IMPACT OF US HACCP REGULATION ON EXPORT OF FISH AND FISHERY PRODUCTS FROM GUYANA

Dianna Abiola DaSilva (MSc.)
University of Guyana, Institute of Development Studies, Turkeyen Campus,
P.O. Box 10-1110. Georgetown, Guyana.
Email: diannabiola@yahoo.com
Telephone numbers: (592) 222- 5409 (w); Fax: 592-222-5551

February 2010

ABSTRACT

The verdict on the impact of product standards on agricultural exports from developing countries is largely that they barricade trade by imposing onerous compliance costs on exporters. However, this paper makes an attempt at determining the impact of process requirements (Hazard Analysis Critical Control Point requirements) on exports. The impact of HACCP requirements on exports of fish and fishery products from Guyana to the US is investigated using a standard gravity model, augmented with a dummy variable. The analysis is undertaken using UN COMTRADE data at the 2 digit (Rev I) level of classification for 39 years, 1970- 2008. The results support the view that standards can be a catalyst for competitiveness and that the perceived costs are often less than assumed given the impact on consumer confidence and demand.

Key words: Food safety standards, HACCP, gravity model.

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ACRONYMS

CAC	CODEX Alimentarius Commission
CARICOM	Caribbean Community
EEC/EC	European (Economic) Community
EU	European Union
FFP	Fish and Fish Preparations
FDA	Food and Drug Administration (USA)
HACCP	Hazard Analysis and Critical Control Point
MRLs	Maximum Residue Limits
FSS	Food Safety Standards
SPS	Sanitary and Phytosanitary
US	United States
USDA	United States Department of Agriculture

1. INTRODUCTION

There has been a notable paradigm shift in the food safety regulatory framework of developed countries from a focus on end-product quality management to quality management along the entire food chain. This approach sees food safety risks being managed through a preventative approach in the embodiment of the so- called Hazard Analysis Critical Control Point (HACCP) - based safety and quality management system (farm-to-table/farm-to-fork approach) (Ababouch et al. 2005).

The HACCP system differs fundamentally from conventional approaches such as the Quality Circles[1] (1970), Total Quality Management[2] (TQM 1980) and ISO 9000 (1980s) quality management frameworks. It offers an integrated approach to quality control management in seafood which bestows responsibility for product quality on all stakeholders involved in fish trade inclusive of farmers, fishers, food processors, transport operators, distributors, importers (consumers) and governments (Ababouch et al. 2005). In addition to featuring characteristics of product standards, HACCP systems also emphasize system design, record keeping procedures, sanitation procedures, employee training, elements that are all important to holistic quality management.

HACCP systems within individual countries should be designed to incorporate five broadly- defined fundamental principles, many of which are embodied in the SPS and TBT agreements. These include: risk analysis- assessment, management and communication; traceability; harmonization of safety and quality standards; equivalence in food safety systems; and ‘risk avoidance or prevention at source’ within the entire food chain- good aquaculture practices/ good harvesting practices and HACCP quality assurance systems (Ababouch et al. 2005).

HACCP has become (1997) a mandatory requirement for export of fish to the US and many other developed countries and some developing (exporting) countries who have

[1] The Quality Circles approached emphasized worker training and communication on quality problems arising during the production process.
[2] The Total Quality Management tool encouraged the creation of attitudes and controls that would support the prevention of health hazards.

consensually accepted HACCP as the most effective tool for managing food safety risks in FFP.

The shift in the nature of the stipulated quality management system has become necessary to minimize health risks (such as Tuberculosis) given the recent deluge of food safety scares and consequent increased consumer demand for safer products. Noteworthy, in the US[3] the majority of food borne illnesses that occur each year are associated with seafood products so that management of health risks associated with seafood is crucial. Approximately 15% of an estimated 76 million food borne iIlnesses that occur every year in the US are associated with seafood consumption (Anders and Caswell 2006).

Further, seafood is a non-homogeneous commodity given diversity in harvest methods, production areas etc. and therefore cannot be easily regulated by universal product standards (Anders and Caswell 2006).

While two decades have elapsed since developed countries have begun to reform their quality management systems for fish, many developing countries such as Guyana have not been able to keep a pace with these developments. This is evident in the inability of all developing countries to become certified to export to all developed countries' markets. Analysis of the impact of such measures on export capacity therefore remains imperative.

A priori it can be construed that the impact of these developments on exports from developing countries, given the *standards- as- barriers* vs. *standards- as- catalyst* dichotomy, is ambiguous. The potential negative impact of HACCP introduction may be associated with the significance of investment cost requirement to demonstrate compliance given that HACCP is not a stand-alone control system and must therefore be supplemented with pre-requisite hygiene measures as well as compliance with end-product measures.

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[3] Globally, the US is one of the largest importers of seafood products (Anders and Caswell 2006).

The potential positive impact remains related to the possibility of stimulating modernization in the production/export supply chain of developing countries given the diffusion of technology that may be embedded in the system.

This paper investigates the impact of the introduction of HACCP requirements on exports of fish and fishery products (FFP) from Guyana to the US, its largest export market for FFP. The paper uses a standard gravity model that normalizes trade between Guyana and the US, augmented with a dummy variable that captures the introduction of the HACCP requirement. The analysis is undertaken using UNCOMTRADE data at the 2 digit (Rev I) level of classification for 39 years, 1970-2008. Attempts are also made to compare the difference in impact of product and process standards by augmenting the model with a measure of stringency calculated based on the inventory approach, with CODEX standards as the reference point for comparison.

2. RESEARCH OBJECTIVES

The main objective of this paper is to ascertain the impact of the introduction of mandatory HACCP requirements on exports of FFP Guyana over the period 1970 to 2008.

To this end, the following are the specific objectives that guided execution of this study:

1. To ascertain the main US regulations governing exports of FFP to that market
2. To employ a gravity model to quantitatively estimate the impact of US HACCP requirements on exports of FFP from Guyana during 1970 to 2008.
3. To weigh the impact of HACCP requirements against the impact of product standards on exports.

