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**SPECIAL ISSUE: FOOD REGULATION AND TRADE: INSTITUTIONAL
FRAMEWORK, CONCEPTS OF ANALYSIS AND EMPIRICAL EVIDENCE**

*Guest Editors: Monika Hartmann,
Bettina Rudloff and Thomas Heckelei*

CONTENTS

Introduction from the Guest Editors	v
The Institutional Framework for Food Regulation and Trade <i>Tim Josling</i>	1
Risk and Economic Assessments for U.S. Imports of Mexican Avocados <i>Everett Peterson and David Orden</i>	17
Standards and Developing Country Exports: A Review of Selected Studies and Suggestions for Future Research <i>John S. Wilson</i>	35
Standards as Barriers and Catalysts for Trade, Growth and Poverty Reduction <i>Miet Maertens and Johan F.M. Swinnen</i>	47
The Role of Public and Private Standards in Regulating International Food Markets <i>Spencer Henson</i>	63
To Regulate or Not? The Trade-off between Food Safety and Consumer Choice <i>Monika Tothova and James F. Oehmke</i>	83

**Consumer Demand for Quality: Major Determinant
for Agricultural and Food Trade in the Future?**

99

Julie A. Caswell and Siny Joseph

SCOPE

The *Journal of International Agricultural Trade and Development* is intended to serve as the primary outlet for research in all areas of international agricultural trade and development. These include, but are not limited to, the following: agricultural trade patterns; commercial policy; international institutions (e.g., WTO, NAFTA, EU) and agricultural trade and development; tariff and non-tariff barriers in agricultural trade; exchange rates; biotechnology and trade; agricultural labor mobility; land reform; agriculture and structural problems of underdevelopment; agriculture, environment, trade and development interface. The Journal especially encourages the submission of articles which are empirical in nature. The emphasis is on quantitative or analytical work which is relevant as well as intellectually stimulating. Empirical analysis should be based on a theoretical framework, and should be capable of replication.

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INTRODUCTION FROM THE GUEST EDITORS

The conflicts between food regulation at the national level and an open international trade system are at the forefront of the trade policy debate. How food safety issues and technical standards are dealt with in the world trading system is crucial for developing countries whose exports might be severely hampered, since they often lack the technical, administrative and financial means to cope with a fragmented system of national food regulations. However, differences in food regulation are also prevalent among industrial countries and increasingly have become a source of conflict in trade policy.

The papers in this volume are based on presentations at the 2006 summer symposium of the International Agricultural Trade and Research Consortium (IATRC) on "Food Regulation and Trade: Institutional Framework, Concepts of Analysis and Empirical Evidence" held in Bonn, Germany. These proceedings consider a selection of the symposium's papers in order to address the full spectrum of the various aspects of food-related trade barriers. The topic is treated from a theoretical and empirical perspective, taking into consideration the role of the government as well as the private sector in setting and adjusting food regulations.

First an overview on the existing institutional framework for food regulation at WTO-level is given by Josling. The author stresses the remarkable changes that have taken place in this area in the past two decades. According to this paper a comprehensive framework for integrating trade and domestic food regulation, e.g. regarding human, plant and animal health/safety is now in place while identifying the scope for improvements in the future. The methodological paper by Peterson and Orden deals with opening avocado trade between the U.S. and Mexico over the period 1991 to 2005. The authors discuss the political economy of lifting the initial ban of the US by introducing a system of pest risk management. i.e. allowing imports into specified US regions from approved orchards in Mexico. Based on a simulation analysis the economic gains from trade considering pest risks, compliance costs in Mexico and potential costs of trade-related pest outbreaks in the U.S. are estimated.

The developing countries' perspective is addressed in two papers. Wilson provides a literature overview on existing studies carried out mainly by the World Bank analyzing the impact of food safety standards and technical regulations on international trade as well as on private companies. Maertens and Swinnen analyse in their paper the relation between food regulation, developing countries' exports, growth and poverty based on a review of existing empirical evidence and new insights from two case studies carried out in Madagascar and Senegal.

Henson elaborates on the role of private food safety and quality standards in international trade. The paper reveals that private standards increasingly govern global food supply chains and thus, have become a crucial trade issue without being regulated by the WTO.

The two final papers consider the perspective of consumers' regarding food regulation from a theoretical and empirical point of view. The question of how to decide on possible general designs of international trade regulations like harmonization of standards, mutual

recognition or autonomous national standards is covered by Tothova and Oehmke's analysis. The authors theoretically analyze the impact of various food safety regulations on consumer choice and welfare. Caswell and Joseph focus in their paper on consumers' demand for specific food quality attributes and its impact on agricultural and food trade. The analysis is based on a survey of studies analyzing consumers' willingness to pay for different quality attributes of food among which one is GM. Specifically for the GM attribute national different attitudes are discussed as potentially relevant factors explaining different national policy settings and thereby as relevant factors influencing trade.

The papers in this volume reveal both, the complexity and the relevance of analyzing the relationship between food regulations and trade. They address the continuing challenge of methodological and data limitations when analyzing these non-tariff barriers. At the same time, they illustrate the rising importance of these regulations and contribute to the understanding of their differentiated impacts on countries and actors.

Bonn, April 2007

Monika Hartmann, Bettina Rudloff, Thomas Heckelei
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THE INSTITUTIONAL FRAMEWORK FOR FOOD REGULATION AND TRADE

*Tim Josling**

ABSTRACT

There has been a remarkable evolution in the institutional framework at the multilateral level in which national regulatory policies operate. The cornerstones of this framework are the SPS and TBT Agreements, the TRIPS, the URAA and the DSU. National policies have begun to be modified in response to the SPS and TBT Agreements. The TRIPS agreement has had an impact on food regulations mainly through the mandate to protect GIs. The URAA has moved countries toward a regime of protection by tariffs and support through direct subsidies. This has accelerated the globalization of the food sector. The DSU has been used by countries to hold countries to their obligations and has ruled against countries that have introduced regulations that are not supported by a risk assessment. Continued development of this framework is expected.

Keywords: Food regulations, SPS agreement, TRIPS agreement.

The past twenty years has seen a remarkable change in the international environment in which farms and food firms operate. This paper reviews the new set of institutions and market structures that make up that international environment. This international environment has been called a “transnational policy space” with actors, agendas, procedures and rules (Coleman, Grant and Josling, 2004). Many of the pieces of this policy space were put into place in the Uruguay Round, in 1995. Others have been the response to increasingly interdependent systems (globalization) in the marketing and processing of foods. All countries are impacted by these changes. Understanding the nature of these rules is therefore an important part of recognizing the drivers of the international environment in which food firms and farms exist.

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THE ANCIENT REGIME

Twenty years ago, in May 1986, the Uruguay Round had not yet started. Trade in agricultural products was included somewhat imperfectly in the General Agreement on Tariffs and Trade (GATT), as a result of a number of exceptions built into the Articles and the special treatment demanded by the dominant countries reluctant to cede any control over agricultural policy (Josling, Tangermann and Warley, 1996). Food policy was also largely autonomous. National authorities communicated on common health problems, but each was essentially responsible for their own set of rules. The real if somewhat diffuse forces of globalization had not yet hit agricultural and food markets, which still seemed to be largely based on internal trade for the meeting of food needs; the sales of surplus temperate zone products from those countries with adequate land resources to those with the greater population density; and the traditional flows of tropical products based on past colonial ties. Much of this trade was therefore in primary products designed for processing, not highly differentiated, with prices largely influenced by the domestic agricultural policies of the OECD countries. Many saw such “world markets” as being an inadequate basis for domestic farm policy. Domestic price policies were supported by border measures that insulated producers from foreign competition. And many considered the food regulations that govern the processing, distribution and retailing of agricultural products also to be sacrosanct.

In the first half of the 1980s, a few countries had experimented with a reform of their domestic policies, and hence were able to change their trade policies in agricultural products. But it was not until the cost of agricultural support to the key players, the US and the EU, exploded that the notion of a broad reform of domestic and trade policies began to take hold: US farm programs rose sharply, as world cereal prices dipped in the middle of the 1980s and demand stagnated and the EU’s Common Agricultural Policy (CAP) was also becoming very expensive, even for the ten members, and the imminent enlargement to include Spain and Portugal threatened more intense competition for southern EU producers. So European politicians became somewhat more receptive to the multilateral discussion of what had previously been off limits.

Partly as a result of lax disciplines, and partly in the absence of effective ways of enforcing those disciplines, the impact of international rules on domestic food policy was minimal. One decision from that era illustrates this lack of regard for international rules: The ban on the use of hormones in beef production within the EU, to curb the misuse of growth-enhancing drugs, was extended in 1985 to include imports of beef, with little apparent concern for whether that action was consistent with international obligations. Indeed, one motivation of some in the EU was clearly to favor domestic producers and protect them from imports. The so-called “fourth criterion” that was being discussed for health and safety regulations was the social and economic position of the industry. Though the issue later revolved around the health implications of the use of six hormones in cattle raising, initially the issue drew its political salience from the impact that using economic criteria in food regulations would have on trade.

But the beef-hormone case in many ways proved to be a watershed: first, it involved groups in farm policy that had not been interested in such matters before. It helped to create the food-safety constituency that now plays a major role in regulation. Second, it alerted policy administrators to the importance of consumer confidence in maintaining demand for a

particular product. Third, the issue helped to convince skeptics in the US Congress that a dispute settlement process with the power to impose decisions on reluctant countries might be a sound investment in the future of the trade system. And fourth, it exposed the weaknesses of the fragmented system of health and safety rules in an increasingly interdependent world.

THE NEW EPOCH DAWNS

In food trade regulation, the start of the new era can plausibly be traced to 1985, the year that the EU extended its hormone ban to imported beef. In that same year the US passed a Farm Bill that began a process of reform in domestic price support policy. The decision in the 1985 US Farm Bill to tie direct payments to historical yields and acres became the basis of the “decoupling” of farm support that dominated the next decade of US farm policy. Even more dramatic was the abrupt decision of the New Zealand government to abandon its support of the livestock sector. Many Latin American countries began to reform their agricultural trade policies about this time, along with their macroeconomic reforms. The landscape was beginning to change.

In 1986 the Uruguay Round was launched with an explicit goal to liberalize trade in agricultural products and remove the anomalies in the GATT. Food policy reform was a natural part of that goal. The decision to include discussions on domestic food regulations as well as farm support policies was critical to the changes that followed. But though the final agreement reached six years later resulted in only modest gains in market access, the Uruguay Round marked a breakthrough in the decades-long attempts to develop a framework of rules for food and agricultural trade as well as for domestic farm policies.

At the same time as the process of developing a multilateral framework for agricultural and food trade was being negotiated in the GATT, bilateral and regional processes were also responding to the demands of globalization and more open economies. The 1985 White Paper on the “completion” of the EU internal market marked the start of a major, and largely successful attempt to reduce transactions costs within the EU by the end of 1992 (EU Commission 1985). Food regulations figured prominently in the debate on how the objective was to be achieved. The tension between harmonization of rules to reduce the cost of selling into many national markets and allowing member states to retain idiosyncratic rules to reflect local conditions threatened to halt the process. The legal ruling in the Cassis de Dijon case of 1979 gave rise to the convenient doctrine of “mutual recognition” which at least in political terms provided a resolution to the problem.

In North America, similar issues were facing negotiators crafting the US-Canada Free Trade Agreement of 1986, the first major (post-war) deviation by the US from its historical preference for multilateral agreements. The agreement with Canada, later recast as NAFTA when Mexico achieved comparable access into the US market, contained rules that attempted to address the inconsistencies between the US and the Canadian food regulations. Though not as ambitious as the European single market program, the Canada-US FTA did experiment with institutional reform in this area, particularly in the area of animal health and safety regulations.

THE EMERGING MULTILATERAL RULES FRAMEWORK

So what is the rules framework that emerged from the Uruguay Round within which food regulation policies and procedures must fit? There are four legs to the table, each mutually supportive.¹ Each leg contains a mix of negative inducements (“sticks”) and positive incentives (“carrots”), designed to encourage countries to stay within the rules, even if to do so constrains formerly autonomous policy choices, and to impose disciplines if they stray too far. These major agreements include the Sanitary and Phytosanitary (SPS) Agreement and the Technical Barriers to Trade (TBT) Agreements, the Trade Related Intellectual Property (TRIPS) Agreement, the Agreement on Agriculture (URAA) and the Dispute Settlement Understanding (DSU) (WTO, 1995). A brief discussion of the provisions of each of these components is necessary before exploring the totality of the framework that they support.

The SPS and TBT Agreements

The central element of the multilateral rule system for food trade is the SPS Agreement, that deals with trade restrictions used in support of measures designed to ensure human, animal, and plant health. An accompanying agreement, the TBT Agreement, relates to technical regulations not designed to deal with health issues. The primary function of the SPS Agreement was to clarify the meaning of Article XX of the GATT. That article established the right of countries to use trade measures if they are necessary to protect animal, plant and human health. The SPS Agreement reaffirms that right but elaborates on the procedures that countries should follow to be sure that they are not unduly restricting market access for other countries. As such, it sets up a framework for national SPS measures so that countries may be certain that they are operating such policies in a way that does not infringe on the rights of trade partners; and it offers a “notification and review” process that allows countries to challenge those measures that appear to infringe on the rights of themselves and others.

The increase in transparency is a major aspect of the reduction of transactions costs for the food industry, and constitutes a significant improvement in the multilateral food system. As Josling, Roberts and Orden put it: “The WTO’s notification requirements constitute the cornerstone of the transparency provisions that are intended to facilitate decentralized policing by trading partners to ensure compliance with the SPS and TBT Agreements’ substantive provisions. All of the major agricultural exporting and importing countries now routinely notify proposed measures. Each notification indicates, among other things, what the proposed measure is, which product or products it is applied to, if it is based on an international standard, and when it is expected to come into force. This increased transparency contributes to the smooth functioning of the world trading system by facilitating both compliance and complaints by trading partners. Compliance is aided when advance notice of new or modified measures provides an opportunity for firms to change production

¹ Other aspects of the Uruguay Round Agreement also have an influence on food trade. These include the General Agreement on Trade in Services (GATS) and the Trade-related Investment Measures (TRIMS) Agreement. In addition, the reduction in the levels of tariffs has encouraged expanded food trade along with the adoption of the new regulatory elements of the multilateral trade regime.

methods to meet new import requirements, thereby minimizing disruptions that such changes can cause to trade flows.” (Josling, Roberts and Orden, 2004).

The negative inducements in the case of food safety regulations were designed to dissuade countries from using SPS measures to protect the incomes of domestic farmers. The most significant of these “sticks” are:

- Prohibition on SPS measures that are not developed by the use of Risk Assessment and are not part of a consistent program to maintain an “acceptable level of risk.”
- Multilateral standards agreed in the standard setting bodies are deemed to be based on risk assessment and therefore should be applied, where such standards exist, unless the country concerned can show with scientific evidence that such a deviation is necessary.

The combination of these two strictures implies a regime for health and safety standards based on risk management principles widely accepted and understood in the scientific community, rather than reacting to the pressures put on regulatory agencies by interested parties.

The “carrots” in this case are designed to give national standards bodies the confidence that the new regime involves credible commitments. They include:

- Setting up of the SPS Committee and the obligation to notify changes in regulations to the Committee before they come into operation.
- The opportunity to challenge the regulations of other countries in the Committee as a way of defusing conflicts.
- Establishing a source of information for exporters on importer SPS regulations.

Moreover, the SPS Agreement attempts to guide countries in their use of harmonized or mutually agreed standards.

- Regarding harmonization, it endorses in particular the use of the standards developed by Codex Alimentarius (CODEX) and the procedures followed by the International Plant Protection Convention (IPPC) for the tracking and control of plant diseases and the International Office of Epizootics (OIE) for similar monitoring of animal diseases. While not requiring countries to use such multilateral standards, the SPS Agreement has had the effect of raising the profile of the three standards bodies, in effect by making the use of their standards and procedures *de facto* consistent with the provisions of the Agreement.
- Regarding equivalence, the SPS Agreement also promotes the use of “equivalence” of regulations negotiated between importers and exporters and “regionalization” of SPS measures, whereby parts of countries can be declared free of particular diseases and be granted access to importing country markets.

The TBT Agreement is not quite as strict in some respects as the SPS Agreement: it does not require a risk assessment and does not insist on scientific evidence as the main criterion for justification of a measure. No definite list of standard organizations as basis for accepted domestic standards is mentioned. But it is not by any means without constraints. It provides

that technical regulations should be applied in a non-discriminatory way, should be used only in pursuit of legitimate objectives, and should be least trade disruptive, taking into account the risks of not fulfilling the objective of the regulation. Risks should therefore be assessed, but in the broader context of a set of objectives that is not limited to health and safety issues. These legitimate objectives could include national security considerations and prevention of deceptive practices, as well as environmental protection.

The TRIPS Agreement

The second leg of the table is the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS). The TRIPS Agreement imposes on all WTO members the obligation to protect the fruits of intellectual labor, both artistic and industrial. Much of the pressure to include such a regime came from the software, pharmaceutical and entertainment industries. The TRIPS in effect introduced a new multilateral regime of particular interest to producers of knowledge goods and those goods where a reputation had been built up by producers. Though it does not specify what instruments countries should use to protect intellectual property, it does give holders of patents and copyrights as well as producers in particular regions some assurance against piracy (Barton, *et al.* 2006). The TRIPS Agreement was a part of the “single undertaking” of the WTO and thus applied to all members. The supervision of the TRIPS agreement was entrusted to a new TRIPS Council, and left an existing institution, the World Intellectual Property Organization, with a smaller role in overseeing IP issues.

Some important aspects of agricultural and food production and marketing were included in the TRIPS. The “sticks” in this case were the obligation to set up protective regulations to apply within each country’s borders. For agriculture these include:

- The protection of patents for biotechnology, specifically new plant material created by gene transfer.
- The establishment of Plant Breeders Rights, but with some flexibility for countries as to how to grant that protection.
- The protection of Geographical Indications (GIs), though again allowing countries a wide range of instruments to affect that protection.

The inclusion of the protection of GIs in the negotiations in the Uruguay Round on trade-related intellectual property issues has essentially transformed GI issues from national, bilateral or plurilateral matters to the multilateral stage.

The TRIPS Agreement incorporates GIs by requiring member states to “provide the legal means for interested parties to prevent” the use of any means “in the designation, or presentation of a good that indicates, or suggests that the good in question originates in a geographical area other than the true place of origin in a manner that misleads the public as to the geographical origin of the good,” as well as any use “which constitutes an act of unfair competition.”

Wines and spirits are singled out for a more comprehensive level of protection. This additional protection was at the request of the EU, and is generally considered to have been a concession by exporters who were unconvinced by the need for such measures in return for

restraints on EU subsidies. It is stipulated that each Member shall provide legal protection for geographical indications “even where the true origin of the goods is indicated or the geographical indication is used in translation or accompanied by expressions such as ‘kind’, ‘type’, ‘style’, ‘imitation’ or the like.” No mention is made of misleading the public or unfairly competing: as the presumption is that no such conditions are required for GI protection for wines and spirits. Moreover, the scope for allowing “generic” exceptions, where a geographical name has become widely used for a type of product regardless of origin, is much narrower for wines and spirits.

The intention of the TRIPS, in the area of GIs, was to increase the level of protection given to such property rights within the global trade system. The Agreement itself gives two avenues to pursue this aim: Countries are mandated to push ahead with a multilateral register of wines and spirits and Members are committed to “enter into negotiations aimed at increasing the protection of individual geographical indications..” The more significant issue in the longer run is whether to extend the additional benefits given to wines and spirits to other agricultural and food products. Certain countries have been anxious to provide that extra protection in order to be able to develop market reputations that would increase producer income. As with wines, this would shift the emphasis away from the prevention of deception towards the control of competition from other producers.

The “carrots” in the case of intellectual property are mainly in the form of the potential to develop further the scope of GIs, and thus are of less interest to those countries that feel that they are typically importers of such goods.

- The possible establishment of a Multilateral Register of Wines and Spirits
- The possible extension of “additional” protection to goods other than wines and spirits.

The wines and spirits register is the source of some controversy, and countries have not been able to agree on its status. The extension of protections given to wines and spirits to other foods and beverages is still further off.

The URAA

The third of the table legs is the Uruguay Round Agreement on Agriculture (URAA). The URAA corrected many of the “exceptions” for agriculture that had been included in the original GATT Articles or negotiated as waivers. Non-tariff barriers were replaced by bound tariffs, and the exception to this rule for supply-control schemes has now ceased to be applicable. Export subsidies have been limited and domestic support (i.e. not given at the border) has been disciplined. Thus the URAA established new rules that radically improved the agro-food trade system by tying the hands of national governments.

The significance of the URAA to food trade cannot be over-emphasized. It provided a set of trade rules for agricultural products that contributed to the establishment of a new international distribution system for farm and food products. By taking away the ability of countries to apply quantitative controls to goods at the border, except for health and safety reasons, it established an environment in which sourcing foods or ingredients from abroad was commercially possible. Put another way, the SPS barriers that had hidden behind

quantitative import restrictions now became exposed as the “front line” in any conflict over market access.

The URAA contains a number of “sticks” designed to prevent behavior by governments deemed collectively to be deleterious to the trade system. The most important of these constraints are:

- Prohibition of export subsidies, other than those specified in the countries schedule.
- Prohibition on Trade-distorting domestic subsidies, above the levels indicated in the country schedules.
- Prohibition on Quantitative Restrictions, other than the Tariff-rate Quotas (TRQs) that were set up under the process of converting non-tariff trade barriers to tariffs.

So to be consistent with these constraints, countries have to move toward protection by tariffs and support for farm incomes through non-trade-distorting payments systems. This has indeed begun to happen, but the rate of further reductions in tariffs and subsidies has remained an open issue in the current round.

The “carrots” in the URAA included a number of provisions designed to encourage countries to accept these prohibitions. These include:

- Temporary shelter in the Peace Clause of agricultural subsidies from the provisions of the Subsidies and Countervailing Measures Agreement (SCM) also negotiated in the Uruguay Round. This clause has been expired now and as first case the Cotton Case between Brazil and the US (see below) confirmed the actual expiration by basing the judgment on the stricter SCM rules.
- A separate category of domestic subsidies (the Blue Box) that could be maintained (but not increased) to satisfy domestic concerns that the US and the EU direct payments programs linked to supply control would be cut.
- Continuation of the process of reform, to satisfy those wanting to see more rapid liberalization, with a proviso that non-trade concerns would be taken into account.
- The establishment of a WTO Agriculture Committee that would have the task of monitoring the compliance of countries with the new rules.

The combination of these rule changes has been to allow the continued integration of global markets in food and farm products. Though the tariffs still remain high, and export subsidies have not been eliminated, the root causes of trade conflicts and distortions are more apparent and the solutions more attainable.

The Dispute Settlement Understanding

The fourth leg of the framework for agricultural policy is the Dispute Settlement Understanding, as also established in the Uruguay Round. This Agreement replaces the GATT dispute settlement process that had become ineffective. Countries could block the establishment of a panel or delay the work by objecting to panel members. When the panel reported, any country (presumably the disappointed party) could block the adoption of the panel report. Especially the later issue on the voting rule has been reformed by applying now

“the negative consensus”, i.e. the rejection of a panel report can only be decided by unanimity (including the winning party) leading to a quasi-automatic acceptance of any report.

The “sticks” in the case of the DSU are the sanctions that can be imposed on countries that are found to violate WTO rules or cause harm to other countries even if not in violation. Specifically, the DSU provides the following restraints on countries found to be contravening the WTO:

- Remove an instrument or cease from an action that violates the WTO Agreements.
- Modify actions that “nullify or impair” the benefits that other members had reasonably assumed to get from the WTO agreements.
- Face sanctions (“withdrawal of concessions”) usually in the form of high tariffs on an equivalent value of trade, or grant concessions of an equal value. The reformed DSU grants the option to rotate the increased tariffs among different products not only covered by the Agreement at stake for the dispute. This option has been applied by the US against EU imports in the hormone-beef case, where the rule violating the WTO SPS Agreement is still in place.

This legal process is in distinction to the political act of negotiating mutual concessions. Panels are supposed to interpret the treaties and not find mutually-beneficial solutions to trade conflicts or propose remedies that satisfy political actors in the countries in conflict. So the introduction of “hard law” into agricultural trade disputes is a significant development.

The “carrots” in this case are the fact that all countries can find remedy through a process that has a set timetable and cannot be blocked by single powerful WTO members. More precisely, it gives all members the right to:

- Initiate consultations and make use of conciliation procedures.
- Request a panel and appeal the findings on legal grounds to the Appellate Body of the WTO, which is another element of the reformed settlement procedure.
- Receive permission to apply sanctions if the losing defendant does not bring actions into line with WTO obligations.

The significance of this is being increasingly realized by countries who until recently would not have considered challenging the larger developed countries, or even their neighbors for fear of retribution, or at best of prevarication. Thus the policy environment has teeth. The other aspects, subsidy constraints, SPS restrictions and GI protection, are made more significant by the fact that violations can and have been declared.

Has the Multilateralization of Food Rules Worked?

The main actors in the setting, implementation and modification of food policies are still the national governments. They are increasingly entwined in the multilateral system that they created, but national governments are still the ultimate source of authority and the enforcer of any agreement. So one test for the new framework is whether governments are in general agreement that it is proving useful. So far the food-rules framework described above has passed the test: no-one wishes to go back to the ancient regime.

The assessment of the SPS Agreement has generally been favorable, despite the continuing saga of the beef-hormone dispute. Josling, Roberts and Orden (2004) conclude that “the SPS Agreement obligation to base regulations on scientific risk assessment clearly has reduced the degrees of freedom for disingenuous use of regulatory interventions and promoted convergence among countries.” In fact, the obligation to base measures on science has led to the resolution of many trade issues through the WTO. The panels have interpreted this requirement in an exacting way, and ruled against countries that have been casual in their use of risk assessment.

But the impact of the risk management requirements of the SPS Agreement has extended far beyond WTO dispute settlement results and complaints to include changes at the national level. The Agreement has generated broad-based regulatory review by many WTO members, both major agricultural exporters and importers, as they determine whether they and their trading partners are complying with the obligation to base their risk management decisions on scientific assessments. This change in national attitudes towards international regulations is a clear sign that the institutional environment has changed. An example in the EU is the establishment of the European Food Safety Authority (EFSA) in 2002. Evidence suggests that regulatory authorities are either unilaterally modifying regulations, or voluntarily modifying regulations after technical exchanges. Enacting regulatory changes that allow greater market access has become easier now that the SPS Agreement assures policymakers that their trading partners must conform to the same science-based principles (Josling, Roberts and Orden, 2004).

Conclusion of the TRIPS Agreement has had important legal and political implications. As a legal matter, it has taken the GATT/WTO system into uncharted territory, covering not merely border measures, but also mandating threshold national regulatory standards and means of enforcing those standards. Politically, it has placed WTO rules and negotiations into the center of domestic political battles over the appropriate scope of IP protection, and has been more responsible than any other issue area for exacerbating North-South acrimony in Geneva. Particularly severe have been the disputes over the effects of TRIPS and patents generally on access to medicines in the developing world.

By general agreement, the URAA has had significant impacts on domestic policies. The reform of the CAP in 1992 owes much to the need to fit in with the URAA being negotiated at that time. The subsequent CAP reforms have continued along the same path, each one making it easier to live within the constraints embedded in the WTO schedules of subsidies. US policy has also reacted to the WTO constraints, in particular the changes in the 1996 Farm Bill that gave the US apparent flexibility to restrain as well the EU and Japan to reduce domestic support levels. But when emergency payments were paid in the three years after 1998, and incorporated in the 2002 Farm Bill, US support approached the WTO domestic support limits for trade-distorting measures.

One clear, if limited, measure of the successes in agricultural trade reform following the Uruguay Round is the way in which countries have implemented their obligations. Tariff ceilings have not been breached, tariff-rate quotas have been made available, if not always filled, export subsidies have come down on schedule despite very weak world markets, and domestic support in most countries is well below allowable limits. The process of notification and monitoring worked well for a time, and the information made available on agricultural trade policies and practices represent a significant increase in transparency. However,

notifications have broadly dried up since 2001, as one might have predicted given the onset of negotiations in the Doha Round.

Discussions within the WTO Committee on Agriculture, as in the SPS and TBT Committees, have created a basis for understanding among governments that is already smoothing the way for further cooperation. The adoption of the URAA has also, until recently, restrained trade conflicts over the external effects of farm support policies. Instead, trade conflicts have festered over food safety and environmental issues peripheral to agricultural protection, such as regulations on genetically-modified organisms.

The Dispute Settlement Understanding has become the lynch-pin of the WTO system. Though not universally popular, it has survived the inevitable conflicts with domestic politicians quite well. The process, though measured, at least has a timetable for the various steps. In food regulation disputes, the DSU has been influential in elucidating the rules as laid down in the SPS and TBT Agreements. As Josling, Roberts and Orden (2004) report, countries have made 32 formal requests for consultations related to food regulation trade barriers under the DSU between 1995 and 2002. They account for 11 percent of the total number of formal DSU complaints for all products under all agreements since the WTO agreements came into effect.

Nine complaints related to food system regulation have reached a WTO panel ruling and the Appellate Body. Seven complaints involved SPS measures and each of these cases concerned regulations that were found to have no rationale in terms of risk reduction. In the first complaint (DS 18) Canada challenged Australia's ban on salmon imports imposed ostensibly to prevent the spread of diseases in recreational and commercial fish stocks. The United States and Canada challenged the scientific basis for the EU ban on growth hormones in beef production in separate complaints (DS 26 and DS 48) that were heard by the same WTO panel. In the fourth complaint (DS 76) the United States challenged Japan's testing requirements regarding treatment effectiveness for all new varieties of selected horticultural products. In the remaining three complaints (DS 291, 292, and 293) the US, Canada and Argentina challenged the EU's moratorium of approvals on GMO products in the years 1999-2003 and the national bans (that are still in force) of several EU Member States as being scientifically unjustified. The measures at issue in each of these cases were imposed by developed countries.

In each case, the panel and Appellate Body ruled for the complainants (exporters) on at least some grounds and a dominating argument was the insufficient scientific justification. So these disputed cases have shown that the measures of countries with advanced scientific establishments are not immune to challenge (Josling, Roberts and Orden, 2004).

The toughest test of the disciplines of the SPS Agreement has been the US and Canada challenge of the scientific basis for the EU's ban on growth hormones in beef production, mentioned above. The EU's defense of its measure rested on its claims that the international standards for these hormones did not meet its public health goals and that the ban represented a precautionary approach to managing uncertain risks. The WTO panel concluded, and the Appellate Body upheld the decision, that the EU's ban violated the provisions of the SPS Agreement. Both the panel and the Appellate Body affirmed the right of WTO members to establish a level of consumer protection higher than the level set by international health standards. The ban was nonetheless judged to be in violation of the SPS Agreement as it was not backed by an objective risk assessment. Although the Appellate Body was willing to acknowledge that the ban was originally motivated by "consumer concerns" rather than by

protectionism, the overall outcome of the case suggests that the WTO will rule against measures based on popular misconceptions of risks as well as more overtly discriminatory measures. As the EU has not yet abolished the ban, tariffs are in place by the US and Canada. This case will likely remain for some time in the dispute system: the EU recently challenged the US tariffs as being rendered inappropriate as a result of a change in EU domestic legislation.

Some of the aspects of the TRIPS provisions on GIs have been the subject of a trade dispute that led to the setting up of a Dispute Settlement Panel. This has given the opportunity to clarify some key issues. The challenge was initiated by the US in June 1999, when the US requested consultations with the EU on the alleged lack of protection for US trademarks and GIs in the EU. Specifically, the US contended that the EU did not accord as much protection to US GIs or similar trademarks as it did to EU producers. Such a situation would be a violation of the basic WTO principle of “national treatment,” that holds that foreign and domestic products should be subject to the same rules. It would also violate several provisions of the TRIPS Agreement, which reasserts the right of national treatment in the case of intellectual property protection.

Initially, the US objected to the Regulation 2081/92 governing GIs (except in the wine sector), as amended. This led to inconclusive talks but neither a resolution nor the selection of a panel. But the revision of the legislation in the EU in April 2003 raised more concerns in the US, and this time the US was joined by Australia in the complaint. A panel was requested by the US and Australia in August 2003, and agreed in October of that year. The panel ruled in April 2005 that the EU has indeed failed to give the US trademark holders adequate protection, as required.

The outcome of the WTO case managed to give comfort to both sides to the dispute. The EU was able to claim that its GI protection program was not WTO-incompatible as such and the US could point to the fact that the EU was found to have violated WTO articles in the way in which it implemented that policy. The EU will have to change its policy regarding the registration of foreign products in the EU market considerably. Its own GI regime will in essence have to be opened to all countries selling GI goods into the EU market. This could over time undermine the strategy of encouraging quality improvements through regional product protection. Having other countries protect EU GIs in their markets, as they are requesting in the current WTO negotiations, would restore some measure of balance in this respect (Josling, 2006).

Besides being the subject of negotiation in the Doha round, the domestic support policies of the developed countries are giving rise to legal questions within the WTO. Until recently there had been few attempts to litigate the issue of whether developed countries are violating the terms of the Agreement on Agriculture as they notify their domestic policies to the WTO and classify subsidies into amber, blue and green boxes. And there were almost no challenges to the subsidies themselves in the period up to 2003, mainly due to the shelter of the Peace Clause, which granted immunity for domestic (and export) subsidies from the full rigors of the non-agricultural subsidy regime as defined in the Agreement on Subsidies and Countervailing Measures. But the peace was shattered when Brazil challenged the US cotton subsidy program and Australia, Brazil and Thailand requested a WTO panel to examine EU sugar policy. The Cotton Panel report found the US policy to be in violation of the URAA and the US was requested to bring its cotton policies into line with the WTO ruling. The

sugar case was also resolved in favor of the complainants, and the EU has already reformed its sugar policy in part to comply with the WTO ruling.

