

Some Economic Implications of Public Labeling

John M. Crespi and Stéphan Marette

This article discusses economic issues related to public labeling. The main contributions in both the empirical and theoretical literatures are presented in order to motivate responses to the questions, when should a regulator promote public labeling, and what are the limits to and the possible market distortions from public labeling? Although the issues are complicated, there is already much economic guidance that can be given to inform the policy debate over food labeling.

Today's consumers are faced with a plethora of food labels concerning safety, nutrition, characteristics, geographic origin, and organic status, just to name a few. There are eco-labels to identify green products, labels proclaiming that a product is "cruelty free," labels indicating whether milk comes from "BSE-free" cows, and labels on goods processed from inputs using genetically modified organisms (GMO). As an inspection seal of a product's characteristics, third-party certification insures (to some extent) the credibility of the information, namely that a labeled product conforms to some standardized principle. In this article we examine the economic issues related to public labeling, which is labeling or certification defined or organized by some regulatory authority such as that which arises through governmental grading, inspection, or regulatory oversight.¹ As such, we examine the economic literature encompassing two main aspects of public labeling: when a public agency directly controls the entire labeling process and when private, third-party middlemen (or producer associations) certify those goods that meet the particular specifications defined by a regulator.

Arrow et al. (1996) show how economic arguments may be used to inform one's rationale when using a cost-benefit analysis. Taking their premise as our cue, we argue that there are important economic considerations to any discussion of public policy on food labeling, and although the issues are complicated, there is already much economic guidance that can be given. From a policy perspective, this paper

¹ See Caswell (1997), Teisl and Roe (1998), and Dimitri (1999) for very complete surveys and historical examinations.

Crespi is assistant professor, Department of Agricultural Economics, Kansas State University. Marette is economist, UMR Economie Publique, INRA-INAPG, Paris

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seeks to address three questions. First, when should a regulator promote public labeling? Second, if a labeling program is deemed necessary, what will be the limits to such a policy? Third, once the decision to label a good has been made, who should pay for the labeling program and how should the program be financed? All of these questions are crucial for developing a complete cost-benefit analysis prior to the imposition of a labeling program. For each issue, we present some of the main (and latest) contributions in both the empirical and theoretical literatures in order to provide policy makers with resources to help inform their decisions. It is important to keep in mind when reviewing this literature that although a label is proposed as a tool for mitigating certain market failures that have resulted from imperfect information (Akerlof 1970), the labeling itself may generate other distortions that can countermand any positive effect coming from the added information. At this stage in the debate over labeling, we feel it is important for economists to bring their knowledge to the fore.

Appropriate Signals Depend on the Type of Differentiation

Before examining these questions, a classification of different food product characteristics will be useful. Arguably all characteristics can be organized under two categories reflecting consumers' preferences: vertical and horizontal product differentiation. Under vertical differentiation, if products of differing quality are offered at the same price, all consumers will buy that product with the highest perceived level of quality. Food safety and product nutrition belong to this category, as no rational person would knowingly choose an unsafe product over a safe one if the price were the same (for a thorough review of the literature on food safety economics, see Antle 2001). The French "Label Rouge" is a classic example of a signal for poultry quality under

a vertical differentiation framework (Ménard 1996; Westgren 1999) where the label signals the higher-quality product.

Under horizontal differentiation, if products with different characteristics are offered at the same price, consumers will choose among the goods according to their individual preferences for the various characteristics inherent in the goods. For example, wines have such a diversity of tastes that even if a Chardonnay and a Cabernet were offered at the same price there would still be a demand for both wines. In Europe, labels proclaiming Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI) link products to their geographic origin, thereby promoting a specific taste or quality linked to a region (EEC 1992).

Some characteristics are not reflected in the physical characteristics of a commodity, but may reflect processes or conditions of production that, in and of themselves, impart value to the consumer. This is the case for the ethical characteristics embodied in a "cruelty free" production processes (Blandford and Fulponi 1999), green characteristics (Kirchhoff 2000), or country-of-origin labels.

In reality, most products contain a multitude of characteristics, which raises the issue of how specific a label must be in order to be effective. For example, precisely what constitutes an "organic food" has been very difficult to define (Browne et al. 2000). The United States Department of Agriculture's (USDA) new guidelines on organic food certification came after years of discussion with industry groups about what characteristics could be considered organic. The new regulations prevent organic producers from using irradiation to decontaminate products, sewage sludge as fertilizer, and genetically modified ingredients (USDA 2003), although some had argued that these techniques did not affect "organic" production since the foods were not produced using conventional, chemical fertilizers, or pesticides. Because such characteristics are hard for consumers to detect, credible third-party certification is necessary to ensure the validity of the program.

For food safety and other risks, public intervention is generally crucial in choosing among different proposals to reassure consumers or restore confidence (Henson and Caswell 1999). When human health is at stake, public intervention often favors command and control instruments such as Minimum Safety Standards (MSS) or the threat

of litigation. MSS can be an efficient policy tool because it simply eliminates those products that do not comply with certain minimum requirements. In other cases, rather simple informational notices that allow consumers to make informed choices may be preferable. When risk is deemed to be small or non-lethal, giving consumers the choice among different levels of risk at different prices may be economically efficient (Beales, Craswell, and Salop 1981). Labeling thus insures product diversity and freedom of choice, as some consumers prefer buying a risky product at a lower price than a higher-priced but less-risky product. As Golan and Kuchler (1999, 1187) point out, "People may also be less willing to accept involuntary risk than risk that is voluntarily assumed."

