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# Food Safety Policy Fights: A U.S. Perspective

Julie A. Caswell

Perspective is very important in understanding the area of food safety. This importance is illustrated by a favorite cartoon of mine that features an older, experienced mouse giving advice to a young mouse. The older mouse, in wrapping up, says to the younger, "... and stay away from scientists—they cause cancer." Facing an avalanche of information on links between diet and health, consumers may, in frustration, sympathize with the mouse's view, and are having some difficulty sorting out which are the important cause-and-effect relationships. Government and industry also are struggling to develop a coherent approach to food safety and nutrition.

Here, I stretch the term food safety to cover all linkages between diet and health, including traditional safety concerns (e.g., microbial contamination, pesticide residues, additives, naturally occurring toxicants, and environmental contaminants), as well as the increasingly prominent area of links between dietary composition and health (e.g., between dietary fiber and cancer). In the United States, both types of diet-health linkages have been front-page news throughout the late 1980s. A short review of some key events will serve to set the stage.

In 1985 the largest recorded outbreak of salmonella-related food poisoning in the United States occurred in the Chicago area when, it is believed, unpasteurized and pasteurized milk were mixed in a processing plant owned by the Jewel Companies, a supermarket chain. There were over 16,000 confirmed cases of salmonellosis as a result and experts believe more than ten times that number were actually affected (Ryan et al.). In 1986 the U.S. General Accounting Office (1986a, 1986b) released two reports concluding, in effect, that the Food and Drug Administration's (FDA) inspection system for pesticide residues in domestic and imported food was woefully inadequate.

In 1987 the television show "60 Minutes" aired a report, considered infamous in the eyes of in-

dustry (which believed it was inflammatory), on the presence of salmonella bacteria in chicken products. Growth in the demand for chicken products slackened after the report (Charlier). First appearing in 1984, the number of health claims on food products exploded after 1987 as the Reagan administration reversed previous policy, which had effectively outlawed such claims. The most noticeable result, perhaps, has been the oat-bran craze. More importantly, however, large numbers of food products now carry health claims, either explicit (e.g., diets high in fiber have been shown to reduce the risk of colon cancer) or implicit (e.g., no cholesterol). The piece de resistance of the decade's growing focus on diet-health linkages came in early 1989 with the Natural Resources Defense Council's well-orchestrated release of its report "Intolerable Risk: Pesticides in Our Children's Food." \* Accompanied by a "60 Minutes" segment and extensive media coverage, the release caused a panic among consumers, especially parents, in regard to the presence of residues of the growth regulator Alar in fresh apples and processed apple products.

These events are a small sample from a much larger set. Understanding of this set of events is often overwhelmed by the number of safety and nutrition issues involved; the amount of coverage the issues have received; the number of players involved, including consumers, firms, state governments, and federal agencies; and the intricacies of federal law. To cut through this confusion, I focus here on what I consider to be the bedrock questions facing public policies and private (consumer, firm, and interest group) strategies in the area of food safety and nutrition. To do so, we turn first to an overview of the demand for and supply of food safety in the U.S. and then focus on the common denominators of the related policy choice problems. These common denominators define the food safety policy fights of the 1980s and 1990s.

## The Demand and Supply Picture

Food safety and nutrition are prominent issues in the U.S. today because of the convergence of sev-

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eral demand and supply factors. First, we know much more scientifically about the links between diet and health than we did in the past. Second, the typical household's expertise in food handling and preparation appears to have declined, particularly with the demise of the full-time homemaker who specialized in such knowledge. Third, the makeup of the food supply has shifted toward products that may pose greater food safety risks: chicken, fish and shellfish, imported produce and processed products, chilled foods, micro waved products and leftovers, and restaurant-prepared meals. And, fourth, the U.S. regulatory system probably deteriorated absolutely, and certainly relative to the task at hand, in the 1980s.

This latter point is particularly important in understanding the food safety environment in the U.S. today. Media reports indicate that the number of resources devoted to food safety fell during the 1980s (Burros, *Time*). Nevertheless, from their perspective, government and industry officials argue, with substantial justification, that the U.S. food supply is among the safest in the world. Consumers, and those who do advocacy on their behalf or in their name, however, may not, from their perspective, find such comparisons relevant. They compare current safety levels to desired levels and find the system inadequate on that basis. Thus, the key to the 1980s is not whether the food safety system operated well in absolute terms (it actually probably deteriorated somewhat), but how it operated relative to desired levels of performance, which were increasing. This comparative issue will be returned to shortly.

