Controlling Avoidance of Food Safety Regulations in Meat Packing Industry

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EXECUTIVE SUMMARY

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The sale of meat and poultry contains asymmetric information dealing with food safety. Since pathogens in most cases are invisible, consumers lack information on the safety of meat and poultry. Government interaction through the Food Safety and Inspection Service (FSIS) in the meat and poultry industry is necessary to regulate the safety of meat and poultry products. Inevitably, any rules in society are likely to include violators. In the meat and poultry industry, violators of the regulations may see economic benefit to do so. The cost of perfectly safe food is far too great for the industry to bear. The marginal gain in revenue from violating a regulation may be greater than the marginal cost. Violators of rules may resort to sophisticated means to avoid detection of the original violations. The means used to avoid detection may be legal or illegal in and of themselves. Effective regulation of avoidance activities will lead to lower violations of the original crime. Such regulations may be ex-ante or ex-post. This paper discusses potential effectiveness of ex-ante or ex-post regulations on avoidance activities of food safety regulations in the meat and poultry industry. The use of ex-ante measures such as contracting external service providers coupled with the threat of ex-post punishment on service providers would potentially decrease the number of avoidance activities and their associated original crime in the meat and poultry industry.

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Abstract

Effective regulation of avoidance activities of food safety regulations will lead to lower violations of the original crime. Such regulations may be ex-ante or ex-post. The use of ex-ante measures such as contracting external service providers coupled with the threat of ex-post punishment on service providers would potentially decrease the number of avoidance activities and their associated original crime in the meat and poultry industry.

Key words: avoidance control; food safety regulations; meat packing industry

Controlling Avoidance of Food Safety Regulations in Meat Packing Industry

In general, the sale of meat and poultry contains asymmetric information dealing with safety. Since pathogens in most cases are invisible, consumers lack information on the safety of meat and poultry. Government interaction through the Food Safety and Inspection Service (FSIS) in the meat and poultry industry is necessary to regulate the safety of meat and poultry products. Inevitably, any rules in society are likely to include violators. In the meat and poultry industry, violators of the regulations may see economic benefit to do so. The cost of perfectly safe food is far too great for the industry to bear. The marginal gain in revenue from violating a regulation may be greater than the marginal cost. Violators of rules may resort to sophisticated means to avoid detection of the original violations. The means used to avoid detection may be legal or illegal in and of themselves. Effective regulation of avoidance activities will lead to lower violations of the original crime. Such regulations may be ex-ante or ex-post. The paper will examine potential effectiveness of ex-ante or ex-post regulations on avoidance activities of food safety regulations in the meat and poultry industry.

History of FSIS

The beginning of federal inspection in the meat and poultry industry stems from the development of the United States Department of Agriculture (USDA) in 1862. The expansion of the railroad, along with the development of refrigeration, enabled packers to process year round and ship farther distances. The Bureau of Animal Industry (BAI) was created in 1884 to prevent diseased animals from making their way in to human food. Upton Sinclair published a book titled “The Jungle” in 1905, which exposed the unsanitary conditions at meat packinghouses in Chicago. The book pressured congress and then president, Theodore Roosevelt, to pass both the Food and Drug Act along with the Meat Inspection Act. Both acts were passed in 1906. BAI’s inspection responsibilities grew immensely after the passing of the Meat Inspection Act. In 1953, the BAI’s responsibilities were transferred to the newly created Agriculture Research Service (ARS) and BAI was terminated. The Poultry Products Inspection Act was passed in 1957 after an enormous jump in demand for poultry products post World War II. The growing meat packing industry became difficult to regulate and by 1967 the Federal Meat Inspection Act was amended as the Wholesome Meat Act. The Wholesome Meat Act increased the individual state inspection responsibilities. The Poultry Products Inspection Act followed suit in 1968 and was amended under the original name. During the late 1960’s both the meat and the poultry inspection programs were combined into the Consumer and Marketing Service of USDA’s Agricultural Research Service. The Animal and Plant Health Service created in 1971, latter named the Animal and Plant Health Inspection Service (APHIS), became responsible for meat and poultry inspection. The inspection responsibilities changed hands once again in 1977, when the Food Safety and Quality Service division was created. The division changed their name one last time in 1981 to the Food Safety and Inspection Service (FSIS). Currently the FSIS is responsible for the inspection of meat and poultry during harvest and processing in the United States. Some states take responsibility for inspection of plants but they use the same standards, or greater, than the FSIS. (USDA 2007)

