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Background, Analysis and Recommendations

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Several food safety incidents have made dramatic headlines over the last six years, including *E. coli* 0157:H7 in spinach in 2006, *Salmonella* Saintpaul in peppers in 2008, *Salmonella* Typhimurium in peanut butter in 2008-09 and *Salmonella* Enteritidis in eggs in 2010. These high-profile events substantially raised consumer awareness about food safety issues. As a result, many Americans now perceive the US food system as vulnerable and call for reforming US food safety institutions.

The data show that the incidence of food-borne illnesses in the United States is extensive. According to recent estimates by the Center for Disease Control and Prevention (CDC), each year 48 million people become sick, 128,000 are hospitalized and 3,000 die from food-borne illness caused by microbial pathogens (CDC 2011).¹ R. L. Scharff reports that the annual health related cost of food safety is around \$103 billion.² Notwithstanding the large number of food-borne illness cases and the considerable economic losses from food-borne illness, the US food industry is recognized as one of the safest in the world.

Food safety provisions have not been prominent in previous farm bills, which traditionally focus on programs managed by the United States Department of Agriculture (USDA). Most food safety regulations do not fall under the USDA's mandate: several other federal agencies have major responsibilities for enforcing food safety regulations. Nonetheless, the Farm Bill, as an omnibus bill, can offer a platform for a reform of US food safety policies.

Agencies Enforcing US Food Safety Regulations³

Fifteen different federal agencies administer a wide range of laws related to food safety (Johnson 2010). Here, the focus is on the roles of the Food Safety Inspection Service (FSIS) of the USDA

¹ The CDC recently published revised estimates of the incidence of foodborne illnesses in the United States. The previous estimates by Mead et al. (1999) claimed that each year 76 million people become sick, 325,000 are hospitalized and 5,000 die from foodborne illness caused by microbial pathogens

² Scharff (2010) derived estimates of the incidence of foodborne illnesses using Mead et al. (1999). Revised estimates using CDC (2011) may yield smaller costs of foodborne illnesses.

³ The information in this section is based on Johnson (2010), FSIS (2007) and FDA (2010a).

and the Food and Drug Administration (FDA) of the Department of Health and Human Services (DHHS). Other agencies' roles are considered only briefly.

Food Safety and Inspection Service

The 1906 Meat Inspection Act required the USDA to inspect all cattle, sheep, goats, and horses when slaughtered and processed into products for human consumption. The regulation applied to facilities that conducted business across state lines. Regulatory institutions and technologies of production have changed significantly since 1906 but, essentially, food safety laws have remained the same since then. For more than a hundred years, inspections have been the basis of the regulation of meat safety; still, regulatory enforcement by the FSIS has evolved. For instance, in 1922 the FSIS adopted new standards for the meat and poultry industries. Table 1 provides a brief summary of major regulations in the US meat and poultry industries.

Today, FSIS continuously inspects plants during the slaughtering and the processing of all cattle, sheep, swine, goats, equines, catfish, and domesticated birds (chickens, turkeys, ducks, geese, emus, ostriches, and guineas). The FSIS also has jurisdiction over the safety of liquid, frozen and dried egg products. The staff of the FSIS comprises around 9,400 employees, of whom 8,000 inspect 6,300 meat slaughtering and/or processing plants. Taxpayers fund continuous inspection, but plants pay for overtime costs. The total budget allocated to the FSIS program for FY 2010 was about \$1 billion (USDA 2010).

Food and Drug Administration

Regulation of food products other than meat was initiated in 1906 with the Food and Drug Act (also known as the Wiley Act). The Bureau of Chemistry of the USDA, which later became the Food and Drug Administration, was responsible of enforcing provisions regarding labeling of food and drugs, interstate transport of unlawful food and drugs and adulteration of food. In 1938, President Roosevelt signed the Food, Drug, and Cosmetic Act. This was a more comprehensive law that mandated enforceable food standards, authorized factory inspections and added enforcement tools to the FDA. In 1940, the FDA was included in the Federal Security Agency, which, in 1953, became the Department of Health, Education, and Welfare, now known as the DHHS. Table 2 briefly summarizes the history of the FDA.

The FDA regulates food products that are not under the responsibility of the FSIS. These include produce, dairy products, seafood, fresh eggs and eggs used as ingredients. The FDA has oversight of more than 44,000 domestic food manufacturers, more than 100,000 registered food facilities and about 200,000 foreign facilities registered with the FDA. Unlike the FSIS, the FDA does not continuously inspect plants and facilities but instead conducts sporadic inspections and relies on notifications within the industry and from other sources to target plants and facilities at risk. In FY 2010, the budget of the FDA for enforcing food safety regulation was about \$1 billion (FDA 2009).

