Food safety regulation: an overview of contemporary issues

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Abstract

This article discusses a number of issues that are influencing the evolution of food safety regulation in developed and, to a lesser extent, developing countries. Whilst not definitive, it aims to highlight those factors which are considered crucial to an understanding of contemporary food safety controls in both the public and private spheres. These issues include criteria applied to assess the need/justification for food safety regulation, relationships between public and private food safety control systems, alternative forms that public food safety regulation can take, strategic responses to food safety regulation, and the trade implications of national food safety controls. The article serves as an introduction to these issues, which are discussed at greater length in the other papers that make up this special issue of *Food Policy*.

Introduction

In both developed and developing countries, food safety assurance systems are generally becoming more stringent, in response to enhanced, both real and perceived, food safety problems. This is occurring through changes in both public (for example direct regulation and product liability) and private (for example self and third party certification) quality control systems. In addition, the relationship between public and private systems is shifting and the entire process is being influenced by the

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implementation of the Sanitary and Phytosanitary (SPS) Agreement under the World Trade Organisation (WTO). This article discusses some of the major factors behind these developments and provides a context for the papers that make up this special issue of *Food Policy* that is devoted to contemporary issues in food safety regulation.

Regulatory systems are facing a number of new and continuing food safety challenges. Prominently, regulatory authorities are having to address new potential food-borne risks (for example BSE and genetically-modified organisms), whilst seeking to improve control of established risks (for example *Salmonella* and *E. coli* O157:H7). Further, there is growing political pressure for increased controls as a mechanism to support consumer confidence in the safety of the food supply following numerous "food scares". At the same time, however, food safety regulations are increasingly viewed sceptically from an economic standpoint, generating pressure for "efficient" regulations, particularly for regulations based on performance criteria or information provision (Antle, 1995). Food safety controls, however, continue to focus predominantly on process-based requirements. Similar pressure has developed to ensure that product liability systems provide efficient incentives to food producers, processors, and distributors to deliver products of acceptable safety.

Private safety control systems, standards, and certification programs are responding to higher consumer requirements, needs for safety controls throughout the vertical chain of distribution, and changes in regulatory and tort liability requirements. International markets and trade agreements are changing the contours of public and private quality control systems. National governments and the European Union now find their control systems under scrutiny as potential non-tariff barriers to trade under the SPS Agreement and are actively pursuing efforts towards co-ordination of regulatory activities. Companies are seeking efficient private means to assure the quality levels necessary to be acceptable to buyers and in compliance with regulations across multiple countries. These challenges have important implications for the structure and conduct of the food system within individual countries and for bi- and multi-lateral trading relationships.

Contemporary issues in food safety regulation

There are a number of issues that are influencing the evolution of food safety regulation. These are most prominent in developed countries, but increasingly their influence can be observed in the evolution of and increase in food safety controls in developing countries. This paper highlights five key issues, not in hierarchical order, which are considered central to an understanding of contemporary food safety regulation. These issues include the criteria employed for establishing regulations, the relationship between public and private food safety control systems, how governments approach regulation, strategic responses by private parties to regulation, and the trade implications of national food safety controls. Although this list is far from exhaustive and other authors may categorise and/or subdivide these issues differently, the paper does emphasise the complex process through which food safety controls are evolving and, in turn, the challenges which policy-makers need to address.

Criteria for instituting food safety regulations

It is now widely recognised that the traditional market failure model put forward by economists is relatively poor at explaining the policy interventions actually implemented by governments (McCormick and Tollinson, 1981; Henson et al., 1995; Ogus, 1994). Rather, it is evident that policy is the outcome of a complex trade-off between alternative demands that reflect the interests of the different groups that might be affected. In the case of food policy this will include consumers, food manufacturers, food retailers and farmers, both at home and abroad, as well as government itself and taxpayers. One of the key challenges facing policymakers is to balance these alternative demands because, in many cases, these different groups apply alternative criteria, both when judging the need for food safety regulation, ex ante, and the success/failure of food safety regulation, ex post. Furthermore, these criteria are generally not explicitly stated, with the result that the policy debate lacks coherence and, in some cases, transparency. This is particularly so in the case of debate about past policy decisions (see for example Bovens and 'Thart, 1996) as is well illustrated by the case of BSE in the UK.