A regulator is useful in setting up a common signal with a clear specification for producers and consumers (Crampes and Hollander 1995). Carpentier, Latouche, and Rainelli (2002), for example, show the drawbacks arising from unclear policies in the case of labeling pork attributes in France. Ethical and green characteristics necessitate not only some sort of certification but also a clear definition of the characteristic in order to persuade consumers (Teisl, Roe, and Levy 1999). A consumer-education program may bring about such clarity provided that the complementary label is seen as credible and accurate (Sexton 1981). Public control over such certification is important so as to avoid misleading "green" labels (Hussain 2000) or eco-label proliferation by private institutions (Ibanez 1998; Lohr 1998). For green products, consumers may display asymmetric preferences due to inadequate information resulting from label proliferation. For GMOs and non-GMOs, product diversity may be socially optimal and facilitated by labeling, with two possible types of message, namely this product "does contain" or "does not contain" GMOs (Caswell 2000; Runge and Jackson 1999; Crespi and Marette 2003). In brief, the regulator must maintain a clear definition for common labels or appellations if the goal of the label is to increase welfare.

In agricultural markets, labeling aims at mitigating potential inefficiencies resulting from imperfect information about product characteristics. If consumers are not fully informed about product characteristics, they may consume an undesired characteristic or pay a price that does not reflect, for example, the risk associated with the good in question. Such asymmetric information concerns

experience characteristics if quality is revealed after purchasing (Nelson 1970) and credence characteristics if quality is not revealed even after purchasing (Darby and Karni 1973). In practice, many labels for characteristics fall into the “credence” category (Caswell and Mojduszka 1996). For example, product safety, production conditions, GMOs, or ethical characteristics are unobservable qualities. Safety as a credence characteristic is a somewhat particular case of the experience characteristic as the lag between consumption and illness increases. Moreover, even with goods commonly considered to be experience goods, consumers may have difficulty recognizing or remembering product quality if the overall quality is defined by a great number of characteristics or if the product’s origin is uncertain.

Because of these issues, public intervention may be required in the absence of private mechanisms to signal product characteristics. As Kessler (1999, 30), who headed the U.S. Food and Drug Administration from 1990 until 1997, recalls:

The food industry alone cannot recoup its credibility. The public is simply not going to believe any assessment of risk that comes from a source with much to lose by exposing dangers. No purveyor of a product can be objective about the risks posed by its own products.

In other words, there is no reason that the signaling of characteristics will emerge spontaneously from a market equilibrium. Nayga, Pohosyan, and Nichols (2002), for example, show that for food irradiation, U.S. consumers trust the safety claims of public agencies much more than they do those of private firms. Interestingly, when the question of food quality is considered, Loisel and Couvreur (2001) show that a majority of French consumers (52%) trust independent consumer-action groups more than they do the French public agency for consumer protection (36%), but trust advertising (5%) and other government agencies (4%) much less.

Consider first the problem with experience characteristics. In this case, a producer may signal high quality via a price or advertising to maintain its reputation because it is easy to detect fraudulent claims in the case of experience goods. Even so, if numerous sellers exist, such a signal may actually become impossible because an individual seller’s ability to implement a signaling strategy depends

on its profitability (Bagwell and Riordan 1991; Milgrom and Roberts 1986), and the more competitive a market, the more difficult it is to signal a high level of quality via a price or brand advertising.² A firm needs some economic rent to allow it to finance a quality signal. Agricultural commodity markets in particular are generally competitive (which is arguably not the case for the highly concentrated food industry), with the opportunities for merger limited by ownership structures and geographic boundaries. The need for a signal may be even more important when consumers cannot be certain of a product’s origin, which is the case when agricultural products from a variety of processors are sold at the retail level with no brand designation. On the other hand, with credence characteristics the absence of consumer detection leads to the complete absence of revelation. Credence characteristics also have the added complication that no signal is credible without third-party intervention. In brief, with experience goods the regulator has to consider whether or not private mechanisms are able to provide relevant information, while with credence goods no firm can validly provide information, since there is incentive to proffer misleading information.

Public institutions that certify product quality are thus very useful in providing information to buyers via governmental grading systems. Given a perfectly competitive situation, the cost of setting up a certification process or managing highly skilled inspectors is generally prohibitive for an individual producer. Further, some processes of certification require basic research and development (R&D). Thus much of the existence of these institutions is explained by the cost and the complexity of laboratory or auditor services for reliably establishing a product’s quality level. Indeed, a single public agency may benefit from economies of scale when fixed R&D costs, certification, or promotion are high (Auriol and Schilizzi 2000). Nevertheless, for some industries, technology and knowledge are available, and a private middleman may develop a credible system of certification (Holleran, Bredhahl, and Zaibet 1999). For example, the various organic-

² A positive price distortion (compared to the price under perfect information) is possible with experience goods if the sellers have to exert effort at each period to maintain product quality (i.e., a moral-hazard model with an infinite horizon; see Shapiro, 1983). However, in any finite-horizon model with moral hazard, sellers will cheat in the last period, hence in the penultimate period, and so on, so that no signal is possible.

food-certification agencies in the U.S. act as private middlemen (Klonsky and Tourte 1998). As certification costs may explain why private certification activities are generally very concentrated, a key issue may be the fostering of competition among middlemen to limit their rent capturing. One of the tradeoffs a regulator must make here would be between any efficiency in a possibly decreasing cost industry of certifiers and market power. Middlemen may provide worthwhile information even if the market power of middlemen may actually outweigh any positive effect coming from information disclosure (Spulber 1996). Wolinsky (1993) argues that with credence characteristics, competition among experts leads to revelation; private certification is therefore preferable when competition between middlemen is possible. However, even with private certification the label specification may require regulatory intervention to lend credibility to the otherwise private signal.³

In brief, in the case of experience-good labeling, the private sector under competition is likely more efficient than a public regulator. However, market failure and the inability of the private sector to police itself should be of far greater concern to policy makers in the case of credence-good labeling.

The Limitations of Public Labeling in Signaling Quality

A regulator must keep in mind that for an uninformed public, a signal such as a label may provide little relevant information. It is therefore crucial to determine whether consumers find the proposed label useful. In this venue, economists have added to the general understanding of consumers' willingness to pay for labeled attributes through the use of experimental studies. For the sake of space we provide just a sampling of these.