Meat Packing Industry

The meat packing industry consists of three main types of plants: poultry processing, animal (except poultry) harvest, and meat (except poultry) processing. Poultry processing plants includes all harvest and processors. In 2002, there were 536 poultry processing plants, which were owned by 311 companies. Of the total 536 poultry processing plants, there were 50% (268) of plants operating with 250 or more employees. The same 250 or more employee plants contributed 91% of the total value of shipments for 2002. In 2002 there were 1870 animal (except poultry) harvesting plants, which were owned by 1776 companies. Six percent or 113 of animal (except poultry) harvesting plants had 250 or more employees and contributed 88% of the total value of shipments. Meat processing plants usually engage in assembly, packing, and cooking of meat (except poultry) products. As of 2002 there were 1338 meat-processing plants owned by 1193 companies. Nine percent or 121 of meat-processing plants had 250 or more employees and contributed 56% of the total value of shipments. (U.S. Census Bureau) In both the poultry processing and animal (except poultry) harvest plants, the larger less numerous plants produced the majority of the products sold. Economies of scale come into effect to generate lower costs and higher profits per pound. However, in the meat processing sector small plants still hold a good portion of the total production as seen in the Table 1 and Table 2.

Table 1

		Plants	Companies	250+ Employee Establishments	250+ Employee Establishments Percent of Total
Poultry Processing					
	1997	473	257		
	2002	536	311	268	50%
Animal (Except Poultry) Harvest					
	1997	1391	1307		
	2002	1870	1776	113	6%
Meat (Except Poultry) Processing					
	1997	1295	1163		
	2002	1338	1193	121	9%

Source: U.S. Census Bureau

Table 2			
2002	**Total Value of Shipments**	**250+ Employees Establishment Value of Shipments**	**Percent Value of Shipments for 250+**
Poultry Processing	$37,634,609,000.00	$34,309,124,000.00	91%
Animal (Except Poultry) Harvest	$56,481,035,000.00	$49,430,081,000.00	88%
Meat (Except Poultry) Processing	$25,882,439,000.00	$14,467,670,000.00	56%

Food Safety Regulations - PR/HACCP

An outbreak of *E. coli* O157:H7 in 1993, which left 400 ill and four dead, led to the demand for stricter standards in the meat packing industry. Officials insisted inspection should become more "science based" compared to past inspections where only sight, touch, and smell were used. FSIS introduced a proposal on February 3, 1995, to satisfy the demand for stricter standards called the Pathogen Reduction and Hazard Analysis Critical Control Points (PR/HACCP). After many comments and a review of the proposal, the final rule was introduced on July 25, 1996. The PR/HACCP final rule included seven principles plants needed to follow during their transition: 1) hazard analysis, 2) critical control point identification, 3) establishment of critical limits, 4) monitoring procedures, 5) corrective actions, 6) recordkeeping, and 7) verification procedures. Critical control points of food safety are found and plans are developed to reduce and prevent contamination. The plant monitors the critical control points for contamination, and when a contaminated product is found they locate and fix the source of the problem. Along with implementing the HACCP, the plants are required to randomly test for general *E. coli* in their production. General *E. coli* is found in the digestive tract of cattle and the testing ensures there is no fecal matter on meat or poultry. The results of the microbial testing are being used to verify the HACCP plan is working effectively. FSIS also conducts random tests for *Salmonella* during production and at the retail level. *Salmonella* was chosen to verify that the PR/HACCP plan is working effectively because it is one of the leading causes of food borne illnesses. Plants also need to implement Sanitation Standard Operating Procedures (SSOP), where plants develop procedures to maintain proper sanitation. SSOP records stating when procedures are completed and when corrective action has taken place must be kept. Recordkeeping is used to help inspectors verify the PR/HACCP regulations are being followed (USDA 1996). Dates of compliance are determined by the size of the plant. Plants with 500 or more employees had a compliance deadline of January 1998. Small plants with the number of employees ranging from 10 to 499 had to comply by January 1999, and very small plants with less than ten employees or less than $2.5 million in annual sales had a deadline of January 2000.

The latter deadline for small plants was made out of fairness, since small plants may incur higher costs per pound to implement the PR/HACCP plan compared to large plants (Muth *et al.* 2007).

The PR/HACCP regulation consists of two different food safety standards. The *E coli* and *Salmonella* testing are considered performance standards in which a plant can use any means to reach the standards. Performance standards tend to be less costly compared to process standards in which the process of producing a product is regulated. Sanitation Standard Operating Procedures (SSOP) and HACCP plans are considered process standards. Process standards tend to be less efficient at achieving proper food safety because of unnecessary steps they may add to the process. With performance standards, a plant can use any means to achieve the standard, which is usually the most cost effective method (Ollinger *et al.*).

