

**Standards and Developing Country Exports:
A Quick Review of Selected Studies and Suggestions for New Research**

Preliminary First Draft

Do Not Quote or Circulate

Prepared for:

Summer Symposium of the International Agricultural Trade Research
Consortium (IATRC)

Food Regulation and Trade:

Institutional Framework, Concepts of Analysis and Empirical Evidence

May 28-30, 2006
Bonn, Germany

John S. Wilson¹

¹ Lead Economist, Development Research Group, The World Bank, 1818 H Street, NW, Washington, DC 20433. This paper draws heavily upon several empirical papers produced at the Bank. The assistance of Ayako Suzuki in the preparation of this draft is appreciated and acknowledged.
Email: jswilson@worldbank.org

1. Introduction: 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 safety, network reliability, or other goals. In principle, product standards² 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 about 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, 1990³). This is possible as technical regulations can increase the flow of information between

² 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.

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

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 selection could 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 (MS) on a good 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 MS 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 agricultural imports to favor domestic producers over foreign rivals, thereby restricting trade. Indeed, there has been a 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, these non-tariff barriers have become of particular concern to firms in developing countries, which may bear relatively larger costs in meeting their requirements than their counterparts in developed nations.

Developing countries are typically “standards takers” rather than “standards makers” since, at the national level, developing their own standards tends to be more costly than adopting those of the major markets (Stephenson, 1997). 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.

These costs associated with foreign standards and technical regulations may be borne publicly and privately. But 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, standards and technical regulations are an increasingly prominent part of international trade policy debate. 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 developing countries within the framework of trade-offs of setting standards at international levels or unilaterally.. This paper reviews and summarizes the recent studies on standard and technical regulations, and proposes future research that could compliment the existing studies.

The rest of this paper is organized as follows: next section reviews the eight recent studies on standard and technical regulations conducted at the World Bank and several others.. The first studies introduced in the next section focus on food safety, which may be of significant importance to developing countries which continue to rely on agricultural exports. The last four studies outlined draw on the World Bank Technical Barriers to Trade (TBT) Survey database, which provides firm-level data on production and export activities, cost structures, impediments to domestic sales and exports, and compliance with standards and technical regulations. Future research is suggested in Section 3, and Section 4 concludes the paper.

2. Summary Results from Selected Studies

2-1 Food Safety

Food safety and the trade-off between precaution and increased agricultural exports 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 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.

Global Trade and Food Safety: Winners and Losers in a Fragmented System (Wilson and Otsuki 2001) This paper examines the impact of adopting international food safety standards and harmonization of standards on global food trade patterns. The paper estimates the effect 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 our analysis, we 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. They further estimate that total world exports would rise by \$38.8 billion if an international standard (Codex) were adopted, compared to the current divergent national standards in place.

What Price Precaution? European Harmonisation of Aflatoxin Regulations and African Food Exports (Otsuki, Wilson and Sewadeh 2001) employs 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 per cent tighter aflatoxin standard in European countries will reduce edible groundnut imports by 11 per cent. A new European Union regulation on aflatoxins will result in a trade flow that is 63 per cent lower than when the Codex Alimentarius international standards are followed.

Balancing Food Safety and Risk: Do Drug Residue Limits Affect International Trade in Beef (Wilson, Otsuki and Majumdar 2003) examines the impact of drug residue standards on trade in beef and trade effect of setting harmonized international standards. 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. Among other developing countries, South African exports would rise by \$160 million, Brazil's by \$200 million, and Argentina's by over \$300 million.

To Spray or Not to Spray: Pesticides, Banana Exports, and Food Safety (Wilson and Otsuki 2004) explores a fundamental question in food safety and environmental standards; do regulations on pesticide have an effect on trade? In order to explore this question, regulatory data from eleven OECD importing countries and trade data from 19 exporting countries, including Latin America, Asia, and Africa are examined. Results suggest that a 10 percent increase in regulatory stringency - tighter restrictions on the pesticide chlorpyrifos - 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, if the world were to adopt a standard at a level of regulatory stringency suggested by Codex – the body charged with setting global standards in this area – in contrast to one set at the level in place in the European Union -- there would be a US\$ 5.3 billion loss in world exports based on this model.

Trade, Standards, and the Political Economy of Genetically Modified Food (Anderson, Damania and Jackson (2004) develops 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 standard, 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. This theoretical result is supported by numerical results from a global general equilibrium model of GM adoption.

