The Impact of Standards and Institutional Capacity on International Trade: An Examination of Food and Agricultural Products

A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Public Policy at George Mason University

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THE IMPACT OF STANDARDS AND INSTITUTIONAL CAPACITY ON INTERNATIONAL TRADE: AN EXAMINATION OF FOOD AND AGRICULTURAL PRODUCTS

by

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A Dissertation
Submitted to the
Graduate Faculty
of
George Mason University
in Partial Fulfillment of
The Requirements for the Degree
of
Doctor of Philosophy
Public Policy

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Spring Semester 2006
George Mason University
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DEDICATION

To my loving wife Taein

ACKNOWLEDGEMENTS

First of all, I would like to thank Professor Reinert who kindly guided me step by step during my Ph.D. study at George Mason University. Other members of my dissertation committee also provided me with invaluable insights. Their supports made it possible for me to complete this Ph.D. program. Help from administrative staff at the School of Public Policy, George Mason University were priceless. My special thanks go to Beth, the director of Ph.D. program student services, who has helped me move forward with encouragement and care. Financial supports through research assistantship and inestimable teachings from the faculty members at the School of Public Policy enabled me to achieve more than I could. I am also grateful of KOTRA, my new employer, for considerately giving me ample time to finalize this dissertation. I cannot forget the prayers and supports from my friends. I also thank my family members for their encouragement and patience. Finally and most importantly, I would like to thank my wife, Taein. She has been with me and waited patiently for me throughout this rather challenging process.

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List of Abbreviations

DSB	Dispute Settlement Body
DSP	Dispute Settlement Panel
EU	European Union
FAO	Food and Agricultural Organization
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Production
GNI	Gross National Income
GTAP	Global Trade Analysis Project
HACCP	hazard analysis critical control points
ICI	Institutional Capacity Index
IPPC	International Plant Protection Convention
ISO	International Standard Organization
MR	mutual recognition
NGO	Non-Governmental Organizations
NIE	New Institutional Economics
NTBs	non-tariff barriers
OECD	Organization for Economic Co-operation and Development
SPS	Agreement on the Application of Sanitary and Phytosanitary Measures
SITC	Standard International Trade Classification
STRs	standards and technical regulations
TBT	Agreement on Technical Barriers to Trade
TRQs	tariff rate quotas
TRTA and CB	trade-related technical assistance and capacity building

WTO	World Trade Organization

Abstract

THE IMPACT OF STANDARDS AND INSTITUTIONAL CAPACITY ON INTERNATIONAL TRADE: AN EXAMINATION OF FOOD AND AGRICULTURAL PRODUCTS

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George Mason University, 2006

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The successful conclusion of the Uruguay Round has reduced tariff rates significantly. However, non-tariff barriers (NTBs), such as food safety regulations, rules of origin, and environmental regulations, have become a major concern to exporters in developing countries. Among non-tariff barriers, food and agricultural standards and technical regulations (STRs) are critical to developing countries since food and agriculture products are one of their most important export items. However, due to the lack of institutional capacity of developing countries, the producers and exporters of developing countries face obstacles in complying with food and agricultural STRs in the markets of developed countries.

In this dissertation, I develop the four dimensions of STR-related institutional capacity: information, conformity, enforcement, and international standard setting. Then, those four institutional aspects are incorporated into a gravity model framework to

investigate whether or not the institutional capacity of developing countries matters in their efforts to minimize or eradicate the negative influence of STRs imposed on their food and agricultural exports. The gravity model results show that informational capacity and conformity capacity of exporting countries has positive impact on trade after controlling for economic size, distance, and STRs. Attention must be given to technical assistance to enhance informational and conformity capacity. However, the result shows that developing countries still face significant obstacles of STRs on their exports even after controlling for informational and conformity capacity.

For the food and agricultural STR-related WTO dispute settlement cases analysis, I focus on the dispute cases that involve developing countries either as a complainant or a respondent. Among these dispute cases, the two dispute cases that resulted in dispute settlement panel and Appellate Body reports are highlighted in this dissertation. The two dispute cases involved exports of: certain shrimp and shrimp products from four Asian countries, India, Malaysia, Pakistan, and Thailand, to the United States; and sardines from Peru to the EC. The results of both cases indicate that developing countries can benefit from the WTO dispute settlement mechanism if proper assistances and strategies are provided.

Chapter 1 Introduction

1.1 Background

The focus of this dissertation is on whether or not the institutional capacity of developing countries matters in their efforts to minimize or eradicate the negative influence of the standards and technical regulations (STRs) imposed on their exports. By institutional capacity, as often conceived in the international development community, I mean the quality of governance or the ability of governments or private entities to deliver essential services to the public.

The successful conclusion of the Uruguay Round has brought down tariff rates significantly. However, non-tariff barriers (NTBs), such as food safety regulations, rules of origin, and environmental regulations, have become a major concern to exporters in developing countries. Among non-tariff barriers, food and agricultural STRs have become a serious concern to developing countries since foods and agriculture products are the most important export items for them.[1]

[1] Concerns regarding extra burdens caused by STRs on the exporters of developing countries have been raised by Finger and Schuler (2000). Recent reports by the Financial Times also have raised concerns about trends for food safety regulations to become protectionist measures in developed countries as well as developing countries. For more detail, see Barnes (2004), Cienski (2004), and Wallis (2004).

The potential for STRs to become trade barriers was foreseen during the Uruguay Round. In order to prevent the misuse of STRs as trade barriers, the Agreement on Technical Barriers to Trade (TBT Agreement) and the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) were established under World Trade Organization (WTO) auspices. The TBT and SPS Agreements were aimed to be the guidelines for WTO Members for setting standards and technical regulations, while anticipating that WTO Members could avoid such STRs as being unnecessary barriers to trade.[2]

However, due to the lack of institutional capacity in the developing countries, their producers and exporters face obstacles in complying with food and agricultural STRs in the markets of developed countries. For example, Finger and Schuler (2000) point out that since developing countries must install "world-class systems," compliance to STRs at the international level requires "extensive investment" of which financial requirements often reach beyond the capacity of developing countries (p. 518). This financial burden prohibits developing countries from strengthening their institutional capacity to overcome STR-related impediments to their exports.

The issues of STRs and institutional capacity are important in the efforts of developing countries to expand their food and agricultural trade. They are important because food and agricultural products are still the key export items of developing countries and because food and agriculture exports are the major income source for developing countries and the least developed countries that try to escape from poverty. In

[2] Preambles of the TBT and SPS Agreements.

2003, more than 19.5% of the world total population were estimated to live on less than $1 per capita consumption a day and 49.7% on less than $2 per capita consumption a day (International Labor Office, 2005). These are no small matters.

Trade development has been recommended as a sustainable way of national economic development because developing countries can expand their market through engaging in international trade (Goldin & Reinert, 2006). Poor countries have been encouraged to integrate into the world trade system with the promise of technical assistance (Rodrik, 2001). The idea of trade as a development engine has been welcomed by poor countries as well. However, trade does not automatically bring about poverty alleviation because of explicit and implicit protection measures.[3]

Although STRs could increase welfare for the public in importing countries as well as producers in exporting countries, recent quantitative studies indicate that STRs are becoming significant barriers for developing countries to access markets in importing countries. These studies have quantified the negative impact of STRs on food and agricultural trade (Otsuki, Wilson, & Sewadeh, 2001a, 2001b; Wilson & Otsuki, 2003; Wilson, Otsuki, & Majumdsar, 2003). However, theses studies did not take the institutional capacity of exporting countries into consideration. As mentioned above, in qualitative studies and discussions in the international development community, the lack of institutional capacity in setting up and maintaining compliance systems in developing countries is often considered as a serious problem. Therefore, it is imperative to include

[3] For further discussion, see Goldin and Reinert (2006)

institutional capacity as an important factor in quantitative studies on the food related STRs and international trade.

In this dissertation, I test the hypothesis that institutional capacity matters in overcoming STR-related trade barriers. Since food and agriculture trade is still important for low-income developing countries, STRs on food and agricultural products are the focus of this paper. As will be discussed below, I develop original measures of four dimensions of standards-related, institutional capacity: information, conformity, enforcement, and international standard-setting. These measures are incorporated into a gravity model to investigate whether these capacities offset the negative effects of Aflatoxin B1 standards on food and agricultural product trade. The results indicate that informational capacity and conformity capacity do indeed have such offsetting effects. The evidence with regard to enforcement and international standard-setting is less clear.

I also review the food and agricultural STR-related dispute cases at the WTO Dispute Settlement Body. I focus on the dispute cases that involve developing countries either as a complainant or a respondent. Among these dispute cases, the two dispute case that produced the dispute settlement panel and the Appellate Body reports are highlighted in this dissertation. The two dispute cases involved exports of, respectively, certain shrimp and shrimp products from the four Asian countries, India, Malaysia, Pakistan, and Thailand, to the United States, and sardines from Peru to the EC. The result of both cases proves that developing countries can benefit from the WTO dispute settlement mechanism if proper assistances and strategies are provided.

1.2 Research Questions and Hypothesis

In this dissertation, the major objective is to see if the institutional capacity of exporting countries, especially developing ones, can make a difference in the effect of STRs on food and agricultural trade. As I mentioned above, STRs are not necessarily trade barriers or specifically TBT. Therefore, my first task is to assess whether or not STRs affect trade negatively without considering institutional capacity. Based on previous research, a hypothesis on this question is as follows.

- STRs affect food and agricultural trade negatively.

The next step, this paper's major objective, is to see whether institutional capacity makes a difference. In order to investigate the institutional capacity of exporting countries, I focus on the capacity of governments and private organizations.[4] A hypothesis that is tested in this paper is as follows.

- The institutional capacity of exporting countries makes a difference in the effect of STRs on food and agricultural trade.

First of all, it is imperative to look at what kinds of institutional capacities are required to surmount technical barriers to trade (TBT) created by STRs on food and

[4] The definition of institution by North is the rule of game. And, he separate organization from institution. However, current research on institution extends the definition of institution into the enforcement mechanism that has close relationship with organization, the agent of game. For further discussion, see Furubotn and Richter (1997) and Williamson (1987).

agricultural products. In order to figure out the required institutional capacities for STR compliance, the requisite components in compliance mechanisms need to be clarified. Compliance procedures for STRs depend on the types of STRs (Josling, Roberts, & Orden, 2004). Product and process STRs for safety protection inflicted on broad products horizontally are the focus in this paper.[5] Major components in compliance procedure for this category of STRs are information gathering, conformity assessment, enforcement, and standard setting. Therefore, the four aspects of institutional capacity are constructed to measure the effect of institutional capacity on food and agricultural trade. The four institutional capacity aspects are:

- Informational capacity
- Conformity capacity
- Enforcement capacity
- International standards setting capacity

I set up separate hypothesis on each of these four institutional capacity aspects. The first hypothesis to be tested is as follows.

- The informational capacity of exporting countries makes a difference in the effect of STRs on food and agricultural trade positively.

[5] For further discussion on the type of STRs, see Maskus and Wilson (2001a) and Josling, Roberst, and Orden (2004).

In order to export food and agricultural products, exporters in exporting countries go through a series of steps to satisfy safety requirements in importing countries. The first step is to find out what kinds of safety regulations exist in importing countries. It is a difficult task for small and medium enterprises in developing countries to obtain such information. Therefore, it is necessary for governments or development NGOs to take initiative in this process. The lack of information about STRs on food and agricultural products often negatively impact exporters of developing countries (OECD, 2001).

Once producers and exporters get information about the STRs on their products, they need to find a way to satisfy the requirements in STRs imposed by importing countries. Although requirements vary across products, a general requirement is to get certification from accredited laboratories or organizations, which is called a conformity assessment process. The role of governments or private agencies becomes vital in this stage since it is too costly for local food and agricultural product producers and exporters to hire an accredited laboratory, which is usually located in importing countries or other developed countries (Barrett, Browne, Harris, & Cadoret, 2002). The governments of exporting countries, therefore, need to be able to provide accreditation or certification services at a reasonable service fee. Or they at least should be able to link local producers and exporters with an internationally recognized accredited laboratory. Hence, the second hypothesis to be tested in this paper is as follows.

- The conformity capacity of exporting countries makes a difference in the effect of STRs on food and agricultural trade positively.

Another important element is the enforcement system for STRs and its hypothesis is as follows.

- The enforcement capacity of exporting countries makes a difference in the effect of STRs on food and agricultural trade positively.

Government capacity to enforce compliance for STRs on domestic products as well as imported ones is also important in measuring institutional capacity. Although it does not directly address the capacity of developing countries to overcome potential trade barriers that STRs may cause, it is still a good indicator to see if exporting countries are ready to overcome extra impediments by STRs. It is because importing countries may feel safer to import the food and agricultural products from the countries with a well maintained STRs enforcement system in place.

The last important element of institutional capacity is the level of each government's involvement in designing international STRs and implementation schemes for enforcement. The hypothesis to be tested is as follows.

- The international standard setting capacity of exporting countries makes a difference in the effect of STRs on food and agricultural trade positively.

The lack of representation and participation by developing countries in international standard setting negotiations are chronic problems for food and agricultural

product producers and exporters in developing countries. In fact, developing countries are often called "standards-takers" (Wilson & Abiola, 2003b, p. xxxv).

1.3 Organization of the Dissertation

This dissertation consists of six chapters, including the introduction chapter. Chapter 2 reviews previous research on three separate areas: the international policy on STRs, the impact of STRs on trade, and the impact of institutional capacity on trade. Chapter 3 examines the process of data collection and data construction, as well as analysis of the Institutional Capacity data.

Chapter 4 introduces four slightly different gravity model specifications. However, I focus on the specification with gross domestic production and population for the discussion on the results of regression analysis. I find that institutional capacity makes a positive impact on the efforts by exporters to overcome standard and technical regulations (STRs) on their food and agriculture products.

Chapter 5 review the dispute cases related to food and agricultural STRs and discus those cases in terms of the institutional capacity of developing countries. Finally, I conclude with the conclusion and policy implication in Chapter 6.

Chapter 2 Literature Review

The literature related to the dissertation falls into four subject areas, each taken up in a separate section of this chapter. The first area concerns policies and legal issues on standard and technical regulations (STRs) mainly at the World Trade Organization (WTO). This section is primarily to understand how food and agriculture STRs are disciplined at the international level and to provide legal foundation to help understanding food and agriculture STR-related dispute settlement analysis in Chapter 6. The second is the economic underpinnings of the impact of STRs on trade. This section considers the literature on the impact of STRs on agriculture trade and provides background information on why and how STRs influence food and agriculture trade. The third is the impact of institutional capacity on trade in general. This section defines and explains institutions and institutional capacity and summarizes the literature on the impact of institution on trade. The fourth is the gravity model, the quantitative model of this dissertation. This section reviews theoretical foundations of gravity models. These last three sections would help understanding the gravity model based quantitative analysis in chapter 5. I consider each in turn.

2.1 International Policies on Standards and Technical Regulations

This section addresses the TBT and SPS Agreements of the WTO. In addition to the TBT and SPS Agreements, other multilateral negotiations are discussed when necessary. The agriculture and food STRs-related cases at the WTO dispute settlement body (DSB) are also discussed in Chapter 6.

The policy and legal issues related to both STRs and trade are diverse and complex. To make the discussion focused on the impact of STRs on trade, it is appropriate to begin our discussion with the issues related to the WTO Agreements. STRs are addressed in three different agreements at the WTO: the TBT Agreement, the SPS Agreement, and Article XX of the GATT.[6] Article XX of the GATT provides discipline for exceptional use of quantitative trade restriction for all legitimate non-economic policy purposes. Especially, Article XX of the GATT allows the WTO Member countries to use safeguards to protect the health and safety of human, plant, and animal life.

The TBT Agreement provides discipline for the use of STRs on all products including industrial and agricultural products, except ones that are covered by the SPS Agreement.[7] Since the WTO was built as a trade facilitating international organization, the TBT Agreement was also designed primarily to prevent protectionist use of STRs. One of the notable successes of the TBT Agreement was to expand the scope and coverage of STRs to "processes and production methods" for goods that have not been covered in the pre-Uruguay Round GATT (Wilson, 1996). It is clear that the TBT

[6] Marceau and Trachtman (2002) did a through review on the relationship among the GATT, the TBT Agreement, and the SPS Agreement and differences on the application of three WTO Agreements.
[7] The TBT agreement is described in more detail in the appendix A.

Agreement was devised to facilitate international trade by standardizing product and production processes standards and regulations across countries and by preventing protectionist measure of STRs. One should note that the TBT Agreement also aims to assure the right of each WTO Member country to protect the safety of humans, plants, and animals and to preserve the environment.

When implementing STRs, the WTO Member countries are required to make certain that STRs do not hinder international trade unnecessarily.[8] The TBT Agreement also encourages the WTO Members to utilize international standards as often as they can when they establish national standard systems.[9] The TBT Agreement requires that WTO Member countries not discriminate against importing products in applying STRs (nondiscrimination discipline).[10]

The SPS Agreement is complementary to the TBT Agreement. The SPS Agreement is designed mainly for the safety of food and agricultural products (Oyejide, Ogunkola, & Bankole, 2001). In addition, the application of the SPS Agreement is limited to measures applied within the STRs imposing country's territory (Marceau & Trachtman, 2002). Like the TBT Agreement, the SPS Agreement is written with an objective to balance the principles to prevent protectionist measures and the right of importing countries to protect the life and health of humans, animals, and plants (Kennedy, 2000; Marceau & Trachtman, 2002; Oyejide et al., 2001). However, the SPS Agreement was developed with an emphasis on the public health protection (Kastner &

[8] Article 2.2 of the TBT Agreement.
[9] Preamble of the TBT Agreement.
[10] Article 5.2 of the TBT Agreement.

Powell, 2002). Consequently, the SPS Agreement leaves more room for countries to impose regulations than the TBT Agreement does (Marceau & Trachtman, 2002).

The SPS Agreement has a narrower scope and better-defined measures than the TBT Agreement. This enables the WTO Member countries to claim legitimacy without much difficulty for their SPS measures on importing products when particular risks to human, animal, and plant safety and health are targeted by their measures (Thorn & Carlson, 2000). Another difference between the SPS Agreement and the TBT Agreement is that the nondiscrimination principle, one of the GATT major principles, can be ignored under the SPS Agreement (Kennedy, 2000, p.91). Once threats to human, animal, and plant safety are scientifically proved, SPS measures can be applied in a discriminating manner against a specific country.

2.2 The Impact of Standards and Technical Regulations on Trade

This section introduces previous studies and their theoretical framework in measuring the impact of STRs on trade. It focuses on the impact of food and agricultural STRs on international trade, with an emphasis on empirical studies.

There have been numerous studies by trade economists and policy analysts to investigate the impact of STRs on trade. Surveys of research in this field can be found in Behgin and Bureau (2001), Josling, Roberst, and Orden (2004), and the OECD (2003). Beghin and Bureau (2001) surveyed research papers on the impact of food and agricultural regulation on trade. Josling, Roberts, and Orden (2004) provide a detailed discussion on several significant issues on the effects of food regulations on trade.

