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Food Safety in the Meat Industry: A Regulatory Quagmire

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In the aftermath of the recent food scares, Europe and the United States face major challenges to maintain a safe food system. Foot and Mouth disease (FMD) and Mad Cow disease (BSE) outbreaks in Europe and the highly publicized product recalls in the United States illustrate the severity of the food safety problems that governments are dealing with. The global meat industry has been exposed to significant food safety and food quality events that in turn have triggered very different responses in the United States and Europe (Goldsmith et al., 2002a).
By the fact that the responses to ensuring safety differ between the US and Europe, are there multiple means to the end objective of a safe food system? This paper, using the US meat industry as an empirical example, develops an institutional model demonstrating alternative mechanisms for achieving safety in the food system. While the traditional response in a time of food safety breech is to intensify regulation, the model developed herein offers complementary and substitute approaches.

In previous work Goldsmith and Basak (2001), Sporleder and Goldsmith, and Goldsmith et al.(2002b) demonstrate the safety challenges facing the agri-food supply chain due to dynamic process innovation, long jump product innovation (i.e. biotechnology), harm measurement, inter-temporal welfare assessments, and positive probabilities of non-trivial harm.
Europe's response to the catastrophic food crises has been to embrace the precautionary principle and press for stricter regulations with emphasis on an "active government role" (Commission of the European Communities, 2000). On the

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other hand, the United States has opted for a more ad hoc and incremental approach (Goldsmith et al., 2002a). There have been criticisms by some experts due to the weakness of these measures (Schuff, 2001; Ginsburg, 2001).
Foodborne pathogens are estimated to result in 76 million illnesses and 5000 deaths in the United States each year (Mead et al., 1999). In 1997, Hudson Foods recalled 25 million pounds of hamburger due to an E.Coli contamination (Loader and Hobbs, 1999; Martin, 1999). Hudson was eventually driven out of business and the plant, one of the most modern in the country, was sold to IBP. In the case of Supreme Beef, two million pounds of beef, to be used in the school lunch program, was recalled due to repeated tests showing high levels of salmonella (Maixner, 2000).

"We've seen a good company…dismantled by being held to a standard that didn't make any sense and was just plain wrong,' said Rosemary Mucklow, chief executive of the National Meat Association (in Maixner, 2000). The beef processor took the USDA to court (and won) after the FSIS (Food Safety Inspection Service) threatened to remove its inspectors. This would have essentially put Supreme Beef out of business . In the summer of 2002 ConAgra recalled 19 million pounds of hamburger suspected of contamination by E.Coli (FSIS, 2002a). Federal inspectors were blamed for escalating the severity of the contamination because of the delay in a notification process that could have begun as early as April. In October 2002 Pilgrim's Pride, recalled 27.4 million pounds of fresh and frozen ready-to-eat turkey and chicken because of possible Listeria contamination (FSIS, 2002b). The outbreak has been linked to 23 deaths and 120 illnesses in eight Northeastern states (Fabi, 2002).

Essentially at the same time though (April 2002), Secretary of the Department of Health and Human Services, Tommy Thompson stated, 'These findings (CDC study that there has been a 23% overall drop in bacterial foodborne illnesses since 1996) represent a true reduction in the number of Americans suffering from foodborne illness' (CDC, 2002). Secretary of Agriculture, Ann Veneman concurred stating, 'These data demonstrate that we are on the right track…and modern, science-based food inspection systems have contributed to our ability to control pathogens during food processing.' (CDC, 2002). So at the same time there are repeated significant food safety breeches, government officials are lauding the system's performance. Yet to confuse matters further, the GAO at the same time reported major failures of FSIS to monitor US food plants (GAO, 2002):

> Although plants are required to take corrective action each time a violation is cited, the number of repetitive violations in various plants- 109 in one plant alone- shows that FSIS has not ensured that recurring violations were eliminated. (GAO, 2002).

These events obviously raise concern about the US meat safety system. More importantly how did we get to this point? Why has the USDA been so challenged?