The FSIS of the USDA is responsible for inspecting meat and poultry from the time it enters the harvesthouse to the time it reaches the retail level. Inspectors at a harvesthouse will examine every animal before (ante mortem) and after death (post mortem) looking for signs of disease. The inspector is also responsible for monitoring sanitation and pathogen levels, along with verifying proper labeling and recordkeeping. With respect to meat and poultry processing plants, the USDA inspectors are not required to inspect every item on the production line. Per product inspection, is less at processing plants since their input of meat or poultry has already been inspected and passed. The inspectors are responsible for monitoring sanitation levels, product ingredients, and recordkeeping along with random testing of products. Processing plants may be inspected daily. However, the USDA does not disclose how often inspectors visit the facilities. USDA inspectors check both harvest and processing plants records to verify their compliance. FSIS is also responsible for inspecting meat and poultry during storage and transportation, where they inspect for proper product handling procedures along with sanitation levels. USDA inspectors may use a variety of enforcement tools to keep adulterated product from reaching consumers. The inspector may halt operation by refusing to perform inspection until the problem is fixed. The FSIS can seize adulterated or contaminated products on the processing line. The FSIS's power is limited, because they are unable to recall meat after it has left the plant and entered the retail market. Recalls in the U.S. are in most cases voluntary by the company. The FSIS may refer the case to a federal attorney in serious cases. (Rawson)

Cost and Benefits of Compliance

The PR/HACCP rule has been the center of numerous studies, which analyze the costs and benefits of the regulation (*e.g.*, Antle 2000; Muth *et al*. 2002; Nganje and Mazzocco). The actual number of food poisoning illnesses is difficult to achieve since most cases are not reported or are misreported as a different illness. Also, the affect of offsetting behavior can skew the cost and benefit results of a regulation. An example of offsetting behavior is noticeable when a consumer believes the meat or poultry product they purchased is safer because of the regulations, and the consumer may not cook it as thoroughly. This increases the likelihood of getting infected with some pathogen bacteria found in meats. Nganje *et al.* show how offsetting behavior plays a role in the increasing gap between decreasing pathogen levels in processing plants and the frequency of food borne illness reported in the U.S. The 2004 survey included some benefits of the PR/HACCP regulation and one of them was product shelf life. Of the plants that were surveyed and responded, 9% reported their products shelf life increased by more than one week,

21% reported an increase in product shelf life by less than one week, 1% reported a decrease in shelf life, and rest of the plants reported their product shelf life as unchanged. The increase in shelf life is believed to be from the decrease in bacteria and pathogens that spoil the meat or poultry product (Ollinger *et al.*). Benefits of regulations are hard to quantify and may be misreported because of offsetting behavior. (Miljkovic *et al.*)

As seen before, the meat and poultry industry consists of very few large plants, which process most of the products sold. This is evidence of economies of scale and can be carried over into the cost of compliance for the PR/HACCP regulation. The introduction of the PR/HACCP rule did not require any capital investments; however, plants not up to FSIS standards may have needed to invest in capital and/or labor. According to Table 3, summarizing the cost of compliance, the average variable cost per pound of harvested meat ranged from approximately 1.5 cents to 2.5 cents for cattle and hogs. Variable costs of compliance for hog and cattle harvesthouses are approximately 3 times larger for the smaller (0-19 percentile) plants compared to the larger (80-99 percentile) plants. Fixed costs of compliance for hog and cattle harvesthouses are over 6 times larger for smaller plants compared to larger plants. Economies of scale allow larger plants to spread the costs of labor and capital investments over a greater amount of product reducing the per pound cost of compliance. In each specific meat industry, the large processors had less cost per pound compared to small processors. The unweighted average finds the meat cost per pound of all plants in a percentile range while the weighted average gives weights to the individual plants using their amount of output (Ollinger *et al.*).