Other federal agencies

Food safety policies in the United States involve several other federal agencies. These include:

- The Centers for Disease Control (CDC) is a non-regulatory agency part of the DHHS. The Food Safety Office of the CDC detects and investigates food-borne illnesses in collaboration with the FSIS and the FDA. The Food Safety Office also supports state and local laboratories, informs health care providers and consumers about prevention and management of food-borne illness.
- The National Marine Fisheries Service of the US Department of Commerce regulates the safety of domestic and imported seafood products. The safety programs covered by the National Marine Fisheries Service are voluntary.
- The Environmental Protection Agency (EPA) enforces regulations that govern the use of chemicals products (e.g., insecticides and pesticides) in food production.

- The USDA's Animal and Plant Health Inspection Service (APHIS) objective is to protect plants and animals from domestic and foreign pests and diseases.
- The Department of Homeland Security has as one of its objectives the protection of the US food supply from all hazards.

State and local institutions

The US food safety system also involves state and local governments. Each state is responsible for managing its own system, provided the system meets federal standards. Until recently, federal regulations limited state agencies' inspections of meat and poultry facilities to plants that do not conduct business out of state. New regulations in the 2008 Farm Bill allow the inspection of plants that ship food across state borders by state agencies under the supervision of the FSIS. The FDA publishes the "Food Code," a set of science-based guidelines to assist regulation of facilities that fall under state and local jurisdiction (mostly restaurants and retailers). Not all states and local food agencies adopt the "Food Code." The Association of Food and Drug Officials reports that fifty-two of fifty-six states and territories adopted a version of the "Food Code," covering 97 percent of the US population (FDA 2010b).

FoodNet and PulseNet

The FSIS, the FDA, and the CDC, along with state and local health departments, collaborate in two networks to monitor, identify and trace food-borne illnesses. The Foodborne Diseases Active Surveillance Network (FoodNet) monitors food-borne illnesses in ten sites in the United States.⁴ The objectives of FoodNet are to determine the burden of food-borne illnesses in the United States, monitor trends, identify the food causing food-borne illness, and disseminate information about food-borne illnesses.

PulseNet is a national network with the objective of quickly identifying pathogens causing food-borne illnesses and facilitate the early identification of common source outbreaks. PulseNet performs DNA "fingerprinting" by pulse-field gel electrophoresis on disease-causing bacteria found on sick people (PulseNet 2010). The results are entered into a national database

⁴ Those sites are part of the Bay area in California, the Denver-Boulder region in Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Oregon, and Tennessee (FoodNet 2010).

located at the CDC and common patterns are identified, facilitating the identification of outbreaks.

Recent Regulatory Changes

The 2008 Farm Bill includes provisions regarding food safety and the recently adopted FDA Food Safety Modernization Act that strengthens the authority of the FDA in enforcing food safety regulation.

Food safety in the 2008 Farm Bill⁵

Historically, food safety has not been a major focus of the Farm Bill and the 2008 Farm Bill was no exception. The bill included provisions for state inspection of meat and poultry, mandatory prompt notification of recalls, catfish inspection and grading, and country-of-origin labeling.

The 2008 Farm Bill amended the Meat Inspection Act and the Poultry Product Inspection Act to authorize an opt-in program for state-inspected plants. In participating states, state-inspected facilities can ship food carrying the federal mark of inspection across state borders. Other amendments also require establishments to notify the USDA promptly if a firm or facility believes that adulterated or misbranded products have entered commerce. Facilities are also required to prepare and maintain recall plans.

Catfish inspections were under the purview of the FDA before 2008. The 2008 Farm Bill shifted that responsibility to USDA under the Meat Inspection Act, and catfish are now subject to continuous FSIS inspection. The US catfish industry, which has faced increased competition from foreign catfish producers, requested the regulatory changes. Advocates for FSIS inspections claim that catfish production in some foreign countries does not meet US food safety standards. Regulatory changes now require that imported catfish be subject to an inspection program equivalent to the one in the United States.

The 2002 Farm Bill introduced a new regulation that requires facility to identify the country of origin for fresh produce, red meats, peanuts, and seafood. Country-of-origin labeling (COOL) was supposed to come into effect in September 2004 but Congress postponed COOL implementation twice (except for seafood, for which COOL became effective in April 2005).

⁵ See Becker (2008) for a summary of the food safety provisions in the 2008 Farm Bill.

The 2008 Farm Bill introduced modifications to COOL with respect to labeling requirements and the regulation became effective on September 30, 2008. Canada and Mexico have successfully challenged COOL at the World Trade Organization claiming that the regulation violates trade agreements by treating domestic and foreign products differently.

FDA Food Safety Modernization Act⁶

The FDA Food Safety Modernization Act (FFSMA) of 2010 amends the Food, Drug, and Cosmetic Act of 1938 with the objective of shifting focus from responding to contamination to preventing it. The act has four titles. Under Title I, food facilities must identify and implement preventive controls to significantly minimize or prevent food hazards. Title I requires the FDA to issue guidance on how to reduce food contaminants and to set standards for the production and harvesting of safe fruits and vegetables. Title I also calls for the collection of fees for facility reinspection, food recalls, voluntary importer program, and importer reinspection. The title also includes exemptions for establishments that sell food directly to consumers with annual sales of less than \$500,000.