3. THEORETICAL FOUNDATIONS- FOOD SAFETY STANDARDS: CATALYSTS OR BARRIERS TO TRADE?

Food safety standards (FSS) have a dual effect on trade and welfare, simultaneously affecting both the importing and exporting countries. For the importing country, FSS are beneficial because of their prima facie objective of protecting consumers from pests and diseases associated with imported food (Wilson and Otsuki 2001; Achterbosch and van Tongeren 2002; Maskus et al 2001).

For exporting countries the precise impact of FSS is ambiguous (Hufbauer et al 2000; Baldwin 2000). FSS can deliberately or inadvertently affect exports from developing countries. They can be deliberately trade-distorting where they are used as a subterfuge for protectionism by their design and application (Baldwin 2000; Iacovone 2003; Hufbauer et. al 2001; OAS 2005). Further, they can inadvertently restrict trade by their compliance cost requirement and their heterogeneity across markets (Baldwin 2000; Walkenhorst 2003 and Iacovone 2003).

Compliance costs (fixed and variable) can affect both the short and long run cost function of exporters (Baldwin 2000; Buzby 2003).

Scale and locational differences influence the significance of compliance costs on producers (Oyejide et al 2000). For small firms that lack economies of scale, the compliance costs of FSS may adversely affect export capacity. In fact, standards can act as a prohibitive tariff that closes export markets to small firms operating in a perfectly competitive market, where they cannot influence output and price and are earning normal profits (Baldwin 2000; Iacovone 2003; Oyejide et al 2000).

The locational effects of standards underscore the cost differences of standards given firm location. Firstly, standards can asymmetrically increase the costs for foreign producers compared to domestic producers and thus have a tariffication effect on all foreign exporters. Secondly, standards can lead to segmentation among all exporters;

where because of their content and design, they close markets to exporters who find compliance a grave difficulty but allow the benefit of unfettered access to those who can comply, which is more likely to be developed- country trading partners (Baldwin 2000).

Oyejide et al (2000) notes that in addition to compliance costs, firms also face costs associated with non-compliance and delays. Exporters are likely to face trade reduction/diversion where they are unable to undertake the investment necessary to bring their exports into conformity with the FSS requirements of importing countries when they become aware of them (Achterbosch and van Tongeren 2002). This is because FSS can raise the elasticity of substitution in demand for similar products (Wilson 2001). Products that are in compliance with the requirements can be readily substituted for products that are not (Gandlsant and Markusen 2000).

Private food safety standards, such as Eurepgap and Global GAP that fall outside the remit of the WTO, also increase the complexity of the standards regime of developed countries. In addition to acting as enforcers of public requirements private players in the standards arena have added testing and certification requirements that exporters must comply with (Fulponi 2007) In fact, Henson and Jaffee (2006) argue that such standards are playing a more prominent role in governing agricultural and food markets than public food safety standards and have become de facto mandatory due to concerns with profitability (Hufbauer et al. 2001). Fulponi (2007) identifies three key developments in the food sector with respect to private standards: (1) the move to voluntary management systems for the monitoring of product and process attributes; (2) the emergence of coalitions of firms for setting private collective voluntary standards and (3) the increased use of global business to business (B2B) standards.

There is concern that these standards are more difficult and/or more effectively enforced than public standards (World Bank 2005).

In addition to understanding the impact of compliance costs on trade, it is also important to understand the specific institutional capacities of developing countries as this is a key factor in determining the significance of the impact of FSS. Developing countries such as Guyana are plagued by administrative, technical and scientific capacity weaknesses. These capacity constraints can further hinder their capacity to enhance access to the markets of developed countries.

The ‘standards-as-catalyst’ perspective emphasize that compliance with FSS provide potential opportunities that developing countries can use to stimulate competitiveness and result in more sustainable and profitable trade over the long term (World Bank, 2005). This is premised on the assumption that competitiveness in agricultural markets for high- value commodities is defined by quality rather than price.

The main avenue through FSS can stimulate positive competitiveness change in exports from developing countries is through their ‘avoidance of the lemons problem’. Standards close an information gap between consumers and foreign suppliers regarding the quality of imported commodities by providing assurances of quality and health to consumers (Unnevehr 2003). Arguably, given the very integrated nature of HACCP systems, assurances of safety are much greater for products that comply with such requirements (Baller 2007). This narrowing of the information asymmetry between consumers and foreign producers can have the effect of stimulating demand. According to the World Bank (2005), without this confidence the market for certain products cannot be maintained, more so increased.

The graphical frameworks below (emulated from Gandslant and Markusen 2001 and Iacovone 2003) depict how FSS can lead to an increase in demand. X_f in Figure 1 is the imported commodity. X_f and X_h are two normal goods that provide the same level of utility to consumers (that is, assuming that utility is constant). With no regulations, consumers would be willing to pay a small amount from their budget for X_f (reflected by the fact that indifference curve 1 intersects the budget line at a point closer to zero from the X axis). However, subject to the budget constraint, when a standard is imposed on good X_f, consumers would be willing to pay more for the assurance that the good is of a higher quality (this is reflected by indifference curve 2 that is vertically higher than indifference curve 1).