The Continued Development of the Rule System

The multilateral policy framework for food trade is, of course, in its infancy. It is difficult to know how far countries may wish to travel down the road to science-based SPS regimes, low tariffs for food and agricultural products, and trade-neutral farm support. A collapse of agricultural markets could cause some backsliding in the area of liberalization. Moreover, the current trade talks in the WTO are proving difficult to conclude. After five years of talks political agreement on the revision of the URAA that would continue the path to reform and tighten further the constraints on domestic policy is still elusive.

Whether or not the Doha Round reaches a conclusion, there is likely to be a continued attempt to test the agreements embedded in the Uruguay Round with the aid of the DSU. The resort to the legal process of the WTO to challenge aspects of food regulations and farm programs places new burdens on domestic policy-makers. Though such a strategy has attractions, particularly for farm commodity exporters who feel frustrated by the ability of importers to stall and resist trade reform, it also carries with it dangers, as it pits the legal remedies in the WTO against the political process of regulating domestic food markets and negotiating domestic farm policy. This could seriously compromise the political acceptance of the multilateral trade rules and the institutions that are currently in place.

As long as national food and farm policies move towards compliance with the SPS and TBT Agreements, the TRIPS and the URAA, pushed by the legal remedies available through the DSU, and the scope for deviant behavior becomes more restricted by negotiation, domestic policies will begin to work more smoothly together. This process is likely to continue so long as the external impacts of policies are of interest to other countries and the domestic political process goes along with (or does not notice) the lack of autonomy. Thus the new institutional regime at the multilateral level will produce a new set of food policies in countries concerned to escape challenge and retribution from trading partners.

In addition, the process of regionalism stands ready to pick up any slack in the multilateral trade rules. As Coleman, Grant and Josling (2004) put it: "Regional integration is closely linked with multilateral integration (globalisation) rather than being unrelated or opposed to it". The authors point out that there is an emerging systemic role for regional trade pacts that arises from their number and ubiquity. Regional trade agreements in effect have come to share with the multilateral pacts such as the WTO (and plurilateral bodies such as the OECD) responsibility for the 'management of globalisation.' This task involves the regulation (or re-regulation) of markets in a global economy to make sure that those markets fulfill the function of allocating resources and distributing products and services without the negative social impacts (market failures) to which an unregulated market is prone (Coleman, Grant and Josling, 2004).

CONCLUSION

For food firms the rules of international trade are becoming clear. National food regulations, though ostensibly autonomous, are now essentially subject to multilateral rules and any deviations are increasingly costly to policy-makers. Moreover, the market provides its own disciplines, and the costs of ignoring these are also costly. Both these developments are probably positive and complementary. The multilateral framework for food regulations that has emerged in the past twenty years is in fact a reasonable basis for future policy, moving along lines that individual countries could well have chosen for themselves. In agricultural policy this path involves minimal involvement of government in commodity markets (since there will be no outlet for surpluses on the world market by way of subsidies) but targeted payments linked to social objectives (to encourage cross-compliance, for instance, with environmental standards).

Such a farm and food system also requires a focus on quality and food safety, and this will come to dominate policy discussions. Local and regional foodstuffs will be promoted as a way of differentiating the product. This will require traceability and identity preservation throughout the supply chain, as well as a labeling system understandable by consumers. Thus in this scenario, farmers and processors join forces with retailers to provide foods that are attractive and healthy for consumers. Under these conditions, the policy environment for farmers will rely increasingly on the impact that the supply chain “captains” can exert on the traditional farm politics. But dangers lurk around every corner: the dividing line between sensible provision of public goods and pandering to populist pressures is narrow.

But, all told, the institutional developments in the food industry of the past twenty years have been remarkable. The framework for integrating trade and domestic regulations in the area of human, plant and animal health and safety is in place. The task for the international community is to build on this framework to encourage trade, improve biosafety and avoid discrimination against developing countries. The role of international institutions is to absorb some of the costs and help to minimize the risks faced by developing countries in their continued integration into the global food economy (Josling, Roberts and Orden, 2004).

REFERENCES

- Barton, J.H., J. Goldstein, T. Josling, and R.H. Steinberg, 2006. *The Evolution of the Trade Regime: Politics, Law and Economics of the GATT and WTO*, Princeton University Press
- Coleman, W., W. Grant, and T. Josling, 2004. *Agriculture in the New Global Economy*, Edward Elgar Press
- EU Commission (1985): Completing the Internal Market. White Paper from the Commission to the European Council, COM (85) 310 final, 14 June
- Josling, T., 2006. “The War on *Terroir*: Geographical Indications as a Transatlantic Trade Conflict,” *Journal of Agricultural Economics*, Vol. 57(3) pp. 337-364 September
- Josling, T.E., D. Roberts, and D. Orden, 2004. *Food Regulation and Trade: Toward a Safe and Global System*, Washington D.C.: Institute for International Economics.
- Josling, T.E., S. Tangermann, and T.K. Warley, 1996. *Agriculture in the GATT*, Macmillan Press, Basingstoke

World Trade Organization, 1995. The Results of the Uruguay Round of Multilateral Trade Negotiations: The Legal Texts, WTO, Geneva

RISK AND ECONOMIC ASSESSMENTS FOR U.S. IMPORTS OF MEXICAN AVOCADOS

*Everett Peterson and David Orden**

ABSTRACT

Over fifteen years since 1991, a complete trade ban has been progressively replaced by U.S. imports of Hass avocados from approved orchards in Mexico under a systems approach to pest risk management. This case illustrates that progress can be made in easing technical trade restrictions when there are economic opportunities from trade, the risk issues can be sharply delineated and addressed, governments are firmly committed to negotiations, and the industry in the exporting country makes the needed investments in production capacity and perseverance in the regulatory process. We discuss the political economy of the opening of avocado trade. We also summarize a simulation analysis that addresses the efficacy of the remaining systems approach measures in terms of economic gains from trade when pest risks, compliance costs in Mexico, and potential costs of trade-related pest outbreaks in the United States are taken into account.

Keywords: WTO, SPS Agreement, Avocados, U.S., Mexico.

Just over ten years ago the World Trade Organization (WTO) strengthened international rules designed to discipline the regulatory measures that countries adopt to achieve legitimate agricultural and food safety as well as quality goals. In the case of sanitary and phytosanitary (SPS) measures, the disciplines require a scientific risk assessment and that measures be formulated to achieve their technical objective in a least trade distorting manner. In the case of quality goals, the agreement on technical barriers to trade (TBT) again requires that measures be appropriate to the objective and least trade distorting. The new disciplines were backed up by a more binding dispute settlement process.

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How well these new multilateral agreements have worked is important for several reasons. First, when sovereign countries adopt regulations to address health, safety and quality goals, they often fail to take into account the international implications of imposing a measure. International accountability is a major goal of the SPS and TBT agreements. Second, the international agreements impose administrative costs on poor countries. In exchange, poor countries ought to benefit from the agreements by gaining market access that enhances their ability to participate in world trade. Third, agricultural trade is growing fastest in high-value products. These are products for which technical standards and regulations are prevalent. Moreover, acceptable standards for agriculture and food are evolving worldwide under various forces. New challenges thus arise for the multilateral agreements as a framework in which national rules are embedded.

One approach to easing technical barriers is to shift from import bans to less restrictive instruments. For risk-related barriers, such opening of market access may be achieved through a systems approach to risk management, whereby a set of compliance procedures are specified that reduce the pest-risk externality associated with trade of a commodity. Adoption of systems approaches rest on a firm foundation in Article 5.6 of the WTO's Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement), which states that Members shall ensure that their measures "are not more trade-restrictive than required to achieve their appropriate level of sanitary or phytosanitary protection taking into account technical and economic feasibility" (WTO, 1994).

A focus of policy interest and empirical analysis in this area has been on the effects of technical barriers on the export opportunities of developing countries. Two themes have arisen. The first theme is that high standards, especially high standards without scientific justification, discriminate against developing countries, and particularly against poor farmers in these countries for two reasons: because they are difficult for exporters in the developing world to meet and because those countries lack the resources to participate actively in the standard setting process through either bilateral or multilateral mechanisms. The second theme is that the increasingly differentiated markets for agricultural and food products in developed and middle-income countries open opportunities for poor countries. Both themes have some merit. Specific cases consistent with each theme have been identified (e.g. ACIAR (2005), World Bank (2005)) and net assessment of the effects is still ongoing. The first theme puts an onus of responsibility on developed countries and their regulatory decisions. The latter theme highlights the important role of multinational supply chains and private sector investment, placing more emphasis on investment climate determinants and other public sector decisions of the developing countries.

By way of illustrating these points, in this article we consider the long dispute between the United States and Mexico concerning importation of Hass avocados. Over the fifteen-year period 1991-2006, a complete trade ban has been replaced by U.S. imports from approved orchards in the state of Michoacán under a systems approach of risk management for fruit flies and avocado-specific pests. This case illustrates that progress can be made in easing technical trade restrictions—at least when there are economic opportunities from trade, the risk issues can be sharply delineated and addressed, governments are firmly committed to the negotiations, and the industry in the exporting country makes the needed investments in production and processing capacity, and quality and in political perseverance in the regulatory process. Easing of the longstanding import ban on Mexican avocados is a trade-facilitating progress that has opened the U.S. market to Mexican producers in successive steps and

created a \$100 million annual export industry. We discuss the political economy of this case, including a review of the multiple regulatory steps through which the market was opened under systems approach risk mitigation measures. We also report the results of a simulation analysis that addresses the efficacy of the remaining measures in terms of economic gains from trade when pest risks and compliance costs in Mexico, and potential costs of trade-related pest infestations in the United States are taken into account.

THE AVOCADO QUARANTINE

Initial Setting

The ban on imports of Mexican avocados was promulgated in 1914 when there were no known controls (chemical or natural predators) for certain host-specific avocado pests prevalent in Mexico but not present in the United States. Subsequent development of modern pesticides and cultural practices has allowed the Mexican state of Michoacán to establish an industry of approved export-oriented avocado orchards. These orchards successfully met the pest control standards of countries such as Canada and Japan, where avocados are not grown but where potential concerns about transmission of fruit fly infestations were prevalent. Mexican quarantine authorities argued that the Michoacán avocado export protocols also provided adequate protection against pest risks of U.S. concern: that the region has low incidence of pests of quarantine significance, that the Hass avocado is not a host, or at least not a preferred host, for fruit flies, and that a systems approach to handling fruit for export had proven effective in eliminating risks of pest infestations being carried abroad. Mexico has contended that the U.S. ban was not justified on a risk basis, but was maintained to protect the U.S. industry economically. The U.S. avocado industry, concentrated in southern California, bitterly opposed opening the U.S. domestic market to Mexican avocados. The industry acknowledged that it receives prices well above those of Mexican exports, but asserted that it fears pest infestations associated with trade not competition in the marketplace. Domestic U.S. producers challenged Mexican assessments of pest risks and the effectiveness of the systems approach to risk management.

Caught in the middle of this controversy was the U.S. Department of Agriculture. Twice during the 1970s USDA took preliminary steps to ease the avocado import ban, but in both cases the decision was aborted.¹ The issue lay unresolved through the 1980s, until NAFTA negotiations started in 1991, provided an opportunity for Mexico to raise its concerns again. Avocados dominated the agenda of many meetings of a joint Phytosanitary Working Group, where scientists from USDA's Animal and Plant Health Inspection Service (APHIS) and Mexico's Dirección General de Sanidad Vegetal (DIGSV) sparred over data requirements, research design, and interpretation of research results concerning possible lifting of the import ban. The technical debates centered on assessment of pest populations, the host status of Hass avocados for fruit flies, and the adequacy of various proposed pest-risk mitigation strategies.

It took four years of bilateral procedural negotiations, data collection and analysis before USDA agreed to consider a Mexican plan for easing the avocado quarantine under a systems

¹ Roberts and Orden (1996) and Orden and Peterson (2006) provide analytic chronologies of the avocado dispute.

approach to pest risk mitigation. By then the new WTO SPS Agreement and strengthened dispute settlement procedures were in place providing further impetus to reconsideration of the avocado import regulation. With some further safeguards, a proposed rule was published by USDA in July 1995 to allow imports of Mexican avocados grown and processed under specified conditions (USDA, 1995). The proposed systems approach required annual surveys to determine pest incidence and pre-harvest, harvest, transport, packing, and shipping measures designed to reduce pest risks.² The distribution of imports was to be further limited to the northeastern United States, to avoid geographic proximity with regions susceptible to pest risks, and to four winter months when the risk of establishment of pests was mitigated by adverse weather.³ Traceability was required so that any infested fruit detected through inspections could be tracked back to the orchard from which it originated. USDA concluded that its proposed approach would provide an adequate level of security to domestic growers. Overall, USDA reported that with the proposed systems approach in place a seed pest or fruit fly outbreak was estimated to occur on average less than once every 1,000,000 years and a stem weevil outbreak might occur on average once every 11,402 years.

Domestic Opposition to Change

With the geographic and seasonal restrictions in USDA's proposed rule, partial easing of the ban opened less than 5 percent of the annual U.S. market to Mexican avocados. Even this partial access was fought aggressively by the domestic industry. The opposition was coordinated by the California Avocado Commission (CAC), which had closely monitored the deliberations from the outset of the NAFTA negotiations. The industry made the argument that the avocado quarantine should not be sacrificed to the political imperative of achieving a trade agreement. This was an aggressive strategy by the industry that turned on its head the conventional perception that regulatory processes are often under excessive pressure not from foreign but from domestic interest groups. Numerous declarations were made by the U.S. growers to the effect that "science might be traded off in a rush to sign a trade deal."

The CAC argument was that imports of Mexican avocados under the proposed systems approach posed an unacceptable risk of pest infestation to domestic groves. The industry asserted that the surveys of pest incidence had failed to establish low population levels in the Michoacán growing area, that the proposed monitoring protocols were inadequate, and that Hass avocados were a better host of fruit flies than Mexico acknowledged. Further, the CAC argued that any infestations of domestic groves that resulted from importation of Mexican avocados would be costly to contain, due to U.S. pesticide regulations and the close proximity of the domestic groves to residential neighborhoods.

The conditions specified by the CAC for amendment of the avocado quarantine could effectively have precluded importation of Hass avocados from Mexico. The first condition, establishing and maintaining a pest free zone, required substantial eradication, monitoring, and quarantine enforcement costs well beyond the perimeters of commercial export groves in

² Pest of concern were identified as avocado-specific (three seed weevils, one stem weevil and one seed moth) and non-specific (three fruit flies).

Mexico. Although it might eventually prove feasible technically, such an approach was regarded as uneconomical by Mexican officials who believed pest risks were already negligible. On a second condition, of a fail-safe post-harvest pesticide treatment, all parties agreed that no such treatment was available that preserved edibility of the fruit. A third condition, of unequivocal non-host status of avocados for fruit flies, also could not be met. The results of DIGSV's fruit fly host status research had indicated that fruit flies will attack Hass avocados shortly after they have been harvested. It was anticipated that additional research to rigorously establish the host status of Hass avocados would confirm that they are non-preferred hosts, but not the higher standard of "unequivocal non-host" that the CAC demanded.

Industry opposition orchestrated by the CAC was effective in temporarily blocking change to the quarantine for the 1995-96 winter shipping season. The CAC kept up its pressure in 1996. It threatened legal action to block lifting of the ban and attempted to circumscribe USDA authority through an amendment to congressional appropriations legislation for APHIS. Full-page advertisements were placed in several national newspapers by the CAC. Against the backdrop of a hangman's noose or smoking gun, these ads claimed that "The USDA is about to sign the death warrant for a billion dollar American industry" (*The Washington Post*, 3/11/96, p. A16).

Initial Economic Assessment

USDA's regulatory procedures for SPS decisions require sequential analysis—first determination that there is essentially no risk associated with a proposed rule and second, on that basis, that economic impacts of the rule be assessed. Such a sequential approach to decision making places greater emphasis on risk assessment than on comprehensive cost-benefit analysis. When the mandate of regulatory authorities is stated in such strong terms for protecting the domestic economy from negative SPS externalities arising from trade, then product bans and other severe quarantine measures emerge quite naturally as policy outcomes. A product ban is a high level of intervention to address an SPS externality, but a ban does eliminate the externality risk to the extent that legal trade is its proximate cause.

Even within the risk assessment dimension, there is plenty of room for dispute. First, issues arise about whether an externality threat exists in a given situation. Second, a ban may or may not be least trade distorting—perhaps there is another way to eliminate the externality risk, one that allows the product to be traded under some specified conditions. Either way, when the policy decision is perceived only in the risk assessment dimension, there is no impetus to ask whether the cost of the policy is warranted by the benefits, that is whether the level of intervention needed to achieve the risk-reduction objective is also desirable on economic criteria, such as maximizing the expected contribution of the affected markets to national welfare. In this context the economic feasibility may suggest that an import ban or other regulation is not well advised on welfare grounds even if there is some risk from trade,

³ The region referred to as the northeastern United States or northeast in this paper includes two regions often separated in avocado shipment data: the northeast and east-central regions (see table 1). Mexican avocados were allowed into Alaska starting in 1993.

or that an import ban or other strict regulation is appropriate, even if it is not the least trade restrictive measure.

In the avocado case, the contestation over the proposed rule brought to light information about pest risks that provided the basis for a cost-benefit analysis taking uncertainty about pest infestation into account (Orden and Romano, 1996; Orden et al. 2001). In their empirical analysis, Orden and Romano (1996) and Orden et al. (2001) divided the domestic U.S. avocado market into two submarkets based on the proposed rule—the northeastern winter regional market and the national aggregate for all other regions and seasons. In the northeastern winter regional market, the domestic price was assumed to fall to the price level of exports from Mexico, substantially below the earlier domestic price. For the rest of the U.S., an equilibrium price was determined by domestic supply and aggregate demand with the northeastern winter regional market excluded.

The proposed partial easing of the avocado import ban had expected effects if no pest infestation occurred. In the northeastern region, the winter season price fell by 35 percent and consumption increased. The domestic price for the remaining aggregated U.S. market fell by 1.3 percent, as displacement effects from the northeastern winter market were absorbed by a combination of expanded consumption elsewhere and reduced domestic supply. A net national welfare gain of \$2.5 million resulted (about 2 percent of initial total consumer plus producer surplus), mostly due to the lower price in the northeast. Consumer surplus increased by \$2.2 million outside of the northeast, but producer surplus fell by a similar amount, so the net welfare gain was small outside of the northeastern winter market. In contrast, a full liberalization of trade (which was not under consideration by USDA at this time) was estimated to depress domestic avocado production by as much as 50 percent after full adjustment to lower prices, and to raise consumer surplus by nearly \$90 million nationwide.

These studies also considered the economic effects of the proposed rule if an avocado pest infestation occurred. A pest infestation increased marginal costs and lowered yields, reducing domestic supply. In the worst-case scenario, with the exaggerated assumption that the whole U.S. crop would be affected, reduced availability of avocados under the partial easing of the import ban pushed up the equilibrium domestic price (excluding the northeastern winter regional market) by 30 percent. The domestic price increase partly offset the effects on producers of lower output and higher production costs but their net loss was \$14.7 million, almost seven times as large as from partial easing of the ban alone. A larger economic effect of the pest infestation was felt by consumers outside of the northeastern winter market: their surplus fell by \$43.5 million with the increased domestic price. Partial easing of the avocado quarantine would not be sound phytosanitary or economic policy under these circumstances. Yet on a probabilistic basis, it took a much higher likelihood of pest infestation than reported by USDA to turn expected net welfare effects negative. For full trade liberalization, even under the worst-case pest infestation, there was a positive benefit-cost relationship as consumer gains from lower prices more than offset the domestic producer losses.

OPENING OF THE U.S. MARKET

Partial Easing of the Ban in 1997

Despite continued industry opposition, in February 1997 USDA issued a final rule permitting limited importation of avocados from Mexico under the systems approach. In rejecting the industry arguments about pest risk, USDA reasserted its positive assessment of the safety of the proposed approach and responded to numerous submissions received during the public comment period of the rulemaking process. USDA also responded to the concerns raised in the March 1996 CAC petition and subsequent CAC communication about the pending decision. It found neither substantive nor procedural grounds for further delay of a decision to allow limited imports under the systems approach being adopted (USDA, 1997). In its economic assessment, USDA evaluated the effects of the rule, based on the assumption, that between 10 to 50 percent of Mexican exports to other markets during November-February would be delivered instead to the U.S. market. Delivery of 50 percent resulted in imports near the level estimated by Orden and Romano (1996). For this level of imports, USDA found similar price effects in the Northeast region and the rest of the country, but its estimates of producer surplus losses and consumer surplus gains were larger. Under the USDA final ruling, Mexican avocados began to enter the U.S. market during the winter of 1997-98.

By 2001, after four shipping seasons, no pest infestations had been detected in the imported avocados, lending credibility to the systems approach. As shown in table 1, shipments of California avocados to the winter market (northeast and east-central regions in the table) were largely displaced by imports from Mexico—the California shipments fell to just 1.0 million pounds during 1999-2000 from an average of 7.7 million pounds during 1986-94 (USDA, 2001). Avocados from Mexico and California appeared to be imperfect substitutes in the northeast market. Wholesale prices of avocados imported from Mexico averaged about 25 percent less than wholesale prices of domestic avocados during this period.

Table 1. California Avocado Shipments to different regions in the U.S. (million pounds)

Region	1986-1994 Average			1999-2000 Season		
	Total	Nov-Feb	Nov-April	Total	Nov-Feb	Nov-April
Pacific	128.8	22.8	51.7	150.3	25.0	58.7
Southwest	60.0	14.7	26.7	59.5	11.3	24.9
West Central	12.5	2.8	5.1	15.2	2.9	6.1
East Central	17.6	4.1	7.5	23.1	0.7	5.7
Northeast	16.9	3.6	6.7	24.4	0.3	6.0
Southeast	9.2	2.2	4.0	23.5	4.8	9.7
Total	244.9	50.3	101.8	295.9	45.0	111.2

Source: USDA, 2001.

Under the limited opening of trade in 1997-98, imports averaged over the period 1998-99 to 2000-01 23.3 million pounds: 21.5 million pounds in 560 shipments in 1998-99, 25.9 million pounds in 669 shipments in 1999-2000, and 22.5 million pounds in 576 shipments in 2000-01. The level of imports from Mexico were well above the displaced California

shipments and nearly double the import demand of 13 million pounds in the northeast winter market predicted by Orden and Romano (1996). Because the level of Mexican imports exceeded the displacements of California sales, one effect of easing of the quarantine apparently was demand expansion due to better seasonal availability of avocados. To the extent that market expansion occurs, it provides benefits to consumers and Mexican producers at little cost to domestic producers.

Prior to 1997, Chile was the major foreign supplier of avocados during the September-December period, and from 1997 to 2001 imports from Chile were nearly five times as much as from Mexico. Avocados from Mexico competed with Chilean exports, but did not dampen total Chilean market sales. The value of avocado imports from Chile fluctuated from \$16 million in 1997-98 to \$51 million in 1998-99, \$35 million in 1999-2000, and \$74 million in 2000-01. Simultaneous growth in imports from Mexico and Chile occurred in the context of a largely weather-related decline in U.S. production, which fell by an average of 35 million pounds during the three seasons 1997-98 to 1999-2000 compared to the average for the two preceding seasons. This demonstrated that imports could stabilize the market in the face of domestic supply variability, thus stabilizing consumer product availability and prices.

Increased Access in 2001

Based on the early success of the avocado import program, in September 1999 Mexico requested that USDA expand its geographic and seasonal access to the U.S. market. USDA acted within a year to obtain public comments on this request. In November 2001, it issued an amended final rule (USDA, 2001). This rule confirmed the risk-reducing effects of the systems approach. The revised rule added access for avocados from Mexico to a west-central region and increased the shipping season to six winter months. Adding the west-central region increased the domestic shipments with which Mexican avocados would compete from a past average of 7.7 million pounds over 1986-94 to 10.5 million pounds. Increasing the length of the import season increased the domestic shipments with which the Mexican avocados would compete from 7.7 million pounds to 14.2 million pounds for the original access area, and to 19.3 million pounds for the expanded area. Thus, the market access was increased substantially for Mexico by the 2001 rule. Issuance of the revised rule encountered less industry opposition than the initial easing of the quarantine. Still, USDA had to overrule a late CAC petition to suspend its decision process based on a court ruling against the U.S. government on an earlier decision to permit citrus imports from Argentina.

Further Opening in 2005

With the additional opening of the U.S. market, avocado imports from Mexico rose from 27.9 million pounds in 2001-02, to 58.8 million pounds in 2002-03, and 76.8 million pounds in 2003-04. The government of Mexico requested in November 2000 that the regulations be amended again to allow importation into all 50 states throughout the year. APHIS undertook another pest risk assessment in response. Although substantial reductions in risk had been associated with the seasonal and geographic shipping restrictions, APHIS eventually concluded that removing these restrictions while retaining other aspects of the systems

approach to risk management would result in fewer than 450 infected fruit entering the U.S. annually, and posed “an overall low likelihood of pest introduction” (USDA, 2004). In part this pest risk assessment rested on the six years of accumulated evidence, in which no pests had been detected in over 10 million inspected fruit. New scientific evidence was also available by 2003 demonstrating that the Hass avocado was not a host to certain fruit flies (Aluja et al. 2004). APHIS issued a new final rule on November 30, 2004 that specified conditions for year-around importation of Mexican avocados into 47 states (all except California, Florida and Hawaii) starting in 2005, with access to all states after a two-year implementation delay. Thus, nearly fifteen years after the avocado trade issue was brought to the fore during the NAFTA negotiations, and nearly eight years after the initial partial opening of the U.S. market, a fundamental reversal of the 1914 ban was accomplished.⁴ In doing so, APHIS continued to restrict imports to eligible orchards operating under a systems approach to risk management. Requirements remained in effect for surveys for avocado-specific pests, certification of compliance with pre-harvest and post-harvest handling requirements, traceability, and sample fruit testing. APHIS also continued to require surveying for fruit flies, rejecting the conclusion that Hass avocados were a “non host” in favor of the more conservative status of “very poor host” (USDA, 2004).

Projected economic effects of the 2004 final rule are presented in tables 2 and 3 (USDA, 2004).⁵ The economic model used for these projections updates average data to a recent two-year base period (October 2001-October 2003) and is more sophisticated than previous modeling in several respects (USDA, 2004; Peterson et al., 2004). On the supply side, California, Mexico and Chile are included as producing regions. The year is divided into two periods: October 15-April 15 (period 1) corresponding to the period in which Mexican avocados had been imported under the 2001 rule, and April 16-October 14 (period 2) during which imports from Mexico had not previously been allowed. Avocados from the three countries are treated as imperfect substitutes by consumers, instead of perfect substitutes, accommodating differences in wholesale prices that have persisted by country of origin during the past six years. The Mexican producer price for exported avocados is held constant because of extensive additional productive capacity eligible for certification, while supply from California and Chile are assumed to be price inelastic. The U.S. is divided into three demand regions: the 31 states that were approved for Mexican avocados under the 2001 rule, 15 additional states, and a separate region for California, Florida and Hawaii. The fuller specification of the seasonality, substitutability, regional demand, and third supplier allows more precise estimation of the effects of a change in the import rule than would be possible with a simpler model structure such as utilized by Romano and Orden (1996) or the earlier USDA assessments. Sensitivity analysis was conducted by simulating the model while drawing its key parameters from assumed random distributions around the benchmark values.

The net effect in the model of allowing Mexican avocados into all states but California, Florida and Hawaii is that exports from Mexico increase by 95.8 million pounds (164.4 percent), as shown in table 2, while supply from California falls by 25.2 million pounds (7.3

⁴ Just as the NAFTA negotiations gave a boost to efforts to have the avocado ban reconsidered, intensive discussions between Mexico and the U.S. about bilateral SPS trade regulations, after a case of BSE was discovered in Washington state, may have created an environment conducive to bringing closure to the assessment of a revised rule on avocados in 2004.

⁵ Peterson served as a consultant to USDA in developing the model used for their economic assessment, which is based on earlier model development in Peterson et al. (2004).

percent) and imports from Chile decrease by 18.1 million pounds (10.2 percent). With access to all 50 states year-round, exports from Mexico increase by 151.1 million pounds (259.4 percent), while supply from California falls by 42.1 million pounds (12 percent) and imports from Chile decrease by 29.1 million pounds (16.4 percent). With full access wholesale and producer prices of California avocados fall \$0.35 on average over the year (20.8 and 33.3 percent, respectively), while these prices fall \$0.15 for Chile (10.8 and 25.4 percent, respectively). Consumer surplus in the U.S. rises by \$121.7 million with Mexican access to 47 states and to \$184.4 million within access to all states, as shown in table 3. Producer surplus falls by \$114.4 million for California in the latter case, leaving a net U.S. welfare gain of \$70.1 million. Based on the risk assessment, adopting the USDA 2004 final rule to open the U.S. avocado market is consistent with its obligations under the WTO to utilize least trade distorting SPS measures. In doing so, USDA regulators have been willing to accept a substantial net loss to domestic producers. Peterson et al. (2004) show that these losses may be offset over a five year period as avocado demand increases due to population and income growth. But this offset was not incorporated in USDA's analysis, which presented the trade, production, consumption and welfare gains and losses shown in tables 2 and 3 as the consequences of the 2004 rule.

Table 2. Estimated Near-Term Changes in Annual Quantities and Prices with 2004 U.S. Avocado Import Rule for Mexico

	Initial Prices and Quantities	Importation Excluding CA, FL and HI	Importation into All 50 States
	million pounds		
Quantity			
Total	581.071	633.542	660.868
Supplied by:			
California	346.011	320.821	303.866
Chile	176.814	158.695	147.695
Mexico	58.247	154.026	209.307
	dollars per pound ^a		
Wholesale Price of:			
Avocados Supplied by:			
California	\$1.63	\$1.43	\$1.29
Chile	\$1.29	\$1.20	\$1.15
Producer Price for:			
California	\$1.02	\$0.81	\$0.67
Chile	\$0.59	\$0.49	\$0.44

^a Prices weighted by regional and time period quantities. Producer and wholesale prices for avocados from Mexico are assumed constant in the model.

Source: USDA, 2004.

Table 3. Estimated Near-Term Welfare Gains and Losses with 2004 U.S. Avocado Import Rule for Mexico

	Importation Excluding CA, FL and HI		Importation Including CA, FL and HI	
	million dollars			
	Change in Welfare ^a	Standard Deviation ^b	Change in Welfare ^a	Standard Deviation ^b
Losses in Producer Welfare				
California	-\$71.37	\$14.27	-\$114.39	\$20.48
Chile	-\$15.71	\$5.29	-\$24.35	\$5.79
Gains in Consumer Welfare				
Period 1 ^c				
Region A ^d	\$4.02	\$0.99	\$7.84	\$1.18
Region B ^e	\$21.92	\$2.08	\$29.66	\$2.34
Region C ^f	\$14.17	\$3.34	\$27.33	\$2.48
Period 2 ^g				
Region A	\$24.998	\$2.70	\$32.42	\$4.22
Region B	\$31.76	\$3.38	\$41.08	\$5.29
Region C	\$24.81	\$5.29	\$46.12	\$6.34
<i>Total</i>	\$121.66	\$3.61	\$184.45	\$1.93
Net U.S. Welfare Gain ^h	\$50.29	\$14.27	\$70.06	\$20.48

^a The difference between baseline values for October 15, 2001-October 15, 2003 and values with the 2004 rule.

^b Standard deviations of the sensitivity analysis distributions.

^c October 15-April 15.

^d The 31 northeast and central states (and the District of Columbia) approved to receive Hass avocado imports from Mexico during the six-month period October 15-April 15 under the 2001 rule. Alaska, which has imported small quantities of Mexican avocados year round since 1993 is excluded from the analysis.

^e Fifteen Pacific and southern states excluding California, Florida and Hawaii.

^f California, Florida and Hawaii.

^g April 16-October 14.

^h The sum of welfare losses for California producers and U.S. consumer welfare gains for all regions and both periods.

Source: USDA, 2004.

Efficacy of the Post-2004 Systems Approach to Risk Management

Progressive easing of the avocado import ban demonstrates successful application of a systems approach which has opened the U.S. market to approved Mexican producers and created a \$100 million annual export industry. However, the compliance costs associated with the regulations remain controversial. Mexican growers and sanitary authorities argue that avocados are not a host for fruit flies, so compliance measures required to monitor fruit fly

infestations are unnecessary, and that compliance requirements for the avocado pests (seed and stem weevils and seed moths) are excessive. The 2004 rule acknowledges that avocados are a “poor” host for fruit flies. But its economic assessment assumed zero pest risk and did not examine compliance costs in Mexico.

In further analysis, Peterson and Orden (2006) extend the previous studies by explicitly considering pest risks, compliance costs in Mexico, and U.S. producers’ control costs and production losses in the event of a trade-related pest infestation. The analysis proceeds along lines suggested by Glauber and Narrod (2005), Rendleman and Spinelli (1999) and Paarlberg and Lee (1998) for determining optimal policies when there are pest risks associated with domestic or international movement of products. The basic model is similar to the model used for the economic analysis of the 2004 rule. Slight differences in specification are that four U.S. demand regions are considered, with Southern California where avocado production is concentrated, treated as a separate region, and the states not importing avocados under the 2001 rule are divided into two regions with substantially different per capita consumption levels. Mexican production is assumed to be highly but not perfectly elastic due to costs associated with bringing additional acreage into compliance with the systems approach measures.

The key additional dimensions of the model address the risk aspects of U.S. imports of avocados from Mexico. Frequencies of pest outbreaks depend on the volume of trade entering pest-susceptible regions and the probabilities of a pest 1) infecting fruit pre- or post harvest, 2) not being detected during harvesting or shipping, 3) surviving shipment, 4) not being detected at the border point-of-entry, and 5) being able to become established. Average and maximum (high) estimates of these risk probabilities are taken from APHIS (1995a, 1995b) estimates under two circumstances: with and without the systems approach measures in place. Fixed and variable costs to growers and processors in Michoacán to comply with the systems approach measures for the avocado-specific pests and for fruit flies were investigated through field research. Level of U.S. acreage likely to be affected by a transmitted pest and costs of U.S. pest eradication and fruit losses were based on literature review and discussions with regulatory authorities.