To answer these questions we developed a conceptual model to better understand food safety policy options in terms of their effectiveness. Our model draws on both legal and economic theories to explain the pros and cons of alternative mechanism to ensure safety, why the US food safety programs are challenged, and why the US approach ultimately relies on a legal framework and Europe utilizes a regulatory framework. One valuable outcome of the model is its ability to explain the limits of the various mechanisms such as ex-ante government regulation, post-market surveillance, or private branding when society attempts to create a safe food system. A controversial result of the model is the support it provides for the precautionary principle in the debate whether the European food safety response is really a guise for trade protection.

In a recent paper, Sporleder and Goldsmith (2001) identified modern phenomena of social attributes challenging the performance of the global food system. Credence attributes , such as -GM, organic, or animal friendly, have taken on a social context forcing the food industry to satisfy both users and non-users. Historically credence goods were the domain of the implicit contract between buyer and seller. Now non-users are involved in the marketing of products because of the social implications; i.e. animal welfare, environmentally friendly, and "fair-trade." A market failure is occurring with the rise of social credence attributes in the modern food system. Markets work well when consumers are able to directly signal suppliers concerning the quality of their products. Bad experiences lead to declining sales. The bilateral exchange between a vendor and customer, in a stylized competitive market, effectively addresses the trade in property.

The market fails in the modern context when the exchange is no longer bilateral. A good example of the challenge concerns the market for corn seed. If genetically modified Bacillus thuringiensis (Bt) corn seed did not perform for farmers, sales would wither. Based on current levels of adoption both vendors and purchasers of Bt seed are satisfied. The exchange process for seed has historically been bilateral focusing on the seed and its performance, never on a co- product of the seed business; pollen. Pollen has historically been a public good, with ill-defined property rights. In the modern setting with transgenic events the natural process of pollen drift no longer is benign and the seed transaction no longer is bilateral, it is multilateral. Seed companies "sell" pollen as well as seed. Seed has a positive price and transgenic pollen a negative price. Non-purchasers may find unwanted pollen in their products. Who "owns" or is responsible for the pollen; the life science company that created the event, the company that marketed the seed product, the farmer who produced the grain, or the processor who created the food product? The customer is no longer simply the farmer, but society as well.

It is a classic case of non-internalized externality. The market provides effective signals to the firm about the agronomic performance of the seed. How does society signal back to the firm about the public goods problem associated with the pollen?

A conventional response with public goods problems is regulation. Society could regulate directly (Northwest (NW) quadrant- Figure 1) or conduct an ex-post test to see if any GM pollen slipped out (Northeast (NE) quadrant)). The case of Starlink® is an excellent case study of the failed performance of such a combined strategy. Sporleder and Goldsmith point out that while policy makers scurry attempting to clean up after a Starlink® breech, they ignore the greater phenomena in a post-industrial food system of arduous measurability, high rates of process and product innovation, and non-trivial harm.

Arduous measurability. It is not just that information is asymmetric across the transaction interface making measurement difficult. With new technologies or pathogens information or useful metrics may not exist at the time of the transaction. A key component of efficient markets is the ability to signal accurately. Inferior results occur because of uncertain metrics.

High rates of process and product innovation. Added to the measurability problem is the rate of product, process, and organizational innovation occurring across the supply chain. While the link from tobacco to cancer is now known to be direct, where does E.coli enter into the meat system? Where does GM material enter into a consumer product supply channel? Modern industrialized food products employ numerous and dynamic sets of ingredients each with their own supply chains. The rate of change and complexities in the private sector portends immense challenges for the regulatory sector to keep pace.

Non-trivial harm. Finally in the past the agro-industrial complex comprised many small firms, involved relatively small lot sizes, and thousands of individual decisions. In the modern agri-food economy scale and industry concentration have increased dramatically, fewer decisions have greater impact, and the harm from poor decision-making may be non-trivial. One of the best examples of this was captured in an article with Robert Shapiro, former CEO of Monsanto (Specter, 2000). In the lengthy interview Mr. Shapiro describes the pressures facing private decision-makers whose decisions in-turn have huge public goods impacts. Once made, the impacts, as is the case with pollen, are irreversible. While biotechnologies on the market to date appear fairly benign, non-trivial unintended consequences may emerge in the future.