The rationale for food safety regulation and/or the success/failure of food safety regulation can be objectively assessed according to scientific and/or economic justification. However, whilst these standards might appear to present a rational framework for the development of food safety regulation, in practice they may be difficult to apply. On the one hand, many of the scientific and/or economic variables associated with food safety are hard to measure and as a consequence these intrinsically objective measures may in practice be very partial. On the other hand, public demands for food safety regulation, which governments can find difficult to resist, may have little scientific and/or economic justification.

The scientific rationale for food safety regulation is incorporated into the framework of risk analysis, a structured approach whereby risks to human health are assessed and the best means for their control identified. Best practice dictates that this consists of a three-stage process (Fig. 1) as follows (FAO/WHO 1995, 1997): (1) *risk assessment*: an assessment is made of the risk to human health associated with a particular food-borne hazard; (2) *risk management*: decisions are made regarding the acceptable level of risk and measures implemented for the control of this risk; and (3) *risk communication*: information about the risk and chosen methods of control are communicated amongst interested parties. The implication is that regulatory decisions based on risk analysis should be consistent across different aspects of food safety and, perhaps, across into other elements of risk, for example environmental protection and transport safety.

The principle of risk assessment has become enshrined in the operating procedures of the international standards organisations, for example Codex Alimentarius, and the SPS Agreement of the WTO. Whilst this has undoubtedly fostered greater discipline on the part of Members in the application of food safety regulation, it has also highlighted the problems associated with the application of risk analysis in practice. In particular, there are many new or fast developing aspects of food safety, for example GMOs, for which the level of scientific understanding is insufficient to

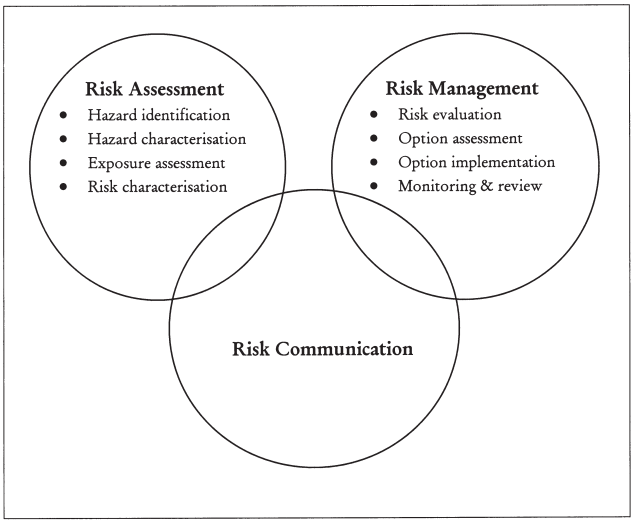

Fig. 1. Structure of risk analysis.

undertake a rigorous risk analysis. There is no agreement as to what governments should do in such circumstances. One suggestion is that they should adopt the "precautionary principle" where scientific evidence is not conclusive enough to determine an appropriate level of protection, but there is a perceived necessity to protect human health (Steinz, 1998).

The precautionary principle has become an intrinsic component of international environmental policy (Freestone and Hey, 1996). For example, the Rio Declaration at the United Nations Conference on Environmental and Development (UNCED) provides that (Freestone, 1994):

> "In order to protect the environment, the precautionary principle shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

However, the precautionary principle does not have such general acceptance in the case of food safety. The United States, for example, generally rejects the precautionary principle as a rationale for food safety regulation, particularly within the international context (Agra Europe, 1999b; Food Regulation Weekly, 1999; Caswell, 1999). To a large part this reflects fears that any relaxation of the need to justify food safety regulation scientifically could provide scope for the use of national food safety requirements as a non-tariff barrier to trade. The EU, however, has argued that to maintain a high level of protection a precautionary approach can legitimately be applied where scientific evidence is incomplete or unconvincing, making a full risk assessment impossible (European Commission, 1997; Steinz, 1998). Moreover, the EU has argued that the precautionary principle is (WTO, 1998):

> "A general customary rule of international law or at least a general principle of law, the essence of which is that it applies not only in the management of risk, but also in the assessment thereof."

