

IV. Market Failure in the Supply of Traceability: Industry and Government Response

It is not surprising to find systematic variation in traceability systems across sectors of the food industry because the costs and benefits of traceability vary systematically. Each sector has confronted different motivations for and constraints to erecting traceability systems. Different food safety problems, supply management concerns, and demands for credence attributes have motivated different sectors of the food industry to build traceability systems that vary in breadth, depth, and precision. Differences in product characteristics and infrastructure have led to differences in traceability costs that have also influenced the breadth, depth, and precision of the different systems.

Variation in traceability systems tends to reflect an efficient balancing of private costs and benefits. Are there, however, cases where variation actually signals market failure? Does the private sector supply of traceability fail to satisfy important social objectives?

The economic literature on market failure suggests that insufficient traceability in food markets could arise as a result of asymmetric or missing information problems in markets for food or as a result of externality or public good aspects of traceability. We find that though these possibilities arise, they do not typify the three food sectors we investigated. In all three food sectors, the private sector has developed methods to address costly market failure problems. We do find, however, that public good aspects of traceability may result in a less than optimal supply of traceability for identifying contaminated food once it has been bought and consumed. In the sections below, we examine areas of potential market failure and industry and government response.

Market Failure and Differentiated Markets for Quality and Safety

Though firms have an incentive to use traceability systems to help generate information on credence attributes of value, they do not have an incentive to generate information about credence attributes that are not of value or have a negative value. As a result, the market may produce too little information about negative attributes. This potential is mitigated through the process of competitive disclosure. For example, though a food product may not sport a “high fat” label, the fact that rival brands are labeled “low fat” may lead consumers to conclude that

the unlabeled product is in fact high in fat. This competitive disclosure, which Ippolito and Mathios (1990) named the “unfolding” theory, results in explicit claims for all positive aspects of products and allows consumers to make appropriate inferences about foods without claims.

However, competitive unfolding tends not to work when an entire product category has an undesirable characteristic that cannot be changed appreciably or for which the costs of alteration are too high, or where disclosure of the attribute may have negative repercussions. One area where product differentiation may be lacking is food safety. Very few firms seek to differentiate their product for consumers with respect to food safety (Golan et al., 2004). This may reflect the fact that foodborne pathogens are a commonly shared problem that is difficult to control with precision (Roberts et al., 2001). Firms may want to avoid specific safety guarantees that could expose them to additional liability because there is always the possibility that even the most careful producer could experience a safety problem. As a result, even the best producers may refrain from marketing safety to final consumers or trying to differentiate themselves from less safe producers.

Firms may also shy away from differentiating themselves and their safety records through traceability or other mechanisms if there is value in some level of anonymity (Starbird and Amanor-Boadu, 2003). If traceability systems increase the probability that a firm will be identified as a source of food safety problems and exposed to liability and bad publicity, then the firm may have an incentive to remain anonymous even if it has a good safety record. The benefits of product differentiation may not outweigh the costs of being more easily linked to a food product in the case of safety problems. In these cases, the market solution results in less disclosure than desired by consumers or less traceability than is socially optimal.

The amount of traceability offered by private firms for product differentiation may also be less than socially optimal if the benefits to the firm of establishing traceability for credible product differentiation is dampened by the existence of partial disclosure and innuendo. In some cases, the possibility of deception may erode producers’ incentives to establish traceability systems because widespread deception makes consumers doubt the veracity of claims made by all producers, even honest

ones. For some honest producers, the benefits of overcoming this high degree of consumer doubt will not outweigh the costs. For example, prior to the introduction of national organic standards, the proliferation of organic standards and labels—some more “organic” than others—may have made it difficult and costly for true organic producers to differentiate their product. Since credence attributes are inherently difficult to verify, they may be especially susceptible to fraud and unfair competition.

Industry Efforts To Bolster Differentiation

In the three food sectors we investigated, producers seem to be responsive to consumer demand for product differentiation. When consumer demand was strong enough to cover the cost of product differentiation, producers responded with new products and new traceability systems to substantiate credence attribute claims. While producers have difficulties marketing safety attributes directly to consumers, producers routinely market safety at earlier stages in the supply chain. The rich variety of differentiated products for sale in the fresh fruit and vegetable, grain, and livestock and meat sectors of the food industry—and the size and diversity of the industry—argue against the conclusion that market failure is stifling product differentiation in any of these markets. And, where market failure may have begun to emerge with respect to credence attributes, individual firms and industry groups have developed systems for policing the veracity of credence claims and for creating markets for differentiated products. Third-party safety/quality auditors are at the heart of these efforts.