Estimations of premia and market valuation of environmental attributes can be found in Blend and van Ravenswaay (1999) and in Nimon and Beghin (1999a). For food safety, willingness to pay measures have been determined using contingent valuation, surveys, and experimental auctions (for instance, see Hayes et al. 1995 for the reduction of

pathogen contamination; Hoban 1997 for biotechnology acceptance; Lusk et al. 2001, Lusk and Fox 2002, and Lusk, Roosen and Fox 2003 for meat; and Shogren et al. 1999 and Nayga, Poghosyan, and Nichols 2002 for irradiated foods). Obviously, the main limits of such empirical methods are sample size and aggregation to the general population. Nevertheless, Shogren et al. (1999) show that revealed willingness to pay for food safety in retail and laboratory settings may be very close, providing evidence that consumer preferences for safety, and hence for safety labeling, may be discerned from laboratory settings. On the other hand, although there is a growing movement for the labeling of credence characteristics that reflect aspects of production conditions such as ethical characteristics, animal welfare, or the absence of child labor, studies have generally shown that a very low premia exist for these labels. For instance, Bigot (2002) shows that while 53% of French consumers revealed that they would pay a premium for such characteristics, when it comes to the actual amount paid, that premium would be no more than 5%; another 44% would pay no such a premium.

Consumers' ability to understand the label is a crucial point that may get lost in any discussion of costs and benefits. For example, the U.S. Nutrition Labeling and Education Act of 1994 has generally been seen as a successful food-labeling program. Finke (2000) determined the key reason for its success was the program's emphasis on educating consumers about what the label meant. Other researchers have shown that signaling will not be socially advantageous when product differentiation is slight or when consumers' premia for labeled characteristics are very low. Mojduszka and Caswell (2000), for example, showed that mandatory nutrition labeling is in part successful because of its significant addition to the amount of desired dietary information available to consumers. On the other hand, the USDA's grades of beef quality based upon fat content may not reflect the taste of many consumers who have a preference for low-fat meat (Cox, McMullen, and Garrod 1990; Unnevehr and Bard 1993). The difficulty in knowing when to promote a label is reinforced when consumer demand is affected by imagined risks. Although Pollak (1998) is more pessimistic about whether and how imagined risks should be accounted for in cost-benefit analyses, Viscusi, Vernon, and Harrington (1996, 663) remind us that in the face of a possible

³ Perfect monitoring is costly (see De and Nabar 1991 and Mason and Sterbentz 1994 for imperfect product testing). Chalfant and Sexton (2002) show that grading errors can increase industry profit. See Coestier (1998) for the determination of an optimal inspection policy.

crisis “an important function of the government is to acquire more scientific information than is feasible for an individual to obtain [and] to communicate this information effectively to the public [since] highly publicized events often are associated with substantial risk perceptions even though the risks involved may not be great.”

Some public-labeling intervention may actually reinforce brand-label proliferation. Wine in Europe is a good example of such appellation proliferation. Peri and Gaeta (1999) count more than 400 official appellations in the wine sector in Italy alone, a profusion that insures product diversity but certainly increases buyer confusion (see also *Consumer Reports* 1997). Similarly, Berthomeau (2002) discusses the difficulty that the various French appellations have had in entering new export markets because of the absence of any clear specification that would distinguish one appellation from another in the consumers' minds. Indeed, Loisel and Couvreur (2001) show that even in France such diverse quality labels obfuscate the signals. For example, the recognition of quality labels by French consumers is only 43% for “Label Rouge,” 18% for “l'Agriculture Biologique,” and 12% for “Appellations d'Origine Contrôlée.” Although “Label Rouge” is a well-established label, the fact that less than half of French consumers recognize it is suggestive of the problems inherent in any label.

Eco-labeling seems to be especially prone to consumer-identification issues, which may cause additional problems for regulators of these products because of their intended welfare effects. In the case of eco-labels, there are usually perceived externalities that a regulator is either trying to mitigate or enhance. For example, an eco-label may use consumers' preferences to stimulate demand in order to encourage certain production processes and discourage others. In such cases, any augmentation of total welfare is still linked to the provision of information but the benefits presumably extend beyond the consumer to society in general (for specific examples see Gudmundsson and Wessells 2000; Grolleau 2001; and Mattoo and Singh 1994 for a simple policy test and Larson 2003 for an application to shade-grown coffee). In order to bring about this increase in welfare, however, consumer information must be especially clear, as ambiguity can create unintended problems. Smith and Potter (1996), examining the EU eco-label program, explain how a well-intentioned policy became mired

in bureaucratic and informational difficulties resulting in rather inefficient environmental regulations. Swallow and Sedjo (2000) show that even when policies are clear and arguably straightforward to implement, their consequences need not always be so. In some cases, eco-labels may even pervert such policy goals of biodiversity or sustainability if certification leads to reallocation of land toward less ecologically sustainable uses.

Country-of-origin labeling is an increasingly touchy subject among policy makers. Although there are but a handful of studies, economists have shown that the origin of food products does seem to matter—at least for European consumers (Hassan and Monier-Dilha 2001). Loureiro and McCluskey (2000) used hedonic approaches to show that label of origin for fresh meat in Spain results in price premia. Roosen, Lusk, and Fox (2003) also suggest that consumers place more importance on labels of origin as opposed to private brands for beef, although this study is applied to European consumers facing mad cow disease, for which regional labels take on a highly significant meaning. In contrast, Bonnet and Simioni (2001) show that French consumers do not value the quality signal provided by the Protected Designation of Origin for Camembert cheese. In this case, the brand appears to be the relevant signal.