Indeed, the EU has recently pressed for greater recognition of the justification and need to apply the precautionary principle to food safety regulation within both the WTO and Codex Alimentarius (Agra Europe, 1999a,b).

The economic rationale for food safety regulation is based on the concept of a "social optimum" level of risk, at which the marginal costs and marginal benefits of changes in the level of food safety are equated (Henson and Traill, 1993; Antle, 1999). In practice, this has been operationalised through regulatory impact analysis, a systematic quantified assessment of the costs and benefits of proposed regulations. This has been promoted, for example, by the OECD and at the current time most OECD Members apply regulatory impact analysis in some shape or form (OECD, 1997).

Although a structured assessment of the economic impact of food safety regulation, as is provided by regulatory impact analysis, might be rather attractive, it is fraught with practical difficulties. In particular, a number of the costs and benefits of food safety regulation are intangible and difficult to convert into monetary amounts, the most notable being human life. While there have been significant developments in valuation methodologies (see for example Caswell, 1995) estimates are sensitive to the specific methods employed and remain politically sensitive.

Whilst scientific and/or economic evaluation is increasingly accepted as good practice in the development of food safety regulation, it is evident that many, and maybe even the majority, of existing interventions would not satisfy such strict criteria. Furthermore, it is evident that both the existing and emerging hazards associated with food that command most attention from governments are not necessarily those for which the risk to human health (as scientifically defined) and/or economic impact is greatest. Rather, governments may also be driven by political considerations such as the need to protect "consumer confidence" or to be seen to take action. Indeed, in certain circumstances public pressure can be the fundamental driving force behind government action as has been observed with GMOs within the European Union.

Relationship between public and private food safety control systems

A wide range of safety control systems has evolved for the typical food product being offered for sale to consumers in retail stores or food service operations as detailed in Fig. 2 (Henson, 1997; Caswell, 1997; Caswell and Johnson, 1991). On

Public		Private	
Direct Regulation	Product Liability	Self-regulation	Certification

Fig. 2. Systems of food quality control.

the public side, direct ex ante regulation in the form of standards, inspection, product testing, and other programmes attempts to ensure the quality of the product by specifying how it is produced and/or its final quality. Companies that are found to not meet the standard are penalised, for example through a system of financial penalties. Product liability is ex post regulation that punishes companies that produce products of insufficient quality through damage awards to those harmed by their actions. Direct regulation and product liability may complement or substitute for each other (or even conflict) in establishing incentives for companies to engage in effective quality control. There are very strong economic arguments for managing these incentives as a system (Viscusi, 1989; Rose-Ackerman, 1991; Kolstad et al., 1990).

There are equally strong arguments for co-ordinating the incentives of public with those of private quality control systems. Private systems include self-regulation and various forms of certification by other parties. Self-regulation includes internal control systems that assure product quality, where the company sets, monitors, and self-certifies the control parameters. It can take place at the level of the individual firm or be instituted by trade organisations that cover the predominance of market supply. Certification involves the setting of product quality standards and their monitoring and certification by parties outside the firm, for example customers, industry trade associations, or bodies such as the International Organisation for Standardisation (ISO). Such certification may be voluntarily sought by the company or required by those with whom it does business. Both self-regulation and certification can act in both an offensive and a defensive manner. In the first case, for example, they may act as a mechanism to increase market share by delivering higher or more dependable quality, and in the second, for example, they may act by protecting current market share from erosion. In both cases, there are incentives for the adoption of private controls by individual operators in the food supply chain.

