and benefits enjoyed by the society. In such a situation, the market price will transmit all necessary information, externalities will not exist, and government regulation is not required. In such a market, a variety of products with different associated quality (e.g., risk or nutrition levels) will be offered for sale at a variety of prices.

We know, however, that the market for food quality is not perfect. The most significant imperfections are that sellers are better informed about quality attributes than consumers; consumers may have misperceptions of the risks and hazards of consuming particular foods; and food quality and information about food quality may have public good characteristics. In this case, food quality (e.g., safety, nutritional quality) may be over- or under-supplied and government often intervenes in an attempt to correct imperfections or mitigate their effects.

Economic Models of Quality and Quality Signaling

The greatest leverage in understanding how consumer markets for food quality operate is gained by using the distinction developed by Nelson (1970, 1974) and Darby and Karni between search, experience, and credence goods and applying it to product attributes. For search attributes (or goods), consumers can determine a product's quality before they buy it by examining or researching the product. For experience attributes (or goods), consumers cannot determine a product's quality until they buy and use it. With credence attributes (or goods), consumers cannot determine the product's quality even after they buy and consume it. Because the information environments for these three types of attributes are so different, they pose very different issues for marketers and regulators. In addition, economic models that try to explain markets for quality can only effectively deal with one type of attribute at a time.

With search attributes or goods the main issue is product selection—the quality and diversity of goods supplied. Spence (1975, 1976) showed in his early work that the single product producer's incentive to provide quality is related to the marginal willingness to pay for quality, for the marginal consumer in the case of a monopolist and for the average consumer in the case of a competitive producer. Because of the way the market for search attributes operates, they have been a relatively minor focus of government regulatory activities. In these markets, consumer information is relatively plentiful and easily attained so consumers can protect themselves and their purchasing patterns provide direct incentives to producers to provide the range of quality consumers are willing to pay for. Furthermore, in food product markets consumers make frequent purchases and most search attributes (e.g., color) are what we term value attributes. They are not related to safety or nutrition so the consequence of consumers being temporarily misled is injuries to their pocketbooks but not to their health. Informational labeling programs are less likely to be instituted for search attributes because the market functions relatively well with respect to them.

For experience attributes, the most important issue is information and how consumers can learn about product quality. What incentives do firms have to supply quality? What prevents firms from taking advantage of imperfect information concerning product characteristics and selling poor quality commodities, which cost less to produce than high quality commodities? There is a moral hazard for the producer who sells an experience good without a warranty to one-time consumers because there is no penalty for selling inferior products. Models of markets for experience goods focus on how consumers can gain information on quality to inform their purchases. Bagwell and Riordan, for example, considered an informed consumers model where consumers enter the market sequentially. In this case, some consumers will know the quality and

some will not. Efficiency may be improved if the knowledge of the informed consumers can be used by previously uninformed consumers. Government may play a role in increasing the number of informed consumers by facilitating communication. An example would be inclusion of some form of consumer rating on product labels.

Information problems in markets for experience goods may also be mitigated if consumers make repeated purchases of a product where their choices are based on prior experience with product quality. In economic models of this situation where reputation is important, a basic result is that equilibria require price to exceed marginal cost (Klein and Leffler, Allen, Shapiro 1982, 1983). In repeated purchase situations, firms producing low quality would lose money. For the reputation mechanism to work as an incentive to firms to produce quality, consumers must have some degree of loyalty to higher quality firms. The less loyalty among customers, the higher the price has to be to prevent firms from cheating on quality.

A key factor in determining whether markets for higher quality experience attributes operate effectively is the success of quality signaling (e.g., labeling, advertising, warranties) by producers to consumers. Several quality signaling models explore how communication between sellers and consumers takes place, and as a result how markets for experience goods perform. Akerlof's classic "lemons" model deals with the case where quality signaling between sellers, who have good information on product quality, and buyers, who have poor information, is totally ineffective. In this case, a market may not exist or only the lowest quality product may be sold because of the adverse selection problem—if quality cannot be signaled, higher quality products cannot get a price premium, and only lower quality products will be offered for sale. On the other hand, Grossman's "unfolding model" predicts a smoothly operating market for experience goods when quality signaling is totally effective, costless, and truthful, and consumers can costlessly

verify quality after making their purchases. Price premiums for higher quality products encourage firms to disclose the exact quality of their products and a market exists for varying levels of quality.