Effects of Labeling on the Marketing Chain and Producer Organizations

Labeling necessitates traceability and, likewise, the resultant traceability technologies and investments that could influence contract design or vertical integration in the agri-food chain. Two important issues for contract design are the sharing of the traceability cost among agents in the supply chain and the type of liability in the case of cheating. For issues linked to the marketing chain—traceability or identity preservation—readers are referred to the works by Barjolles, Chappuis, and Riordan (1999), Caswell, Bredahl, and Hooker (1998), Hennessy (1996), Vetter and Karantinis (2002), and Bullock and Desquilbet (2002). As traceability is essential for labeling, the information should be controlled by a third party or by the government. A regulator should define a complementary control policy through random inspections and fines on discovered cheaters, since enforcement of the control policy is crucial for the label's credibility.

To prevent free riding and to preserve a common reputation, European and U.S. legislation allow farmers to jointly determine and jointly signal the quality of their products through promotions and labeling, albeit under very specific rules (Tirole 1996; Bourgeon and Coestier 1996; Crespi and Sexton 2003).⁴ Some voluntary labels, such as European indications of origin or quality (e.g., PDO and PGI, discussed above), may even bring about market power because joint signaling necessitates some cartelization of marketing in the industry. However, the negative effect of the producers' market power may be outweighed by the positive effect of quality improvement and signaling (Marette, Crespi, and Schiavina 1999). Producer organizations must be scrutinized to make sure they are not misusing their authority by excluding certain competitors. Labeling in agriculture has led to antitrust investigations for well-known products. Cases include cheeses in Italy and France, poultry in France, and ham in Italy.⁵ Generally, the contested practices included price fixing, output reduction, and limits to entry (specifically, see Table 2 in Lucatelli 2000). These practices were recognized as infringements of national-competition laws because they imposed restrictions that were not necessary for the production and promotion of high-quality products. Although the antitrust authority did recognize coordination as sometimes useful to improve quality, the message the Italian and French regulators sent was that governments should be vigilant in preventing an abuse of the spirit of the labeling regulations.

Optimal Public Policy: When Should a Regulator Promote Public Labeling?

Clearly, a mandatory labeling system will be more costly than a voluntary system because the regulator needs to monitor all producers, which will increase

⁴ Article 81(3) of the European Union allows agreements among sellers "which contribute to improving the production or distribution of goods or to promoting technical or economic progress, while allowing consumers a fair share of the resulting benefit." Antitrust authorities in Europe are vigilant regarding producer coordination and have made the necessity of producer cooperation to achieve "technical or economic progress" a key point for antitrust exemption.

⁵ See the Conseil de la Concurrence (Paris), decisions 92-D-30 (April 1992) and 94-D-41 (July 1994) and Autorita Garante della Concorenza e del Mercato (Rome) decisions 3999 (July 1996), 4352 (October 1996), 6549 (November 1998).

bureaucracy.⁶ In certain cases, mandatory and voluntary public labeling can actually hurt competition, since mandatory labeling may limit sellers' entry by adding costs to doing business (Caswell 1998). On the other hand voluntary labeling need not be benign if sellers are able to design labels that create barriers to entry in a particular segment of the market.

Even with these caveats, however, given the importance of labeling, the questions remain what is the best way to finance a public inspection program, and who should pay for it? Surprisingly little has been written on these topics in the economics literature. A recent study by the United States Department of Agriculture found a variety of user-financing schemes being used by food-safety inspection agencies around the world (MacDonald et al. 1999). Some public inspection agencies charge an inspected firm a fixed fee regardless the number of units inspected, others charge a per-unit fee, while still other agencies charge no fee, the inspection costs being borne by the public through taxes. For example, the USDA's Food Safety and Inspection Service funded only 13.5 percent of its 1996 costs through the collection of \$85 million in user fees (MacDonald et al. 1999, iii), with the remainder funded by taxpayers.

The method of financing is important, since different methods of raising revenues for labeling impose different distortionary costs on the economy. If the public is expected to pay for a labeling program that is managed by an official agency, a lump-sum tax may be used. In this case it is well known that lump-sum taxes are generally preferred over other types of financing like sales taxes or user fees because, although they reduce overall income, lump-sum taxes do not distort market behavior. In the case of food labeling, however, there can be very good reasons why a general lump-sum tax may not be optimal, even though it is non-distorting.

First, citizens may already feel that income taxes are too high or there may already be a high opportunity cost of public funds making a labeling program subordinate to other uses of general revenue. Second, and more importantly, food-consumption decisions are highly personal so that a governmental program to label some characteristic may be important for the individual who consumes

⁶ Hooker and Caswell (1996), Segerson (1999), and Crespi and Marette (2001a) compare mandatory and voluntary certification.

the good but may mean nothing to a consumer who does not purchase the labeled good (e.g. vegetarians care very little about the USDA's inspection seals on meat products).

The regulator may therefore prefer direct user-financing of the public labeling program where the cost of the program is financed through fees on the producers and/or consumers who benefit directly from the information. Because it shows that producers and/or consumers are willing to "accept" the fees that cover the costs of certification, a balanced budget for an agency that has implemented user fees is a signal of the relevance of the activity (i.e. that the public benefits of the labeling program are greater than or equal to its costs). When such a decision is made, there still remains the question of the type of user fee that should be implemented.