Three alternative compliance scenarios are examined with the pest risks and costs integrated into the supply side of the model. The first scenario assumes access to the U.S. market with the systems approach measures in effect as specified in the 2004 rule. The second scenario considers further removal of the compliance measures directed specifically toward fruit flies. This is interpreted to raise the probability of a fruit fly infestation during pre- or post-harvest from its level estimated by APHIS under the systems approach to its level estimated without risk mitigation measures. Other fruit fly and avocado-specific pest risk probabilities are assumed to remain at their systems approach levels, because inspections continue in packing plants and at the U.S. border. Finally, in the third scenario, all of the systems approach measures are eliminated. The risk probabilities are assumed to be at their estimated levels for no risk-mitigation measures in place. For each scenario, Peterson and Orden (2006) consider the outcomes under the estimated average and high risk probabilities reported by APHIS.

**Table 4. Welfare Effects Under Alternative Regulation of
U.S. Imports of Mexican Hass Avocados**

	Benchmark	(Scenario One) Unlimited Seasonal and Geographic Access with Compliance Measures		(Scenario Two) Unlimited Access without Fruit Fly Compliance Measures		(Scenario Three) Unlimited Access without Compliance Measures for Fruit Flies and Avocado Pests			
						Average Risk		High Risk	
		Simulation	St. Dev.	Simulation	St. Dev.	Simulation	St. Dev.	Simulation	St. Dev.
Pest Related Costs for Avocados	Million Dollars								
Mexican Compliance	6.267	11.644	0.105	9.414	0.105	0.000	0.000	0.000	0.000
U.S. Expected Control	0.000	0.020	0.008	0.021	0.008	3.091	1.243	25.257	10.019
Other Fruit Fly Costs	0.000	6.5E-06	3.3E-07	0.001	7.3E-05	0.015	0.002	0.124	0.002
Welfare Effects	Million Dollars								
Producer Surplus									
California		-107.651	15.755	-108.483	15.759	-112.851	16.103	-119.989	18.818
Chile		-25.069	4.693	-25.341	4.701	-26.268	4.751	-24.959	4.797
Mexico		3.108	0.981	3.198	1.006	3.607	1.124	3.788	1.207
U.S. Equivalent Variation		179.443	18.917	182.029	19.547	193.308	19.136	175.675	22.971
Net U.S. Welfare		71.791	6.290	73.547	5.523	80.442	6.156	55.562	12.735

Note: Mexican compliance costs reported above include those incurred by producers and exporters. The U.S. expected pest control costs reported exclude the small expenditures shown for fruit fly control by producers of other crops than avocados; net U.S. welfare differs from U.S. equivalent variation plus change in U.S. producer surplus by this expenditure.

Source: Peterson and Orden, 2006.

A synopsis of result from the analysis integrating risks and related costs into the expected economic equilibrium outcomes is shown in table 4. In the model benchmark, Mexican compliance costs are estimated to equal \$6.3 million, which is nearly 20 percent of producer gross revenue from exports under the 2001 rule. Pest risks and U.S. control costs are assumed equal to zero with the systems approach in place in the benchmark period.

For unlimited seasonal and geographic access under the 2004 rule, results in Table 4 use the average risk probabilities estimated by APHIS, but differ little with the maximum risk probabilities. Total Mexican compliance costs rise to \$11.6 million, but fall to about 10 percent of producer gross revenue as the Mexican export volume expands and fixed compliance costs are spread over more output. The expected cost of pest control for U.S. avocado producers is very small (\$0.02 million) and control costs for fruit fly infestation in other crops are negligible. Effects of opening the U.S. market under the 2004 rule on California and Chilean producers, on U.S. consumers, and on net U.S. welfare are similar to the results reported in Table 3, allowing for the slight modifications to the model. There is a gain of producer surplus in Mexico of \$3.1 million with the highly elastic supply.

When the compliance measures for fruit flies are eliminated in the second scenario, Mexican compliance costs fall to \$9.4 million, largely because of direct cost savings and to a smaller extent a larger export volume. The expected costs of pest control in the U.S. remain small.⁷ There is a slight gain in the net U.S. welfare, but well within the standard deviation of the simulation estimate for the 2004 rule first scenario. Using the average or high risk probabilities did not effect the simulation results substantially.

The final columns of Table 4 display the model outcomes for elimination of all the systems approach compliance measures. In this case, the levels of average versus high estimated pest risk probabilities have a substantial effect on the results. In this third scenario, there are no compliance costs in Mexico. Under the average pest risk probabilities, trade-related pest infestations become frequent enough that expected control cost for California avocado growers rise to \$3.1 million. Producer and wholesale prices of California avocados (not shown in Table 4) are similar to those in the first scenario but with growers incurring pest costs and the quantity of avocados supplied annually by California falls by an additional 3.5 million pounds. Californian producer surplus declines by an additional \$5.2 million compared to the first scenario. Chile also experiences a loss of exports and producer surplus. Mexican avocado exports increase compared to the first scenario and producer surplus increases by \$0.5 million. Consumers in the U.S. obtain a \$13.9 million larger gain in equivalent variation in this scenario compared to the first scenario. The net U.S. welfare gain is \$80.4 million, an \$8.6 million increase. Thus, there is a significant additional domestic welfare gain associated with eliminating all of the system approach compliance measures at the average pest risks estimated by APHIS, in spite of the significant pest-related losses to California avocado growers.

Under the assumption of the high risk probabilities estimated by APHIS, higher pest-related costs have a negative effect on California producers, U.S. consumers, and net U.S. welfare. In short, higher pest risk is detrimental economically. Expected pest control costs in the U.S. rise to \$25.3 million as shown in table 4. The supply of California avocados declines further in response to falling net producer prices (with control costs taken into account) and also because of the damage to fruit from the avocado pests. Producer surplus for California

⁷ Again, results are shown for the average pest risks estimated by APHIS, but differ little with the high risks.

growers falls by an additional \$7.1 million for the third scenario with high risk probabilities compared to average risk probabilities.

The decline in California production due to higher pest control costs and fruit damage has a deleterious effect on U.S. consumers. The quantity of California avocados consumed decreases with smaller gains in equivalent variation. The net U.S. welfare gain is only \$55.6 million in scenario 3 under high pest risk probabilities. The gains in equivalent variation and net U.S. welfare in scenario 3 under high pest risk probabilities are less than in scenarios 1 or 2 under either average or high risk probabilities. Thus, given the uncertainty in available information on pest risks, one can not conclude unambiguously that fully eliminating the existing systems approach to pest risk management would be a welfare improving deregulation.

CONCLUSION

The sequential issuance of the 1997, 2001 and 2004 USDA rules allowing avocado imports from Mexico are an example of successful adoption of a systems approach to risk mitigation. The 1997 rule only opened the market to a small extent, but it did so despite significant domestic industry opposition. The 2001 ruling more than doubled the proportion of the total U.S. market to which Mexico had access, but that proportion remained less than 10 percent. Economic consequences for the domestic industry, and gains for Mexican producers and U.S. consumers, were relatively limited.

Substantial further progress occurred in 2004 under the precedent set in the first two rules. USDA's initial systems approach rested on numerous risk mitigation measures. Among these, the seasonal restriction of winter shipping only and the limited geographic access, first to 19 then to 34 states, were determined to be necessary components of risk management. Nevertheless, after inspections failed to detect any pest infestations in imports under the system approach, and as scientific evidence became available to substantiate the poor host status of avocados for fruit flies, USDA reconsidered its position and relaxed these two restrictive measures. Net economic effects of this revision to its import rules are larger than under the first two rules. The long avocado case from 1991 to 2005 illustrates how difficult it is to make progress on trade expansion when there are complex risk issues at stake and a strong domestic industry is affected by the decision making outcome. It also represents a noteworthy success in this regard.

Even with this accomplishment, several of the system approach requirements that remain in place have been subject to question and there may be additional modifications to the required procedures. We summarize recent analysis by Peterson and Orden (2006) that takes pest risks, compliance costs and expected U.S. trade-related pest costs into account for alternative scenarios for avocado import pest-risk management. This analysis suggests three broad conclusions. First, the gains from the decision made by USDA in 2004 to allow imports of Mexican avocados without geographic or seasonal restrictions under a systems approach is confirmed when pest risks and related costs are incorporated into the analysis. Second, the additional U.S. welfare gains from further modification of the systems approach to reduce compliance costs associated with fruit fly control measures are modest at best. Third, entirely abandoning the systems approach would be a questionable decision on pest-risk and

economic criteria. By this we mean that there may be a net U.S. welfare gain, but it comes as a trade-off with higher pest-related control costs and losses borne by California producers. Moreover, knowledge of pest risk probabilities is not sufficient to rule out a smaller U.S. welfare gain in this case than occurs when some or all of the system approach compliance measures are retained.

REFERENCES

- Australian Centre for International Agricultural Research (ACIAR). 2005. *“International Food Safety Standards and Processed Food Exports from Developing Countries: A Comparative Study of India and Thailand.”* Draft papers presented at a project workshop, Canberra, Australia, June.
- Aluja M., F. Diaz-Fleisher, and J. Arredondo. 2004. “Non-host Status of *Persea Americana* ‘Hass’ to *Anastrepha ludens*, *Anastrepha oblique*, *Anastrepha serpentine* and *Anastrepha striata* (Diptera Tephritidae) in Mexico.” *Journal of Economic Entomology*. 97:2.
- Glauber, J. W., and C. Narrod. 2001. *“A Rational Risk Policy for Regulating Plant Diseases and Pests.”* Regulatory Analysis 01-05, AEI-Brookings Joint Center for Regulatory Studies, Washington DC, June.
- Orden D., and E. Romano. 1996. *“The Avocado Dispute and Other Technical Barriers to Agricultural Trade Under NAFTA.”* Invited paper presented at the conference on NAFTA and Agriculture: Is the Experiment Working, San Antonio, Texas, November.
- Orden D., C. Narrod, and J. W. Glauber. 2001. *“Least Trade-Restrictive SPS Policies: An Analytic Framework is there but Questions Remain.”* In K. Anderson, C. McRae, and D. Wilson (eds) *The Economics of Quarantine and the SPS Agreement. Centre for International Economic Studies, Adelaide.*
- Orden D., and E. Peterson. 2006. “Science, Opportunity, Traceability, Persistence and Political Will: Necessary Elements of Opening the U.S. Market to Avocados from Mexico.” In U. Grote, A. K. Basu, and N. Chau (eds) *New Frontiers in Environmental and Social Labeling. Springer.*
- Paarlberg P. L., and J. G. Lee. 1998. “Import Restrictions in the Presence of a Health Risk: An Illustration Using FMD.” *American Journal of Agricultural Economics*. 80:2 (February): 175-83.
- Rendleman, C. M., and F. J. Spinelli. 1999. “The Costs and Benefits of Animal Disease Prevention: The Case of African Swine Fever in the US.” *Environmental Impact and Assessment Review*. 19: 405-26.
- Peterson, E., P. Evangelou, D. Orden, and N. Bakshi. 2004. *“An Economic Assessment of Removing the Partial U.S. Import Ban on Fresh Hass Avocados.”* Selected paper presented at the annual meeting of the American Agricultural Economics Association, August.
- Peterson, E., and D. Orden. 2006 *“Linking Risk and Economic Assessments in the Analysis of Plant Pest Regulations: The Case of U.S. Imports of Mexican Avocados.”* USDA/ERS Contractor and Cooperator Report No. 25, November.
- Roberts, D., and D. Orden. 1996. “Determinants of Technical Barriers to Trade: The Case of U.S. Phytosanitary Restrictions on Mexican Avocados, 1972-1995.” In D. Orden, and D.

-
- Roberts (eds) *Understanding Technical Barriers to Agricultural Trade*. International Agricultural Trade Research Consortium, Department of Applied Economics, University of Minnesota, St. Paul, MN.
- United States Department of Agriculture, Animal and Plant Health Inspection Service (USDA/APHIS). 1995a. "*Importation of Avocado Fruit (Persea americana americana) from Mexico: Supplemental Pest Risk Assessment.*" Washington DC, May.
- _____. 1995b. "*Risk Management Analysis: A Systems Approach for Mexican Avocado.*" Washington, DC, May.
- United States Department of Agriculture (USDA) (1995) "*Notice of Proposed Rule on Importation of Hass Avocados.*" Federal Register 7 CFR Part 319, Docket 94-116-3, pp. 34832-34842, July 3.
- _____. 1997. "*Importation of Hass Avocado Fruit Grown in Michoacán, Mexico.*" Federal Register 7 CFR Part 319, Docket 94-116-5, February 5.
- _____. 2001. "*Mexican Hass Avocado Import Program: Final Rule.*" Federal Register 7 CFR Part 319, Docket 00-003-4, pp. 55530-55552, November 1.
- _____. 2004. "*Mexican Avocado Import Program: Final Rule.*" Federal Register 7 CFR Part 319, Docket 03-022-5, pp. 69748-69774, November 30.
- World Bank. 2005. Food Safety and Agricultural Health Standards: Challenges and Opportunities for Developing Country Exports. *Agriculture and Rural Development Department*, Report No. 31207, January.
- World Trade Organization. 1994. *The Results of the Uruguay Round of Multilateral Trade Negotiations: The Legal Texts*. GATT Secretariat, Geneva, Switzerland.

STANDARDS AND DEVELOPING COUNTRY EXPORTS: A REVIEW OF SELECTED STUDIES AND SUGGESTIONS FOR FUTURE RESEARCH

*John S. Wilson**

ABSTRACT

This paper reviews selected studies, largely produced in the Research Group of the World Bank, on the impact of product standards on international trade, as well as food safety standards on trade in agricultural products. The role of standards, i.e. overcoming market failures versus creating barriers to trade is explored. Several studies which examine the impact of product standards on trade and the costs of compliance with technical standards are reviewed. These studies draw on firm level data in the World Bank Technical Barriers to Trade database. Finally, the issue of harmonization of standards, through Mutual Recognition Agreements (MRA), as a method of trade facilitation is examined. MRAs appear to increase the likelihood of firms to engage in export markets, especially in the agricultural sector. The paper ends with suggestions for future research, including the need for panel data studies with the time dimension and more extensive studies of a relationship between technical standards and consumer welfare.

Keyword: safety standards and technical barriers, study survey, compliance costs with standards.

WHY STANDARDS MATTER TO TRADE

Technical regulations, such as product certification requirements, performance mandates, testing procedures, conformity assessments, and labeling standards, exist to ensure consumer

* Lead Economist, Development Research Group, The World Bank, 1818 H Street, NW, Washington, DC 20433, Email: jswilson@worldbank.org. This paper draws heavily upon and summarizes several empirical papers produced at the World Bank. The assistance of Ayako Suzuki and Witold Czubala in the preparation of this draft is appreciated and acknowledged. This paper is part of broader research project underway in the World Bank's Development Research Group on trade costs, facilitation, and economic development. The project is supported by a Trust Fund of the United Kingdom's Department for International Development (DFID). The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the view of the World Bank, its Executive Directors, or the countries they represent.

safety, network reliability, or other goals. In principle, product standards¹ play a variety of useful roles in overcoming market failures. For example, emission standards for cars motivate firms to internalize the costs of promoting environmental quality. Food safety standards help to ensure that consumers are protected from health risks and deceptive practices, information which would not ordinarily be available in private markets. For consumers, efficient and non-discriminatory standards allow comparison of products on a common basis in terms of regulatory characteristics, permitting enhanced competition. From the producers' point of view, production of goods subject to recognized standards could achieve economies of scale and reduce overall costs. Since standards themselves embody information about technical knowledge, conformity to efficient standards encourages firms to improve the quality and reliability of their products.

Standards also may reduce transaction costs in business by increasing the transparency of product information and compatibility of products and components (David and Greenstein, 1990²). This is possible as technical regulations can increase the flow of information between producers and consumers regarding the inherent characteristics and quality of products. Jones and Hudson (1996), using a model with a variance reduction approach, argued that standardization reduces the costs of uncertainty associated with assessing product quality. Cost savings are reflected in the reduction of time and effort which consumers spend on search.

International standards, in the absence of multilateral consensus on the appropriate level or setup of standards, also provide common reference points for countries to follow so that transaction costs can be reduced. For example, in 1961 *Codex Alimentarius* was developed as a single international reference point in order to draw attention to the field of food safety and quality. Similarly, international standards developed by the International Standards Organization (ISO) provide a basis especially for the developing countries to choose norms that are recognized in foreign markets. In this regard, conformity to global standards can increase export opportunities.

Despite their potential to expand competition and trade, standards may be set to achieve the opposite outcomes. In general, standards can act to raise the compliance costs of some firms (e.g., new entrants) relative to other firms (e.g., incumbents) thereby restricting competition. Fischer and Serra (2000) examine the behavior of a country that imposes a minimum standard on a product produced by a domestic firm and a foreign competitor. In their model, costs rise with the standard, and there is a fixed setup cost of producing at two standard levels. Depending on the size of the foreign market and the fixed setup cost, they showed that the domestic firm will lobby for the lowest minimum standard that excludes the foreign firm or for no standard at all.

This outcome may be most likely in the context of international trade, where governments might choose technical regulations or sanitary and phytosanitary standards on

¹ The terms "standards" and "standards and technical regulations" are used interchangeably throughout this paper. The WTO provides a clear distinction between standards and technical regulations; the former are voluntary and the latter are mandatory technical requirements. In many cases "standards" cover mandatory technical requirements.

² This paper surveys the literature on standards-setting processes and their consequences for industry structure and economic welfare. They examined four kinds of standardization processes: (1) market competition involving products embodying non-proprietary standards, (2) market competition among (proprietary) standards, (3) agreements within voluntary standards-writing organizations, and (4) direct governmental promulgation.

agricultural imports to favor domestic producers over foreign rivals, thereby restricting trade. Indeed, there is evidence of rising use of technical regulations as instruments of commercial policy in the unilateral, regional, and global trade contexts (Maskus and Wilson, 2001). As traditional barriers to trade have fallen, non-tariff barriers have become of particular concern to firms in developing countries. These firms may bear relatively larger costs in meeting their requirements than their counterparts in developed nations. At the firm level, complying with differing standards in such major export markets as the European Union (EU), the United States, and Japan can add costs and limit export competitiveness.

Costs associated with foreign standards and technical regulations may be borne publicly and privately. Developing countries typically have neither the public resources required to provide national laboratories for testing and certification nor the capability for collective action to raise their standards. As a result, a significant portion of meeting the costs of standards may be borne by individual firms.

Given this context, food safety standards and technical regulations are an increasingly prominent part of international trade policy debate -- though they are at least partly addressed differently. This paper, therefore, presents in separate sections summary studies on food safety standards and technical standards. Standards have different impacts on international trade in the agricultural and non-agricultural markets. This is due, in part, to the intrinsic differences in these markets. As a result elasticities with respect to trade protection measures differ and in more general terms, there are different effects on consumer welfare depending whether agricultural or non-agricultural products are affected by standards. This is particularly true in regard to how standards affect developing country exporters and the costs and benefits for global trade in adopting consensus international standards. However, there have been few empirical studies that examine the impacts of standards imposed by importing nations on exporters. This paper reviews and summarizes empirical studies on standard and technical regulations, and proposes future research that could compliment the existing studies.

The paper is organized as follows: the first part provides a review of recent studies on food safety standards and technical regulations, most of which have been conducted at the World Bank. This review is not meant to be exhaustive, but rather serve to highlight a sample of research work in this field at the Bank. The first set of papers focus on food safety. This issue is of particular importance to developing countries which continue to rely on agricultural exports. The approaches taken in regard to analysis of food safety and trade here concentrate largely on the differing impact of setting regulations at higher or lower levels of stringency. They also center on the trade-offs of setting standards for food safety at levels suggested by international standards versus national ones. The studies on technical regulation and conformity assessment outlined subsequently draws on the World Bank Technical Barriers to Trade (TBT) survey database. The database provides firm-level data on production and export activities, cost structures, impediments to domestic sales and exports, and compliance with technical regulations. As such, those studies address questions of compliance costs of technical regulations and whether it is possible to identify their impact on export propensity and related questions. Conclusions and suggestions for future research are outlined in the concluding section of the paper.

SUMMARY RESULTS FROM SELECTED STUDIES

Studies Focusing on Specific SPS Issues

This section outlines, in a broad manner, the welfare and trade impacts of standards related to food safety based on selected studies conducted recently. Food safety and the trade-off between precaution and increased agricultural trade continue at the forefront of policy debate. Discussions of food safety standards and their relation to trade were prominent in many of the position papers developed in advance of the World Trade Organization (WTO) Ministerial in Doha set for November 2001. These issues remain high profile, in part as discussions start about a post-Doha round (either successful or delayed) focus on non-tariff barriers to trade. How food safety is addressed within the trading systems is of significant importance to developing countries which continue to rely on agricultural exports. Moreover, in a fragmented system of conflicting national standards – and lack of agreement on globally accepted regulation of food safety attributes – export prospects for the least developed countries can be severely limited.

In this context (Wilson and Otsuki 2003) examine in a gravity model context the impact of adopting international food safety standards and harmonization of standards on global food trade patterns. The paper estimates the effect of differing levels of aflatoxin standards in 15 importing (4 developing) countries on exports from 31 (21 developing) countries. Aflatoxin is a natural substance which can contaminate certain grains and nuts when storage and drying facilities for these commodities are inadequate. Based on their analysis, the authors find that adopting a worldwide standard for aflatoxin B1 – the most potentially toxic of all aflatoxins – based on current international guidelines is found to increase the cereal and nut trade among the countries studied by \$US 6.1 billion from the 1998 levels. This is approximately 51 percent higher than the status quo level of 1998. They further estimate that world exports in cereals and nuts could increase by \$38.8 billion if an international standard (Codex) was adopted, compared to the current divergent national standards in place.

Gravity models are widely used in international trade due to their good empirical fit. Otsuki, Wilson and Sewadeh (2001) employ a gravity model to estimate the impact of changes in aflatoxin standards on trade flows of groundnut products using trade data for Europe and Africa during 1989-1998. Results suggest that a 10 percent tighter aflatoxin standard in European countries will reduce edible groundnut imports by 11 percent. A new European Union regulation on aflatoxins will result in a trade flow that is 63 percent lower than when the Codex Alimentarius international standards are followed.

Another paper that focuses on standards in agricultural products is Wilson, Otsuki and Majumdar (2003). The study examines the impact of drug residue standards on trade in beef and trade effect of setting harmonized international standards with data over the period 1995-2000 in a gravity model context. The authors find that if international standards set by Codex were followed in antibiotics, global trade in beef would rise by over \$3.2 billion or about 57 percent higher than the value of total trade flow under the pre-harmonization scenario. Among developing countries exporting to the European Union, for example, South African exports would rise by \$160 million, Brazil's by \$200 million, and Argentina's by over \$300 million in these estimations.

Food safety and environmental standards are fundamental for quality of products and security of consumers. Wilson and Otsuki (2004) explore the following question: do regulations on pesticide have an effect on trade in bananas? The authors use a gravity model to evaluate changes in trade flows. In order to analyze this question, regulatory data from eleven OECD importing countries and trade data from 19 exporting countries over the period 1997-99, including Latin America, Asia, and Africa are examined. Results suggest that a 10 percent increase in regulatory stringency - tighter restrictions on the pesticide chlorpyrifos, a common organophosphate insecticide - leads to a decrease in banana imports by 14.8 percent. This represents a significant impact on trade, including prospects for developing countries which continue to rely on exports of agricultural commodities such as bananas. In addition, the findings suggest that lack of consensus on international standards and divergent national regulations on pesticides is costly. For example, there is a \$5.5 billion difference in exports in bananas between a standard at a level of regulatory stringency suggested by Codex Alimentarius in contrast to one set at the level in place in the European Union

Non-harmonized standards are a main barrier in international trade. The motivation for policy makers to introduce and enforce this type of standards is in the area of political economy. Anderson, Damania and Jackson (2004) develop a common-agency lobbying model to examine why North America and the European Union have adopted such different policies towards genetically modified food. Their results show that when farmers lobby policy makers to influence standards, and consumers and environmentalists care about the choice of standards, it is possible that increased competition from abroad can lead to strategic incentives to raise standards, not just lower them as shown in earlier models.

The issue of harmonization of standards, and how this affects the welfare of consumers and international trade, is an important part of ongoing research and analysis. Henry de Frahan (2004) deploys a structural gravity model to quantify and test the hypothesis that EU harmonization of food regulations increases EU bilateral trade. The data include 10 product categories, including meat, fish, fruit and vegetables, oils and fats, dairy and cheese, grain, sugar, cacao, tea and coffee, condiments, and miscellaneous food products. His result suggests that bilateral exports subject to harmonized food regulations are 253 percent greater than bilateral exports not covered by harmonized food regulations for 1998. The paper also estimates a tariff equivalent of trade costs that arises from non-harmonized food regulations which ranges between 73 percent and 97 percent.

Studies Focusing on Technical Regulations Based on World Bank Technical Barriers to Trade (TBT) Survey

This section addresses compliance costs related to technical regulations applied to goods. There has been a rising use of standards and technical regulations as instruments of commercial policy in unilateral, regional, and global trade contexts as tariff and quota barriers continue to decline. Standards and technical regulations are principally used to mitigate food, animal plant safety risks, and to provide common norms for product quality, for example. However, these technical requirements also can pose barriers to trade by imposing unnecessary costly and time consuming tests, or by laying out unjustified different requirements in different markets. These technical requirements are of particular concern to developing countries that are seeking to penetrate into the markets of industrialized countries.

The World Bank Standards and Trade Survey (2004) produced firm level data on the impact of technical requirements and standards on developing country exports. The intent of the survey was to solicit input from agricultural, manufacturing, and trade firms in various emerging market countries regarding technical barriers encountered, which impact their ability to successfully export products. The data provides financial information for each firm and the effects of domestic, foreign, and international technical regulations as well as of various other impediments to businesses on exports.

The data collected covers 689 firms in 24 industries in 17 developing countries in the year 2002.. The use of a uniform methodology across countries and industry sectors, such as textiles and apparel, raw agricultural products, and processed food and tobacco, enables comparison of standards and regulations, and their impacts on firms' production and conformance activities between countries and industries. Information on technical regulations specific to five major export markets allows to compare the stringency and importance of technical regulations by export markets. These five export markets include the EU, the USA, Japan, Canada, and Australia.

An overview of the results for the 17 countries in the World Bank Standards and Trade Survey is provided in Wilson and Otsuki (2004). The major findings include those related to general factors that affect businesses in these developing countries and export success. Among the main barriers are a limited access to credits and a low demand for both exporting and non exporting firms. Product quality is also reported to be a key factor affecting export success. For firms that are willing but unable to export, low demand and costs of transporting goods are major impediments to exports.

The overall findings from the survey data also indicate that 70 percent of firms that export are confronted by mandatory standards and technical regulations. The majority of firms responding to the survey perceive technical regulations to be important for entering export markets, however, the obligation to meet these requirements may discourage export.

Among the major export markets studied, the EU is the one whose technical regulations are most widely perceived to be important, followed by the US. By regional comparison, a large share of firms in Eastern European and Latin American Countries consider technical regulations to be central. Moreover, among foreign technical regulations, product quality standards are most widely perceived to be relevant for export success, followed by performance standards and testing/certification requirements. In general, however, variation across the importance of technical regulations is small compared to variation across countries.

In regard to compliance with standards and technical regulations, data in the TBT database suggest that tasks associated with compliance to technical regulations is most commonly done within the firm and with the resources - plant, equipment, workers, and technology - that are already in place. Among the firms that incur any costs for compliance, additional cost per type of effort is commonly within 10 percent of investment costs and mostly undertaken for investment in additional plant or equipment.

Evidence on conformity assessment from the data suggests several general conclusions. Firms that perform in-house conformity testing have costs that are typically more expensive than outsourcing this work. Data on international standards suggests that ISO standards are the ones most commonly used. The majority of firms that responded, consider international standards to be important for successful sales in both, domestic and foreign markets. Regarding Mutual Recognition Agreements (MRA), these are generally not common among

the firms in the 17 studied countries, however, a majority of firms report that MRA could lead to cost saving.

Based on this summary review, there is increasing empirical evidence and data that suggest that, mandatory standards, and technical regulations, as well as international standards, are important factors that affect domestic sales, and the firms' ability to export. Production and investment costs may be higher for firms that face technical regulations, but compliance costs account for only a small portion of total costs as they are likely to be lower than 10 percent of the investment costs. While current participation rates in MRAs are low, these could provide more export opportunities for firms.

Part of the new research agenda on product standards examines how standards affect both fixed and variable costs. The former determines the entry decisions for firms seeking to access foreign markets, while the latter influences the propensity to export once entry decision was taken. A paper by Chen, Otsuki and Wilson (2006) examines how meeting foreign standards affects firms' export performance, reflected in export propensity and market diversification using data from the above referenced World Bank Technical Barriers to Trade database. With a simple model, the authors analyze a profit-maximizing firm's export behavior by modeling its decision to export to a set of differentiated markets. Firms are represented in the manufacturing and agricultural sectors and data are from a survey conducted in 2002. Results here suggest that technical regulations can adversely affect firms' propensity to export in developing countries. In particular, testing and lengthy inspection procedures reduce exports by 9 percent and 3 percent, respectively. Furthermore, the model outcome indicates that the difference in standards across foreign countries causes diseconomy of scale for firms, and affects decisions about whether to enter export markets. Those empirical results imply that standards, under certain conditions, can impede exporters' market entry, reducing the likelihood of exporting to more than three markets by 7 percent. In addition, firms that outsource components are more challenged by compliance with multiple standards.

The costs of compliance to standards are analyzed in the context of a production function, in Maskus, Otsuki and Wilson (2005). The authors develop econometric models to provide first estimates of the incremental production costs for firms in developing nations in conforming to standards imposed by major importing countries. The data are from the World Bank Technical Barriers to Trade survey conducted in 2002 of firms in the manufacturing and agricultural sectors. The findings indicate that standards do increase short-run production costs by requiring additional inputs of labor and capital. A 1 percent increase in investment to meet compliance costs in importing countries raises variable production costs by between 0.06 and 0.13 percent, a statistically significant increase. Among other findings are that the fixed costs of compliance are non-trivial; approximately \$425,000 per firm or about 4.7 percent of value added on average.

The results of the paper by Maskus, Otsuki and Wilson (2005) may be interpreted as one indication of the extent to which standards and technical regulations might constitute barriers to trade. While the impact on costs of compliance is relatively small, these costs can, nevertheless, be decisive factors driving export success for companies. In this context, there is scope for considering that costs resulting from trade restrictions due to import regulations may be considered as "proof of damage". This is a major criterion in the WTO to identify trade distortion and thereby to condemn an import regulation. This could encourage harmonization of regulations to international standards.

The issue of harmonized standards and their impact on trade is examined in Chen, Suzuki and Wilson (mimeo). The paper focuses on the effect of MRAs on exports from developing countries. The authors use the Heckman's selection model. This model enables an examination of two distinct aspects of export behavior of firms, namely, whether to export, obtained from the first step of Heckman's model or *the export decision function*, and given this choice, how much to export from the second stage or *the export performance function*. Data are from the World Bank Technical Barriers to Trade data base of exports from 17 developing countries engaged in manufacturing and agricultural trade into the OECD markets.

Negotiations involving standards raise issues that are both politically and analytically challenging. Unlike tariffs, standards cannot be simply negotiated away. The primary purpose of standards should center on the enhancement of welfare by remedying market failure – arising, for example, from safety attributes of products, negative environmental externalities, or product incompatibility due to the producers' failure to coordinate. Agreements on standards must therefore secure the gains from integrated markets without unduly compromising the role of standards as remedies for market failure. Not only are the motives for standards ostensibly aimed at maximizing welfare but they should be applied in a non-discriminatory manner on both foreign and domestic firms. However, in spite of the supposed symmetry of treatment, the impact on trade can be highly asymmetric because the costs of compliance can differ across countries.

There are at least three types of agreements dealing with technical barriers to trade:

- The simplest and potentially most powerful is the mutual recognition of existing standards, whereby a country grants unrestricted access of its market to products that meet any participating country's standards. This was the approach taken in principle by the European Union, with the spur of the Cassis de Dijon judgment of the European Court of Justice. MRA are, however, not likely to be an option if there is a significant difference in the initial standards of the countries, as became evident in the context of the European Union.
- In such cases, a certain degree of harmonization is a precondition for countries to allow products of other countries to access their markets. The most important example of such harmonization is the New Approach of the European Union, which resulted in a set of directives from the European Commission setting out essential health and safety requirements for most regulated products.
- In other cases, neither mutual recognition nor harmonization of substantive standards may be deemed feasible or desirable. Countries may nevertheless choose at least to mutually recognize each other's conformity assessment requirements, i.e. country A trusts country B to certify that the products made by country B conform to country A's standards. In this case, producers from country B may still face different standards in different markets, as opposed to mutual recognition case. Conformity assessment could be done locally resulting in lower costs of compliance.

Examples of the MRA approach include the intra-EU mutual recognition system in sectors where there are no EU harmonized directives and the EU's agreements with a number of other countries. A key element of these agreements is the rule of origin. The MRAs between the EU and USA and the EU and Canada specify that conformity assessment done in

one of the MRA countries, in which products are manufactured or through which they are imported, is accepted throughout the entire agreement region. Other agreements, such as the MRAs the EU has concluded with Australia and New Zealand, impose restrictive rules of origin which require that third country products continue to meet the conformity assessment of each country in the region.