Mainstream articles on STRs are either economic welfare analyses or qualitative case studies. Most of economic welfare analyses are simply theoretical research (Beghin & Bureau, 2001; Bigsby & Whyte, 2001). However, there are a limited number of empirical studies in this category. Through a case study on bilateral apple trade between the United States and Japan, Calvin and Krissoff (1998) measured the welfare loss or gain of consumers and producers in Japan and the United States by assessing tariff rate equivalence for the welfare loss or gain caused by the regulations on imported apples in the Japanese market. The authors concluded that the regulation on the apples imposed by Japan has a more negative impact than the tariff does on the apple exports from the United States.

As illustrated in Beghin and Bureau (2001), measuring the welfare loss and gain is complex. Calculating the impact of STRs on the supply and demand elasticity of food and agricultural products can be imprecise since the assumption that STRs are the only factor to affect the price elasticity is somewhat simplified. In addition, these studies do not directly address the effect of STRs on trade.

The studies that have been conducted on the impact of STRs on food and agricultural trade are generally characterized by qualitative analysis with simple descriptive statistics. It is understood from these studies that there are negative effects of STRs on food and agricultural trade. Negative impacts are much greater on the exports of developing countries (Finger & Schuler, 2000; Otsuki et al., 2001a; Wilson & Abiola, 2003a). Furthermore, these negative impacts are much more significant on the exports of small and medium size producers of developing countries. The more serious negative

impacts on small and medium size producers is due to disparity, in terms of financial resources and informational resources, between multinational corporations and small/medium size producers (Dunn, 2003).

The reasons for negative effects on the exports of developing countries are external and internal. External reasons include: 1) the inconsistency of STRs in importing countries (Barrett et al., 2002; Hufbauer, Kotschwar, & Wilson, 2002), 2) the high costs of the certification process (Barrett et al., 2002; Wilson, 2002), and 3) the geographical uniqueness inherent in STRs (Dunn, 2003). Most significant internal reasons are the lack of financial resources (Finger & Schuler, 2000) and the lack of human and institutional capacity (Wilson, 2002).

Inconsistency of STRs across countries is problematic to the producers of developing countries since it could require a great deal of investment to satisfy different STRs in each country. Hufbauer, Kotschwar, and Wilson (2002) investigated the impact of product STRs on trade among Central American countries. The authors pointed out that differences in STRs of importing countries might turn into insurmountable trade barriers to distort trade flow from developing countries.

The high costs of compliance are also critical to developing countries. Finger and Schuler (2000) said, "[e]ffective use of the WTO agreement depends on extensive investment, it is not a matter of applying *existing systems* of standards to international trade, it is a much broader matter of installing world-class systems" (p.518). For instance, it is costly for the producers of developing countries to hire an international certification and inspection body to insure that the safety level of their export products are equivalent

to that of STRs in developed countries (Barrett et al., 2002).[11] The World Bank's Rural Development project in Madagascar for livestock vaccination cost about $11.8 million for 9 years from 1980 to 1988 (Finger & Schuler, 2000). Fresh food and agricultural products, which consist of more than half of food and agricultural exports from developing countries, require considerable initial investments to meet the strict STRs of importing countries (Unnevehr, 2000).

The geographical uniqueness of STRs can also be an important reason why local farmers and producers in developing countries face difficulties in exporting their products and sometimes are forced out of business. Dunn (2003) investigated the impact of the European Union (EU) SPS measures on local pig farmers and the pork industry in Poland. Dunn argued that the uniqueness of the EU SPS measures introduced in the Polish pork market entails more financial burdens on local pig farmers and meat producers because the EU SPS measures were written in the economic, social, and political context of the EU rather than those of Poland. He asserted that local farmers and pork producers could not compete with transnational companies that were linked with sufficient financial resources and familiar with the uniqueness of the EU SPS.

In addition to external reasons, internal reasons cannot be overlooked in explaining the impact of the imposition of STRs on trade. Although internal factors are interrelated with external factors, the focus on internal factors might be more relevant since those areas are where developing countries can take initiative with proper assistance

[11] This could leave producers no alternative but to raise the price of their products, which would lower the price competitiveness in the market of importing countries. However, some may argue that the enhanced safety system in exporting countries could increase the confidence level of products among the consumers in importing countries, which may increase the market share of imported products. But, when safety regulations are unnecessarily trade restrictive, the first argument is more persuasive.

from international development agencies and donors. In addition to expensive compliance costs as an external factor, the lack of financial resources of developing countries can hinder building a safety assurance system that can be accepted at the international level. Even when developing countries decide to build an up-to-date safety assurance system, it would make no sense economically since implementation costs would be extremely high compared to the annual budget of these countries, and there are more important development needs (Finger & Schuler, 2000).

Besides the adequate financial resources, the successful compliance with STRs is contingent upon the level of human and institutional capacity of developing countries (Wilson & Abiola, 2003b). Human and institutional capacities are required in such activities as gathering information about STRs in the export markets, issuing certifications through conformity assessments, enforcing STRs, and participating at international standard setting meetings.

Many solutions for the problems that developing countries face have been suggested. In order to reduce the cost problem, Barrett et al. (2002) suggested building an indigenous or local inspection body through strengthening local capacity and through increasing financial support by international public and private donors. The authors also recommended group certification mechanisms for small local producers in developing countries as a provisional method. Lutz (2000) argues that mutual recognition (MR) would be the optimal policy choice in reality for a country with lower quality standards since full harmonization might drive a firm with lower quality standards out of the market.

While research on the impact of STRs on food and agriculture trade gained quite a lot of attention from academics, as suggested above, quantitative empirical research has been limited (Maskus & Wilson, 2001a; OECD, 2003). There have been a few empirical research papers on the effects of STRs on food and agriculture trade flow. Otsuki, Wilson, and Sewadeh (2001a) conducted a regression analysis using a gravity model to investigate the effect of the current EU aflatoxin regulation on the exports of selected food and agriculture products from African countries to the EU. They also conducted a simulation study on whether or not the new EU standards (harmonized aflatoxin standards), which would be introduced in 2002, would have more negative impacts on the exports from African countries than the less strict international standards. The authors estimated that, compared to the Codex international standard, the new EU aflatoxin standard would cost African countries US$ 670 millions in lost exports while causing 1.4 less cancer death per billion annually in EU countries.

One shortcoming of this study is that the authors did not take the institutional capacity of exporting countries into consideration. The lack of institutional capacity in setting up and maintaining compliance systems in developing countries is often considered as a serious problem by the international development community. Therefore, it is imperative to include institutional capacity as an important factor in quantitative studies on the food related STRs and international trade. In this dissertation, I extend the methodology used by Otsuki, Wilson, and Sewadeh (2001a).

2.3 Standards Related Institutional Capacity

The importance of institutional capacity for trade has been well understood among both policy makers and academics. In fact, building institutional and human capacity in developing countries has become the core of trade-related technical assistance activity at the WTO as well as other international development organizations (Kostecki, 2001). Institutional capacity especially matters in the efforts of developing countries to increase their trade activities since the complexities of the WTO negotiations and other multilateral trade negotiations have exceeded the capacity of developing countries (OECD, 2001).

Responding to the increasing attention being given to the importance of institutional capacity on trade expansion, trade economists and policy analysts began investigating the effects of institutions on trade. These studies are based on the theoretical framework drawn from the New Institutional Economics (NIE). The proponents of NIE are primarily interested in transaction costs that vary among countries or societies according to their institutional structure. Unlike neoclassical economics, the NIE assumes that there are frictions in market transactions. As a mechanism to reduce costs caused by frictions, NIE economists have introduced the concept of institutions.

Douglas North defines institutions as "the rules of the game in a society" or "the humanly devised constraints that shape human interaction" (North, 1990, p.3). However, the focus of studies on the effects of institutions has expanded into various areas. In order to enable markets to function properly, enforcement systems and organizations implementing enforcement systems are necessary in addition to rules (World Bank,

2002). Studies on institutions, therefore, include enforcement systems and organizations enforcing rules (WTO, 2004). The successful enforcement system is contingent upon organizational capacity. Consequently, the focus in the dissertation is more on the capacity of organizations or the quality of governance or "institutional capacity." Indeed, institutional capacity in trade-related capacity building projects and activities often refers to the administrative and management capacity of governments, private organization, and/or non-governmental organizations (NGOs) in implementing trade-related policies effectively.

Some quantitative empirical research has been recently conducted, using the gravity model in most cases, to examine the impact of institutions on trade in general. Most of these studies have confirmed the hypothesis that institutional quality has positive effects on international trade flow. For example, Koukhartchouk and Maurel (2003) assessed the potential trade benefits of Russia's accession to the WTO and Central Eastern European counties to the EU by calculating the impact of institutional improvement of those countries on trade. Adopting the Index of Economic Freedom, built by the Heritage Foundation, Koukharchouk and Maurel measured the level of institutional quality. Institutional quality was measured for ten different institutional variables from the level of trade openness to the size of black market activities.[12] In their conclusion, they asserted that trade would expand when institutional quality is enough to secure safe contracts among parties involved.

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[12] Ten institutional indicators are: trade policy, fiscal burden of government, government intervention, monetary policy, capital flows and foreign investment, banking and finance, wages and prices, property rights, regulation and corruption, and black market.

Utilizing the six indicators of governance quality, constructed by Kaufmann (2002), de Groot et al. (2004) studied the effect of institutional quality on bilateral trade.[13] They focused on difference as well as similarity of institutional quality among countries. de Groot et al. affirmed the hypothesis that institutions matter in trade and asserted that countries with similar institutional capacity tend to trade more with each other. Extending the studies of de Groot et al., Jansen and Nordas (2004) investigated the impact of three domestic institutional variables on bilateral trade. Controlling for the quality of domestic transportation infrastructure and trade policy, Jansen and Nordas concluded that government effectiveness has a positive effect on bilateral trade flows.[14] However, their study did not confirm that two other institutional quality indicators, rule of law and control of corruption, have statistically significant effects.

Unlike the studies on the effects of general institutional capacity on trade, studies on the impact of institutional capacity specifically related to STRs on agricultural trade have been limited. The only available study on the effects of standards, interlinking institutional capacity, on agricultural trade is the institutional change model-based study, which reviews the impact of changes in dry bean standards on the institutional structure of the dry bean industry (Sterns & Reardon, 2002). Therefore, this dissertation fills an important gap in the literature.

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[13] Six indicators are voice and accountability; political stability; government effectiveness; regulatory quality; rule of law; and control of corruption. See de Groot et al. (2004) and Kaufmann, Kraay, and Zoido-Lobaton (2002) for the further information.

[14] Trade policy is measured by an average tariff ratio for each country.

2.4 The Gravity Model

Gravity models of international trade are based on Newton's Law regarding the gravitational force (GF_{ij}) between two bodies or objects i and j:

$$GF_{ij} = \frac{M_i M_j}{D_{ij}} \quad i \neq j \tag{1}$$

where M refers to the mass of the bodies and D_{ij} is the distance between object i and object j.

In Equation 1, one can see that the gravitational force is directly proportional to the mass of the bodies and indirectly proportional to the distance between the bodies. In the sense of economics, M refers to the status of economic development or the size of economy and D_{ij} refers to the trade prohibiting factors such as tariffs, physical distance, and trade distorting policies. In the beginning, gravity models received criticism for lacking theoretical foundations of economics. However, this is the case no more. Gravity models have been driven with traditional trade theories including the Ricardian model and the Heckcher-Ohlin model, based on comparative advantage through either technology difference or factor endowment difference, and new trade theories, which claim intra-industry trade rather than inter-industry trade in the traditional trade model, including increasing return to scale and monopolistic competition.[15] I examine the

[15] Surveys of theoretical foundations for gravity models can be found in Evenett and Keller (2002), Deardorff (1998), and Feenstra, Markusen, and Rose (2001).

interpretation of parameter estimations in gravity models according to different trade theories.

Beginning with Tinbergen (1962), gravity models of international trade have implemented Equation 1 in various ways. In each of these implementations, the trade flow or exports from country i to country j (e_{ij}) takes the place of the gravitational force. There are a number of ways this is implemented. Here I consider four alternatives.

In the *first alternative*, mass in Equation 1 is associated with the gross domestic product of the countries involved. In this case, Equation 1 becomes:

$$e_{ij} = \frac{gdp_i gdp_j}{dist_{ij}} \quad i \neq j \tag{2}$$

Taking natural logs gives us:

$$\ln e_{ij} = \alpha + \beta_1 \ln gdp_i + \beta_2 \ln gdp_j + \beta_3 \ln dist_{ij} + \varepsilon_{ij} \tag{3}$$

Equation 3 was the initial form of the gravity equation in early gravity model literatures, starting from Tinbergen's study (Wilson et al., 2003). This alternative closely resembles the gravity model in physics and was referred mainly in literature to prove the gravity model with economics theories.[16] In this alternative, gross domestic product of i and j are usually treated as the size of economy or the market size. This approach can mainly be seen in literature deriving gravity models from new trade theories, which explains the determinant of trade mainly through difference in preference and product differentiation. The Linder Hypothesis, which explains the determinant of trade through differences in preference, suggests the high-income countries tend to have same

[16] For the theoretical foundation for this alternative, see Bergstrand (1985), Feenstra, Markusen, and Rose (2001), and Deardorff (1998).

preferences and trade with each other excessively (Deardorff, 1998).[17] Along with the Linder Hypothesis, the literature driving gravity models based on product differentiation, either by its origin (the Armington assumption) or at the level of a firm (monopolistic competition), takes the same approach.[18]

On the other hand, literature deriving gravity models from traditional trade models takes a slightly different but similar interpretation for gross domestic production. Based on the H-O model, Deardorff (1998) suggested that countries with similar pattern of factor endowments would trade more with each other. High income countries are likely to be capital-intensive in their production and consume capital-intensive products due to their high income, which results in the higher volume of trade among high income countries. Intuitively, it also seems obvious that the signs of both coefficients are likely to be positive since the more a country has to sell (the more currency a country has), the more they can export (the more the country can import) (Grossman, 1998). In this approach, gross domestic product of exporters can be interpreted as production capacity rather than the size of market or economy. In fact, the gross domestic product of the origin (exporter) country, *i*, is sometimes explicitly referred to as production capacity and only total income of a industry in concern was used as total income of an exporter (Koo & Karemera, 1991).

Therefore, as implied also in the physics of Equation 1, the expected signs here are $\beta_1, \beta_2 > 0$. However, when applied to agricultural goods, Engel's Law might suggest

[17] See chapter 13 of Markusen et al. (1995) for the detail of the Linder Hypothesis.
[18] For instance, Jansen & Nordås (2004) take this approach.

that gross domestic product in the destination country would have a negative influence on demand for imports. Hence it is also possible that an expected sign could be $\beta_2 < 0$.

Empirically, the gravity model in this alternative has been mainly used in analysis of trade flow of manufactured goods among limited number of countries, especially high-income countries. However, the attempts have been also made to investigate the trade flow of non-manufactured goods among countries, including low-income countries.[19] The outcomes of these gravity equation analyses conform to the expected sings, $\beta_1, \beta_2 > 0$, in manufactured goods and primary goods (including agriculture goods) as well as aggregated goods.

In the *second alternative*, mass in Equation 1 is associated with gross domestic product per capita. In this case, Equation 1 becomes:

$$e_{ij} = \frac{\left(\frac{gdp_i}{pop_i}\right)\left(\frac{gdp_j}{pop_j}\right)}{dist_{ij}} \quad i \neq j \tag{4}$$

Taking natural logs gives us:

$$\ln e_{ij} = \tau + \delta_1 \ln\left(gdp_i / pop_i\right) + \delta_2 \ln\left(gdp_j / pop_j\right) + \delta_3 \ln dist_{ij} + \varepsilon_{ij} \tag{5}$$

This alternative has been used in only a few studies. Some authors may have mistakenly taken gross domestic product per capita as the size of economy like gross domestic product in the *first alternative*. In an econometrics sense, gross domestic per

[19] For example, Feenstra, Markusen, and Rose (2001) analyzed, utilizing a gravity model approach, the trade flow of differentiated goods (manufacturing goods) and homogenous goods (primary goods) among OECD countries as well as non-OECD countries. In addition, Koo and Karemera (1991) analyzed the trade flow of wheat with the gravity model with additional specific trade policy variables on wheat.

capita does not fully represent the economic size or market size of a nation since it only represent the average income level of individuals (possibly status of development) in that country. While the level of average individual income can tell the purchasing power (preference) of a nation, it is not clear that how much amount of imports can be created without knowing the size of population of the nation.

In the *third alternative*, mass in Equation 1 is associated with both gross domestic product and population. In this case, Equation 1 becomes:

$$e_{ij} = \frac{gdp_i pop_i gdp_j pop_j}{dist_{ij}} \quad i \neq j. \tag{6}$$

Taking natural logs gives us:

$$\ln e_{ij} = \varphi + \gamma_1 \ln gdp_i + \gamma_2 \ln pop_i + \gamma_3 \ln gdp_j + \gamma_4 \ln pop_j + \gamma_5 \ln dist_{ij} + \varepsilon_{ij} \tag{7}$$

Equation 7 is the transformation of Equation 5. Equation 7 separates the gross domestic product per capita of Equation 5 into gross domestic product and population. Equation 7 is discussed in more detail below.

In the *fourth alternative*, mass in Equation 1 is associated with *both* gross domestic product and per capita gross domestic product. In this case, Equation 1 becomes:

$$e_{ij} = \frac{gdp_i\left(\frac{gdp_i}{pop_i}\right)gdp_j\left(\frac{gdp_j}{pop_j}\right)}{dist_{ij}} \quad i \neq j \tag{8}$$

Taking natural logs gives us:

$$\ln e_{ij} = \mu + \nu_1 \ln gdp_i + \nu_2 \ln\left(gdp_i / pop_i\right) + \nu_3 \ln gdp_j + \nu_4 \ln\left(gdp_j / pop_j\right) + \nu_5 \ln dist_{ij} + \varepsilon_{ij} \quad (9)$$

Equation 9 is another transformation of Equation 5. Equation 9 adds gross domestic product to Equation 5. Compared to Equation 7, the effect of the gross domestic product component of Equation 9 is dispersed in two places. This would result in a different coefficient outcome for the gross domestic product variable of Equation 7 and 9 in a regression analysis.

As mentioned above, examining Equations 5, 7, and 9 shows us that the parameters involved are transformations on one another. In particular: $\gamma_1 = \delta_1 = \nu_1 + \nu_2$, $\gamma_2 = -\delta_1 = -\nu_2$, $\gamma_3 = \delta_2 = \nu_3 + \nu_4$, and $\gamma_4 = -\delta_4 = -\nu_4$. Although three equations are equivalent to each other, Equation 5 is not as useful as other two alternatives in empirical studies due to the reason discussed above. Equation 7 and 9 can be treated as the same specification except the fact that Equation 9 only replaces population with gross domestic product per capita. Consequently, Equation 7 and 9 share same theoretical foundations. I discuss Equation 7 and 9 at the same time.

Along with Equation 3, Equation 7 and 9 were commonly used in empirical gravity model-based studies. Population or gross domestic product per capita was added because of its empirically-proven significant effect on trade (Anderson, 1979; Bergstrand, 1989; Leamer, 1974). These alternatives were also supported by theoretical foundations.[20] As in Equation 3, these theoretical foundations are basically based on the general

[20] For the discussion on theoretical foundation of this alternative, see Anderson (1979), Bergstrand (1989) and Leamer (1974).

equilibrium of microeconomics utility and production function, with or without reference to new and traditional trade models. However, the variable that was given the strongest theoretical foundation is gross domestic product.