To our knowledge, in the economic literature on food labeling there is only one article that directly addresses the appropriate type of fee. Crespi and Marette (2001a) show in an application to food-safety certification that in most cases either a per-unit or an *ad valorem* fee will be preferable over a fixed fee on the processing firm. Their rationale is straightforward. Prior to a labeling program, an informational externality exists in the food product since consumers are uncertain of the safety of unlabeled food. The informational externality is mitigated or eliminated through the use of a fee that pays for the labeling program, leading to lowered consumption of unlabeled goods and increased consumption of labeled goods. Furthermore, either a per-unit or an *ad valorem* fee is preferable because such fees maintain competition among those sellers who sell the same type of products. The sellers and the consumers of the labeled products will incur the cost because the fee is passed on in the price, with the share of burden determined through the relative supply and demand elasticities, so while there is a welfare loss due to the fee, there is no further market distortion. On the other hand—and just as important for a regulator to understand—is that in the presence of such informational externalities a fixed fee can actually lead to a greater market distortion through a monopolization effect that arises in this case, as only a firm with some market power will be able to take on the fixed certification burden. The choice of a fixed fee would only be justified if the number of sellers is very low and the cost to the inspection agency itself is fixed. For example, the U.S. Food and Drug Administration may well be justified in

their use of fixed fees for pharmaceutical inspections since the FDA's costs stem largely from fixed inspection technologies and there are few firms involved due to patent restrictions. Since food production and processing are arguably more competitive than drug production, and since the largest share of the costs is realized in inspector hours (i.e., "variable" rather than "fixed" costs), food inspection and labeling such as that performed by the USDA is likely to be welfare improving if per-unit or *ad valorem* fees cover the inspection costs.

In summary, in the case of food-safety or other vertical-differentiation labeling, either the firms who produce the good or the consumers themselves should bear the burden of the program unless the opportunity cost of public funds is low or the labeling program affects a very large share of the citizenry. Where the burden is placed upon the firm and the consumer, the optimal type of assessment is typically a per-unit or *ad valorem* fee rather than a fixed fee; again, it matters little where the fee is imposed since the actual incidence of the tax depends on the relative demand and supply elasticities.

One of the major concerns today among exporters is how the requirement of a label by an importing country will affect the demand for a good. Recent work on this issue has been performed by Smith and Potter (1996), Mahé (1997), Bureau, Marette, and Schiavina (1998), Hooker (1999), Nelson et al. (1999), Nimon and Beghin (1999b), Crespi and Marette (2001b), and Sheldon (2002). Labels entail international trade implications, such as non-tariff barriers. Economists and policy makers have argued that, ideally, regulators should develop trade policy to maximize integration of any trade distortions coming from a labeling program (OECD 1999). The Uruguay Round of the General Agreement on Tariffs and Trade (GATT) provided a framework for solving disputes through the WTO's Dispute Settlement Body; it tackles the problem of non-tariff trade barriers through the Sanitary and Phytosanitary (SPS) agreement and a strengthened Technical Barriers to Trade (TBT) agreement. The scope of the 1979 TBT agreement was also extended during the Uruguay Round, where compliance with relevant international standards was encouraged. The TBT agreement is wide-ranging and covers all technical regulations and standards (except those falling under the SPS agreement), including those relating to packaging and labeling.

U.S. trade representative Robert Zoelick an-

nounced in January of 2003 that he wished to bring a WTO case against the EU's GMO-labeling requirement, calling it a "Luddite" policy (Alden 2003). The U.S. position is that without a scientific basis for segregation, such labeling amounts to a non-tariff trade barrier because it imposes a labeling "tariff" on mostly U.S. producers who use GMOs. The policy difference between the two sides is that, for the most part, the U.S. is arguing about labeling based on the conventions of the SPS agreement—since GM foods pose no more food-safety risk than do conventional foods, there is no rationale to the labeling. The Europeans counter that under the TBT agreement, countries may take precautionary measures against risk (Caswell 2000; Sheldon 2002). These are legal issues to be considered by policy makers; what is largely missing from the debate is a discussion of exactly how consumer preferences should enter the argument.

Giannakas and Fulton (2003) and Crespi and Marette (2003) do not consider the causes of welfare changes from the presence of GMOs but simply assert that consumers are maximizing welfare based upon their perceptions. In their model, consumers maximize utility based upon their preferences toward GM products regardless the basis for these preferences. If consumers have lower utility from the consumption of GMOs, it does not matter whether that utility is lower because they are being "duped" or because they have preferences that are based upon valuations other than the safety of the food. Using this simple framework, Crespi and Marette determine a practical test to help policy makers discern whether mandatory labeling is being used to increase societal welfare or whether it is being used as a trade barrier. Essentially, in a country that requires labeling, if the ratio of consumers concerned about GMOs to indifferent consumers is low, a voluntary label on GM goods is likely all that is necessary to improve welfare; if this ratio is high, a mandatory label on GM goods may very well increase welfare in that country. The implication is that mandatory labels on GM goods in nations where most consumers show little interest in the debate should be closely examined.

Conclusion

In summarizing the work of economists on food-labeling issues, we have argued that when a public label has been mandated, it is imperative that the

regulatory agency take into account several important factors before deciding the type of label to use. First, the regulator needs to take into account the nature of the product, since the success of a particular labeling program will very likely depend on whether a product is vertically or horizontally differentiated, whether the good is a credence or an experience good, and whether the label is clear or creates informational externalities. Second, the regulator must keep in mind how the labeling cost will affect the structure of the market and who should pay for the label. As discussed, in most cases a per-unit or ad valorem fee is both efficient and sufficient to bring about a welfare improvement if a label is deemed necessary. By showing the relevant research to inform the policy debate, we hope that this paper will serve as a reference for policy makers.