The draft paper of Chen, Suzuki and Wilson (mimeo) addresses the question of how MRA on conformity assessment between two trading partners affect firms' export decisions in developing countries. Specifically, the study examines two distinct aspects of export behavior of firms, namely, *whether to export* and *how much to export*. The paper also compares such effect with that of the traditional Preferential Trade Agreements (PTA), which has been focused on reducing tariffs.

Preliminary findings indicate that MRAs do affect firms' decision of whether to export while it has little effect on their decision of how much to export. This may suggest that standards selection could act to raise the compliance costs of some firms (e.g., new entrants) in developing countries relative to other firms (e.g., incumbents) thereby restricting competition (Fischer and Serra, 2000). MRAs appear to reduce such fixed costs to enter export markets. Specifically, the preliminary results show that the probability of firms in developing countries to export is 52.3 percent higher if trading partner countries have such agreements. The effect is more outstanding in the agricultural sector; the probability of agricultural firms to export is 75.3 percent higher with MRAs. This may also suggest that it is considerably difficult for agricultural firms in developing countries to enter new export markets without MRAs.

CONCLUSIONS AND SUGGESTIONS FOR FUTURE RESEARCH

The review of selected studies outlined here indicates several general conclusions about standards as they relate to trade and development prospects. First, there is increasing empirical evidence that standards affect international trade, including the ability of developing country firms to expand export opportunities. In addition, as noted in the studies which draw on the TBT database, the costs of compliance with multiple technical regulations can be estimated and these costs can be significant. The selected studies on food safety and trade suggest that a continued divergence between national and international standards has consequences in regard to trade flows. Setting standards at more stringent levels than international standards can have an important impact on trade prospects for developing country exporters. Systematic differences between types of standards and differences across sectors need to be further explored and may be possible with data such as that available in the TBT database.

Research to date on standards relies primarily on cross-sectional variations at a point in time. In order to obtain more robust and precise results regarding the impact of standards on trade, new research with panel data and dynamic models are needed. The World Bank is currently considering, for example, to extend the TBT database into a panel dataset. Moreover, new dynamic models should take into account both short-run and long-run cost and benefit from meeting foreign standards for developing countries.

Limited numbers of reliable datasets, which allow for quantifying the impact of technical standards on international trade, are an important impediment for future studies. The difficulty to collect data is a result of heterogeneity of non-technical barriers to trade among different countries. Also, the collection of the firm level data that will allow for cost analysis of technical product standards is a prerequisite for the future research in the area. This direction should be a priority for research organizations engaged in economic research and trade.

Regarding directions for future research, the question of whether to continue to invest in international standards development at Codex and other bodies, given the continued unilateral regulatory decisions taken by governments on SPS measures is a key one. Developing countries are affected in a significant way in regard to the balance between risk and safety reflected in how standards are set. There is a considerable effort being made in those countries to harmonize national standards setting with international ones. Due to the nature of international standards, the alignment to those standards is the choice of the individual country's government or firm. A country or a firm is expected to align with international standards only when it finds the alignment to be profitable by considering WTO disputes if they deviate from recommended standards. The questions such as whether alignment with international standard is costly or cost saving and which international standard a country should align remain to be answered empirically. In addition, whether or not such an effect from harmonization is sector specific should be also examined.

Furthermore, more research which explicitly examines the effect of standards on consumer welfare is needed. As mentioned above, unlike tariffs, standards cannot be simply negotiated away because their existence potentially is justified by remedying market failures. Thereby higher standard may decrease or increase consumer welfare: it may decrease welfare by discouraging the import of cheap products from developing countries while it may increase welfare because of the higher product quality and safety. New research should examine such trade-off and confirm the implication of standard on consumer welfare.

REFERENCES

- Anderson, K., R. Damania, and L. A. Jackson. 2004. "Trade, Standards, and the Political Economy of Genetically Modified Food," *CIES Discussion Paper*, 0410, School of Economics, University of Adelaide, Australia.
- Chen, M. Xiaoyang, T. Otsuki, and J. S. Wilson. 2006. "Do Standards Matter for Export Success?" World Bank Working Paper #3809, World Bank, Washington D.C.
- Chen C., M. Xiaoyang, A. Suzuki, and J. S. Wilson (mimeo). "Do Mutual Recognition Agreements Expand Trade?" The World Bank, Washington D.C.
- David, P. A., and S. Greenstein. 1990. "The Economics of Compatibility Standards: An Introduction to Recent Research." *Economics of Innovation and New Technologies* 1: 3-41.
- Fischer, R., and P. Serra. 2000. "Standards and Protection." *Journal of International Economics* 52: 377-400.

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- Henry de Frahan, B., and M. Vancauteren 2006. "Harmonization of Food Regulations and Trade in the Single Market: Evidence from Disaggregated Data." *European Review of Agricultural Economics*, 33: 337-360.
- Jones, P., and J. Hudson. 1996. "Standardization and the Costs of Assessing Quality." *European Journal of Political Economy* 12: 355-361.
- Maskus K., T. Otsuki, and J.S. Wilson 2005. "The Cost of Compliance with Product Standards for Firms in Developing Countries: An Econometric Study." *The World Bank Policy Research Working Paper Series* 3590
- Maskus, K. E., and J. S. Wilson, eds. 2001. *Quantifying the Impact of Technical Barriers to Trade: Can it be Done?* University of Michigan Press, Ann Arbor.
- Otsuki, T., J. S. Wilson, and M. Sewadeh. 2001. "What price precaution? European harmonization of aflatoxin regulations and African groundnut exports." *European Review of Agriculture Economics* 28 (3): 263-284
- Otsuki, T., and J. S. Wilson. 2003. "Food Safety and Trade: Winners and Losers in a Fragmented System." *Journal of Economic Integration* 18(2)
- Otsuki, T., and J. S. Wilson. 2004. "Standards and Technical Regulations and Firm's Ability to Export: New Evidence from World Bank Standards and Trade Survey." The World Bank, Washington D.C.
- Wilson, J.S., and T. Otsuki. 2004. "To spray or not to spray: pesticides, banana exports, and food safety." *Food Policy* 29(2): 131-146.
- Wilson, J. S., T. Otsuki, and B. Majumdar. 2003. "Balancing food safety and risk: do drug residue limits affect international trade in beef?" *Journal of International Trade and Economic Development* 12(4): 377-402.
- World Bank. 2004. "*The World Bank Technical Barriers to Trade Survey.*" <http://www1.worldbank.org/wbiep/st-db/> (accessed October 20, 2006).

STANDARDS AS BARRIERS AND CATALYSTS FOR TRADE, GROWTH AND POVERTY REDUCTION

*Miet Maertens and Johan F.M. Swinnen**

ABSTRACT

The importance of food standards in global trade has increased sharply. It is argued that these standards imposed by high-income countries diminish the export opportunities for developing countries and lead to an unequal distribution of the gains from trade, resulting in the marginalization of poorer farmers and small agri-food businesses. In this paper we critically review the arguments and empirical evidence on the link between increasing food standards, developing country exports and welfare in those countries; and provide new insights from two original case-studies. We conclude that the empirical evidence is often weaker than claimed and that high-standards agricultural trade can be an engine of pro-poor export-led growth in developing countries.

Keywords: food standards, global supply chains, vertical coordination, poverty.

Developing countries are increasingly integrated in international agricultural markets with lower international trade barriers and domestic reforms. The agri-food exports of low- and middle-income countries have increased from \$ 92 billion in 1980 to \$ 168 billion in 2000, and an increasing share of this comes through high-value trade (Aksoy, 2005). The integration of developing countries in global trade is argued to stimulate economic growth and poverty reduction (Anderson and Martin, 2005). However, the recent debate on food standards casts doubt on the beneficial effect of trade liberalization. The first critique is that the proliferation and tightening of quality and safety standards in high-income markets is causing new (non-tariff) barriers for developing country exports (Augier et al., 2005; Brenton and Manchin, 2002). The second critique is that high-standards trade may do little for the welfare of poor farmers and fishermen, as they may be excluded from high-value supply chains while the rents in the chain are extracted by multinational companies and developing country elites (e.g. Dolan and Humphrey, 2000; Farina and Reardon, 2000; Reardon et al,

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1999). Standards would cause an unequal distribution of the gains from trade and result in the marginalization of poor farmers and small businesses.

The aim of this paper is to review the arguments and empirical evidence on the link between increasing food standards on the one hand and, developing country exports and welfare on the other hand. We first describe the process of increasing food standards. Then we discuss how standards can act as barriers and/or catalyst to developing country exports. The distributional consequences of standards and welfare implications of high-standards agricultural trade are the subject of section four. We conclude with results of two recent studies and their implications.

INCREASING FOOD STANDARDS

In the past two decades food standards – including food quality and safety standards, and technical regulations – have increased sharply and now play a central role in trade. Food standards are increasing not only in quantity but also in stringency and complexity (Farina and Reardon, 2000; Jaffee, 2003; Henson and Mitullah, 2004). This is apparent in a number of ways. First, there are standards at different levels (national, regional and international) which often are not harmonized. Second, both public standards, set by national and international legislators, and private standards, set by food and retail companies, play an important role (Henson, 2006). Third, standards refer both to product characteristics and to the processes of production, handling, processing and transportation. The latter are becoming increasingly important (Farina and Reardon, 2000). Finally, also control and enforcement mechanisms are complex, vary widely across countries, and are increasingly dealt with by the private sector.

A number of factors contribute to explaining the sharp increase in food standards in recent years. First, consumers in high-income markets have a growing demand for product quality and food safety. This demand stems from rising income levels, changing dietary habits and increasing awareness of health and food safety problems – triggered by a series of recent food crises. This has led to public and private action in setting food standards, establishing effective control mechanisms, developing certification schemes and validating food labels. In addition, NGOs played a role. They made consumers aware of ethical and environmental aspects related to food and agricultural trade, which induced an increase in standards related to these aspects.

Enhanced technical and scientific knowledge has contributed to the increasing complexity of food standards. Scientific expertise of food safety risks and agricultural health has facilitated (and justified) the accurate setting of food standards in correspondence with public health interests. Some technological advances (e.g. genetic modification) have generated additional food safety concerns among consumers (Henson, 2006). Also new technical possibilities have shifted norms and consumer expectations.

Another factor is that increased trade in fresh food products prone to food safety risks has increased the need for elaborated food standards that guarantee food quality and safety throughout the supply chain. The share of fresh food products – such as fruits and vegetables, and fish and seafood products – in world agricultural trade, and especially in developing country exports, has increased sharply over the past two decades (Aksoy, 2005). Fresh food

products are not only subject to specific quality demands by consumers in high-income countries; trade in such products also entails higher food safety risks.

The shift towards large retail chains for food distribution has increased the importance of food standards¹. Large retailers such as super- and hypermarkets put much emphasis on freshness, product quality and food safety because the risk of selling 'bad' food is potentially devastating to a branded supermarket – much more than to traditional traders in a wet market where the rule is *caveat emptor*² (Gulati et al, 2005)

Rich country food standards are affecting developing countries through trade and foreign direct investment (FDI). First, while consumers' expectations for quality and safety are much lower in developing countries than in rich countries (Wilson and Abiola, 2003), increased trade in fresh products has imposed rich country standards on developing country producers, putting aside differences in norms between countries that stem from cultural differences, differences in income levels, differences in food safety risks and the perception of these risks. Second, foreign investment in food processing, trading and retailing in developing countries (resulting from a liberalized investment climate and proactive efforts by developing countries to attract FDI in this sector) has also contributed to the spread of high standards in these countries (Swinnen, 2005; Dries and Swinnen, 2004; Reardon, et al., 1999).

FOOD STANDARDS AS BARRIERS AND CATALYSTS FOR EXPORT GROWTH

In principle, food standards, certification schemes and food labels are supposed to be in the interest of public health and to facilitate trade between countries which have diverging implicit norms on food quality and safety. As such, standardization and certification can help to reduce transaction costs related to such trade. Compliance with international food standards can therefore increase developing countries' access to international markets. This process can be a catalyst for upgrading and modernization of developing country's food supply systems which enhances their competitiveness (e.g. Jaffee and Henson, 2005). However, food standards can also be used as (non-tariff) barriers to trade, diminishing export opportunities and offsetting the gains from trade liberalization (e.g. Augier et al., 2005; Brenton and Manchin, 2002). In this section we briefly review the arguments and empirical evidence underpinning these different views

Discriminatory Use of Standards

Increased trade liberalization creates incentives for countries that see quotas removed and tariffs reduced, to (ab)use standards to bar imports and protect domestic farmers and agri-food companies (Neff and Malanoski, 1996). There is evidence that parallel standards are used to

¹ The concentration in food retail is very high in some industrial countries such as France where eight retailers account for 90% of food retails. Also in developing countries, particularly in Latin America and Asia, supermarkets are emerging and rapidly gaining importance. The share of food retailed through these outlets ranges between 30 and 75% in Latin America (Reardon and Berdegúe, 2002).

² *Caveat emptor* or 'let the buyer be aware'.

the disadvantage of developing countries. For example Mathews et al. (2003) find that several countries effectively discriminate by having zero-tolerance for salmonella on imports of poultry products from developing countries while not attaining or monitoring this standard for domestic supplies – which has contributed to a number of disputes raised at the WTO. Also Vermeulen et al (2006) document the use of parallel standards by EU countries to bar Fresh Fruits and Vegetables (FFV³) imports from South-Africa.

The discriminatory use of standards is also reflected in the rise in dispute settlement cases on these issues at the WTO where the Sanitary and Phytosanitary (SPS) Agreement and the Technical Barriers to Trade (TBT) Agreement are intended to prevent this (Hufbauer et al., 2002). A main drawback for developing countries confronted with discriminatory standards is that they often lack the scientific and institutional capacity for WTO dispute settlement. In recent years, however, the participation of developing countries in the WTO institutional processes has improved and the number of SPS related notifications by developing countries has increased (Roberts, 2004).

Cost of (non-)Compliance

High cost of compliance with food standards is another argument in the literature why standards may act as barriers to trade. This cost is argued to be high for developing countries because they generally lack the infrastructure, institutional, technical and scientific capacity for food quality and safety management. In addition, the divergence between national food quality and safety norms and international standards (the ‘standards diverge’) is higher for developing countries, leading to higher compliance costs. For poor countries lacking financial means, the cost of compliance could be prohibitively high, undermining their competitive capacity.

However, the empirical evidence on this issue is limited and what is available suggests that the cost of compliance with quality and safety standards is much lower than generally assumed. For example Aloui and Kenny (2005) estimate the cost of compliance with SPS measures to 3% of the total cost of export tomato production in Morocco. Cato et al. (2005) have estimated the cost to implement compliance to quality and safety standards to be less than 3% and the cost to maintain this compliance less than 1% of the total value of shrimp exports from Nicaragua. Moreover, it is argued that compliance costs could still be reduced if standards would be harmonized and internationally uniform conformity assessment and certification procedures adopted.

In contrast, the cost of non-compliance with standards is potentially very high. The inability to comply with standards can at first lead to border detentions⁴ and ultimately result

³ The term FFV, standing for “fresh fruits and vegetables”, was defined by Diop and Jaffee (2005, pp. 237) to comprise all SITC (Standard International Trade Classification) Revision 1, Chapter 5 items except nuts, roots, and tubers.

⁴ For example, in the period January – May 1999, the US Food and Drug Administration reported almost 3,000 border detentions of imported FFV and more than 1,500 detentions of fishery products, mostly from developing countries, on the basis of contamination, pesticide residue violation and failure to meet labeling requirements (Henson et al., 2000; Unnevehr, 2000)

in trade restrictions such as import bans for specific products⁵. These measures are extremely costly; in the short run in terms of immediate forgone export earnings and in the long run in terms of damaging a country's reputation and eroding its export competitiveness. For example, the EU ban on fish exports from Kenya decreased export earnings by 37% (Henson et al., 2000), and US border detentions of vegetable shipments from Guatemala made this country lose \$ 35 million annually in the period 1995-1997 (Julian et al., 2000).

Benefits of Compliance

Some developing countries have been successful in complying with increasing food standards and developing competitive export sectors. Among the success stories are Thai and Kenyan horticulture, Thai and Nicaraguan shrimp, and Indian spices (Jaffee, 2003, 2005; World Bank, 2005). Also horticultural exports from Senegal and Madagascar can be added to this list as these sectors experienced accelerated growth precisely during a period of increasing standards (see expositions below). Jaffee and Henson (2004) conclude that in these successful cases, high standards were catalysts to upgrade export capacity and to (re)-position the sectors in competitive global markets. In this way, compliance to standards provided a basis for long term export growth.

SUMMARY

The arguments and the evidence briefly summarized in this section suggest that there are important benefits for developing countries to invest in food quality and safety to address international standards while the failure to do so potentially implies very high losses. Important challenges for developing countries are the use of parallel standards by importing countries. A key conclusion would be to abolish these parallel standards and support developing country capacity to challenge these at international trade dispute settlement. A first step in that direction has already been done by the establishment of the Advisory Centre of WTO Law (AWCL) in 2001 (AWCL, 2006).

FOOD STANDARDS AS BARRIERS AND CATALYSTS FOR GROWTH AND POVERTY REDUCTION

Understanding the link between standards on the one hand, and export competitiveness and performance of developing countries on the other hand, is crucial in the design of a broader development agenda as integration in global markets is generally believed to benefit economic growth. Yet, there is a concern that the poor may not benefit proportionately from international trade. Hence, another critical policy issue is to understand the link between standards, export chains and rural incomes in developing countries. The cost and structural

⁵ For example, in 1997 the EU banned fish exports from Kenya on grounds of food safety risks and from Bangladesh on the basis of non-compliance with hygiene norms in processing plants.

changes associated with standards compliance can cause significant redistribution of welfare across countries, along supply chains and in societies (World Bank 2005). This redistribution determines whether high-standards agri-food trade can be an engine for pro-poor growth.

In analyzing these distributive consequences one should distinguish two issues (Swinnen, 2005). The first (“exclusion”) concerns the participation and exclusion of weaker players such as small and medium enterprises and poor farmers. The second (“rent distribution”) concerns the distribution of the gains in high-standards agricultural supply chains. Both issues are critically related to how food supply chains have been restructured in response to increasing standards. We discuss these structural changes and their implications for exclusion and rent distribution in the supply chain. We briefly review the empirical evidence and present insights from two of our recent studies.

Consolidation of the Supply Base

Food standards pose specific challenges – arising from financial, technical and institutional constraints – for small agro-food businesses, exporters and farmers in developing countries to stay in business in export markets. Although, in general the cost of compliance with standards might be low relative to the total export value, this cost might be very high relative to the means of small firms and poor farmers (Reardon et al., 1999). Hence food standards could lead to those weaker players exiting profitable export markets, and hence to the consolidation of the export supply base.

The literature has presented evidence of ongoing consolidation in agricultural export production in developing countries. Dolan and Humphrey (2000) and Jaffee (2003) observed that smaller firms in Kenya and Zimbabwe are increasingly squeezed out of fresh vegetable export while the sector is more and more dominated by a few large agro-industrial companies. There is also evidence of consolidation at the level of primary producers, which is closely related to vertical coordination (VC), discussed in the next section.

Vertical Coordination in the Supply Chains

Compliance with increasingly complex and stringent food standards and monitoring of this compliance throughout the supply chains requires tighter VC in the chains. In order to ensure large and consistent volumes of high-quality and safe produce, importers, food processors and distributors in high-standards markets increasingly procure from preferred suppliers or specialized wholesale markets, often on a contract basis, and thereby push the food distribution system towards more VC. Smaller businesses might be disadvantaged in such vertically coordinated supply chains, which leads to further consolidation. For example in Kenya, the few large vegetable exporters who dominate the sector all have contracts with supermarket chains in the UK and other European countries (Dolan and Humphrey, 2000).

Also upstream the supply chain VC is increasing. Traditional spot market trading systems with ‘middlemen’ are generally not effective in high-standards trade because of high transaction costs related to monitoring compliance with standards. Faced with increased standards, agro-industrial food companies and exporters are increasingly changing their procurement system towards more VC (Swinnen, 2005). This occurs in two ways. First, agro-

exporting firms might increase the coordination within production contracts with primary suppliers. Tighter contract coordination might include additional specifications on product and process attributes, intensified farm assistance programs (e.g. the provision of inputs, credit and extension services), and closer involvement in farm management decisions (e.g. stipulation of a technical itinerary and chemical applications on the farmers' field). Such highly coordinated contracts can ease conformity to food quality and safety standards and reduce transaction costs related to high-standards contract farming.

Second, a more radical change of increased VC implies a shift from smallholder contract-based production towards large-scale vertically integrated estate production by agro-processing and food trading companies. This large-scale vertically integrated way of production increases the scope for standardized production and for meeting high standards at low transaction costs. However, this also entails additional risks and costs for the agro-industry – e.g. labor supervision costs.

Empirical evidence shows that VC in agricultural export supply chains in developing and transition countries has increased as a result of increasing food standards (Swinnen, 2005, 2006). Gulati et al. (2005) have noted a sharp increase in animal contract-production in Southeast Asia in response to increasing standards. For the FFV export sector in Kenya Jaffee (2003) reports intensified extension services and closer governance in supplier-contracts, motivated by increased standards.

However, there is mixed evidence on how far-reaching the shift from small-scale contract-based production to large-scale vertically integrated industrial production actually is. The Kenyan FFV sector has been studied much in this respect but figures on the decreasing importance of smallholder contract-farming vary widely across studies (e.g. Gibbon, 2003; Jaffee, 2003; Dolan and Humphrey, 2000). While Minot and Ngigi (2004) indicate a shift towards vertically integrated agro-industrial production in the banana sector in Ivory Coast, Unnevrher (2000) claims that the fruit export sector in this country is still largely based on smallholder contract-production.

The empirical findings highlight that there might be a divergence in how supply chains respond to increasing standards and that there is a need for more empirical evidence to provide a more general and consistent picture.

Exclusion

The general view in the literature is that small farmers, and especially the poorest ones, are increasingly being squeezed out from high-standards export production. Many authors point to the fact that high standards impede poor farmers' participation in export supply chains (e.g. Reardon et al., 2003; Pimbert et al., 2001; Kherallah, 2000; Gibbon, 2003). The agro-industry prefers to contract with larger farms because of lower transaction costs, especially for monitoring conformity with standards, compared to sourcing from a large number of (dispersed) small suppliers (Key and Runsten, 1999). Moreover, sourcing from poor farmers might imply an additional burden for companies as these farmers might require more intensive farm extension and additional financial assistance in order to meet quality and safety standards.

However, standards are themselves instruments for specifying and harmonizing product and process attributes over suppliers, and can as such also reduce transaction costs in dealing

with a large number of suppliers (Reardon et al., 2003). Moreover, well-specified contracts include farm extension and assistance programs that can alleviate the financial and technical constraints small farmers face in meeting increasingly stringent standards. In fact, high-standards contract-farming with tight contract-coordination and intensified farm assistance programs could provide a basis for constrained small farmers to participate in high-value export production. In addition, firms might prefer to contract with smaller farms because they might have a cost advantage – especially if it concerns labour intensive production with relatively small economies of scale, such as FFV production – or because contract enforcement might be less costly with small suppliers.

While several papers in the literature argue that the poorest farmers are excluded from high-value contract-farming (e.g. Reardon et al., 2003; Weatherspoon and Reardon, 2003; Reardon and Barrett, 2000; Kirsten and Sartorius, 2002; Reardon et al., 1999) there are actually remarkably few studies providing clear empirical evidence on this issue. Further, there is empirical evidence that in some cases poor and small farmers are included to a much larger extent than assumed based on the above mentioned arguments (Swinnen, 2005). Moreover, an important – and much overlooked – argument in the welfare analyses of high-standards trade is that the exclusion of poor farmers from contract-farming, if it happens, is only part of the effect. To fully assess the welfare implications, one needs to take into account new employment opportunities created both at the farm level and the processing and trading level in the chains. As is demonstrated by our Senegal study (see below) the creation of employment for poor workers on vertically integrated large farms has major welfare and poverty implications. In addition, off-farm employment in packaging, contract monitoring, handling, etc. should all be included.

Rent Distribution

Participation of small enterprises and poorer farmers in high-standards export production and trade is a necessary but not a sufficient condition for an enhanced welfare effect of high-standards agricultural trade; they also need to effectively benefit from this participation. It has repeatedly been argued that the gains from high-standards agricultural trade are captured by foreign investors, large food companies and developing country elites (e.g. Dolan and Humphrey, 2000; Farina and Reardon, 2000; Reardon et al., 1999). Consolidation of the export supply base and VC in the supply chain are said to amplify the bargaining power of large agro-industrial firms and food multinationals, displace decision-making authority from the farmers to these downstream companies, and strengthen the capacity of these companies to extract rents from the chain to the disadvantage of poor farmers (Warning and Key, 2002).

However, recent empirical studies have demonstrated a beneficial effect for smallholders participating in high-standards contract production. For example Dries and Swinnen (2004) show that small dairy farmers gain in terms of productivity from contract production with large foreign milk processors. Gulati et al. (2005) provide similar evidence for smallholder animal production in Southeast Asia. Contracts provide a basis for farmers to access the credit, inputs, and technology they need for upgrading their production in terms of productivity and quality. Moreover, there might be important indirect effects as contract-farming can reduce crop price volatility, lead to more stable incomes and reduce households'

cash flow constraints. Such indirect effects are demonstrated in the case-study on vegetable exports from Madagascar presented below.

The standards-induced shift from smallholder contract-based production to large-scale industrial farming is generally perceived as bad from an equity perspective. This shift would marginalize small farmers, change their status from farmers to farm-workers, and diminish the gains they receive from agricultural trade. However, this argument seems to run counter to development economics literature which mentions off-farm employment opportunities as an important catalyst for rural development and poverty reduction due to farm – non-farm linkages. This issue is explored further in the case-study on vegetable exports from Senegal below.

Case Studies on Madagascar and Senegal

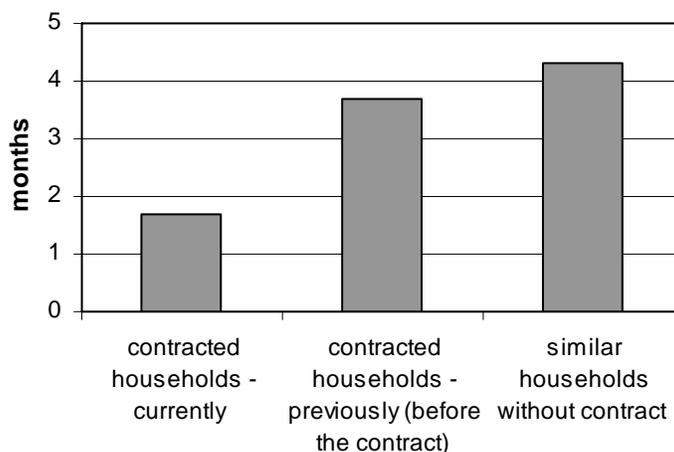
Two of our recent studies provide illustrative examples of the welfare implications of high-standards agricultural trade in poor Sub-Saharan African countries; Madagascar and Senegal.

The Case of Vegetable Exports from Madagascar (from Minten et al., 2006)

In Madagascar – one of the poorest countries in the world with a poverty headcount ratio of 70% – the production of vegetables, mainly French beans, destined for export to EU supermarkets has grown rapidly over the last 15 years despite the imposition of stringent public and private safety and quality requirements and despite major disadvantages of geography, bad local infrastructure, low rural education levels, and high compliance and transaction costs. Exports from Madagascar currently account for around 10% of the French bean market in Europe. Exports go through one company, who has regular contracts with five main supermarket chains in France, Belgium and the Netherlands. The firm follows the supermarkets' private protocols indicating quality specifications, hygiene instructions, and ethical standards such as employment practices. The company itself buys vegetables – mainly French beans – from almost 10,000 small farmers in the Highlands of Madagascar based on contracts. These contracted farms are generally small with an average farm size of 1 ha and cultivate vegetables for export on extremely small plots of land ranging from 0.01 to 0.05 ha. As part of the contract, seeds, fertilizer and pesticides are supplied on credit by the firm at the beginning of the growing season. The firm has set up an elaborate system of on-farm monitoring using a strict hierarchical structure with around 300 permanent extension agents. The majority of contracted farmers (71%) are visited by these company agents at least once a week. With this intensive monitoring system, the company wants to ensure compliance with quality and safety standards, avoid 'side-selling', and provide technical advice to the farmers.

Farmers benefit significantly from this high-standards contract production through a combination of effects. First, the contract directly improves farmers' access to modern inputs and credit. Second, the income gained from contract-farming constitutes 47% of household income. Third, important benefits of contract-farming are better technology and management practices – especially the use of compost - which spillover to other crops and further enhance household income. As a result off-season rice productivity is 64% higher on plots under contract. Fourth, contracts result in higher welfare and more stable incomes. The length of the

lean period has been reduced by two months due to contract-farming (figure 1); which is an important factor for poverty reduction.



Source: Minten et al., 2006

Figure 1. Impact of contract-farming on the length of the lean period in Madagascar.

The Case of Vegetable Exports from Senegal (from Maertens and Swinnen, 2006)

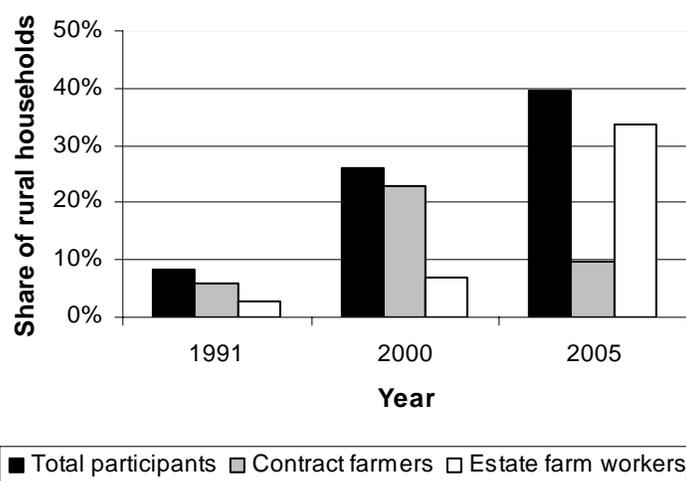
Exports of FFV from Senegal increased sharply over the past 15 years – from 2,700 tons in 1991 to 16,000 tons 2005 – and play a central role in Senegal's export diversification strategy. French beans represent almost half (42%) of the total FFV export volume aside from other major crops including cherry tomatoes (23%) and mangoes (16%). Apart from some small volumes exported to neighboring countries, FFV are exported to the EU; in particular to France (40%), the Netherlands (35%) and Belgium (16%). Senegal ranks fourth as external supplier of French beans to the EU.

FFV exports to the EU have to satisfy a series of stringent public quality and safety standards – including common marketing standards, SPS measures, general hygiene rules based on HACCP control mechanisms, and traceability standards. Moreover, many large trading and retailing companies have engaged in establishing private food standards that are even stricter. For example, the Euro-Retailer Produce Working Group (Eurep) has engaged in adapting food quality and safety standards into the EurepGAP certification protocol. Agri-food businesses in the EU increasingly require such private certification from their suppliers.

Increasing food standards have induced consolidation and increased VC in the vegetable export supply chain in Senegal. First, some of the smaller exporters dropped out, leading to a decrease in the number of FFV exporting firms – from 27 firms in 2002 to 20 firms in 2005 – and to an increasing market share of the largest companies. Second, exporting firms increasingly engage in tighter coordination with downstream importers and wholesalers in the EU through more binding contracts. Third, exporting firms rely on more elaborated production contracts with smallholders and tighter coordination and supervision within those contracts. Fourth, larger exporters in the chain are increasingly engaging in fully integrated estate production instead of relying on contracts with small farmers. In fact, the seven largest exporters have in 1999 founded an organization with the specific aim of becoming EurepGAP certified and have agreed on account of this to seek to obtain at least 50% of the exported

volume from the companies own integrated production. This shift has resulted in a decreasing volume of vegetables that is sourced from smallholders on a contract basis.

These developments have major implications for small farmers and rural households. First, participation of rural households in the export supply chain continues to increase but the nature of this participation has since 2000 changed from contract-farming to estate farm employment (figure 2). Second, not only more but also more poorer households participate in export production as farm workers on agro-industrial estates. Contract-farming in export vegetable production is biased towards relatively better-off (albeit still small) farmers with more land and means to cultivate the land while wage employment in vegetable estates is undertaken by rather poorer and lower educated households. Third, participation in the export supply chain, whether as estate farm worker or as contracted farmer, increases household income substantially. Regression analysis – accounting for potential selectivity and treatment bias – reveals that estate farm workers and contracted farmers have incomes that are 50% to 130% higher than the average income in the research area. Fourth, these developments have a major impact on rural poverty reduction. We simulated that regional poverty is 12% lower due to this high-standards vegetable export production and extreme poverty by 20%.



Source: Maertens and Swinnen, 2006.

Figure 2. Evolution of household participation in vegetable export production in Senegal, % of households in a vegetable producing region.

CONCLUSION

The main conclusion of this study is that the empirical evidence supporting the view of standards being barriers to trade and leading to the marginalization of poor farmers is more limited than generally argued and that recent survey-based evidence suggests that high-standards agricultural trade can be an engine of pro-poor export-led growth in developing countries.

The evidence and the presented case-studies show that with increasing food standards it is possible for poor countries to maintain and develop their competitive capacity in export markets. Firms' strategic responses are important in this but these responses might diverge across countries and sectors, reflecting underlying differences in initial conditions, and lead to different supply chain structures. In Madagascar increasing standards have led to the elaboration of an intensified smallholder contract system with increased coordination, monitoring and extension while in Senegal exporting companies have sought to increase vertically integrated production on bought or rented land. As a result, high-standards vegetable export production is realized through smallholder contract-production in Madagascar while it is increasingly organized around integrated estate production in Senegal. Both strategies have been successful for realizing high-standards exports and for assuring small farmers and rural households to share in the benefits of these exports. The case-study from Madagascar illustrates that given the right incentives poor farmers can successfully participate in and gain from high-standards contract production. The results from Senegal demonstrate that rural households do share in the benefits of high-standards export production, even if this production is realized through integrated estate farming, through labor market effects. Moreover, these positive welfare effects emerge even if the export sector is becoming increasingly concentrated and dominated by one (as in the case of Madagascar) or a few large firms. The benefits rural households receive might be direct or indirect and can lead to improved equity and reduced poverty in rural societies. These studies on the local welfare effects of high-standards agricultural trade clearly indicate that standards can be a catalyst for trade, growth and poverty reduction in developing countries.