Improving information (i.e., moving from the Akerlof toward the Grossman world) through means such as advertising and labeling may solve or mitigate the quality signaling problem. Whether consumers gain from being provided additional information depends on their relative transaction costs for becoming informed and how receptive they are to the messages. Using information imposes costs upon consumers. Those who attach little value to particular quality attributes may choose to ignore information about them.

Many food quality attributes are experience attributes, with the above models giving insight into the operation of markets for them. For example, attributes such as taste and cooking properties can be readily assessed by consumers during use. For these attributes, reputation models with quality signaling match how markets operate. Government is unlikely to become heavily involved in requiring informational labeling of these attributes because with repeated purchases the market can satisfactorily self-correct.

Food safety and nutritional characteristics are experience attributes in some respects. For example, if a consumer eats a particular food product and experiences a foodborne illness as a result, he or she has gained direct knowledge of the quality of that product. Several factors interfere, however, with food safety operating as an experience attribute. In many cases consumers may not be able accurately to link a particular product with an incidence of illness or even be aware of a possible link. The inability to pinpoint cause and effect makes ex post evaluation of safety as a quality attribute difficult. This is particularly true if longer periods of time intervene between consumption of a product and ill effects as may be the case with some

types of residue exposure. Similarly, the ill effects of a nutritionally poor diet occur over a period of time making links between specific products and ill effects difficult for consumers to make.

Informed consumer and reputational models of markets for experience attributes do not apply well to food safety and nutritional attributes because of the consumer's problem in forming a quality judgement. Furthermore, for food safety even if cause and effect relationships are relatively well-known (e.g., eating a contaminated product will result in illness), the probability of a product being contaminated may not be well-known. Thus it is uncertain how well one's former experience predicts future experience. For these reasons, it is useful to treat food safety and nutrition as credence attributes where the consumer has significant difficulty or cannot assess quality even after consumption.

Economic models of quality hit a dead end when they come to discussion of credence attributes or goods because information is so imperfect that these markets for quality simply do not function well. As noted above, the food safety and nutritional attributes of food are largely credence attributes. The key factor that makes them credence attributes is that it is not practicable *for individual consumers* to assess the quality of the product. For example, an individual consumer will not find it practicable to test the protein content or foodborne pathogen contamination level of his or her food. The consumer cannot measure the quality and also cannot learn it from his or her experience in consuming the product. Informed consumer and reputational models of markets for quality do not apply here. Quality signaling may still be used but requires a reputable certification agent whom consumers can trust. It is in this context that government often chooses to play a role in making it practicable for consumers to assess quality by requiring informational labeling.

Transforming Experience and Credence Attributes into Search Attributes

The presence of imperfect information, transaction costs in acquiring and using information, and externalities may make private markets for quality work inefficiently. In these cases, policy makers often look for correction tools. One of these tools can be direct government regulation of production processes or product characteristics but such regulation is often criticized as economically irrational and costly. In response to this criticism, there has been some movement away from traditional forms of regulation toward interventions that are believed to be more compatible with seller and consumer incentives. This has resulted in increased interest in techniques that ensure consumers have sufficient information to protect themselves against unsafe products or unfair seller behavior. Economists have argued that if the government has the choice between banning a risky product or activity and providing information about the risks involved, it should choose information provision (Magat and Viscusi).

Over the last decade, the government of the United States has placed a stronger emphasis on use of information provision programs as a means of influencing economic behavior. Providing additional or different information is attractive because it is a demand-led instrument, which may be effective in giving consumers the means for making better decisions. If information problems can be solved directly through informational regulation, more stringent forms of regulation such as process or performance standards will not be required. These latter approaches raise concerns because they may restrict both consumer and producer choice and increase costs unnecessarily. Quality signaling through product labeling and information disclosure requirements encourages market incentives with relatively limited government involvement, which is consistent with the regulatory philosophy of many policy makers.

Information remedies can take a variety of forms including the: mandatory disclosure of information about the nature of a product and how it should be used; controls on voluntary claims in product promotion and the use of product names; provision of public information and education; and subsidies for the provision of information. Our discussion focuses on the first two remedies and their effect on quality and quality signaling at the interface between government requirements, manufacturer response, and consumer demand. Mandatory information disclosures often garner more attention than controls on voluntary claims, but both are important and they often work in tandem.