Harmonization of Food Regulations and Trade in the Single Market: Evidence from Disaggregated Data (Henry de Frahan (2004)) uses a structural gravity model to quantify and test the hypothesis that EU harmonization of food regulations increases EU bilateral trade. His result suggests that bilateral exports subject to harmonized food regulations are 253% 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% and 97%.

2-2 Studies Drawing on the World Bank Technical Barriers to Trade (TBT) Survey

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 industrialized country market.

The World Bank Standards and Trade Survey provides 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 affect of domestic and foreign technical regulations on exports, international standards, and other various impediments to business and export.

The data collected covers 689 firms in 24 industries in 17 developing countries. The use of a uniform methodology across countries and industries 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 also enables us to compare the stringency and importance of technical regulations by export markets. These five export markets include the EU, USA, Japan, Canada, and Australia.

Standards and Technical Regulations and Firm's Ability to Export: New Evidence from World Bank Standards and Trade Survey(Wilson and Otsuki 2004) provides the overview of the major patterns for the entire 17 countries in the World Bank Standards and Trade Survey. The major findings include:

General factors that affect business

- Limited access to credits and low demand are the most crucial impediments to business among both exporting and non exporting firms. Product quality and existence of high demand are found to be major factors to increase ability to export. For firms that are willing but unable to export, low demand and costs of transporting goods are major impediments to exports.

Mandatory standards and Technical Regulations

- 70 percent of firms that export are confronted by mandatory standards and technical regulations. The majority of those who responded perceive technical regulations to be important for entering export markets but the obligation to meet these requirements may discourage export.
- More firms confront mandatory standards and technical regulations than domestic technical regulations, but compliance costs to meet the regulations are about the same between domestic and foreign regulations.
- Among the major export markets studied, the EU is the export market whose technical regulations are most widely perceived to be important, followed by the US.
- By regional comparison, a large share of firms in East Europe and LAC consider technical regulations to be important.
- Among foreign technical regulations, product quality standards are most widely perceived to be important for success in exportation, 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.
- Technical regulations possibly reduce production costs and the ability to export.

Compliance

- Compliance to technical regulations is most commonly done within the capacity of the existing plant, equipment, workers, and technology. Among the firms that incur any cost for compliance, additional cost per type of effort is commonly within 10 percent of investment cost.

- But among the firms that incur any cost of compliance, investment in additional plant or equipment is the most common effort.
- Product re-design and additional employment are also common types of compliance efforts because they require smaller amount of installation costs.

Conformity assessment

- The EU conformity assessment is most widely imposed.
- Firms' conduct of their own conformity testing is typically more expensive than outsourcing.

International standards

- Among international standards, ISO is most commonly used.
- The majority of firms that responded consider international standards to be important for successful sales in domestic and foreign markets.

Mutual Recognition Agreements

- Mutual Recognition Agreements are generally not common among the firms in the 17 studied countries.
- East Europe and Latin America and Caribbean most actively participate in MRAs.
- The majority of firms that responded consider that Mutual Recognition Agreements lead to cost saving.

In summary, mandatory standards and technical regulations as well as international standards are important factors that affect domestic sales and the 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 the cost increase as they are likely to be lower than 10

percent of the investment costs. While current participation level is low, MRAs would provide more export opportunity. Relatively advanced countries are more likely to succeed in MRAs but less developed nations should raise their capacity in providing more credible accreditation to attract potential partner countries.

Standards and Technical Regulations: Do They Matter to Export Success in Developing Countries? (Chen, Otsuki and Wilson (2004)). This paper examines how meeting foreign standards affects firms' export performance, reflected in export propensity and market diversification. Results here suggest that technical regulations can adversely affect firms' propensity to export in developing countries. In particular, testing procedures and lengthy inspection procedures reduce exports by 9% and 3%, respectively. Furthermore, in our model, the difference in standards across foreign countries causes diseconomy of scale for firms and affects decisions about whether to enter export markets. The empirical presented here implies that standards, under certain conditions, can impede exporters' market entry, reducing the likelihood of exporting to more than three markets by 7%. In addition, we find that firms that outsource components are more challenged by compliance with multiple standards.

The Cost of Compliance with Product Standards for Firms in Developing Countries: An Econometric Study (Maskus, Otsuki and Wilson 2005) The authors develop econometric models to provide the first estimates of the incremental production costs for firms in developing nations in conforming to standards imposed by major importing countries. Our 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. We also find that the fixed costs of compliance are non-trivial; approximately \$425,000 per firm or about 4.7 percent of value added on average.