Rather than leading to the exclusion of small farms and poor households, standards-induced shifts to integrated estate farming may primarily change the role of rural households in export supply chains from (contracted) farmers to (salaried) farm workers. Furthermore, if contract-farming is indeed biased to relatively larger farms, the shift from smallholder contract-based production to estate production might actually improve the participation of poorer households as farm workers on agro-industrial estates. This puts a new perspective into the debate on poor households' exclusion from high-standards supply chains on which the empirical evidence – that needs to be based on farm and household-level survey work – is still lacking. One of the case-studies presented fills this gap in the empirical literature.

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REFERENCES

- AWCL. Advisory Centre on WTO Law. December 2006. <http://www.acwl.ch>.
- Aksoy, M.A. 2005. "The evolution of agricultural trade flows" in *Global Agricultural Trade and Developing Countries*, edited by Aksoy M. A. and J. C. Beghin, The World Bank, Washington D.C.
- Aloui, O., and L. Kenny. 2005. "The cost of compliance with SPS standards for Moroccan exports: a case-study" Agricultural and Rural Development Discussion Paper, Washington D.C.: The World Bank.
- Anderson, K., and W. Martin. 2005. "Agricultural Trade Reform and the Doha Development Agenda" *World Economy* 28, no9, pp. 1301-27
- Augier, P., M. Gasiorek, and C. Lai Tong. 2005. "The Impact of Rules of Origin on Trade Flows" *Economic Policy* 20, no. 43: 567-623.
- Brenton, P., and M. Manchin. 2002. "Making the EU Trade Agreements Work. The Role of Rules of Origin" CEPS working document no 183, Brussels: Centre for European Policy Studies.
- Cato, C.J., S.W. Otwell, and A.S. Coze. 2005. "Nicaragua's Shrimp Subsector: Developing a Production Capacity and Export Market During Rapidly Changing Worldwide Safety and Quality Regulations" Agricultural and Rural Development Discussion Paper, Washington D.C : The World Bank.
- Dolan, C., and J. Humphrey. 2000. "Governance and Trade in Fresh Vegetables: The Impact of UK Supermarkets on the African Horticulture Industry" *Journal of Development Studies* 37, no. 2 : 147-176.
- Dries, L., and J.F.M. Swinnen. 2004 "Foreign Direct Investment, Vertical Integration and Local Suppliers: Evidence from the Polish Dairy Sector" *World Development* 32, no. 9: 1525-1544.
- Farina, M.M.Q., M. Elizabeth, and T. Reardon. 2000. "Agrifood Grades and Standards in the Extended Mercosur: Their Role in the Changing Agrifood System" *American Journal of Agricultural Economics* 82, no. 5: 1170-11.
- Gibbon, P. 2003. "Value-Chain Governance, Public Regulation and Entry Barriers in the Global Fresh Fruit and Vegetable Chain into the EU" *Development Policy Review* 21, no 5: 615-25.
- Gulati, N. A. 2005. et al. "Growth in High-Value Agriculture in Asia and the Emergence of Vertical Links with Farmers". Paper presented at the workshop *Linking Small-scale Producers to Markets: Old and New Challenges*, Washington D.C: The World Bank.
- Henson, J. S. 2006. "The Role of Public and Private Standards in Regulating International Food Markets" Paper presented at the IATRC Symposium. Bonn.
- Henson, J.S., and W. Mitullah. 2004. "Kenyan Exports of Nile Perch: Impact of Food safety Standards on an Export-Oriented Supply Chain" Discussion Paper, Washington D.C.: The World Bank.
- Henson, J.S., A.-M. Brouder, and W. Mitullah. 2000. "Food Safety Requirements and Food Exports from Developing Countries: The Case of Fish Exports from Kenya to the European Union." *American Journal of Agricultural Economics* 82, no. 5: 1159-69.
- Hufbauer, G., B. Kotschwar, and J. Wilson. 2002. "Trade and Standards: a look at Central America" Institute for International Economics and the World Bank.

- Jaffee, S. 2003. "From Challenge to Opportunity: Transforming Kenya's Fresh Vegetable Trade in the Context of Emerging Food Safety and Other Standards in Europe" Agricultural and Rural Development Discussion Paper, Washington D.C.: The World Bank.
- Jaffee, S. 2005. "Delivering and Taking the Heat: Indian Spices and Evolving Product and Process Standards" Agricultural and Rural Development Discussion Paper, Washington D.C.: The World Bank.
- Jaffee, S., and S. Henson. 2004. "Standards and Agro-food Exports from Developing Countries" Rebalancing the Debate" World Bank Policy Research Working Paper no. 3348, Washington D.C.: The World Bank.
- Jaffee, S. and S. Henson. 2005. "Agro-food Exports from Developing Countries: the Challenges Posed by Standards" in *Global Agricultural Trade and Developing Countries*, edited by Aksoy M.A. and J. C. Beghin, The World Bank, Washington D.C.: The World Bank.
- Julian, W. James, G. H. Sullivan, and G.E. Sanchez. 2000. "Future Market Development Issues Impacting Central America's Nontraditional Agricultural Export Sector: Guatemala Case Study" *American Journal of Agricultural Economics* 82 : 1177-1183.
- Key, N., and D. Runsten. 1999. "Contract farming, smallholders, and rural development in Latin America: the organization of agroprocessing firms and the scale of outgrower production" *World Development* 27 no. 2: 381-401.
- Kherallah, M. 2000. "Access of smallholder farmers to the fruits and vegetables market in Kenya", IFPRI.
- Kirsten, J., and K. Sartorius. 2002. "Linking agribusiness and small-scale farmers in developing countries: is there a new role for contract farming?" *Development Southern Africa* 19, no. 4: 503-529.
- Maertens, M., and J.F.M. Swinnen. 2006. "Trade, Standards and Poverty: Evidence from Senegal" LICOS Discussion Paper no. 177, Leuven: LICOS.
- Mathews, H. K., J. Bernstein, and J. C. Buzby. 2003. "International Trade of Meat/Poultry Products and Food Safety Issues", in *International Trade and Food Safety: Economic Theory and Case Studies*, edited by Buzby J.C, Agricultural Economic Report No AER 828, Economic Research Service, USDA.
- Minten, B., L. Randrianarison, and J. F.M. Swinnen. 2006. "Global Retail Chains and Poor Farmers: Evidence from Madagascar" LICOS Discussion Papers no. 164, Leuven: LICOS.
- Minot, N., and M. Ngigi. 2004. "Are Horticultural Exports a Replicable Success Story? Evidence from Kenya and Côte d'Ivoire" EPTD/MTID discussion paper, IFPRI, Washington, D.C.: IFPRI.
- Neff, A, S., and M. A. Malanoski. 1996. "Trade Reform Increase Likelihood of Challenges to Food Standards" *Food Review*.
- Pimbert, M. et al. 2001. "Global Restructuring, Agri-Food Systems and Livelihoods. Sustainable Agriculture and Rural Livelihoods Programme" Gatekeepers Series no. 100, London.
- Reardon, T., and C. B. Barrett. 2000. "Agroindustrialisation, globalization and international development: an overview of issues, patterns and determinants" *Agricultural Economics* 23: 195-205.

- Reardon, T., and J. Berdegú. 2002. "The Rapid Rise of Supermarkets in Latin America: Challenges and Opportunities for Development" *Development Policy Review* 20, no 4: 371-88.
- Reardon, T. et al. 1999. "Global change in agrifood grades and standards: agribusiness strategic responses in developing countries" *International Food and Agribusiness Management Review* 2, no. 3: 421-435.
- Reardon, T., et al. 2003. "The Rise of Supermarkets in Africa, Asia, and Latin America" *American Journal Agricultural Economics* 85, no. 5: 1140-1146.
- Roberts, D. 2004. *The Multilateral Governance Framework for Sanitary and Phytosanitary Regulations: Challenges and Prospects*. Washington D.C: The World Bank.
- Swinnen, J.F.M. 2005. *The Dynamics of Vertical Coordination in Agrifood Chains in Eastern Europe and Central Asia*. Washington D.C.: The World Bank.
- Swinnen, J.F.M. 2006. *Global Supply Chains, Standards and the Poor*, CABI publishing.
- Unnevehr, L. 2000. "Food Safety Issues and Fresh Food Product Exports from LDCs" *Agricultural Economics* 23, no. 3: 231-240.
- Vermeulen, H. et al. 2006. "Private Standards, Handling and Hygiene in Fruit Export Supply Chains: A Preliminary Evaluation of the Economic Impact of Parallel Standards" International Association of Agricultural Economics Conference, Gold Coast, Australia.
- Warning, M., and N. Key. 2002. "The Social Performance and Distributional Impact of Contract Farming: An Equilibrium Analysis of the Arachide de Bouche Program in Senegal" *World Development* 30, no. 2: 255-263.
- Weatherspoon, D.D., and T. Reardon. 2003. "The Rise of Supermarkets in Africa: Implications for Agrifood Systems and the Rural poor" *Development Policy Review* 21, no. 3: 333-356.
- Wilson, S. J., and V. Abiola. 2003. *Standards and Global Trade: A Voice for AFRICA*. The World Bank. Washington, DC.
- World Bank. 2005. "Food Safety and Agricultural Health Standards: Challenges and Opportunities for Developing Country Exports" Poverty Reduction and Economic Management Trade Unit and Agricultural and Rural Development Department, Report No 31207, Washington D.C.: The World Bank.

THE ROLE OF PUBLIC AND PRIVATE STANDARDS IN REGULATING INTERNATIONAL FOOD MARKETS

Spencer Henson *

ABSTRACT

While much of the focus of the economic literature has been on the role of public food safety and quality standards both as policy instruments and as non-tariff barriers to trade, it is evident that private standards are playing an increasing role in the governance of agricultural and food supply chains. This paper provides an overview of the evolution of private food safety and quality standards, outlining how and why business-to-business and private collective standards have come to play an increasingly dominant role in determining the action of firms in the agricultural and food sectors, and the ways in which such standards influence trade flows. The paper contends that private food safety and quality standards can play a contrasting role in both reducing and enhancing trade in agricultural and food products, although there has been very limited empirical analysis of their impacts to date.

Keywords: Technical barriers to trade; Food Safety; Food Quality; Regulation; Trade.

The proliferation and evolution of food safety and quality standards in industrialized countries, driven predominantly by the reform of regulatory controls in response to consumer concerns about food safety and quality, scientific developments regarding the risks associated with food, and concerns over the economic costs associated with established food-borne hazards, has received much attention in the academic literature (Henson and Caswell, 1999; Garcia Martinez *et al.*; World Bank, 2005). Here ‘food safety’ refers to the attributes of food that have potential effects on human health, while all other product attributes are taken to fall under the umbrella of ‘food quality’; such that food safety attributes can be considered a subset of food quality attributes and indeed there may be an increasing blurred distinction between the two. A major theme in this literature is the potential impact of food safety and quality standards on trade in agricultural and food products (Baldwin, 2001; OECD, 2003; Josling *et al.*, 2004), reflecting both the proliferation of food safety and quality standards and increasing recognition of the importance of non-tariff measures for international trade in agricultural and food products (Henson and Loader, 2001). Indeed, a growing number of

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analytical studies have highlighted the trade reduction and/or diversion effects associated with food safety standards in particular (Beghin and Bureau, 2001). A specific focus of this literature has been the possible adverse impact on developing countries attempting to exploit potentially lucrative markets for high-value agricultural and food products (Jaffee and Henson, 2004; World Bank, 2005), alongside the role of food safety and quality standards in international markets as catalysts for the enhancement of capacity and the strategic repositioning of exports.

Contemporary agri-food systems are increasingly pervaded by a plethora of private food safety and quality standards that operate alongside regulatory systems and which, although not legally binding in a regulatory sense, can be *de facto* mandatory for suppliers (Henson and Northen, 1998). These private standards have evolved in response to regulatory developments and, more directly, consumer concerns, and as a means of competitive positioning in markets for high-value agricultural and food products (World Bank, 2005). More generally, the evolution of private standards reflects the preponderance of ‘soft law’ in the governance of economic national and international systems (Morth, 2004) and the innovation of regulatory systems (Black *et al.*, 2005), including the increasing use of co-regulation (Garcia Martinez *et al.*, 2005). As a result, it is arguably private rather than public standards that are becoming the predominant drivers of contemporary agri-food systems (Henson and Hooker, 2001). Further, there is evidence that private standards, which are well established in many industrialized countries, are fast becoming a global phenomenon, and pervading even developing country agri-food markets (Reardon *et al.*, 2001; Reardon and Berdegué, 2002; Henson and Reardon, 2005). The predominant focus of the economic discourse on food safety and quality standards, however, remains public regulation (Henson and Hooker, 2001) and liability standards (see for example Buzby *et al.*, 2001). This is particularly so in the literature on trade effects of food safety and quality standards, and on the impact of non-tariff measures more generally. While there are signs that the role that private standards play in international markets for agricultural and food products is beginning to be recognized (see for example Jaffee and Henson, 2005; World Bank, 2005), there is a glaring paucity of related empirical studies.

This paper provides an overview of the growing importance of private standards in international markets for agricultural and food products, examining the extent to which these are dominating over the regulatory actions of governments and highlighting the plausible impacts on trade. It outlines the primary drivers behind the evolution of private standards and provides a review of the current situation in industrialized country markets. While there is relatively scant empirical evidence of the impact of private standards on trade in agricultural and food products, it is argued that such standards are fast becoming a primary determinant of market access, especially in selected industrialized countries. At the same time, the evolution of private food safety and quality standards is challenging the role of the World Trade Organization (WTO), in particular the Agreement on Sanitary and Phytosanitary Measures (SPS Agreement) and on Technical Barriers to Trade (TBT Agreement) and the utility of government-to-government diplomacy.

DISTINGUISHING PUBLIC AND PRIVATE STANDARDS

Food safety and quality standards can be promulgated in a variety of institutional forms that differ in the extent to which users have freedom of choice and action regarding compliance and the role of the public and private sectors in promulgating and/or enforcing these standards. Standards can be mandatory in a legal sense or required in practice because of the sheer proportion of buyers that require them (NRC, 1995). Alternatively, standards can be voluntary, such that potential users are free to decide whether to comply. While mandatory standards are generally the preserve of public institutions, both public and private institutions can play a role in voluntary standards governance.

Compliance with mandatory or regulatory standards is obligatory in the legal sense and thus they are generally set by public institutions. Food safety has traditionally been seen as the preserve of government regulation as a means to achieve a socially-desirable level of protection to human health (Antle, 1995; Henson and Caswell, 1999; Caswell and Johnson, 1991), enforced through official inspection of production facilities and/or end products. Voluntary consensus standards arise from a formal coordinated process involving participants in a market with or without the participation of government. A variety of private entities may be involved in the establishment of voluntary consensus standards including industry and trade organizations, professional societies, standards-setting membership organizations and industry consortia, which in some cases are coordinated by a public entity. Broadly, the international standards developed by the International Organization for Standardization (ISO) and national and/or regional standards bodies take the form of voluntary consensus standards. The standards developed by private standards-setting institutions, for example the Safe Quality Food (SQF) Institute and the British Retail Consortium (BRC), are examples specific to food safety and quality. Members of the standards-setting group attempt to achieve consensus on technical specifications that meet best their collective needs. Use of the resulting standards is generally voluntary, although they may be applied by the majority of suppliers, reflecting the economic advantage associated with standardization and/or market requirements. Finally, *De Facto* mandatory standards arise from an uncoordinated process of market-based competition between private firms. When a particular set of products or specifications gains sufficient market share that it acquires authority these specifications are then considered a *de facto* standard. Standards promulgated by private entities are not legally mandated. However, through market transactions such standards may become mandatory in practice; firms have little or no option but to comply if they wish to enter or remain within a particular market.

As will be seen, the broad established trend in high-value agricultural and food markets involves a shift from mandatory standards as the predominant form of governance over food safety and quality, positioned within the public sector, to more voluntary forms of oversight. This opens the way for an increasing predominant role for, and indeed has been actively driven by, the private sector. Thus, the distinction and shift between public and private standards can be seen through both the growing role of standards promulgated by private processes of consensus-building and/or the emergence of propriety private standards as *de facto* mandatory in agricultural and food markets (Henson and Northen, 1998). However, such trends are not unique to the agricultural and food sector. Indeed, the increasing role of voluntary consensus and *de facto* mandatory standards in many sectors is discussed in the

industrial organization literature (see for example Farrell and Saloner, 1985; Katz and Shapiro, 1985), for example through the victory of leading innovative firms (for example the VHS standard for video recording) and/or the efforts of firms collectively to share network externalities (Economides, 1996; Katz and Shapiro, 1994). Similar debates are ongoing in the legal literature where reference is made to the shift from ‘hard’ to ‘soft’ law (Morth, 2004); soft law refers to ‘rules of conduct which, in principle, have no legally binding force but which nevertheless may have practical effects’ (Snyder, 1993), or in the international context as ‘the body of international instruments which *per se* do not make law (that are of non-legal character) but which still possess variable regulatory force’ (Sztucki, 1990).

TRENDS IN GLOBAL FOOD MARKETS

In order to understand the evolution of public versus private modes of governance over food safety and quality it is necessary to recognize and examine underlying processes of change in global agricultural and food markets. A rapidly expanding body of literature in agricultural economics (see for example World Bank, 2005; Fulponi, 2005; Reardon *et al.*, 2001) and rural sociology (see for example Fold and Pritchard, 2005; Busch, 2000; Busch and Bain, 2004; Ponte and Gibbon, 2005) highlights the ways in which agricultural and food systems are being transformed. Increasingly, supply chains for agricultural and food products are extending beyond national boundaries, facilitated in part by new food, communications and transportation technologies and a more liberal trade policy environment (Henson and Reardon, 2005; OECD 2004; Fulponi, 2005; Nadvi and Waltring, 2003). Along these supply chains ownership is becoming more concentrated such that a diminishing number of key economic players have power over global agricultural and food markets. In particular, concentration within food retailing - such that the five-firm concentration ratio (CR_5)¹ in many industrialized countries exceeds 50 percent - is driving a shift towards buyer-driven supply chains (Gereffi, 1999; Gereffi *et al.*, 2003; Humphrey and Schmitz, 2003) that are extending internationally with global sourcing and the emergence of multinational retailers and food service and manufacturing firms. The ways in which dominant firms in the food sectors compete is also changing, with quality attributes being increasingly used for ‘de-commodification’ (Raikes *et al.*, 2000) and product differentiation (Busch and Bain, 2004). Indeed, it is argued that the ways in which agricultural and food markets are structured and operate are defined by quality-based competition, with the institutional arrangements associated with standardization becoming critical to the legitimacy of quality attributes embedded in products (Allaire and Boyer, 1995; Busch and Bain, 2004).

Alongside the structural and institutional transformation of agricultural and food markets have been pervasive trends in consumer demand that have put greater focus on product quality (Kinsey, 2003). Despite major advances in agricultural and food technology and in scientific understanding of the risks associated with food, consumer concerns about food safety persist. In fact, high profile food ‘scares’ in a number of industrialized countries have served to fuel consumer concerns and erode confidence in prevailing mechanisms of food safety control, focused predominantly on public regulation (Henson and Caswell, 1999).

¹ The share of the market held by the five firms with the largest market shares.

Indeed, it is some of these very advances in food technology (for example irradiation and genetic-modification) that have generated concerns among consumers in the form of so-called ‘technological risks’ (Bech, 1992). Conversely, consumers have increasingly focused on a broader array of food product and process attributes when assessing product quality. These quality attributes encompass the manner in which products are produced (for example organic production and animal welfare) and substances present in products that are perceived to be unsafe and/or unhealthy including naturally-occurring constituents (for example cholesterol) and contaminants (for example pesticide residues), as well as the wider impacts of the agri-food chain on the environment, worker welfare, etc. Thus, agricultural and food products are increasingly viewed as a complex array of quality attributes that are packaged in differing combinations and quantities, many of which are credence characteristics that cannot be directly observed even post-consumption.

TRENDS IN FOOD SAFETY AND QUALITY STANDARDS

Overall Trends

The increasing focus of global agri-food systems on food safety and quality attributes has served to highlight the role of product and process standards. While standards are ubiquitous to any market economy (Busch, 2000; Henson and Reardon, 2005; Mainsville *et al.*, 2005) and serve a fundamental role in the organization of supply chains for products and services, the current food safety and quality environment has enhanced the role of agri-food standards, while national and international institutional reforms have served to focus attention on the efficacy of alternative standards regimes and their secondary impacts, including on trade in agricultural and food products. Product and process standards provide a mechanism through which public authorities can regulate the food system in order to pursue social food safety and quality objectives. Indeed, as highlighted above, the predominant focus of the economic literature on food safety and quality standards has been on the scope for failure of food product markets to provide a socially-optimum level of food safety and/or quality, for example due to information imperfections and asymmetries, externalities, etc. (see for example Henson and Traill, 1993; Antle, 1995; Caswell and Johnson, 1991). At the same time, food safety and quality standards are critical for meeting the demands of consumers, and increasingly form the basis of product differentiation in contemporary food markets (Henson and Reardon, 2005). Indeed, Busch and Bain (2004) argue that agri-food standards have come both to codify and define product quality.

In the *public sphere*, regulations have been revised and significant institutional changes made in the oversight of food safety (Jaffee and Henson, 2004), including the implementation of process and performance-based approaches (Caswell *et al.*, 1998). Certainly, there is now enhanced regulatory oversight of food supply chains, reflected in the greater incidence of SPS measures across WTO Member countries. In many cases, food safety standards have been tightened on foods that have long raised safety concerns (for example *Salmonella* and *Campylobacter*), while new measures have been applied to address emerging hazards and/or in areas that were previously less regulated (for example mycotoxins). With respect to food quality, public standards have been implemented to ensure fair competition and/or to prevent

consumers from being misled (for example organic products), and to otherwise promote 'fair' quality-based competition. At the same time, product liability is playing a more prominent role, both through tort liability standards (Buzby *et al.*, 2001) and the 'duty of care' required of food sellers with respect to their legal food safety obligations (see for example Henson and Northen, 1998). These trends have occurred within the context of the institutional framework and rules of the WTO (Henson, 2000; Josling *et al.*, 2004; Roberts, 2004).

In parallel with the evolution of public food safety and quality standards have been moves by the *private sector* to address consumer concerns regarding food safety and/or quality and to harness these concerns as a means to compete in quality-defined markets. Much of the motivation behind this trend has been the mitigation of the reputational and/or commercial risks associated with food product safety, related in part to the level and nature of public regulatory requirements, alongside quality-based modes of product differentiation. More broadly, a wide range of market and firm-level factors motivate the implementation of enhanced food safety and quality controls (see for example Segersen, 1999; Henson and Caswell, 1999) such that there is a rapidly increasing plethora of private 'codes of practice', standards and other forms of supply chain governance (Jaffee and Henson, 2004). These efforts have been especially prominent among large firms in the food retail, manufacturing and service sectors, reflecting both their considerable market power and competitive strategies based around 'own' or private brands that tie a firm's reputation and performance to the quality supplied by its products (Bergès-Sennou *et al.*, 2004). Thus, contemporary agri-food systems are increasingly governed by an array of inter-related public and private standards (Ponte and Gibbon, 2005), especially in supply chains for high-value and quality-differentiated agricultural and food products. Indeed, it has been recognized that the role of public and private mechanisms of governance should ideally be coordinated (Henson and Caswell, 1999), such that co-regulatory approaches (Garcia Martinez *et al.*, 2005) are being increasingly employed aimed at achieving social food safety and/or quality objectives more efficiently.

Both reflecting and supporting the promulgation of private food safety and quality standards has been the development of quality meta-systems (Caswell *et al.*, 1998) such as Hazard Analysis and Critical Control Point (HACCP), good manufacturing practice (GMP) and good agricultural practice (GAP). Some of these meta-systems are embedded in voluntary public standards at the national and/or international levels (for example ISO 22000) and may not be specific to agricultural and food products (for example ISO 9000), while others are propriety private standards developed by standards bodies (for example SQF 2000) or by individual food firms. Such meta-systems can be viewed as 'codes of conduct' for the agri-food system in achieving a particular bundle of food safety or quality attributes and associated supply processes. Increasingly, such systems govern the way in which the entire supply chain operates, from primary production through to retail distribution. At the same time, the evolution of these meta-systems has been both stimulated and facilitated by the development of a multi-tiered system of conformity assessment based around certification and accreditation (NRC, 1995). Thus, contemporary agri-food systems are governed not only by public and private standards, but also by public and private modes of enforcement. While many of these meta-systems started out as voluntary 'codes' of good practice, they are increasingly pervading public regulations (for example through the inclusion of HACCP in regulatory food safety controls) such that the relations between public and private food safety and quality standards are complex (Ponte and Gibbon, 2005); while private standards may

evolve as a means to facilitate compliance with public regulatory requirements, regulators are increasingly adopting the mechanisms employed by private standards, and indeed even referencing private standards, in their rule-making (Henson and Northen, 1998; Henson and Hooker, 2001).

Trends in Private Standards

Private firms arguably have the greatest incentive to implement private standards where there are inadequate public food safety and/or quality standards; here private standards act as a substitute for missing public institutions (Reardon *et al.*, 2001; Henson and Reardon, 2005). Indeed, the demand for food safety and quality by consumers and the actions of firms in response may mean that the implementation of minimum quality standards by government has little or no impact on the safety or quality of products supplied and consumed (Shapiro, 1983; Ronnen, 1991). As firms compete among themselves in national and international markets and attempt to differentiate their products in order to gain and/or protect market share, public standards are unlikely to provide sufficient scope for product differentiation on the basis of safety and quality attributes (Henson and Reardon, 2005) and to reward firms for investing in enhanced food safety and quality controls (Reardon *et al.*, 2001). Thus, there may be strong incentives for leading firms to promulgate private standards in order to differentiate themselves from competitors that operate at or near regulatory food safety and/or quality requirements. Where public standards are well-developed and afford a high level of food safety and/or quality, there may still be an incentive to implement private standards, for example as a means to manage liability, limit exposure to potential regulatory action and/or pre-empt future regulatory developments (Lutz *et al.* 2000). Indeed, where the sunk costs of investing in enhanced meta-systems are high, the benefits from being an early adopter can be considerable (Jaffee and Henson, 2004).

To some extent, regardless of prevailing public food safety and quality standards, private standards have become the predominant basis for product differentiation in markets increasingly driven by quality-based competition. Standards take the form of technical specifications, terms and definitions and principles through which goods are categorized or included in product groupings (Jones and Hill, 1994). Thus, in the context of agricultural and food products they permit the production, identification and preservation of product and process characteristics through the supply chain in a consistent manner over time, especially in the case of credence attributes that relate to how products are produced and handled rather than their intrinsic characteristics (Henson and Traill, 1993; Hobbs *et al.*, 2000). Indeed, private standards have arguably become critical to strategies that differentiate products and firms, requiring the consistent supply of food safety and quality attributes supported by branding and certification (Bergès-Sennou *et al.* 2004). Further, by enabling firms to capture the benefits of the product attributes they supply, private standards provide incentives for asset-specific investments, for example in meta-systems such as HACCP.

Private standards also function as instruments for the coordination of supply chains by standardizing product requirements over suppliers (Henson and Reardon, 2005). This becomes of greater importance as supply chains become more global and encompass differing regulatory, economic and regulatory environments. In turn, standards act to reduce the transaction costs and risks associated with procurement, especially where high levels of

oversight are required in order to ensure that food safety and quality attributes are delivered. The main reduction in costs comes from using process standards to co-ordinate supply chains, with firms complementing the private standards they implement with their own quality meta-systems and branding (Caswell *et al.*, 1998). Indeed, the construction of trust and reputation around the visible symbol of a brand can enhance the credibility of private standards among consumers (Henson and Northen, 1998). To build this confidence on the basis of consistency of standards compliance over time requires rigorous vertical co-ordination that can be costly to achieve. Private food safety and quality standards and the associated processes of conformity assessment are one mechanism through which the associated costs can be managed.

Drives to enhance minimum quality standards, pre-empt regulatory developments and differentiate products, and at the same time manage the transaction costs and risks associated with expansive supply chains, have provided impetus for the evolution of private food safety and quality standards. This has been predominantly driven by the major food retail and/or food service operators that have the oligopsonistic power to induce changes in their supply chains and/or can motivate their suppliers through price premia and other preferential terms. The promulgation of private standards has occurred most notably in industrialized country markets, and in particular Europe, although they are beginning to pervade global supply chains and to be implemented in developing countries (Reardon *et al.*, 2001; Reardon and Berdegué, 2002; Henson and Reardon, 2005). While private food safety and quality standards have become more numerous, their specific forms have also evolved rapidly, arguably at much faster rates than public standards change (Krislov, 1997; Jones and Hill, 1994), reflecting the enhancement and evolution of quality meta-systems and efforts by leading firms to manage the transaction costs associated with private supply chain governance. Indeed, there may be a natural tendency for private standards to transform as leading firms drive new regimes once the level of adoption with existing standards reaches a certain threshold in order to maintain market differentiation and to retain related price premia (Codron *et al.*, 2000).

In most contexts, private food safety and quality standards initially take the form of business-to-business requirements formulated by individual firms in pursuit of their market objectives, in order to facilitate regulatory compliance and manage exposure to product liability (OECD 2004; Fulponi, 2005). The introduction of a 'due diligence' defense in the UK (Hobbs and Kerr, 1992; Henson and Northen, 1998) was arguably the first major impetus for the development of such standards. Prior to 1990, food safety standards in the UK invoked a so-called 'warranty' defense whereby suppliers were only required to show that food products did not enter into a state which contravened legal requirements while under their control. The Food Safety Act 1990 brought about the reversal of legal liability for food product safety along the supply chain, providing for a defense of 'due diligence' whereby suppliers are required to demonstrate that they had been proactive in ensuring that food from suppliers conforms to legal food safety standards. Major food retailers in the UK, that were increasingly utilizing private label products as a means of market differentiation, responded by developing food safety protocols for suppliers that were enforced through second-party audits. Subsequently, the introduction of the EU's Rapid Alert system through which details of products in contravention of legal requirements and that pose a risk to human health are made available to the public, provided impetus for large food retailers and/or importers across Europe to apply greater oversight of their suppliers, most typically through proprietary business-to-business food safety and quality standards.

While the application and enforcement of firm-level food safety and quality standards may afford the highest level of ‘due diligence’ against regulatory liability and the greatest scope for firm and product-level differentiation on the basis of food safety and quality, while promoting competitive advantage on the basis of ability to manage complex networks of firms through the supply chain (Porter, 1990; Casella, 2001; OECD 2004), the associated transaction costs can be extremely high. This is particularly the case where food retailers source from suppliers that are dispersed globally. Thus, through the 1990s a series of competing third party food safety standards were established by industry organizations or private firms as a substitute for business-to-business standards (Henson and Northen, 1998). Although a number of large food retailers began to adopt these standards, initially the leading firms tended to retain their own systems of second party certification because of scepticism about the level of protection third party standards afforded against legal liability. However, in the mid-1990s a discourse began to emerge between the major food retailers, initially in the UK and then more widely, over the development of joint private standards that would permit suppliers to be certified through a single third party audit against a harmonized code (Henson and Northen, 1998). This reflected a growing recognition among large food retailers that a collective private standard would reduce the costs of governing food safety along their supply chains, while expanding the population of suppliers from which they could procure. More generally, it supports the contention that collective private standards evolve as club goods to improve market functioning and promote the competitive advantage of members through voluntary coalitions of firms, often resulting in the formation of new standards bodies (Casella, 1997; 2001). Thus, in the UK all but one of the major food retailers has collaborated in the development of a harmonized private food safety standard through the British Retail Consortium (BRC). Similar efforts by German and (more recently) French food retailers have led to the International Food Standard (IFS). In the United States, the Food Marketing Institute (FMI), a member-based organization supporting the food distribution sector, acquired the Safe Quality Food (SQF) series of food safety standards for agricultural production, food processing, and food distribution that had been originally developed by the Ministry of Agriculture of the State of Western Australia.

Casella (2001) argues that firm-level coalitions for the formation of harmonized collective standards will shift from predominantly national to primarily international as markets become more globally-integrated. Thus, we would predict that, with a diminishing number of dominant global food retailers, efforts will be made to act collectively in areas where there are common interests for standardization, shifting the focus of harmonization efforts from national and/or regional institutions (such as the BRC and IFS) towards the evolution of international private standards organizations. Indeed, this is now being observed through the formation of the Global Food Safety Initiative (GFSI) which is developing guidelines for the benchmarking of national and regional private food safety standards in order to bring about harmonization or mutual recognition of differing codes (see below). Likewise, a coalition of 13 major food retailers across Europe has formed the Euro-Retailer Produce Working Group that has developed a common private protocol on good agricultural practice (EUREPGAP).

Private food safety standards are arguably playing a fundamental role in achieving effective food safety and quality governance along buyer-driven supply chains that are increasingly global in nature (Nadvi and Waltring, 2003; Humphrey and Schmitz, 2003). In many cases, however, standards are not directly communicated to consumers; rather they

support broader product differentiation efforts, for example through private label development. A parallel series of private food safety and quality standards has evolved, however, that are linked to co-brands and/or symbols that are used directly in consumer markets. These have been developed by major food retailers, but also producer organizations in an effort to counteract the dominance of the retail sector. At the same time, there has been a tendency for collective private standards to become more inclusive both vertically along supply chains, through the inclusion of suppliers and/or their representative organizations, and the participation of non-commercial interests, including non-governmental organizations, consumer groups, etc. These trends reflect concerns about the potential anti-competitive impacts of collective private standards, recognition that network efficiencies may be enhanced by the participation of other levels of the supply chain, and the perceived need for oversight by non-commercial interests in order to preserve the legitimacy of private standards.