For example, both forms of information regulation are used by the Nutrition Labeling and Education Act of 1990 (NLEA), which went into effect in 1994. Nutrition labeling is mandatory in the form of a standardized nutrition information panel that presents data on the macro- and micronutrients found in a food. In addition, voluntary nutrient content claims (e.g., low sodium, high fiber) and health claims (e.g., claims linking increased consumption of a nutrient to lower incidence of a specific disease) that are made outside the standardized information panel are circumscribed by the law. These types of voluntarily-provided information are regulated in order to prevent deception and to facilitate product evaluation by consumers. Under the NLEA, a voluntary low fat claim means the same thing whether it appears on a bag of potato chips or a can of soup and, in fact, means that the product is low fat as defined by the regulation.

Whether they mandate information or simply circumscribe voluntarily- provided information, labeling regulations result in a basic transformation of the information environment in markets for quality attributes. They do so by transforming former experience or credence attributes into search attributes. (They may also improve the information environment for search attributes themselves.) Mandatory disclosures, for example, make it practicable for consumers to judge

quality before purchasing a product by establishing a quality scale, requiring testing of quality, and mandating a reporting format. Regulation of voluntary claims serves similar purposes. The monitoring and enforcement activities of the government then attempt to ensure that the disclosures made are truthful and credible. For example, mandatory nutrition labeling makes characteristics such as fat content into search attributes that can be verified by reading the package label, while government oversight of claims increases their credibility. Thus labeling policies are intended to improve the quantity, and often the nature, of quality signaling in markets in order to improve the functioning of markets for quality attributes.

Informational labeling for food safety attributes is currently in an early stage of development. As with nutrition, labeling of food safety attributes transforms credence into search attributes, although several special circumstances make the information environment for food safety distinct from that of nutrition. One of these circumstances is that some food safety attributes such as foodborne pathogen levels can change considerably after the product leaves the processing plant raising questions about the point at which quality should be measured and labeled. Another is whether labeling of safety levels is acceptable to policy makers, food companies, and consumers.

Labeling to inform users about recommended food handling practices is yet a different case. For example, in the wake of the *E. coli* O157:H7 outbreak in the western United States in early 1993, the U.S. Department of Agriculture required all fresh meat and poultry products to carry safe handling labels. These labels communicate safe handling practices including recommended storage, cooking temperature, and sanitation practices. They do not differentiate between beef products, for example, because all products carry the same label, but may serve to differentiate between meat products in general and other food products that do not carry specific handling instructions. How this type of informational labeling functions in practice as a quality signal

depends on whether consumers interpret it as an indicator of poor quality (e.g., the product poses a significant risk) or simply as a reminder to use good kitchen practices.

Are Labeling Policies Effective?

How do the changes labeling policies make in the information environment affect the market for quality in food products? And how do those changes in markets affect the ultimate targets of policy such as the health status of consumers? A significant problem with evaluating the effectiveness of informational labeling requirements is that the programs are often complementary to or coincidental with other forces influencing markets for quality. Measuring a separate, distinct effect for labeling programs is difficult in these circumstances.

For example, markets for nutritional quality were already changing significantly prior to implementation of the NLEA in 1994. Ippolito and Mathios found that in the late 1980s consumers were changing their purchasing patterns for ready to eat cereal as they became informed of the health benefits of cereal consumption and that advertising was an important source of information. Frazão and Allshouse used scanner data for the years 1989-1993 to document strong growth in the availability of nutritionally-improved versions of foods in 37 food categories. Zarkin and Anderson suggest that the direction and magnitude of demand changes as a result of implementation of the NLEA depend on whether consumers initially over- or underestimated the nutrient content of foods. However, distinguishing the impact of nutrition labels from that of other factors such as press coverage of links between nutrition and health or doctors' recommendations is difficult. Research that attempts to do just that is underway.

A second complicating factor in evaluating labeling policy is that it influences markets for quality in a variety of ways. Caswell and Padberg argued that the role of labeling should be viewed in a much broader sense that goes beyond its influence as a direct shopping aid for

consumers. These roles include influencing product design, advertising, consumer confidence in food quality, and consumer education on diet and health.

Finally, relationships between levels of consumer information and behavior are complex. For example, extensive work by Viscusi and Magat (1987, 1992) examined how people alter their behavior in response to hazard warnings and risk labeling in a variety of settings. Their findings provide specific directives for when different types of information provision instruments are effective and when they are not, as well as which kinds of instruments will have the greatest impact. The implications of this and other empirical and theoretical research on policies that provide information is that labels can change consumers' levels of understanding about quality attributes and alter their consumption behavior. However, variation across consumers in their responses to the information can be expected.