Theoretical explanations for the inclusion of population or gross domestic product per capita in the gravity equation and their expected signs is somewhat lacking (Jansen & Nordas, 2004; Koukhartchouk & Maurel, 2003). For instance, using a Cobb-Douglas expenditure function in order to drive the gravity model, under assumptions of homothetic preference across nations and product differentiation at its origin, Anderson (1979) was only able to provide theoretical foundation explicitly to income factor of the gravity model while he acknowledged the important role of population in the expenditure function but failed to provide theoretical foundation for the addition of population.

Leamer (1974) also attempted to explain international trade with the trade potential of countries in trade by measuring the effects of some development variables including national income and population and other trade-related variables including resource endowment factors, and trade restricting factors.[21] However, this approach was considered to lack economic principles too.[22] This fact could primarily be the reason why gravity models only included gross domestic product variables in some cases.

In interpreting gross domestic product in Equation 7 and 9, it seems to be not much different from the interpretation of gross domestic product in Equation 3. Gross domestic product in Equation 7 and 9 is considered as trade potential (Leamer, 1974) or

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[21] Population is considered as a resource variable as well as development variable in term of "demand preference" (Leamer, 1974).
[22] See footnote 2 in Anderson (1979).

implied as production capacity of exporters and purchasing capacity of importers (Anderson, 1979). With regard to expected signs on the gross domestic products are the same as in Equation 3.

The expected signs for population (or gross domestic product per capita) are somewhat confusing. In gravity-model based studies, population is considered as the size of the economy or market, sometimes the status of development, or a proxy for factor endowment ratio. Furthermore, a population variable of the origin country (exporter) and of the destination country (importer) was not distinguished in many cases.

With regard to expected signs on the population variables, these are typically positive, an interpretation in terms of market size or $\gamma_2, \gamma_4 > 0$. That said, however, there is the possibility of import substitution as well as market size effects. If the import substitutions effects dominate, the expected sign is $\gamma_4 < 0$. On the other hand, population, after controlling for gross domestic product, may not represent market size. It rather represents the status of development indirectly, which expect to be an opposite sign of gross domestic product per capita (Pelletiere & Reinert, 2004). In this case, the expected signs on population variable in Equation 7 are: $\gamma_2, \gamma_4 < 0$. The expected signs on gross domestic product per capita in Equation 9 are: $\nu_2, \nu_4 > 0$.

Alternatively, population (or gross domestic product per capita) of exporters and importers can be related to resource endowment ratio and preference of consumers respectively (Bergstrand, 1989; Leamer, 1974). Bergstrand (1989) explicitly links a theoretical foundation of the gravity equation with the Heckscher-Ohlin (H-O) model for exporter's gross domestic product per capita and with monopolistic competition model

for importer's gross domestic product per capita. In his model, the coefficient of importer's gross domestic product per capita is interpreted as individual income while that of exporter's gross domestic per capita as a (weak) proxy for capita-labor endowment ratio.

The expected parameter sign of gross domestic product per capita for *i* and *j* depends on the elasticity of substitution in consumption in his model. When the elasticity of substitution in consumption exceeds unity, Bergstrand claims that the expected sign would be $\nu_2 > 0$ and < 0 for capital-intensive goods and labor-intensive goods respectively. In the case of population coefficient estimation in Equation 7, the expected sings are: $\gamma_2 > 0$ for labor-intensive goods and $\gamma_2 < 0$ for capital-intensive goods. This factor intensity approach seems to work well for homogenous goods and trade of differentiated goods seems to be well explained by intra-industry trade model (Evenett & Keller, 2002). Bergstrand (1989) also asserts that, when products traded are luxury goods (necessity goods), the expected sign of gross domestic product per capita is positive (negative), $\nu_4 > 0$ ($\nu_4 < 0$).

In empirical studies, the signs of gross domestic product or population vary and depend on the types of trade data as expected above but not all the times. When trade of aggregated goods among high income countries is concerned, the signs of coefficient estimate prove to be positive in most cases (Bergstrand, 1989; Evenett & Keller, 2002). This outcome holds when the type of countries expends to include developing countries (Evenett & Keller, 2002; Longo & Sekkat, 2004; Roberts, 2004). Even when goods traded is intensive in labor or land other than capital, the positive (negative) sign of gross

domestic product per capita (population) remains (Pelletiere & Reinert, 2004; Wilson et al., 2003). As expected, Bergstrand (1989) shows that the signs of gross domestic product per capita (population) in the study with labor-intensive industry trade data are negative (positive). On other hand, when quality or effectiveness of governance or institution was controlled, the signs become negative interestingly even in some studies with aggregated goods data (Anderson & Marcouiller, 2002; de Groot et al., 2004).

2.5 Summary

In this section, I reviewed the literature on the international legal framework on STRs, the impact of STRs on trade, the impact of institutional capacity on trade in general, and the theoretical foundations of gravity models. Among the various international agreements, the SPS and TBT Agreements of the WTO works as major legal frameworks to discipline the use of food and agriculture STRs. The literature review on the impact of STRs on trade shows that STRs on food and agriculture trade are concerned as trade barriers to the exports of developing countries. However, it is important to note that the impact of institutional capacity on trade proves to be positive in the literature I reviewed. This means that exporting countries with strong institutional capacity can offset the negative impact of STRs on their exports. The last section of the literature review shows that the gravity model can be derived from any trade theory. The literature review also reveals that the interpretations of the gravity model outcomes vary across different theoretical foundations.

Chapter 3 Data

This chapter describes the process of data collection and data construction, as well as analysis of the Institutional Capacity data. The data used in building the four institutional variables are discussed first. After the discussion on data, an analysis of Institutional Capacity data is provided. Then, data for other variables and the dispute case analysis of Chapter 5 are discussed. Although the dataset built to measure the four Institutional Capacity dimensions suffers from measurement problems, it provides proxies for the capacity of the public or private entities in delivering STR-related services to the public.

The analysis of Institutional Capacity data shows that Sub-Saharan African countries lack Institutional Capacity related to standard and technical regulations (STRs) while some developing countries, especially emerging developing economies, hold Institutional Capacity almost at the same level as developed countries. Although data for other variables collected for the gravity model analysis are mainly for 2001, I used data from other years in some cases if data for 2001 are not available. However, I made sure that the data do not suffer validity problems. I use two cases involving developing countries for dispute case analysis. The two cases are: 1) the United States vs. India, Malaysia, Pakistan, and Thailand and 2) European Union vs. Peru. I consider each section of this Chapter in more detail below.

3.1 Institutional Capacity

The Institutional Capacity variables, Information Capacity (INF), Conformity Capacity (CON), Enforcement Capacity (ENF), and International Standard Setting Capacity (INT), are continuous variables from 0 to 1 where 0 is the lowest capacity in dealing with standards. Each of these four institutional variables for exporting countries is constructed by averaging the score for each of sub-components that vary across four institutional variables. Data for the Institutional Capacity variables were collected from various sources with careful attention to food and agricultural safety STRs. I tried to limit the scope of data within food and agricultural safety STRs as much as possible. The data for Institutional Capacity variables are for 2001.

The scoring methodology and data sources for each of the four Institutional Capacity dimensions are illustrated comprehensively in Table 3.1. I describe the scoring method for each of the four institutional variables in turn. First, Information Capacity is measured indirectly through three indicators: 1) the percentage of population using the Internet, modified from the data, Internet Users per 10k Inhabitants, obtained from the International Telecommunication Union (ITU),[23] 2) the Education Index by the United Nations Development Programs (UNDP),[24] and 3) the completeness of national government websites' online service delivery from the World Market Research Centre

[23] Data can be obtained from the ITU websites at http://www.itu.int/ITU-D/ict/statistics/.
[24] Data can be found from the Human Development Report (2003).

Global e-Government Survey carried out by Brown University.[25] The average of three indicators for each country is used as the Information Capacity score.

Table 3.1 The Method to Construct Four Institutional Capacity Dimensions

Type	Contents	Points	Explanation	Data Source
Informational	Indexes for information technology readiness	1	Average score for three components: 1) population using internet index, 2) the education index, and 3) the completeness of e-government	1). ITU website 2). UNDP website 3). Inside Politics website
Conformity	The existence of conformity assessment system and recognition system	1	Certifications per a establishment - The number of ISO 9000 certifications awarded divided by the number of establishments	1. Survey of ISO 9000 certifications in 2001 at the ISO website. 2. International Yearbook of Industrial Statistics
Enforcement	Formal independent STRs-related government agencies Legal activities at the international level	1	Average score for three components: 1) the existence of enquiry point and government authority under the SPS Agreement, 2) the existence of enquiry point and government authority under the TBT at the WTO Website, and 3) the existence of National Plant and Protection Organization (NPPO)	WTO website
International standard setting	Participation status of STRs-related international organizations	1	Average score for five components: 1) WTO Ministerial Meeting Participation, 2) Codex Membership, 3) Codex Convention Participation, 4) IPPC Contracting Party, and 5) IPPC Convention Participation	1) WTO website 2) and 3) Codex website 4) and 5) IPPC Website

[25] The survey is available at http://www.insidepolitics.org/egovt01int.html.

The underlying concept of the construction of the Information Capacity score is as follows: First, data on the population using the Internet can show the level of penetration by people into the Internet-friendly environment. Second, the education index can approximate the general capacity of people in utilizing the internet as a communication tool or an information searching tool. In these two cases, I assume that the attitude of farmers and food producers toward Internet technology is identical to the general public. Finally, the completeness of national governments' websites can show the level of national governments' capacity to utilize the internet as an information and service delivery tool (West, 2001). This survey evaluates the websites of national governments in a number of features that enables the public to assess information on government services and receive government services online.[26] In this case, I also assume that the capacity of government represent its capacity in delivering STR-related information or helping farmers or food producers to obtain the information.

These three datasets suffer some measurement problems. First, a measurement problem comes from the nature of international statistics. International statistics are usually collected by national statistics agencies and submitted to international organizations. In many cases, national agencies use different definitions and criteria even for the same subject, which is the case for the percentage of population using internet and the Education Index, to certain degree, in this dissertation. Measurement problems can also be caused by complexities of factors that are affecting subject matters. In the case of this dissertation, measuring the level of governments' internet readiness or utilization

[26] For details of these features, see West (2001).

involve factors more than those used in constructing dataset. However, no attempts that try to measure the level of e-government escape from this criticism. These are the best available data for 2001.

In addition to the measurement problems, data on Information Capacity have another concern. These three indicators may not fully explain Information Capacity related to food and agriculture STRs in each country. The reasons are two-fold. First, the combination of these three datasets does not directly measure but only act as proxy for the ability of public or private sectors to deliver information on STRs. Second, these three datasets only cover internet-related capacity. However, I need to heed the fact that communications through the Internet is much faster and more efficient than through postal mails or physical visits (Wilson & Abiola, 2003b). Furthermore, I can assume that the general capacity in utilizing internet infrastructure can approximate the information delivery capacity by public and private entities in STR-related field to their clients (farmers in this case). Therefore, the score generated by averaging three statistics can provide approximate, but appropriate, information for Information Capacity.

Conformity Capacity is measured by the number of International Standard Organization (ISO) 9000 certifications divided by the number of establishments in each country. ISO 9000 certifications are awarded for quality management systems that have satisfied the production process criteria set by the ISO. Although certifications are awarded not only in the food and agricultural industry but also in other manufacturing industries, the number of certifications awarded could capture the capacity of governments to help food and agricultural producers and exporters as well as the capacity

of exporters.[27] In fact, ISO 9000 series is being increasingly adopted as one of hazard analysis critical control points (HACCP) systems in the food and agricultural industry (Unnevehr & Jensen, 1999).[28]

The ISO certification data were obtained from the official website of the ISO. The establishment data were obtained from the International Yearbook of Industrial Statistics published annually by the United Nations Industrial Development Organization (UNIDO). However, I was not able to obtain the establishment data for a number of countries due to the unavailability of data, which resulted in the reduced number of countries for the regression analysis in Chapter 4.

There are other measurement issues. These issues are, as in the case of Information Capacity, mainly due to the nature of international statistics whose quality depends on the quality of national or regional reporting agencies. The first issue is related to the data on the number of establishments. The definition for establishment is not consistent across countries. It is not consistent in two ways. First, some countries report the number of establishments while others the number of enterprises. The concept of enterprise is larger than that of establishment. For instance, a corporation is considered as an enterprise while a factory, a division of a corporation, as an establishment. Second, the minimum unit of establishment or enterprise is not consistent across countries. For

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[27] The ISO 9000 certification data include not only certifications awarded to agriculture and food sector but also those to other manufacturing sectors. However, it is still valid to use these data since food and agricultural industry depends on other manufacturing industries for the process and delivery of food and agricultural products. For instance, the capacity of the food can container manufacturing industry may affect the exports of processed foods. Therefore, including ISO 9000 certification for sectors other than food and agricultural industry will help one to capture the capacity of exporting country in general.

[28] The HACCP system is a process standard rather than a product standard. For more discussion about the HACCP system, see Unnevehr and Jensen (1999).

instance, some countries report the number of establishments with 10 or more employees as the number of establishments in their country. These countries may report fewer numbers of establishments than when they use all establishments as criteria for establishment. This fact may weaken the validity of data for Conformity Capacity since the number of establishments for a same country can change according to different criteria used in each country.

Anther issue is related to data on the number of ISO 9000 certifications. Data on ISO 9000 is gathered through national or regional entities such as national standard agencies or certification organizations (ISO Central Secretariat, 2004). ISO acknowledges that there might be double counting or undercounting and claims neither academic nor scientific accuracy.[29]

Although there are the shortfalls mentioned above, data for Conformity Capacity is still valid as an indicator to delineate the general trend of Conformity Capacity of the countries covered in this dissertation. For instance, the majority of countries in our dataset used all establishments as criteria for establishment. In addition, the countries that used establishment with 10 or more employees as criteria are low- or middle-income countries. Therefore, for these countries, I assume that the number of establishments would not change significantly even as the criteria for establishment would vary. The details of establishment definition for each country are described in Table 3.2 in Appendix A.

[29] For details of shortcomings, see ISO Central Secretariat (2004).

Enforcement Capacity is measured by three different components: 1) the existence of enquiry point and government authority under the Sanitary and Phytosanitary (SPS) Agreement of the World Trade Organization (WTO), 2) the existence of enquiry point and government authority under the Technical Barriers to Trade (TBT) Agreement of the WTO, and 3) the existence of National Plant and Protection Organizations (NPPOs).

The maximum point 1 is allocated for each component of Enforcement Capacity. Then, the average score is calculated for these three sub-components. Each component is scored according to the existence of government agencies or private agencies recognized by governments that deal with food and agriculture STRs. The country with an independent food and agriculture STR-related agency is given 1, the full score. If the country has a food and agriculture STR-related unit without any formal independent status, the score for this country is given 0.5.

Under the SPS and TBT Agreements, each WTO member country is required to submit information about a national enquiry point, a single government authority in charge of responding to enquires by the WTO Member countries.[30] In most cases, these national contact points are also in charge of implementing regulations on food safety or plant protection. I carefully evaluated the WTO documents, up to 2001, which give information on national enquiry points. It does not matter whether food and agriculture STR-related national enquiry agency is under the ministry of agriculture, the ministry of foreign affairs, or the ministry of trade as long as it is solely in charge of STR-related

[30] This information can be found in Committee on Sanitary and Phytosanitary Measures, WTO (2001a) and Committee on Technical Barriers to Trade, WTO (2001).

measures. The third component is the presence of official contact points of the International Plant Protection Convention (IPPC). The data for the third component are obtained from Official Contact Points and Directory of National and Regional Plant Protection Organizations prepared by the Secretariat of the IPPC.[31] The scoring method is same as in the first and second components.

As the last variable, International Standard Setting Capacity is measured through the membership status, as of 2001, at the WTO,[32] the IPPC[33] and the Codex Alimentarius (Codex)[34] and the participation level at annual or biannual meetings or conventions at the WTO,[35] the IPPC,[36] and the Codex[37] in 2001. It is important to look at the membership status and participation level at the important meetings since it is claimed that developing countries are not able to influence the international standard setting process due to their low level of participation at the international standard organizations (Wilson & Abiola, 2003b).

Data are available at the website of these organizations: the Codex, the IPPC, and the WTO. The member country of or contracting party, as of 2001, to the WTO, the IPPC, or the Codex was given 1, the full score, otherwise 0. As to the participation level, the country that sent multiple representatives (more than two) was given 1, the full score. The country that sent a sole representative was assigned with 0.5 and 0 if a country sent none. The overall score was obtained by averaging these six data.

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[31] This information can be found in Secretariat of the International Plant Protection Convention (2002).
[32] This information can be found at http://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm.
[33] This information can be found at http://www.fao.org/Legal/TREATIES/004s-e.htm.
[34] This information can be found in Secretariat of the Joint FAO/WHO Food Standards Programme (2001).
[35] This information can be found in World Trade Organization (2001).
[36] This information can be found in Food and Agriculture Organization (2001).
[37] This information can be found in Secretariat of the Joint FAO/WHO Food Standards Programme (2001).

Enforcement Capacity and International Standard Setting Capacity are more direct measurement of Institutional Capacity than the other two dimensions. One, however, may question the accuracy of these two indicators to reflect the reality in each country. In fact, the dataset does not explain the quality of agencies in charge of STR-related measures or representatives participating at the meetings. However, these two indicators could capture the proximity of capacities in these two Institutional Capacity dimensions.

3.2 Institutional Capacity Analysis

In this section, I analyze the four dimensions of Institutional Capacity for each and Institutional Capacity as a whole. The raw scores for each institutional variable as well as total score are in Table 3.3 and Table 3.4 in Appendix A. The data for Institutional Capacity that I have built include 30 developed countries and 86 developing countries. These countries are the WTO Member countries as of 2001. I have collected data of 116 countries for Information Capacity, Conformity Capacity, and International Standard Setting Capacity. On the other hand, I was only able to collect data for 58 countries on Conformity Capacity and consequently for total Institutional Capacity. The fewer number of countries covered for Conformity Capacity is due to the lack of available data for the number of establishments in each country as I discussed in the previous section. The countries omitted are mostly developing countries (50 countries out of total 58 countries), especially the Sub-Saharan African countries, Latin American countries, and Caribbean countries (41 countries).

Figure 3.1 shows that total score of Institutional Capacity (Institutional Capacity Index or ICI), which is the sum of four dimensions of Institutional Capacity, for 58

countries is positively related with the natural log of PPP GDP per capita. The correlation between the natural log of Purchasing Power Parity (PPP) GDP per capita and ICI is 0.58 (see Table 3.5). Interestingly, the correlation (0.85) between Information Capacity and the natural log of PPP GDP per capita is the most highly correlated among other correlations. It is clear that Information Capacity is the highest contributing factor to the positive correlation between the overall ICI and the natural log of PPP GDP per capita.