Title II focuses on the detection and response to food safety problems. The second title requires the allocation of more resources to the inspection of domestic facilities and food imports and the establishment of a product tracing system. Title II specifies that the CDC must improve illness surveillance systems. In addition, it gives authority to the FDA to order food product recalls.

The third title applies to the safety of imported food. It requires importers to verify that foreign suppliers comply with US food safety standards. Under title III, the FDA must develop a program to expedite review for participating importers. Title III also requires the FDA to reach out to foreign governments to facilitate the inspection of foreign facilities, to set provisions to recognize third-party audits of foreign facilities, and to prohibit imports of food from foreign facilities that refuse inspection. Miscellaneous provisions in title IV approve funding for some food safety centers and establish a protection mechanism for whistleblowers employed in facilities that violate food safety regulation.

The food industry initially supported the act, but some industry groups removed their support following the late addition of exemptions for small firms to reduce regulatory burdens

⁶ For a summary of the act see GovTrack.us (2010).

that could otherwise possibly shut down their operations. However, there is no justification to exempt small firms on the basis that they supply safer food. Small food producers may even be those that supply the least safe food. Exempting small firms does not satisfy the objective of increasing food safety.

Whether the 2010 act will significantly affect the safety of food in the United States depends on how the FDA implements the provision of the act and whether congress will appropriate an estimated \$1.4 billion for the act to be implemented over a five-year period. Moreover, the support from the industry suggests that food facilities are already doing more than the act requires and, therefore, improvements in food safety are likely to be modest.

On the Economics of the US Food Safety System

The US food safety system involves food producers, regulation agencies, and consumers, all of which are institutions that respond to their own incentives given the information available to them. Information gaps create a disconnect between the perceived safety and true safety of food and therefore distort the incentives for safe food production and consumption. Most of the time, food product contamination is not observable by organoleptic inspection and, therefore, producers and consumers often do not know when a food product is contaminated. Other information gaps include a lack of information about the origin of a food product and the identity of the food product that causes food-borne illness.

The information gaps that motivated food safety regulation in 1906 still exist, although their extent has changed. Given the information technology available one hundred years ago, strict regulation of food safety and inspection of facilities may have been the most efficient policy. However, regulations designed one hundred years ago, or even twenty years ago, may no longer be the most efficient policy alternatives. Markets now provide more incentives because the cost of information has decreased and markets for information and certification now exist. Consumers are better educated about the risk of food-borne illnesses, and food suppliers have more knowledge about how to produce safe food. Given technological improvements, markets for food safety are now less subject to market failures deriving from asymmetric information caused by information gaps.

Food safety, information and consumption

Consumers choose what food to consume and how to handle that food given the information they possess about the risks of food-borne illness. Nonetheless, the information available to consumers is still incomplete. They do not observe food safety directly and therefore must rely on their perception of food safety in making their choices. Often, consumers are incorrect in assessing the risk of food-borne illness because of lack of knowledge about food safety or lack of information about the conditions under which a product is prepared. Incorrect assessment of food-borne illness risks cause either too much or too little consumption of food products. Lack of information about risk also causes consumers to mishandle food, a major cause of food-borne illness.

Consumers are often not able to observe identity of the firms that produce specific food products. This implies that consumers cannot rely on the reputations of food sellers to make inferences about food product safety. In addition, if a food product causes illness, consumers cannot seek monetary compensation from the firms where food was contaminated. The market offers a solution to the lack of information regarding product origin. Many firms differentiate their products and some offer traceability. By clearly identifying the origin of food, firms offer their name and reputation as a guarantee that food is safe.

Health authorities' roles in informing consumers include dissemination of information about the existence of hazardous food and educating consumers about the risk of food-borne illness. Education is a recurrent activity: for example, food safety agencies remind consumers to cook their hamburgers thoroughly at the beginning of each barbecue season. During a recent outbreak of *Salmonella* in eggs, authorities reminded consumers not to consume runny eggs. Food recalls also play a role in educating consumers because every recall that receives media attention serves as a reminder of the risk of food-borne illness.

Consumers' use of information about food safety is difficult to understand and to predict. For instance, many consumers believe that organically grown or kosher food products are safer than conventional food. These two product attributes have nothing to do with food safety and may lead consumers to make incorrect inference about food safety. Some empirical evidence even shows that the risk of food-borne illness is greater in organic food compared to conventional food (Cueng 2010). Consumers revise their perception of food safety following the discovery of contamination using the new information available. Of course, given that contamination is negative information, a food scare causes a decrease in the demand for an

affected product. The intensity of the shift is unpredictable. A recent analysis based on US meat consumption and media coverage concluded that most food incidents have small economic effects on demand (Piggott and Marsh 2004). However, the discovery of *E. coli* 0157:H7 in spinach in 2006 had an immediate and large effect on spinach purchases. Sales of bagged spinach had not recovered to their prior level 26 weeks after the incident (Arnade, Calvin and Kuchler 2009). Incidents involving leafy greens that followed the 2006 incident had smaller impacts on the demand. Overall, it is not clear why consumers react strongly to some food safety scares but not to others. Media coverage, the nature of contamination, consumers' prior knowledge of the safety of a product, and how government agencies deal with the scare may play all important roles in determining consumer reactions.