Third-party entities (neither the buyer nor the seller) provide objective validation of quality attributes and traceability systems. They reassure input buyers and final consumers that the product’s attributes are as advertised. Third-party verification of credence attributes can be provided by a wide variety of entities, including consumer groups, producer associations, private third-party entities, and international organizations. For example, Food Alliance and Veri-Pure, private for-profit entities, provide independent verification of food products that are grown in accordance with the principles of sustainable agriculture. Third-party entities certify attributes as wide ranging as kosher, free-range, predator-friendly, no-hormone use, location of production, and “slow food.”

Governments can also provide voluntary third-party verification services. For example, to facilitate marketing, producers may voluntarily abide by commodity grading systems established and monitored by the government.

Third-party entities also offer services to validate safety procedures and bolster market differentiation with

respect to food safety. A growing number of buyers, including many restaurants and some grocery stores, are beginning to require that their suppliers establish safety/quality traceability systems and to verify, often through third-party certification, that such systems function as necessary. A growing number of firms are beginning to try to differentiate the safety of their products and processes for input buyers.

Most, if not all, third-party food-safety/quality certifiers such as the Swiss-based Société Générale de Surveillance (SGS) and the American Institute of Baking (AIB) recognize traceability as the centerpiece of a firm’s safety management system. For example, AIB’s standard food safety audit specifies a number of traceability-specific activities including (American Institute of Baking, 2003):

- Records were maintained for all incoming materials indicating date of receipt, carrier, lot number, temperature, amounts, and product condition.
- A documented, regularly reviewed, recall program was on file for all products manufactured. All products were coded, and lot or batch number records were maintained. Distribution records were maintained to identify the initial distribution and to facilitate segregation and recall of specific lots.
- All raw materials were identified in the program and work in progress, re-work, and finished products were traceable at all stages of manufacture, storage, dispatch and, where appropriate, distribution to the customer.

Third-party standards and certifying agencies are employed across the food industry. In 2002, AIB audited 5,954 food facilities in the United States and was slated to audit 6,697 in 2003 (Wohler, 2003); SGS expected to perform over 1,000 U.S. food safety audits in 2003 (Guidry and Muliyil, 2003); and ISO management standards are implemented by more than 430,000 organizations in 158 countries (ISO website). Food sectors employing third-party verifiers cover the spectrum from spices and seasoning to fruit and vegetables to meat and seafood to bakery products and dough. The growth of third-party standards and certifying agencies is helping to push the whole food industry—not just those firms that employ third-party auditors—toward documented, verifiable traceability systems.

Third-party audits provide customers, buyers, and in some cases, governments with assurances that a firm’s safety management systems, including its traceability systems, have met some objective standards for quality. These assurances have potential to translate into increased

demand because they foster confidence in the safety of the firm's products on the part of downstream and final customers. These assurances are helping to reduce the potential for market failure and to bolster markets for safety and quality.

Government Efforts To Bolster Differentiation

Government may also try to stimulate the supply of information and product differentiation. Mandatory traceability has been suggested as one possible policy option for supplying consumers with more information about credence attributes, including such diverse attributes as country of origin and genetic composition. One difficulty with such proposals is that they often fail to differentiate between valuable quality attributes, those for which verification is needed, and other less valuable attributes. For example, a government policy requiring that producers of valuable organic foods provide verification that these foods are indeed organic could protect consumers from fraud and producers from unfair competition. No such verification would be necessary for conventionally produced foods. Consumers do not need proof that conventional foods are indeed conventional—there is no potential for fraud in this case, no danger that producers would try to cheat consumers by misidentifying organic as conventional. A mandatory traceability system for both organic and conventional foods is unnecessary to protect consumers from fraud or producers from unfair competition.

Likewise, government may have an incentive to require that producers of foods that are not genetically engineered verify that these foods are in fact not genetically engineered, if that attribute is of value to some consumers. However, no such verification would be necessary for the genetically engineered foods currently on the market, because this attribute is not of value to consumers (most genetically engineered products currently on the market have producer, not consumer attributes). A mandatory traceability system for both genetically engineered and non-genetically engineered foods is unnecessary to protect consumers from fraud or producers from unfair competition. Such a system would raise costs without generating compensating benefits. Mandatory traceability for product differentiation that is not targeted to specific attributes of value to consumers will be costly and unnecessary.

Another difficulty with mandatory traceability lies in the propensity for government programs to require uniformity. As our industry review illustrates, private firms operate a wide variety of complex, highly sophisticated traceability systems. A government-mandated system that required all firms to adopt the same template could be

highly costly and inefficient. For example, mandatory traceability systems requiring a common or standard lot size could result in enormous, unnecessary costs to industry. One meat processor found that, by working with USDA to develop a sub-lot sampling system, it was able to reduce the amount of product that needed to be destroyed in cases of contamination and, as a result, substantially reduced its destruction costs. In another case, a fruit producer found that USDA safety requirements specifying a particular lot size led to the development of a complicated traceability system that did not mesh with the plant's production/transportation system.