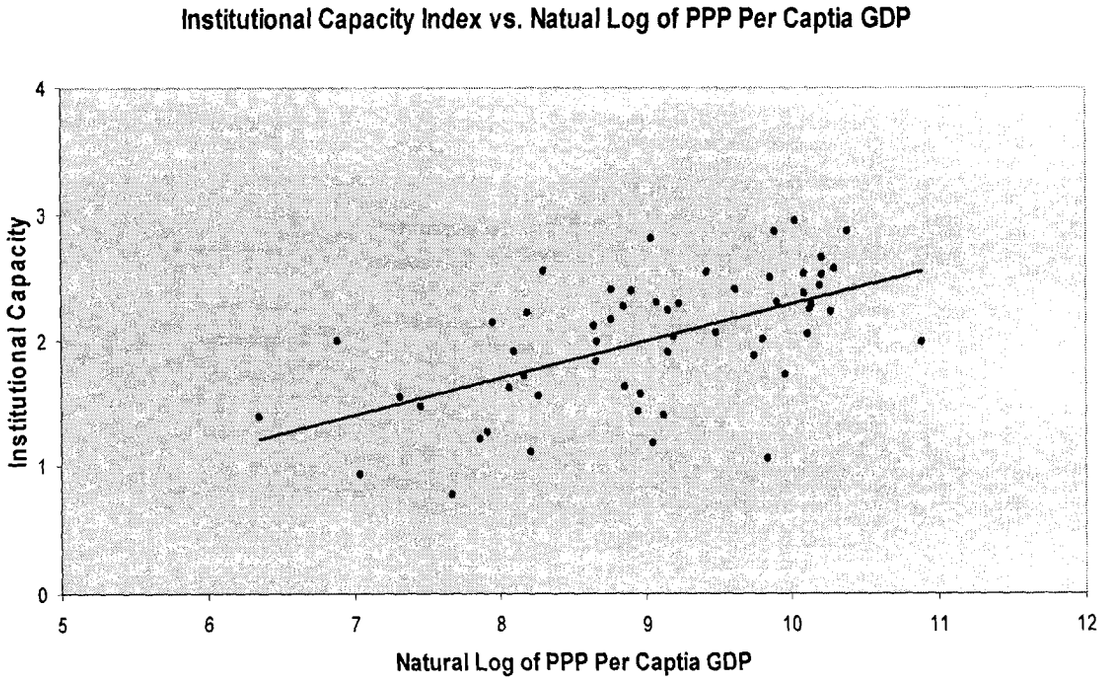

Figure 3.1. Institutional Capacity Index vs. Natural Log of PPP Per Capita GDP

As one can see in Table 3.5, the correlation between the natural log of GDP per capita and other three Institutional Capacity dimensions are not over 0.5. The highest is Conformity Capacity, which is 0.41. The level of these three Institutional Capacity

dimensions is not strongly correlated to the level of GDP per capita. The strong correlation of Information Capacity with the level of GDP per capita is possibly due to two sub-components of Information Capacity: the Education Index by the UNDP and the percentage of population using internet. These types of data may be positively associated with the level of individual income, measured by GDP per capita in this case. Data sources of other Institutional Capacity dimensions are not necessarily affected by the level of individual income. For instance, the participation level of some low-income countries can be high due to the financial assistance by international development agencies or donors. I consider each dimension of Institutional Capacity in more detail later in this section.

Table 3.5 Correlation among Institutional Capacities and Natural Log of Per Capita GDP

	lnGDPPC	ICI	INF	CON	ENF	INT
lnGDPPC	1.00					
ICI	0.58	1.00				
INF	0.85	0.61	1.00			
CON	0.41	0.66	0.42	1.00		
ENF	0.33	0.82	0.39	0.29	1.00	
INT	0.26	0.65	0.16	0.18	0.42	1.00

Observations = 58

I also expand the number of countries by excluding Conformity Capacity in order to see if the trend holds for the larger set of countries. The expanded correlation in Table 3.6) also demonstrates as similar trend as the correlation outcome for 58 countries (see Table 3.6). The correlation between Information Capacity and the natural log of PPP

GDP per capita is the highest among three Institutional Capacity dimensions and the correlations between other two dimensions and the natural log of PPP GDP per capita are below 0.5.

Table 3.6 Correlation among Institutional Capacities and Natural Log of Per Capita GDP

	lnGDPPC	INF	ENF	INT
lnGDPPC	1.00			
INF	0.88	1.00		
ENF	0.42	0.46	1.00	
INT	0.39	0.37	0.47	1.00
Observations = 116				

Table 3.7 shows the mean and standard deviation for four Institutional Capacity dimensions. The mean of Enforcement Capacity for all countries is the highest and is 0.71. This means that majority of countries covered have an independent food and agriculture STR-related agency. The mean of International Standard Setting Capacity and Enforcement Capacity is above 0.5 while that of Information Capacity and Conformity Capacity is below the half of the total score. However, interpreting this cross-dimension comparison of means should be given caution due to different method for each Institutional Capacity dimension. The interpretation is more meaningful when it is done along with the comparison of standard deviations across four dimensions, which tells us about the diversity of Institutional Capacity among countries.

Table 3.7 Comparison of Institutional Capacity (IC) Means and Standard Deviation for Developed/Developing Countries[38]

Dimension	# of Countries (Developed/Developing)	All Mean (S.D.*)	Developed Mean (S.D.*)	Developing Mean (S.D.*)
INF	116 (30/86)	0.40 (0.12)	0.55 (0.06)	0.35 (0.09)
CON	58 (22/36)	0.14 (0.19)	0.23 (0.25)	0.08 (0.12)
ENF	116 (30/86)	0.71 (0.28)	0.86 (0.20)	0.66 (0.29)
INT	116 (30/86)	0.58 (0.20)	0.64 (0.14)	0.56 (0.21)
ICI	58 (22/36)	2.01 (0.52)	2.30 (0.42)	1.83 (0.49)

* S.D. is standard deviation.

First of all, among standard deviations for all countries, one can notice that the standard deviation is the largest for Enforcement Capacity. This standard deviation of Enforcement Capacity for only developing countries is larger than that for only developed countries. This means that, even though the majority of countries have strong Enforcement Capacity (have an independent food and agriculture STR-related agency in other words), some developing countries fall far behind in this capacity. Another interesting point is that the standard deviation of Conformity Capacity for developed countries is much larger than that for developing countries. Along with the lowest mean of Conformity Capacity, this could be interpreted as Conformity Capacity for developing countries being very low all together while Conformity Capacity among developed countries are diverse, and some developed countries have very low Conformity Capacity. This outcome might have to do with the high cost of obtaining ISO 9000 certification. The preparation for ISO 9000 certification takes a significant long period and costs a lot even for some companies in developed countries.

[38] I used the definition of the World Bank that defines countries under $9,385 Gross National Income (GNI) per capita as developing countries. This group of countries is called the low- and middle-income countries in the World Bank database.

3.3 Specific Dimensions of Institutional Capacity

I next turn to the details of each dimension of Institutional Capacity. I focus on the ranking of countries in each Institutional Capacity dimension. I compare the relative position of each country in each of the four dimensions of STR-related Institutional Capacity rather than to compare the absolute score of capacity of each country. In order to understand why the relative comparison is better, let's take an example. Portugal has the score 1 in Enforcement Capacity and the score 0.48 in Information Capacity. In absolute terms, it seems that Portugal has much stronger capacity in Enforcement Capacity than in Information Capacity. However, due to the differences in data sources, comparison between the scores of these two dimensions of Institutional Capacity will not make sense. In fact, Portugal is ranked 28th in Information Capacity and one of 34 countries at the first tier in Enforcement Capacity. Consequently, Information Capacity and Enforcement Capacity of Portugal can be said to be similar to each other. Therefore, cross-dimension comparison needs to be done in relative terms.

Table 3.8 Ranking in Information Capacity

Rank	Information Capacity
1	Iceland
2	Canada
3	Australia
4	Finland, Norway, New Zealand
7	Netherlands, Rep. of Korea, Sweden, United Kingdom, Denmark
12	Germany
13	Austria, Singapore
15	Japan, Israel
17	Ireland, Belgium
19	Switzerland, France, Luxembourg, Estonia, Slovenia
24	Italy

25	Malaysia
26	Spain, USA
28	Portugal, Cyprus
30	Argentina, Chile, Hungary, Greece, Malta
35	Poland
36	Guyana, Latvia, Lithuania, Slovakia
40	Uruguay, Bulgaria, Bahrain, Croatia, Barbados, Peru, Czech Rep.
47	Brazil
48	Mexico, Costa Rica, Belarus, Philippines, Bolivia, Thailand
54	South Africa, Georgia, Mauritius, Antigua and Barbuda, Trinidad and Tobago
59	Mongolia, Kyrgyzstan, Jamaica, Belize, Jordan, Panama
65	Ecuador
66	Grenada, Fiji, Paraguay, Colombia, Turkey, Sri Lanka
72	El Salvador, Indonesia, China, Albania, Kuwait, Dominican Rep., Dominica
79	Rep. of Moldova, Namibia, Botswana
82	Romania, Tunisia
84	Kenya, Honduras, Gabon, Venezuela
88	Egypt, Swaziland, Zimbabwe, Guatemala
92	Malawi
93	Zambia, Ghana, Uganda, India
97	Morocco, Cameroon
99	Madagascar
100	Congo, Papua New Guinea
102	United Rep. of Tanzania
103	Nigeria, Bangladesh
105	Pakistan, Sierra Leone
107	Senegal, Angola
109	Chad, Benin, Mozambique
112	Central African Rep.
113	Guinea
114	Mali
115	Burkina Faso
116	Niger

Let's turn to Information Capacity (see Table 3.8). The highest ranking countries are developed countries while the ten lowest ranked countries are all Sub-Saharan African countries. Except South Africa and Mauritius (a small island nation), all 26 Sub-Saharan African countries are ranked below 79th out of 116 countries. Among developing

countries, Estonia and Malaysia are among the top ranked countries, followed by Eastern European countries and Latin American and Caribbean countries that are placed at the upper middle rankings of all countries.

As to Conformity Capacity (Table 3.9), three countries, Singapore, Israel, and Ireland, are far ahead of the other 58 countries covered in the dissertation.[39] The physical characteristics of these three countries in common are their small size of land and population compared to other developed countries, which could result in the relatively small size of economy. It is easier to manage the whole industries. These countries are highly specialized in Internet technology (IT) and consumer electronics.[40] These countries could be treated as outliers since their comparative advantage are in IT and consumer electronics. However, one needs to treat these countries carefully. As mentioned before, Conformity Capacity includes manufacturing industry other than food and agriculture-related industries, and it is likely that the capacity of other manufacturing industry may influence the capacity of food and agriculture sector. For the gravity model analysis in Chapter 4, these three countries are included.

With the exclusion of the majority of Sub-Saharan African countries and Latin and Caribbean countries, Conformity Capacity for developing countries does not present any unique trend at the regional level. While some developing countries, such as Hungary, Mexico, China, and Turkey that are ranked among the top ten, show matching Conformity Capacity with developed countries, the majority of developing countries are

[39] See Table 3.3 in Appendix A for the raw score of these three countries.
[40] The International Trade Center (ITC) provides information on Revealed Comparative Advantage. For more detail, visit the countries site of the ITC website at http://www.intracen.org/menus/countries.htm.

clustered around the low score of Conformity Capacity (the mean is 0.8 with standard deviation, 0.12).

Table 3.9 Ranking in Conformity Capacity

Rank	Conformity Capacity
1	Singapore
2	Israel
3	Ireland
4	Hungary
5	United Kingdom
6	Mexico
7	China
8	Netherlands
9	Turkey
10	Canada
11	Mauritius, Thailand
13	Germany
14	Rep. of Korea, Malaysia, Slovenia
17	Norway, Austria
19	Colombia
20	Belgium
21	Luxembourg, Spain
23	Denmark
24	New Zealand, Japan, Italy
27	Sweden, Brazil
29	Egypt, Lithuania, Malta
32	Cyprus, Estonia, India
35	Romania
36	Panama, Portugal, Kenya
39	Senegal, Jordan, Morocco, Ecuador, Tunisia, Croatia, Kuwait, Bulgaria
47	Sri Lanka, Latvia, Costa Rica, Malawi, Rep. of Moldova, Poland
53	Botswana, Georgia, Mozambique, Kyrgyzstan, Mongolia, Albania

As to Enforcement Capacity, countries are grouped into seven groups due to the database construction, explained in the preceding section. Developing countries show the diverse pattern of distribution all over 7 tiers of ranks while the majority of them (57

countries) are ranked at the top three tiers (See Table 3.10). Sub-Saharan African countries and Latin and Caribbean countries are scattered all over 7 tiers with Latin and Caribbean countries are skewed toward higher ranks (about half of them are in the first and second tiers) and Sub-Saharan African countries relatively toward lower ranks (only one third are in the first and second tiers).

Table 3.10 Ranking in Enforcement Capacity

Rank	Enforcement Capacity
1	Austria, Belgium, Bolivia, Brazil, Bulgaria, Cameroon, Canada, China, Costa Rica, Ecuador, El Salvador, Estonia, Finland, France, Ghana, India, Israel, Japan, Mexico, Morocco, New Zealand, Nigeria, Norway, Peru, Portugal, Romania, Singapore, Spain, Sweden, Switzerland, Thailand, Tunisia, USA, Venezuela.
35	Argentina, Australia, Barbados, Czech Rep., Denmark, Dominica, Dominican Rep., Egypt, Germany, Hungary, Iceland, Ireland, Italy, Jordan, Kenya, Luxembourg, Malaysia, Malta, Mauritius, Netherlands, Niger, Papua New Guinea, Poland, Rep. of Korea, South Africa, Sri Lanka, United Kingdom
62	Benin, Fiji, Grenada, Guatemala, Honduras, Indonesia, Kyrgyzstan, Latvia, Madagascar, Malawi, Mongolia, Pakistan, Paraguay, Philippines, Slovakia, Slovenia, Swaziland, Trinidad and Tobago, Turkey, Uganda, United Rep. of Tanzania, Uruguay
84	Bahrain, Bangladesh, Botswana, Colombia, Cyprus, Gabon, Georgia, Greece, Jamaica, Namibia, Panama, Senegal, Zambia, Zimbabwe
98	Albania, Belarus, Belize, Burkina Faso, Chile, Croatia, Guinea, Guyana, Mali, Mozambique
108	Antigua and Barbuda, Central African Rep., Kuwait, Lithuania
112	Angola, Chad, Congo, Rep. of Moldova, Sierra Leone

Eastern European and Central Asian countries as well as Asian countries show similar trend to Latin and Caribbean countries. Middle East and North African developing countries are all at the first and second tiers. Interestingly, high-income Middle East countries and Mediterranean countries are at the two lowest tiers (Kuwait at the lowest tier and Bahrain, Cyprus, and Greece are at the second lowest tiers).

Again, countries are clustered along with ten ranks in International Standard Setting Capacity (See Table 3.11). Among all countries, it is interesting to see that the countries in the top two tiers of International Standard Setting Capacity are all Latin American countries except Morocco. Including Morocco, these countries are all developing countries. Although the International Standard Setting Capacity of developing countries in general is lower than that of developed countries as I can see the difference in means in Table 3.7, some developing countries possess higher or equivalent International Standard Setting Capacity than developed countries. This high level of International Standard Setting Capacity of developing countries may be due to the increased interests and activities in improving the participation of developing countries at the meeting hosted by STR-related international organizations.[41]

Among developing countries, it is the Sub-Saharan African countries that lack International Standard Setting Capacity, relative to other developing countries as well as to developed countries. Nineteen out of 28 Sub-Saharan African countries are ranked at

[41] There are however many problems left to be resolved. For instance, the quality of participation, such as the ability of evaluating issues at the meeting and of developing strategic approach, needs to be improved and the participation at the regional meetings or meetings on specific subjects also needs to be increased (Committee on Sanitary and Phytosanitary Measures, 2001b). The dataset of this dissertation does not cover these issues.

or below the sixth tiers while more than half of developing countries in other regions are ranked at or over fifth tiers.

Table 3.11 Ranking in International Standard-Setting Capacity

Rank	International Standard Setting Capacity
1	Mexico, Uruguay
3	Argentina, Brazil, Chile, Morocco, Panama
8	Australia, Bulgaria, Canada, China, Costa Rica, Czech Rep., Guatemala, Hungary, India, Indonesia, Kenya, Malaysia, Netherlands, New Zealand, Norway, Peru, Rep. of Korea, Senegal, South Africa, Thailand, Tunisia, Turkey, USA
31	Austria, Botswana, Cyprus, Denmark, Estonia, Finland, Germany, Ghana, Greece, Ireland, Malta, Paraguay, Philippines, Slovakia, Spain, Sweden, United Kingdom
48	Bangladesh, Barbados, Belgium, Colombia, Croatia, Dominican Rep., France, Italy, Japan, Mauritius, Nigeria, Poland, Romania, Switzerland, Uganda, Zimbabwe
64	Angola, Bolivia, Cameroon, Ecuador, Egypt, El Salvador, Gabon, Honduras, Israel, Kuwait, Lithuania, Luxembourg, Namibia, Papua New Guinea, Portugal, Singapore, Slovenia, Swaziland, United Rep. of Tanzania
83	Albania, Belize, Benin, Fiji, Grenada, Guinea, Guyana, Madagascar, Malawi, Mali, Mongolia, Mozambique, Niger, Pakistan, Rep. of Moldova, Sierra Leone, Sri Lanka, Trinidad and Tobago
101	Antigua and Barbuda, Bahrain, Burkina Faso, Central African Rep., Chad, Congo, Dominica, Georgia, Iceland, Jordan, Latvia, Venezuela, Zambia
114	Jamaica, Kyrgyzstan
116	Belarus

Table 3.12 and 3.13 list, alphabetically, the names of developing countries that were ranked tenth from the highest and the lowest respectively. The number of countries in some dimension is beyond ten since countries at the same ranking were counted even

though the total number goes over ten. Brazil, China, Hungary, Malaysia, Mexico, and Thailand are the countries ranked in the highest top ten in three dimensions of Institutional Capacity. The economies of these Asian developing countries and Latin American countries are very vibrant.[42]

The three Asian countries are some of fastest growing economies in the world. Brazil is one of the economically dynamic four BRICs (Brazil, Russia, India, and China) countries. Mexico is the beneficiary of the North American Free Trade Area (NAFTA) and other Free Trade Agreements (FTAs). Hungary is also claimed as a successful story among the East European transitional countries. These economic successes could have been partially supported by the quality of governance or the capacities of public or private entities, which could have also influenced these countries to achieve the highest STR-related Institutional Capacity among all developing countries covered.

On the other hand, Burkina Faso, Central African Rep., Chad, and Mozambique are the ones ranked in the lowest top ten in three dimensions of Institutional Capacity (see Table 3.13). Interestingly, but not surprisingly, four countries in the lowest top ten in three Institutional Capacity dimensions are Sub-Saharan African countries. One can conclude that Sub-Saharan African countries are still facing the lack of Institutional Capacity, which could result in their failing to overcome trade barriers influenced by food and agriculture STRs on their exports. These countries are geographically disadvantaged:

[42] Economic information on each country is available from the World Factbook by the Central Intelligence Agency (CIA) of the United States at http://www.cia.gov/cia/publications/factbook/index.html.

