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CONSUMER EFFECTS OF HARMONIZING INTERNATIONAL STANDARDS FOR TRADE IN ORGANIC FOODS

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ABSTRACT---

Even if governments agree on equivalency of organic standards across countries, consumers may still believe domestically produced organic foods are superior to imports. We simulated a partial equilibrium model of trade in organic wheat between the United States and Germany to illustrate the welfare gains and losses associated with international harmonization of organic standards. Six cases were examined – no equivalency in standards (the *status quo*), equivalency of standards with complete and incomplete import acceptance, exporters certifying in importing country with complete and incomplete import acceptance, and exporters paying educational costs, with incomplete import acceptance. Results demonstrate that importing country consumers are better off if they are willing to accept imports as equivalent to domestically produced organic foods. Strategies to reduce resistance such as educational programs or foreign certification add costs to production that reduce quantity traded and impose welfare losses on exporting country producers and importing country consumers.

-----KEY WORDS-----

organic agriculture, international trade, partial equilibrium, market simulation

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Consumer Effects of Harmonizing International Standards for Trade in Organic Foods

Luanne Lohr and Barry Krissoff

Worldwide markets for organic foods are expanding, with annual growth rates of 25 to 30 percent in the European Union (EU), the United States (US), and Japan for more than five years. Using 1997 sales data and annual growth rates from the International Trade Centre (ITC 1999), and assuming a linear trend, projected market size in 2010 will be at least $46 billion in the EU, $45 billion in the US, and $11 billion in Japan. As many as 20 to 30 percent of consumers surveyed in Europe, North America, and Japan claim to purchase organic foods on a regular basis (Lohr 1998a). Yet, "organic" does not mean the same thing to all these consumers because organic food production and processing standards are not harmonized across countries. Certifiers of organic food production, processing, and handling use different rules according to regulatory, philosophical, and technical goals. This research compares the trade and welfare implications of harmonizing international standards for organic food certification with the *status quo* market response to differential standards.

We develop a partial equilibrium trade model to illustrate the gains and losses associated with international harmonization of organic standards. Market behavior is simulated under realistic assumptions about the evolution of a harmonized standard to obtain welfare results for comparison with the *status quo* market response to varying standards. We identify the conditions under which harmonization is beneficial to consumers and those under which it is harmful, and use this information to suggest how proposed US standards will affect trade.

Current Status of International Harmonization

No single international regulation establishes uniform standards for organic certification and no single agency or body is designated to accredit certifiers (ITC 1999). Exported goods must meet the production standards of the importing country, as determined by the competent organic authority in that country, typically the national government body responsible for regulating domestic certification. Legal (federal, regional, state) standards supercede private (farmer-based or for-profit) standards. At least 100 regional or national standards have been enacted worldwide, and numerous private sector standards exist as well (ITC 1999). Inspection is carried out by public or private entities to verify that organic production processes meet standards. Certification confirms that standards are met so that buyers can be certain of product integrity. Accreditation recognizes the competence of certifiers to conduct inspections and offer certification. There are 30 organic accreditation bodies worldwide (ITC 1999).

An exporting country may apply to have its standards approved across the board for designated products, regions, or certifiers by the importing country or region. If not granted blanket equivalency, exporters must submit documents for contract-by-contract verification that certification standards applied to the product are compatible with prevailing standards in the importing country. The contract-by-contract approach is cumbersome, and is associated with high transaction costs, including occasional rejection of shipments due to perceived

incompatibility of standards. Exporters have evolved several certification alternatives to try to reduce transaction costs. These include using an independent local certifier accredited under international certification process standards ISO/IEC Guide 65 or EU process standards EN 45011, using a local branch of an accredited international certifier, using local certifiers who have partnered with accredited international entities, using an international certifier or an entity in the importing country approved for third country certifications, and subcontracting to processors or distributors certified in the importing country (ITC 1999).

Without national standards in place in the US, there has been substantial effort on the part of private companies to develop certifier label recognition among importers and government authorities in the importing countries. This can reduce individual firm transactions costs by increasing knowledge about the certification and establishing its comparability to the importing country standards. An unpublished telephone interview of US organic exporters and foreign importers conducted by the University of Georgia in July and August 1999 assessed certifier recognition in Europe and Japan. Of the dozens of active certifiers in the US, only four for-profit certifiers, two farmer-based non-profit certifiers, and two state government certifiers were identified as having name recognition in foreign countries. Individual producers contribute to this awareness by providing information about the certification standards they adhere to whenever they conduct a transaction. Under uniform US standards, exporting firms will still assume at least part of the cost of educating foreign buyers about US standards during their transactions.

This situation has incited a call for harmonization of standards through international accreditation of certifiers to reduce marketing costs. Accreditation insures that certifiers hold organic producers and processors to minimum industry standards. This provides the means for governmental and extra-governmental organizations to regulate organic processes without monitoring every single producer or processor within their geopolitical boundaries. By serving as accreditors, the entities who have the power to control international trade can review other countries' standards and negotiate acceptable standards for equivalency. Although a national government may also serve as a certifer, the system of accreditation introduces flexibility in the type of organization permitted to certify and the organic rules they apply to their clients or members.

Some progress has been made toward unified accreditation in both the private and public sectors. All allow for variation in specific standards as long as standard-setting and inspection guidelines are met. The International Federation of Organic Agriculture Movements (IFOAM) is a private sector umbrella association established in 1972 to encourage organic agriculture and trade (ITC 1999). With more than 100 members representing national associations, certifiers, traders and processors, IFOAM is the largest and most influential organization of its type (Lohr 1998a). IFOAM's Basic Standards of Organic Agriculture and Food Processing have served as the framework for numerous certification programs and its accreditation program assesses compliance with these standards. In 1999, 13 certification bodies were accredited by IFOAM with six more under review (ITC 1999). In 2000, 14 IFOAM-accredited certification bodies, including four private US certifiers, took the additional step of signing a multilateral agreement to extend blanket equivalency to all other signees, boosting the international credibility of

IFOAM accreditation (*Ecology and Farming* 2000). The effectiveness of this agreement in promoting harmonization is as yet unknown.

The IFOAM standards have been influential on work completed in 1999 by the Codex Alimentarius Commission's Committee on Food Labeling and Committee on Food Import and Export Inspection and Certification Systems to develop international guidelines for national standards (ITC 1999; K. DiMatteo, personal communication). Guidelines for crop production, marketing, and labeling have been approved by the Commission, which will consider the Committee's recommended livestock guidelines in 2001 (K. DiMatteo, personal communication). Codex is particularly concerned with preventing the use of national standards as trade barriers. While not envisioned as a basis for equivalency, these guidelines may be used by the World Trade Organization in settling disputes. An exporting country who adheres to these guidelines would be in a stronger position to demand access to an importing country's markets, even if its own national standards are less strict. These guidelines may result in harmonized standards by influencing trade dispute arbitration.