Regulation makes food production techniques more uniform, reducing variability in the extent of food safety risks among subsections of the industry. As a result, consumers know more about the food production process and the expected safety of food.⁷

Incentives for the production of safe food

Food producers respond to market and regulatory incentives when investing effort in food safety. The amount of effort depends on whether the firm can secure a premium for delivering safe food, costs of recalls and liability, and food safety regulation.

Producing safe food is costly. Making a food product safer may involve modifying or slowing down a production process, hiring new labor, educating workers, purchasing safer but more expensive inputs or investing in food safety technologies. The cost of producing safer food increases at an increasing rate and it is not possible to make all food safe all the time. As a practical matter, regardless of the effort any firm invests in food safety, it can never guarantee with certainty that food is always safe. The cost of food safety has, however, been decreasing over time, contributing to make food safer in the United States.

Firms have incentives to produce safe food from the consequences they face for delivering contaminated food, including losses in revenue, costs of food recalls and liability.⁸ These losses and costs do not apply for every unit of contaminated food that a firm delivers.

⁷ Increased food safety, by either new regulations or technological change, affects consumers' effort to handle food safely. That is, knowing that food is safer, consumers do not handle food as carefully, which in the end can cause more cases of food-borne illness.

⁸ Strict liability applies most of the time for food contamination in the US legal system.

Most food-borne illness incidents are undetected. Thus, the first condition for those costs to apply is to identify unsafe food. For example, a doctor may identify the cause of an illness as a food pathogen or a customer may detect tainted food.

The second condition for the costs of recalls and liability to apply is to identify the origin of contaminated food. Traceability systems and product branding may facilitate the identification of the origin of an unsafe food product. If unsafe food is detected and traced to its origin, then the firm responsible for the incident will incur recall costs, and possibly liability costs. Therefore, the costs incentives for firms to produce safe food increase with respect to the capacity of identifying unsafe food, the capacity to trace the origin of unsafe food and the size of the costs for food recalls and may have to pay compensation to the affected consumers.

Government regulation may force firms to augment food safety efforts or constrain the type of effort that firms can undertake. Regulation of food safety roots has its in the absence of incentives for firms to deliver safe food. To understand this, consider the US food industry before the 1906 acts. At that time, there was little product differentiation, the technology to identify food-borne illnesses was inexistent and traceability was practically impossible, and firms had few market incentives to supply safe food. The 1906 acts forced firms to exert at least a minimal effort to supply safe food.

Food safety regulation can take two forms: process (design) standards and performance standards. Under a process standard, a regulator imposes practices or technologies to a food producer. Under a performance standard, a regulator imposes a maximum contamination level and monitors food safety. Process and performance standards can yield the same food safety. However, the costs of process and performance standards are not the same. Performance standards give more flexibility to plants and are therefore in general less costly to implement. However, a regulator can prefer process standards because they are less costly to monitor. Also, many food pathogens are unknown and it is therefore impossible to test for their presence. A performance standard metric may be a poor indicator of food safety because of zero or negative correlation between the prevalence of unknown pathogens and the pathogen that constitutes the metric. A process standard may contribute to reduce the number of illnesses from unknown pathogens.

Historically, food safety standards in the United States have generally been process standards. For example, inspectors physically observe the conditions under which production

takes place. Some performance standards have also been introduced. For example, FSIS inspectors observe carcass quality. Between 1998 and 2000, the FSIS implemented PR/HACCP,⁹ a set of standards that place more emphasis on science and combine process and performance standards. HACCP is a flexible process standard where each firm designs its own food safety plan targeting points where contamination is more likely to occur. The FSIS enforces performance standards in PR/HACCP systems by testing for *E. coli* and *Salmonella*. PR/HACCP is a move toward a more science-based approach to food safety that is in the line with technology innovations. The FDA mandates HACCP plans for fluid milk, juice, fish, and seafood industries and for retail food.

Firms now have more incentives to deliver safe food than they did in 1906, in particular because of product differentiation, or the branding of food products. Differentiation creates two types of market incentives for food producers. First, the rents associated with product differentiation imply that a food safety incident will cause larger losses of revenues. The delivery of unsafe food can offset gains from product differentiation because consumers lose confidence in the product. Thus, a firm that seeks to secure a premium for a product will take extra care to produce safe food.

Second, product differentiation facilitates and reduces the cost of trace-back and therefore makes firms more accountable for food safety incidents. The expected costs for delivering unsafe food for a firm today are much more important than they were to a firm operating one hundred years ago. Authorities are now better at identifying outbreaks and tracing the origin of food products. The more accurate the detection and the tracing of unsafe food, the more accountable a firm will become for food safety failures.