Burkina Faso, Central African Rep., and Chad are land-locked countries.[43] In addition, all four countries suffer from natural disasters such as droughts, flood, and desertification. In addition, these countries are members of the Least Developed Countries (LDCs) a majority of their populations engaged in subsistence agriculture. Situations seem stark for Sub-Saharan African countries, especially LDCs.

Table 3.12 The Highest Top Ten Ranked Developing Countries

INF	CON	ENF	INT
Argentina	Brazil	Bolivia	Argentina
Chile	China	Brazil	Brazil
Estonia	Colombia	Bulgaria	Bulgaria
Guyana	Egypt	Cameroon	Chile
Hungary	Hungary	China	China
Latvia	Lithuania	Costa Rica	Costa Rica
Lithuania	Malaysia	Ecuador	Czech Rep.
Malaysia	Malta	El Salvador	Guatemala
Malta	Mauritius	Estonia	Hungary
Poland	Mexico	Ghana	India
Slovakia	Thailand	India	Indonesia
	Turkey	Mexico	Kenya
		Morocco	Malaysia
		Nigeria	Mexico
		Peru	Morocco
		Romania	Panama
		Thailand	Peru
		Tunisia	Senegal
		Venezuela	South Africa
			Thailand
			Tunisia
			Turkey
			Uruguay

[43] Economic and geographic information on these countries were obtained form the World Factbook by the CIA of the United States at http://www.cia.gov/cia/publications/factbook/index.html.

However, there is hope too. Some Sub-Saharan African countries, such as Kenya, Ghana, and Mauritius, are ranked at the upper middle rankings (see Table 3.4 in Appendix A). In addition, some LDCs, such as Senegal and Uganda, are also associated with the middle or upper middle rankings in some Institutional Capacity dimensions. Senegal is above the mean of International Standard Setting Capacity for all countries. The three Institutional Capacity dimensions, excluding Conformity Capacity, of Uganda is about or above the mean for developing countries.

Table 3.13 The Lowest Top Ten Ranked Developing Countries.

INF	CON	ENF	INT
Angola	Albania	Albania	Antigua and Barbuda
Benin	Botswana	Angola	Belarus
Burkina Faso	Costa Rica	Antigua and Barbuda	Burkina Faso
Central African Rep.	Georgia	Belarus	Central African Rep.
Chad	Kyrgyzstan	Belize	Chad
Guinea	Latvia	Burkina Faso	Congo
Mali	Malawi	Central African Rep.	Dominica
Mozambique	Mongolia	Chad	Georgia
Niger	Mozambique	Chile	Jamaica
Senegal	Poland	Congo	Jordan
	Rep. of Moldova	Croatia	Kyrgyzstan
	Sri Lanka	Guinea	Latvia
		Guyana	Venezuela
		Lithuania	Zambia
		Mali	
		Mozambique	
		Rep. of Moldova	
		Sierra Leone	

3.4 Data for Standards and Technical Regulations

In the model of Chapter 4, the variable *ST* is the maximum level of standards (Aflatoxin B1) on food and agricultural imports. Aflatoxins are a group of toxins

developed by molds and may cause liver disease and cancer (Otsuki et al., 2001a). Aflatoxins are easily built up in humid and hot environment and can be found on such agriculture products as cereals, nuts, and dried fruits (Miraglia, De Santis, Grossi, & Brera, 2004). The major aflatoxins are Aflatoxin B1, B2, G1, and G2 (FAO, 1997). The maximum level of Aflatoxin B1 that can be allowed in food is the STR covered in this dissertation. The unit is in particles per million (ppm).

Table 3.14 Maximum Level of Aflatoxin B1 Allowed on Cereal Products

Importers	Aflatoxin B1 (ppm)	Importers	Aflatoxin B1 (ppm)
Algeria	10.0	Lithuania	2.0
Austria	2.0	Luxembourg	2.0
Barbados	10.0	Malaysia	17.5
Belgium	2.0	Mauritius	5.0
Brazil	12.5	Mexico	10.0
China	11.7	Netherlands	2.0
China, Hong Kong SAR	15.0	Nigeria	20.0
Colombia	7.5	Norway	2.5
Cyprus	5.0	Portugal	2.0
Czech Rep.	5.0	Rep. of Moldova	5.0
Denmark	2.0	Russian Federation	5.0
Egypt	5.0	Slovakia	11.7
El Salvador	10.0	South Africa	5.0
Estonia	2.0	Spain	2.0
Finland	2.0	Sri Lanka	15.0
France	2.0	Sweden	2.0
Germany	2.0	Switzerland	2.0
Greece	2.0	Thailand	10.0
Hungary	2.0	Tunisia	2.0
Iceland	2.0	Turkey	2.0
India	15.0	United Kingdom	2.0
Ireland	2.0	United Rep. of Tanzania	5.0

Italy	2.0	Uruguay	7.5
Jamaica	10.0	USA	10.0
Japan	10.0	Viet Nam	5.0
Jordan	15.0	Zimbabwe	5.0

Table 3.15 Maximum Level of Aflatoxin B1 Allowed on Nut products

Importers	Aflatoxin B1 (ppm)	Importers	Aflatoxin B1 (ppm)
Australia	7.5	Luxembourg	5
Austria	5	Malaysia	17.5
Barbados	10	Mauritius	5
Belgium	5	Netherlands	5
Brazil	15	New Zealand	7.5
Bulgaria	5	Nigeria	20
Canada	7.5	Norway	2.5
China, Hong Kong SAR	17.5	Philippines	10
Columbia	5	Portugal	5
Czech Rep.	5	Rep. of Moldova	5
Denmark	5	Russian Federation	5
El Salvador	10	Slovakia	10
Estonia	5	South Africa	5
Finland	5	Spain	5
France	5	Sri Lanka	15
Germany	5	Sweden	5
Greece	5	Switzerland	2
Hungary	5	Thailand	10
India	15	Tunisia	2
Ireland	5	Turkey	5
Israel	5	United Kingdom	5
Italy	5	Uruguay	7.5
Jamaica	10	USA	10
Japan	10	Zimbabwe	5
Lithuania	5		

The aflatoxin data were obtained from the Food and Agriculture Organization of the United Nations (FAO) survey of mycotoxin standards on food and feed stuffs in 1995, *Worldwide Regulations for Mycotoxins 1995: A Compendium* (FAO, 1997) and the updated version of the FAO survey of mycotoxins, *Worldwide Regulations for Mycotoxins in 2003*. The FAO survey of mycotoxin standards in 2003 provides information on legal basis and the publication year for the new regulations on the maximum level of aflatoxin in each country.

This allowed me to build the dataset for the variable *ST* in 2001 since I could update new aflatoxin level in each country if there was any change before 2001. If any change occurred after 2001, I used data from *Worldwide Regulations for Mycotoxins 1995*. There are cases that the aflatoxin regulation information of a certain country did not exist in the 1995 FAO survey but appeared in the FAO 2003 survey. If it is not clear that the aflatoxin regulation in this country was in place before 2001, I did not include the aflatoxin regulation information of this country in this dataset. The number of countries covered for cereal or cereal preparations is 52 including 30 developing countries and 49 including 25 developing countries in the analysis for nuts or nut products. The level of Aflatoxin B1 for each country is provided in Table 3.14 and 3.15.

3.5 Data for other variables

The base year for whole dataset is 2001. The value of food and agricultural trade between two countries (Variable *V* in Chapter 4) was obtained from the United Nations Statistical Office. The unit of these data is the United States dollar (USD). The specific product categories covered in this paper is cereal or cereal preparations (SITC 04) and

nuts or nut products (SITC 0577 and 05892). The classification of product categories follows the Standard International Trade Classification (SITC) Rev. 3. I chose import data over export data because countries tend to keep better track of import data than export data for tariff purposes.

Gross domestic product (Variable *GDP* in Chapter 4) is measured by the World Bank purchasing power parity (PPP) data from World Development Index (WDI) database. Population (variable *POP* in Chapter 4) was obtained from World Development Index (WDI) database. Data for distance between two countries (variable *DIST* in Chapter 4) were obtained from the Centre D'etudes Prospectives et D'informations Internationales (CEPII) database.[44]

3.6 Data for Dispute Settlement Analysis

The dissertation analyzes the WTO dispute settlement cases related to STRs in Chapter 5. The litigation capacity of developing countries is very critical for these countries to utilize the benefits of the WTO Agreements on STRs. Policy implications are drawn, with an emphasis on the *Institutional Capacity* of developing countries, from the analysis of the dispute cases. For archival data related to dispute settlement analysis, the online document facility at the WTO is the major source.[45] The WTO has made dispute settlement documents, including panel and appellate reports, available online. Since the focus of this dissertation is on the Institutional Capacity of developing countries, I only

[44] Distance data can be obtained at http://www.cepii.fr/.
[45] The WTO online document facility can be found at http://docsonline.wto.org/.

consider dispute cases that involved developing countries as either defendants or complainants and that adopted a panel report.

As of 2005, there have been two cases involving developing countries, which produced an adopted panel report. First case is against the United States by India, Malaysia, Pakistan and Thailand regarding an import ban on shrimp and shrimp products. The documents that are used are the panel report (WT/DS58/R) and the Appellate Body report (WT/DS58/AB/R). The other dispute was between European Communities and Peru on trade description of sardines. The major documents produced in these dispute cases include the panel report (WT/DS231/R) and the Appellate Body report (WT/DS231/AB/R).

Chapter 4 Model and Results

In this chapter, I first introduce four gravity model specifications that vary with regard to the scale of economy (or the status of economic development) variables. Then, I focus on the first specification with both gross domestic production and population for the discussion on the results of regression analysis. I find that institutional capacity makes a positive impact on the efforts by exporters to overcome standard and technical regulations (STRs) on their food and agriculture products. Next, I discuss differences on the results of the four different specifications. The specification with both GDP and population shows the strongest validity as the gravity model in the regression analysis of this dissertation. Finally, I conclude this chapter with a summary of the findings.

4.1 The Gravity Mode Specifications

The primary method in this dissertation is the extension of the econometric approach that Otsuki, Wilson, and Sewadeh (2001a) used in their study. In addition to variables used in the study by Otsuki, Wilson, and Sewadeh, the theoretical framework in this research includes the institutional capacity of governments and, to a certain extent, private agencies on STRs. The institutional capacity of governments and private agencies needs to be taken into account in order to ascertain if food and agriculture food STRs become trade barriers regardless of the level of institutional capacity.

This type of study would tell if STRs are significant trade barriers as well as whether exporting countries are ready to deal with international standards. The extended gravity framework that is used in this dissertation is as follows:

$$\ln(V_{ij}) = b_0 + b_1 \ln(GDP_i) + b_2 \ln(GDP_j) + b_3 \ln(POP_i) + b_4 \ln(POP_j) + b_5 \ln(DIST_{ij}) + b_6 \ln(ST_j) + b_7 \ln(INF_i) + b_8 \ln(CON_i) + b_9 \ln(ENF_i) + b_{10} \ln(INT_i) + \varepsilon_{ij} \quad (4.1)$$

where i = export country and j = import country

In Equation 4.1, V is bilateral trade value. GDP is the gross domestic product (GDP) of importing and exporting countries. POP is the population of each country. Unlike in Otsuki, Wilson, and Sewadeh (2001a), instead of using only GDP per capita, I use GDP and population concurrently since GDP per capita (the level of individual income) used in the study of Otsuki, Wilson, and Sewadeh does not fully address the size of national economy (Anderson, 1979).[46] $DIST$ is the geographical distance between two countries trading with each other. ST is standards and technical regulations imposed by importing country's government on imports. INF, CON, ENF, INT are respectively information, conformity, enforcement, and international standard setting capacity of the institutional capacity of exporting countries. The process of constructing the four components of institutional capacity was elucidated in Chapter 3. The error term ε_{ij} is assumed to be normally distributed with zero mean.

[46] Typically the effect of population has been found to be statistically significant. For the details on the standard gravity model, see Section 2.4 in Chapter 2. See also Chapter 2 for further discussion.

As mentioned above, the model of this dissertation differs from that of Otsuki, Wilson, and Sewadeh (2001a) in that Equation 4.1 use GDP and population as the size of economy, while that in the study by Otsuki, Wilson and Sewadeh uses only GDP per capita (GDPPC). The GDP per capita approach, however, is also utilized to compare the outcome between two specifications: GDP and population as economy size vs. GDP per capita as income size. The specification using GDP per capita is as follows:

$$\ln(V_{ij}) = b_0 + b_1 \ln(GDPPC_i) + b_2 \ln(GDPPC_j) + b_3 \ln(DIST_{ij}) + b_4 \ln(ST_j) + b_5 \ln(INF_i) + b_6 \ln(CON_i) + b_7 \ln(ENF_i) + b_8 \ln(INT_i) + \varepsilon_{ij} \quad (4.2)$$

where i = export country and j = import country

Equation 4.2 is equivalent to Equation 4.1. As mentioned in Chapter 2, a model with GDP and population can be transformed not only into Equation 4.2 but also into a model with GDP and GDP per capita.[47] I also compare the outcome of the model with GDP and GDP per capita in order to see if there are some differences and what specification is more valid if there are differences in the outcomes of these different models. The specification of this model, which is very close to Equation 4.1, is as follows:

$$\ln(V_{ij}) = b_0 + b_1 \ln(GDP_i) + b_2 \ln(GDP_j) + b_3 \ln(GDPPC_i) + b_4 \ln(GDPPC_j) + b_5 \ln(DIST_{ij}) + b_6 \ln(ST_j) + b_7 \ln(INF_i) + b_8 \ln(CON_i) + b_9 \ln(ENF_i) + b_{10} \ln(INT_i) + \varepsilon_{ij} \quad (4.3)$$

[47] See Chapter 2.4. for more detail.

where i = export country and j = import country

In addition to Equations 4.2 and 4.3, a traditional gravity model specification, which includes only GDP as income size or economy size, is utilized to compare the outcome with that of all three equations above. Although this specification is not equivalent to the former three equations, this approach has been used in not a small number of gravity model based studies (Bergstrand, 1985). The specification of using only GDP is as follows:

$$\ln(V_{ij}) = b_0 + b_1 \ln(GDP_i) + b_2 \ln(GDP_j) + b_3 \ln(DIST_{ij}) + b_4 \ln(ST_j) + b_5 \ln(INF_i) + b_6 \ln(CON_i) + b_7 \ln(ENF_i) + b_8 \ln(INT_i) + \varepsilon_{ij} \quad (4.4)$$

where i = export country and j = import country

4.2 Outcomes and Discussion: with Focus on Institutional Capacity

In this section, the discussion is limited to the outcome of the specification in Equation 4.1 and the focus is on the impacts of the four Institutional Capacity variables on the effect of STRs on trade flow. The positive or negative sign of the coefficients in this paper represent increases or decreases respectively in trade between countries i and j as a result of value change of the dependent variable. All variables take the double-log form. The coefficients of the independent variables in the double-log regression represent the elasticity of a dependent variable with respect to an independent variable. For example, the coefficient b_1 represents the elasticity of trade with respect to GDP. If b_1 is

larger than 1, it means that a 1% increase of GDP would bring more than 1% increase in trade.

As discussed in Chapter 2, the expected signs for the coefficients of *lnGDP* and *lnPOP* for import countries are straightforward. The sign is expected to be positive for ln*GDP*. If Engel's Law prevails, the coefficient sign is expected to be negative.[48] The coefficient of ln*POP* is expected to be negative since increases of population reduce the per capita income. However, the expected sign for the coefficient of *lnGDP* and *lnPOP* for export countries is rather complex. For the interpretation of coefficient signs for export countries' variables, I take the approach articulated by Bergstrand (1989). Bergstrand states that the coefficients of GDP and GDP per capita of exporters (alternatively population used in this dissertation) acts as "a proxy of [exporter's] national output expressed in terms of units of capital" and "a proxy of [exporter's] capital-labor endowment ratio" rather than as a proxy for the size of economy (p.146).

In this case, since agriculture sector is labor intensive sector rather than capital intensive sector, I expect the coefficient of ln*POP* of exporters to be positive, which is opposite to the expectation for the population coefficient for importers. In the case of ln*GDP* of exporter, I expect the coefficient sign to be positive. The coefficient of ln*DIST* is expected to be negative because transportation costs increase as the distance between two countries gets larger.

ln*ST* and the four variables of Institutional Capacity are also in a double-log form. The interpretation of the coefficient results for these variables will be the same as that of

[48] See Chapter 2.4 for the details.

other variables in a double-log form. For instance, if the coefficient of Conformity Capacity is greater than 1, it means that 1% increase of Conformity Capacity would increase more than 1% of trade value. I expect the coefficient of ln*ST* to be positive. The expected result is positive because the higher level of tolerable maximum aflatoxin B1 residue means that a regulation is less strict. A more general interpretation is that food and agricultural STRs negatively affect the flow of food and agriculture trade. However, we also expect institutional capacity to have statistically significant effects on food and agricultural trade. Based on studies about the effects of institutions on trade, it is anticipated that the effect of STRs would be reduced or cancelled out when the institutional capacity of government is controlled.

The results of the gravity model are summarized in Table 4.1 through Table 4.4. Table 4.1 shows the outcome on cereals or cereal products and Table 4.2 on nuts or nuts products. Table 4.3 and 4.4 are sub-categories of nuts or nut products: preserved or prepared nuts (Table 4.3) and fresh or dried nuts (Table 4.4). I discuss the outcome of cereals or cereal products first and that of nuts or nut products later.

To simplify the discussion, I focus on the outcomes of four variables of Institutional Capacity. I briefly discuss those of other variables in this section and visit these variables in the next section. I first ran a regression that includes as exporters all countries whose data for Institutional Capacity was available (Column 1). Next, I ran a separate regression including three institutional variables: Information Capacity (*lnINF)*, Enforcement Capacity (*lnENF*), and International Standard Setting Capacity (*lnINT*) (Column 3).

Table 4.1. Gravity Model Results for Cereals and Cereal Preparations

	1	2	3	4	5	6
Exporters	All	Developing	All	Developing	All	Developing
Constant	-16.84**	-8.61**	-12.26**	-4.21	-4.00	7.00
	(-12.43)	(-4.44)	(-5.67)	(-1.32)	(-1.31)	(1.33)
lnGDP	0.53**	0.29**	0.58**	0.32**	0.72**	0.47**
importer	(7.86)	(3.11)	(8.33)	(3.11)	(8.65)	(3.62)
lnGDP	1.25**	1.13**	0.80**	0.75**	0.16	-0.25
exporter	(21.05)	(9.70)	(5.62)	(3.39)	(0.76)	(-0.65)
lnPOP	-0.04	0.05	-0.07	0.05	-0.19*	-0.04
importer	(-0.53)	(0.51)	(-0.92)	(0.45)	(-2.13)	(-0.27)
lnPOP	-0.46**	-0.60**	0.05	-0.19	0.74**	0.95**
exporter	(-7.48)	(-5.15)	(0.36)	(-0.88)	(3.62)	(2.54)
lnDIST	-1.11**	-0.90**	-1.18**	-0.95**	-1.50**	-1.52**
	(-19.41)	(-10.73)	(-19.53)	(-10.49)	(-20.28)	(-11.81)
lnST	0.38**	0.42**	0.38**	0.41**	0.48**	0.46**
	(4.56)	(3.64)	(4.36)	(3.27)	(4.61)	(2.85)
lnINF			2.24**	1.59*	4.62**	4.27**
			(4.28)	(2.38)	(6.09)	(3.54)
lnCON					0.18**	0.35**
					(2.67)	(3.47)
lnENF			-0.32**	-0.21	-0.19	-0.11
			(-2.98)	(-1.79)	(-1.55)	(-0.81)
lnINT			0.18	0.12	0.28	0.12
			(0.75)	(0.41)	(0.83)	(0.23)
Observations	2270	1176	2017	989	1332	572
Adjusted R-squared	0.32	0.19	0.34	0.19	0.3929	0.27

Note: t-scores are in parentheses. "*" denotes significance at the5 percent level and "**" at the 1 percent level.