What does demand for food safety look like? What are the desired levels of safety? Much work is currently being done developing economic models of consumer (or private) demand for food safety and nutrition. This work focuses on incorporating food-related risk considerations into consumer decision making (e.g., Zellner; Choi and Jensen; Falconi and Roe). Generally, the riskiness (or alternatively, the healthfulness) of a food product becomes an argument, either directly or indirectly, in the expected utility to be derived from consumption of the product. Attention is then focused on how to characterize the risk-based component of demand. What is it that consumers worry about in regard to food safety and nutrition? How do they form, and subsequently update, their beliefs about the risk associated with consuming particular products? Given that consumers evaluate food products based on multiple attributes (taste, convenience, prestige, etc.), to what degree do these risk beliefs ultimately affect demand?

While these models attempt to understand pri-

vate demand for food safety and nutrition, food has complex characteristics that generate a public demand as well. Food consumption itself is a private good in that one person's consumption excludes that of another. But there are externalities associated with food consumption that generate a public demand for food safety and nutrition. These externalities, associated with acute illnesses (e.g., salmonellosis) or chronic disease (e.g., arteriosclerosis), include burdens on the health-care system and productivity losses to the economy (Roberts; Roberts and Pinner). The social demand they generate underlies government regulation in this area.

A second foundation of public demand for government regulation is the existence of imperfections and failures in markets for information on food safety and nutrition attributes. Food is traded in markets characterized by imperfect and asymmetric information, since many attributes of the product are not readily observable before purchase or sometimes even after consumption (Zellner). Improving information availability is a major rationale for government activity.

Finally, public demand is generated because it is being increasingly recognized by government and industry that food safety and nutrition have important public good and joint production characteristics. The public good here is a specific type of information—confidence in the safety of the food supply—the use of which is nonexclusive. This confidence is jointly produced by industry and government, and there is a temptation for firms to free ride by underproducing safety believing that any costs in terms of reduced confidence will be spread over all firms. Alternatively, in this situation, firms may try to use brand names in order to turn confidence into a private good. Rarely, however, can a firm insulate itself from the effects of other firms' and the government's actions in the same market.

Thus, we have both private and public demand for food safety and nutrition, and private and public supply. Much confusion arises from the failure to distinguish carefully and understand fully the relationships between these different sources of demand and supply. The next section offers a common-denominators framework for analyzing the key food safety and nutrition policy issues.

### **The Common Denominators of Food Safety Issues**

The demand and supply situation boils down to two common questions that apply to all food safety and nutrition issues. This first question is, "Who

sets the standards and what form do they take?" This is the standard-setting function that reflects demand for food safety. The second question is, "Who enforces the standards and what form does the enforcement take?" This is the enforcement function that reflects the supply of food safety.

In the U.S., there are diverse answers to the question of who sets and enforces standards. The who may be private parties (consumers, firms, groups of consumers or firms), the federal government, or state governments. It is useful to look at this question in the format of a grid, as shown in Figure 1, where all combinations are possible and more than one combination can coexist. Examples will help to illustrate the cells. An example of private standard setting and private standard enforcement is in the area of cholesterol intake. Currently there are no U.S. government standards regarding the cholesterol content of foods.<sup>1</sup> Many individuals, however, have chosen to limit their cholesterol intake in light of links between cholesterol and heart disease, and based on the recommendations of health professionals. These people set private standards and engage in self-enforcement, passing up super-premium ice cream and buying fat-free frozen yogurt.

Regulation of additives in the food supply is an example of federal standard setting and enforcement. The PDA reviews all such additives, classifying them as Generally Recognized as Safe for intended uses or as approved food additives. Additives that have not been approved for use by the PDA are not available to the consumer, regardless of whether he or she would, based on his or her own private standards, like to use them.

The final diagonal cell, state standard setting and enforcement, is illustrated by California's Proposition 65, the Safe Drinking Water and Toxic Enforcement Act of 1986 (Phipps, Alien, and Caswell). Proposition 65 establishes a duty to warn consumers before exposure to substances that pose cancer or reproductive risks.<sup>2</sup> Thus, within California this state law establishes and enforces information standards. In reality, the management of most food safety and nutrition problems spans more than one cell, with private and government actions being intertwined.