While it is not clear *a priori* that a single private food safety and/or quality standard is the optimum (Farrell and Saloner, 1986), for example given that firms may wish to differentiate their products and/or otherwise to supply to different standards, there is an inevitable trade-off between economies of scale and the need to reduce transaction costs, and the ability to cater to consumer demands for variety along a continuum of food safety and quality dimensions. More generally, the proliferation of private standards acts to reduce network economies and can enhance transaction costs on the part of both supply chain buyers and sellers. Thus, while the general tendency is towards the dominance of a small number of collective private food safety and/or quality standards that span international markets, it is not evident that a single global standard *per se* will emerge. Indeed, as fast as collective private standards are evolving, leading food retailers are introducing their own proprietary standards that cover particular spheres of food safety and/or quality in order to retain scope for product differentiation. At the same time, international standards are evolving through public or quasi-public institutions. For example, ISO 22000 establishes a global standard for food safety management that encompasses production through to distribution. The impact that this will have on established private food safety standard is yet to be seen.

The amalgam of trends in both public and private spheres has resulted in a complex and dynamic landscape of food safety and quality standards that are highly inter-related and increasingly mimic and/or pre-empt one another (Ponte and Gibbon, 2005), while governance structures increasingly traverse national boundaries. The current standards environment is summarized in Table 1, where a distinction is made between standards that are public mandatory, public or private collective voluntary (thus akin to voluntary consensus standards) and buyer-specific or proprietary standards.² This latter category is increasingly taking the form of *de facto* mandatory standards promulgated by dominant firms. Each standard is also categorized according to whether the geographical location of the actors involved is national or international.

² The current 'state of play' is described in more detail in Henson (2006).

Table 1. Examples of Private Food Safety and Quality Standards

		Public Mandatory	Public Voluntary	Private	
				Collective	Business-to-Business
Focus	National	National Legislation	Food Safety Enhancement Program HACCP Advantage [SQF]*	Dutch HACCP BRC Global Standard Assured Food Standards Qualität und Sicherheit Integrale Keten Beheersing	Nature's Choice (Tesco Stores - UK) Field-to-Fork (Marks and Spencer - UK) Filière Agriculture Raisonnée (Auchan - France) Filière Qualité (Carrefour - France) Terre et Saveur (Casino)
	International	EU Regulations	ISO 9000 ISO 22000	International Food Standard SQF 1000/2000/3000 EUREPGAP	Wal-Mart Nestle

*: Until July 2003.

While a distinction can be made between private standards that apply to one sub-sector and those that lay down codes of practice for the entire supply chain, all encompass meta-systems such as HACCP (Chia-Lui Lee, 2005). Thus, the BRC Global Standard and the IFS essentially apply to food processing, while Assured British Meat (UK) and Qualität und Sicherheit (Germany) encompass both primary production and processing. A further distinction can be made between standards that focus on food safety and those that cover a wider spectrum of quality attributes. The SQF 1000 standard entirely focuses on food safety in agricultural production, while EUREPGAP includes requirements on environmental protection. Enforcement and conformity assessment regimes also differ across prevailing standards. In general, collective private standards are enforced through third party certification, although buyers may undertake second party audits on new suppliers. While some business-to-business standards are enforced through third party audits (for example Nature's Choice of Tesco Stores in the UK), second party audits are more common. Regardless of the standard, third party auditors are generally required to be accredited to the ISO 45000 series by the official accreditation agency in the countries in which they operate. Thus, it is interesting to note that private standards regimes are reliant on public systems of oversight to ensure credibility and allow for a rigorous liability defense.

Alongside ongoing processes of private standards development for food safety, standards are being developed at both the collective and business-to-business levels for a wider range of food quality attributes. These take the form of formal collective standards, often involving a wide group of stakeholders including commercial firms, trades unions, government and NGOs. For example, the Ethical Trading Initiative (ETI) and Social Accountability International (SAI) have both developed labor standards based broadly on International Labor Organization (ILO) conventions that are being increasingly required by food retailers and/or manufacturers that source globally. At the same time, industry organizations are coordinating processes of benchmarking to promote the harmonization and/or mutual recognition of business-to-business standards. This suggests that, while private food safety standards have pervaded the supply chains to major food retailers on an increasingly global basis, similar regimes will increasingly govern food quality attributes.

TRADE EFFECTS OF PRIVATE FOOD SAFETY AND QUALITY STANDARDS

The implementation of private governance regimes for food safety and quality raises challenges for the analysis of international trade in agricultural and food products that are only now beginning to be addressed. As outlined above, private standards are a relatively new element of the food safety and quality landscape and evolving rapidly. At the same time, the predominance and forms of private food safety and quality standards differ widely across countries, products and/or markets. In basic commodity markets, public standards continue to be the principal mode of governance (World Bank, 2005). Across an increasing array of high-value agricultural and food product markets, however, private standards are increasingly the dominant drivers. For example, in the UK all but one of the major food retailers, collectively accounting for around 58 percent of retail food sales, require third party certification to the BRC Global Standard in lieu of their proprietary business-to-business standard when sourcing

private label products. In turn, adoption of the BRC Global Standards has expanded rapidly with the number of certified processing facilities increasing from less than 500, all of which were in the UK, in 1999 to 5,500 across 64 countries in 2005 (BRC, 2005).

Despite the evolution of private standards and their increasing role in the governance of global supply chains for agricultural and food products, most of the current debate on the trade impact of food safety and quality standards has focused on public regulations at the national or supra-national levels (Garcia Martinez and Poole, 2004; Busch *et al.*, 2000). Indeed, public standards remain important. Exporters are still required to comply with regulatory requirements in their export markets, some of which necessitate prior approval at the country and/or facility level before even being able to gain market access (see for example Henson and Mitullah, 2004). At the same time, there is increasing recognition that private food safety and quality standards are becoming the predominant market access issue for a broad array of high-value markets (Henson and Loader, 2001). In this regard, the predominant concern is the impact on developing countries that are seeking to exploit potential market opportunities for non-traditional products as a means to diversify their agricultural and food exports away from tropical commodities (see for example Jaffee and Henson, 2005; World Bank, 2005; Chia-Hui Lee, 2006). However, there is a worrying lack of empirical analysis on the trade effects of private standards, with most studies to date focusing on the impacts of voluntary national or international product standards (see for example Swann *et al.*, 1996; Moenius, 1999) and/or codified quality meta-systems such as ISO 9000 (see for example Turner *et al.*, 2000).

Examining prevailing private food safety and quality standards regimes suggests that the impact on agricultural and food product trade is likely to be complex, with potentially significant trade reduction and diversion. These trade effects are likely to be highly product, exporter and/or importer specific, at both the country and firm levels (Jaffee, 2003; Garcia Martinez *et al.*, 2002). In principle we might be able to analyze the impacts of private standards in a similar manner to public standards, and indeed it has been suggested that the distinction between these two regimes in the trade setting can be over-emphasized. However, isolating the trade effects of particular private standard (for example the BRC Global Standard) and/or the impacts on particular country product exports is made difficult by lack of data and (especially in the case of business-to-business standards) the firm-specific nature of these standards, among other factors. Regardless, at the minimum it is critical that we recognize the role that private standards are playing in determining trade flows and incorporate such considerations in empirical modeling exercises. Perhaps the initial entry point here is detailed case studies before turning to quantitative analysis?

The potential for private food safety and quality standards to impede trade largely relates to the costs of implementing enhanced systems of food safety and quality management, which in many cases go much beyond regulatory requirements. These costs are likely to be greatest for exporters in countries where public and/or private food safety and quality management systems are less well-developed (Wilson and Abiola, 2003). This suggests particular challenges for developing countries where public oversight is compromised by weak infrastructure and poor access to human resources and/or where high-value exports of agricultural and food products are in their infancy (Jaffee and Henson, 2004). Where public or private resources are scarce, the up-front investments can be an absolute barrier to market entry, while the 'ratcheting-up' of standards over time can act to exclude weaker countries and exporters therein. Further, to the extent that there are significant economies of scale

associated with compliance, this will tend to favor larger exporters and/or producers, bringing about processes of market restructuring.

More generally, the growing dominance of buyer-driven supply chains on a global scale requires a new analytical perspective in examining the role of food safety and quality standards as potential barriers to trade. In a world where private standards predominate, the key issue for any exporter is to gain access to a given buyer's supply chain rather than a national market *per se* (Dolan and Humphrey, 2001; Reardon and Farina, 2001). As a diminishing number of leading retail, food service and (to a lesser extent) food processing firms govern these supply chains and/or across these supply chains a declining number of private standards lay down the conditions for entry, there is greater scope for exclusion from entire markets. At the same time, however, for those exporters who do gain access to these supply chains, the benefits in terms of long-term trade relations through systems of 'preferred suppliers' can be significant. More broadly, the challenges associated with compliance with strict private standards can be fundamental catalysts to processes of up-grading and capacity development, while providing opportunities to position themselves strategically in key export markets (Jaffee and Henson, 2004).

Turning to the potential for private food safety and quality standards to facilitate trade, it is evident that processes of harmonization and mutual recognition are taking place with respect to both the standards themselves and the associated systems of conformity assessment. Indeed, these processes are arguably occurring at a much faster rate than is common for national public regulations through bilateral and/or multilateral government-to-government negotiations. At the same time, the shift to third party certification has reduced the transaction costs associated with global supply chains for agricultural and food products to leading food retailers and food service firms. In principle, once an exporter has been certified to a dominant collective private standard, they are able to gain access to the supply chain of all buyers that accept this standard. At the same time, conformity to an established private standard can have a high signal value, even among customers that do not require the standard. This would suggest that dominant business-to-business standards could perhaps have greater scope to impede trade than collective private standards.

The growing predominance of private standards in governing agricultural and food markets raises challenges for public modes of governance at both the national, regional and international levels (Nadvi and Waltring, 2003). Should public authorities concede the governance of global supply chains to private standards or attempt to rein these in? While private standards are influenced by regulatory requirements (Wilson and Abiola, 2003; Ponte and Gibbon, 2005), there are questions over whether and how this influence might be enhanced. There are also wider policy issues, for example the scope for anti-competitive behavior on the part of dominant firms (Casella, 2001). Internationally, while the SPS and TBT Agreements have established an institutional framework that governs the public regulatory activities of WTO Members in the sphere of food safety and quality, private standards would appear to fall outside of this regime. Indeed concerns have been raised about the challenges confronting the SPS Agreement due to the growing importance of private standards, most notably EUREPGAP (WTO, 2005; Chia-Hui Lee, 2006).

CONCLUSIONS

While economists have continued to focus much of their analysis on the role of government regulations and other forms of public action on the management of food safety and quality, private standards have become an increasingly dominant mode of governance in global supply chains for agricultural and food products. To some extent, private food safety and quality standards have emerged in response to the regulatory and reputational risks faced by leading firms in supply chains, most notably major food retailers, but at the same time have been employed to facilitate competitive strategies of product differentiation on the basis of an increasingly wide array of food safety and quality characteristics. Private food safety and quality standards have also evolved from being predominantly business-to-business requirements to collective standards as leading firms have made efforts to manage the transaction costs associated with their global supply chains. As these supply chains have begun to span national borders, private standards have emerged as a critical trade issue.

Empirical research has demonstrated that public food public safety and quality standards can act as significant barriers to trade in agricultural and food products. Although we might expect private standards to have similar effects, there is absence of a comparable body of empirical literature. There is clearly a need for empirical research in this regard, and for quantitative analysis in particular. To the contrary, the trend towards collective private standards and the harmonization and mutual recognition of these standards across global markets suggests that trade in high-value agricultural and food products might be facilitated by the growth of private governance regimes. Indeed, the tendency and speed towards harmonization of Such impacts will occur, however, as a natural consequence of the evolution of private systems of food safety governance rather than by intention or design, while raising challenges for established systems of governance of food safety and quality standards through the WTO.

REFERENCES

- Allaire, G., and Boyer, R. 1995. *La Grande Transformation*. INRA, Paris.
- Antle, J. M. 1995. *Choice and Efficiency in Food Safety Policy*. AEI Press, Washington DC.
- Baldwin, R.E. 2001. Regulatory protectionism, Developing Nations and a Two-Tier World Trade System. *Brookings Trade Review*, 3: 237-280.
- Bech, U. 1992. *Risk Society: Towards a New Modernity*. Sage Publications, Santa Monica.
- Beghin, J.C. and Bureau, J-C. 2001. Quantitative Policy Analysis of Sanitary, Phytosanitary and Technical Barriers to Trade. *Économie Internationale*, 8: 107-130.
- Bergès-Sennou, Bontems, P., and Réquillart, V. 2004. Economics of Private Labels: A Survey of Literature. *Journal of Agricultural and food Industrial Organization*, 2 (3): 1-23.
- Black, J., Lodge, M., and Thatcher, M. (eds) 2005. *Regulatory Innovation: A Comparative Analysis*. Edward Elgar, Cheltenham.
- BRC 2005. *BRC Global Standards*. British Retail Consortium, London.
- Busch, L., and Baine, C. 2004. *New! Improved? The Transformation of the Global Agri-Food System*. *Rural Sociology*, 69 (3): 31-346.

- Busch, L. 2000. The Moral Economy of Grades and Standards. *Journal of Rural Studies*, 16, 273-283.
- Buzby, J., Frenzen, P.D., and Rasco, B. 2001. *Product Liability and Microbial Food-Borne Illness*. Economic Research Service, US Department of Agriculture, Washington DC.
- Casella, A. 1997. Free Trade and Evolving Standards. In: Bhagwati, J.N., and Hudec, R.E. (eds.) *Fair Trade and Harmonization: Prerequisites for Free Trade?* MIT Press, Cambridge.
- Casella, A. 2001. *Product Standards and International Trade. Harmonization Through Private Collations?* *Kyklos*, 54 (2/3): 243-264.
- Caswell, J., Bredahl, M.E., and Hooker, N. 1998. *How Quality Management Meta-Systems are Affecting the Food Industry. Review of Agricultural Economics*, 20 (2): 547-557.
- Caswell, J.A., and Johnson, G.V. 1991. Firm Strategic Response to Food Safety and Nutrition Regulation. In: Caswell, J.A.. (ed). *Economics of Food Safety*. Elsevier Science Publishing Company, New York.
- Chia-hu, L. 2006. Private Food Standards and Their Impacts on Developing Countries. *DG Trade Unit G2, European Commission, Brussels*.
- Codron, J-M., Sterns, J.A., and Reardon T. 2000. *Consumer Preferences, Experience and Credence Issues and Their Strategic Implications for French and US Fresh Produce Sectors*. Paper presented at the annual meeting of the International Agribusiness Management Association, Chicago.
- Dolan, C. and Humphrey, J. 2001. Governance and Trade in Fresh Vegetables: the Impact of UK Supermarkets on the African Horticulture Sector. *Journal of Development Studies*, 37 (2): 147-176.
- Economides, N. 1996. The Economics of Networks. *International Journal of Industrial Organization*, 14: 673-700.
- Farrell, J., and Saloner, G. 1985. Standardization, Compatibility and Innovation. *Rand Journal of Economics*, 16: 70-83.
- Fold, N., and Pritchard, B. (eds.) 2005. *Cross-Continental Food Chains*. Routledge, London.
- Fulponi, L. 2005. Private Voluntary Standards in the Food System: The Perspective of Major Food Retailers in OECD Countries. *Food Policy*, 30 (2): 115-128.
- Garcia Martinez, M., and Poole, N. 2004. The Development of Private Fresh Produce Safety Standards: Implications for Developing Mediterranean Exporting Countries. *Food Policy*, 29: 229-255.
- Garcia Martinez, M., Fearne, A., Caswell, J.A., and Henson S.J. 2005. *Co-Regulation of Food Safety: Opportunities for Private-Public Partnerships*. Imperial College at Wye, Ashford.
- Gereffi, G. 1999. International Trade and Industrial Upgrading in the Apparel Commodity Chain. *Journal of International Economics*, 48: 37-70.
- Gereffi, G., Humphrey, J., and Sturgeon, T. 2003. *The Governance of Value Chains. Review of the International Political Economy*, 12 (1): 78-104.
- Henson, S.J. 2000. *Appropriate Level of Protection: A European Perspective*. Paper presented at the seminar The Economics of Quarantine. Melbourne Business School, Melbourne.
- Henson, S.J. 2006. *The Role of Public and Private Standards in Regulating International Food Markets*. Paper presented at the summer meeting of the International Agricultural Trade Consortium. University of Bonn, May.

- Henson, S.J., and Caswell, J.A. 1999. Food Safety Regulation: An Overview of Contemporary Issues. *Food Policy*, 24: 589-603
- Henson, S.J., and Hooker, N.H. 2001. Private Sector Management of Food Safety: Public Regulation and the Role of Private Controls. *International Food and Agribusiness Management Review*, 4: 7-17
- Henson, S.J., and Loader, R.J. 2001. *Barriers to Agricultural Exports from Developing Countries: The Role of Sanitary and Phytosanitary Requirements*. World Development, 29 (1): 85-102.
- Henson, S., and Mitullah, W. 2004. *Kenyan Exports of Nile Perch: Impact of Food Safety Standards on an Export-Oriented Supply Chain*. World Bank, Washington DC.
- Henson, S.J., and Northen, J.R. 1998. Economic Determinants of Food Safety Controls in the Supply of Retailer Own-Branded Products in the UK. *Agribusiness*, 14 (2): 113-126.
- Henson, S.J., and Reardon, T. 2005. Private Agri-Food Standards: Implications for Food Policy and the Agri-Food System. *Food Policy*, 30 (3): 241-253.
- Henson, S.J., and Traill, W.B. 1993 Economics of Food Safety. *Food Policy*, 18 (2): 152-162
- Hobbs, J. E., Fearn, A., and Spriggs, J. 2002. Incentive Structures for Food Safety and Quality Assurance: An International Comparison. *Food Control*, 13: 77-81.
- Hobbs, J. E., and Kerr, W.A. 1992. Costs of Monitoring Food Safety and Vertical Coordination in Agribusiness: What Can Be Learned From the British Food Safety Act 1990? *Agribusiness*, 8 (6): 575-584.
- Humphrey, J., and Schmitz, H. 2003. Governance in Global Value Chains. In: Schmitz, H. (ed.) *Local enterprises in the Global economy: Issues of Governance and Upgrading*. Edward Elgar, Cheltenham.
- ISO 2005. *The ISO Survey of Certifications 2004*. ISO, Geneva.
- Jaffee, S. 2003. *From Challenge to Opportunity: Transforming Kenya's Fresh Vegetable Trade in the Context of Emerging Food Safety and Other Standards in Europe*. World Bank, Washington, DC.
- Jaffee, S., and Henson, S.J. 2004. *Standards and Agri-food Exports from Developing Countries: Rebalancing the Debate*. World Bank. Policy Research Working Paper 3348. World Bank, Washington, D.C.: The World Bank.
- Jones, E., and Hill, L.D. 1994. Re-Engineering Marketing Policies in Food and Agriculture: Issues and Alternatives for Grain Trading Policies. In: Padberg, D.I. (ed.) *Re-Engineering Marketing Policies for Food and Agriculture*. Food and Agricultural Marketing Consortium,
- Josling, T.E., Roberts, D., and Orden, D. 2004. *Food Regulation and Trade: Toward a Safe and Open Global Food System*. Institute for International Economics, Washington DC.
- Katz, M.L., and Shapiro, C. 1985. *Network Externalities, Competition, and Compatibility*. American Economic Review 75: 424-440
- Kinsey, J. 2003. *Emerging Trends in the New Food economy: Consumers, Firms and Science*. Paper presented at the conference Changing Dimensions of the Food Economy: Exploring the Policy Issues., The Hague, Netherlands.
- Krislov, S. 1997. *How Nations Choose Product Standards and Standards Change Nations*. University of Pittsburgh Press, Pittsburgh.
- Lutz, S., Lyon, T.P., and Maxwell, J. 2000. Quality Leadership When Regulatory Standards are Forthcoming. *Journal of Industrial Economics*, 48 (3): 331-348.

- Moenius, J. 1999. *Information Versus Product Adaptation: The Role of Standards in Trade*. University of California, San Diego.
- Morth, U. 2004. Introduction. In: Morth, U. (ed) *Soft Law in Governance and Regulation*. Edward Elgar, Cheltenham.
- Nadvi, K., and Waltring, F. 2003. Making Sense of Global Standards. In: Schmitz, H. (ed.) *Local enterprises in the Global economy: Issues of Governance and Upgrading*. Edward Elgar, Cheltenham.
- NRC 1995. *Standards, Conformity Assessment and Trade*. National Research Council, Washington DC.
- OECD 2003. *The Impact of Regulations on Agro-Food Trade: the Technical barriers to Trade (TBT) and Phytosanitary Measures (SPS) Agreements*. OECD, Paris.
- OECD 2004. *Private Standards and the Shaping of the Agri-Food System*. OECD, Paris.
- Ponte, S., and Gibbon, P. 2005. Quality Standards, Conventions and the Governance of Global Value Chains. *Economy and Society*, 37 (1), 1-31.
- Porter, M. 1990. *The Competitive Advantage of Nations*. MacMillan, London.
- Raikes, P., Jensen, M.F., and Ponte, S. 2000. Global Commodity Chain Analysis and the French *Filiere* Approach: *Comparison and Critique*. *Economy and Society*, 29: 390-417.
- Reardon, T., and Berdegue, J.A. 2002. The Rapid Rise of Supermarkets in Latin America: *Challenges and Opportunities for Development*. *Development Policy Review*, 20 (4): 371-388.
- Reardon, T., Codron, J-M., Busch, L., Bingen, J., and Harris, C. 2001. Global Change in Agri-Food Grades and Standards: Agribusiness Strategic Responses in Developing Countries. *International Food and Agribusiness Management Review*, 2 (3/4):421-435.
- Reardon, T., and Farina, E.M.M.Q. 2001. *The Rise of Private Food safety and quality Standards: Illustrations from Brazil*. Paper presented at annual meeting of International Food and Agribusiness Management Association, Sydney.
- Roberts, D. 2004. *The Multilateral Governance Framework for Sanitary and Phytosanitary Regulations: Challenges and Prospects*. World Bank, Washington DC.
- Ronnen, U. 1991. Minimum Quality Standards, Fixed Costs and Competition. *Rand Journal of Economics*, 22: 490-501.
- Segerson, K., 1999. Mandatory Versus Voluntary Approaches to Food Safety. *Agribusiness: An International Journal*, 15 (1): 53-70.
- Shapiro, C. 1983. Premiums for High Quality Products as Returns to Reputation. *Quarterly Journal of Economics*, 98: 659-679.
- Snyder, F. 1993. Soft Law and Institutional Practices in the European Community. In: Martin, S. (ed.) *The Construction of Europe: Essays in Honour of Emile Noel*. Kluwer academic Press, Dordrecht.
- Swann, P., Temple, P., and Shurmer, M. 1996. Standards and Trade Performance: The UK Experience. *Economic Journal*, 106: 1297-1313.
- Sztucki, J. 1990. Reflections on International Soft Law. In: Ramberg, L. bring, O., and Sliwinski, R. (eds.) *Festskft Till Lars Hjerner*. Norstedts, Stockholm.
- Turner, C.R., Ortmann, G.F., and Lyne, M.C. 2000. Adoption of ISO 9000 Quality Assurance Standards by South African Agribusiness Firms. *Agribusiness*, 16 (3), 295-307.
- Wilson, J., and Abiola, V.O. (eds.) 2003. *Standards and Global Trade: A Voice for Africa*. World Bank, Washington DC.

World Bank 2005. *Food Safety and Agricultural Health Standards: Challenges and Opportunities for Developing Country Exports*. World Bank, Washington DC.

WTO 2005. Committee on Sanitary and Phytosanitary Measures: Summary of the Meeting Held on 29-30 June 2005 (G/SPS/R/37). World Trade Organization, Geneva

TO REGULATE OR NOT? THE TRADE-OFF BETWEEN FOOD SAFETY AND CONSUMER CHOICE

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ABSTRACT

This paper investigates welfare consequences of food safety regulations. It develops a theoretical model exploring the implications of food safety standards on the number of varieties when consumers prefer more variety to less. Strengthening food standards can result in the loss of varieties that do not meet the required standards, but still generate utility for consumers. The paper examines the relationship between standards and a loss of variety domestically and internationally; and ranks possible international trade policies (harmonization of standards leading to harmonized trade, mutual recognition of others' standards leading to non-harmonized trade, and isolationism leading to autarky) in terms of their welfare implications. The model shows possible welfare worsening consequences of harmonization compared to isolation and concludes that when consumers prefer variety, non-harmonized trade is always welfare improving relative to autarky. Thus, food safety legislation imposed in a good faith might limit consumer choice and welfare.

Keywords: consumer choice, food safety, trade, standards.

Food safety (or lack of it) demonstrates itself in a variety of forms: fast-acting and quickly detectable food-borne illnesses (such as diarrhea, salmonellosis); food contamination likely to lead to an illness in a longer term (e.g. Creutzfeldt Jacob Disease) and food safety issues with yet uncertain outcomes. For the purposes of this paper, food safety standards are defined to be minimum food safety criteria required in the production, processing or distribution of a market product. Some of the most controversial examples of what constitutes safe foods are raw milk cheeses and other dairy products, rare steaks and other meats, undercooked shellfish, raw and soft-boiled eggs, sushi, non-pasteurized cider, etc. The

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concept of food safety and consequent standards are based on each country's historic, cultural, production, culinary and other traditions and perceptions of risks. As such, food safety standards remain in the domestic policy jurisdiction, justifying potential differences across countries. While international efforts to align food safety (and other) standards are under way, international recommendations like the ones of the Codex Alimentarius Commission are not yet developed for all areas, and even where they do exist, countries are guaranteed the right to choose standards they deem appropriate to protect human, animal, and plant health as long as they are least-trade distorting (WTO, 2006). Consequently, different national food safety standards imposed in good faith often interact or even conflict in the international trade arena, and might be suspected of acting as non-tariff trade barriers if trading partners do not subscribe to the same definition and critical levels of food safety.

This paper investigates the welfare consequences of food safety standards. It develops a theoretical model exploring the implications of food safety standards on the number of varieties when consumers prefer more variety to less. In particular, it examines the relationship between standards and a loss of variety domestically and internationally, and ranks possible international trade policies (harmonization of standards leading to harmonized trade, mutual recognition of others' standards leading to non-harmonized trade, and isolationism leading to autarky) in terms of their welfare implications. For the sake of exposition, some aspects of the theoretical model are demonstrated on a simplified example of raw and pasteurized milk cheeses where the quest for uniform food safety on the market could come at the expense of losing valued varieties.

MODEL

Foodstuffs are differentiated not only in the variety space, but also in the attributes space. For example, the "variety space" of "dairy products" includes an assortment of dairy products, such as fluid milk and yoghurt with different fat content, different types of cheese, crème, etc. For the purposes of this paper, each type of cheese represents a different variety. An "attribute" of, for example, soft cheese would be whether it was produced from raw or pasteurized milk. It is assumed that the different attributes lead to different safety levels. Every time a new variety (of cheese) is introduced, the average quantity produced of each variety (of dairy products) declines and the average cost of production rises, but the consumers gain from greater variety, *ceteris paribus*. Once trade opens, each of the two countries in the model produces a set of varieties, and wants to import other varieties that have similar attributes, i.e., similar food safety characteristics.

From a sovereign perspective, each country would determine its own standard (or lack thereof) for defining the attributes (for example, acceptance of raw milk dairy products) to meet domestic consumer preferences. Let's assume each country sets a certain minimum standard: that is, "everything above" the minimum standard is accepted. The implication of this assumption in the dairy example would be that if a country considers raw milk soft cheeses safe, it also accepts pasteurized milk soft cheeses. If a country only considers pasteurized dairy products safe, it prohibits raw milk products. For simplicity assume that both attributes (raw and pasteurized versions) of the same variety are priced equally. The model presented is static, and instantaneous adjustments are made as needed. It is assumed

that consumers are able to distinguish between attributes at no cost to them and that transportation is costless.

Production exhibits increasing returns to scale. Firms in the model do not earn any excess profits, and government does not impose any taxes or award subsidies. Due to the zero profit assumption and the assumption of identical production costs across varieties and attributes, producers are indifferent as to what attribute is demanded from them, so that the attribute is set at a level determined endogenously by the consumers' utility maximizing decision. The "consumer decides" model is well suited to describe the growing role of consumer concerns and demands in trade.

Each country, consisting of like individuals, has access to the same production technologies, and differs from the other country in its consumers' preference for attributes, or in other words, "tolerance level" for what they might perceive as a minimum food safety (in a way that will be made more precise momentarily). We assume that there are no externalities in consumption or production.

We start with a basic Krugman (1979, 1980) model where goods are differentiated in the variety space only. Each consumer has the utility function:

$$U = \left(\sum_{j=1}^N (d_j)^\theta \right)^{\frac{1}{\theta}} \quad (1)$$

where

$$\theta = \left(1 - \frac{1}{\sigma} \right), \sigma > 1 \quad (2)$$

σ represents the elasticity of substitution between varieties, assumed to be constant and the same for all varieties; d denotes consumption of the differentiated goods; and the subscript j denotes the variety. The consumer derives utility from a large number of varieties (indexed one to N). θ is a parameter used for ease in exposition, and does not have a direct interpretation except in terms of the elasticity of substitution (e.g. $\theta = 0$ corresponds to unitary elasticity of substitution and $\theta = 1$ corresponds to no substitutability). With scarce labor and positive fixed costs, it may be that only $n < N$ varieties are actually produced. All varieties enter the utility function symmetrically carrying the same weight. We do not yet distinguish between different attributes.

Each consumer is endowed with one unit of labor only. There is no capital and we normalize the wage per unit of labor to one, so that consumer income consists entirely of wage earnings $w = 1$. The entire stock of labor is used in production; consumers do not derive any utility from leisure. The demand for the differentiated good is obtained through maximization of the CES utility subject to the budget constraint:

$$\begin{aligned} \text{Max} \quad & \left(\sum_{j=1}^N (d_j)^\theta \right)^{\frac{1}{\theta}} \\ \{d_j\}_{j=1}^N \quad & \text{s.t.} \quad \sum_{j=1}^N p_j d_j = 1 \end{aligned} \quad (3)$$

Assuming an interior solution, the first-order conditions for the differentiated good maximization problem are:

$$\left(\sum_{j=1}^N (d_j)^\theta \right)^{\frac{1-\theta}{\theta}} (d_j)^{\theta-1} = \phi p_j \quad (4)$$

$$\sum_{j=1}^N p_j d_j = 1 \quad (5)$$

where ϕ is a Lagrange multiplier. Solving these two first-order conditions yields the demand for variety j where it is optimal to purchase all varieties available in equal quantities:

$$d_j = \frac{p_j^{-\sigma}}{\sum_{j=1}^n p_j^{1-\sigma}} \quad (6)$$

σ represents the elasticity of substitution between pairs of varieties of the same product (i.e., yoghurt or milk as varieties of dairy products). The price elasticity of demand faced by producers is:

$$\varepsilon^D = \sigma + \frac{p_j^{1-\sigma}}{\sum_{j=1}^n p_j^{1-\sigma}} (1-\sigma) \quad (7)$$

As n (the number of actual varieties produced) is large, we make the usual assumption that the firm disregards the second component in the elasticity term, and considers σ to be the elasticity of demand it faces (Helpman and Krugman, 1985).

Up to this point the model closely follows Krugman (1980). Now assume that each variety can have one of two attributes (soft cheese made of raw or pasteurized milk). Consumers have preferences over the two attributes that imply the two are substitutes. In particular, we view quantities of the variety in “quality-adjusted units” (recall each country puts a different weight on different attributes), so that

$$d_j = d_j^R + \lambda^C d_j^P. \tag{8}$$

d_j^R is the quantity of variety j made from raw milk, d_j^P is the quantity of variety j made from pasteurized milk, and λ^C is a country-specific parameter that converts the physical quantity of cheese made of pasteurized milk into a utility-equivalent quantity. For example, if consumers in country C prefer cheese made of pasteurized milk only $\frac{1}{2}$ as much as cheese made of raw milk, then $\lambda^C = \frac{1}{2}$ and it takes 2 units of cheese made of pasteurized milk to generate the utility equivalent to that generated by 1 unit of cheese made of raw milk.

The linear quality adjustment of equation (8) and increasing returns to scale in production ensure that in autarky each country consumes each variety in only one attribute type. To see this, think of consumers constructing their own consumption of variety j by purchasing goods with the two different attributes and putting them together. Using this interpretation, the price of a unit of variety j is the minimum cost of creating the variety from the components with the two different attributes. If we let p_j^R and p_j^P represent the prices of the components with the different attributes (although both are priced equally, we keep the superscripts for the sake of exposition), then the price of the bundle is $p_j = \min\left(p_j^R, p_j^P / \lambda^C\right)$. This follows from

the fact that it requires $1/\lambda^C$ units of the good with the attribute of “made of pasteurized milk” to provide the same utility as one unit of the good with the attribute of “made of raw milk”. If $p_j^R < p_j^P / \lambda^C$, then consumers only demand the attribute of “made of raw milk” for variety j . If the inequality is reversed, they demand only the attribute of “made of pasteurized milk” for variety j , and if the two are equal, consumers are indifferent (but increasing returns to scale means that only one attribute type will be produced). Since the process of the constituent components can, in principle, vary by variety, it is possible that some varieties will be constructed of only raw milk products, others of only pasteurized milk products.