In Column 1, I intend to see how the outcome of traditional gravity equation, without controlling for Institutional Capacity, would look like. In Column 3, I did not include *lnCON* because of a limited number of available data for this variable. I ran a separate regression for the gravity equation with all four institutional capacity variables (Column 5). As one can see in Table 4.1, the number of observations for Column 5 (1332) was significantly reduced, compared to that of Column 3 (2017). I also ran these

three different regressions on only developing countries as exporters (column 2, 4 and 6). This was done in order to measure the effect of Institutional Capacity of developing export countries on their exports.

Column 1 of Table 4.1 takes only the traditional gravity model variables with the STRs variable. The coefficients of the GDP variable for both export and import countries are of expected signs (positive) and statistically significant at the one percent level. The coefficients of the GDP variable of both importing and exporting countries also behave as expected for the regression with three institutional capacity variables: Information Capacity, Enforcement Capacity, and International Standard Setting Capacity (Column 3). In Column 5, the GDP variable of import countries remains statistically significant at the one percent level while that of export countries becomes statistically insignificant. This trend holds for the regressions only with developing countries as exporters.

In Column 1, the population variable of import countries is of expected sign but not statistically significant and remains negative in Column 3 and 5. After controlling for all four institutional capacity variables, the coefficient of the population variable of import countries becomes statistically significant at the five percent level. The coefficient of importer's population is not statistically significant in the regression for developing export countries (Columns, 2, 4, and 6). Interestingly, the population variable of export countries is not of expected sign but statistically significant at the one percent level (Column 1). However, this result conforms to the traditionally expected sign (negative). On the contrary, by adding the four institutional variables, the coefficient of the population variable for exporting countries becomes positive and statistically significant

at the one percent level (Column 5). This outcome, which is of expected sign, confirms the labor-intensive production attribute of the agriculture sector elaborated above and in Chapter 2. The same trend also shows up in the outcome of the regression for only developing countries as exporters.

The coefficient of bilateral distance is of the expected sign and statistically significant at the one per center level throughout all six columns. Furthermore, the bilateral distance elasticity of trade flow increases when all four institutional capacity variables are controlled in both the all export countries case and the developing export countries case. The coefficient of the STRs variable is also of expected sign and statistically significant at the one percent level in Column 1 and remains stable throughout all six columns. It is important to see that the negative effect of STRs on trade flow is still significant even after controlling for the four Institutional Capacity variables for both cases of all countries as exporters and only developing countries as exporters. For instance, one percent increases (decrease) of allowable maximum level of Aflatoxin B1 is related to 0.46 percent increase (decrease) of the cereals or cereals products exports from developing countries after controlling for income size, distance, and Institutional Capacity (Column 6). In more direct terms, developing countries covered in this study could have exported about 13.2 million US$ more in addition to the total 2.9 billion US$ of cereals or cereal products to the world if import countries had raised by 1 percent the allowable level of the maximum aflatoxin B1 residue in food in 2001.

Next, I focus on the four Institutional Capacity variables. Column 3 of Table 4.1 takes three institutional variables excluding the conformity capacity variable of all

exporting countries. The outcome of the three institutional variables is very interesting. While the coefficient of the international standard setting capacity variable is not statistically significant, that of the information capacity variable and the enforcement capacity variable is statistically significant at the one percent level. Notably, the effect of the enforcement capacity variable on trade flow turns out to be negative, which is opposite to that of the information capacity. In other words, while information capacity works to offset the negative effect of STRs on trade, enforcement capacity adds to the negative effect of STRs. However, the coefficient of the enforcement capacity variable becomes statistically insignificant in the regression that takes only developing countries as exporters. But, the coefficient sign remains negative.

Column 5 takes all four institutional capacity variables. This form is the complete one that I wish to investigate. The information capacity variable and the conformity capacity variable have the expected signs and are significant at the one percent level. The enforcement capacity variable is not statistically significant. However, it is still of the negative sign. These results hold for the outcome for developing export countries. One noteworthy observation is that the information capacity elasticity (4.62 in Column 5 and 4.27 in Column 6) of trade flow is much higher than the conformity capacity elasticity (0.18 in Column 5 and 0.35 in Column 6).

Statistically significant positive effects of information capacity and conformity capacity imply that institutional capacities that are directly associated with supply-side constraints matter for export countries, especially developing ones. Information capacity and conformity capacity are factors that are closely related to an increase of production

capacity (or, supply-side capacity). Let's look at the data of information capacity and conformity capacity. Data used for information capacity is the average score of three components that measure the capacity of individuals and public entities in utilizing internet to obtain or deliver public services or information on certain public services.

Therefore, the statistically significant positive effect of information capacity means that the exporting countries with high informational capacity are making a positive difference in helping local farmers and agriculture exporters to overcome the negative impact of STRs on their exports. Although the data are not specific for aflatoxin B1 on cereals and cereal products, it can approximately measures the capacity of a country in obtaining or delivering information for STRs on food and agriculture products in helping local farmers or food producers to deal with STRs on their exports. The distribution of STR-related information by the public or private technical assistance agencies and the access to the information by local farmers and exporters are critical to enhance productivity in export activities.[49]

Data used for conformity capacity are the number of ISO 9000 certifications divided by the number of establishments in each exporting country. ISO 9000 certifications are awarded for quality management systems that have satisfied the production process criteria set by the ISO (ISO Central Secretariat, 2004). Although certifications are awarded not only in the food and agricultural industry but also in other manufacturing industries, the number of certifications awarded could capture the capacity

[49] As mentioned, one should be careful in interpretation since data we used was not directly related to the capacity of exporting countries to guide their farmers to STR-related information. Instead, the informational capacity variable measures the overall informational capacity of exporting countries.

of governments to help food and agricultural producers and exporters as well as the capacity of exporters.[50] In fact, ISO 9000 series is being increasingly adopted as one of hazard analysis critical control points (HACCP) systems in the food and agricultural industry (Unnevehr & Jensen, 1999).[51]

Therefore, one can assume that the fact that some countries with higher number of ISO 9000 certifications per establishment can export more cereals and cereal products proves that ISO 9000 system works well to improve capacity of exporting countries to comply with other non-process standards such as the limit of chemical residue on agriculture products. However, with the current dataset, we cannot be certain which sector, public or private, contribute to enhance conformity capacity: the increased number of ISO 9000 certification in this case.

The international standard setting capacity variable is not statistically significant although it is of expected sign. On the other hand, the enforcement capacity variable is of negative sign. In the regression outcomes with the three institutional capacity variables, the coefficient of enforcement capacity has the negative sign and is statistically significant at the one percent level (Column 3). Although the interpretation of this result is not as robust as in the case of information capacity and conformity capacity, one can

[50] For instance, the capacity of the food can container manufacturing industry may affect the exports of processed foods. Therefore, including ISO 9000 certification for sectors other than food and agricultural industry will help one to capture the capacity of exporting country in general.
[51] The HACCP system is a process standard rather than a product standard. For more discussion about the HACCP system, see Unnevehr and Jensen (1999).

articulate that countries with higher enforcement capacity are likely to export less.[52] This is not exactly what I expected.

Let's further investigate what this result means. These two dimensions of institutional capacity are less closely related to supply-side factors. For instance, data used to measure enforcement capacity is to indicate whether there are government agencies in charge of food and agriculture STRs. Stronger enforcement capacity means that regulation agencies can more effectively force local farmers and food producers to comply with regulations on cereals or cereal products for domestic consumption. On one hand, stronger enforcement capacity of an export country may help to increase the exports of its local farmers and food products producers by ensuring the confidence of consumers in import countries on their exports (Maskus & Wilson, 2001a). On the other hand, an exporting country with higher enforcement capacity may put their cereal farmers and cereal products producers in a less competitive position in the world market since the price of these products could be higher due to the high compliance costs. This fact may lead farmers and producers to set the price of export products higher, which results in losing price competitiveness in the world market.

It is, however, possible that data do not capture the real institutional capacity. The fact that a country has a food safety regulation agency with strong capacity may not tell whether the country has proper institutional capacity to promote the exports of food and agricultural products. The capacity also depends on other factors such as whether STR-

[52] However, one needs to be cautious in making this conclusion since the negative effect of enforcement capacity on trade flow is not statistically significant on the regressions with all four institutional capacity dimensions (Column 5).

related agencies provide technical assistance for complying with STRs, how adequate these technical assistance programs are, and whether the location of STR-related agencies are decentralized (closer to farmers and food producers). The data do not tell the quality sides of STRs-related agencies. This data quality concern applies to the data of international standard setting capacity. I suppose that export countries that actively participate in the meetings and other activities of STRs-related international organizations effectively represent interests of their farmers and exporters as well as they properly provide appropriate information to local farmers and exporters so that these farmers and food products producers could prepare for STRs that are negotiated at the international agencies. However, the current data only measure the level of participation not the quality of participants and their activities.

Let's turn to the regression on nuts or nut products. I begin with the regression only for traditional gravity model variables and the STRs variable. Column 1 of Table 4.2 only takes the traditional gravity model variables and the STR variable of all exporting countries. The coefficients of the traditional gravity model variables, which are population, GDP, and bilateral distance, are of expected sings and significant at the one percent level. As mentioned before, the population variable of exporters is expected to be positive due to the labor-intensive nature of agriculture products. As expected, the STRs variable is negative and statistically significant at the one percent level. This result holds for the regression of developing export countries except the GDP variable of exporter that is negative and become insignificant statistically (Column 2).

Table 4.2. Gravity Model Results for Nuts and Nut Products

	1	2	3	4	5	6
Exporters	All	Developing	All	Developing	All	Developing
Constant	-17.38**	-13.60**	-15.06**	-4.26	-10.39**	-1.75
	(-11.53)	(-6.93)	(-6.69)	(-1.39)	(-3.17)	(-0.36)
lnGDP	1.23**	0.96**	1.32**	1.11**	1.45**	1.22**
importer	(13.94)	(8.28)	(14.37)	(9.06)	(12.72)	(7.60)
lnGDP	0.16**	-0.01	-0.09	-0.79**	-0.39	-1.17**
exporter	(2.83)	(-0.10)	(-0.66)	(-4.17)	(-1.88)	(-3.53)
lnPOP	-0.73**	-0.47**	-0.82**	-0.61**	-0.94**	-0.68**
importer	(-7.77)	(-3.72)	(-8.32)	(-4.53)	(-7.69)	(-3.83)
lnPOP	0.54**	0.59**	0.81**	1.38**	1.02**	1.74**
exporter	(8.21)	(5.17)	(5.83)	(7.40)	(4.89)	(5.24)
lnDIST	-0.66**	-0.46**	-0.70**	-0.59**	-0.97**	-0.73**
	(-11.39)	(-5.48)	(-11.46)	(-6.62)	(-12.47)	(-5.76)
lnST	0.47**	0.78**	0.39**	0.78**	0.35*	0.58*
	(3.35)	(4.32)	(2.70)	(4.11)	(1.95)	(2.29)
lnINF			1.30**	3.38**	0.08	2.02
			(2.54)	(5.81)	(0.10)	(1.90)
lnCON					0.26**	0.23*
					(3.51)	(2.21)
lnENF			-0.14	-0.08	-0.03	-0.04
			(-1.78)	(-0.99)	(-0.29)	(-0.38)
lnINT			0.17	0.41	-0.66	-0.02
			(0.64)	(1.30)	(-1.86)	(-0.03)
Observations	1622	991	1413	803	897	459
Adjusted R-squared	0.28	0.24	0.30	0.29	0.33	0.30

Note: t-scores are in parentheses. "*" denotes significance at the10 percent level, "**" at the 5 percent level, and "***" at the 1 percent level.

After adding three institutional capacity variables, except the GDP variable of exporters, all other traditional gravity model variables and the STRs variable are of expected signs and remain statistically significant at the one percent level (Column 3). This result does not change even after being controlled for the conformity capacity variable that reduces the number of observation (Column 5). Interestingly, the GDP variable of exporter turns into a negative sign and becomes statistically insignificant after

controlled for the four institutional capacity variables. This trend is more obvious in the regression outcome for the case of developing export countries (Column 4 and 6). Only the GDP variable of exporter does not produce stable result as the number of observation changes.

The coefficients for the STRs variable ($\ln ST$) are of expected signs and statistically significant at the one percent level in Column 1 and 3 but become statistically less significant after controlling for all four institutional capacity in Column 5 (significant only at the five percent level). This trend holds for the regression for developing export countries. However, one can see that the STR elasticity is higher in the case of developing export countries than in the case of all exporting countries in all three cases: the traditional gravity model variables only case, the three institutional capacity variables controlled case, and the all four institutional variable controlled case (comparison between Column 1 and 2, between Column 3 and 4, and Column 5 and 6). One can conclude that STRs matters more for the exports of developing export countries.

As to the institutional capacity variables, the regression result for all exporting countries, controlling for the three institutional capacity variables, shows a similar pattern as in the regression for cereals or cereal preparations. Like the result in Column 3 of Table 4.1, the information variable is of expected sign and statistically significant at the one percent level (Column 3 of Table 4.2). The signs of the enforcement capacity variable and the international capacity variable are negative and positive respectively, which are the same signs of these variables in the regression for cereals or cereal preparations. But, the enforcement capacity variable is not statistically significant unlike

the one in the cereals or cereal preparations case. In the regression with all four institutional capacity variables, the information capacity variable becomes statistically insignificant while the conformity capacity, which is added in Column 5, is of expected sign and statistically significant at the one percent level. The developing export countries case also has the same result although the conformity capacity variable is only statistically significant at the five percent level (Column 4 and 6).

It is worthy to note that the conformity capacity variable is the only institutional variable that is statistically significant both in the cereals or cereal preparation case and the nuts or nut products case when all four institutional capacity variables are taken into consideration. One can conclude that the conformity capacity that is strongly related to supply-side capacity matters the most for overcoming the negative effects of STRs on the exports in general. Furthermore, one can also conclude that the conformity capacity of developing export countries matters more in the cereal or cereal preparation case then in the nuts or nut products case. The coefficient of the conformity capacity variable ($\ln CON$) in Column 6 of Table 4.1 is 0.35 and that in Column 6 of Table 4.2 is 0.23. In the case of cereals or cereal preparations, the conformity capacity elasticity is greater in the case of developing export countries (0.35) than in the case of all export countries (0.18) while the conformity capacity elasticity is similar in both cases for the nuts and nut products regression.

Now, I break nuts or nut products into two sub-categories: preserved or prepared nuts (SITC 05892) and fresh or dried nuts (SITC 0577). This breakdown is done to further investigate the relative effect of the allowable maximum level of Aflatoxin B1 on

each product category that could have a different way of storing or harvesting method. The results are summarized in Tables 4.3 and 4.4. All the GDP and population variables of importer and the bilateral distance variable are of expected signs and statistically significant at the one percent level in Table 4.3 and Table 4.4 except only the population variable in Column 6 of Table 4.3 where it is of expected sign but not statistically significant.

Table 4.3. Gravity Model Results for Preserved or Prepared Nuts

	1	2	3	4	5	6
Exporters	All	Developing	All	Developing	All	Developing
Constant	-17.06**	-15.20**	-15.83**	-7.00	-3.96	8.99
	(-8.87)	(-4.97)	(-5.29)	(-1.30)	(-0.92)	(1.20)
lnGDP	1.21**	0.79**	1.29**	0.96**	1.32**	1.02**
importer	(10.28)	(4.05)	(10.30)	(4.21)	(8.56)	(3.42)
lnGDP	0.52**	0.58**	0.47**	-0.08	-0.43	-1.54
exporter	(6.80)	(3.30)	(2.52)	(-0.24)	(-1.49)	(-2.78)
lnPOP	-0.86**	-0.43*	-0.96**	-0.66**	-0.93**	-0.60
importer	(-6.51)	(-1.95)	(-6.87)	(-2.49)	(-5.37)	(-1.70)
lnPOP	0.03	-0.14	0.09	0.54	0.94**	1.94**
exporter	(0.42)	(0.81)	(0.45)	(1.60)	(3.29)	(3.56)
lnDIST	-0.71**	-0.35**	-0.75**	-0.49**	-1.05**	-0.72**
	(-10.36)	(-2.92)	(-10.34)	(-3.61)	(-11.41)	(-3.86)
lnST	0.68**	1.18**	0.64**	1.27**	0.54**	1.29**
	(3.99)	(4.59)	(3.55)	(4.29)	(2.46)	(3.38)
lnINF			0.45	2.75**	1.79	4.83**
			(0.61)	(2.63)	(1.62)	(2.73)
lnCON					0.45**	0.59**
					(4.70)	(4.01)
lnENF			-0.29	-0.12	-0.36	-0.31
			(-1.64)	(-0.58)	(-1.29)	(-0.95)
lnINT			0.82*	0.31	-0.09	-0.06
			(2.13)	(0.54)	(-0.18)	(-0.07)
Observations	989	486	877	388	600	250
Adjusted R-squared	0.25	0.19	0.26	0.19	0.30	0.26

Note: t-scores are in parentheses. "*" denotes significance at the5 percent level and "**" at the 1 percent level.

Table 4.4. Gravity Model Results for Fresh or Dried Nuts

	1	2	3	4	5	6
Exporters	All	Developing	All	Developing	All	Developing
Constant	-18.23**	-13.49**	-18.53**	-7.70**	-16.21**	-12.60**
	(-11.22)	(-6.72)	(-7.80)	(-2.49)	(-4.83)	(-2.68)
lnGDP	1.21**	1.05**	1.32**	1.21**	1.46**	1.38**
importer	(12.89)	(8.80)	(13.47)	(9.74)	(12.23)	(8.83)
lnGDP	0.10	-0.14	-0.03	-0.70**	-0.16	-0.54
exporter	(1.60)	(-1.32)	(-0.23)	(-3.77)	(-0.76)	(-1.69)
lnPOP	-0.66**	-0.48**	-0.75**	-0.61**	-0.87**	-0.74**
importer	(-6.62)	(-3.80)	(-7.17)	(-4.58)	(-6.91)	(-4.37)
lnPOP	0.60**	0.71**	0.78**	1.29**	0.78**	1.09**
exporter	(8.51)	(6.02)	(5.31)	(6.97)	(3.64)	(3.39)
lnDIST	-0.56**	-0.51**	-0.57**	-0.62**	-0.81**	-0.71**
	(-9.07)	(-5.92)	(-8.81)	(-6.78)	(-9.95)	(-5.80)
lnST	0.32*	0.56**	0.27	0.55**	0.26	0.39
	(2.18)	(3.05)	(1.72)	(2.83)	(1.38)	(1.61)
lnINF			0.94	2.69**	-1.12	-0.42
			(1.73)	(4.47)	(-1.34)	(-0.39)
lnCON					0.18*	0.16
					(2.31)	(1.50)
lnENF			-0.12	-0.05	-0.01	-0.004
			(-1.54)	(-0.62)	(-0.11)	(-0.04)
lnINT			-0.12	0.25	-0.88*	-0.50
			(-0.42)	(0.77)	(-2.34)	(-0.98)
Observations	1381	876	1200	712	742	403
Adjusted R-squared	0.28	0.26	0.31	0.31	0.35	0.36

Note: t-scores are in parentheses. "*" denotes significance at the 5 percent level and "**" at the 10 percent level.