Some background on major categories of food safety and nutrition concerns at this point will be

**Figure 1. Grid of Potential Decision-Making Patterns for Food Safety and Nutrition Issues**

		Standard Setting		
		Standard Enforcement	Private	Federal Govt. State Govt.
Private	Cholesterol			
	Intake			
		Federal government	Additives	California's Proposition 65
		State government		

helpful in the further discussion of crosscutting issues that follows. These concerns are commonly grouped into six areas. Of these, experts typically rank microbial contamination and nutritional imbalances (e.g., too much fat, too little fiber in the diet) at the top of their list of concerns. They are followed, some distance back, by naturally occurring toxicants (e.g., aflatoxin) and environmental contaminants. Even further back on the list are pesticide residues and food additives. The U.S. regulatory framework for handling these concerns is complex, with the Food and Drug Administration (FDA), the U.S. Department of Agriculture (USDA), and the Environmental Protection Agency (EPA) all having jurisdiction in different areas. Of course, private parties are also very active in providing food safety and in influencing government regulation of these concerns. As private and public parties attempt to manage these six areas of concern, they repeatedly come up against the same set of issues. We turn now to three of these crosscutting issues.

*What Standards Should Be Set? Risk Assessment and Risk Perception*

For each of the six food safety and nutrition concerns, the bedrock question is, "What standards should be set?" This decision is complicated by the difference between formal risk assessments and the informal risk perceptions held by individuals. In the U.S. regulatory system, the developing science of quantitative risk assessment is the basis for generating the underlying data necessary for making standard-setting decisions. These risk assessments are probabilities attached to the likelihood of the occurrence of illness, injury, or death based on epidemiological or experimental data (e.g., Lave, National Academy of Sciences).

The key characteristic of these assessments is their probabilistic nature. They are probabilistic in at least two senses. First, the outcome of the risk-assessment process is commonly stated in terms of a probability; for example, the chance of getting cancer over a lifetime from eating food with resi-

<sup>1</sup> However, standards of identity for food products may indirectly dictate the amount of cholesterol in a food product. For example, butterfat standards for ice cream result in cholesterol being present in most of these products. The labeling of cholesterol content is also regulated.

Under current implementation regulations, Proposition 65 has not been applied to food, but a recent state court case may soon force such an application.

dues of a particular pesticide is one in one million, or  $10^{-6}$ . Second, the data which underlie the risk-assessment outcome commonly require numerous assumptions which have confidence intervals attached to them. With epidemiological data, for example, risk assessment might focus on the incidence of outbreaks of foodborne illness in the U.S. in a particular year. Since not all cases will be reported, and indeed many people who suffer such an illness will simply think they have the flu, scientists must extrapolate from the reported cases to estimate the true incidence in the population (Roberts and Foegeding). Experimental data require even greater extrapolation because they involve making predictions of human health impacts based on feeding studies conducted on animal species. Such studies are a frequent target for attack by critics and consumers alike since they conjure up visions of rats fed the equivalent of hundreds of cans of artificially sweetened soda per day.

Although very lively debate is ongoing over the details of risk assessment, there is widespread agreement on methodology and little doubt that such information is of great use in making regulatory decisions. After this point, however, all is contention. Even if we all agree on a quantitative risk assessment, say that 3 people in 10,000 would get cancer after lifetime exposure to a particular natural toxicant, we still must decide whether that risk is low, medium, or high, and more importantly, whether it is acceptable or unacceptable. Some leverage can be gained on the low/medium/high issue through comparison of risks across products and activities. However, such cross comparisons offer relatively little leverage in determining whether a risk is acceptable. Researchers have found that risk has multiple characteristics that influence whether it is acceptable, only one of which is represented by the information contained in a quantitative risk assessment. Also important are characteristics such as personal control over exposure, observability, newness, and whether the risk is dreaded (Fischhoff et al.). Consumers, for example, may be willing to accept a higher risk when it is associated with a product that they perceive as having substantial benefits. This appears to have been the case with saccharin, which Congress left on the market despite its carcinogenic potential because it was the only artificial sweetener available at the time. Consumers also may be willing to accept higher risks for exposures they can control versus those they cannot.