The relative importance of these public and private modes of food safety control will reflect, amongst other things, the nature of public regulation and the structure of the food supply chain. For example, there are important differences between the UK and US in the use of product and tort liability. Since 1990, the product liability system for food products in the UK has hinged on the concept of “due diligence”. Evidence that a company took all reasonable precautions and exercised all “due diligence” to avoid commission of an offence provides a defence against liability. This public provision has motivated extensive private quality control activity amongst food companies that want to be able to prove they have exercised “due diligence”, based predominantly on third party certification (Henson and Northen, 1998; Bredahl and Holleran, 1997; Zaibet and Bredahl, 1997). In the US, product and tort liability plays a less significant role as a direct incentive for quality assurance. Following a reasonable standard of care (roughly equivalent to “due diligence”) may or sometimes may not provide a defence in consumer product liability cases. Such cases, for example for damages to people who suffered a food-borne illness, often generate large settlements. However, the degree of care taken may provide some protection in settlement negotiations and in suits between companies in the supply chain.

It is likely that in both the UK and USA ex post liability plays a secondary role

as an incentive to the immediate market impacts of being responsible for, or associated with, a food-borne illness outbreak. In the UK, the prominence of major retailers with a high proportion of own-branded products, plus the number of large branded manufacturers, means that companies in the supply chain have a great deal to lose from a product failure (Henson and Northen 1997, 1998). The risk of a liability settlement large enough to bankrupt a company may be greater for smaller operators. However, major retailers and manufacturers do emphasise the role "due diligence" plays in their decision-making, perhaps because it is the more visible constraint on their activities. In the US, the costs of settling liability suits are typically large but may be offset by insurance coverage. Coming after the impacts of loss of reputation and market sales, these costs have an additional rather than a central effect.

Approaches to public food safety regulation

Public regulation of food safety can take place in a number of ways (Fig. 3) that differ in the degree to which they impede freedom of activity. At one extreme, information measures require suppliers to disclose certain facts about their products, but do not otherwise restrict behaviour. At the other, suppliers may need prior approval of a product from an official agency before being permitted to release it onto the market; such approval will be based on pre-specified safety criteria. Food safety standards allow suppliers to release products onto the market without any prior control, but suppliers that fail to meet certain minimum safety standards commit an offence.

Food safety standards can take three main forms. Target standards do not prescribe any specific safety standards for the supplier's products or the processes by which they are produced, but impose criminal liability for pre-specified harmful consequences that arise from their products. Performance standards require certain levels of safety to be achieved when the product is supplied, but leave suppliers free to choose the mechanisms through which they meet such conditions. Specification standards are applied both to products (product standards) and the processes by which those products are made (process standards) and can take positive or negative forms; either compelling products to contain particular ingredients or the use of particular

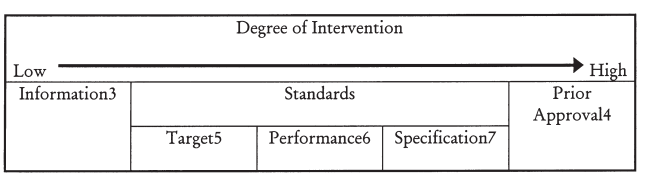

Fig. 3. Forms of government food safety regulation. For example, (3) a requirement to nutritionally label food products; (4) a positive list system as generally operates for food additives; (5) a general requirement that suppliers should "not knowingly sell a product which is harmful to health"; (6) a requirement that a product have residues below a specified maximum level; (7) a requirement that a product is heated to a certain temperature (process standard) or has a particular composition (product standard). Source: Based on Ogus (1994).

production methods, or prohibiting the use of particular ingredients or production methods.

In most countries, public food safety regulation takes the form of standards. In general, a target standard lays down the requirement that food sold for human consumption must be safe, whilst a series of specification standards, covering both products and the processes by which they are manufactured, outline how this is to be achieved. Further, performance standards may be specified for particular products, defining the levels of contamination, for example, that are deemed unacceptable. The consequence of this is that food products are typically subject to multi-layered regulation that can impose high costs of compliance on suppliers. In particular, the frequent use of product and process standards tends to restrict the freedom of suppliers to control food safety in a manner that is most appropriate to their operations, hampering efficiency and innovation.