The results of the GDP and population variables of exporter vary depending on the product types and the number of observations due to the changes of variables (trade flow and institutional capacity). Especially, the GDP variable of exporter does not provide the same result in both product categories. However, when controlled for the four institutional capacity variables, the population variable of exporter is of expected sign

and statistically significant at the one percent level for both product categories while the GDP variable of exporter is not (Column 5 and 6 of Table 4.3 and 4.4).

The bilateral distance variable is of expected sign and statistically significant at the one percent level in both product categories (ln*DIST* in Table 4.3 and Table 4.4). The STRs variable in the preserved or prepared nuts case is of expected sign and statistically significant at the one percent level. On the other hand, the STRs variable in the fresh or dried nuts case shows a statistically insignificant outcome in many cases. The STRs variable in this product type is of expected sign but not statistically significant for the regression with all export countries after controlled for the institutional capacity variables. It is only significant at the five percent level when no institutional capacity variables are considered. Although the regression for developing export countries shows a statistically significant outcome in Column 2 and 4, the STRs variable for the developing export countries case is not statistically significant at all after controlling for the four institutional capacity variables.

In the case of preserved or prepared nuts, the conformity capacity variable is of expected sign and statistically significant at the one percent level like the results in other cases. The information capacity variable is of expected sign but only statistically significant at the one percent level for the developing export countries cases in Column 4 and 6. The enforcement capacity variable has the negative sign as in other cases but statistically insignificant. The international capacity variable does not show a strong result. The result of the four institutional capacity variables in the fresh or dried nuts case is not strong. When the conformity capacity is not taken into consideration, only the

information variable in the developing export countries case is statistically significant. When the all four institutional capacity variables are concerned, the conformity capacity and the international standard setting capacity for all export countries are statistically significant only at the five percent level. Therefore, one can conclude that institutional capacity matters more for the export increase of preserved or prepared nuts than for fresh or dried nuts. This is natural since the maximum level of aflatoxin B1 allowed on nut products does not have any effect on the exports of fresh or dried nuts.

4.3 Outcome and Discussion: Comparison among Four Specifications

In this section, I compare the regression results of four different specifications developed in Chapter 2 and the Section 1 of this chapter in order to see which specification is more valid to investigate the bilateral trade flow. First, I compare the traditional gravity model variables across all four specifications. Second, I focus on the changes on the outcome of non-traditional gravity model variables ($\ln ST$ and four institutional capacity variables: $\ln INF$, $\ln CON$, $\ln ENF$, and $\ln INT$) as the traditional variable for the size of economy varies. In this section, I only consider the complete specifications with all four Institutional Capacity variables.

The discussion begins with the outcome of cereals trade for all countries as exporters (Table 4.5 and Table 4.6). The first column of each table takes the GDP and population variables as economy side factors. The second column takes only the GDP per capita variable as economy factors. The third column takes only the GDP variables as the size of economy. The fourth column is to replace the population variable of the first column with the GDP per capita variable.

Table 4.5. Gravity Model Results Cereals and Cereal Products for All Countries as Exporters

	1	2	3	4
Model	GDP & POP	GDPPC	GDP	GDP & GDPPC
Constant	-4.00	24.99**	-11.61**	-4.00
	(-1.31)	(7.93)	(-6.59)	(-1.31)
lnGDPPC importers		0.50**		0.19*
		(5.32)		(2.13)
lnGDPPC exporters		-0.49*		-0.74**
		(-2.08)		(-3.62)
lnGDP importers	0.72**		0.56**	0.53**
	(8.65)		(14.85)	(13.38)
lnGDP exporters	0.16		0.88**	0.89**
	(0.76)		(17.08)	(17.44)
lnPOP importers	-0.19*			
	(-2.13)			
lnPOP exporters	0.74**			
	(3.62)			
lnDIST	-1.50**	-1.11**	-1.44**	-1.50**
	(-20.28)	(-13.42)	(-19.92)	(-20.28)
lnST	0.48**	0.62**	0.34**	0.48**
	(4.61)	(5.19)	(3.85)	(4.61)
lnINF	4.62**	3.60**	2.20**	4.62**
	(6.09)	(4.14)	(6.28)	(6.09)
lnCON	0.18**	0.33**	0.15*	0.18**
	(2.67)	(4.31)	(2.26)	(2.67)
lnENF	-0.19	0.13	-0.25*	-0.19
	(-1.55)	(0.92)	(-2.06)	(-1.55)
lnINT	0.28	1.83**	0.40	0.28
	(0.83)	(4.87)	(1.16)	(0.83)
Observations	1332	1332	1332	1332
Adjusted R-squared	0.39	0.19	0.39	0.39

Note: t-scores are in parentheses. "*" denotes significance at the5 percent level and "**" at the 1 percent level.

Table 4.6. Gravity Model Results for Cereals and Cereal Preparations: Developing Countries as Exporters

	1	2	3	4
Model	GDP & POP	GDPPC	GDP	GDP & GDPPC
Constant	7.00	30.99**	-4.47	7.00
	(1.33)	(6.03)	(-1.7)	(1.33)
lnGDPPC importers		0.38**		0.04
		(2.70)		(0.27)
lnGDPPC exporters		-1.10**		-0.95**
		(-2.69)		(-2.54)
lnGDP importers	0.47**		0.44**	0.43**
	(3.62)		(7.42)	(6.81)
lnGDP exporters	-0.25		0.71**	0.70**
	(-0.65)		(8.55)	(8.49)
lnPOP importers	-0.04			
	(-0.27)			
lnPOP exporters	0.95**			
	(2.54)			
lnDIST	-1.52**	-1.14**	-1.42**	-1.52**
	(-11.81)	(-8.50)	(-11.60)	(-11.80)
lnST	0.46**	0.59**	0.44**	0.46**
	(2.85)	(3.40)	(3.21)	(2.85)
lnINF	4.27**	2.56*	1.82**	4.27**
	(3.54)	(1.99)	(2.51)	(3.54)
lnCON	0.35**	0.58**	0.32**	0.35**
	(3.47)	(5.52)	(3.18)	(3.47)
lnENF	-0.11	0.10	-0.16	-0.11
	(-0.81)	(0.72)	(-1.23)	(-0.81)
lnINT	0.12	1.08*	-0.29	0.12
	(0.23)	(2.01)	(-0.60)	(0.23)
Observations	572	572	572	572
Adjusted R-squared	0.27	0.14	0.27	0.27

Note: t-scores are in parentheses. "*" denotes significance at the5 percent level and "**" at the 1 percent level.

Compare the GDP variables in Column 1, 3, and 4 as well as GDP per capita in Column 2 of Table 4.5, which takes all countries as exporters. These variables are considered as the size of economy or the status of development. As discussed above,

these variables are generally expected to be positive. The GDP variables and the GDP per capita of importer is of expected sign and statistically significant at the one percent level. On the other hand, the signs and the statistical significance of these economy variables of exporter vary depending on the model specifications. The GDP per capita variable of exporter in Column 2 takes the negative sign and is statistically significant at the five percent level. This variable becomes statistically significant at the one percent level for the developing export countries case (Column 2 of Table 4.6).

As one can notices, the GDP per capita variables of Column 2 move along with the POP variable of Column 1 and the GDP per capita variable of Column 4, which are of expected signs and statistically significant. The GDP per capita variables in Column 2 (Equation 4.2 in Section 1) behave as the population variables in Column 1 (Equation 4.1 of Section 1) or the GDP per capita variables in Column 4 (Equation 4.4 of Section 1) do. The population and GDP per capita variables of exporter in Column 1 and 4 are considered as a proxy for the labor-capital ratio of industry.[53] Therefore, the GDP per capita of export in Column 2 (Equation 4.2) can be considered as a proxy for a capital-labor ratio rather than a development status or a purchasing power. This conforms to the factor endowment interpretation of a gravity model by Bergstrand (1989).

The GDP variables of exporter demonstrate a more confusing pattern. The GDP variable of exporter is often regarded as the size of economy, and the coefficient sign is expected to be positive.[54] While the GDP variables of exporter in Column 3 and 4 are of the expected signs and statistically significant at the one percent level, the GDP variable

[53] See Chapter 2.4 for more information.
[54] See the explanation for Equation 3 in Chapter 2 for more information.

of exporter in Column 1 is not statistically significant although it is of expected sign (positive). Furthermore, this GDP variable of exporter gets the negative sign in the outcome of the regression for developing export countries although it is statistically insignificant (Column 1 of Table 4.6). There are some issues to be dealt for the GDP variable of exporter. I revisit this later.

When other variables are considered, Equation 4.1 (Column 1) and 4.4 (Column 4) are not different from each other in their coefficient estimations since these two specification is equivalent to each other with the same number of variables (Equation 4.4 replacing the population variable of Equation 4.1 with the GDP per capita variable). Therefore, I only consider the first three specifications. The bilateral distance variable, one of traditional gravity model variables, is of the expected sign and statistically significant at the one percent level for all four specifications and for both regressions with all export countries and developing export countries The coefficient signs for the STRs variable, ln*ST*, also do not change across the four specifications in their signs and statistical significance (significant at the one percent level) although there are some slight difference on the elasticity of trade flow (Table 4.5 and 4.6).

Let's turn to the four Institutional Capacity variables. The Information Capacity and Conformity Capacity variables are of expected sign and statistically significant.[55] The Enforcement Capacity variable and International Standard Setting Capacity variable are somewhat unpredictable. The coefficient signs and statistical significance vary depending

[55] some are at the five percent level

on the type of specification. For instance, the coefficient of the Enforcement Capacity is statistically significant only for the specification with the GDP variable only.

By looking at the different results of the four Institutional Capacity variables across the three specifications, one can speculate that there could be omitted explanatory variables. Especially, the specification only with the GDP per capita seems to suffer this omitted variable problem. The scores of adjusted R-squared shows that the specification with the GDP per capita variable only has the lowest explanatory power for both the all export countries case and the developing export countries case (Column 2 of Table 4.5 and Table 4.6) although this specification is equivalent to the specification of Column 1 and 4.

The differences on non-traditional variables among three specifications, especially on Institutional Capacity, get larger in the case of nuts and nut products (Table 4.7 and 4.8). The coefficient sign of the Information variable (ln*INF*) and the International Standard Setting Capacity variable (ln*INT*) for the specification only with the GDP variable (Column 3) is negative and statistically significant at the one percent level and the five percent level respectively for both regressions: one with all export countries (Table 4.7) and the other with developing export countries (Table 4.8). These two Institutional Capacity variables of other two specifications in Column 1 and Column 2 take the various signs and statistically insignificant. The only Institutional Capacity variable showing a robust outcome is the Conformity Capacity variable (ln*CON*). The coefficient of the Conformity Capacity variable is positive and statistically significant

throughout all three specifications and does not change even when only developing countries are taken as exporters.

Table 4.7. Gravity Model Results for Nuts and Nut Products: All Countries as Exporters

	1	2	3	4
Model	GDP & POP	GDPPC	GDP	GDP & GDPPC
Constant	-10.39**	10.43**	-15.70**	-10.39**
	(-3.17)	(3.30)	(-6.88)	(-3.17)
ln*GDPPC* importers		1.29**		0.94**
		(10.39)		(7.69)
ln*GDPPC* exporters		-0.65**		-1.02**
		(-2.87)		(-4.89)
ln*GDP* importers	1.45**		0.64**	0.51**
	(12.72)		(12.78)	(9.79)
ln*GDP* exporters	-0.39		0.58**	0.63**
	(-1.88)		(9.50)	(10.65)
ln*POP* importers	-0.94**			
	(-7.69)			
ln*POP* exporters	1.02**			
	(4.89)			
ln*DIST*	-0.97**	-0.77**	-0.85**	-0.97**
	(-12.47)	(-9.16)	(-10.94)	(-12.47)
ln*ST*	0.35*	0.76**	-0.12	0.35*
	(1.95)	(4.01)	(-0.67)	(1.95)
ln*INF*	0.08	-1.12	-3.22**	0.08
	(0.10)	(-1.29)	(-7.98)	(0.10)
ln*CON*	0.26**	0.39**	0.22**	0.26**
	(3.51)	(4.90)	(2.83)	(3.51)
ln*ENF*	-0.03	0.11	-0.10	-0.03
	(-0.29)	(1.09)	(-1.10)	(-0.29)
ln*INT*	-0.66	0.62	-0.73*	-0.66
	(-1.86)	(1.71)	(-1.98)	(-1.86)
Observations	897	897	897	897
Adjusted R-squared	0.33	0.19	0.27	0.33

Note: t-scores are in parentheses. "*" denotes significance at the5 percent level and "**" at the 1 percent level.

Table 4.8. Gravity Model Results for Nuts and Nut Products: Developing Countries as Exporters

	1	2	3	4
Model	GDP & POP	GDPPC	GDP	GDP & GDPPC
Constant	-1.75	18.08**	-17.49**	-1.75
	(-0.36)	(3.86)	(-5.49)	(-0.36)
lnGDPPC importers		1.11**	0.66**	0.68**
		(6.39)	(9.23)	(3.83)
lnGDPPC exporters		-1.50**	0.51**	-1.74**
		(-4.18)	(5.84)	(-5.24)
lnGDP importers	1.22**			0.55**
	(7.60)			(7.28)
lnGDP exporters	-1.17**			0.57**
	(-3.53)			(6.78)
lnPOP importers	-0.68**			
	(-3.83)			
lnPOP exporters	1.74**			
	(5.24)			
lnDIST	-0.73**	-0.49**	-0.47**	-0.73**
	(-5.76)	(-3.63)	(-3.79)	(-5.76)
lnST	0.58**	1.05**	0.32	0.58*
	(2.29)	(4.03)	(1.30)	(2.29)
lnINF	2.02	0.47	-2.41**	2.02
	(1.90)	(0.42)	(-3.59)	(1.90)
lnCON	0.23*	0.44**	0.26*	0.23*
	(2.21)	(4.14)	(2.37)	(2.21)
lnENF	-0.04	0.08	-0.12	-0.04
	(-0.38)	(0.81)	(-1.21)	(-0.38)
lnINT	-0.02	0.81	-1.05*	-0.02
	(-0.03)	(1.51)	(-2.18)	(-0.03)
Observations	459	459	459	459
Adjusted R-squared	0.30	0.17	0.24	0.30

Note: t-scores are in parentheses. "*" denotes significance at the5 percent level and "**" at the 1 percent level.

There must be differences among three specifications. In general, Equation 4.1 (Column 1) and Equation 4.3 (Column 3) show relatively similar trend, compared to the outcome of Equation 4.2 (Column 2). According to the score of adjusted R^2, the

specification with the GDP variable and the population variable (Equation 4.1) has the better explanatory power. The conclusion that we can reach for the validity of three specifications of the gravity model in this dissertation is that the specification with both ln*GDP* and ln*POP* show the most valid one in analyzing international trade.

I have set Equation 4.4 (Column 4) aside in the comparison of non-traditional gravity model variables among different specifications because Equation 4.4 has the same coefficient estimates with Equation 4.1 (Column 1). However, one can see that there are differences in the traditional gravity model variables, especially the economy variables. I revisit this in order to see which specification is more valid (or easier to interpret). The GDP per capita variables of Equation 4.4 and the population variable 4.1 are same except the direction of its coefficient signs, which is opposite to each other.

Therefore, the focus is on the GDP variables of these two specifications. As one can notice, the GDP variables of Equation 4.4 has all positive signs and are statistically significant at the one percent level in both the cereals case and the nuts case. It is the GDP variable of Equation 4.1 that does not have unambiguous results. It is only statistically significant at the one percent level in the case of nuts and nut products for developing export countries and takes the negative sign.

The answers to the question, why the signs of the GDP variable of export in Equation 4.1 are not stable and not significant, can be found in high correlation with the GDP and population of exporter in our dataset. The correlation between GDP and population of exporter is 0.87 and that between GDP and GDP per capita of exporter is 0.07 for cereals and cereal products (Table 4.9). On the other hand, the correlation

between GDP and population of importer is as high as that between GDP and population of export. Why does then only the GDP variable of exporter have a weak result? That has to do with the relatively high correlation between the GDP variable of exporter and the four Institutional Capacity variables. The correlation of the four Institutional Capacity variables with GDP is over 0.30 except the Information Capacity variable (Table 4.9).

Table 4.9 Correlation among Variables for Cereals and Cereal Preparations

	lnGDP importer	lnGDP exporter	lnPOP importer	lnPOP exporter	lnGDPPC importer	lnGDPPC exporter
lnGDP importer	1.00					
lnGDP exporter	-0.11	1.00				
lnPOP importer	0.86	-0.06	1.00			
lnPOP exporter	-0.08	0.87	-0.03	1.00		
lnGDPPC importer	0.28	-0.09	-0.25	-0.09	1.00	
lnGDPPC exporter	-0.04	0.07	-0.05	-0.42	0.02	1.00
lnDIST	0.11	0.29	0.20	0.34	-0.18	-0.15
lnST	0.02	0.10	0.30	0.08	-0.53	0.01
lnINF	-0.02	0.05	-0.03	-0.40	0.01	0.91
lnCON	-0.07	0.33	-0.05	0.10	-0.04	0.41
lnENF	-0.04	0.32	-0.03	0.19	-0.01	0.21
lnINT	-0.06	0.42	-0.03	0.39	-0.06	0.00

# of observation: 1332

The correlation between the four Institutional Capacity variables and GDP is even higher in the case of nuts or nut products (Table 4.10), which has a statistically significant negative sign of the GDP of exporter. Therefore, the outcome of the GDP of

exporter seems to be strongly influenced by population and the four Institutional Capacity variables. The interpretation can be that, controlling for population and Institutional Capacity, the level of GDP determine the amount of excess nuts or nut products. The higher the income is, the less the tradable nuts or nut products are.