Experts often express frustration that consumers' ranking of the importance of the six food safety and nutrition concerns is inverted from that of the experts. Part of this gap between consumers' per-

ceived risk and the actual scientific risk assessment is no doubt due to consumers being relatively ill informed about the actual probabilities. If this were all there is to it, then an educational program would serve to align the risk assessment and perception. But the gap is also due to consumers caring about a broader range of risk characteristics than is captured in the risk assessment.

In practice, consumer demand is based on perceived risk, not on a quantitative risk assessment. Consumers are apparently quite aware that what counts is the quality and composition of the overall diet. Thus we have the phenomenon, leaving him or her open to ridicule by those who value consistency, of a person avoiding beef products because of their fat and cholesterol content but indulging in super-premium ice cream. Moreover, consumers appear willing to make selected "deals with the devil," thinking that if they reduce risk in one area, then maybe they will not suffer any ill consequences from increased risk in another. Here we can observe a person who would not eat an apple treated with Alar but consumes raw shellfish and enjoys dining at his or her favorite sushi bar. Thus, the gap between risk perception and risk assessment is due to differences in information on and evaluation of risks and, I am convinced, to an element of making deals with the devil.

Both government and private parties must make leaps from scientific risk-assessment information to risk perception to standard setting, with the standard setting embodying the decision on what is acceptable risk. *The fight* in the 1980s and 1990s in regard to standard setting is focused on defining acceptable risk. No one would argue that the federal government's current acceptable risk standards are consistent. The various pieces of legislation, including the Delaney clause, which dictates a zero risk standard with regard to cancer, dictate different standards, and many substances remain effectively grandfathered under less-stringent older standards. In the late 1980s, these inconsistencies have been particularly evident in the treatment of pesticide residues, where the risk standard applied varies depending on whether the residue is in a raw product or concentrates in the processing of a finished product (National Academy of Sciences). This rather embarrassing situation has led to recommendations aimed at standardization of acceptable-risk benchmarks across areas. One such attempt is the EPA's proposal to institute a negligible-risk standard for all its pesticide-residue-related decisions. This standard would be set at a one-in-one-million lifetime risk in most cases. Attempts at standardization are extremely contentious, however, because they may be viewed as attempts to adopt a lowest com-

mon denominator, reducing the protection consumers receive.

Government risk standards provide an important floor or bench mark in all areas of food safety and nutrition. Private parties are then free to institute their own higher standards over the products they grow, process, and consume. Thus, while the EPA sets maximum residue standards for pesticides in food, many Americans buy organic foods, which have no such residues and thus meet a stricter standard. Many of the clashes over food safety and nutrition issues in the 1980s were caused by shifting standards of acceptable risk. In particular, U.S. consumers' risk tolerance is decreasing in the area of food safety and nutrition. The conflict we see is a struggle among consumers, consumer advocates, business, and government for the upper hand in defining acceptable risk standards and adjustment by industry and government to these new standards.

#### *How Should Risk Standards Be Implemented? Banning Versus Information Strategies*

The second issue which cuts across all areas of food safety and nutrition concerns is, "How should risk standards be implemented?" The range of government policy choices is large with many nuances but can be boiled down to two basic options. Under the first option, government standards act as a floor. In this case, any product that does not meet the standard is declared illegal for sale. In shorthand, we can refer to this as the 'banning strategy'. The second option is for government standards to serve as a bench mark, with regulation focused on the supply of information to consumers regarding the food safety or nutrition attribute in question. In shorthand, we can refer to this as the "information strategy." Both strategies are widely used by government and have different implications for private markets for food safety and nutrition.

The banning, or floor, strategy is attractive where the risks associated with the substance in question are high enough that no fully informed consumer would buy the product, the attributes involved are difficult for consumers to evaluate, or there are substantial externality costs associated with its use. Through setting and enforcing standards, government can assure that a minimum level of safety or nutritional quality is delivered to all consumers. Examples of this approach can be found in all six areas of food safety and nutrition concerns, although the actual means of implementation vary. Standards for microbial contamination, for instance, are enforced through an extensive system of plant inspection and final product sampling con-

ducted by the PDA and the USDA, while standards for additives are enforced through an PDA approval system.

Banning strategies usually limit firm and consumer behavior to a greater extent than do information strategies. The latter strategies involve government regulation of the supply of information to consumers regarding food safety or nutrition attributes. For example, the federal government periodically publishes nutritional guidelines for the American people. Food sold in the U.S. is not required to conform with these guidelines in any way nor are consumers' diets monitored for compliance. To further the acceptance of these standards (as well as for other reasons such as preventing deception), however, the government has extensive labeling regulations that are intended to provide consumers with the information necessary to follow the nutritional guidelines.