Table 3

Plant type	Unweighted mean cost per pound[2] Size percentile 0-19	80-99	Mean	Industry weighted mean cost per pound[3] Size percentile 0-19	80-99	Mean
	Dollars per pound					
Cattle slaughter:						
Variable costs	0.023	0.008	0.022	0.010	0.003	0.0033
Fixed costs	0.055	0.009	0.022	0.020	0.004	0.0045
Number of plants	17	27	135	17	27	135
Hog slaughter:						
Variable costs	0.016	0.005	0.014	0.008	0.001	0.0020
Fixed costs	0.050	0.008	0.026	0.022	0.003	0.0043
Number of plants	23	22	96	17	22	96
Poultry slaughter:						
Variable costs	0.025	0.004	0.010	0.023	0.004	0.0037
Fixed costs	0.013	0.004	0.008	0.012	0.003	0.0047
Number of plants	14	9	58	14	11	58
Cooked meat processing /no slaughter:[4]						
Variable costs	0.018	0.005	0.016	0.015	0.005	0.007
Fixed costs	0.079	0.019	0.036	0.057	0.015	0.018
Number of plants	50	37	198	50	37	198
Raw meat processing/no slaughter:[5]						
Variable costs	0.020	0.005	0.013	0.006	0.003	0.0046
Fixed costs	0.027	0.012	0.017	0.006	0.005	0.0080
Number of plants	25	26	139	25	26	139

Source: "Meat and Poultry Plants' Food Safety Investments: Survey Findings" by Michael Ollinger, Danna Moore, and Ram Chandran, (2004).

Small plants are unable to bear the cost of the labor and capital investments needed to meet the PR/HACCP standards and satisfy their customers. Plants may not have needed capital investments if they were already operating at FSIS standards. (Ollinger and Moore) Numerous small plants produce a wide range of specialty products in which each product needs a PR/HACCP plan. The development of each PR/HACCP plan increases cost per pound for meat processing plants. The recordkeeping needed with each PR/HACCP plan also increases the cost for small plants. Small plants that produce commodity products are unable to compete against the large processing plants and are faced to specialize or exit the industry. The development of the PR/HACCP regulations in 1996 also increased production downtime and decreased production yield throughout the industry. During regular daytime hours, the actual cost of inspection is free; however, cost of compliance may be far too great for some plants to manage.

The implementation of a regulation to better food safety may cause a variety of effects on different plants. For example, Muth *et al*. (2007) discovered that very small and small harvest plants of any kind were more likely to exit because of the PR/HACCP regulation. The effectiveness of a food safety regulation needs to be measured by both their benefits and costs. There are numerous differences in harvest plants and these cause different exit rates and

regulation effects. These differences are evident when examining exit rates: older meat harvest plants are more likely to exit than younger plants; plants in states with higher minimum wages are less likely to exit; and meat harvest plants that harvest cattle, along with poultry harvest plants that harvest turkeys, are less likely to exit.

Muth *et al.* (2007) analyzed the rates of entry and exit, before, during, and after the implementation of the PR/HACCP regulation. The adoption of the PR/HACCP may have caused small and very small meat harvest plants to exit. According to the results, very small meat harvest plants were 11.1% more likely to exit during the implementation period compared to before implementation of the PR/HACCP regulation. Small meat harvest plants were also more likely to exit during the implementation period by 8.4%. When comparing the period after implementation of the regulation to before implementation, very small meat harvest plants were 6.6% and small meat harvest plants were 7.3% more likely to exit. After reviewing the results, the authors suggested that very small and small meat harvest plants were more likely to exit because of the PR/HACCP regulations. The authors also suggested that the exit rate because of the PR/HACCP regulations decreases with time. Large meat harvest plants likelihood of exiting did not change during and after implementation compared to before the PR/HACCP regulation. When reviewing the data for poultry harvest plants, very small and small plants were no more likely to exit during implementation compared to before implementation of the PR/HACCP regulation. However, very small poultry harvest plants were 11.1% and small poultry harvest plants were 8% more likely to exit after implementation of the regulation compared to before implementation. Large poultry harvest plants likelihood to exit did not change because of the PR/HACCP regulation. Very small and small poultry harvest plants exited the industry latter compared to their meat harvest plant counterparts. The results suggest very small and small meat harvest plants were more likely to exit because of the PR/HACCP regulation but the rate decreased over time. The decrease in rate could be caused by the exit of inefficient plants in the beginning leaving the more efficient plants to survive.

The cost of compliance depended on many variables. For example, plants which had contracts that included food safety standards, produced products under brand names, or exported their product to countries who then inspect their product, were subject to a lower fixed cost of compliance for the PR/HACCP regulation. The plants experienced lower costs because they were achieving higher food safety standards before the implementation of the PR/HACCP regulation compared to other plants. The survey also found plants that utilized a process control program before implementation of the regulation had less or the same costs compared to other plants. Process control programs consist of monitoring critical control points similar to the PR/HACCP plan (Ollinger *et al.*).