The most widely recognized organization associated with accreditation is the International Organization for Standardization, which promotes rationalization of standards to facilitate trade, product development, and research cooperation. ISO/IEC Guide 65 establishes generic principles for certification bodies and has been adapted for organic accreditation by IFOAM and Demeter, an international network of certifiers for biodynamic farming (ITC 1999). The EU's standardizing bodies have adapted ISO Guide 65 in EN 45011, their requirements for certifying bodies. Beginning in June 1999, all domestic and foreign certifiers approved by the EU had to meet these rules. In response to the needs of US exporters to Europe, the Meat Grading and Certification Branch, under the US Department of Agriculture's (USDA) Agricultural Marketing Service, began accrediting US certifiers according to ISO Guide 65. The ISO standards are seen as a stopgap measure for equivalency in organic production as they do not govern production methods, only production certification processes.

The United States moved closer to national accreditation with the posting of a final rule for national organic standards in December 2000. Once the final rule is implemented, the federal government will accredit domestic and foreign certifiers selling product in the US and will have standing to apply for blanket import approval in the EU. Although details of standards differ across countries, international harmonization appears to be inevitable.

Impacts of Harmonization on Consumers

A single minimum standard can reduce consumers' costs of obtaining information about the production process, an otherwise unobservable characteristic. Consumers, who pay premiums from 20 to 200 percent for organics in most countries, are protected from fraudulent assertions and mislabeled products (Michelson et al. 1999). Reducing the information asymmetry between seller and buyer should result in a gain in consumer welfare. Yet, even fully informed consumers may differ in their perceptions of quality.

This welfare improvement depends on credibility of certification, internalized by the consumer as confidence in the organic label. Michelson et al. (1999) argued that the certification

label is a generic requirement for sale of a good as organic rather than a brand cue, so consumers are not influenced by additional promotional expenditures to look for and purchase a particular organic label. There is almost no generic advertising to educate consumers about basic production principles and advantages of consuming organic foods (Michelson et al. 1999). As a result, underlying confusion about the nature of organic products makes consumers more dependent on labels as cues. This alters the branding aspect of particular certifier labels. Currently, in many countries, there is little competition by labels within a geographic market. As interregional and international trade expand the flow of organic foods, consumers are more likely to see multiple certifications competing in the same product category in the same outlet. Consumers faced with multiple certifications may revert to other signals for selecting goods, such as looking for domestic labels in which they have more confidence.

If both the importing and exporting countries view each others' certification as equivalent, organic product flow is optimized and the good is treated as homogeneous with respect to standards. Legal equivalency agreed upon by governmental accreditors does not mean that standards are identical, nor does it guarantee consumer acceptance of the legal designation. Even if standards are identical, consumers and buyers in the importing country are likely to view imports as subject to less stringent requirements, to be "less organic." To allow for flexibility in local conditions, production standards *per se* will not be harmonized. To the extent that philosophical, technical or cost factors differ, standards will vary across countries. It is in the interest of beneficiaries of domestic production (farm organizations, trade groups, environmental groups) to encourage perceptions of differential quality. Given a preference for locally grown foods that already exists in many countries (ITC 1999), consumers are likely to believe that domestically produced organic foods are superior to imported foods in at least some attribute dimensions. At the extreme, consumers would reject imports altogether.

The relative difficulty of importing organics into a country is affected in large part by these concerns over perceived or real differences in standards. US respondents in the University of Georgia survey previously mentioned stated that they experience a high degree of difficulty importing to Austria, France, and Switzerland, and a moderate degree of difficulty for Germany and Japan. Since Germany, France, and Switzerland are three of the four largest markets in the EU, and Japan is the second largest single-country market in the world behind the US (ITC 1999, Wittenberg 2000), consumer perceptions in these countries are paramount to US exporters.

There are several studies suggesting that credibility of foreign certification is questioned by consumers. Japanese consumers are highly skeptical of imported organic products, with consumer studies indicating that one reason for not purchasing these foods is that foreign certifications are untrustworthy (Wittenberg 2000). This perception is expected to be exacerbated when Japanese national organic standards are implemented in 2001 (Wittenberg 2000). EU consumers voice similar concerns. Even though there is a single certification requirement for crop production and processing in the EU (EC Regulation 2092/91), administration and marketing are left to each country's competent authority, no unified logo for labeling products was designated until 2000, and stricter regulations may be required by individual countries for domestic labels, which are most trusted by consumers. Michelsen et al. (1999) reported cases of refusal of traders to handle foreign product or refusal of certifying bodies to permit entry of products from other countries, even when both the exporting and

importing countries were in the European Union and subject to the same minimum organic standards. In those cases, there was concern about the erosion of domestic standards by importation of foods produced under (perceived) less strict requirements, which might result in a loss of consumer confidence. Michelsen et al. (1999) stated that while unified certification is necessary, it is not sufficient for market growth. Many consumers will still view their country's standards as stricter and "more organic" unless marketing campaigns are successfully conducted to contradict this perception.

In the importing country, harmonization to a minimum standard perceived to be less strict than the domestic standard could reduce demand for imported organic food, since it would be viewed as inferior. Alternatively, demand for imports could increase if a two-tiered demand develops, with lower-priced, (perceived) lower quality imports being purchased by consumers who cannot afford foods that meet the stricter domestic standard but who want to participate in the organic market. Demand would then be segmented into import and domestic shares, with the possibility of price variability across quality groups and nonequal market shares for imports and domestically produced foods. The imports would be perceived as of different, and poorer, quality than domestically produced organic foods by some segment of the consumer population. This share of organic buyers would refuse to purchase the imports at any price. The remaining share would be indifferent between imported and domestically produced organics. They would purchase the lower priced of the two products, which would be the imports, if the second premise presented above holds.

With demand segmentation in the importing country, the slopes of the demand curves for the two groups are different from each other unless the share of consumers in each group is the same. Which slope is relatively steeper depends on whether a smaller percentage rejects or accepts imports, since the original market demand curve is partitioned by dividing these percentages into its slope. In previous applications of this model by Tauer (1994) to bST and non-bST milk and by Lohr (1998b) to three classes of eco-labeled foods, the percentages of consumers requiring particular quality characteristics were determined empirically.