In recent years governments have reviewed their approaches to food safety regulation and looked to new forms of food safety control that are more efficacious and impose a lesser burden on food businesses. In particular, there has been a shift towards performance-based measures that afford suppliers greater flexibility to achieve the desired level of food safety in the most efficient manner. Simultaneously, recognising that end-product testing is an inefficient form of food safety control, requirements have been progressively put in place for process controls based on the principles of hazard analysis critical control point (HACCP). HACCP is widely recognised in the food industry as an effective approach to establish good manufacturing practices for the production of safe food. This is achieved by establishing process controls through the identification of points in the production process that are most critical to monitor and control (Unnevehr and Jensen, 1996; Mortimore and Wallace, 1998). In some cases, the specific form of HACCP system to be applied is detailed in the regulation. In others, for example the EU, there is a general requirement that a HACCP-based food safety control system should be in place, although the specific form this system takes is not specified. A number of analyses have demonstrated that HACCP is an effective and cost-effective approach to food safety regulation (Unnevehr and Jensen, 1996; Crutchfield et al., 1997; Roberts et al., 1996).

The forms of food safety regulation applied have implications for the level and form of enforcement by public authorities. In the case of traditional product and process standards, enforcement authorities are charged with inspecting food businesses to ensure that they are in compliance. This may necessitate frequent visits to facilities that manufacture products deemed to be “high risk” or, in extreme cases (for example slaughtering of animals for meat), continuous inspection. With performance-based regulation paired with HACCP-based process standards, however, once it has been verified that the food safety system in place is effective, enforcement will rely largely on audits of production records. As a result, costs of enforcement are likely to be lower.

Strategic response to food safety regulation

The inter-relationship between the regulatory activities of government and the strategic behaviour of firms is well recognised (Caswell and Johnson, 1991; Henson and

Heasman, 1998). On the one hand, regulation is a major element of the environment in which firms operate and can constrain the strategic behaviour of firms, particularly in heavily regulated sectors and/or sectors subject to frequent regulatory change (Porter, 1980; Porter and van der Linde, 1995). The food industry is one example of this. On the other hand, capture theory suggests that firms may attempt to co-opt the regulatory process in an attempt to gain strategic advantage (Stigler, 1971; Peltzman, 1976). This can occur at the level of the individual firm or the industry through, for example, interest groups.

A number of studies have examined the strategic behaviour of firms in the context of environmental regulation and these provide an insight into the ways in which firms might react to food safety regulation (see for example Barrett, 1991; Rugman and Verbeke, 1998a,b; Porter and van der Linde, 1995; Henriques and Sadorsky, 1996). Corporate response in terms of compliance will depend on the expected economic benefits. A further issue is the degree to which these benefits are driven primarily by expected improvements in industrial performance (for example market share or profitability) or by sanctions associated with non-compliance (Fig. 4) (Rugman and Verbeke, 1998a,b). In the former case, firms may choose to comply voluntarily, whilst in the latter case compliance will depend on the strength of enforcement authorities. This acknowledges the fact that enforcement may play very different roles in the regulatory process according to the nature of the regulation and the strategic response by firms (Hutter, 1997; Henson and Heasman, 1998).

Firms can benefit strategically from food safety regulation in view of the fact that costs of compliance differ according to efficiency in compliance which, in turn relates to factors such as firm size, existing standards of operation, and cost structure (Nehrt, 1998; Caswell and Johnson, 1991). This creates opportunities for firms to obtain first-mover advantage, to enhance competitiveness relative to other firms in the market and to erect barriers to entry or mobility. At the same time, however, the costs of compliance associated with food safety regulation can act to reduce the overall competitiveness of a sector relative, for example, to less regulated sectors in other

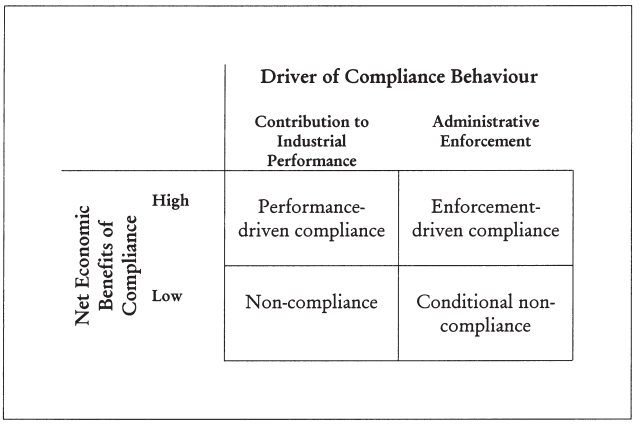

Fig. 4. Compliance with food safety regulation. Based on Rugman and Verbeke (1998b).