Historically, the regulatory community has depended on metrics and measurement to ensure safety. What if measurement and metrics (NW quadrant) are incapable of keeping up? Five years after the Hudson meat case (1997) the USDA is still wrestling with its mandate to keep tainted meat off the market (see Maixner, 2000A, B and Feedstuffs, 2002). As simple a task as it appears to measure E.coli or salmonella, the regulatory environment is failing (GAO, 2002). In application cause, effect, and responsibility are difficult to determine (see the case of Pilgrim's Pride). Now map that process over to post-market surveillance (NE quadrant). What is the probability that direct linkages between cause and effect and in turn

liability will be established in the arena of GMOs? Cause and effect may eventually be proven, but will the determination of ex-post liability be timely and relevant to affect the behavior of firms ex-ante? Now add in non-trivial harm and timing becomes very critical.

The Case of Meat: Europe vs. the US

In the US there have been numerous failures of the system yet reform of the industry and novel regulation is not apparent. Food borne illnesses outpace product liability cases from any other sector (ERS 2001). Yet meat consumption continues to rise, consumer outcry is muted, and industry seems little affected (Goldsmith et al. 2002a). As the Supreme Beef and ConAgra cases (discussed below) demonstrate, the ultimate enforcement mechanism in the US is the court of law and in both cases the court provided the firm with relief; southeast quadrant of Figure 1.

In Europe, full meat traceability and an animal passport system are emerging. New policies in the EU recently instituted new and tighter mandatory beef labelling rules. EU officials say this will give consumers more detailed information about the beef that they are buying. Compared to the existing legislation, beef labels now must include (in addition to the place of fattening, slaughtering and cutting) precise information about where the animal was born and raised. EU Ag Commissioner Franz Fischler (2001) stated that the rules would enable "full traceability of cattle in the EU" and provide EU consumers with the protection they demand. This policy approach, because it is a direct ex-ante approach falls in the northwest quadrant of Figure 1.

The differences in response, Europe in the northwest and the US in the southeast can be traced to underlying constitutional differences. The US system is rooted in the Bill of Rights and the sanctity of the individual.

> The Constitution of the United States incorporates a written Bill of Rights. It places great symbolic weight on human rights. It elevates the basic rights of man to supreme constitutional status. (Lord Irvine of Lairg, 2000).

Judges then are the protector of those rights and thus have a role superior to that of the other branches of government (Aldisert, 1977). England, for example, has no such anchor. English law observes rights as residual (Lord Irvine of Lairg, 2000) and set in the dynamic process of Parliament rule.

> In theory, in practice and in constitutional structure and procedure, the British courts have always been firmly placed under…Parliament. The Parliament is the ultimate and unchallengeable maker of the law they apply. (Shapiro, 1981, p.66).

This then creates two diametrically opposite perspectives where the US system focuses on the individual and the English system focuses on the polity. In application the rights of the individual are unchangeable while the needs of the polity change. Therefore the US system is predisposed to protect against Type I errors and England against Type II errors. Type I errors are errors in jurisprudence that convict the innocent and Type II errors free the guilty. A society where individual rights are pre-eminent worries when rights are trampled, thus each individual and firm has standing before the court of law. In the Supreme Beef case, the defendants argued that the USDA violated the firm's rights to conduct business when the USDA threatened to remove their inspectors (Maixner, 2000a). In the ConAgra case (June and July 2002) suspicions and testing began in April, but a formal and public recall did not occur until July 19 (Schuff, 2002a&b). The delays lead to not only more meat being put on the market but most of the meat being consumed by the public.