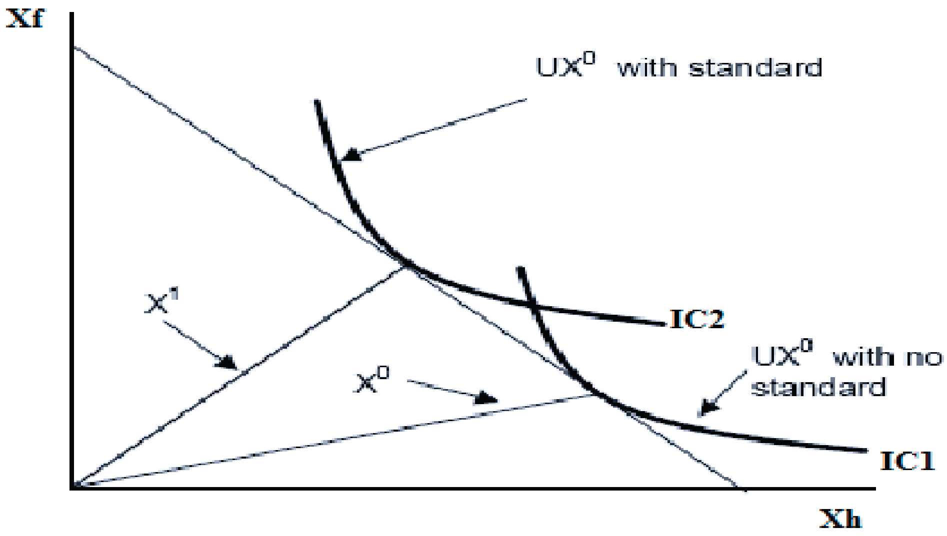

Figure 1 Effect of Standards on willingness to pay (for good Xf)

Source: Gandslant and Markusen (2001)

The increase in willingness to pay translates into an increase in demand.[4]. Figure 2 illustrates that demand increases from DD to DD`` and leads to an upward movement of the equilibrium price (to a price above p`) and a greater expansion in trade and aggregate welfare than under a standards- free trading environment (Oyejide et al 2000).

[4] This is based on the basic economic premise that demand is reflected by the willingness and ability of consumers to pay for goods.

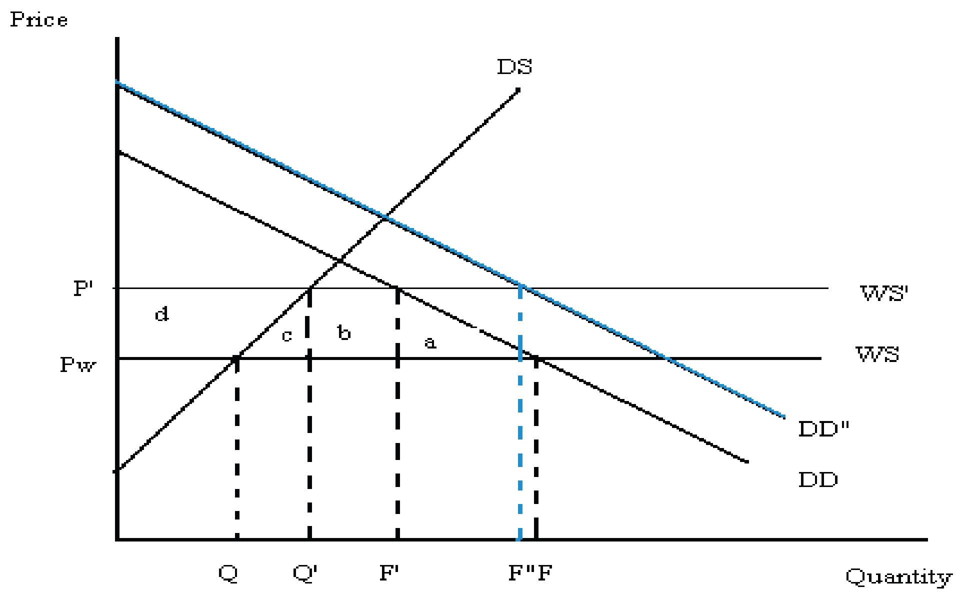

Figure 2 Effect of SPSMs on demand in a small country

Source: Iacovone (2003)

FSS can therefore facilitate continued and increased access to the markets of developed countries for agriculture exporters from developing countries through their impact on consumer demand.

4. METHODOLOGICAL APPROACH

This paper employs the gravity model to undertake an estimation of the impact of the HACCP regulation on fish exports from Guyana to the US over a 39 year period, 1970-2008. The gravity model normalizes trade between two countries using several factors that promote or inhibit trade. It has its genesis in Newtonian "law of Universal Gravitation" (Newton's Apple 1867)"

$$F_{ij} = G^* M_i M_j / D^2_{ij}.$$

Where; F_{ij} is the attractive force; M_i and M_j are the masses; D_{ij} is the distance between the two objects and G is a gravitational constant (Kuratani 2004; Head 2003). It therefore assumes that the economic size and geographical distance of countries are the main factors influencing trade relations between countries. The model can thereafter be augmented to measure the impact of standards on exports.

The gravity model used in this paper is a single-country fixed effects model that follows a log-linear econometric time-series specification so as to be able to interpret the estimated coefficient as the elasticity of the variables as well as to capture the temporal dynamics of trade.

The gravity model used in this paper has the following specification:

$$\ln X_{US/GY} = \beta_0 + \beta_1 \ln PGDP_{Gy} + \beta_2 \ln PGDP_{US} - \beta_3 \ln Dist_{US/GY} + \beta_4 \ln HACCP_{US} + \beta_5 \ln CBI + \beta_6 \ln STR + U_{ijt}$$

Where;

Ln $\boldsymbol{X_{it/ji}}$ is the natural log of real exports of FFP from Guyana to the US valued at US $'000 at 2004 prices. Export data were obtained primarily from the United Nations Commodity Trade Statistics (COMTRADE) database and the Bureau of Statistics, Guyana. The data was used at the 2 digit level of dis-aggregation based on revision 1 of the standard industrial trade classification system (S.I.T.C). Time series averages were used to fill missing gaps in the data set for the years 1993 and 1995.

Ln $\boldsymbol{PGDP_{GY}}$ and ***Ln*** $\boldsymbol{PGDP_{US}}$ are, respectively, the natural log of Guyana's real Per Capita GDP and the Per Capita GDP of the US measured in US$'000 at 2004 prices. Data were obtained from the United Nations.