A flexible government-mandated system would likely be more efficient and less burdensome than one that required that all firms revamp their traceability systems to conform to a standard template. In the United States, both AMS and FSA rely on industry-developed traceability and bookkeeping systems to monitor the domestic origin of food purchased for Federal procurement programs. Programs such as the U.S. national organic food standard depend on private certifiers to provide flexibility to the system. Organic food certifiers, approved by the U.S. Department of Agriculture, work with growers and handlers to develop individualized recordkeeping systems to assure traceability of food products grown, marketed, and distributed in accordance with national organic standards.

Market Failure and Traceability for Food Safety

Though failure by private markets to supply adequate traceability for product differentiation is a concern to regulators, an even bigger concern is failure by private markets to supply adequate traceability systems for basic food safety control and monitoring. In some cases, the amount of traceability supplied by firms may be less than the social optimum because the public health benefits of traceability for food safety are larger than the firm's benefits. A firm's food safety traceability benefits include the reduction in the potential for lost markets, liability costs, and recalls, while the potential social benefits include a long list of avoided costs, including medical expenditures and productivity losses due to foodborne illness, costs of pain and suffering, and the costs of premature death.

Social benefits may also include the avoided costs to firms that produce safe products but lose sales because of safety problems in the industry. A firm's traceability system not only helps minimize potential damages for the individual firm, it also helps minimize damages to the whole industry and to upstream and downstream industries as well. For example, a series of widespread ground meat recalls has the potential to hurt the reputation and

sales of the entire meat industry, including downstream industries such as fast food restaurants and upstream suppliers such as ranchers. The benefits to the industry of a traceability system pinpointing the source of the bad meat and minimizing recall (and bad publicity) could therefore be much larger than the benefits to the individual firm.

As mentioned in the section on differentiation, the amount of traceability supplied by firms may also be lower than the social optimum because firms may find value in some level of anonymity. If traceability systems increase the probability that a firm will be identified in the case of food safety problems and exposed to liability, then the firm may have an incentive to underinvest in traceability: the value of anonymity may reduce the firm's incentives to invest in traceability systems.

Private cost-benefit calculations may also differ from social calculations if the costs of erecting traceability systems are lower when industry groups or governments undertake these projects than when individual firms build them on their own. Or, once built, the marginal cost of including other firms or foods in the traceability system may be small or nothing. In these cases, the private benefits of such systems may not outweigh the private costs while the social benefits do outweigh the social costs. Public defense and libraries are classic examples of such a situation; traceability systems for detecting and tracing foodborne illness outbreaks to their source may be another.

Firms have an incentive to identify and isolate unsafe foods and to remove them from the supply chain as quickly as possible. Few firms, however, have an incentive to monitor the health of the Nation's consumers in order to speed the detection of unsafe product. Such a traceability system would be extremely expensive and would be poorly targeted to any individual firm's needs. The benefits to an individual firm of building a system to monitor all foodborne illness outbreaks just in case one is linked to the firm's product would certainly not outweigh the costs. However, the collective benefits to industry and to consumers may well outweigh the costs. Early detection and removal of contaminated foods can reduce the incidence of foodborne illness and save lives.

Industry Efforts To Increase Traceability for Food Safety

A host of new food safety concerns have pushed food industries to reevaluate their safety protocols, including their traceability systems. For the most part, industry has worked to strengthen safety systems in response to new threats, though the speed and success of industry response

has varied. The fresh fruit and vegetable sector has probably been the most successful in adjusting traceability systems in response to new safety problems. This reflects the fact that firms in the sector have already established robust traceability systems and that the industry has experienced a series of foodborne illness outbreaks.

In the mid-1990s a series of well-publicized outbreaks, traced back to microbial contamination of produce, raised public awareness of potential problems. Recent outbreaks like the one traced to scallions served at a restaurant chain, continue to focus public attention on safety of fresh fruit and vegetables. Good-agricultural-practice audits, including traceability audits, are becoming a necessary part of doing business, as more and more buyers demand safety assurances. In addition, several grower organizations have developed systems to strengthen traceability. In the case of an outbreak, a grower organization that encourages traceback can prove to the public that their product is not responsible for the problem. Or, in the unfortunate case where the industry is responsible for the outbreak, the problem grower or growers can be identified and damage can be limited to that group.

The grain industry has yet to experience a well-publicized, pivotal safety problem. There have not been any major safety scares that would warrant the reevaluation of the industry's safety system, including its traceability systems. The highly processed nature of the product, and the large number of critical safety points along the production chain, largely eliminate safety problems that may arise early in the production process, thereby reducing the need for detailed traceability systems.