In the British system, because of the role of the Parliament, the unit of analysis is the polity, which balances the rights of individuals against the needs of society. Letting go the guilty is far worse because society as whole is made worse off. In this way it can be said the liberty trumps democracy (society) in the US while democracy (society) trumps liberty in the UK.

What this explains is why food safety is essentially a legal issue in the US and why it is essentially a regulatory issue in the UK. This explains why regulators are stymied in the US because proving cause, effect, and responsibility is difficult when the system is most concerned about not committing a Type I error (the Supreme Beef case is an excellent example of this process). The defendant is assumed innocent and given the benefit of the doubt.

On the other hand the US system is not entirely without discipline. Consistent with a Type I environment, tort law and its practice in the US facilitates legal action by harmed parties (see Buzby and Frenzen, 1999). There is an entire industry of lawyers specializing in product liability law driven by the incentives of contingent-fee contracts. Not just in the UK, but also throughout the EU, tort law and product liability statutes are in their infancy compared to the US (College of Europe, 2000). In the UK, for example, there are no contingent-fee contracts but instead a loser-pays rule that minimizes the quantity of frivolous lawsuits and may stand in the way of an individual's right to justice (Posner, 1996).

Both the European and US responses are limited in their ability to oversee a safe food system. The direct ex-ante regulatory approach (NW) fails because of the industry complexity problem where the government fails to keep up. Policy makers could move to the NE quadrant and test ex-post using programs of post-market surveillance. This approach is challenged because it is not able to be accurately

measured and because of non-trivial harm problems. To be effective, post-market surveillance, or the threat of post-market surveillance, which is done in the future, needs to affect investment (corporate capital plans) and strategic behavior in the present. In an ex-ante fashion such impact would substantively improve the stochastic properties of a negative health event, thus addressing the non-trivial harm feature of the problem.

Thirdly, policy makers could choose the southeast quadrant, ex-post incentive strategies, such as legal liability. This fails in the constitutional setting of the US due to the Type I error avoidance environment. On constitutional grounds individual firms would and can skirt the full power of the law (see Viscusi, 1989). As well, under a SE policy framework plaintiffs can overshoot by engaging in an excessive number of frivolous lawsuits. This creates "noise" in the system making difficult the exercise of justice. That leaves the southwest quadrant of indirect ex-ante policy. Two mechanisms that are incentive based and ex-ante are fiduciary bonding and private branding.

Private Branding

In its simplest form, branding can involve both product differentiation and firm reputation. Brands have special utility for signalling intangible societal attributes, such as animal welfare and non-genetically engineered products. In such cases the consumer has difficulty assessing quality based on consumption and determining whether the product complied with its stated claim. For example, consumption of a steak identifies its sensory quality to the consumer. Branding the steak as "Certified Angus" signals to the consumer, ex-ante, that the steak is consistent quality from similar genetics and justifies a price premium. Branding does not mean that the differences are well defined; only that differences exist. This signaling of differences can be accomplished in a variety of ways; through, advertising (Nelson, 1974; Milgrom, 1986; Nichols, 1998), reputation-building strategies (Shapiro, 1983), warranties (Gal-Or, 1989), or simply brand-building through capital investment (Klein and Leffler, 1981; Thomas, 1995).

Branding creates a private good. Alternatively, government-grading systems generate a public good. The firm through the private good communicates directly with the consumer. Trust is built in the brand because the firm makes investments ex-ante and requires repeat or multiple purchases over which to spread the investment. If the initial consumption experience fails to deliver, repeat purchases won't be forthcoming and ill will constrains sales. So for the firm, branding is incentive compatible as the risks are high; whether from the loss of brand capital, warranty expenditures, reputation, or advertising expenses.

There is an implicit contract between the firm and the consumer, in which the firm has no incentive to signal inaccurately. The consumer experiences what is expected or at least trusts the firm that the product contains the advertised attributes. For example, a consumer cannot use sensory criteria for an egg from a laying hen to

determine the hen's living conditions. Burger King requires 75 square inches of space rather than the minimum industry standard of 62 inches (Smith, 2001). However, customers trust suppliers to verify societal concerns even if there is no direct information available to the customer. In this case the brand allows a separation (differentiation) in the marketplace by quality in the form of intangible societal attributes.