The Per Capita GDP variables were used to measure the effect of income on trade relations between Guyana and the USA. Income measures the economic size of countries and respectively reflects purchasing and output capacity of the importing and exporting country. For the importing country, a larger per capita GDP translates into a larger purchasing capacity, and hence a greater demand for imported goods (Kalbasi 2001). Per capita GDP is also an indication of the level of development of a country. Based on the specialization hypothesis proffered by the H-O theorem and theories of economies of scale and product differentiation, economically larger countries are expected to produce a variety of goods and trade more (Evenett and Keller 1998; Deardorff 1995).

The ceteris paribus effect of the per capita GDP is therefore assumed to be positive. This is substantiated by the fact that the Newtonian equation had assumed that the force of attraction is greater between objects of a similar size.

Ln Dist $_{GY/US}$ is the Natural log of distance between Guyana and each of its trading partners. It is measured as '000 kilometres. and was obtained from the CEPII database, which calculates distance as a weighted average of the distance between the economic centers[5] of the countries, which may or may not include the capital, using the geodesic approach.

Distance is used as a proxy for several cost factors that separately affect trade (Head 2003) such as: transport costs; time elapsed during shipment; synchronization costs; communication costs and transaction costs. These costs increase with distance. Therefore, ceteris paribus, the coefficient distance is expected to be negative.

Ln STRJ $_{it/jt}$ is an index used to capture the stringency of the US's product standards on exports of FFP from Guyana. It was constructed based on the inventory approach and determined by the following criteria:

$$I = \sum_t \text{CUM } Std_i / \text{CUM } Std_{codex}$$

[5] This is based on the geographic distribution of the population (2004) within each state. The distance formula used is a generalized mean of city-to-city bilateral distances, weighted by population developed by Head and Mayer (2002): $d_{ij} = (\sum_{k \in i} (pop_k/pop_i) \sum_{e \in j} (pop_e/popj)\, d^{\theta}_{ke})^{1/\theta}$
Where: pop_k, is the population of agglomeration k belonging to country i and θ, measures the sensitivity of trade flows to bilateral distance.

That is, I is a cumulative comparison the regulations of the US[6] against CODEX recommended guidelines.[7]

Where I $\geq 0 \sim \geq 1$

I ≥ 1, US' standards are on par with or are more stringent than the recommended Codex guideline.

I ≤ 1, US' standards are more lax than the recommended Codex guideline.

The following criterion is used to determine Std_i

$Std_{it} = Tol^j_i \geq Tol^j_c$

Where: Std_i Tol_i is the tolerance level of the US for standard j that is greater than or equal to the guideline of the CAC for the same standard at time t.

Four categories of regulations were chosen: labeling, contaminants, veterinary drug residue and additives.

Data for standards were obtained from title 21 of the code of federal regulations (CFR) and documents from the compliance policy programme for the US and the CAC Documents repository.

INT ***CBI/LOME/CARICOM*** is a dummy variable that measures the impact of the free trade arrangement on trade flows between Guyana and each of its trading partners. *A priori,* a

[6]The following regulations were used to obtain data: Code of Federal Regulations (CFR) Title 21- Food and Drugs (volume 2), 'Chapter 1- Food and Drug Administration,' Department of Health and Human Services, part 101- Food Labeling, Revised 2003; part 170-199- Food Additives; part 123- Fish and Fishery Products; and Code of Federal Regulations (CFR) Title 40- Protection of environment (volume 2), Chapter 1- Environmental Protection Agency (EPA), part 180- Tolerances and Exemptions from Tolerances for Pesticide Chemicals in Food. Also, FDA/ORA Compliance Policy Guide Sections 555.300, 556.660 US Food and Drug Administration, Office of regulatory Affairs, viewed September 2007, http://www.fda.gov/ora/compliance_ref/cpg/cpgfod/default.htm#sc555

[7] The following CAC documents were used to obtain data: CODEX General Standard for Contaminants and Toxins in Foods, CODEX STAN 193-1995, Rev.2-2006; CODEX General Standard for Contaminants and Toxins in Foods, CODEX STAN 193-1995, Rev.2-2006; CODEX General Standard for Food Additives, CODEX STAN 192-1995; Codex MRLs for pesticides.

free trade arrangement can have either a negative or a positive impact on bilateral trade.

$HACCP_{US}$ is a dummy variable added to the equation to measure the impact of the 1997 introduction of US HACCP requirements on exports. This variable can have either a negative or a positive impact on exports.

The term ***U_{ijt}*** is the error term and is assumed to be normally distributed with mean zero.

The gravity approach offers an advantage of other approaches in that it allows for a direct indication of the direction and impact of the imposition of a standard on trade flows. Other approaches, such as surveys and case studies and partial equilibrium approaches while they provide more detailed analyses, do not provide a direct estimation of the trade impact of standards (Beghin and Bureau 2001; Iacovone 2003).

Additionally, the gravity model because it is constructed on time series data provide an indication of trends and dynamics unlike other approaches such as surveys that are usually one time occurrences (Iacovone 2003). The gravity model also allows for a comparison of how diverging standards promote or inhibit trade between an exporting country and several of its importing country partners (Wilson and Otsuki 2000; Beghin and Bureau 2000).

5.1 U.S. REGULATIONS FOR SEAFOOD IMPORTS

HACCP and general hygiene requirements of the US are laid out in part 123 of title 21 of the Code of Federal Regulations. The regulations establish requirements for good manufacturing practices that cover the entire production chain including primary production. They also stipulate regulations relevant to hazard analysis and control; the design and facilities of establishment; production methods and practices; maintenance and sanitation of establishment; verification records; certification; registrations/approval of food businesses and transportation. The requirements seek to ensure that products are safe until they get to the final consumer (Ababouch et al 2005).