If legal equivalence is accepted by consumers, imports are treated as homogeneous in the market. Similarly, in countries that do not have national standards, there is no widespread basis for judging the relative strictness of foreign and domestic rules, so discrimination against imports is less likely. Organic claims for imports into Canada and the US are verified by importers rather than the government, if they are checked at all, because as of the end of 2000, neither country had implemented national organic standards. In Japan, importation was assessed by the University of Georgia's survey as moderately difficult in 1999, but is expected to be much more difficult with the implementation of national standards in 2001 (Wittenberg 2000). Whether consumer acceptance of imports is less likely than consumer rejection in most industrialized countries depends on perceptions of equivalency between domestic and exporting country standards. These perceptions may be influenced by exporter behavior as well as by government action.

Consumers are aware that firms in the exporting country at least conform to the minimum international standard, but not necessarily to stricter domestic standards in the importing country. Firms attempting to capture foreign market share could incur additional costs of certifying with a

foreign entity to assure consumers in that country of the quality of their product. To avoid excess cost, these firms might opt out of their domestic certification programs altogether, leaving fewer domestic firms to share the fixed costs of certification and accreditation. The result would be a two-tiered supply in the exporting country segmented into domestic and export shares.

With supply segmentation of the type described, both the intercepts and the slopes of the supply curves for the two groups are different from each other. The market supply curve is partitioned according to the foreign market share captured by exporters, with the resulting export slope being steeper than the domestic supply slope if the foreign market share is less than 50 percent. The market intercept is adjusted upward separately for each supply segment according to the fixed cost of domestic certification (for domestic suppliers) and the cost of foreign certification (for exporters).

A combination of segmented demand and segmented supply could occur if exporters engaged in foreign certification, but consumers in that country still rejected the import as inferior. This could conceivably happen if consumers are aware of the country-of-origin and distrust the foreign production system, even if domestic certification is granted. Alternatively, exporters could certify domestically and invest in educational programs to promote their certification or product quality to foreign consumers. Unless they already accept the imported product as homogeneous with the domestically produced version, it is unlikely that all foreign consumers would be convinced by such a campaign. Some percentage of those foreign consumers who would have rejected the certification outright will be convinced to buy the product, according to some function of educational spending by the exporters. This generates segmented demand in the importing country. Supply in the exporting country is partitioned according to the foreign market share captured by exporters, as explained previously, and the supply intercept for export supply is adjusted upward by the cost of educational spending. Again, both segmented demand and segmented supply would result.

Simulating Consumer Welfare Effects

To examine the possible outcomes of harmonization as described in the last section and the impacts on consumer welfare, we develop a concrete example of trade under varying assumptions about perceived product homogeneity. The autarky situation (no trade) is simulated as a baseline of comparison for all trade scenarios. In the current market environment, perceptions of consumers in the importing country dictate acceptance of imports. We consider six cases. The cases compared with the autarky baseline are summarized on Table 1 and explained below.

Table 1. Summary of Scenarios Compared with the Autarky Baseline

Scenario	Exporter Behavior in Exporting Country			Consumer Behavior in Importing Country	
	Domestic certification with equivalency granted	Importing country certification	Domestic certification with education campaign	All accept imports	Some do not accept imports
1 (status quo)	[a]				X
2	X			X	
3	X				X
4		X		X	
5		X			X
6			X		X

[a] Under the status quo, prior to promulgation of the Final Rule for National Organic Standards, suppliers certify domestically, but equivalency cannot be granted due to lack of US government regulations.

In Case 1, the exporting country standards are not granted equivalency by the importing country. Exporters incur additional transaction costs to access the import market. This is the *status quo* situation between the US and the EU. In Case 2, the importing country and exporting country standards are perceived as equivalent, and the product traded is homogeneous.

In Case 3, the exporting country's standards are perceived as less stringent and the product is no longer homogeneous. Demand in the importing country is segmented so that domestic demand is for a perceived higher quality good and import demand is for a lower quality product. The price differential between the two reflects in part the quality differentiation. In Case 4, supply in the exporting country is segmented into domestic and export supply shares. Exporters certify with an entity in the importing country and opt out of domestic certification in the exporting country. The domestic share in the exporting country incurs higher fixed costs because accreditation program costs are spread over fewer producers. It is assumed that consumers in the importing country are unable to distinguish imports from domestically produced organics when both display the same certification label, and so treat them as homogeneous.

Case 5 is the same as Case 4, except consumers are assumed to have information that enables them to identify imports, which they treat as lower quality. An example of such information is country of origin labeling. This results in two-tiered demand in the importing country and two-tiered supply in the exporting country. In Case 6, exporters certify with domestic entities, but invest in educational programs to promote their country's certification process. It is assumed that educational spending is less than 100 percent effective, but will increase the percentage of consumers in the importing country who will accept the imports. Demand is segmented in the importing country and supply is segmented in the exporting country.

The simulation method used was adapted from Tauer (1994) and Lohr (1998b). Partial equilibrium models of linear supply and demand were constructed for each case for the importing and exporting countries. Systems of equations representing the trade scenarios were solved simultaneously using the nonlinear module of GAUSS™ Version 2.2 (Aptech Systems, Inc., 1997). All demand and supply equations were set up in price-dependent form.

Each case is graphically presented, followed by a discussion of parameter values used for the scenarios. For all graphs in this section, the subscript *m* refers to the importing country and the subscript *x* refers to the exporting country. ES and ED refer to excess supply and excess demand. All vertical axes are prices and all horizontal axes are quantities. The left graph is for the exporting country and the right graph is for the importing country. All cases are based on a "large country" trade model, which is appropriate for the US, Japan, and the EU as a whole and for most countries individually in the EU, since the largest organic markets are in these countries.

Case 1 - Equivalency Not Granted (Status Quo)

If blanket equivalency is not granted to an exporting country, firms must negotiate certification equivalency for each contract. Figure 1 shows the extra cost incurred by the exporting country modeled as a tax equivalent imposed by the importer. Prices differ in the importing and exporting countries because the price creates a tax wedge. The importing country faces price P + tax while the exporter faces P - tax. The dashed line shows the implication of the excess costs. Quantity exported is Qsx - Qdx, which is less than quantity of imports desired, equal to Qdm - Qsm. The extra transactions costs drive down domestic price in the exporting country as they raise it in the importing country.