It is key to understand that in virtually all areas of food safety and nutrition regulation, mixed banning and information strategies are used. For example, the federal government has pesticide-residue standards for food that act as a floor, which if violated make a product illegal for sale. Beyond this, for products that are marketed as containing lower residues (e.g., organic produce), information regulation applies. Any claims made relative to the product cannot be deceptive, and use of terms such

*The fight* in the 1980s and 1990s over how standards should be implemented is focused on both the mix of banning and information strategies used and the level of enforcement of each. The hallmark of the Reagan administration was deregulation, which in practice meant either lessened enforcement of existing laws, a shift from banning strategies toward information strategies, or both. In any case, more reliance was placed on private markets to provide food safety, nutrition, and information on these attributes to consumers.

The regulatory changes of the 1980s created a new environment for food growers, processors, distributors, and retailers (Caswell and Johnson). Increased consumer awareness of and concern about diet-health linkages coincided with a relaxed regulatory environment. Thus, there was increased demand for food safety and nutrition at the same time that government supply decreased. In addition, the Reagan administration's decision to allow health claims on food products made it much easier for firms to market the safety and nutrition-related characteristics of their products and services.

Together these factors have ushered in a new era of differentiation of food products and retail services based on safety and nutrition. Many firms

have jumped at this opportunity for setting and enforcing private standards. There is no doubt in my mind that many aspects of this increased reliance on markets have been beneficial to consumers by increasing the range of products and information available. But there is also little doubt in my mind that these gains have been jeopardized by the failure of the federal government to adequately regulate labels and advertisements.

An increased reliance on market forces, particularly information, requires that careful attention be paid to the rules of the game to ensure that these forces generate the desired levels of performance. Increasing the scope of differentiation based on food safety and nutrition means that, since these are attributes desired by the consumer, there will be strong temptations for firms to stretch the truth in order to claim these characteristics. Thus, increased reliance on information strategies must be coupled with strong regulation of label claims and advertising to prevent deception. Here, the PDA, which regulates label claims, and the Federal Trade Commission (FTC), which regulates advertising, fell down on the job during the 1980s. With a strong belief in the capacity of markets to self-correct and in consumers' ability to wade through and discount deceptive claims, the PDA and FTC brought few deception cases against major food products. Thus we have been experiencing a virtual free-for-all, with the Bush administration just beginning to show signs of reining in the situation.<sup>3</sup>

Recent regulatory initiatives by the Bush administration indicate that the pendulum is swinging back toward increased regulation, or reregulation. But where possible, this reregulation is likely to be based on the use of information, rather than banning strategies. This means that there will continue to be strong private markets for food safety and nutrition, with firms engaging in differentiation to serve these markets. For all intents and purposes, the genie is out of the bottle and the food industry, from farmers to retailers, will have to learn to operate in a market where food safety and nutrition are important bases of competition.

It is important to note that not all segments of industry have taken to the current era of deregulation and differentiation with equal enthusiasm. Some of industry is still reeling from these developments. Many believe that society benefited from the presumption that all food available on the mar-

ket is safe and that differentiation based on safety creates higher costs with no real benefit in terms of improved health status for consumers. Others simply do not want to compete on the basis of food safety and nutrition. They may feel that setting and enforcing risk standards is beyond the scope of their expertise and should be handled by government, or they may be comfortable with the current bases of rivalry in their industry and not wish to have their boats rocked. It behooves firms and industry associations that oppose these developments to scrutinize the basis of their objections. Their arguments will be on much more solid footing if they can argue that their opposition is based on a belief that more reliance on government regulation is desirable rather than on simply protecting their turf.

#### *Who Should Set and Implement the Standards?*

The final crosscutting issue is, "Who should be responsible for setting and implementing safety and nutrition standards?" This issue is, of course, closely linked to the previous two because standard setting and enforcement are so closely tied to the party who carries them out. As noted earlier, the major candidates are the federal government, state governments, or private parties (firms, consumers, and their associations).