Producers follow a Krugman model of monopolistic competition, assuming fixed and marginal costs are identical across raw and pasteurized milk made varieties. Increasing returns in the differentiated sector are internal to firms – an initial outlay of labor (“fixed cost”) is needed to start up production, resulting in decreasing average cost; marginal costs are constant within a variety, attribute combination. Firms producing differentiated goods are assumed to be symmetric, resulting in the same price and output across varieties. The presence of the scale economies ensures that in equilibrium only a finite number of varieties are produced, each firm produces a different variety, and each variety will be produced with one attribute (made of raw or pasteurized milk) only. Each firm producing to a certain

specification faces the same cost function regardless of its location. All varieties are perfect substitutes in production. The number of varieties produced within the economy is determined by the number of firms. Firms can enter freely into the differentiated industry. The usual profit maximization and zero-profit entry conditions apply regardless of the chosen attribute. These conditions, along with consumer demands, determine price and production levels. The equilibrium in production is described by the number of firms and the price level. Since only labor is used in the production, following Krugman (1980) we specify the cost functions:

$$c_i(y_i) = wl_i(y_i) = w(S + y_iM) \quad (9)$$

where $l_i(y_i)$ is the labor requirement to produce y_i units of variety i regardless the attribute, S is the fixed labor component, and M is the marginal labor component for producing any variety. Letting the wage equal one, we set marginal revenue equal marginal cost to find the profit-maximising price charged for variety j :

$$p_j = \frac{\sigma}{\sigma - 1} M \quad (10)$$

Since all varieties with a given attribute have the same marginal cost, the price of all varieties with the given attribute will be the same. By free entry, profits are driven to zero, so that average cost equals price. After solving the model, this implies that each firm will hire $S\sigma$ workers. If the amount of labor available is L , then the total number of varieties regardless the attribute will be:

$$n = \frac{L}{S\sigma} \quad (11)$$

In the basic Krugman model, marginal costs impact price, while fixed costs together with the size of the economy influence the number of varieties produced in an economy.

WELFARE EFFECTS OF DIFFERENT FOOD POLICY STRATEGIES

Isolationist Domestic Policy

For a single [autarkic] economy with identical consumers, only products made of raw milk are produced if $\lambda < 1$. Only products made of pasteurized milk are produced if $\lambda > 1$. Consequently, the indirect utility function (labelled V) in the country preferring “raw milk” dairy products is:

$$V^R = \frac{1}{p} n^{\frac{1-\theta}{\theta}} \tag{12}$$

If the country puts greater weight on “pasteurized” products, the indirect utility becomes:

$$V^P = \frac{\lambda}{p} n^{\frac{1-\theta}{\theta}} \tag{13}$$

Superscripts on V serve merely notational purposes, R indicates only raw milk cheeses (or other dairy products) are produced, P indicates only pasteurized milk dairy products are produced. Notice λ (the weight put on the pasteurized milk attribute) is listed without a country superscript due to the single-country case. Define $W(\lambda) = \max(V^R, V^P)$ to be social welfare as a function of λ the marginal rate of substitution between different attributes of the same variety. The graph $W(\lambda)$ is shown in figure 1. For $\lambda < 1$ the country maximizes welfare by producing only with the “raw milk” attribute. As λ exceeds 1, only varieties with the “pasteurized milk” attribute are produced. Social welfare increases as a function of λ since the value to consumers of the “pasteurized milk” attribute increases as λ increases.

Any enforcement of a standard different from the standard prevailing on the basis of consumer preferences for attributes (raw or pasteurized dairy products) would result in lower welfare since in case of linear preferences utility is maximized by consuming only one type of product. Consumption of other types of product or both products would locate the consumer on the lower indifference curve. So far we have assumed that the cost of production is the same across attributes and varieties and thus consumers were deciding on the basis of their preferences with the cut-off point of marginal rate of substitution between attributes being one.

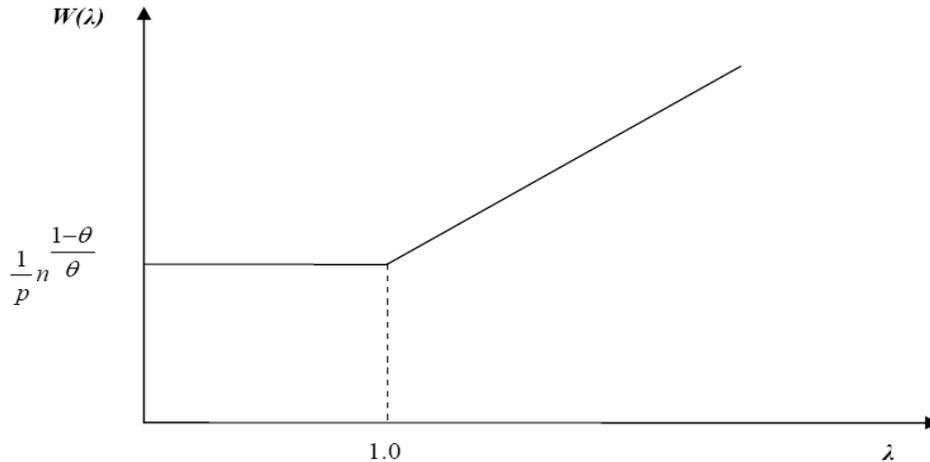


Figure 1. Social welfare as a function of weight put on the consumption of “pasteurized milk” attribute: isolationist policy (autarky).

Harmonization

“Opening trade” in a one-factor model coincides with Krugman (1980), and translates into a larger factor (labor) pool, as well as a larger product market to supply. Constant elasticity of demand assures the price levels (or, outcomes of the profit maximizing conditions) do not change. The growth in the size of the market measured as an increase in the labor force does not influence the individual firm’s output, but divides it among a larger number of consumers, resulting in lower per capita consumption of any variety. Also due to the constant elasticity assumption, the entire increase in the stock of labor in the integrated economy is directed into production of varieties not existing in autarky, and does not increase the amount of labor directed to existing varieties. Intuitively the basic Krugman model claims that trade is good as it (at least) increases the number of available varieties, as is the case in this model, and consumers in the integrated economy benefit from a larger number of varieties available to them at the price identical with the autarky price. Therefore, having more varieties available in an open trade than in autarky is a sufficient reason to trade and integrate (Krugman, 1980).

In a free trade situation, a country that can import one variety from another country can reallocate the resources previously used in the production of one variety to production of a new variety and consumers benefit from the introduction of a new variety. However, in order to trade, the country must find an exporter whose minimum attributes match (or exceed) the domestic attributes. One way to accomplish this is by adapting the domestic attributes to world market conditions or attributes, but this entails a decrease in utility (from consumption at sub-optimal attributes) since the attributes were originally set to meet domestic consumer preferences. Thus, the country must trade off the utility gained from an increase in the variety of food available with the loss in utility from sub-optimal attributes.

For open trade scenarios we assume consumers in each country are able to distinguish between attributes, “raw” and “pasteurized” dairy products are perfectly traceable, and segregation is guaranteed. Product labelling schemes, if present, are costless. Possibly allowing for differently sized economies, and consequently differing numbers of varieties across countries, define n to be number of varieties in the home country, and n^* to be number of varieties in the foreign country. When a non-harmonized trade is not a policy option, in order to trade, countries must harmonize their production (and consumption) standards. The presence of fixed costs prevents production of both attributes: if a certain variety would be produced in both attributes, the country sacrifices production of new varieties and is not producing on the highest point of its production possibilities frontier. The number of varieties produced in each country depends on the country’s labor force. If trade is permitted, and all goods are standardised to the attribute “pasteurized”, the indirect utility function is:

$$V^P = \frac{\lambda}{p} (n + n^*)^{\frac{1-\theta}{\theta}} \quad (14)$$

If trade is permitted, and all goods are standardized to the attribute “raw” (recall that attribute “raw” includes both “raw” and “pasteurized” dairy products), the indirect utility function is:

$$V^R = \frac{1}{p}(n+n^*) \frac{1-\theta}{\theta} \tag{15}$$

With a single representative consumer in each country, the indirect utility is in fact the social welfare. Each harmonized indirect utility function is graphed in figure 2 (equal size country case; for different size countries the utility has to be weighted by the relative size of the country). If the countries have similar preferences, i.e. $\lambda, \lambda^* \geq 1$ or $\lambda, \lambda^* \leq 1$, where λ is the domestic preference parameter and λ^* is the foreign one, then the countries enjoy similar preferences and standards and trade is straightforward. If the home country has $0 < \lambda < \underline{\lambda}$, it prefers trade standardized to raw then autarky and would retain the smallest utility from trade standardized to pasteurized. If the foreign country has $\lambda^* > \bar{\lambda}$, it prefers trade standardized to pasteurized to autarky, with the latter being still better than trade standardized to raw. In this case the countries will not be able to find a mutually beneficial trade regime (i.e., will not agree on a product standard). If however, $\underline{\lambda} \leq \lambda \leq 1$ or $\bar{\lambda} \geq \lambda^* \geq 1$ then the countries can reach a mutually beneficial trade agreement. Within these ranges, each country will prefer either trade regime to autarky, and thus will benefit even if trade is harmonized to the other country's standard. The particular trade regime agreed upon will depend on the values of λ and λ^* and nature of the negotiations and bargaining power of the two countries.

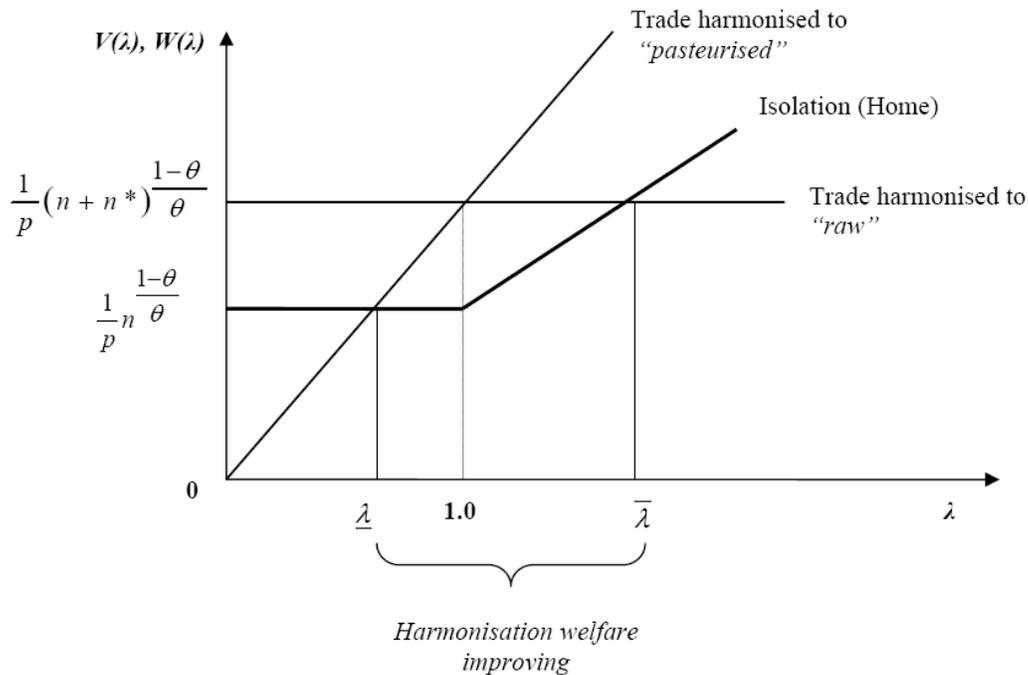


Figure 2. Social welfare as a function of λ : isolation, harmonisation to “raw” and “pasteurized”, equal size country case. Figure drawn from a single country perspective.

A similar diagram illustrating open trade and autarky welfares in a small and large country is graphed in figure 3. Note that figure 3 is analogous to figure 2, but that the curves measure social welfare as a representative consumer’s utility. When the countries are the same size (have the same number of representative consumers), then the representative consumer utilities are the same as country welfares. When the countries are different sizes, the representative consumer from the large country may represent a greater population than does the representative consumer from the small country. However, the ranges of preferences (i.e. the range of λ) over which the country prefers trade will be the same as the range of preferences over which the representative consumer prefers trade.

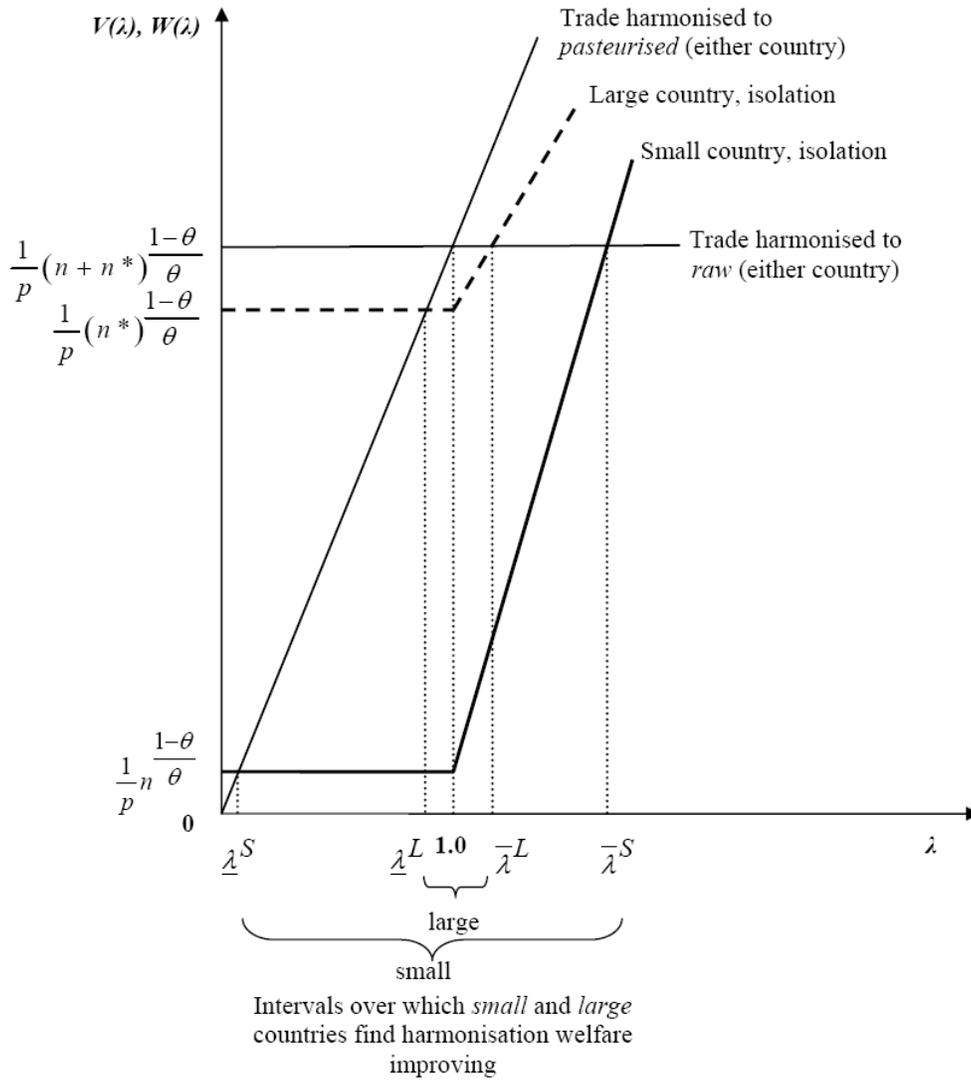


Figure 3. Social welfare as a function of λ : isolation, harmonisation to “raw” and “pasteurized”, small and large country.

In figure 3, on the abscissa we notice two intervals: an interval over which the small country finds harmonization to either trade regime beneficial ($\underline{\lambda}^S, \bar{\lambda}^S$), and an interval over which the large country finds the harmonization to either trade regime beneficial ($\underline{\lambda}^L, \bar{\lambda}^L$). $\underline{\lambda}^S$ is the solution to

$$\frac{\lambda}{p}(n+n^*)\frac{1-\theta}{\theta} = \frac{1}{p}n\frac{1-\theta}{\theta} \Rightarrow \underline{\lambda}^S = \left(\frac{n}{n+n^*}\right)\frac{1-\theta}{\theta} \quad (16)$$

$\bar{\lambda}^S$ is the solution to

$$\frac{1}{p}(n+n^*)\frac{1-\theta}{\theta} = \frac{\lambda}{p}n\frac{1-\theta}{\theta} \Rightarrow \bar{\lambda}^S = \left(\frac{n}{n+n^*}\right)\frac{\theta-1}{\theta} \quad (17)$$

Similar calculations using the autarky number of varieties of the large country (n^*) apply to $\underline{\lambda}^L$ and $\bar{\lambda}^L$. Interpreting figure 3, if the small country has $\lambda^S < \underline{\lambda}^S$, then for the small country trade standardized to “pasteurized” is worse than autarky. If the large country has $\lambda^L > \bar{\lambda}^L$, then for it trade standardized to “raw” is worse than autarky. Thus, whether the attribute is “raw” or “pasteurized”, in this case one country will be worse off than autarky and will not agree to the harmonization.

Notice that the length of the interval over which the small country finds the unilateral harmonization beneficial is large, while the interval over which it is favorable for the large country to change its own standard to harmonize with the small country is narrow. In addition, if the large country decides unilaterally to harmonize, the large-country representative consumer’s gains from trade is small compared to the small country’s representative consumer’s gains from trade. That is, it is far more likely that the small country will harmonize to the large-country standard than conversely.

Pesticide residue standards for fruits and vegetables are examples of where the small country (e.g. Chile) agrees to the standards imposed by a larger importer (e.g. the U.S.) in order to access the U.S. market. Maximum residue limits for beef tetracycline and livestock disease standards are similar examples.

Non-Harmonized Trade

For welfare comparison, suppose now that the countries – regardless of their size – would allow trade without requiring harmonization of attributes. One country produces (and trades) only raw milk varieties (regardless of what the other country does). In that case the indirect

utility function from consuming both raw and pasteurized varieties (as earlier, assuming fixed and marginal costs are attribute and variety invariant) is:

$$V = \frac{1}{p} \left(n + n^* \lambda^{\frac{\theta}{1-\theta}} \right)^{\frac{1-\theta}{\theta}} \quad (18)$$

where n and n^* are the numbers of varieties produced in the individual countries. It is possible $n \neq n^*$ due to differing endowments across countries, not different technologies across countries. A representative consumer consumes varieties previously available in autarky, as well as varieties produced in the other country. If $\theta > 0.5$, the “non-harmonized” trade social welfare is convex for $\lambda \in \langle 0, 1 \rangle$, as graphed in figure 4 (If $\theta < 0.5$, the “non-harmonized” trade social welfare is concave for $\lambda \in \langle 0, 1 \rangle$, but the same general results apply). Non-harmonized trade is always welfare increasing regardless of the weights in the linear utility function (λ).

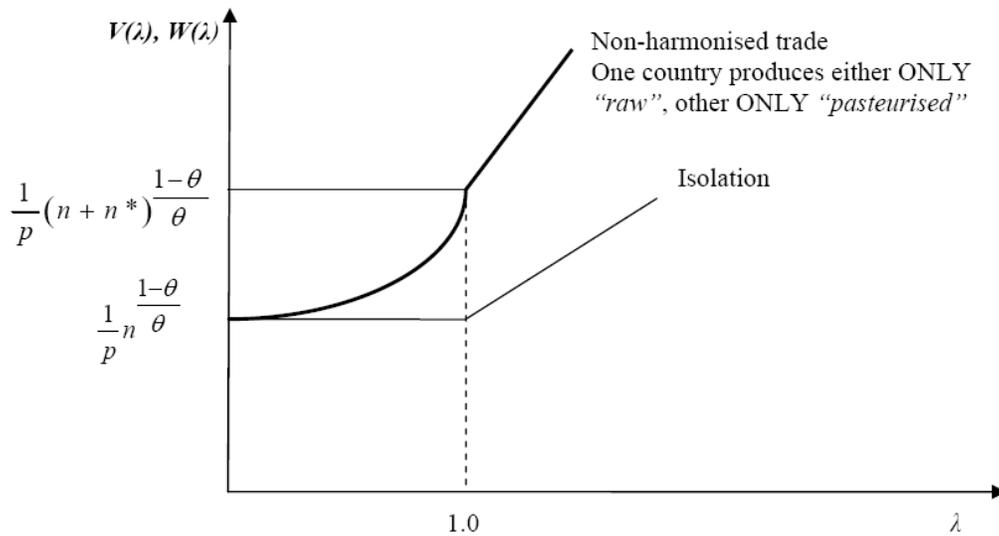


Figure 4. Social welfare as a function of weight put on the consumption of pasteurized version: isolation and non-harmonized trade, $\theta < 0.5$.

Examples of non-harmonized trade with respect to food safety are rare. Non-food examples of products with different standards include electrical appliances such as travel irons or radios that use different types of plugs or batteries.

An extension of the paper is to explore de facto “clubs” of countries that adopt similar standards (or lack of standards) for food safety between countries, taking countries’ preferences for a particular regulatory approach as exogenous and rooted in the consumers’

preferences. Tothova and Oehmke (2004) conclude that when harmonization of standards and regulatory approaches is required for trade to occur but countries' standards and preferences are very diverse, countries are better off maintaining different standards and remaining in autarky rather than harmonizing or reaching a compromise standard. When countries do not globally harmonize or compromise, the model gives rise to de facto "clubs" of countries. Members of each club have similar standards and are engaged in food trade with other members of that club (i.e., they harmonize within the club). Differences in standards across clubs prevent members of different clubs from trading food products, so that there is no cross-club trade in food products. This paper does not pursue the idea of polarization of trading partners into two clubs based on standards rooted in consumer preferences and emergence of trade agreements, although clubs (or trade agreements with like-minded partners) offer an opportunity to consume a larger number of varieties compared to autarky (for discussion see Tothova and Oehmke, 2004).

CONCLUSIONS

In setting up domestic regulations in the area of food safety regulators take into account human, animal, and plant health. However, as this paper shows, regulations that are too tight are likely to lower welfare as they restrict the number of varieties available. The model above demonstrated that in an environment that values variety, non-harmonized trade is always welfare improving relative to autarky. However, setting up appropriate policies and marketing channels for non-harmonized trade appears to be difficult. At a minimum, such a situation would require some sort of identity preservation and labelling system. The costs of such systems are not well studied, but Bullock and Desquillbet (2002) argue that in some cases these costs could be significant. Even in the presence of such a system, product liability issues for the product with the less restrictive food safety standard could eliminate the incentive for suppliers to trade.

If harmonization of standards is required for trade to occur, countries are risking lower welfare due to consuming varieties on a different standard as opposed to their standards that prevailed in autarky. In the case of differently sized economies, a small country could choose not to harmonize if meeting the large-country standard meant a cost increase to farmers or processors relative to the traditional way in which a staple crop was produced. A small country could find harmonization beneficial if consumers are largely indifferent between the existing standard and that required by the trading partner, and the costs of production are similar. If trade is desired, small countries might have to harmonize their standards with large countries, or produce according to a "non-aligned" standard for the domestic market only. In the latter case, the economies of scale might not be sufficient to sustain production, as cheaper (although less desired) imports flood the market, and/or identity preservation costs might be high, and the number of varieties would drop. Continuing to develop international guidelines setting minimum food safety standards would be helpful. However, food safety legislation imposed in a good faith effort to protect consumers might limit consumer choice and welfare. In addition, a country deciding to choose more stringent standards that it deems appropriate for human, animal, and plant health might still be suspected of imposing a non-tariff trade barrier.

The model in the paper has assumed that production costs are the same across varieties. It may be that in the case of food safety, achieving a higher standard entails higher production costs. The country that preferred the (relatively) “low” standard for reasons discussed in the introduction would have to pay the higher production costs in order to meet the importing country standards. In the absence of an identity preservation system these higher costs would be incurred by all producers, even those targeting the domestic consumer, and these higher costs would be passed on to the domestic consumer. Thus, the basic intuition of the model holds (there is little difference in the model between lower consumer utility because they do not like the product and lower consumer utility because they pay more for the product as can be seen in the construction of p_j or in the indirect utility functions (14) and (15)). The range for which harmonization is welfare improving for the country with preferences for the lower standard decreases as the cost of achieving the higher standard rises, and if the difference in production costs is sufficient, then isolation may be the socially optimal policy.

The model does not incorporate negative health externalities. The presence of negative external health risks due to consumption of products that meet only the other country’s lower standard could mitigate the gains from non-harmonized trade. I.e. if by consuming at the lower standard a consumer could get sick (which is accounted for in his utility function) and a contagious disease is passed to another consumer (the externality), the welfare loss of the second consumer(s) could offset the gains from accessing a greater variety of products through non-harmonized trade. Similarly, an externality occurs if other taxpayers have to pay for the health care costs of the original consumer. A food-safety regulator could seek to enforce a stricter standard than desired by the individual consumer, in order to internalize the externality. For example, the regulator, maximizing the social welfare function that internalizes the cost of treating potential food-borne illnesses from consuming dairy products made of non-pasteurized milk, might restrict the use of non-pasteurized milk or tax dairy products made of raw and pasteurized milks. Such actions would limit the negative externality (or tax dollars could be spent on control), but they would also limit the gains from non-harmonized trade.

In conclusion, international food safety standards are most likely to be welfare improving when there is little discrepancy across countries about what constitutes safe food, and when the standards apply to contagious diseases. In this case the standards will facilitate harmonized trade and there will be gains from trade with relatively little concern about consumer distaste for the standard. When consumers in different countries are notably different in what they consider to be safe, and when the standards apply to safety issues that apply primarily to the individual(s) consuming the food, then international standards can act to limit individual choice and decrease welfare even in a trade situation.

REFERENCES

- Bullock, D.S., and M. Desquilbet. 2002. The Economics of Non-GMO Segregation and Identity Preservation: *Food Policy* 27: 81-99
- Helpman, E., and P. Krugman. 1985. *Market Structure and Foreign Trade*. Cambridge, MA: MIT Press.

- Krugman, P., 1979. Increasing Returns, Monopolistic Competition, and International Trade. *Journal of International Economics* 9(4): 469-79.
- Krugman, P. 1980. Scale Economies, Product Differentiation, and the Pattern of Trade. *American Economic Review* 70(5): 950-959.
- Tothova, M. 2004. *Truth vs. Beauty: Essays on Standards, Trade, and Agreements*. Doctoral Dissertation. Michigan State University, East Lansing, MI.
- Tothova, M., and J. F. Oehmke. 2004. Genetically modified food standards trade barriers: harmonisation, compromise, and sub-global agreements. *Journal of Agricultural and Food Industrial Organization*, (Vol 2 Article 5). Available on-line at <http://www.bepress.com>.
- World Trade Organization. 2006. Various online materials. Available at <http://www.wto.org>. Accessed on May 2, 2006.

CONSUMER DEMAND FOR QUALITY: MAJOR DETERMINANT FOR AGRICULTURAL AND FOOD TRADE IN THE FUTURE?

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ABSTRACT

The impact of consumer demand for quality on the agricultural and food system is an increased emphasis on quality differentiation but not all in the direction of upgrading quality. The more elite market segments are thriving and reaching growing numbers of consumers but the basic price/quality markets remain strong. Most recent economic studies find that consumers are willing to pay for food safety and other quality attributes, and for information about them. The magnitude of the valuations varies by food product, attribute, country, and study design. This literature and a case study of genetically modified foods suggest that consumer demand has a strong effect on agricultural and food trade.

Keywords: food quality, food safety, consumer demand, willingness to pay, international trade.

Analyses of the effect of changes in consumer demand on agricultural and food trade have a tendency to begin with sweeping statements such as “consumer demand is a key driver of today’s agricultural and food trade,” “demand for quality is increasing among consumers around the world,” or “the agricultural system is moving from being commodity based to being based in differentiated food products.” While these statements may be generally true, they have the usual drawback associated with sweeping statements—they tend to obscure important facts. Here we focus on where consumer demand for specific food quality attributes, including safety, is coming from; its nature and level; and how likely it is to affect agricultural and food trade in the future.

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TRENDS IN CONSUMER DEMAND

Product quality is determined by the set of attributes or characteristics of a food product, as well as how those attributes and characteristics are assured and communicated to consumers. Information on food quality for consumers is featured in the media, and delivered by health care professionals, governments, consumer groups, and food processors and retailers as part of their advertising strategies. Overall, consumer food choices are influenced by a variety of factors including taste, convenience, price, available alternatives, health status, and cultural traditions. Consumers are thinking about quality attributes such as food safety, nutrition, organic production, fair trade, free range, animal friendly, and locally grown. There is nothing new in consumers caring about multiple attributes of food products but the continuing differentiation of food products means that consumers can get information on and care about a broader range of attributes.

Consumers come to the market with prior experience, a level of education, perceived quality risks, a quality consciousness, goals they hope to achieve in using the product, and other personal and situational factors. Companies use these factors to design marketing efforts and choose quality control systems that will produce quality and also allow them to signal (communicate) quality to consumers using indicators and cues, such as certification systems, labeling, and branding. These cues and indicators are particularly important for credence attributes that the consumer cannot evaluate even after consumption, such as whether there are pesticide residues in a particular tomato. The central point is that quality is multidimensional, as is quality signaling.

The impact of consumer demand for quality, including safety, on food markets must be considered in terms of market segments and industry developments. Some segments have strong demand for what they perceive to be higher quality products. For example, the organic market has been growing very rapidly in many countries. In the United States, the growth rate for organic products exceeded 20% in the years throughout the 1990s and is estimated to be 9-16% through 2010 (Dimitri and Oberholtzer 2005). However, low price, or more accurately high value (price for quality), drives a large share of the food market. For example, fueled by high levels of efficiency in its supply chain and low prices, Wal-Mart has grown to be the largest food retailer worldwide. Most interestingly, the same consumer can dip into very different product and store markets to meet different needs. For example, recent research shows a marked increase in multi-outlet shopping. In addition, food markets in many less developed countries are rapidly adopting the supermarket format for food shopping (see, e.g., Reardon, Timmer, and Berdegue 2004).

Overall, the impact of consumer demand for quality on the agricultural and food system is an increased emphasis on quality differentiation but, and this is key, not all in the direction of upgrading product quality. Though the more elite market segments are thriving and reaching growing numbers of consumers, the basic price/quality markets remain strong, especially where lower income consumers face increasing budget challenges.

EVIDENCE ON CONSUMER WILLINGNESS TO PAY FOR QUALITY ATTRIBUTES

The role of consumer demand in shaping markets for agricultural and food products has been increasingly emphasized over the last two decades (McCluskey et al. 2005; Peterson and Chen 2005; Grannis and Thilmany 2002; Unterschultz, Quagraine, and Veeman 1998; Magnusson and Cranfield 2005; Hobbs et al. 2005). A problem, however, is to identify causality—are changes in consumer demand shaping international agricultural and food markets, or are companies, other interest groups, and governments shaping consumer demand? Of course, the answer is both. Without attempting to capture causality, we review research done by several economists in recent years on consumer demand for a variety of quality attributes. The literature has become quite voluminous; our goal is to draw the implications of this literature for agricultural and food trade.

WILLINGNESS TO PAY FOR FOOD QUALITY: OVERALL OBSERVATIONS

We begin by making several overall observations based on our reading of the body of research on willingness to pay for quality attributes detailed in table 1 and meta- or comparative analyses appearing recently in the literature (Lusk et al. 2005; Florax, Traversi, and Nijkamp 2005; Ehmke 2006; McCluskey, Grimsrud, and Wahl 2007). In the area of food safety, educated and employed consumers are more concerned about such safety and are willing to pay a premium for it (see, e.g., Latouche, Rainelli, and Vermersch 1998). In the event of an outbreak, consumers who are younger are more susceptible to negative media (Verbeke, Ward, and Viaene 2000). Common trends observed during outbreaks, for example in the case of BSE, are substitution to other meats and more emphasis on food safety (McCluskey et al. 2005). Firms that handle organic and food products with quality assurance systems are found to benefit in these situations. With an outbreak, consumers are willing to pay more for products that are tested and labeled, i.e. they are more willing to pay for products that provide information in comparison to products that do not.

In general, consumers have not proven to be very open to food treated with some technologies (e.g., irradiation, genetically modified (GM) foods, and antibiotic use in livestock), more so when there is a lack of information regarding the risks attached to them. They may prefer categories of food products that use these technologies if they are offered extra benefits in the form of price discounts, or a health or environmental emphasis (Shogren et al. 1999, Zhang et al. 2004). There is a whole spectrum of degrees of acceptance/rejection of foods created through use of biotechnology (GM foods) as discussed in detail below. Other reasons for acceptance or rejection of technologies can be the level of trust associated with government programs, perceptions of science, and the positive or negative influences of the media (Curtis, McCluskey, and Wahl 2004).