In terms of the arduous measurability, branding can be effective. Customers may not be able to measure the quality of a product, for example the environmental impact of the Bt event in corn. But when Monsanto makes an assertion and a commitment to market the product there is an implicit contract with the farmer and many ultimate customers that due diligence and prudent safety measures have been employed. Branding, for example with Bt products, is an effective signaling mechanism for private exchanges between the firm and customer; and in a Smithian way, is beneficial to society as a whole.

Branding is less effective though when uncertain and diffuse externalities exist. As mentioned, branding is an efficient signal for the private exchange of goods, but what if the aggregate risks to society are greater than the risks born by the individual customer? It is not simply that the Smithian outcome is not efficient when private and societal preferences are heterogeneous. Traceability systems and process branding could address part of the market failure by discounting terminal products containing bacillus thuringiensis corn. The real failure of a product and process branding system is its inability to effectively insure against large and unforeseen damages that swamp the brand equity such as non-trivial harm revealed in the future.

Fiduciary Bonding

An alternative mechanism that addresses the incompatibility between private and public risk bearing is the requirement of assurance bonds.

> "Bonds are designed to confront the resource users with the marginal social costs of the 'worst case' (author's quotations) results of their activities undertaken…. Where the time-distance between the parties at either end of an external effect is considerable, and where there is a high level of uncertainty about the nature or severity of the effect, and the scope for creating a market for that effect is limited." (Costanza and Perrings, 1990, pp. 58-59 and 64-65).

A key incentive feature, different from the threat of litigation and large fines, is that bonding is an ex-ante process. Consequently internalization and caution are introduced into the firm's managerial processes and investment strategies as the business model is being designed.

In application, a bond is a declaration of ex-ante liability rather than the current practice of the burden placed on harmed parties to raise claims ex-post (Costanza and Perrings, 1990; Thomas and Randall, 2000). The bond would be held to compensate those affected by the (ex-ante) immeasurable harm or until the uncertainty or risk had been reduced to commercially viable levels. To engage in the uncertain activity the firm would be required to post a bond in an amount equal to the "worst case scenario" losses. If such losses did not materialize or uncertainty was reduced over time the bonding level declines. The burden is on the firm to provide evidence that the expectation of harm has declined and that their capital obligation should be reduced.

Bonding does several things. First and most importantly it pushes incentives ahead in time. Funds are posted ex-ante. Second, bonding is incentive compatible making the producer of the risk bear the risk. Third, bonds are insurable creating a market for the risk and reducing the cost on the firm. Fourth, bonding rates are dynamic. As information is revealed over time, through additional research or post-market surveillance, risks are reduced, bonding levels would be ratcheted down reducing the burden on the firm. Finally, the firm adapts its capital plan because of the explicit and ex-ante identification of the risk. Theoretically the design is to reduce cavalier behaviour by the firm without destroying the incentives for innovation. Striking a fine balance is critical. An application might be an insurance bond posted by a meat company in the event of a food pathogen outbreak. Posting the bond ex-ante would then theoretically effect the firm's investment and governance of its supply chain.