References

- Akerlof, G. 1970. "The Market for Lemons: Qualitative Uncertainty and The Market Mechanism." *Quarterly Journal of Economics* 84(1): 488–500.
- Alden, E. 2003. "US Postpones WTO Case on Modified Foods." *The Financial Times*. February 6. <http://news.ft.com>.
- Antle, J. M. 2001. Economic Analysis of Food Safety. *Handbook of Agricultural Economics*. B. Gardner and G. Rauser, eds. Elsevier Science B.V., Amsterdam. 1b:1083–1136.
- Arrow, K. J., M. L. Cropper, G. C. Eads, R. W. Hahn, L. B. Lave, R. G. Noll, P. R. Portney, M. Russell, R. Schmalensee, V. K. Smith, and R. N. Stavins. 1996. "Is There A Role for Benefit-Cost Analysis in Environmental, Health and Safety Regulation?" *Science* 272:221–222.
- Auriol, E and S. Schilizzi. 2000. *Quality Signaling Through Certification*. Working Paper, IDEI, Université de Toulouse, France.
- Bagwell, K. and M. Riordan. 1991. "High and Declining Prices Signal Product Quality." *American Economic Review* 81:224–239.
- Barjolles, D., J. Chappuis, and B. Sylvander 1999. *From Individual Competitiveness to Collective Effectiveness, A Study On Cheese With Protected Designations of Origin*. INRA-Université du Mans, France.
- Beales, H., R. Craswell, and S. Salop. 1981. "The Efficient Regulation of Consumer Information." *Journal of Law and Economics* 24(2):

- 491–544.
- Berthomeau, J. 2002. *Comment Mieux Positionner les Vins Français sur Les Marchés d'Exportation?* Ministère de l'Agriculture, Paris.
- Bigot, R. 2002. "La Consommation 'Engagée': Mode Passagère ou Nouvelle Tendance de La Consommation?" *Les 4 Pages Des Statistiques Industrielles*, SESSI, DIGITIP, Ministère de l'Économie et des Finances et de l'Industrie, Paris.
- Blandford, D., and L. Fulponi. 1999. "Emerging Public Concerns in Agriculture: Domestic Policies and International Trade Commitments." *European Review of Agricultural Economics* 26(3): 409–424.
- Blend, J. and E. van Ravenswaay. 1999. "Measuring Consumer Demand for Ecolabeled Apples." *American Journal of Agricultural Economics* 81(5):1072–1077.
- Bonnet, C. and M. Simioni. 2001. "Assessing Consumer Response to Protected Designation of Origin Labeling: A Mixed Multinomial Logit Approach." *European Review of Agricultural Economics* 28(4):433–449.
- Bourgeon, J. M. and B. Coestier. 1996. *Private Versus Public Product Labeling*. Cahier du THEMA 96-19, University Paris X., Nanterre.
- Browne, A., P. Harris, A. Hofny-Collins, N. Pasiecznik, and R. Wallace. 2000. "Organic Production and Ethical Trade: Definition, Practice and Links." *Food Policy* 25(1):69–89.
- Bullock, D. and M. Desquilbet. 2002. "The Economics of Non-GMO Segregation and Identity Preservation." *Food Policy* 27:81–99.
- Bureau, J. C., S. Marette, and A. Schiavina. 1998. "Non-Tariff Trade Barriers and Consumers' Information: The Case of The EU-US Trade Dispute Over Beef." *European Review of Agricultural Economics* 25(4):437–462.
- Carpentier, A., K. Latouche, and P. Rainelli. 2002. *Food Safety in the Demand of Meat Quality: The Case of Pork Chops in France*. 2002 World Congress of Environmental and Resource Economists.
- Caswell, J., M. Bredahl, and N. Hooker. 1998. "Impacts of Quality Management Metasystems On The Food Processing Sector." *Review of Agricultural Economics* 20(2):547–557.
- Caswell, J. 1997. *Uses of Food Labeling Regulation*. Organisation for Economic Co-operation and Development, Paris. <http://www.oecd.org>.
- Caswell, J. 1998. "How Labeling of Safety and Process Attributes Affects Markets for Food." *Agricultural and Resource Economics Review* 27:151–158.
- Caswell, J. 2000. "An Evaluation of Risk Analysis as Applied to Agricultural Biotechnology (With A Case Study of GMO Labeling)." *Agribusiness* 16(1):115–123.
- Caswell, J. and M. Mojduszka. 1996. "Using Informational Labeling to Influence The Market for Quality in Food Products." *American Journal of Agricultural Economics*, 78(5):1248–1253.
- Chalfant, J. and R. Sexton. 2002. "Marketing Orders, Grading Errors, and Price Discrimination." *American Journal of Agricultural Economics* 84(1):53–66.
- Coestier, B. 1998. "Asymétrie de l'Information, Réputation et Certification." *Annales d'Économie et de Statistiques* 51(2):49–78.
- Consumer Reports. 1997. "Wine Without Fuss." October:10–16.
- Cox, L., B. McMullen, and P. Garrod. 1990. "An Analysis of the Use of Grades and Housebrand Labels in the Retail Beef Market." *Western Journal of Agricultural Economics* 15:245–253.
- Crampes, C. and A. Hollander. 1995. "How Many Carats Is Gold? Welfare Effect of Easing A Denomination Standard." *Journal of Regulatory Economics* 7:131–143.
- Crespi, J. M. and R. J. Sexton. 2003. "Competition, U.S. Farmer Cooperatives, and Marketing Orders." *Économie Rurale* 277–278:3–19.
- Crespi, J. M. and S. Marette. 2001a. "How Should Food Safety Certification Be Financed?" *American Journal of Agricultural Economics* 83(4): 852–861.
- Crespi, J. M. and S. Marette. 2001b. "Politique de Label et Commerce International." *Revue Économique* 52(3):665–672.
- Crespi, J. M. and S. Marette. 2003. "'Does Contain' vs. 'Does Not Contain': Does It Matter which GMO Label is Used?" *European Journal of Law and Economics* 16(3):327–344.
- Darby, M. and E. Karni. 1973. "Free Competition and the Optimal Amount of Fraud." *Journal of Law and Economics* 16:67–88.
- De, S. and P. Nabar. 1991. "Economic Implications of Imperfect Quality Certification." *Economic Letters* 37:333–337.
- Dimitri, C. 1999. "Order Out of Chaos? The Evolution of Marketing Institutions." *Choices* Fourth