Table 1. Recent Consumer Willingness to Pay Studies by Country and Product Attributes

	Animal welfare		Country of Origin Labeling		Traceability	
	<i>Beef</i>	<i>Pork</i>	<i>Beef</i>	<i>Produce</i>	<i>Beef</i>	<i>Pork</i>
Canada	18% ^a and 19% ^b sandwich	16% ^a and 13% ^b sandwich			7% ^a and 9% ^b sandwich	10% ^a and 7% ^b sandwich
U.S.	16% ^b and \$0.50 ^c per sandwich	20% ^b and \$0.53 ^c per sandwich	11% ^h steak, 24% ^h hamburger	\$0.49/lb ^m apples, \$0.48/lb ^m tomatoes	7% ^b and \$0.23 ^c per sandwich	18% ^b and \$0.50 ^c per sandwich
	Food safety					
	<i>Beef</i>		<i>Pork</i>		<i>Grain/ Salmon</i>	
Canada	20% ^a and 18% ^b sandwich		17% ^a and 13% ^b sandwich			
U.S.	20% ^b and \$0.63 ^c per sandwich \$0.77/lb ^d irradiated ground beef \$6.98/lb ⁱ and \$8.12/lb ^j growth hormone-free steak \$3.23/lb ⁱ and \$3.31/lb ^j non-GM feed steak		23% ^b and \$0.59 ^c per sandwich		5-8% ^e , 50-62% ^l , 41.2% ^g non-GM vegetable oil, 15-28% ^e and 52.5% ^g non-GM Salmon, 12-17% ^c non-GM cornflakes, 31.4% ^g non-GM cornflakes, 40.9% ^g non-GM fed salmon	
France	\$9.34/lb ⁱ , 9.94/lb ^j and 0.30/lb ^k growth hormone-free steak, \$9.18/lb ⁱ , 9.32/lb ^j and 2.79/lb ^k non-GM feed steak					
Germany	\$6.99/lb ⁱ , 7.29/lb ^j and 1.93/lb ^k growth hormone-free steak, \$7.63/lb ⁱ , 7.67/lb ^j and 2.55/lb ^k non-GM feed steak					
Norway	\$1.39/lb ⁿ hormone-free steak				55-69% ^f non-GM vegetable oil, 54.2% ^f non-GM fed salmon and 67% ^f non-GM salmon	
Spain	5% ^o label certified beef					
U.K.	\$8.72/lb ⁱ , 7.39/lb ^j and 0.86/lb ^k growth hormone-free steak, \$7.47/lb ⁱ , 6.31/lb ^j and 8.88/lb ^k non-GM feed steak					
Japan	56% ^p BSE-tested				30-40% ^q non-GM canola oil, 33-40% ^t non-GM vegetable oil	
	Food safety					
	<i>Beef</i>		<i>Pork</i>		<i>Grain/ Salmon</i>	
Korea					54.2% ¹ non-GM vegetable oil, 81.2% ^l non-GM tofu	
Taiwan					17-21% ¹ non-GM vegetable oil, 21.19% ^l non-GM soybean oil, 37.42% ¹ non-GM tofu, 108.4% ^l non-GM fed salmon	
China					38% ^u GM rice, 16.3% ^u GM soybean, 23.4% ^t non-GM soybean oil, 41.5% ^t non-GM rice, 23.3% ^t non-GM vegetable oil	
Kenya					13.7% ^c GM maize	

^aHobbs, Bailey, Dickinson and Haghiri 2005

Methodology: Vickrey second price auction

Time of study: March 2002

Place of study: Saskatchewan and Ontario; Canada

Food product being studied: Ham and roast beef sandwich

^bDickinson, Hobbs and Bailey 2003

Methodology: Vickery style auction experiments

Time of study: October 2001 and March 2002

Place of study: Logan, Utah; USA and Saskatoon, Saskatchewan; Canada

Food product being studied: Ham and roast beef sandwich

^cDickinson and Bailey 2002

Methodology: Lab auction study, non-hypothetical bid data

Time of study: October 2001

Place of study: Logan, Utah; USA

Food product being studied: Ham and roast beef sandwich

^dNayga, Aiew, Woodward 2004

Methodology: Face to face WTP experiment, Contingent Valuation Method

Time of study: March- June 2002

Place of study: Austin, Houston, San Antonio, and Waco, Texas; USA

Food product being studied: Irradiated ground beef

^eChen and Chern 2002

Methodology: Contingent Valuation Method, Mail survey

Time of study: March 2001

Place of study: Columbus, Ohio; USA

Food product being studied: non-GM vegetable oil, non-GM salmon and non-GM cornflake breakfast cereal

Note: GM and GM-fed salmon in same category

^fChern, Rickertsen, Tsuboi and Fu 2002

Methodology: Stated preference approach, National telephone survey

Time of study: March-April 2002

Place of study: Agricultural university of Norway, Norway and Ohio State University, USA

Food product being studied: non-GM vegetable oil, non-GM fed salmon and non-GM salmon

Note: Mean WTP is measured as a range because the base price for GM food was varied in the design of offered prices in the survey.

^gKaneko and Chern 2003

Methodology: Contingent Valuation Method, Telephone survey

Time of study: April 2002

Place of study: sample entire US

Food product being studied: non-GM vegetable oil, non-GM cornflake cereal, non-GM-fed salmon, non-GM salmon

Note: WTP highest to non-GM salmon and different from GM-fed salmon due to weaker aversion to GM foods involving only modification of plant genes

^hUmberger, Feuz, Calkins, and Sitz 2003

Methodology: Face to face survey and auction

Time of study: 2002

Place of study: Chicago and Denver; USA

Food product being studied: Steak and hamburger- beef

Note: "USA guaranteed" label

ⁱLusk, Roosen and Fox 2001

Methodology: Contingent Valuation Method, Mail survey

Time of study: Spring 2000

Place of study: France, Germany, UK and USA

Food product being studied: Hormone-free, GM-free feed beef steak

^jLusk, Roosen and Fox 2003

Methodology: Contingent Valuation Method, Mail survey

Time of study: Spring 2000

Place of study: France, Germany, UK and USA

Food product being studied: Hormone-free, GM-free feed beef steak

Note: Estimated premiums are large in magnitude as consumers overstate their WTP in hypothetical settings (hypothetical bias). *Relative* magnitude of the WTP values assuming hypothetical bias is similar across countries.

^kTonsor and Schroeder 2003

Methodology: Survey and choice experiments

Time of study: August 2002

Place of study: London; UK, Frankfurt; Germany and Paris; France

Food product being studied: Hormone-free and GM-free beef steak

Note: "USA grown" label

^lKim and Kim 2004

Methodology: Contingent Valuation Method, Student survey

Time of study: Nov-Dec 2003

Place of study: Seoul; Korea

Food product being studied: non-GM vegetable oil and non-GM tofu

^mMabiso, Sterns, House, and Wysocki 2005

Methodology: Vickrey auction, Face to face interview

Time of study: Nov 2003- Jan 2004

Place of study: Gainesville, Florida, Lansing, Michigan and Atlanta, Georgia; USA

Food product being studied: Fresh apples and tomatoes

Note: "USA grown" label

ⁿAlfnes and Rickertsen 2003

Methodology: Stated Choice survey-Contingent Valuation Method, Experiment auction

Time of study: April 2000

Place of study: Norway

Food product being studied: hormone status for beef

Note: Uses non-hypothetical techniques

^oAngulo and Gil 2004

Methodology: Telephone survey

Time of study: Spring 2002

Place of study: South of Spain

Food product being studied: label-certified beef

^pMcCluskey, Grimsrud, Ouchi, and Wahl 2005

Methodology: Contingent valuation method, Face to face survey

Time of study: Dec 2001

Place of study: Nogano; Japan

Food product being studied: BSE-tested beef

^qKaneko and Chern 2004

Methodology: Vickery second-price auction

Time of study: Dec 2003

Place of study: Tsukuba, Tokyo; Japan

Food product being studied: non-GM canola oil

^rLin, Somwaru, Tuan, Huang, and Bai 2005

Methodology: Contingent Valuation Method, Personal interviews

Time of study: Fall 2002

Place of study: Beijing, Shandong, Jiangsu, Zhejiang and Shanghai; China

Food product being studied: Non-GM rice, non-GM soybean oil and non-GM vegetable oil

Note: Overstate WTP due to hypothetical bias. Rice is the main food staple that is not consumed in a highly processed form, while soybean oil is a food product consumed after crushing which destroys much of the DNA sequence; more WTP for non-GM rice.

^sKimenju and De Groot 2005

Methodology: Contingent Valuation Method, Face to face interview

Time of study: Nov-Dec 2003

Place of study: Nairobi; Kenya

Food product being studied: GM maize

^tChiang (2004) as cited by Lin, Somwaru, Tuan, Huang, and Bai 2005

Methodology: Contingent Valuation Method, National Telephone survey

Time of study: January 2000-September 2002

Place of study: Taiwan

Food product being studied: non-GM soybean oil, non-GM tofu and non-GM salmon

^uLi (2003) as cited by Lin, Somwaru, Tuan, Huang, and Bai 2005

Methodology: Contingent Valuation Method

Time of study: August 2002

Place of study: Beijing, China

Food product being studied: GM rice and GM soybean oil.

Similarly, there is a demand for food products that are explicitly specified as pesticide free. In most cases, it has been found that willingness to pay is expressed by consumers who are more concerned about health and the environment, insensitive to price, younger in age, higher in education, and who have more household income (Magnusson and Cranfield 2005).

Food safety may be assured by practices such as traceability, transparency and assurance (TTA); labeling of different characteristics such as Country of Origin Labeling (COOL); and information on processes such as use of Hazard Analysis Critical Control Points (HACCP). However, there are differences in the European Union and the United States in the objective of implementation of these systems that can ensure food safety. TTA systems in the E.U. have been implemented because it is a requirement to gain access to markets whereas in the U.S. implementation has focused more on consumers' willingness to pay. In other words, these systems are more often mandatory in the E.U. than in the U.S. There are valuation experiments in which consumers have chosen food safety over traceability. Consumers in the U.S. and Canada are found to be more willing to pay for information on animal treatment and food safety assurance than on traceability alone (Dickinson and Bailey 2002).

COOL imparts information on the origin of food products. Various studies show that consumers are willing to pay a higher price for a country of origin label because they use this information as both safety and quality cues. It serves as a means by which consumers can differentiate domestic goods from imports. Hence they are willing to pay for the information, especially when they prefer domestic goods and consider them to be safer (Unterschultz, Quagraine, and Veeman 1998). With COOL, willingness to pay is also dependent on a number of factors such as consumer awareness, price sensitivity, and demographics. Some studies have shown that consumers are concerned about animal welfare, the use of antibiotics in animal feed, and the use of growth hormones in animal production systems (Grannis and Thilmany 2002). This is, however, subject to the type of study conducted and its objective. To date, the studies of traceability systems put the most emphasis on animal welfare concerns and health effects.

WHAT THE NUMBERS SAY

There have been a number of studies completed that attempt to measure consumer willingness to pay (WTP) for particular food attributes or combinations of attributes. Table 1 presents our review of a sample of these studies published in the last five years organized by country and attribute. Panel A of Table 1 reports findings on consumers' willingness to pay in Canada and the U.S. for three different attributes: traceability, country of origin labeling, and animal welfare. Panel B of Table 1 focuses on WTP estimates for food safety across countries. The Table 1 footnotes provide extensive detail on the design of the studies included in the table.

A common feature in WTP studies is the use of various types of hypothetical (e.g., surveys, choice experiments (conjoint analysis)) and non-hypothetical (e.g., experiments) valuation methodologies. Because we focused on the past five years, the studies included in the table tend to showcase issues that have been prominent during this period, including the impact of BSE and genetic modification, on the attitudes of consumers as measured in terms of their WTP for food products with particular attributes. The figures in the table are reported

either as percentage changes from a base price, dollars per pound, or dollars per product (e.g., a sandwich). Many studies are for meat products. There is variation in the form of meat used in experiments or surveys; common forms are sandwiches, steak, or hamburger. A majority of the experimental studies have been conducted with students at different universities. In some studies, there is a WTP range as the base price was varied in the design of offered prices in the survey. Estimated premiums are often large in magnitude. This raises the concern that hypothetical valuation methodologies may overstate WTP (i.e., there is hypothetical bias). Consumer characteristics have varying and non-uniform effects in different WTP studies.

Studies of consumers' valuation of the use of genetic modification have been done in a broad range of countries. Studies show that GM/non-GM foods have different interpretations in these countries. Some countries are more open to GM food, while others are not. Countries where GM food is disfavored outnumber those where it is more favored. This research is discussed in more detail in the case study below.

Estimates are also available in the Willingness to Accept (WTA) format where consumers state their willingness to accept a food product depending on the incentive offered. The designs of WTP and WTA experiments are similar except that items to be exchanged are reversed. Nayga, Woodward, and Aiew (2005) illustrate the difference in formats. In a WTP experiment, after information about the nature of food irradiation is provided, each respondent is given a pound of non-irradiated ground beef and some money as a gift for participating in the study. The respondent is then asked his/her willingness to exchange the pound of non-irradiated ground beef and a first bid money offer for a pound of irradiated ground beef. In contrast, each WTA respondent is given a pound of irradiated ground beef as a gift for participating in the study. The respondent is then asked his/her willingness to exchange the pound of irradiated ground beef for a pound of non-irradiated ground beef and some money. Recent literature shows wide disparities in the estimates of WTP and WTA for a food product with different attributes. Uncertainty associated with characteristics or quality of the good is likely to contribute to the observed discrepancies between WTP and WTA (Isik 2004). We have not included WTA estimates in Table 1 because the WTP format has been used in a much broader set of studies, which facilitates our objective to compare studies.

In addition to eliciting estimates of consumers' WTP for food products, a number of studies focus on other important aspects of demand such as the inherent reasons for, and factors that affect, their choices. These factors include demographics such as education, income, and age as discussed above. Different studies can report very different WTP figures for the same characteristic of a food product. For example, in the case of non-GM vegetable oil in the U.S., the premium estimate ranges from 5-62% across studies. The variation may be attributable to hypothetical bias, consumer characteristics, or study design. Across countries, even more variables, such as differences in the income elasticity of demand at different average income levels, may affect the range of WTP estimates. Which aspects of consumer demand are being measured may be unclear across studies. For example, studies on the labeling of the country of origin do not consistently distinguish between consumer demand for information on domestic, as opposed to imported foods. The number of other product attributes included in the study design may also influence the WTP elicited for a country of origin label (Ehmke 2006). Table 1 is dominated by work on GM/non-GM food. However, in the U.S. and Canada there are a number of studies spread over consumers' WTP for food safety, animal welfare, COOL, and traceability.

SUMMARY

Recent literature suggests that consumers are willing to pay varying amounts for enhancement of some food attributes or the absence of other attributes, and, importantly for information that they believe provides quality assurance. At the least, we can say that these WTP differentials depend on the product, the attribute, and the country. The reported, although perhaps not the actual, amounts may also depend on the study design. One potentially important factor that is not standardized across studies is the information environment in which valuations are elicited. In most studies, the consumer is presented information on the product attributes being valued before or during the valuation process. This immediate information environment may affect the valuations elicited from study to study. While the size of the premiums (or discounts) consumers would be willing to pay (or to accept) for products with particular attributes vary across countries and consumer segments, the key implications of valuation studies for trends in international agricultural and food trade may be in whether consumers apply a premium or discount and the reasons for them doing so. The blank cells in Table 1 suggest there is a potential for more research on some attributes. This research could be helpful to marketing agencies and public policy makers as well as in understanding consumer demand. The meta- and comparative analyses that have been completed recently suggest paths to structuring research so that it yields more than snapshot pictures of the strength of consumer demand for particular attributes or attribute combinations.

CONSUMER DEMAND IN A GLOBAL TRADE ENVIRONMENT: THE CASE OF GENETICALLY MODIFIED FOODS

Globalization is having a significant impact on consumer demand for food quality. The global sourcing of food products means the year-around availability of both commonplace and exotic products. In addition, the variety within product categories is greatly extended with global trade. Global food sourcing may add to the attributes of concern to consumers in making food choices. For example, if consumers are buying salmon, they may want to know where and how the salmon was produced in order to gauge possible undesirable contaminants and desirable fatty acid levels, as well as to know what environmental effects are associated with the product. On the supply chain side, retailers have to coordinate and control the attributes of their offerings across longer supply chains.

One of the most controversial consumer demand subjects globally is the acceptance/rejection of genetically modified (GM) food. International trade has been significantly affected by differences in the reception of biotechnology across countries. An extensive chicken and egg argument is ongoing about whether differences in government policy toward GM foods across countries are the result of different consumers' (citizens') views toward biotechnology or whether government policy has led consumer acceptance/rejection. The long-running WTO dispute brought by the United States against the European Union based on the E.U. policy toward GM foods is centered on arguments over the use and adequacy of risk assessments. However, this trade conflict also reflects different perceptions of what the market for GM foods would have looked like in the E.U. if not for

European policy that has been inhospitable to the introduction of GM foods. Essentially the underlying U.S. view is that these products would have been accepted in the E.U. if the governments had not put up barriers to them. Similarly, media coverage may affect consumer acceptance (see, e.g., Kalaitzandonakes, Marks, and Vickner 2004). We cannot resolve the chicken and egg arguments of which came first—consumer response, government policy, or media coverage. However, there is a large number of studies that documents the disparity across countries in demand responses to GM products and the underlying reasons for the disparity (Chern et al. 2002; Springer et al. 2002; Kim and Kim 2004; Curtis, McCluskey, and Wahl 2004; Li et al. 2003).

The proponents of biotechnology typically emphasize its ability to deliver an improved supply of food and medicine, and an increase in environmental quality due to less need for pesticides. Opponents argue biotechnology is an interference with nature that has unknown and potentially disastrous effects on health and the environment (Nelson 2001). Zhang et al. (2004) observe that American consumers do not seem to exhibit concerns over GM foods. However, consumers remain concerned about the potential risks of GM crops on human health (Ganiere and Chern 2004). Perceived benefits may outweigh perceived risks if the GM products offer extra benefits over traditional products (such as a price discount, or health or environmental attributes). In a study comparing U.S. and Chinese consumers, Zhang et al. (2004) found that the attitudes of the majority of American and Chinese consumers are generally supportive of the new technology. However, consumers in both countries are clearly more willing to accept GM plant products than GM animal products.

Uncertainties associated with consumer acceptance of GM foods have emerged in many countries, especially in Europe and Japan (Chern et al. 2002). Springer et al. (2002) found important differences in acceptance of GM foods within Europe. The mean rejection rate for the 15 countries studied was 73% but it ranged from 85% in Greece to 58% in Great Britain. In another study, Carlsson, Frykblom, and Lagerkvist (2004) found that Swedish consumers did not see GM food as equivalent to conventional food. Consequently, the Swedish consumers support mandatory labeling and are willing to pay higher prices to ensure a total ban on the use of GM in animal fodder.

Curtis, McCluskey, and Wahl (2004) find that more positive consumer perceptions toward GM may stem from more urgent food needs. In Asia, Japan and Korea stand out as countries with low consumer acceptance for GM food in comparison with other countries such as China and Taiwan that show greater acceptance. A study of acceptance of GM food in Beijing shows that consumers were willing to pay a 38% premium for GM rice and a 16.3% premium for GM soybeans over their conventional counterparts (Li et al. 2003). In Korea, Kim and Kim (2004) found a large number of consumers who are willing to buy GM products, if they are offered at a discount. Li et al. (2003) report that consumers in China have positive attitudes toward the use of biotechnology in agriculture, although they have little knowledge. Their attitudes are influenced by positive media coverage that is controlled by the government. Younger people are more willing to purchase GM food products with product-enhancing attributes, which indicates that the Chinese market may be more open to GM foods in the future. Additionally, government investment in biotechnology remains strong, as China works to fulfill its food self-sufficiency policies.

De Groote et al. (2004) argue that although consumers in Africa may be critical towards food with GM content, they may not be able to reject this food given concerns about food shortages, nutritional intake, and a mismatch of per capita food production with population

growth. Kimenju and De Groot (2005) find that consumers in Kenya have positive perceptions of the production enhancing characteristics of GM crops. However negative perceptions regarding environmental risk, health risk and ethical and equity concerns, which are not based on scientific evidence, dominate the consumers' attitude towards GM food. Willingness to pay is affected negatively by health risk perceptions and ethical and equity concerns, while trust in government to ensure food quality has a positive influence in this study.

GM technology has generally been accepted in North and South America, while the European Union, Japan, and South Korea remain very reluctant. China and Taiwan also have higher levels of acceptance. A generalization that can be made across studies is that better educated and higher income groups are more aware of GM crops. This awareness holds with respect to the potential benefits of the technology as well as regarding the potential negative effects, including those on the environment and on biodiversity.

Two separate analyses provide further systematic insights into how consumers value GM foods. Lusk et al. (2005) conducted a meta-analysis of 25 studies that together report 57 valuations of GM food. Due to wide differences regarding the use of demographic variables in these studies, this meta-analysis did not attempt to capture the effect of demographic differences on consumer valuation. In addition, it was only able to focus on point estimates of willingness to pay (or to accept) because many of the underlying studies did not present confidence intervals on their estimates. The authors find that a high percentage of the variation in premiums found for non-GM food over GM food between studies are explained by geographical region (European consumers have the highest premium), who is asked for a valuation (the premiums of shoppers are lower than those of the general population), how the study is conducted (in-person valuations are higher than those by mail or phone), whether the study is hypothetical or non-hypothetical (non-hypothetical designs yield lower valuations), whether the study estimates willingness to pay or willingness to accept (WTA valuations are higher than those for WTP), and product type (GM meat is the least desired GM food). Overall, premiums for non-GM food averaged from 42% (unweighted average of all data) to 23% (weighted average excluding one outlier). Lusk et al. (2005) state that, "This analysis leads us to conclude that previous research has effectively identified *what* consumers' valuations are, given a particular valuation method (p. 41)." They go on to note that because valuations are significantly affected by elicitation method, users of these studies must be careful in choosing which types of studies to rely on in their decision making.

In a second analysis, McCluskey, Grimsrud, and Wahl (2007) compare the roles of country (Canada, China, Japan, Norway, and the United States), demographic, and knowledge differences in explaining consumer valuation of GM foods using in-person surveys in supermarket and shopping areas, a contingent valuation methodology, and different products depending on the country. They find that consumers required on average a discount of 60% for the GM food studied in Japan, of 50% in Norway, of 24% in Canada, and of 24% or 8%, depending on the product and survey location, in the U.S. In China, a premium of 38% was elicited. Knowledge about GM products and demographic variables (formal education, gender, age, and whether there were children under 18 in the household) did not have uniform effects on consumer valuation across the countries studied. Some variables were statistically positive or negative depending on the country. McCluskey, Grimsrud, and Wahl (2007) conclude that "the stage of economic development, along with cultural attitudes valuing

tradition and skepticism of science, must all be considered (p. 13)” when evaluating consumer preferences for GM food.

Overall, research shows clear patterns of differences in consumer demand for GM foods across countries. These differences may influence government policy or vice versa; nonetheless they clearly exist. Together differences in consumer demand and policies affect the exchange of goods and trade relations. To date consumer knowledge and demographic factors do not appear to provide clear predictions of consumer valuation across countries, while study design likely has a more uniform effect on the valuations elicited. The result from a trade perspective is a picture of a series of differentiated markets. In this regard, GM foods are probably the most salient example of the effect of consumer demand on agricultural and food trade.

IS CONSUMER DEMAND A DRIVING FORCE IN GLOBAL AGRICULTURAL AND FOOD TRADE?

Managing food safety risks and providing desired levels of other quality attributes is a complex task, particularly in globalized agricultural and food markets. Farmers, food processors, food distributors, retailers, and food service companies are faced with varied demands for food quality, including food safety, from consumers.

We have reviewed recent studies, meta-analyses, and comparative studies of consumer willingness to pay for particular food attributes and packages of attributes. The studies generally detect a willingness to pay but the magnitude varies by attribute, food product, country, and study design. This literature, along with trend analysis of market developments, clearly suggests that consumer demand is a major determinant of agricultural and food trade. This effect is evident in the ongoing differentiation of food products on the basis of a growing range of attributes.

In looking to the future, however, we conclude that the body of research completed on consumer valuation of foods with different attributes indicates that in terms of its life cycle, the impact of changing consumer demand for quality on agricultural and food trade has passed through its introduction and growth stages. These market forces are now in their maturity in many markets. In those where they are not fully in place, the outlines of where they are going are clearly visible. We expect consumer demand for quality to remain a strong force in global trade over the coming decades. However, the shape of that impact is known and, in large part, the adjustment to it has already occurred or is ongoing. Consumer demand factors will evolve in the direction of adding to and further differentiating the list of attributes. This leaves room for enterprising companies and countries to respond to and lead consumer demand.

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REFERENCES

- Alfnes, F., and K. Rickertsen. 2003. "SC-X: Calibrating Stated Choice Surveys with Experimental Auction Markets." Paper presented at the American Agricultural Economics Association Annual Meeting, Montreal, Canada, 27-30 July.
- Angulo, A.M., and J.M. Gill. 2004. "Consequences of BSE on Consumers' Attitudes, Perceptions and Willingness to Pay for Certified Beef in Spain." Paper presented at the 84th EAAE Seminar 'Food Safety in a Dynamic World,' Zeist, The Netherlands, 8-11 February.
- Carlsson, F., P. Frykblom, and C.J. Lagerkvist. 2004. "Consumer Benefits of Labels and Bans on Genetically Modified Food—An Empirical Analysis Using Choice Experiments." Paper presented at the American Agricultural Economics Association Annual Meeting, Denver CO, 1-4 August.
- Chen, H., and W.S. Chern. 2002. "Consumer Acceptance of Genetically Modified Foods." Paper presented at the Annual Meeting of the American Agricultural Economics Association, Long Beach CA, 28-31 July.
- Chern, W.S., K. Rickertsen, N. Tsuboi, and T.-T. Fu. 2002. "Consumer Acceptance and Willingness to Pay for Genetically Modified Vegetable Oil and Salmon: A Multiple-Country Assessment." *AgBioForum* 5(3):105-112.
- Chiang, F.-S. 2004. "An Analysis of Consumer Perception and Acceptance of Genetically Modified Foods in Taiwan." Paper presented at the 8th ICABR International Biotechnology Conference, Ravello, Italy, 8-11 July.
- Curtis, K.R., J.J. McCluskey, and T.I. Wahl. 2004. "Consumer Acceptance of Genetically Modified Food Products in the Developing World." *AgBioForum* 7(1/2):70-75.
- De Groote H., S. Mugo, D. Bergvinson, G. Owuor, and B. Odhiambo. 2004. "Debunking the Myths of GM Crops for Africa: The Case of BT Maize in Kenya." Paper presented at the American Agricultural Economics Association Annual Meeting, Denver CO, 1-4 August.
- Dickinson, D.L., and D. Bailey. 2002. "Meat Traceability: Are U.S. Consumers Willing to Pay for It?" *Journal of Agricultural and Resource Economics* 27(2): 348-364.
- Dickinson, D.L., J.E. Hobbs, and D. Bailey. 2003. "A Comparison of U.S. and Canadian Consumers' Willingness to Pay for Red-Meat Traceability." Paper presented at the American Agricultural Economics Association Annual Meetings, Montreal, Canada, 27-30 July.
- Dimitri, C., and L. Oberholtzer. 2005. "Market-Led Versus Government-Facilitated Growth: Development of the U.S. and E.U. Organic Agricultural Sectors." Washington, DC: U.S. Department of Agriculture, Economic Research Service WRS-05-05, August.
- Ehmke, M.T. 2006. "International Differences in Consumer Preferences for Food Country-of-Origin: A Meta-Analysis." Paper presented at the American Agricultural Economics Association Meeting, Long Beach CA, 23-26 July.

- Florax, R.J.G.M., C.M. Travisi, and P. Nijkamp. 2005. "A Meta-Analysis of the Willingness to Pay for Reductions in Pesticide Risk Exposure." *European Review of Agricultural Economics* 32(4):441-467.
- Ganiere, P., and W.S. Chern. 2004. "Consumer Acceptance of Genetically Modified Foods: A Profile of American Consumers." Paper presented at the American Agricultural Economics Association Annual Meeting, Denver CO, 1-4 August.
- Grannis, J., and D.D. Thilmany. 2002. "Marketing Natural Pork: An Empirical Analysis of Consumers in the Mountain Region." *Agribusiness*. 18(4):475-489.
- Hobbs, J.E., D. Bailey, D.L. Dickinson, and M. Haghiri. 2005. "Traceability in the Canadian Red Meat Sector: Do Consumers Care?" *Canadian Journal of Agricultural Economics* 53:47-65.
- Isik, M. 2004. "Does Uncertainty Affect the Divergence between WTP and WTA Measures?" *Economics Bulletin* 4(1):1-7.
- Kalaitzandonakes, N., L.A. Marks, and S.S. Vickner. 2004. "Media Coverage of Biotech Foods and Influence on Consumer Choice." *American Journal of Agricultural Economics* 86(5):1238-1246.
- Kaneko, N., and W.S. Chern. 2003. "Consumer Acceptance of Genetically Modified Foods: A Telephone Survey." Paper presented at the American Agricultural Economics Association Annual Meeting, Montreal, Canada, 27-30 July.
- Kaneko, N., and W.S. Chern. 2004. "Willingness to Pay for Non-Genetically Modified Food: Evidence of Hypothetical Bias from an Auction Experiment in Japan." Paper presented at the American Agricultural Economics Association Annual Meeting, Denver CO, 1-4 August.
- Kim, H.S., and K. Kim. 2004. "A Multi-Country Assessment of Consumer Attitudes of Genetically Modified Foods and the Implications for New Labeling System." Paper presented at the American Agricultural Economics Association Annual Meeting, Denver CO, 1-4 August.
- Kimenju, S.C., and H. De Groote. 2005. "Consumers' Willingness to Pay for Genetically Modified Foods in Kenya." Paper presented at the 11th International Congress of the EAAE (European Association of Agricultural Economists), The Future of Rural Europe in the Global Agri-Food System, Copenhagen, Denmark, August.
- Latouche, K., P. Rainelli, and D. Vermersch. 1998. "Food Safety Issues and the BSE Scare: Some Lessons from the French Case." *Food Policy*. 23:347-356.
- Li, Q., K.R. Curtis, J.J. McCluskey, and T.I. Wahl. 2003. "Consumer Attitudes toward Genetically Modified Foods in Beijing, China." *AgBioForum*. 5(4):145-152.
- Lin, W., A. Somwaru, F. Tuan, J. Huang, and J. Bai. 2005. "Consumer Attitudes toward Biotech Foods in China." Paper presented at the American Agricultural Economics Association Annual Meeting, Providence RI, 24-27 July.
- Lusk, J.L., J. Roosen, and J.A. Fox. 2001. "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." Paper presented at the American Agricultural Economics Association Annual Meeting, Chicago IL, August.
- 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*. 85(February):16-29.

- Lusk, J.L., M. Jamal, L. Kurlander, M. Roucan, and L. Taulman. 2005. "A Meta-Analysis of Genetically Modified Food Valuation Studies." *Journal of Agricultural and Resource Economics*. 30(1):28-44.
- Mabiso, A., J. Sterns, L. House, and A. Wysocki. "Estimating Consumers' Willingness to Pay for Country of Origin Labels in Fresh Apples and Tomatoes: A Double-Hurdle Probit Analysis of American Data Using Factor Scores." Paper presented at the American Agricultural Economics Association Annual Meeting, Providence RI, 24-27 July.
- Magnusson, E., and J.A.L. Cranfield. 2005. "Consumer Demand for Pesticide Free Food Products in Canada: A Probit Analysis." *Canadian Journal of Agricultural Economics* 53:67-81.
- McCluskey, J.J., K.M. Grimsrud, H. Ouchi, and T.I. Wahl. 2005. "Bovine Spongiform Encephalopathy in Japan: Consumers' Food Safety Perceptions and Willingness to Pay for Tested Beef." *The Australian Journal of Agricultural and Resource Economics* 49:197-209.
- McCluskey, J.J., K.M. Grimsrud, and T.I. Wahl. 2007. "Comparison of Consumer Responses to Genetically Modified Foods in Asia, North America, and Europe." In R.E. Just, J. Alston, and D. Zilberman, eds. *Regulating Agricultural Biotechnology: Economics and Policy*. New York, NY: Springer/Kluwer Academic Publishers, pp. 1-14.
- Nayga, Jr., R.M., R. Woodward, and W. Aiew. 2005. "Experiments on the Divergence between Willingness to Pay and Willingness to Accept: The Issue Revisited." *Economics Bulletin* 17(4):1-5.
- Nayga Jr., R.M., W. Aiew, and R. Woodward. 2004. "Willingness to Pay for Irradiated Food: A Non Hypothetical Market Experiment." Paper presented at the 84th EAAE Seminar 'Food Safety in a Dynamic World,' Zeist, The Netherlands, 8-11 February.
- Nelson, C.H. 2001. "Risk Perception, Behavior, and Consumer Response to Genetically Modified Organisms." *American Behavioral Scientist*. 44:1371-1388.
- Peterson, H.H., and Y. Chen. 2005. "The Impact of BSE on Japanese Retail Meat Demand." *Agribusiness*. 21(3):313-327.
- Reardon, T., P. Timmer, and J. Berdegue. 2004. "The Rapid Rise of Supermarkets in Developing Countries: Induced Organizational, Institutional, and Technological Change in Agrifood Systems." *Electronic Journal of Agricultural and Development Economics*. 1(2):168-183.
- Shogren, J.F., A.F. John, D.J. Hayes, and J. Roosen. 1999. "Observed Choices for Food Safety on Retail, Survey, and Auction Markets." *American Journal of Agricultural Economics*. 18(5):1192-1199.
- Springer, A., K. Mattas, G.T. Papastefanou, and A. Tsioumanis. 2002. "Comparing Consumer Attitudes towards Genetically Modified Food in Europe." Mimeo.
- Tonsor, G.T., and T.C. Schroeder. 2003. "European Consumer Preferences for U.S. and Domestic Beef: Willingness to Pay for Source Verification, Hormone-Free, and Genetically Modified Organism-Free Beef." Paper presented at the American Agricultural Economics Association Annual Meeting, Montreal, Canada, 27-30 July.
- Umberger, W.J., D.M. Feuz, C.R. Calkins, and B.M. Sitz. 2003. "Country of Origin Labeling of Beef Products: U.S. Consumers' Perceptions." *Journal of Food Distribution Research*. 34(3):103-116.

- Unterschultz, J., K. Quagraine, and M. Veeman. 1998. "Effects of Product Origin and Selected Demographics on Consumer Choice of Red Meats." *Canadian Journal of Agricultural Economics*. 46:201-219.
- Verbeke, W., R.W. Ward, and J. Viaene. 2000. "Probit Analysis of Fresh Meat Consumption in Belgium: Exploring BSE and Television Communication Impact." *Agribusiness*. 16:215-234.
- Zhang, C., J. Bai, J. Huang, W.K. Hallman, C. Pray, and H.L. Aquino. 2004. "*Consumer Acceptance of Genetically Modified Foods: A Comparison between the U.S. and China.*" Paper presented at the American Agricultural Economics Association Annual Meeting, Denver CO, 1-4 August.

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