Conclusion

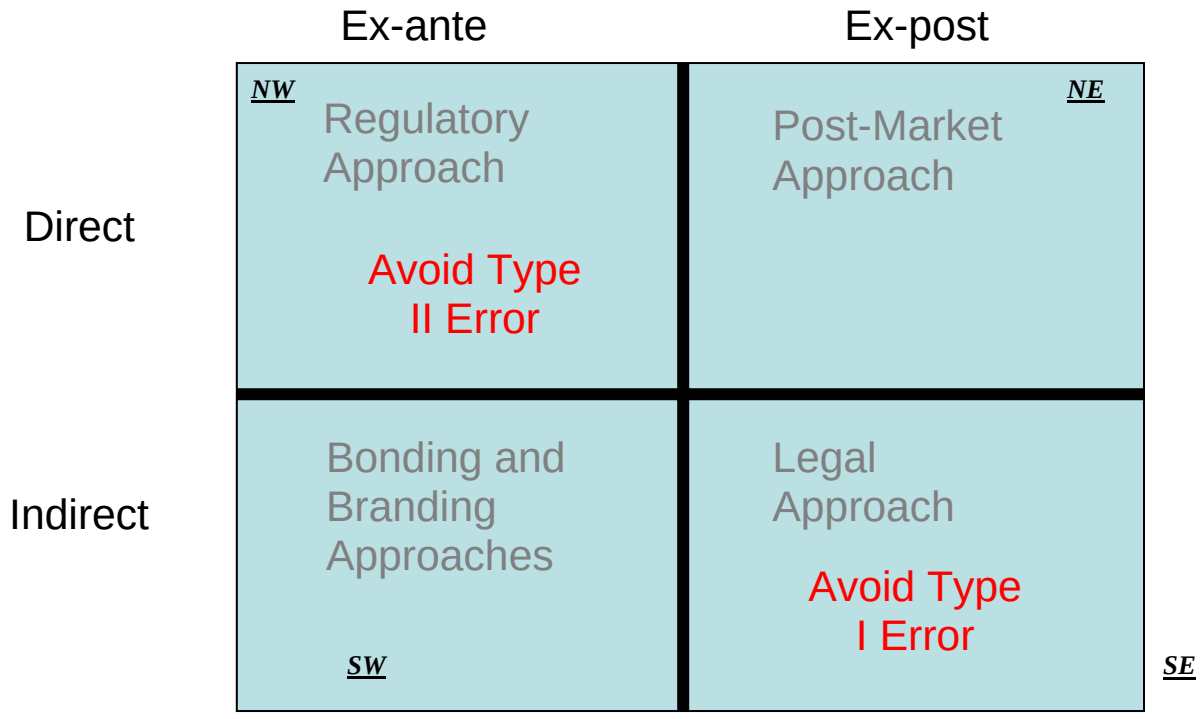
Addressing the risks associated with the modern food system is challenging. Two underlying features, the constitutional environment and the business environment, will have significant impact on optimal policy. The precautionary principal for Europeans is rational given the lack of tort law and the challenges an ex-ante direct approach faces (NW). The horrid experiences with BSE reflect the challenges regulatory policy has keeping up with industrial practices. As the residual claimant, European governments have an incentive to over regulate. On the other hand, the US system involves government operating more tangentially to industry (see FDA, 2001). Organizations like the USDA have conflicting roles, supporting the industry through its grades and standards, while at the same time attempting to challenge errant practices. It is unable to keep up (GAO, 2002). Post-market assessment approaches (NE) are challenged by the immeasurability problem. Even assuming measurability were not a problem, ex-post approaches can be stymied by the US style legal environment (SE).

Policy makers are left then with exploring ex-ante incentive compatible approaches to complement their ex-ante regulations and post-market assessments. Science has

a role to play but in a much more targeted way. Good policy needs to be set within the business and constitutional environment, which in the case of food safety provides unique challenges. By understanding ex-ante approaches, such as bonding and branding, policy makers can then built a regulatory approach adaptive to the realities of the food industry.

One example, of an emerging food safety institution emerging in Europe is the food retailer. A process known as double branding helps fill the trust void. For food retailers, a lack of trust means a lack of consumption, and a lack of consumption means a lack of store traffic. Trust can be a competitive advantage. In the current environment, retailers fill the trust void staking their image as a hostage asset. Consumers are unsure of relying on the government and the science community for information about what is safe. Assuming monopolistic competition, the retailer serves as the trust broker bringing into the store products that are trustworthy because its own reputational brand is under scrutiny. Modern retailers, as emerging supply chain "captains," represent a new institution that may provide safety and discipline (ex-ante) in the ever-complex food system.

Figure 1. Stylized Food Safety Policy Environment



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