Our results may be interpreted as one indication of the extent to which standards and technical regulations might constitute barriers to trade. While the relative impact on costs of compliance is relatively small, these costs can be decisive factors driving export success for companies. In this context, there is scope for considering that the costs associated with more limited exports to countries with import regulations may not conform to World Trade Organization rules encouraging harmonization of regulations to international standards, for example. Policy solutions then might be sought by identifying the extent to which subsidies or public support programs are needed to offset the cost disadvantage that arises from non-harmonized technical regulations.

Do Mutual Recognition Agreements Expand Trade? (mimeo) This draft paper examines the effect of Mutual Recognition Agreements (MRAs) on exports from developing countries. Agreements on standards raise issues that are both politically and analytically challenging. Unlike tariffs, standards cannot be simply negotiated away because the original reason for their existence is not trade protection but 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 honorable, so in principle is their implementation: unlike tariffs, the same standards are imposed on both foreign and domestic firms. However, in spite of the supposed

symmetry of treatment, the impact on trade may turn out highly asymmetric because the costs of compliance are likely to differ across countries.

There are in fact three main 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. Mutual recognition agreements (MRAs) 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 many 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. Examples of such initiatives are the intra-EU MRAs on some un-harmonized industries 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.

This paper addresses the question of how Mutual Recognition Agreements (MRAs) on conformity assessment between two trading partners affect firms' export decisions in developing countries. Specifically, we examine two distinct aspects of export behavior of firms, namely, *whether to export* and *how much to export*. We also compare 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, our preliminary result shows that the probability of firms in developing countries to export is 52.3 % higher if trading partner countries have such agreements. The effect is more outstanding in agricultural sector; the probability of agricultural firms to export is 75.3% 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.

3. Suggestions for Future Research

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 is needed. The Bank is currently considering, for example, extending the World Bank 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.

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 question around which new research agendas could be built. Developing countries are affected in a significant way in regard to the balance between risk and safety reflected in how standards are set. Considerable discussion continues about harmonization of SPS measures with international standards. The WTO Agreement, for example includes provisions on alignment of SPS measures with international consensus standards. Is this a realistic goal, given the evidence on continued unilateral decision-making at the national level? 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 the original reason for their existence is not trade protection but the enhancement of welfare by remedying market failure. Higher standard may decrease or increase consumer welfare. It may decrease welfare by discouraging importing cheap products from developing countries while it may increase welfare because of the better product quality. New research could examine such trade-off and confirm the implication of standard on consumer welfare.

Bibliography

Anderson, Damania and Jackson (2004), "Trade, Standards, and the Political Economy of Genetically Modified Food," CIES Discussion Paper 0410, School of Economics, University of Adelaide, Australia

Chen, Otsuki and Wilson (2004), "Standards and Technical Regulations: Do They Matter to Export Success in Developing Countries?" The World Bank, Washington D.C.

Chen, Suzuki and Wilson (2006), "Do Mutual Recognition Agreements Expand Trade?" (mimeo.) The World Bank, Washington D.C.

David, Paul A. and Shane Greenstein. (1990) "The Economics of Compatibility Standards: An Introduction to Recent Research." *Economics of Innovation and New Technologies* 1: 3-41.

Fischer, Ronald and Pablo Serra (2000), "Standards and Protection," *Journal of International Economics* 52: 377-400.

Henry de Frahan (2004), "Harmonization of Food Regulations and Trade in the Single Market: Evidence from Disaggregated Data." Document de Travail 2004-21, ESPO/ECON, Departement des sciences economiques, UCL.

Jones, P. and J. Hudson. (1996). "Standardization and the Costs of Assessing Quality," *European Journal of Political Economy*, 12, 355-361.

Otsuki, Wilson and Sewadeh (2001) “What price precaution? European harmonization of aflatoxin regulations and African groundnut exports”, *European Review of Agriculture Economics* Vol. 28 (3) pp.263-284

Stephenson, Sherry M. (1997) “Standards, Conformity Assessment and Developing Countries,” Policy Research Working Paper 1826, The World Bank, Washington DC.

Wilson and Otsuki (2001) “Global Trade and Food Safety: Winners and Losers in a Fragmented System”, The World Bank, Policy Research Working Paper Series: 2689

Wilson and Otsuki (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 and Otsuki (2004) “To spray or not to spray: pesticides, banana exports, and food safety,” *Food Policy*, vol. 29(2), pages 131-146, April.

Wilson, Otsuki and Majumdar (2003) “Balancing food safety and risk: do drug residue limits affect international trade in beef?” *Journal of International Trade & Economic Development* Vol. 12(4), page 377-402, December

Wilson, Otsuki and Maskus (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