In addition to the cost of compliance, there is a loss of possible revenue for rejected meat or poultry. The loss of revenue is an opportunity cost for the plant. When a plant incurs a noncompliance issue, they must dispose of their contaminated product, which is accompanied by a cost to the plant. The disposal of their input is an opportunity cost, since they cannot use that particular input to produce a desirable output. In general, contaminated meat or poultry is used in other non-food products; however, their value decreases substantially with the contamination. (Cho and Hooker)

Violations

The loss of sales along with the cost of compliance compels some businesses to participate in illegal activities. Violating a regulation may be costly if caught; however, the violation may also increase a plant's profit substantially. When a plant violates a regulation, they are able to produce items at lower cost. The plant has less opportunity cost, since they do not need to dispose the defective products or inputs. If a plant is risk neutral, they will violate the regulations up to the point where marginal cost equals marginal revenue. In addition to violating the first regulation, businesses will naturally participate in other illegal acts to avoid detection. The act of committing an avoidance behavior may be a crime in itself; such acts in the meat industry include mislabeling, counterfeiting official inspection documents, illegal record keeping, or mail fraud, etc. Other acts of avoidance, such as the use of sophisticated means to prevent detection, may not be a crime by themselves, but their use may increase the punishment for the original crime. (Nussim and Tubbach).

Meat and poultry products sold as adulterated, mislabeled, or misbranded can be produced at a lower cost and in turn be sold at a lower price compared to safe food. Consumers suffer the consequences of the unwholesome food. According to the Federal Meat Inspection Act, title 21, chapter 12, subchapter 1, no official USDA device, mark, label, or certificate can be forged. No business can knowingly label their product as inspected and passed when in fact, the product has not been inspected or the product was inspected and condemned. The act defines misbranded as any label containing misleading information, fails to mention all ingredients in the product, or if the product fails to bear the official inspection legend. Labels must be positioned on the outermost package layer and visible to consumers. An official inspection legend is any symbol that represents the product as being inspected and passed by the USDA. The sale of adulterated and uninspected meat and poultry benefits the violators and is harmful to consumers. A couple of cases serve as examples to illustrate the ex-post punishment of the violators.

Sale of Uninspected Meat

The sale of uninspected meat and poultry is in violation of the Federal Meat Inspection Act and businesses may perform other illegal activities to reduce their risk of detection. Such avoidance activities include mislabeling, misbranding, mail fraud, and/or illegal record keeping. In the case of the Queen's Market grocery store from Kansas City, MO, along with the Kingsville Hog Market, the avoidance was mislabeling their meat as passing USDA inspection and the initial violation was the sale of uninspected meat. Kingsville Hog Market delivered the swine to Parmley's Holden locker, a USDA non-inspected facility, where it was harvested and processed. Queen's Market knowingly purchased the uninspected meat and sold it as USDA inspected meat. In total 9,057 pounds of swine product was offered for sale or sold to customers between November 29, 2002 and March 6, 2003. Kim Huynh, Nham Pham, and their business Queen's Market along with Rick Anstine, owner of Anstine Enterprises and Kingsville Hog Market were sentenced on December 6, 2007. According to the news release by John F. Wood, United States Attorney for the Western District of Missouri, "The court ordered Queen's Market to pay a $2,000 fine following its guilty plea to aiding and abetting the sale to the public of adulterated food that was unfit for human consumption. Anstine, Huynh and Pham were each sentenced to one year of probation after pleading guilty to aiding and abetting the misbranding of

food. On Aug. 7, 2007, the court also ordered Anstine Enterprises to pay a $10,000 fine after pleading guilty to aiding and abetting the misbranding of food." (http://www.usdoj.gov/usao/mow/news2007/anstine.sen.htm) Selling uninspected meat is harmful to consumers and socially wasteful. The effective use of ex-ante and/or ex-post regulations on avoidance activities may lower the probability of the occurrence of such an act.

Sale of Adulterated Meat

In general, the inspection of wholesale, storage, and transportation businesses in the meat industry is lower than harvesthouses and processing plants. Substantial amounts of crimes committed in the meat industry occur in the meat-handling sector. One of the most common crimes committed is the sale or transportation of adulterated meat or poultry. Adulterated meat or poultry is defined using such terms as unhealthy, unwholesome, inedible, or filthy, etc. Meat or poultry can become adulterated when stored, transported, or processed in unsanitary conditions. A misdemeanor is charged to the company and/or individual who unknowingly sold or transported the adulterated product. The punishment of this crime may increase to a felony, if the violator knowingly sold or transported the adulterated product. When a violator of this crime intends to defraud customers and/or the government, the punishment for such an act increases. The intent to defraud can be interpreted as an avoidance activity, which may or may not be a crime in itself. (Food Processing, 2002).