A major source of conflict is the division of responsibility for food safety and nutrition regulation between the federal and state governments. As the federal regulatory system stumbled in the 1980s, the states were quick to step into the breach, becoming active in a number of areas where federal law does not expressly preempt their activity. Examples of areas regulated include warning labels (e.g., California's Proposition 65), deceptive advertising, sale of irradiated food, and point-of-purchase information on pesticides used on fresh fruits and vegetables. States have traditionally enjoyed a fair degree of latitude in establishing such regulations (Caswell).

Industry has not been pleased with the fruit of this new federalism. Firms and trade associations argue that costs associated with the resulting fragmentation of the national market far outweigh any benefits to consumers from such state regulation. As changes in federal regulatory programs are considered, industry groups are pushing hard to get explicit preemption of state regulation written into legislation and federal agency regulations. They appear willing to trade somewhat stricter federal regulation for federal preemption. However, this trade fails to satisfy state governments, consumer advocates, and environmental activists. An attempt

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Several states have been active, in the breach, in pursuing deceptive advertising cases against food products. They have won agreements to revise or withdraw advertisements from Campbell Soup, Kellogg, and Nabisco.

in 1986 at sweeping reform of the federal pesticide law failed, in part, because of disagreement on this point.

The second key conflict in this area is over the degree to which private parties should be relied on to set and implement food safety and nutrition standards. In other words, how well do private markets for these attributes work? Because of the externality and public-good characteristics of food products, many individuals, including some in industry, are skeptical about further increased reliance on private markets.

The fight in the 1980s and 1990s over who should set and implement standards has thus largely focused on attempts to suppress the states' increasing involvement in regulation of food safety and nutrition. I believe this is, in large part, a losing cause because the states want to retain the right to provide consumer protection and do not trust the federal government to do an adequate job. They have allies in Congress who will support their cause. Firms are likely to be dealing with more fragmented markets as a result of successful state regulatory efforts.

#### *A. Fight Summary: The Case of Health Claims*

The fights over food safety and nutrition policy in the 1980s, and as they carry over with full force into the 1990s, are here highlighted by a briefcase study of health-claims regulation. In defining acceptable risk, government agencies and private parties worked hard during the 1980s to develop a consensus on accepted relationships between dietary composition and health. This led to the development of a series of dietary recommendations that appeared throughout the decade.

Regulation of health claims for food products reflected the general shift away from banning toward information strategies. President Reagan's decision to allow such claims reversed the prior regulatory strategy that had banned them. In the case of health claims, this shift was not accompanied by increased federal efforts to regulate deception, resulting in a virtual free-for-all situation in which several states attempted to step in. The states' efforts to regulate claims have led to attempts to suppress state involvement. It is not clear at this writing whether new health-claims policies being written in Congress and the PDA will include preemption language.

Finally, ambivalence about increased reliance on private markets is evident in the area of health claims. Secretary of Health and Human Services Louis Sullivan, for example, said in early 1990

that he believed that regulation of health claims in the late 1980s had been too lenient. Reregulation is almost a certainty, but we are not likely to return to a ban on health claims. Much more likely is a continued reliance on information-based regulatory strategies, albeit coupled with closer regulation of the content of information provided to consumers through labels and advertising.

### **Conclusions/Predictions**

Food safety and nutrition are pivotal issues in the food system today because debate over them articulates values associated with the environment, production agriculture, government restrictions on private business operations, the role of government as protector, and consumer choice. What will the food safety and nutrition picture look like in the future? My predictions are as follows. U.S. consumers' tolerance for risk associated with food safety and nutrition will continue to decrease (in other words, their standard for acceptable risk will become stricter). This will be reflected in a retreat from the lax regulatory environment of the 1980s. But, where possible, government will use information strategies that give more choice to consumers in preference to banning strategies. This will put a premium on effective regulation of label claims and advertising in order to prevent deception.

Even as regulation tightens, we will not be returning to the pre-1980s regulatory environment. There will continue to be strong private markets for food safety and nutrition, with firms engaging in differentiation to serve these markets. Firms and industries that wish this were not true must recognize that the genie is out of the bottle and must learn to compete on these bases. Those firms and industries clamoring for uniform national standards may be disappointed as attempts to trade national food law reform for federal preemption are largely unsuccessful. Firms are likely to be dealing with a more fragmented market due to state regulation and, perhaps more importantly, due to market segmentation based on consumers' responsiveness to the marketing of safety and nutrition attributes. This, from my perspective, is the outline of the food safety and nutrition environment in the 1990s.

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