The HACCP system is based on seven principles that include:

1) Conduct a hazard analysis
2) Determine the critical control points (CCPs)
3) Establish critical limit(s)
4) Establish a system to monitor control of the CCP
5) Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control
6) Establish procedures for verification to confirm that the HACCP system is working effectively and
7) Establish documentation concerning all procedures and records appropriate to these principles and their application.

Importer-verification[8] is a key component of the US' HACCP requirement for exporting countries. The US requires that processors/ importers take positive steps to verify that the processor/exporter's HACCP plan is in accordance with US stipulation so as to preventive adulterated foods from finding their way on the market.

Verification activities, as listed in 21 CFR part 123 can include:

- Obtaining HACCP and sanitation monitoring records relating to the specific lot of fish or fishery product being offered for import;
- Obtaining a copy of the exporter's HACCP plan and periodically testing imported products;
- Obtaining lot-by-lot certification from the exporting government or a competent third party that indicates that the products were processed in accordance with the requirements of section 123;

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[8] The Verification activities can be done by a contracted third party.

- Regular inspection of foreign processors' facilities by importers and obtaining a written guarantee from the foreign processor that the imported product conforms to the requirements of section 123.

Registration of food processing, packing and storage facilities was introduced as a mandatory requirement by the U.S. Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (Bioterrorism Act). The Bioterrorism Act also requires that exporters inform the FDA on the expected arrival of shipments of goods so that a determination can be made as to whether inspection should be performed at the border.

Other requirements relevant to fish include:

2.1 Labeling Requirements

The main law governing the admissibility of imports of FFP into the US is Title 21 part 101 of the U.S. Code of Federal Regulations, which covers the requirements of the Federal Food, Drug, and Cosmetic Act and the Fair Packaging and Labeling Act.

2.2 Food Additive Regulations

Title 21CFR Part 170-199 governs the use of additives on FFP exported to the US. Exporters/manufacturers are usually required to submit a petition to the Food and Drug Association (FD) requesting permission for the use of an additive (Part 171 of CFR 21). For additives that are approved, the FDA will issue regulations highlighting the foods in which the additive can be used and will establish MRLs.

In parts 172 and 173 of CFR 21, the FDA has published lists of primary and secondary additives that may be directly added to food for human consumption. Parts 184 and 189 respectively publish lists of direct food substances recognized as being safe and of substances that are prohibited from use in human food.

2.3 Microbiological Criteria

US standards for microbiological pathogens are published in sections of the Compliance Policy Guide/ programme on the FDA-CFSAN website and in the “Fish and Fisheries Products Hazards and Controls Guidance,” which is published every two years since 1997 (See Appendix 11).

US MRLs for microbiological pathogens are generally more lax than those set by the European Union. For instance, the US has a standard of 10,000/g for vibrio parahaemolyticus which is much greater than the <100 CFU/g set by the UK and the Netherlands. Additionally, the US has a higher tolerance level for Staphylococcus aureus in fish (equal to or greater than 100,000 to 1,000,000/gram) compared to the EU (1 000/gram). However, the US has established maximum residue limits for a wider array of bacterial pathogens compared to the EU.

2.4 Residues of Veterinary Drugs and Chemical Contaminants

MRLs for veterinary drugs in fish are not widely established. The US has MRLs for 24 veterinary drugs compared to 8 in the EU (see appendix 2).

The US accepts the CAC guideline for residue limits for Oxytetracycline at 200 ug per kg which is the same as the.[9] There is no commonality in the veterinary drugs for which MRLs are set by the EU. The EU has established MRLs for Flumequine, Oxolinic acid, Florfenicol, Deltamethrin, Chloramphenicol and Nitrofurans which are not set by the US.

The U.S. has less stringent regulations for chemical contaminants (See Appendix 3) compared to the EU and CAC. However, the US has established standards for the marine toxins; amnesic shellfish poison, neurotoxic shellfish poison and paralytic shellfish poison, while the EU has not.

[9] This is based on the conversion 1 mg = 100 ug

2.5 Certification and Inspection Requirements

While certification and the existence of a competent authority are not mandatory requirements of the US, as is the case with the EU, title 21 CFR part 123.12 does provide for countries to voluntarily enter into memorandums of understanding (MOU) or similar agreements with the FDA that documents the equivalency or compliance of their food safety system with the US system (Ababouch et al 2005).

Regular (non-mandatory) checks for verification of compliance with the technical and legal requirements of are conducted at the border. These checks include paper, identity and physical checks. Physical checks are variable and depend on the status of the country of origin and compliance history of the exporting firm (Ababouch et al 2005).

5. EMPIRICAL ANALYSIS

5.1 Results of Econometric Estimation

The gravity model was tested for violation of key classical assumptions: linearity, multicollinearity, autocorrelation and heteroscedasticity, as any violation can result in the results being biased and unreliable. The results suggest that the classical assumptions were generally not violated. The overall fit of the model is also statistically significant at the 95% confidence level. Further, three of the regressors are statistically significant at the 5% level of significance using the student's T test (see appendix 4).

The elasticity of the coefficient of the estimate of HACCP is 1.5%. This indicates that the introduction of HACCP requirements in the US has had a positive and significant impact on bilateral export flows between the US and Guyana over the period 1970- 2008.

This is to be contrasted with the negative and insignificant impact of stringent US product standards relative to Codex guidelines (-0.8%). It suggests that both the magnitude and direction of the impact of standards on bilateral trade is correlated with the nature of the regulation under consideration.

5.1 Analysis of Results

The positive impact of US HACCP requirement on exports of FFP from Guyana is consistent with the standards-as-catalyst view purported by the World Bank and other theorists (Achterbosch and von Tongeren 2002 and Oyejide et al 2001) who argue that standards can catalyze changes in the production and export supply chain of developing countries and facilitate enhanced competitiveness of high-value agricultural export commodities as well as sustainable and profitable trade over the long term (World Bank, 2005). This is premised on the assumption that competitiveness in agricultural markets for high- value commodities is defined by quality rather than price.