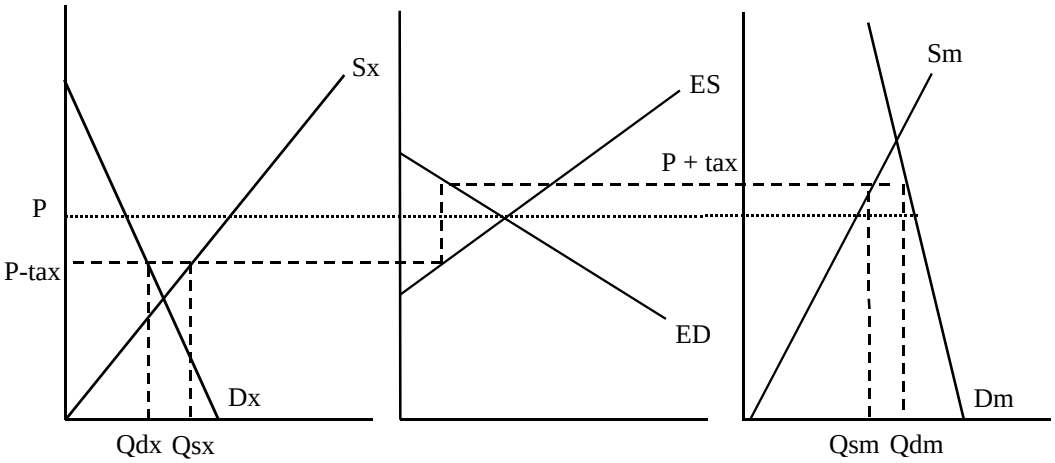

FIGURE 1. Equivalence vs. No Equivalence Between Exporting and Importing Countries

Case 2 – Equivalency Granted, Homogeneous Goods

The dotted line in Figure 1 shows the equilibrium at ED = ES. Adjusting the quantities demanded and supplied in the importing and exporting countries to reflect the equilibrium price

results in Qsx - Qdx = Qdm - Qsm. This case should generate the greatest welfare improvement over autarky because there are no extra transactions costs. A single price, P, prevails in both countries and consumers in the importing country treat the imported good as identical to the domestically produced version.

Case 3 – Equivalency Granted, Imports Rejected

In Figure 2, demand in the importing country is segmented into domestic (subscript *d*) and import (subscript *m*) demand. There are two equilibrium prices (Pmd and Pmm) and quantities (Qmd and Qmm) determined by the domestic and import supply and demand curves. The market is segmented by assuming that more than 50 percent of consumers in the importing country refuse to buy imports due to perceived inferiority of the import good. Dividing the demand curve slope by this share gives Dmd, the domestic demand in the importing country. The rest of demand in the importing country is Dmm.

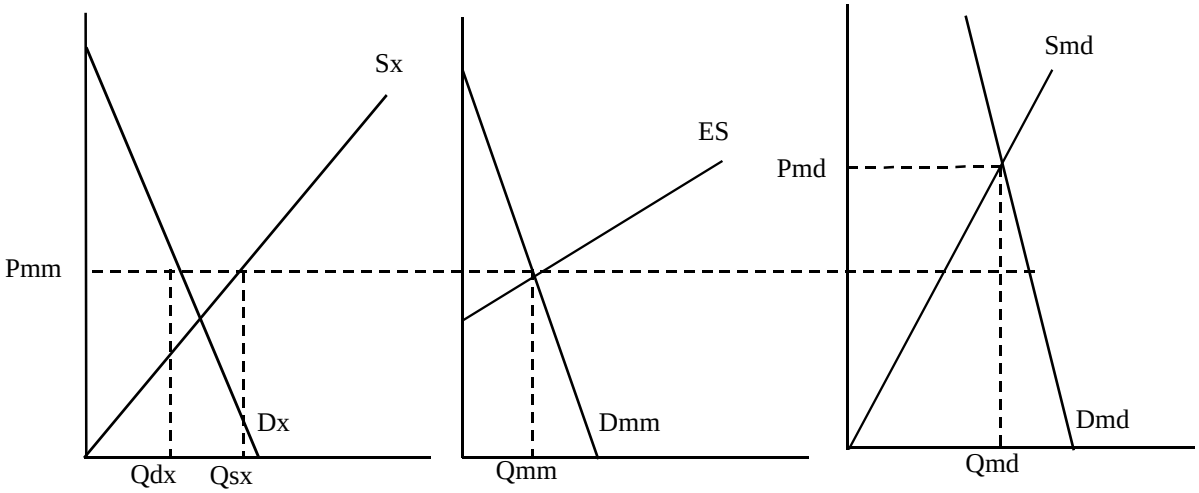

FIGURE 2. Imports Rejected, Segmented Import Demand

The domestic supply curve in the importing country is Smd. Import supply is given by ES, the excess supply curve generated from conditions in the exporting country. The quantity exported is Qsx - Qdx as before, and it is assumed all excess supply is sold in the importing country at equilibrium price Pmm. Domestic demand Dmd is more elastic than import demand Dmm and domestic supply Smd is more inelastic than import supply, ES. Domestic price Pmd is greater than import price Pmm as long as the share refusing to purchase imports at price Pmm is greater than 50 percent. Domestic quantity Qmd is greater than import quantity Qmm despite the lower price of imports due to quality perceptions.

The concept of excess demand presupposes a homogeneous good in the importing country where quantity supplied in that country is insufficient to meet quantity demanded and imports are required to make up the difference. In a trade situation with segmented demand in the importing country, the quantity of imports demanded is not set by excess domestic demand because imports and domestic production are heterogeneous to a segment of consumers. With segmented demand, it is possible to establish different equilibrium prices and quantities because consumers choose between two qualitatively different goods. This is shown graphically by

placing the demand for the domestically produced good, Dmd, and the demand for the imported good, Dmm, in the importing country on different graphs.

In Figure 2, the middle graph is necessary to know the total quantity exchanged in the importing country. Qmm from the middle graph must be added to Qmd from the right graph to obtain the total. In Figure 1, the total quantity exchanged can be assessed by looking only at the graph for the importing country, for which Qsm is the domestically produced quantity consumed, and Qdm-Qsm is the imported quantity consumed. For the exporting country, the left graph in Figure 2 is sufficient to determine both exports and domestic use, as it is in Figure 1. In both figures, domestically produced quantity consumed in the exporting country is Qdx and export supply is Qsx-Qdx, which is equivalent to Qmm in Figure 2. The middle graphs in Figures 1 and 2 show excess supply in the exporting country, but the information is redundant to the calculations that can be made using only the information from the left graphs.

There is no producer surplus in the importing country associated with the ES curve since these suppliers only sell domestically. Suppliers in the exporting country obtain surplus domestically and in the export market. The segmented demand curve has two components – domestic demand Dmd shown in the right graph and import demand Dmm shown in the middle graph, so consumer surpluses must be summed across the two markets to obtain consumer surplus in the importing country. Consumer surplus in the exporting country is obtained by the usual calculations related to Dx.

Case 4 – Exporters Certify in Importing Country, Homogeneous Goods

In this situation, shown in Figure 3, the exporting country is assumed to have segmented supply, with export suppliers differentiated from domestic suppliers. Unlike Case 3, no set share of supply is assumed to be exported. Instead, the model exploits the cost increasing effects of the segregated domestic and international certification to solve for the share of production that is exported. Export supply is found by dividing the export share into the slope coefficient, and domestic supply is obtained by dividing one minus the share into the slope. Exporters certify with an entity in the importing country and do not share the domestic organic program costs. Suppliers who remain in the domestic market incur higher fixed costs of accreditation and certification because exporters have opted out of the domestic program. If this strategy is successful, imports will be indistinguishable by certification label from domestically produced organics. Consumers in the importing country will treat both as homogeneous and thus, only one demand curve exists in the importing country.