We think informational labeling requirements are likely to have a significant impact on demand patterns and the dynamics of markets for food quality. As information about product quality and use characteristics improves, manufacturers will compete for market shares from sales to attribute-conscious, label-using consumers. Products and industries with less desirable quality profiles may reformulate or redesign processes to avoid unfavorable comparisons with other products. As labeling solutions to information problems in markets for food product quality are relied upon more heavily, it is important to make the ex post effort to evaluate what impact this informational labeling is having.

References

Akerlof, G. A. "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism."

Quarterly Journal of Economics 84 (1970):488-500.

Allen, F. "Reputation and Product Quality." *Rand Journal of Economics* 15 (1984):311-327.

Bagwell, K. and M. Riordan. "Equilibrium Price Dynamics for an Experience Good." Discussion Paper 705 (1986), CMSEMS, Northwestern University.

Caswell, J. A. and D. I. Padberg. "Toward a More Comprehensive Theory of Food Labels."

American Journal of Agricultural Economics 74 (1992):460-468.

Darby, M. R., and E. Karni.. "Free Competition and the Optimal Amount of Fraud." *Journal of Law and Economics* 16 (1973):67-88.

Frazaõ, E. and J. E. Allshouse. "Nutritionally Improved Foods in Grocery Stores: 1989-93." In *The Economics of Reducing Health Risk From Food*, J. A. Caswell, ed., 149-161. Storrs, CT: Food Marketing Policy Center, 1996.

Grossman, S.J. "The Informational Role of Warranties and Private Disclosure about Product Quality." *Journal of Law and Economics* 24 (1981):461-489.

Henson, S. and B. Traill. "The Demand for Food Safety, Market Imperfections, and the Role of Government." *Food Policy* 18(2 1993):152-162.

Hooker, N. H. and J. A. Caswell. "Regulatory Targets and Regimes for Food Safety: A Comparison of North American and European Approaches." In *The Economics of Reducing Health Risk From Food*, J. A. Caswell, ed., 1-17. Storrs, CT: Food Marketing Policy Center, 1996.

Ippolito, P. M. and A. D. Mathios. "Information, Advertising, and Health Choices." *Rand Journal of Economics* 21 (1990): 459-80.

- Kinsey, J. "GATT and the Economics of Food Safety." *Food Policy* 18(2 1993):163-176.
- Klein, B., and K. Leffler. 1981. "The Role of Market Forces in Assuring Contractual Performance." *Journal of Political Economy*, 81:615-641.
- Lancaster, K. *Consumer Demand: A New Approach*. New York, NY: Columbia Univ. Press, 1971.
- Magat, W. A. and W. K. Viscusi. *Informational Approaches to Regulation*. Cambridge, MA: MIT Press, 1992.
- Nelson, P. "Advertising as Information." *Journal of Political Economy* 81 (1974):729-754.
- Nelson, P. "Information and Consumer Behavior." *Journal of Political Economy* 78 (1970):311-29.
- Shapiro, C. 1983. "Premiums for High Quality Products as Rents to Reputation." *Quarterly Journal of Economics*, 98:659-680.
- Shapiro, C. 1982. "Consumer Information, Product Quality, and Seller Reputation." *Bell Journal of Economics*, 13:20-35.
- Spence, M. "Product Differentiation and Welfare." *American Economic Review* 66 (1976):407-414.
- Spence, M. "Monopoly, Quality, and Regulation." *Bell Journal of Economics* 6 (1975):417-429.
- Swinbank, A. "Industry Note: Completion of the EC's Internal Market, Mutual Recognition, and the Food Industries." *Agribusiness* 9(5 1993):509-522.
- van Ravenswaay, E. O. "Valuing Food Safety and Nutrition: The Research Needs." In *Valuing Food Safety and Nutrition*, J. A. Caswell, ed. 3-26. Boulder, CO: Westview Press, 1995.
- Viscusi, W. K. and W. A. Magat. 1987. *Learning about Risk: Consumer and Worker Responses to Hazard Information*. Cambridge, MA: Harvard University Press.

Viscusi, W. K., J. M. Vernon, and J. E. Harrington, Jr. *Economics of Regulation and Antitrust*,
2nd Edition. Cambridge, MA: MIT Press, 1995.

Zarkin, G. A., D. W. Anderson. "Consumer and Producer Responses to Nutrition Label
Changes." *American Journal of Agricultural Economics* 74 (1992):1202-1207.