The integrated HACCP quality management system is therefore an important factor contributing positively towards sustained exports of FFP to the US markets.

The impact of standards on competitiveness and demand is reinforced by a 2004 study by the United States Agency for International Development- Guyana Trade and Investment Support (USAID-GTIS) which highlighted that US importers/buyers of fish from Guyana are of the view that Guyana’s fish and the management and processing practices are of a high quality (Zweig 2004).

The World Bank (2005) argues that compliance with standards (such as HACCP) more often act as a “catalyst for progressive change” (World Bank 2005) by providing developing countries with an incentive to modernize production/ export supply chains. However, the extent to which this benefit may be realized is affected by institutional capacity deficits in developing countries. This is corroborated by Anders and Caswell (2006) who point to a gap between growing standards requirements in developed countries and the development of modernized supply chain structures for many export industries in developing countries that remains to be bridged.

Nevertheless, implementing conformity assessment procedures in order to enhance capacity along the production chain to comply with process standards, such as HACCP, may potentially allow developing countries to expand market share and acquire new forms of competitive advantage given their already natural comparative advantage in agricultural commodities given resource endowments and factors cost. For instance, the labour intensity of requirements that pertain to testing, conserving, preparing, processing and packaging can allow developing countries to gain a competitive edge over developed countries and result in more sustainable and profitable trade over the long term (World Bank 2005; Hufbauer et al 2001; Mustafa 2004; Achterbosch and van Tongeren 2002).

Enhancing capacity along the production/export supply chain may also allow for increased flexibility in complying with changing standards, giving developing countries scope to expand their export base and supply to a range of different markets (Mustafa 2004) and develop niche marketing strategies.

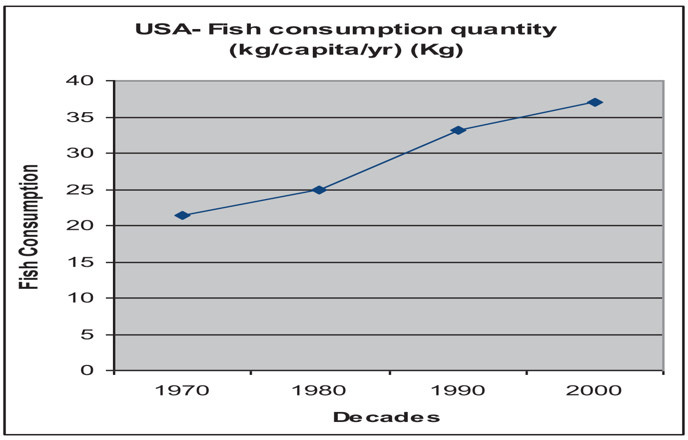
Standards can also lead to the attainment of economies of scale by restricting the production process to a limited range of product characteristics or processes so that division of tasks (specialization) becomes possible. This can reduce time lags and coordination costs that otherwise would hinder the efficiency with which firms operate (Hufbauer et al 2001; Achterbosch and van Tongeren 2002). The attainment of allocative and productive efficiencies can also force inefficient firms to close down operations or merge with stronger enterprises (Maskus and Wilson 2001), reducing the size of export industries.

Many of the indirect benefits associated with standards are spillovers from standards compliance by exporters and mainly accrue to the domestic populace and workers. These include: impacts on domestic food safety (World Bank 2005); increased agricultural productivity (Simeon 2006); worker safety and rural livelihoods (World Bank 2005); enhanced competition- where all exporters conform to one standard, comparison is easier and competition is sharper (Hufbauer et al 2001) and technology diffusion-exporters can benefit from the technology embodied in a standard (Hufbauer et al

2001). There may also be spillover benefits into the domestic SPS regime resulting in their being greater clarity to the appropriate SPS management functions of government (World Bank 2005) and increased capacity-building within the public sector (Henson and Jaffee 2006).

While the econometric model has indisputably revealed a strong and positive correlation between HACCP and trade flows between the US and Guyana, other factors similarly affect export flows and can stultify or magnify the perceived impact of standards.

Noteworthy, the economic size of the US market, as measured by Per capita GDP is a significant factors affecting bilateral trade between Guyana and the US for FFP. Income reflects purchasing capacity. The coefficient of the estimate of the per capita GDP of the US is 1.7%, indicating that a 1% increase in the per capita income of the US will result in a 1.7% increase in the demand for fish from Guyana. This highlights the positive income elasticity of demand for high value agricultural commodities in high income countries. Ceteris paribus, increased incomes would lead to increased imports and consumption of FFP from Guyana. This is corroborated by the fact that globally the US is one of the largest importers and consumers of fishery products. Over the last four decades the US has had a consistently high demand for fish and fishery products (see Figure 33). Between 1980 and 2003 seafood consumption in the US increased by more than 50% and is still on the rise.



Source: Author’s calculation based on data obtained from the FAO Fishery database

Figure 3- US annual per capita consumption of fish and fishery products

The US also has a trade deficit for fish that was estimated at US$9.7 Bn for 2008, which means that imports will remain an important source of satisfying domestic consumption. Anders and Caswell (2006) also divulge that the demand for high quality fish by developed countries generally exceeds the supply capacity of developing countries and has contributed to increasing prices. As such, scope exists for Guyana to further increase export supply where food safety standards can be met.

The availability of substitutes and market share of countries are also economic factors in export markets that influence export flows. Guyanese exporters supply a very small share of the US market compared to larger supplies such as Canada who provide a substitute commodity that importers could readily switch to if Guyanese exporters are unable to comply with standards. In fact, a survey of US fish importers conducted by the United States Agency for International Development (USAID) revealed that US importers consider Guyana's fish/shrimp to be products that there are available substitutes for (Zweig 2004).