When a business recognizes their meat or poultry products have become adulterated they may decide to continue operations as normal and knowingly sell the adulterated meat or poultry to their customers. The act of knowingly selling adulterated meat or poultry is the original crime committed. To avoid detection, the violator may participate in other legal or illegal activities. The decision to sell the adulterated meat depends on the cost of disposing of the product, which includes the potential loss of sales also known as opportunity cost. If the costs are far too great, then the decision to participate in illegal activities may become more economical for the business. The decision to sell adulterated meat also depends on several factors such as what kind of risk taker the business is along with the amount of punishment incurred for detection. The business in either case may or may not fix the source of the adulterated meat.

In the case of LaGrou distribution systems, the crime was the sale of adulterated meat and using multiple avoidance activities to prevent detection. LaGrou distribution systems operated a cold storage warehouse in Chicago. The warehouse stored both meat and poultry products for their customers. On occasion, the total amount of product coming in and going out in a day would reach two million pounds. Along with storing meat and poultry products, the warehouse was a perfect habitat for rodents. The rodents created unsanitary conditions at the warehouse, which allowed meat and poultry products to become adulterated. The beginning of the rodent problem is unknown, but the company knew about the problem since 1999, based off the testimony by their manager David Smith. Smith found the problem soon after he began working in January of 1999, and he promptly told LaGrou president, Jack Stewart. Stewart and Smith would have frequent meetings about the rodent problem, approximately three times a week. The rodent problem only worsened over time according to Smith's testimony. According to Smith by late 2001 or early 2002, employees were catching at least one or two rats a day. LaGrou employees would destroy products in which the rodent damage was visible by the naked

eye. However, LaGrou did not conduct any tests to ensure other products were not adulterated. As the problem worsened, employees were instructed to participate in so-called “Rat Patrols”, where at one point 50 rats were captured. These patrols were not effective in controlling the rodent problem, and LaGrou’s pest control company recommended steps to alleviate the problem. The steps recommended were to: cement holes in the walls, seal sewer lids, and rodent proof their doors. Stewart believed the costs were too great and he never gave Smith the authority to follow through with the recommendations. On many occasions, customers would make claims for damaged product. On one occasion a customer made a claim that their product was damaged by rodents. After hearing the claim, Stewart sent them a letter stating they have a small rodent problem in their basement freezer and that the customer’s product would be moved. The customer’s product was never moved, and the rodent problem was not isolated to one area. LaGrou did note product damage on customer’s bills, however they would never report it as rodent damage. They would use such terms as damaged by the forklift etc. instead. In the spring of 2001, a quality assurance manager for a LaGrou customer, Aura Foods, came to inspect their product. The manger found a severe rodent problem, along with mold, ceiling and wall damage, and other unsanitary conditions. When the problem was brought to the attention of Stewart through a claim of product damage by Aurora Food, he quickly downplayed the situation. Stewart refused to pay the claim and lied to Aurora Foods, by stating a recent American Sanitation Institute inspection found no problems, and their pest control company only found “two totes with old mouse droppings”. Testimony by both the pest control company and the American Sanitation institute reinforced the claim that there was a severe rodent problem. On May 25, 2002, a USDA inspector visited the facility and found employees processing ham to be frozen without proper USDA inspection. A return visit by another inspector on May 29, 2002, yielded a detention of the ham after examining the unsanitary conditions the ham was being processed and stored. That same day both inspectors examined the warehouse more thoroughly. The inspectors found adulterated meat products, fresh rodent droppings, along with many other sanitation violations. The inspectors told Smith they would return the next day to inspect the entire facility and that no product should enter or leave the downstairs freezer of the warehouse. With the knowledge of inspectors returning the next day, Stewart told LaGrou employees to clean up the warehouse and remove damaged product. A total of fourteen USDA inspectors, along with inspectors from other agencies, such as the FDA, arrived at the facility the following morning. The damaged product was found by inspectors in dumpsters. Samples of the products were tested and were found to be contaminated with rodent hair and fecal matter. The food product stored at LaGrou was adulterated by rodents and other unsanitary conditions. All the food products stored at the facility, a total of 22 million pounds, were detained on May 30, 2002. The detained products were either destroyed or decontaminated. Customers of LaGrou along with the USDA were able to develop a decontamination system to save over 12 million pounds of product. The cost of decontaminating was $2.7 million. LaGrou was ordered to pay restitution to their customers in the amount of $8.2 million ($2.7 million for decontamination and $5.5 million for destroyed product). The company was convicted with knowingly storing meat and poultry products in unsanitary conditions. A $2 million fine was imposed on LaGrou along with a 5-year probation. Jack Stewart was convicted of five felonies and sentenced to pay part of the $8.2 million in restitution and 33 months of prison. (*United States of America vs. LaGrou Distribution Systems, Incorporated).*