The food sector has also been evolving toward more concentration and increasing vertical integration (Sexton 2000). Some food safety commentators claim that this process poses a threat to food safety. Their argument is that with the evolution of the food industry toward greater industrialization, food safety scares are becoming more common and involve products previously considered safe. This argument ignores other facts about the food industry. First, authorities are more capable of identifying food-borne illnesses, contributing to the increase in the number food scares reported. Second, concentration in the food industry facilitates the detection of food safety incidents. Thus, it is possible that food is safer than ever before. Industry concentration may lead

⁹ PR/HACCP stands for Pathogen Reduction/Hazard Analysis and Critical Control Points.

to food safety incidents that result in many food-borne illnesses and become more widespread, but these incidents are consequently easier to detect. Few recognize that concentration and vertical integration increase the incentives for firms to produce safe food. Large firms are more exposed to food recalls and liability because it makes unsafe food easier to detect and to trace back to its origin.

Other incentives for food safety include information about firms' performance. The FSIS now publishes results for *Salmonella* tests for chicken and turkey slaughter plants. Unlike *E. coli O157:H7*, *Salmonella* is not an adulterant, and meat and poultry can receive FSIS approval even though it contains *Salmonella*. However, the FSIS is allowed to publish the results of *Salmonella* tests and let buyers decide whether to buy or not from a plant (FSIS 2010).

Food safety regulation implementation

The FSIS, the FDA, and other agencies are responsible for implementing and enforcing regulations set by policymakers under budgets fixed by Congress. The agencies have some flexibility in implementing regulation, creating some room for rent-seeking behavior by food suppliers. For instance, firms may lobby for leniency regarding the implementation of costly rules. To some extent, interest groups may exert so much influence over regulatory agencies and their managers that they effectively take over the agency's policies. The FSIS is more susceptible to regulatory capture than the FDA because the USDA deals with farm policies and offers a wide range of services to food producers. For instance, USDA manages many programs that financially support farms and offers grading and certification services to many industries. In particular, USDA offers grading services to the meat industry, but also conducts meat plant inspection under the FSIS. The DHHS and the FDA neither deal with farm policies nor offer services to the food industry, and they are therefore less subject to capture. The danger with regulatory capture is that an agency becomes lax in applying regulations, making those regulations ineffective or applicable only to subsets of the food industry.

Public perception also influences food safety agencies. In particular, in some food safety incidents, the public may perceive food safety agencies as responsible. Examples include the recent events involving *Salmonella* in eggs and *Salmonella* in peanut butter, where lack of inspection was identified as a factor in the outbreaks. Food safety agencies (and policymakers)

therefore tend to favor actions that are visible and countable—for example, number of inspections. These continuous inspections remain prevalent in the food industry. Nonetheless, given technological advances, policies that favor identification of food-borne illnesses and the traceability of food may now cost less than direct regulation and yield the same level of food safety. However, better identification of food-borne illnesses exposes agencies to more critiques because the reported number of food-borne illnesses increases.

The Role of Food Recalls and Their Effectiveness

Food recalls are actions taken by food suppliers that result in the removal from the market of a product that is contaminated or mislabeled. Under current regulation, the FSIS does not have the power to force firms to recall products but can stop the inspection of a facility that refuses to recall a food product, therefore shutting down its operation. The FFSMA received a great deal of attention because it gives authority to the FDA to order recalls. Many perceive recalls as an effective tool to prevent food-borne illnesses because they remove potentially contaminated products from the market. However, recalls may play a greater role in preventing illnesses by providing incentives to food producers.

Virtually all firms follow the FSIS and the FDA recommendations to recall products. This does not mean that firms are effective in conducting food recalls. A food recall can be very costly and affect the reputation of a firm. A firm may delay a recall, hide the true quantity of product that is possibly contaminated, or exert little effort in removing the contaminated product.

Food recalls have two main functions: (1) *ex ante*, the threat of a costly food recall increases the incentives for a food producer to assure that the product is safe, and to (2) remove contaminated food from the market to prevent food-borne illnesses. In general, food recalls are ineffective in removing contaminated products from the market. Teratanavat and Hooker (2004) describe recalls of meat and poultry in the United States between 1994 and 2004. The authors find that problems with meat and poultry products were discovered on average almost two months after production. Some recalls even occurred more than a year after production. Between 1994 and 2000, the average recovery rate ranged between 39 and 68.1 percent and for most years was below 50 percent.

For meat, poultry, and other products with a long shelf life, recovery rates may be high even months after production. However, in fresh produce or other products with short shelf lives,

recalls are often too late. For example, in the outbreak of *E.coli*-contaminated spinach in September 2006, the FDA immediately recommended that consumers stop eating spinach after contamination was discovered. Retailers reacted by removing all spinach from their shelves. Still, even with a swift reaction by the FDA, many illnesses had already occurred. The following factors were important: the time between harvest and the availability of spinach in retail stores, the incubation period for the illness, the time it takes for laboratory to identify the cause of illness, and the time it takes authorities to discover the source of the outbreak. As a result, the contaminated spinach was already off the shelves by the time the FDA issued a warning and the recall was announced.