Theoretically, there is also a locational effect associated (Oyejide et al's 2000) with standards, with respect to the impact of proximity to alternative lucrative markets as measured by distance. However, bilateral trade between Guyana and the US seems to be less influenced by the distance between them. Similarly the benefits of preferential access to the US market through the Caribbean Basin Initiative (CBI) does not influence significantly export flows between US and Guyana.

6. CONCLUSION

This paper sought to examine the impact of US HACCP requirements on exports of FFP from Guyana to that market using a gravity model. The results largely reveal that the impact as been positive as opposed to end-product standards that were estimated to have had a negative impact on exports over the period 1970-2008. This underscores that improvements are more readily introduced into the production system of fish exporters through process standards that are concerned with a supply chain approach to managing health risks.

The paper further highlights that other factors affect trade and that together these may have a greater impact on export flows than the perceived negative impact of standards which may be less than assumed. It is therefore important that HACCP requirements, notwithstanding, the significance of the investment cost to demonstrate compliance, are embraced as an important precursor to improving the competitiveness of fishery exports which continues to be an important export commodity for Guyana.

7. REFERENCES

Ababouch, L, Gandini, G & Ryder, J. 2005. 'Causes of detentions and rejections in international fish trade,' FAO Fisheries Technical paper No. 473, Fisheries and Aquaculture department, date viewed October 12, 2007, http://www.fao.org/docrep/008/y5924e/y5924e0c.htm#TopOfPage

Achterbosch, T & van Tongeren, F. 2002. 'Food safety measures and developing countries: literature overview,' date viewed July 5, 2007, http://www.lei.dlo.nl/uk/content/research/FoodSafetyDCs.pdf

Anders, S, & Caswell, Julie A. 2006. 'Assessing the Impact of Stricter Food Safety Standards on Trade: HACCP in U.S. Seafood Trade with the Developing World,' Selected Paper prepared for presentation at the American Agricultural Economics Association Annual Meeting, Long Beach, California

Baller, S. 2007. 'Trade Effects of Regional Standards Liberalization, a Heterogeneous Firms Approach,' World Bank working paper 4124, date viewed May 11, 2007, http://wwwwds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2007/02/20/000016406_20070220102755/Rendered/PDF/WP04124.pdf

Deardorff, A.V. 1995. 'Determinants of Bilateral trade: Does gravity work in a neoclassical world?' NBER working paper series, working paper 5377, viewed November 2007, http://www.nber.org/papers/w5377.v5.pdf,

Evenett, S. J, & Keller, W. 1998. 'On theories explaining the success of the gravity model,' NBER Working Paper 6529, viewed November 2007, http://www.nber.org/papers/w6529.pdf

Fish and Fisheries Products Hazards and Controls Guidance (3rd Edition). 2001. US Food and Drug Administration- Center for Food Safety and Applied Nutrition, viewed October 28, 2007, http://www.cfsan.fda.gov/~comm/haccp4a.html

'Food Safety and Agricultural Health Standards: Challenges and Opportunities for Developing Country Exports.' 2005. Report No. 31207, Poverty Reduction & Economic Management Trade Unit and Agriculture and Rural Development Department World Bank, viewed April 23, 2007, http://www.oecd.org/dataoecd/41/46/34410813.pdf

Ganslandt, M. Markusen, J. 2001. 'National Standards and International Trade,' Working Paper No. 547, The Research Institute of Industrial Economics, Stockholm, viewed April 23, 2007, http://swopec.hhs.se/iuiwop/papers/iuiwop0547.pdf

Head K. 2003. 'Gravity for Beginners,' viewed January 2007, http://strategy.sauder.ubc.ca/head//gravity.pdf

Henson, S, & and Jaffee, S. 2006. 'A Strategic Perspective on the Impact of Food Safety Standards on Developing Countries,' Invited paper prepared for presentation at the International Association of Agricultural Economists Conference, Gold Coast, Australia, August 12-18, 2006

Hufbauer, G, Kotschwar, B, & Wilson, J.S. 2001. 'Trade Policy, Standards, and Development in Central America,' The World Bank Development Research Group, Policy Research Working Paper 2576, viewed April 30, 2007, http://www.boaoforum.com/06NewDown/2Hufbauer,%20Kotschwar%20and%20Wilson%202001%20Trade%20and%20Standards%20in%20C.pdf

Iacovone, L. 2003. 'Analysis and Impact of Sanitary and Phytosanitary Measures,' (Paper presented at the second conference on the Economic Implications of the Doha Development Agenda for Latin America and the Caribbean, CEPII/IADB Washington, D.C., October 6), viewed May 30, 2007, http://www.iadb.org/INT/Trade/1_english/4_SpecialInfo/Conference/2003/q_Oct6_CEPEII/6/Iacovoneppt.pdf

Kalbasi, H. 2001. 'The Gravity Model and Global Trade Flows,' viewed January 2007, http://ecomod.net/conferences/ecomod2001/papers_web/KALBASI.pdf

Kuratani, T. 2004. 'Regional Trade Agreements and Bilateral Trade Flows,' Shikoku University, viewed January 2007, http://wwwsoc.nii.ac.jp/jsie/Annual_Conferences/64th_Ritsumeikan/paper/14-1.pdf

Mustafa, K. 2004. 'Barriers Against Agricultural Exports from Pakistan: The Role of WTO Sanitary and Phytosanitary Agreement, viewed April 23, 2007, http://staff.kfupm.edu.sa/EE/shahzada/kiran/Export_Composition/Barriers%20Against%20Agricultural%20Exports%20from%20Pakistan%20The%20Role%20of%20WTO%20Sanitary%20and%20Phytosanitary%20Agreement.doc

Otsuki, T, Wilson, J.S, & Sewadech, M. 2001a. 'Saving two in a billion: A case Study to Quantify the Trade Effect of European Food Safety Standards on African Exports,' Development Research Group, World Bank, viewed April 23, 2007, http://siteresources.worldbank.org/INTRANETTRADE/Resources/Topics/aflatoxins.pdf