The domestic demand curve in the exporting country is Dxd. The export demand curve is the same as the excess demand curve, ED, generated by conditions in the importing country. The quantity exported is Qxx, which is equivalent to Qdm – Qsm in the importing country, sold at equilibrium price, Pxx. Domestic supply, Sxd, is more elastic than export supply, Sxx, and domestic demand Dxd is more inelastic than export demand, ED. The domestic supply curve in the exporting country shifts by the amount of the accreditation cost increase. The export supply curve, Sxx, shifts up by the additional cost, if any, of certifying in the importing country. Domestic equilibrium quantity, Qxd, is greater than export quantity, Qxx, and domestic price, Pxd, is greater than export price, Pxx, if the accreditation cost increase is less than the cost

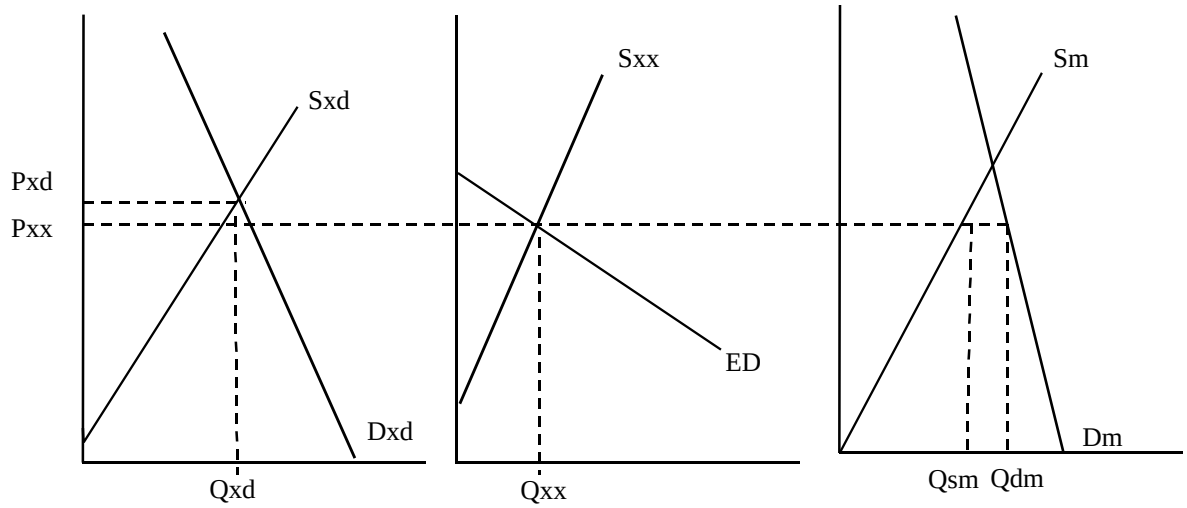

FIGURE 3. Exporters Certify in Importing Country, Homogeneous Good

increase for certifying abroad and the share of supply exported is less than the share for domestic consumption.

In a trade situation with segmented supply in the exporting country, the quantity of exports supplied is not set by excess domestic supply because exports and domestic production are segmented by costs. Similar to segmented demand, it is possible to establish different equilibrium prices and quantities because producers who export incur different costs from those who produce for domestic market. In this paper, these costs were assumed to be related to certification and education, as shown on Table 1. This is shown graphically by placing the supply for the domestically produced good, Sxd, and the supply for the exported good, Sxx, in the exporting country on different graphs.

In Figure 3, the middle graph is necessary to know the total quantity exchanged in the exporting country. Qxx from the middle graph must be added to Qxd from the left graph to obtain the total. In Figure 1, the total quantity exchanged can be assessed by looking only at the graph for the exporting country, for which Qsx is the domestically produced quantity supplied, and Qsx-Qdx is the exported quantity. In Figure 3, domestically produced quantity consumed in the importing country is Qdm and import demand is Qdm-Qsm, which is equivalent to Qxx. For the importing country, the right graph in Figure 3 is sufficient to determine both imports and consumption of domestically produced goods, as it is in Figure 1. In both figures, domestically produced quantity consumed in the importing country is Qdm and import demand is Qdm-Qsm, which is equivalent to Qxx in Figure 3. The middle graphs in Figures 1 and 3 show excess demand in the importing country, but the information is redundant to the calculations that can be made using only the information from the right graphs.

There is no consumer surplus in the exporting country associated with the ED curve because these consumers purchase only domestically produced organics. Consumers in the importing country obtain surplus domestically and from the import market. The segmented supply curve has two components – domestic supply Sxd shown in the left graph and export supply Sxx shown in the middle graph, so surpluses must be summed across the two markets to

obtain producer surplus in the exporting country. Producer surplus in the importing country is based on the domestic supply curve Sm.

Case 5 – Exporters Certify in Importing Country, Imports Rejected

This case has the same assumptions as Case 4 – exporters certify in the importing country leaving fewer domestic suppliers to share organic accreditation program costs and thus increasing domestic costs. However, in Case 5, it is assumed that additional information is available to consumers in the importing country so that they can identify which organic products are imported and which are domestically produced. As in Case 3, the imports are rejected by some share of consumers. Figure 4 shows this situation.