The 2000 spinach recall did little or nothing to prevent new cases of illness. However, the recall and loss of consumer confidence in the safety of spinach had a strong impact of the California leafy-green industry. In 2007, California leafy-green farmers formed the California Leafy Green Products Handler Marketing Agreement (LGMA 2010). The state marketing agreement specifies practices that reduce contamination risks and require audits of handlers and growers by USDA inspectors. The LGMA pays for these inspection services.

Recalls can also be ineffective because they do not target the right product. An example is the outbreak of *Salmonella* Saintpaul in jalapeño peppers in 2008. After reports of several food-borne illnesses caused by one strain of *Salmonella*, on June 3, 2008, the FDA warned consumers not to eat certain types of tomatoes. On June 27, the FDA admitted that tomatoes might not have been responsible for the outbreak. The FDA then broadened the investigation to products often consumed with tomatoes such as cilantro and jalapeño peppers. The FDA lifted the tomato consumption warning on July 17 and announced on July 21 that it had found a sample of jalapeño peppers contaminated with *Salmonella* Saintpaul. Firms linked to the contaminated peppers immediately initiated recalls.

Why did it take so long to discover the *Salmonella* vector in the 2008 outbreak? The outbreak's location may have played an important role because states differ in their ability to identify outbreaks and their ability to communicate effectively with the CDC. New Mexico and Texas reported the first food-borne illness case at the end of May (the outbreak may have started as early as April). Minnesota officials reported the first illness caused by *Salmonella* Saintpaul on June 23, three weeks after the FDA warning. It took Minnesota health officials a little over

two weeks to determine that jalapeño peppers were the vector of contamination (Marcotty and Lerner 2008).

Overall, the main role of recalls in the food safety system is not to prevent illnesses by removing contaminated food from the market. Rather, the role of recalls in the food safety system is to inform consumers and punish firms that deliver unsafe food by increasing their cost, therefore increasing their incentives to deliver safe food.

Policy Recommendations

The following recommendations for future legislation are based on the discussion in the previous sections. The focus is on recommendations that are feasible, given the constraints that currently apply on the US food system. The recent adoption of the FFSMA shows that major changes to food safety regulation are difficult. These recommendations provide guidance on how to improve food safety policies by reallocating resources and making use of technological innovations.

A more controversial and perhaps more cost effective set of recommendations would shift food safety regulation from an inspection and process standard paradigm to an accountability paradigm. Given recent improvement in information technologies and detection of food-borne illnesses, it may be possible to substitute market incentives and government fines for food safety regulations. This would shift more responsibility for food safety to producers by increasing surveillance rather than direct regulation. In such a system, the government could reduce the number of costly inspections but increase its efforts to detect food-borne illnesses.

1. Merge the FSIS and the FDA into a single agency in the DHHS.

The rationale for the administrative separation of the FSIS and the FDA was based on the statutes enacted in 1906. Over the years, many plans to merge the two institutions have been proposed but never carried out. A single federal entity regulating food safety in the United States would facilitate communication, harmonize enforcement, and allow for a more efficient allocation of financial resources toward products presenting a higher risk. A single agency may also benefit from economies of scale.

What agency should take responsibility for food safety? Some argue that the FDA should be part of the USDA because the USDA has a better understanding a food production. However, the USDA provides many services to farmers and other firms involve in the production of food

while the DHHS does not provide similar services. Thus, food producers are likely to capture a food safety agency under the USDA than under the DHHS. Given the risk of capture, I recommend that lawmakers form a single food safety agency within the DHHS.

2. Reallocate inspection efforts

Food plant inspections are here to stay because they explicitly demonstrate the involvement of lawmakers and food agencies in the food safety system. Under the current system, the FSIS inspects meat and poultry plants continuously and the FDA inspects other processing plants sporadically. The difference between the inspection policies is justified by the assumption that meat poses higher food safety risks. However, it is difficult to conceive that the risk differences are sufficiently great to support continuous inspection for one product and inspection once every few years for other products.

A single food safety agency should allocate inspection efforts based on actual risks. For example, consider a plant that packages beef and a plant that packages leafy greens. If firms do not pay attention to food safety standards in packaging beef and leafy greens, contamination is more likely to occur in beef. In practice, as discussed above, firms have incentives to deliver safe food to avoid recalls and lawsuits and to secure future profits. It is possible that the beef packer uses product differentiation (explained above) and cannot escape financial losses if a food safety incident occurs, but that the leafy-greens packer remains anonymous in the event of a food safety incident. Therefore, the beef packer has more incentives to deliver a safe product than the leafy-greens packer. In that case, a sound inspection system should allocate more effort toward the inspection of the leafy-greens packer than toward the inspection of the beef packer. Inspection policy should take into account risk given the market incentives for firms to deliver safe food rather than absolute risk with no safety effort.