countries. As barriers to trade have diminished through the activities of the WTO, for example, this can act as a constraint on the regulatory activities of nation states. This is well documented in the case of environmental and animal welfare regulations, for example (Rugman, 1997; Henson et al., 1999a).

Trade implications of national food safety controls

Considerable progress has been made since the Second World War in lowering explicit barriers to trade such as tariffs. As tariff barriers have declined, however, the emphasis placed on non-tariff barriers has increased, both due to the global proliferation of non-tariff measures and because of wider recognition of the impact non-tariff barriers can have on trade. Sanitary and phytosanitary (SPS) measures, of which food safety regulations are one type, are an example of non-tariff measures that can impede trade (Petrey and Johnson, 1993; Ndayisenga and Kinsey, 1994; Thilmany and Barrett, 1997). Indeed, there is growing evidence that SPS measures are fast becoming one of the most important barriers to trade in agricultural and food products (Henson et al., 1999b). For example, it is estimated the total impact of technical barriers on US exports of agricultural products was $4,907 million in 1996 (Roberts and DeRemer, 1997; Thornsbury et al., 1997). Of this, 90 per cent was due to SPS measures. The impact of food safety standards in particular was estimated to have been around $2,288 million.

In an attempt to overcome the trade distortive effects of food safety regulation and other SPS measures, governments have attempted to co-operate in their regulatory efforts. This has been termed regulatory rapprochement (Jacobs, 1994; Caswell and Hooker, 1996; Hooker and Caswell, 1999). It is possible to discern three levels of regulatory rapprochement that vary in the level of co-operation from weak to strong. Firstly, "co-ordination" refers to attempts to minimise differences in food safety regulations between countries, for example through voluntary international codes of practice. Secondly, "mutual recognition" involves the acceptance of different forms of food safety regulation amongst countries as "equivalent". Thirdly, "harmonisation" involves the standardisation of food safety regulations between countries, for example through international standards.

There has been a long-standing commitment to try to harmonise food safety regulations, where possible, through the international standards organisations—Codex Alimentarius, International Plant Protection Convention (IPPC) and International Office of Epizotics (OIE). However, the most comprehensive attempt to address the impact of SPS measures on trade in agricultural and food products is the WTO's Sanitary and Phytosanitary (SPS) Agreement. The Agreement defines guiding principles that aim to minimise the trade distortive effects of food safety standards and procedures for the resolution of disagreements between countries over the "legitimacy" of standards. The Agreement essentially requires Members to *justify* the food safety regulations that they apply and demonstrate that any trade distortive effects are proportionate. There are two approaches through which national food safety regulations can be justified. Firstly, through the adoption of international standards, which are automatically assumed to comply with the provisions of the Agreement. Sec-

ondly, through an assessment of the risks to human (as well as plant and animal) health addressed by the food safety regulation concerned.

Given that many countries choose to adopt different/higher standards than those specified by international agencies, for example because they aim to achieve a lower level of risk (as is allowed under the Agreement), risk assessment is a key element of the discipline laid down by the WTO. Although the specific nature of the process of risk analysis is not specified by the SPS Agreement, certain requirements must be satisfied if a national food safety regulation is to be justified (see for example Hooker and Caswell, 1999). Firstly, risk assessment should involve generally recognised techniques (for example those defined by the international standards organisations) that clearly distinguish between hazards and risk (as detailed in Fig. 1). Secondly, risk assessment must be supported by currently available scientific evidence (or "pertinent information" where this is not available). Thirdly, it must be demonstrated that the level of protection is *appropriate* given the level of risk that the country aims to achieve and is *consistent* across different contexts/situations. Finally, it must be shown that actions taken to achieve the desired level of protection do not impede trade unnecessarily.