Oyejide, T.A, Ogunkola, E.O, & Bankole, S.A. 2001. ‘Quantifying the Trade Impact of Sanitary and Phytosanitary Standards: What is known and Issues of Importance for Sub- Saharan Africa,’ (Paper prepared for the Workshop on “Quantifying the Trade Effect of Standards and Regulatory Barriers: Is It Possible?” World Bank, Washington D.C April 2000), viewed April 23, 2007, http://iodeweb1.vliz.be/odin/bitstream/1834/824/1/oyejide1.pdf

UNCTAD. Private sector standards and developing country exports of fresh fruit and vegetables. Communication from the United Nations conference on trade and development (UNCTAD)

Wilson, J. & Otsuki, T. 2000. ‘Global Trade and Food Safety: Winners and Losers in a Fragmented System,’ World Bank Research Paper, viewed April 23, 2007, http://www.agtradepolicy.org/output/resource/WinnersLosers.pdf

Zweig, M. 2004. ‘Cluster Market Assessment: Fisheries and Seafood,’ (Report submitted by Carana Corporation to USAID Guyana Trade and Investment Support), viewed August 7, 2007, http://www.gtisproject.com/index.php?option=com_content&task=view&id=65&Itemid=68

8. APPENDICES

Appendix 1- US and EU MRLs for Microbiological Pathogens in Fish

	Maximum Residue Level	
Microbiological pathogen	**USA**	**EU**
Salmonella	Absence	absence in 25 g
E. coli	MPN of 230/100 g	<230/100 g
Listeria monocytogenes	Absence	
Vibrio cholerae	Absence	
Vibrio parahaemolyticus	levels equal to or greater than 10,000/g	<100 CFU/g[a]
Staphylococcus aureus	equal to or greater than 100,000 to 1,000,000/gram	1 000/gram
Vibrio vulnificus	Absence	
Clostridium botulinum	1. Presence of viable spores or vegetative cells in products that will support their growth; or, 2. Presence of toxin.	
Mesophilic aerobic bacteria		100 000/g
Source: Fish and Fisheries Products Hazards and Controls Guidance (2001)		

Appendix 2- US and EU MRLs for Veterinary Drugs in Fish

Veterinary residue	**Maximum Residue Limit**	
	USA (ppm)	**EU ug/kg**
Aldrin & Dieldrin	0.3	
Chlordane	0.3	
Chlordecone	0.3	
DDT, DDE, & TDE	5	
Ethylene Dibromide (EDB)	0.3	
Heptachlor and heptachlor epoxide	0.3	
Mirex	0.1	
Formalin	15 -250 micro liters per lt.	

2,4-D	1	
Simazine	12	
Diquat	0.1	
Glyphosate	0.2 to 0.25	
Triclopyr	3 to 3.5	
Imazapyr	0.1 to 1	
Bensulfuron methyl	0.05	
Carfentrazone-ethyl	0.3	
Oxytetracycline	2	
Sulfadimethoxine/Ormetoprim	0.1	
Fluridone	0.5	
Sulfamerazine	0	
Imazethapyr	0.1	
Finquel	1,200	
Sodium chloride	10 to 1,000 mg/L	
Flumequine		600
Oxolinic acid		100
Florfenicol		1 000
Deltamethrin		10
Emamectin		100
Thiamphenicol		50
Chloramphenicol		limit of determination
Nitrofurans		limit of determination

Appendix 3- Codex, US and EU MRLs for Chemical Contaminants in Fish

Chemical contaminant	**Maximum Level**			
	Product	**CAC mg/kg**	**USA (ppm)**	**EU mg/kg**
Lead	Fish Muscle	0.2		0.2
	Crustaceans	0.5	1.5	0.5
	Bivalve Molluscs	1.5		1.5
	Cephalopods (without viscera)			1
	fish	0.3		
	clams, Oysters and mussels		1.7	
Cadmium	Muscle meat of fish			1

	Muscle meat of swordfish			0.1
	Crustaceans	0.5	3	0.5
	Bivalve Molluscs	2		1
	Cephalopods (without viscera)	2		1
	Clams, Oysters and mussels		4	
Mercury/Methyl	Fishery products and muscle meat of fish			0.5
	muscle meat of mackerel or butterfish, swordfish, redfish, marlin etc.			1
	All fish	0.5 to 1	1 ppm	
Chromium	Crustacea		12	
	Molluscan bivalves		13	
Hard or sharp foreign object			0.3 (7mm) to 1.0 (25mm) in length	
Arsenic	Crustacea		76	
	Clams, oysters, and mussels		86	
Nickel	Crustacea		70	
	Clams, oysters, and mussels		80	
Amnesic shellfish poison- contaminant	shellfish		20	
Neurotoxic shellfish poison	shellfish		0.8	
Paralytic shellfish poison- contaminant	shellfish		0.8	
Dioxins (2001)	fish and fishery products		No specific tolerances	4pg/g fresh Weight 1ng/kg (lower action level established in 2002)
Histamine		10 mg/kg	5 mg/100 (50ppm)	10 mg/100 g (100ppm) to 20 mg/100g (200

				ppm)
Source of information: EC Directives 1881/2006; 2375/2001; 466/2001; 221/2002 CODEX STAN 193-1995, Rev.2-2006 US Food and Drug Administration- Center for Food Safety and Applied Nutrition Compliance Policy Guide Sec 555.300				

Appendix 4- Results of Estimation FFP (03)

Variables		
	Coefficient	**T- Statistic**
α	25.0	
ln $PGDP_{GY}$	-2.2	-6.0*
ln $PGDP_{US}$	1.7	5.2*
ln $DST_{GY/US}$	-14.0	-0.9
ln STR	-0.8	-0.1
D_{CBI}	-0.2	-0.5
D_{HACCP}	1.5	5.9*
R- Squared	90%	
Adj R-Squared	88%	
F- Statistic	46*	
Number of Observations	39	
* significant at the 5% level		