Avoidance Control

Detection of the avoidance activity and the original crime are correlated. Generally, when a crime is detected the underlying avoidance activities are also detected. Avoidance activity can be controlled using either price or quantity methods. When using price control, the avoidance activity becomes more costly and decreases the likelihood of the business participating in the original crime. Decreasing the benefit from an avoidance activity is also considered price control. Price control may use taxes to increase the cost of an avoidance activity. In the meat industry, the benefit and or cost of avoidance activity may be changed to limit the occurrence of crimes such as the sale of adulterated meat and the sale of uninspected meat. Quantity control reduces the occurrence of avoidance activity by limiting the use of an activity. Requiring licensing for label makers in the meat industry may reduce the occurrence of a business mislabeling their product. Another example of quantity control would be prohibiting or limiting the sale and possession of avoidance devices. (Nussim and Tubbach).

Two other options of avoidance control include ex-ante regulations, and ex-post punishment. Both options can be used with price or quantity control. However, price control tends to be used with ex-post punishment and quantity control tends to be used with ex-ante regulations. Ex-post punishment is used after the avoidance activity has been detected, while ex-ante regulations are used to prevent the avoidance activity. With the avoidance activity such as mislabeling, an ex-ante regulation could be additional labeling and record keeping requirements of businesses, set forth by the USDA. Ex-post punishment may increase crime because it increases the marginal cost and marginal revenue of committing the crime. Ex-ante regulations, however, increases the cost of avoidance decreasing the likelihood of a business participating in avoidance activities and the original crimes. Control of avoidance before detection using ex-ante measures is difficult, since the regulations may hit the wrong target and have no affect on the original crime. Ex-ante regulations may also be targeted at activities that are legal when used properly which can affect non-violators of the crime. Ex-ante quantity control regulations are hard to implement in cases where detection is necessary. (Nussim and Tubbach).

Private action and government regulations both contribute to food safety. When a business increases their food safety to satisfy their customers, it is called private action. Contracts between the meat or poultry processor and their customer may include limits on pathogens and sanitation control. The meat and poultry processor benefits from higher prices and a guaranteed buyer, when they adhere to the contract's safety requirements. The customer yields benefits from the contract since there is greater control of food safety and less recalls or opportunity cost. Branding of products is also included in private action. When a product is branded, a consumer can recognize the product and its history. The consumer may determine the branded product is unsafe because of recent recalls and not purchase the product. Along with the potential loss of sales with branding, there are also benefits for the meat or poultry processor. If meat or poultry processor is able to produce safe food without recalls, than they may charge a premium for their product. The most effective and efficient method of controlling food safety processes are a variety of government regulations and private actions that include all food safety concerns. An increase in FSIS product testing along with reporting their findings to the public would help increase private action and food safety. Reporting PR/HACCP and SSOP compliance inspections to consumers will increase the demand for safe food and in turn private

action in the meat industry (Ollinger and Moore). When consumers are effectively informed on the food safety of the products than an efficient degree of food safety is attainable (Antle 1996).

Avoidance Control through Service Providers

Control of pests such as rodents, insects, and birds are crucial in the effort to produce safe meat and poultry for consumers. Cockroaches are one of the common pests found in processing plants. Cockroaches harbor bacteria such as *salmonella,* which can have a harmful effect to humans. To control cockroaches their habitat must be removed, there must be inspection of incoming shipments, and possible use of a food plant permitted insecticides. Houseflies are another potential pest that can contaminate meat or poultry. Control of houseflies can be done by removing breeding sites, preventing entry of flies into the plant, and the use of flytraps. Birds, such as pigeons, sparrows, and starlings are the most common when it comes to food contamination in plants. Birds carry diseases and can contaminate meat or poultry products with their feathers, parasites such as mites, and their droppings. Preventing the birds from entering the plant is one method of control along with traps and poisons. Eliminating nesting places for birds is also an effective technique to prevent bird-food contamination. Rats and mice are also a problem in the food industry. Rodents can contaminate products by the disease they carry, and can damage product physically by gnawing, etc. Eliminating the rodent's habitat and food source is one example of control. The proper use of traps and other devices can be effective in controlling the number of rodents. (Keener).