3. *Standardize detection methods of food safety incidents across states and collect more data on food-borne illnesses*

Efforts to detect food-borne illnesses are very different in different states, both in terms of practices and resources allocated to those practices. Many outbreaks go unnoticed because some states do not have proper detection systems. A standardized system across states and a national database would facilitate the detection of food pathogen outbreaks. Combined with better trace back, firms responsible for food safety incidents would become more accountable.

Better data collection could be achieved through expansion of FoodNet, a program that is currently limited to ten regions. More comprehensive data collection could help account for the relationship between regional preferences and food safety, and facilitate the identification of food safety outbreaks and emerging pathogens.

4. *Increase information provided to buyers about food suppliers performance*

Many recalls or failures by firms to pass inspection are not widely publicized. Thus, consumers are often unable to make consumption decision based on a firm's food safety record. The recent FSIS initiative to publish *Salmonella* tests results is a step in the right direction. Local health authorities have undertaken similar initiatives. For example, in Los Angeles County, California, restaurants must display hygiene grade cards that report their performance in the most recent inspection. Mandating publication of food inspection records would increase buyers' information and increase food suppliers' incentives to deliver safe food.

Conclusion

The US food system is widely recognized as one of the safest in the world. Nevertheless, about one in every six American is sick every year from eating a contaminated food product (CDC 2011). Food safety incidents often make the news and many perceive the US food system as vulnerable.

The US government has been regulating food safety for now more than one hundred years. The FSIS and the FDA are the two main agencies responsible of enforcing food safety laws. Before the recent adoption of the FDA Food Safety and Modernization Act, the United States had not seen a change in its food safety laws in more than seventy years. Even though food safety regulations remained unchanged for a long time, enforcement of food safety laws by

regulatory agencies evolved. Despite the recent passage of the FDA Food Safety and Modernization Act in 2010, the next farm bill can include food safety provisions.

Inspections and process standards form the basis of US food safety regulation. This is not likely to change in the near future. However, the market plays an increasing role in the food safety system. Firms have increased incentives to supply safe food as incidents become detected and traced back to the firm of origin more frequently. Food safety regulation may utilize private incentives and technological changes to make food suppliers more accountable for food safety incidents.

More feasibly, in the short to medium term, changes in food safety regulation should aim at correcting inconsistencies or loopholes that exist in US food safety laws. For example, policymakers could merge the FSIS and the FDA to allow for a better allocation of resources and exploit potential return to scales. Standardizing states' detection systems for food-borne illnesses and collecting better data about the incidence of food-borne illnesses would make firms more accountable and help construct better food safety policies.

References

- Arnade, C., L. Calvin and F. Kuchler. 2009. "Consumer's Response to a Food Safety Shock: The 2006 Foodborne Illness Outbreak of E. coli O157 Linked to Spinach." *Review of Agricultural Economics* 4: 734-750.
- Associated Press. 2006. "Spinach Farmers Try to Grow Public Confidence." *NBC News*. Available at <http://www.msnbc.msn.com/id/15095551/>.
- Becker, G. S. 2008. "Food Safety Provisions of the 2008 Farm Bill." CRS Report for Congress RS22886.
- California Food Emergency Response Team. 2007. "Investigation of an Escherichia coli O157:H7 Outbreak Associated with Dole Pre-Packaged Spinach." Available at http://www.marlerclark.com/2006_Spinach_Report_Final_01.pdf.
- Center for Disease Control and Prevention. 2010. "Estimates of Foodborne Illness in the United States." Available at <http://www.cdc.gov/foodborneburden/>.
- Chung, M. 2010. "Organic vs. Conventional: A Bacterial Comparison." *Food Safety News*. Available at <http://www.foodsafetynews.com/2010/02/organic-meat-dairy-safer/>.

Food and Drug Administration. 2009. "FY 2010 Congressional Justification." Available at <http://www.fda.gov/AboutFDA/ReportsManualsForms/Reports/BudgetReports/ucm153374.htm>.

Food and Drug Administration. 2010a. "About FDA: History." Available at <http://www.fda.gov/AboutFDA/WhatWeDo/History/default.htm>.

Federal Drug Administration. 2010b. "Real Progress in Food Code Adoption" Available at <http://www.fda.gov/Food/FoodSafety/RetailFoodProtection/FederalStateCooperativePrograms/ucm108156.htm>.

FoodNet. 2010. Website available at <http://www.cdc.gov/foodnet/>.

Food Safety and Inspection Service. 2007. "Agency history." Available at http://www.fsis.usda.gov/About_Fsis/Agency_History/index.asp.

Food Safety and Inspection Service. 2010. "Salmonella Verification Testing Program: Monthly Reports for Establishments by Performance Category." Available at http://www.fsis.usda.gov/Science/Salmonella_Verification_Testing_Program/index.asp.