- Quarter:49–53.
- EEC. 1992. Directives n. 2081/92 and n.2082/92 (L. 208), Brussels, Belgium.
- Finke, M. S. 2000. "Did the Nutrition Labeling and Education Act Affect Food Choice in the United States?" *Food Technology* 53:56–59.
- Giannakas, K. and M. Fulton. 2003. "Consumption Effects of Genetic Modification: What if Consumers are Right?" *Agricultural Economics* 27:97–109.
- Golan, E. and F. Kuchler. 1999. "Willingness to Pay for Food Safety: Costs and Benefits of Accurate Measures." *American Journal of Agricultural Economics* 81(5):1185–1191.
- Grolleau, G. 2001. "Eco-Label Selectivity: A Difficult Tradeoff between Attenuating the 'Assurance Problem' and Allowing Efficient Strategies for Environmental Product Differentiation." *Journal of Economic Research* 6(1):45–58.
- Gudmundsson, E. and C. R. Wessells. 2000. "Eco-labeling Seafood for Sustainable Production: Implications for Fisheries Management." *Marine Resource Economics* 15(2):97–113.
- Hassan, D. and S. Monier-Dilhan. 2001. *Signes De Qualité Et Qualité Des Signes*. Cahier de recherches, 2001-07, INRA-ESR Toulouse.
- Hayes, D., J. Shogren, S. Shin, and J. Kliebenstein. 1995. "Valuing Food Safety in Experimental Auction Market." *American Journal of Agricultural Economics* 77(1):40–53.
- Hennessy, D. 1996. "Information Asymmetry as a Reason for Food Industry Vertical Integration." *American Journal of Agricultural Economics* 78(5):1034–1043.
- Henson, S., and J. Caswell. 1999. "Food Safety Regulation: An Overview of Contemporary Issues." *Food Policy* 24:589–603.
- Hoban, T. J. 1997. "Consumer Acceptance of Biotechnology: An International Perspective." *Nature Biotechnology* 15:232–235
- Holleran, E., M. Bredahl, and L. Zaibet. 1999. "Private Incentives for Adopting Food Safety and Quality Insurance." *Food Policy* 24:669–683.
- Hooker, N. 1999. "Food Safety Regulation and Trade in Food Products." *Food Policy* 24: 653–668.
- Hooker, N. and J. Caswell. 1996. *Voluntary and Mandatory Quality Management Systems in Food Processing*. Department of Resource Economics, University of Massachusetts, Massachusetts, USA.
- Hussain, S. 2000. "Green Consumerism and Ecolabeling: A Strategic Behavioural Model." *Journal of Agricultural Economics* 51(1):77–89.
- Ibanez, L. 1998. *Competition in Environmental Labeling*. Working paper, IDEI, Université de Toulouse, France.
- Kessler, D. 1999. "Europe Needs a Stronger Food Safety Regulator." *Time* July 5:30–31.
- Kirchhoff, S. 2000. "Green Business and Blue Angels—A Model of Voluntary Overcompliance with Asymmetric Information." *Environmental and Resource Economics* 15(4):403–420.
- Klonsky, K. and L. Tourte. 1998. "Organic Agricultural Production in the United States: Debates and Directions." *American Journal of Agricultural Economics* 80:1119–1124.
- Larson, B. A. 2003. "Eco-Labels for Credence Attributes: The Case of Shade-Grown Coffee." *Environment and Development Economics* 8(3): 529–547.
- Lohr, L. 1998. *Welfare Effects of Eco-Label Proliferation: Too Much of A Good Thing*. Working paper, University of Georgia.
- Loisel, J.P. and A. Couvreur. 2001. *Les Français, la Qualité de l'Alimentation et l'Information*. Credoc INC, Paris.
- Loureiro, M. L. and J. J. McCluskey. 2000. "Assessing Consumer Response to Protected Geographical Identification Labeling." *Agribusiness* 16(3):309–320.
- Lucatelli, S. 2000. *Appellations of Origin and Geographical Indications in OECD Member Countries: Economic and Legal Implications*. OECD, Paris.
- Lusk, J. L., and J. A. Fox. 2002. "Consumer Demand for Mandatory Labeling of Beef from Cattle Administered Growth Hormones or Fed Genetically Modified Corn." *Journal of Agricultural and Applied Economics* 34:27–38.
- Lusk, J. L., J. Roosen, and J. A. Fox. 2003. "Demand for Beef from Cattle Administered Growth Hormones or Fed Genetically Modified Corn: A Comparison of Consumers in France, Germany, the United Kingdom, and the United States." *American Journal of Agricultural Economics* forthcoming.
- Lusk, J. L., T. L. Marsh, T. C. Schroeder, and J. A. Fox. 2001. "Wholesale Demand for USDA Quality Graded Boxed Beef and Effects of Seasonality." *Journal of Agricultural and Resource Economics* 26:91–106.