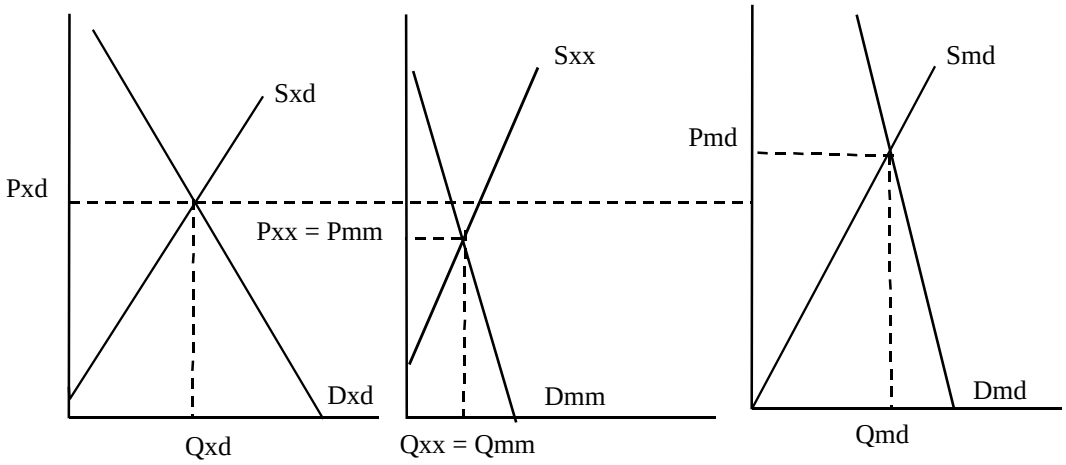

FIGURE 4. Exporters Certify in Importing Country, Imports Rejected

Both supply in the exporting country and demand in the importing country are segmented. There are now three equilibrium prices and quantities, one each in the domestic markets of the exporting and importing countries and one for the export supply and import demand curves. As in Case 4, the share exported is divided into the supply curve in the exporting country to segment supply and the share who refuse to buy imports is divided into the demand curve in the importing country to segment demand. The export supply curve, Sxx, and the import demand curve, Dmm, are more inelastic than their respective domestic supply and demand curves.

The share of consumers who refuse imports is set, as in Case 3, and the share of supply exported is determined by elasticities and equilibrium conditions, as in Case 4. The import share sets the upper limit on international trade, since it is a fixed value. Both domestic prices, Pmd and Pxd, are greater than the trade price, Pxx = Pmm, and both domestic quantities, Qxd and Qmd, are greater than the quantity traded, Qxx = Qmm. This result requires that trade represent less than 50 percent of the share of total supply in the exporting country and total demand in the importing country. Also, for this result, the cost of certifying in the importing country must be greater than the additional cost of accreditation to domestic suppliers in the exporting country. There is no consumer surplus associated with export supply, Sxx, and no producer surplus

associated with import demand, Dmm, for reasons given in Cases 3 and 4. Other welfare effects are calculated as usual.

Case 6 – Exporters Pay Education Costs, Incomplete Import Acceptance

In Case 6, exporters certify domestically, so cost differentials from Cases 4 and 5 between domestic and export suppliers in the export country are eliminated. However, exporters invest in education of consumers in the importing country about the quality of their products and certification with the aim of convincing consumers to accept imports. The efficiency of educational spending is assumed to be less than 100 percent, so that the share who reject imports is less than in Cases 3 and 5, but is not zero. This scenario is similar to that in Figure 4, except that the intercept for the domestic supply curve in the exporting country begins at the origin, there being no additional accreditation costs incurred. The intercept for the export supply curve shifts upward by the amount of educational spending.

Demand in the importing country and supply in the exporting country are both segmented, as in Case 5. In the exporting country, the supply curve is segmented as it was in Cases 4 and 5. In the importing country, the slope of the demand curve is divided by the share of consumers who refuse to buy imports to get domestic demand and by one minus this share to get import demand. The share refusing to buy imports was not set exogenously. Spending as a percentage of price is multiplied by educational efficiency, defined as the percentage increase in share buying imports per percent of educational spending, and was subtracted from the default share refusing to buy imports. Thus, the share of imports demanded was dependent on decisions made by exporters. Consumer surplus does not exist for the export supply curve, nor producer surplus for the import demand curve, but all other welfare effects are calculated as usual using the trade price, Pxx = Pmm, and quantity, Qxx = Qmm, along with domestic demand and supply curves in each country.

The results that actually occur in the market depend on elasticities of demand, prices for imported and domestic organics, and costs of certification and accreditation. All the situations described are possible for the US under current conditions. Since the US will probably implement its national standards in 2001, the *status quo* scenario (Case 1) will not maintain. Case 2 is the least likely to result across all countries to which the US exports organic foods, since consumer acceptance of imports varies. Case 3 represents the initial situation that is likely following implementation of US standards. Cases 4 and 6 are responses to rejection of US exports certified domestically, with Case 4 being the more optimistic in terms of foreign consumer response. Case 5 would occur if foreign consumers distrust their own certification programs. This is a possible result with fragmented certification, where there are multiple certifiers in the country and none are dominant enough to be credible throughout. Examples include Germany, with more than 50 certifiers, Austria, with 22 certifiers, and Italy, with eight control bodies. Also, Case 5 might result if consumers are aware of the origin of the import, and despite certification in their own country, distrust the production method and reject the import.

Application of the Trade Model

The model was simulated for a two-country partial equilibrium with the United States exporting wheat to Germany. The US is a major producer of organic wheat, calculated at 101,806 metric tons, based on 1997 acreage from Greene (2000) and yield from the Organic Farming Research Foundation (OFRF) (1999). Germany is the largest single market for organic food products outside the US and a substantial producer of organic wheat in Europe. Domestic production was calculated at 59,880 metric tons, based on 1995 arable acreage from Foster and Lampkin (1999), percent allocated to wheat, and yield per hectare from Offerman and Nieberg (2000). Prices differed markedly between the countries, with 1997 farm price for US organic wheat calculated at $231.48 per metric ton, based on per bushel price from OFRF (1999). German farm price in 1995 was calculated at $485.40 per metric ton, based on per ton price in ecus from Offerman and Nieberg (2000).

These prices and quantities, along with elasticities of supply and demand, were used to obtain the intercepts and slopes for the demand and supply curves. The demand elasticity for wheat in the US was assumed to be -0.0255, consistent with the own-price elasticity for conventionally grown wheat (Barnes and Shields 1998). This is reasonable since organic processors and consumers are unlikely to have more flexibility in substituting other grains for wheat than do conventional processors and consumers. While availability of substitutes in terms of quantity is probably more limited for organic processors, there is no solid information on which to choose a different elasticity. The German demand elasticity for wheat also was assumed to be -0.0255.

Both US and German supply elasticities were set at 1.00. This forces the supply curve through the origin. It is reasonable to examine this case since both US and German farmers sell some portion of certified organic wheat through conventional market channels. For German farmers, about 15 percent of wheat does not enter the organic market and so fails to return the expected price premium (Michelson et al. 1999). In the US, about 20 percent of organic wheat acreage is sold as conventional (OFRF 1999). This flexibility in marketing permits organic growers to take advantage of price-cost differentials, timing of market demand and other factors that should increase responsiveness to price changes. The slopes and intercepts are presented in Table 2.

TABLE 2. Demand and Supply Equations

	Intercept	Slope
United States		
Supply	0.00	0.0023
Demand	9309.18	-0.0892
Germany		
Supply	0.00	0.0081
Demand	19520.64	-0.3179

The market curves represented in Table 2 assume there is no substitution of conventional for organic wheat in either demand or supply. Although end consumers (households) may

choose conventional wheat products when organic prices increase, processors and other intermediaries modeled here cannot because EU regulations require that 95 percent of the ingredients of a product labeled "organic" be of certified origin (EU Council Regulation 2092/91). The US standards also stipulate this level of organic content. On the supply side, at least one year for the transition period is required in the EU countries and a three-year transition period is required in the US rules, so farmers lose certification and must start over if they farm the land using conventional practices.