In the case of LaGrou Distribution Systems, they found no need to control the overwhelming population of rodents. The company deemed proper control of the rodents by a pest control company would be too costly. The ignorance of the company on the seriousness of the problem inevitably brought it to the attention of inspectors, and the company was punished by a substantial fine. Inspectors however were unable to recognize the problem until a numerous amount of product was sold adulterated. A proper use of an ex-ante measure to control avoidance activity would prevent the sale of adulterated meat like in the case of LaGrou Distribution System.

Nussim *et al.* explain an ex-ante measure to control avoidance activity could be increasing the liability to service providers such as accountants, lawyers, and financial advisors who contribute to the avoidance activity. The increase in liability to service providers will increase the price of their service, which will increase the cost to the principle violator of the crime. The avoidance activity invested by service providers for their own benefit is assumed nonexistent or unrelated to the principle crime.

An effective control method of the sale of adulterated meat would be to eliminate avoidance activity through pest control companies. Pest control companies are considered a service provider and the use of Nussim *et al.* ex-ante measures can be adopted. Contracts between meat or poultry processors and pest control companies are necessary to eliminate products being sold that are contaminated by pests. The contracts would have to be forced onto the processors; otherwise, they may not find it economical to comply. The relationship between the processor and their pest control company must be transparent. Actions taken by the pest control company must be well documented and accessible to inspectors. The contracts are

developed so that the pest control companies become liable for the work they have done at the processor's facility. The pest control company is forced to control all pests at the processing facility because of the potential fine to them if the meat or poultry is found adulterated. Two situations are plausible with the case of a contract between processors and pest control companies: 1. The pest control company controls all pests and inspectors find no serious contamination of product. The pest control company pays no fine and generates revenue from their services. Meat and poultry processors only have to pay for the services of the pest control company according to their contract. 2. The pest control company is unable to control all pests and product becomes adulterated. Inspectors at the meat or poultry processing plant notice the pests and charge the plant with the sale of adulterated meat. The pest control company is liable for the sale of adulterated meat or poultry and is issued a fine. The yearly contract fee remains intact, and the fee is paid by the processors. The yearly contract fee must remain intact; otherwise, processors may find it economical to contaminate their product by rodents to avoid the service fee.

The use of contracts with other service providers can reduce avoidance activity and the original crime. The contracts can be set up with accountants, lawyers, and financial advisors. The contracts would resemble the pest control example by increasing the liability of the service provider. Rules and regulations already exist for accountants and lawyers, so the regulations associated fine's amount would be increased to limit avoidance activity. The increase in the fine's amount will also increase the amount of money a service provider will charge to processors to participate in avoidance activities.

The service providers fine and/ or restitution cost would have to be greater than the sum of the contract fee and the economical benefit their customer may receive for their participation in the original crime and avoidance activity. The sale of uninspected meat and tax evasion of an 'x' amount would be an example of the economical benefit a service provider may receive from illegal activity. The service provider and processor would have no economical gain from avoidance activity. The amount of contract fees that will be transferred to consumers is undetermined at this point. The marginal cost to processors for the contracts could be greater for small plants compared to large plants as in the example of the findings by Ollinger *et al*. presented earlier.

Conclusion

The sale of meat and poultry contains asymmetric information dealing with food safety. Since pathogens in most cases are invisible, consumers lack information on the safety of meat and poultry. Government interaction through the Food Safety and Inspection Service (FSIS) in the meat and poultry industry is necessary to regulate the safety of meat and poultry products. Inevitably, any rules in society are likely to include violators. In the meat and poultry industry, violators of the regulations may see economic benefit to do so. The cost of perfectly safe food is far too great for the industry to bear. The marginal gain in revenue from violating a regulation may be greater than the marginal cost. Violators of rules may resort to sophisticated means to avoid detection of the original violations. The means used to avoid detection may be legal or illegal in and of themselves. Effective regulation of avoidance activities will lead to lower violations of the original crime. Such regulations may be ex-ante or ex-post. This paper

discusses potential effectiveness of ex-ante or ex-post regulations on avoidance activities of food safety regulations in the meat and poultry industry. The use of ex-ante measures such as contracting external service providers coupled with the threat of ex-post punishment on service providers would potentially decrease the number of avoidance activities and their associated original crime in the meat and poultry industry. Utilizing such an ex-ante measure would reduce the amount of cases such as the LaGrou Distribution System example and the Kingsville Hog market example. The cases mentioned are examples where the crime was detected; however there may be multiple cases where the crime goes undetected. The use of ex-ante measures on service providers would likely reduce the total number of processors non-complying with food safety regulations. To conclude, the paper is intended to raise the awareness of the existence of the problem of avoidance of food safety regulations in meat packing industry, its potential legal and economic consequences, and potential for further legal actions, ex-ante and ex-post, against the violators.

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