The beef sector may be experiencing the most difficulty of the three sectors in responding to new safety threats. These difficulties can be traced to uncertainties in the science of food safety and pathogen control in meat and institutional and philosophical barriers to traceability in the sector. Despite these difficulties, the industry has developed a number of approaches for strengthening food safety accountability and traceability. For example, the Beef Industry Food Safety Council (BIFSCo) has taken on the task of organizing representatives from all segments of the beef industry to develop industry-wide, science-based strategies to solve the problem of *E. coli* O157:H7 and other foodborne pathogens in beef. Industry groups are also cooperating to develop the national animal identification plan (see box, "Animal Identification," p. 32).

Buyers in the beef industry are also increasingly relying on contracting or associations to improve product trace-

ability and safety. Fast food restaurants and other retailers have begun adopting the role of channel captains, monitoring the safety of products up and down the supply chain. By demanding safer products from their suppliers, these restaurants have successfully created markets for food safety. The success of these markets rests on the ability of these large buyers to enforce standards through testing and process audits—and to identify and reward suppliers who meet safety standards and punish those who do not. These large buyers have spurred the development of traceability systems throughout the industry.

Government Efforts To Increase Traceability for Food Safety

Mandatory traceability is one possible policy tool for increasing the food system's traceback capability. However, since the government's primary objective for food safety traceback is the swift identification and removal of unsafe foods, other policy tools may be more efficient than mandatory traceability. Policy aimed at ensuring that foods are quickly removed from the system, while allowing firms the flexibility to determine the manner, will likely be more efficient than mandatory traceability systems. For some firms, plant closure and total product recall may be the most efficient method for isolating production problems and removing contaminated food from the market. For other firms, detailed traceback, allowing the firm to pinpoint the production problem and minimize the extent of recall may be the most efficient solution. In either case, contaminated food is quickly removed from distribution channels and the social objective is achieved.

A performance standard, such as a standard for mock recall speed, is one possible policy tool for providing firms with incentives to establish efficient traceability systems. Mock recalls are a good tool for checking the ability of a system to quickly and accurately identify and remove contaminated product. In the United States, the two Federal agencies responsible for food safety, the U.S. Department of Agriculture (USDA) and the U.S. Food and Drug Administration (FDA), encourage firms to perform mock or simulated recalls to ensure that potentially contaminated foods can be tracked and removed from the system in an expedient manner. In addition, most, if not all, third-party safety/quality control certifiers require traceability documentation and mock recalls as part of their safety audits. Depending on the needs of the client, many also monitor and time mock recalls to evaluate the speed and precision with which facilities can identify potentially contaminated product. Société Générale de Surveillance monitors a 2-hour mock recall for many of its clients.

One area where industry has not had any incentive to create traceability systems is in tracking food once it has been sold and consumed. Firms have an incentive to identify and isolate unsafe foods and to remove them from the supply chain as quickly as possible. But, few firms have an incentive to monitor the health of the Nation's consumers in order to speed the detection of unsafe product. Such a traceability system would be extremely expensive and would be poorly targeted to any individual firm's needs. The benefits of building a system to monitor all foodborne illness outbreaks just in case one is linked to the firm's product would certainly not outweigh the costs. However, the collective benefits to industry and to consumers may outweigh the costs. Government-supplied foodborne illness sentinel systems could, therefore, play an important role in closing gaps in the food systems traceability system. By providing this public good, the government could increase the capability of the whole food supply chain to efficiently and quickly respond to food safety problems.

In the United States, the Federal Government and other public health entities have taken strides in building the infrastructure for tracking the incidence and sources of foodborne illness. The Foodborne Diseases Active Surveillance Network (FoodNet) combines active surveillance for foodborne diseases with related epidemiologic studies to help public health officials better respond to new and emerging foodborne diseases. FoodNet is a collaborative project of the Centers for Disease Control and Prevention (CDC), nine States, USDA, and the FDA. Another network, *PulseNet*, based at CDC, connects public health laboratories in 26 States, Los Angeles County, New York City, the FDA, and USDA to a system of standardized testing and information sharing.

With better surveillance of foodborne illness outbreaks, regulators can increase the likelihood that unsafe foods and unsafe producers will be more quickly identified. Better surveillance therefore reduces the risk of foodborne illness in two ways: by more quickly removing unsafe food from the food supply and by putting additional pressure on suppliers to produce safe foods. By increasing the likelihood that unsafe producers are identified, surveillance systems increase the likelihood that these producers will bear some of the costs of unsafe production, including recall, liability, and bad publicity. Increased surveillance therefore increases the potential costs of selling unsafe food, providing producers with increased incentive to invest in safety systems, including traceability systems.