Other parameters were specified for the individual cases. Available information on market conditions was used to generate parameters; and in all cases, the assumed values are conservative. In Case 1, transaction cost was assumed to be five percent of equilibrium price. In Cases 3 and 5, the share of German domestic market assumed to refuse to buy US imports was 80 percent, which is a conservative estimate. Cereals rank as the most important organic food group in the country, with organic holding 3.4 percent of total market share for cereals (Michelson et al. 1999). Organic bakeries, the main consumers of wheat, account for 8 percent of the total organic market, worth DM 250 million, and an estimated DM 3 million is imported (ITC 1999). Another DM 17 million worth of raw materials is imported for production of pasta and cereals. German consumers are considered among the most critical in the EU and local sourcing is an important factor in their purchase decisions (ITC 1999). Importers must work extremely hard to meet these discerning standards and satisfy the German consumer.

In Cases 4 and 5, the accreditation cost increase to domestic suppliers was assumed to be 0.5 percent of equilibrium price, based on program costs and number of domestic producers estimated by the USDA. The foreign certification cost increase to export suppliers was assumed to be 1.5 percent of domestic US certification costs, based on costs in Germany and the US (Offerman and Nieberg 2000). In Case 6, educational spending was assumed to be 5 percent of equilibrium price and educational efficiency was assumed to be 75 percent. Previous research by Lohr (1998b) suggested that these are realistic values for domestic education programs about eco-labels in the US, but they probably overstate the cost-effectiveness of a foreign education program given the strength of German attitudes.

Price and quantity equilibria for the six scenarios are shown in Table 3. The six cases were compared to autarky in terms of consumer, producer and net surpluses, which are shown in Table 4. The results were consistent with the graphical analyses presented. In all cases, US consumers were made worse off while German consumers gained. Net surpluses were all positive, with Germany gaining three to twelve times as much as the US from trade. Quantity traded and US and German net surpluses were highest when the import good was treated as homogeneous with domestically produced organic wheat in Germany (Cases 2 and 4). US consumers lost the most in these cases due to domestic price increases over autarky of 24.1 percent for Case 2 and 25.1 percent for Case 4.

The best situation for the US (Case 2) gave a net surplus of $697,670. In this case, 25,086 metric tons was exported, and domestic quantity demanded was 101,183 metric tons, 0.6 percent lower than under autarky. Price was 24 percent higher for US consumers with trade. The best result for Germany (Case 4) gave a net surplus of $2,501,082. With 25,156 metric tons imported, and domestic quantity supplied at 48,144 metric tons, total German consumption was

TABLE 3. Price and Quantity Equilibria Under Trade Scenarios [a]

	Price ($/mt)	Domestic Quantity [b] (metric tons)	Quantity Traded [c] (metric tons)
CASE 1. Equivalency not granted (status quo)			
United States	272.75	101,345	18,612
Germany	301.46	37,189	-18,612 [d]
CASE 2. Equivalency granted, homogeneous goods			
United States	287.10	101,183	25,086
Germany	287.10	35,418	-25,086
CASE 3. Equivalency granted, imports rejected			
United States	258.35	101,505	12,119
Germany – Imports	258.35		-12,119
Germany – Domestic	390.26	48,144	
CASE 4. Exporters certify in importing country, homogeneous goods			
United States – Exports	286.55		25,156
United States – Domestic	289.40	101,157	
Germany	286.55	35,350	-25,156
CASE 5. Exporters certify in importing country, imports rejected			
United States – Exports	255.15		12,121
United States - Domestic	260.28	101,483	
Germany - Imports	255.15		-12,121
Germany – Domestic	390.26	48,144	
CASE 6. Exporters pay education costs, incomplete import acceptance			
United States – Exports	276.93		14,377
United States - Domestic	263.09	101,452	
Germany - Imports	276.93		-14,377
Germany – Domestic	372.31	45,930	

[a] Under autarky, the U.S. equilibrium price for organic wheat was $231.38 per metric ton and quantity was 101,806 metric tons. In Germany, equilibrium price was $485.40 per metric ton and quantity was 59,881 metric tons.

[b] Domestic quantity demanded for U.S., domestic quantity supplied for Germany.

[c] Quantity traded is positive for the exporting country and negative for the importing country. When there is a single price for domestic and imported or exported quantity, quantity traded represents excess demand or excess supply for that country.

[d] Excess demand in Germany was 4,658 metric tons.

TABLE 4. Welfare Changes Compared to Autarky

	Producer	Consumer	Net Surplus
CASE 1. Equivalency not granted (status quo)			
United States	4,575,655	-4,191,632	384,022
Germany	-8,927,537	11,067,710	2,140,173
CASE 2. Equivalency granted, homogeneous goods			
United States	6,342,950	-5,645,280	697,670
Germany	-9,448,681	11,935,937	2,487,256
CASE 3. Equivalency granted, imports rejected [a]			
United States	2,894,338	-2,731,518	162,820
Germany	-5,138,678	7,304,343	2,165,665
CASE 4. Exporters certify in importing country, homogeneous goods [b]			
United States	6,560,908	-5,878,061	682,847
Germany	-9,468,156	11,969,238	2,501,082
CASE 5. Exporters certify in importing country, imports rejected [c]			
United States	3,050,006	-2,927,191	122,815
Germany	-5,138,679	7,343,136	2,204,458
CASE 6. Exporters pay education costs, incomplete import acceptance [d]			
United States	3,636,148	-3,211,957	424,190
Germany	-5,982,738	8,159,588	2,176,850

[a] Share of German domestic market assumed to refuse to buy imports was 80%.
[b] Share of exporting country supply traded was 20.21%.
[c] Share of exporting country supply traded was 10.95%.
[d] Share of exporting country supply traded was 12.32%.

73,300 metric tons, 22 percent higher than without trade. Price decreased by 41 percent from the autarky case.

The *status quo* situation described in Case 1 resulted in a net surplus for the US that was only 55 percent of the surplus in Case 2. The net surplus for Germany was 86 percent of the best result described in Case 4. As a two-country model, the simulation results overstated the true trade conditions. The actual quantity of all cereals imported into Germany in 1997-1998 was estimated at 25,000 metric tons while the simulated quantity for organic wheat imported from the US was 18,612 metric tons (Michelson et al. 1999). France, Canada, Italy, Australia, the Czech Republic, and Hungary also export cereals to Germany, with total quantity imported estimated at 10 percent of the domestic organic market share (Michelson et al. 1999). The simulated share of imports was 33 percent of domestic quantity demanded. Of key importance in the simulation results was the price effect in Germany, which even with the extra transaction cost due to lack of equivalency reduced the German domestic price by 38 percent. Maintaining a significant price

differential with an importing country's domestic price improves the attractiveness of US exports, even if not granted full equivalency by the importing country.