- MacDonald, J., F. Kuchler, J. Buzby, F. Lee, and L. Aldrich. 1999. *User-Fee Financing of USDA's Meat and Poultry Inspection*. United States Department of Agriculture, Economic Research Service, Agricultural Economic Report Number 775. Washington, D.C.
- Mahé, L. 1997. "Environment and Quality Standards in The WTO: New Protectionism in Agricultural Trade? A European Perspective." *European Review of Agricultural Economics* 24(3):480–503.
- Marette, S., J. M. Crespi, and A. Schiavina. 1999. "The Role of Common Labeling in a Context of Asymmetric Information", *European Review of Agricultural Economics* 26(2):167–178.
- Mason, C. and F. Sterbentz. 1994. "Imperfect Product Testing and Market Size." *International Economic Review* 35(2):61–86.
- Mattoo, A. and H. V. Singh. 1994. Eco-Labeling: Policy Considerations. *Kyklos* 47:53–65.
- Ménard, J. 1996. "On Clusters, Hybrids and Other Strange Forms: The Case of the French Poultry Industry." *Journal of Institutional and Theoretical Economics* 152:154–183.
- Meurer, M. and D. Stahl. 1994. "Informative Advertising and Product Match." *International Journal of Industrial Organization* 12(1):1–19.
- Milgrom, P. and J. Roberts. 1986. "Price and Advertising Signals of Product Quality." *Journal of Political Economy* 94:796–821.
- Mojduszka, E. M. and J. A. Caswell. 2000. "A Test of Nutritional Quality Signaling in Food Markets Prior to Implementation of Mandatory Labeling." *American Journal of Agricultural Economics* 82(2):298–309.
- Nayga, R., A. Poghosyan, and J. Nichols. 2002. *Consumer Willingness to Pay for Irradiated Food*. Department of Agricultural Economics, Texas A&M University.
- Nelson, G., T. Josling, D. Bullock, L. Unnevehr, M. Rosegrant, and L. Hill. 1999. *The Economics and Politics of Genetically Modified Organisms in Agriculture: Implications for WTO 2000*, Bulletin 809, November, University of Illinois at Urbana-Champaign.
- Nelson, P. 1970. "Information and Consumer Behavior." *Journal of Political Economy* 78: 311–329.
- Nimon, W. and J. Beghin. 1999a. "Are Eco-Labels Valuable? Evidence from The Apparel Industry." *American Journal of Agricultural Economics* 81(3):801–811.
- Nimon, W. and J. Beghin. 1999b. "Ecolabels and International Trade in The Textile and Apparel Market." *American Journal of Agricultural Economics* 81(5):1078–1083.
- OECD. 1999. *Food Safety and Quality Issues: Trade Considerations*. Consultants' report by J.C. Bureau, E. Gozlan, S. Marette, revised by W. Jones and published under the responsibility of the Secretary General (Paris:Organisation of Economic Co-operation and Development).
- Peri, C. and D. Gaeta. 1999. "Designations of Origins and Industry Certifications as a Means of Valorizing Agricultural Food Products." In *The European Agro-Food System and The Challenge of Global Competition*, S. Vinci, ed. ISMEA, Milan, Italy.
- Pollak, R. 1998. "Imagined Risks and Cost-Benefit Analysis." *American Economic Review* 88: 376–379.
- Roosen, J., J.L. Lusk, and J.A. Fox. 2003. "Consumer Demand for and Attitudes Toward Alternative Beef Labeling Strategies in France, Germany, and the UK." *Agribusiness: An International Journal* 19:77–90.
- Runge, C. and L. Jackson. 1999. *Labeling, Trade and Genetically Modified Organisms (GMOs): A Proposed Solution*. Center for International Food and Agricultural Policy, University of Minnesota, St Paul.
- Segerson, K. 1999. "Mandatory Versus Voluntary Approaches to Food Safety." *Agribusiness* 15(1): 53–70.
- Sexton, R. 1981. "Welfare Loss from Inaccurate Information: An Economic Model with Application to Food Labels." *Journal of Consumer Affairs* 15(2):214–231.
- Shapiro, C. 1983. "Premiums for High-Quality Products as Returns to Reputations." *Quarterly Journal of Economics* 78:659–679.
- Sheldon, I. 2002. "Regulation of Biotechnology: Will We Ever 'Freely' Trade GMOs?" *European Review of Agricultural Economics* 29: 155–176.
- Shogren, J., J. Fox, D. Hayes, and J. Roosen. 1999. "Observed Choices for Food Safety in Retail, Survey, and Auction Markets." *American Journal of Agricultural Economics* 81(5): 1192–1199.
- Smith, M. and S. Potter. 1996. "Eco-labelling and Environmental Policy: Policy Confusion Per-

- sists." *Policy Studies* 17(1):73–80.
- Spulber, D. 1996. "Intermediation and Market Microstructure." *Journal of Economic Perspectives* 10(3):135–152.
- Swallow, S. K. and R. A. Sedjo. 2000. "Eco-Labeling Consequences in General Equilibrium: A Graphical Assessment." *Land Economics* 76(1): 28–36.
- Taylor, R. and J. Tick. 2001. *The StarLink Case: Issues for the Future*. Resources for the Future, Washington, D.C.
- Teisl, M. and B. Roe. 1998. "The Economics of Labeling: An Overview of Issues for Health and Environmental Disclosure." *Agricultural and Resource Economics Review* 27:140–150.
- Teisl, M., B. Roe, and A. Levy. 1999. "Ecocertification: Why It May Not Be a 'Field of Dreams'." *American Journal of Agricultural Economics* 81(5):1066–1071.
- Tirole, J. 1996. "A Theory of Collective Reputation." *The Review of Economic Studies* 63(1): 1–32.
- Unnevehr, L. and S. Bard. 1993. "Beef Quality: Will Consumers Pay for Less Fat?" *Journal of Agricultural and Resource Economics* 18: 288–295.
- USDA. 2000. United States Department of Agriculture. <http://www.ams.usda.gov/nop>.
- USDA. 2003. United States Department of Agriculture. "Labeling and Consumer Protection." <http://www.fsis.usda.gov/OPPDE/larc/Organic.htm>.
- Vetter, H. and K. Karantinis. 2002. "Moral Hazard, Vertical Integration, and Public Monitoring in Credence Goods." *European Review of Agricultural Economics* 29:271–280.
- Viscusi, K., J. Vernon, and J. Harrington. 1996. *Economics of Regulation and Antitrust*. MIT Press, Cambridge, MA.
- Westgren, R. 1999. "Delivering Food Safety, Food Quality, and Sustainable Production Practices: The Label Rouge Poultry System in France." *American Journal of Agricultural Economics* 81(5): 1107–1111.
- Wolinsky, A. 1993. "Competition in a Market for Informed Experts' Services." *Rand Journal of Economics* 24(2):380–398.