The SPS Agreement has important implications for food safety regulation at the national level. In effect it constrains the activities of regulatory agencies, requiring them to adopt only food safety controls that can be scientifically justified and which have the minimum possible impact on trade. It is evident, however, that governments face domestic demands for regulation that may not satisfy these requirements. The decision by the EU to require labelling of food products containing GMOs, which is now the subject of a complaint within the Technical Barriers to Trade (TBT) rather than the SPS Committee, is a good example. As a result, there has been considerable debate about the need to incorporate the "precautionary principle" more formally into the SPS Agreement.

Whilst greater discipline in the development of food safety regulation may be desirable from an economic efficiency perspective, the SPS Agreement lays down standards that governments rarely satisfy in their risk management decisions (Henson 1997, 1999). On the one hand regulatory decisions are frequently inconsistent—more onerous controls are routinely applied to particular risks and in certain situations than others. On the other, there may be little scientific justification for such inconsistencies. For example they may reflect consumer demands which themselves are out of line with current scientific opinion. This is illustrated by the value placed on reductions in risk across different hazards, measured through the cost per life saved implied by public risk management investments. Such data typically indicate large differences in risk management decisions between types of hazard (see for example Soby et al., 1993; Ramsberg and Sjoberg, 1997; Tengs, 1995). For example, Morrall (1986) analyses the risk management policies adopted by various US government agencies over the period 1967–84. Whilst the FDA invested $123 million per life saved on controls on DES in cattle feed, the NHTSA only invested $100,000 per life saved in steering column protection. It is highly unlikely that controls on DES in cattle feed would have passed any form of cost–benefit analysis. Indeed over this

period, investments in other areas with a lower cost per life saved were refused on economic efficiency grounds.

Finally, the SPS Agreement addresses only one of the four public and private food quality control systems. Through it incentives and mechanisms have been put in place to encourage the reduction of non-tariff barriers to trade arising from direct regulation. The success of the agreement in accomplishing this goal will be determined by current and future cases and negotiated agreements. In this process, Codex standards and the regulatory programs of individual countries will influence each other. Thus, it is likely that direct regulatory standards will become increasingly global in terms of the criteria that are applied and the mechanisms used to ensure that standards are met. However, there is no similar movement to align liability standards. Perhaps doing so is not necessary because liability imposes an ex post judgement on the adequacy of quality control systems. However, widely varying liability systems will continue to present different quality control incentives to companies operating in different countries. Self-regulation and certification is largely decentralised except for major programs such as ISO. The need to harmonise or rationalise these standards across countries is likely to arise when trade volume is significant and the companies involved see a cost or marketing advantage to doing so.

Conclusions

This paper has aimed to introduce a number of contemporary and interrelated issues that are influencing the evolution of food safety regulation, predominantly in developed countries. It is evident that systems of food safety control are evolving, with an increasingly complex interaction between public and private modes of regulation. Simultaneously, food safety regulation is subject to close scrutiny in terms of its scientific justification and economic efficiency, both domestically and in the international arena, which in turn is influencing the course of this evolution. For example, public food safety regulation is becoming more performance and process-based, placing greater emphasis on the responsibility of food businesses to implement effective food safety controls. In turn, food businesses are using food safety regulation strategically in a bid to gain competitive advantage.

These issues are addressed further in the six other papers that make up this special issue of *Food Policy*. The first two papers focus on current developments in direct regulation of food safety by governments by discussing the estimation of the benefits and costs of this regulation (Antle) and the economic implications of the widespread adoption of HACCP as a regulatory approach (Unnevehr and Jensen). The third paper focuses on the trade implications of these and other developments in national level direct regulation (Hooker). This is followed by analysis of product liability systems as a form of food safety regulation (Buzby and Frenzen). The last two papers then turn to private incentives for food safety assurance (Holleran, Bredahl, and Zaibet) and the strategic responses of companies to regulation (Loader and Hobbs). Together these papers present a multifaceted view of current developments in food safety regulation.

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