In both cases (Cases 3 and 5) where a large percentage refused to accept the imports, gains were lower for the US. The extra costs to both domestic and export suppliers in Case 5 resulted in only $122,815 net surplus to the US and the lowest price for US exports at $255.15 per metric ton, 10 percent higher than autarky. In Case 3, net surplus was $162,820, at price $258.35. These cases resulted in the smallest loss to US consumers, as domestic equilibrium quantity was greater than for the other scenarios. US consumers are better off if the differential between domestic US and German prices is large, but the differential between US domestic and export prices is small. Scenarios 3 and 5 generated intermediate surplus values for Germany, but the smallest quantities traded, at 12,119 metric tons for Case 3 and 12,121 metric tons with Case 5.

The low export-import prices were a reflection of German unwillingness to buy imports that is built into the scenarios. With a higher level of resistance, import prices would be lower and domestic prices higher as autarky is approached. Erosion of this resistance would move prices toward the cases in which imports are viewed as homogeneous with domestically produced goods, with attendant benefits to US producers and negative impacts on US consumers.

Case 6 gave net surplus for the US intermediate to the other cases, at $424,190, and produced an intermediate surplus result for Germany, at $2,176,850 improving on the *status quo* by 10 percent for the US and 2 percent for Germany. This was the only case in which US domestic price was below both the trade price and the Germany domestic price. Educational spending exerted downward pressure on US domestic price and educational spending efficiency raised the trade price. As either or both of these increase, the effect would be magnified. If costs of education are borne by the government, exports would be favored even more.

The last scenario is the most complicated in terms of behavioral effects on market equilibrium. The share of Germans who will not buy US organic wheat declines if either spending increases or efficiency increases, but the effects are not the same. The equilibria are related via the slopes for German demand curves due to share imported (which depends on spending and efficiency), the shift in the US export supply curve intercept due to education cost, the slopes of US supply curves due to shares exported (which is free to vary in this scenario) as explained in the case description. Thus, the results are not straightforward where there is two-tiered demand in the import country and two-tiered supply in the export country.

Sensitivity analyses conducted on the efficiency of education and educational spending parameters revealed that increased educational spending by US exporters, without increased efficiency, drives up the trade price, depresses the German domestic price, and increases the US domestic price. An educational efficiency gain magnifies the effect of a spending increase. The trade price rises higher, as does the US domestic price, but the German domestic price declines. The relative effects on slopes and intercepts of the demand and supply curves is such that the gap between German domestic and import prices becomes smaller, and the gap between US domestic and export prices becomes greater. As a result, the export share of US supply increases as more Germans perceive the import as of equal quality with domestically produced wheat.

Most of the results presented are subject to the parameters used to simulate the models. While realistic, conservative values were selected for these parameters. Different values could alter the relative rankings of the scenarios on the basis of surpluses. Of particular importance is the treatment of consumer resistance to imports in Germany. The *status quo* is usually considered a worst case situation by the industry due to the cumbersome transactions, but in the simulations here, Case 1 implicitly assumed that German consumers would buy all the product offered at the higher "taxed" price. Exactly because of the extra costs incurred under the *status quo* system, care is usually taken to insure that the contracts are fulfilled and delivery of product accepted, so the resistance to imports may be masked. Harmonization may generate a false sense of security among exporters, who will encounter lower transactions costs but revealed resistance to their products from consumers in the importing country.

Conclusions

From the example provided for organic wheat trade between the US and Germany, several conclusions may be drawn. The *status quo* situation is not the best for either country. The US organic industry and the USDA are responding appropriately by developing accreditation standards that will permit the US to apply for EU equivalency. The *status quo* situation imposes extra transactions costs on exporters whose certification is not recognized with full equivalency in the importing country. While trade does occur, there is excess demand in the importing country, which in the real world will be met by US competitors.

German consumers would be better off if they were not so discriminating in their preferences for domestically produced wheat. However, uncertainty and concern about food safety and fragmentation in German and US certification authorities are likely to perpetuate this differentiation on the part of consumers. Certification label branding is likely to evolve along with harmonization of standards. Consumers confronted with a multiplicity of organic labels will look for the familiar, which typically will be a domestic label. Depending on how distrustful they are of foreign certification, some consumers may continue to refuse imported organic foods. There are intangible gains to offering consumers greater choice, especially if the market is segmented into heterogeneous domestic production and imports. Consumers in the importing country who could not otherwise afford organic foods, can buy imports because the import price is forced down.

As long as organic production, processing, and handling requirements are not identical across countries, some consumers will still view their country's standards as stricter and "more organic." Certification in the importing country offers a second-best solution to US producers provided that no other information, such as country of origin labeling, undermines the camouflage of the domestic label. To the extent that costs of foreign certification are higher than US certification, US producers will incur an extra expense if they have to use this method of market entry.

Harmonization of accreditation standards alone is not sufficient to guarantee welfare maximization in international organic trade. If consumers do not accept the equivalency of imported and domestically produced organic foods, welfare gains cannot be maximized.

Reassuring foreign consumers of US certification quality and maintaining cost-competitiveness are important factors in international marketing. Consumer perceptions of product homogeneity are critical whether developed through educational programs or foreign certification. The US government conducts trade fairs to educate foreign buyers about US organic products. Results here suggest that domestic producers may not gain significantly from education efforts, if domestic consumers in the importing country are resistant to imports. The greatest welfare gains occur if equivalency is accepted, whether or not exporters certify domestically or in the importing country (Cases 2 and 4). In the absence of consumer acceptance, welfare improvements over the *status quo* are not significant for consumers in the importing country. For US producers, surplus gains compared with autarky may actually be less if imports are rejected than the situation under the *status quo* without equivalency.

Currently, organic trade shows are conducted by the US government only for purposes of product introduction. This *de facto* leads to a discussion between US vendors and foreign buyers of the organic standards under which the product was certified Whether or not the US government provides educational programs about US organic standards, firms will continue to promote their products, and of necessity, to educate about the standards to which their products conform. The organic industry has begun to develop export market assessments using a grant from FAS in 2000 under the Export Market Assistance Program. This is a step toward identifying reasons for resistance to US organic products and ways to overcome consumer resistance in importing countries.

International trade in organics could benefit both US consumers and producers. The welfare effects of importing into the US should be explored. By simulating results for other countries and other crops, a view of the US organic consumer's overall position may be developed and more general conclusions may be drawn.

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