Golan, E., J. Caswell, T. Roberts, M. Ollinger, E. Salay, and D. Moore. 2004. "Food Safety Innovation in the United States." Economic Research Service. Agricultural Economic Report Number 831.

Govtrack.us. 2010. "S.510: FDA Food Safety Modernization Act." Available at <http://www.govtrack.us/congress/bill.xpd?bill=s111-510&tab=summary>.

Johnson, R. 2010. "The Federal Food Safety System: A Primer." CRS Report for Congress RS22600.

Leafy Greens Marketing Agreement. 2010. Website available at <http://www.caleafygreens.ca.gov/>.

Marcotty, J. and M. Lerner. 2008. "'Team Diarrhea' helped state crack salmonella case." *Star Tribune*. Available at <http://www.startribune.com/lifestyle/health/25837094.html?page=1&c=y>.

Mead, P. S., L. Slutsker, V. Dietz, L. F. McCaig, J. S. Bresee, C. Shapiro, P. M. Griffin, and R. V. Tauxe. 1999. "Food-related Illness and Death in the United States," *Emerging Infectious Diseases*, 5: 607-625. Available at <http://www.cdc.gov/ncidod/eid/vol5no5/mead.htm>.

Piggott, N. E. and T. L. Marsh. 2004. "Does Food Safety Information Impact U.S. Meat Demand?" *American Journal of Agricultural Economics* 86: 154-174.

PulseNet. 2010. Website available at <http://www.cdc.gov/pulsenet/>.

Scharff, R. L. 2010. "Health-Related Costs from Foodborne Illness in the United States."

Produce Safety Project. Available at <http://www.producesafetyproject.org/media?id=0009>.

Sexton, R. J. 2000. "Industrialization and Consolidation in the U.S. Food Sector: Implications for Competition and Welfare." *American Journal of Agricultural Economics* 82 1087-1104.

Teratanavat, R. and N. H. Hooker. 2004. "Understanding the characteristic of US Meat and Poultry Recalls: 1994-2002" *Food Control* 15: 359-367.

United States Department of Agriculture. 2010. "Budget Summary and Annual Performance Plan." Available at <http://www.obpa.usda.gov/budsum/FY10budsum.pdf>.

Tables

Table 1: Brief History of the Food Safety and Inspection Service

Year	Regulation	Description
1884	Creation of the USDA Bureau of Animal Industry (BAI)	BAI was responsible for preventing diseased animal entering the food chain and for the quarantine of imported animals.
1906	Meat Inspection Act	The Inspection Division of the BAI became responsible for the administration of the Meat Inspection Act.
1953		Abolition of the BAI and transfer of responsibilities to the Agricultural Research Service (ARS).
1957	Poultry Products Inspection Act	Mandatory USDA inspection of poultry at slaughter and processing.
1967	Wholesome Meat Act	Amendments to the 1906 Meat Inspection Act to require states to have inspection programs at least equivalent to the federal programs.
1968	Poultry Products Inspection Act	Merge within the Consumer and Marketing Service of the Agricultural Research Service the inspection of meat and poultry, which were previously conducted by separate agencies
1971		Creation of the Animal and Plant Health Service to administer the regulatory functions of the Agricultural Research Service.
1972		The inspection of meat and poultry is transferred to the Animal and Plant Health Inspection Service (APHIS)
1977		The Food Safety and Quality Service is assigned the inspection of meat and poultry.
1981		The Food Safety and Quality Service is renamed the Food and Inspection Service (FSIS).
1997		The FSIS announces the implementation of Hazard Analysis Critical Control Point systems in meat and poultry.

Source: FSIS (2007).

Table 2: Brief History of the Food and Drug Administration

Year	Regulation	Description
1862		Creation of the USDA Bureau of Chemistry.
1906	Food and Drug Act (also known as the Wiley Act)	Addition of regulatory responsibilities to the Bureau of Chemistry regarding the labeling of food and drugs, the interstate transport of unlawful food and drugs and the adulteration of food.
1927		Reorganization of the Bureau of Chemistry which became the Food, Drug, and Insecticide Administration
1931		The Food, Drug, and Insecticide Administration is renamed the Food and Drug Administration (FDA).
1938	Food, Drug, and Cosmetic Act	More comprehensive law mandating enforceable food standards, authorized factory inspections and added enforcement tools to the FDA
1940		The FDA became part of the Federal Security Agency.
1953		The Federal Security Agency is renamed Department of Health, Education, and Welfare.
1958	Food Additive Amendments	Amendments to the Food, Drug, and Cosmetic Act of 1938 to include provisions regarding the safety of ingredients in processed foods.
1979		The Department of Health, Education, and Welfare became the Department of Health and Human Service.
2010	FDA Food Safety Modernization Act	Adds authority to the FDA to order recalls, requires firms to develop food safety programs, requires traceback of fruits and vegetables and increases the number of facilities inspection.

Sources: FDA (2010a) and Govtrack.us (2010).