Table 4.10 Correlation among Variables for Nuts and Nut Products

	lnGDP importer	lnGDP exporter	lnPOP importer	lnPOP exporter	lnGDPPC importer	lnGDPPC exporter
lnGDP importer	1.00					
lnGDP exporter	-0.17	1.00				
lnPOP importer	0.91	-0.15	1.00			
lnPOP exporter	-0.13	0.83	-0.10	1.00		
lnGDPPC importer	0.31	-0.07	-0.12	-0.08	1.00	
lnGDPPC exporter	-0.06	0.28	-0.07	-0.30	0.02	1.00
lnDIST	0.17	0.13	0.18	0.29	-0.02	-0.29
lnST	0.20	0.05	0.32	0.05	-0.25	0.01
lnINF	-0.05	0.17	-0.05	-0.35	0.01	0.91
lnCON	-0.08	0.49	-0.07	0.17	-0.02	0.55
lnENF	-0.03	0.36	-0.02	0.20	-0.02	0.27
lnINT	-0.07	0.57	-0.07	0.45	-0.01	0.20

# of observations: 897

However, the GDP variable of exporter is statistically significant only for the nuts or nut products case with developing export countries. This interpretation cannot be generalized. Rather, its is more likely that the GDP variable of exporter does not matter for the trade flow of these two product categories when controlled for Institutional Capacity and population along in addition to other traditional gravity model variables.

Although the result of Equation 4.4 (Column 4) is more straightforward, the coefficient estimate of the GDP of exporter in Equation 4.1 and 4.4 differs from each other, and the interpretation of the GDP of exporter could be different in each case, it is not sure which specification is more valid.

4.4 Summary of the Findings

I summarize the findings of the two sections above here. First, the summary of the findings on the four Institutional Capacity variables and the STRs variable is that Information Capacity and Conformity Capacity have a positive impact on the exports of cereals or cereal products as well as nuts or nuts products. However, the result is sensitive to the types of products as seen in the results of fresh or dried nuts. Enforcement Capacity and International Standard Setting Capacity does not have any significant outcome for the regression with all four Institutional Capacity variables. Interestingly, the Enforcement Capacity variable takes a negative sign for all results, which means that Enforcement Capacity influences trade flow negatively. In one case that is the regression for cereals or cereal preparations without the Conformity Capacity variable, the Enforcement Capacity variable is statistically significant at the one percent level.

Based on these results, one can conclude that Information and Conformity Capacity, which is related to reduce supply-side constraints, help local farmers or food producers to overcome the negative effects of STRs on their exports. According to the results of Enforcement Capacity, it also can be implied that the existence of regulatory agencies itself in exporting country does not necessarily mean that farmers and producers get help to be competitive in the world market although the results is less robust than that

of Conformity Capacity. However, STRs still remain to have as significant negative effects on trade, especially on the exports of developing export countries.

As to the conclusion of discussion on what specification is more valid, one can find that the specification both with GDP and population (or GDP per capita) turns out to be the most valid. This conclusion is based on two facts: 1) the four different specifications do produce different results on the coefficients of the four institutional capacity variables although the outcomes on other non-traditional gravity model variables (STRs) remain relatively unchanged and 2) the higher score of adjusted R-square is the highest on the specification with both GDP and population.

Chapter 5 Legal Disputes

The focus of this chapter is to review the dispute cases related to food and agricultural standards and technical regulations and discus those cases in terms of the institutional capacity of developing countries. In the quantitative analysis chapter, institutional capacity was defined as the quality of governance or the ability of governments or private entities to deliver essential services to the public. In this chapter, the concept of institutional capacity is more narrowed down. By institutional capacity, we mean the ability of governments to prepare legal arguments at the WTO Dispute Settlement Body and the Appellate Body. This institutional capacity includes the ability to defend its position legally, the ability to back its position with scientific evidence, and the ability to benefit from the decision made by the panel or the Appellate Body. This chapter first introduces the dispute settlement process. Second, the use of dispute settlement mechanism is reviewed. Finally, the chapter focuses on the dispute cases involving developing countries either as a complainant or a respondent.

5.1 Dispute Settlement Process

For general discipline for the dispute settlement procedure, Article 11 of the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) and Article 14 of the Agreement on Technical Barriers to Trade (TBT Agreement) make reference to Article XXII ad XXIII of General Agreement on Tariffs and Trade (GATT) 1994, which is "elaborated and modified" by the Understanding Rules and Procedures Governing the Settlement of Disputes (Dispute Settlement Understanding or DSU). According to Article XXIII of GATT 1994, there are three forms in which a dispute can be initiated: "a violation complaint", "a non-violation complaint," and "a situation complaint" (Hoekman & Kostecki, 2001, p75).

In any of these three forms, a WTO Member country first can request consultation with the WTO Member country whose trade restriction or measures nullify or impair the benefits of the WTO Agreements covered in the DSU (Article XXII of GATT 1994). Thirty days are given before a consultation begins between parties involved (DSU Article 3). If "a mutually agreed solution" cannot be reached within 60 days from the date of consultation request, a complaining Member country can request the establishment of a panel (DSU Article 7). Alternatively, if perishable goods are in concern, 10 days are given for initiating a consultation and 20 days for reaching a mutually agreed solution (DSU Article 8).

In general, a panel consists of three panelists who are experts in the field of a dispute by experience or training (DSU Article 8.1 and 8.2). Panelists should serve in their individual capacity and should not be selected from the both parties of a dispute or a

country that request the third party status in the dispute (DSU Article 8.3 and 8.9). A panel is expected to issue a panel report of its findings and decisions within six months starting from the date of the composition of a panel (three months in cases of urgency) (DSU Articles 12.8). However, a panel can take three more months to complete its report, not exceeding nine months in total (DSU Articles 12.9). A panel report should be adopted within 60 days of its circulation unless there is objection to the adoption by the consensus of the WTO Member countries (DSU Article 16.4).

When either of the parties to a dispute does not agree with the panel decision, it can appeal to the Appellate Body. The Appellate Body is expected to issue the report of its decision within 60 days in general and 90 days in case that further consideration is needed (DSU Article 17.5). The adoption of the Appellate Body report should be done within 30 days of the circulation of the report. The Appellate Body is a standing body, established by the Dispute Settlement Body (DSB), and consists of seven experts in law, trade, and the related fields of the WTO Agreements and appointed for four-year terms, renewable once. Three persons of the Appellate Body serve in each case.

After the adoption of a panel report or a report by the Appellate Body, the schedule to implement decisions by the panel or the Appellate Body should be made within eighteenth month beginning from the date for establishment of a panel by the DSB at the latest. It is recommended that the implementation of the panel or the Appellate Body decisions should occur within 15 months of the adoption of a panel or Appellate Body report. A complaining party can ask for compensation or retaliate up to the level set

by the DSB if a responding party does not comply with the decisions by the panel or the Appellate Body within the reasonable time period.

In addition to the general procedure delineated in the DSU, the SPS and TBT Agreements include provision on an expert group. In both Agreements, advice from experts is required by establishing either an advisory technical expert group (SPS Agreement) or a technical export group (TBT Agreement) in considering dispute cases. While the SPS Agreement does not specify the details of an advisory technical expert group, the TBT Agreement provides the specifics of a technical expert group in Annex 2. It is worth mentioning that, like a DSB panelist, technical experts from parties to a dispute cannot serve in a technical expert group and should serve in their individual capacities (Annex 2.3 of the TBT Agreement).

5.2 Use of Dispute Settlement Mechanism

Among dispute cases related to STRs, cases on food and agriculture trade are the most frequently brought to the Dispute Settlement Body (DSB) (Maskus & Wilson, 2001b). Table 1 is a brief summary of dispute cases related to food and agriculture products between 1995 and 2005. The number of dispute settlement cases invoked during the 1995 and 2005 period was 40. Panels were established for 17 cases. Among these cases, panel reports on 7 cases were adopted, 6 cases reached mutually agreed solutions, and 3 cases are still open as of 2005.

The United States and Canada used the DSB the most frequently under the SPS and TBT Agreements. These two countries have brought a total 18 cases to the DSB. Developed countries have invoked 26 cases altogether. Majority of the cases invoked by

developed counties were against developed countries.[56] However, developing countries have not disregarded the dispute settlement system.

Table 5.1 A Summary of the Dispute Settlements under the Measures of SPS and TBT Agreements

Country that makes complaints	95	96	97	98	99	00	01	02	03	04	05	Total	Country that responds to complaints
Total	8	5	4	4	1	3	2	6	7	0	0	40	N/A
United States	3	2	1		1	2		1	1			10	Korea (3), Australia (1), EC (2), Belgium (1), Japan (2), Mexico (1)
Canada	3	1		2					1			8	Australia (1), Korea (1), EC (5), US (1)
EC			2					1	1			4	US (1), India (1)
Australia									1			1	EC
New Zealand			1									1	EC
Switzerland				1								1	Slovak Republic (1)
Philippines		1						2				3	Australia (2), US (1)
Argentina								1	1			2	EC (2)
Hungary								1	1			2	Croatia, Turkey
Peru	1						1					2	EC (2)
Chile	1											1	EC
Ecuador							1					1	Turkey
India		1*		1								2	EC
Nicaragua									1			1	Mexico
Thailand						1						1	Egypt

Source: WTO dispute settlement documents
* India, Malaysia, Pakistan, and Thailand jointly requested for consultation.

[56] The definition of developed and developing countries in the WTO system is used.

Fourteen cases were initiated by developing countries. Ten cases were against developed countries: 6 cases against the EU, 2 cases against Australia, and 1 case against the United States. Interestingly, 5 cases were against developing countries: Hungary vs. Croatia, Hungary vs. Turkey, Ecuador vs. Turkey, Nicaragua vs. Mexico, and Thailand vs. Egypt. Especially, from 2000 to 2005, ten cases out of 18 dispute cases were brought by developing countries. In addition, when developed countries are filing complaints, developing countries also filed to join consultations as a third party. Developing countries are now becoming more active participants in the dispute settlement process (See Table 5.2).

Table 5.2. Dispute Cases by Country Group

Country that makes complaints vs. Country that respond	95	96	97	98	99	00	01	02	03	04	05	Total
Total	8	5	4	4	1	3	2	6	7	0	0	40
Developed vs. Developed	3	2	3	2	1	1		1	4			17
Developed vs. Developing	3	1	1	1		1		1	1			9
Developing vs. Developed	2	2		1			1	3				9
Developing vs. Developing						1	1	1	2			5

Source: WTO dispute settlement documents.
Note: Among countries covered in this section, developed countries include EC, the United States, Japan, Australia, New Zealand, Switzerland, Canada, and Belgium. Others are considered as developing countries.

The increased presence of developing countries in the WTO dispute settlement process may have significant implications for developing countries, especially the low-income developing countries. Recent increase of disputes involving developing countries

could mean the more frequent use of food and agriculture STRs by developing countries. While agricultural products still remain as primary export items for these countries, the exporters of developing countries now have to overcome the negative impact of food and agriculture STRs imposed not only by developed countries but also by developing countries. However, the rulings of the Dispute Settlement Panel (DSP) and the Appellate Body at the WTO show some positive signs for discouraging the use of standards as a trade barrier (Kennedy, 2000; Kloiber, 2001; Maskus & Wilson, 2001b; Victor, 2000).

Consequently, in 2004 and 2005, no new dispute case has been initiated. Nevertheless, there is much works left to fully integrate developing countries, especially low-income ones, into the world economy. Some suggest that technical and financial assistance needs to be provided to developing countries should these countries go to the WTO DSP and Appellate Body to resolve disputes (Kennedy, 2000). It is also argued that developed countries also need to do more to deliver on their promise of technical and financial assistance to help developing countries comply with STRs (Kloiber, 2001; Micklitz, 2000).

5.3 Analysis of Dispute Cases involving Developing Countries

There are 23 cases that involve developing countries. Those 23 cases are summarized in Table 5.3. Among them, panel and Appellate Body reports were adopted in only two dispute cases. The two dispute cases involved exports of, respectively, certain shrimp and shrimp products from the four Asian countries, India, Malaysia, Pakistan, and Thailand, to the United States, and sardines from Peru to the EC. These two cases have been analyzed elsewhere, so I will not discuss these two cases in detail. Instead, I will

focus on the impact of the dispute settlement panel and Appellate Body's decisions on the exports of developing countries.

The US-Shrimp Case.

The first food and agriculture STR-related dispute case involving developing countries is the US-Certain Shrimp and Shrimp Products case (Shrimp case). This case was hotly debated among the environmentalists and trade policy analysts, and reviewed elsewhere intensively in terms of environment concerns. I do not intend to discuss this case with environment concerns. Instead, I briefly summarize the case and discuss the case in terms of the STR-related institutional capacity of developing countries.

In October 1996, India, Malaysia, Pakistan, and Thailand jointly requested consultation with the United States on its import restriction on certain shrimp and shrimp products. During the consultation, the four complaining countries and the US did not reach a mutually agreed solution. In pursuit of Article XX of GATT,[57] Malaysia and Thailand requested the establishment of the DSB panel in January 1997. Later in the same month, Pakistan requested the establishment of the panel. In February 1997, India also requested the establishment of the panel. In February 1997, the DSB panel was established jointly for these four countries. This dispute panel drew much attention and 16 countries joined the dispute panel as third parties.

The major dispute is whether the quantitative restriction measure of Section 609 of Pubic Law 101-162 of the United States (Section 609) are legitimized under Article

[57] See Chapter 2.1 for the details of legal reference.

XX(b) or XX(g) of the GATT.[58] Section 609 prohibits the importation of shrimps and shrimp products if shrimps were caught by vessels without turtle excluder devices (TEDs). There was no disagreement whether Section 609 was in violation of "general elimination of quantitative restrictions," Article XI of the GATT. Rather, the parties to the dispute argued whether Article XX(b) and XX(g) can be used as an excuse for the quantitative restriction that was imposed to protect sea turtles. In May 1998, the dispute panel found that the measure of the United States does not fall under the exemptions under either Article XX(b) or XX(g) due to its discriminatory nature of the US measure (Bisong, 2000). The United States gave a longer period of adjustment time for the Caribbean countries, which the measure was imposed earlier, than the four complaining WTO Member countries.

The United States appealed to the Appellate Body in July 1998. The decision by the Appellate Body came out in October 1998. Again, the Appellate Body found the US measure not justified due to its "unjustifiable and arbitrary discrimination" by the US officials (Bisong, 2000). However, unlike the panel's decision, the Appellate Body found the measure by the United States can be justified under Article XX(g) of the GATT.[59] Therefore, the importing countries can utilize Article XX if they apply the import restriction measure in a non-discriminatory manner (Pyatt, 1999).

This case is important in terms of the capacity of developing countries to deal with STR-related legal disputes in the following matters: 1) the applicability of domestic

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[58] See WTO Dispute Settlement Body, *Import Prohibition of Certain Shrimp and Shrimp Products*, WT/DS58/R, 15 May 1998

[59] See WTO Appellate Body, *Import Prohibition of Certain Shrimp and Shrimp Products*, WT/DS58/AB/R, 15 October 1998

law outside its country, 2) the environmental concern, and 3) the implementation of the panel and the Appellate Body's decisions.

The first issue is whether the quantitative restriction measure of Section 609 of Pubic Law 101-162 of the United States (Section 609) can be applied globally beyond the border of the imposing country. As one can see in the Appellate Body's decision, Section 609 can be legitimized under Article XX(b) or XX(g) of the GATT as long as the measure is applied without "unjustifiable and arbitrary discrimination. This fact might mean that developing exporting countries could be affected negatively by the domestic environmental regulations set by the importing countries (Stewart, 1998). In this case, the four Asian complaining countries might have lost their price competitiveness due to the cost accrued by installing the TEDs or adopting other relevant measures.

The second issue, the environmental concern, can also be called the competitiveness concern. This issue could be analyzed in terms of the trade liberalization vs. sustainable development debate. Environmental NGOs and some developed countries focus more on the sustainable development while developing countries focus on the liberalization of trade of fishery, which they have comparative advantage. It, however, does not mean that developing countries do not care about the sustainable development or developed countries the liberalization of fishery trade. Nonetheless, as seen in the first issue, the movement of sustainable development could drive developing countries beyond their capacity by forcing them to cope with regulations for environmentally sustainable economic activities.

Lastly, the implementation of the panel's recommendation is worth deserving some attention in terms of the capacity of developing countries. In October 2000, Malaysia requested to bring the matter to the DSB regarding the non-compliance by the US to the Appellate Body and panel's recommendation.[60] The case was considered by the same panel that reviewed the original shrimp case. In June 2001, the panel concluded that the measure by the US, which was modified according to the decisions of the panel and the Appellate Body, were consistent with Article XX. The panel's decision was based on the fact that the US was doing its best to reach a multilateral deal to conserve sea turtles.

Malaysia, however, did not agree with the panel's finding and appealed to the Appellate Body. In October 2001, the Appellate Body also concluded in favor of the US and confirmed that the modified measure by the US was consistent with Article XX of the GATT 1995.[61] The Appellate Body argued that the United States was not supposed to be held responsible for the conclusion of a multilateral or bilateral negotiation for the protection and conservation of sea turtles as long as it showed that it had done a "serious good faith effort" during the negotiation process. However, it is not clear if this Appellate Body's decision means that multilateral negotiation efforts can be used as a justification for imposing import restriction when an active participation was present even if the negotiation includes disadvantageous contents toward one or two specific exporting countries.

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[60] See WTO Dispute Settlement Body, *United States – Import Prohibition of Certain Shrimp and Shrimp Products*, WT.DS58/RW, 15 June 2001.

[61] See WTO Appellate Body, *United States – Import Prohibition of Certain Shrimp and Shrimp Products: Recourse to Article 21.5 of the DSU by Malaysia*, WT/DS58/AB/RW

The EC-Sardines Case.

"Sardines" is an important food fish, usually preserved in a can with oil. Due to the EC regulation (EEC) 2136/89, which was adopted in June 1989, Peru exporters could not use the name "sardines" for their exporting products any more in the EU market. In June 2001, Peru requested to establish a dispute settlement panel, complaining the EC Regulation (EEC) 2136/89 is inconsistent with Article 2 and 12 of the TBT Agreement as well as Article I, III, and XI:1 of the GATT 1994. The panel was established in July 2001. After missing the first deadline due to the complex nature of the dispute, the panel issued the panel report on May 2002. The panel concluded that the EC Regulation was in violation of Article 2.4 of the TBT Agreement. On June 2002, the EC appealed to the Appellate Body. The Appellate Body once again concluded in favour of Peru although it revered some of the panel's decisions.

This case is important in two points in terms of the impact on the exports of developing countries. The first is whether "relevant international standards" were considered properly before the EC set up its technical regulation, the EC regulation (EEC) 2136/89. And the second important point is the Peru's use of the legal technical assistance program provided by the WTO.

The first is related to Article 2.4 of the TBT Agreement, which was also the major argument between Peru and the EC. As mentioned above, the panel found that the EC regulation was in violation with Article 2.4 of the TBT Agreement. Article 2.4 of the TBT Agreement reads:

> Where technical regulations are required and relevant international standards exist or their completion is imminent, Members shall use them, or the relevant parts of them, as a basis for their technical regulations except when such international standards or relevant parts would be a ineffective or inappropriate means for the fulfilment of the legitimate objectives pursued, for instance because of fundamental climatic or geographical factors or fundamental technological problems.

Article 2.4 urges the WTO Member countries to use international standards as possible as they can unless those international standards are not effective or appropriate due to particular conditions of the imposing countries. The dispute was organized around the issue that whether the Codex Stan 94 was an effective and appropriate international standard and that the EU regulation was based on this international standard.

Peru argued that the Codex Stan 94, which enables Peru's exporters to use the trade description, sardines, for their products, was an internationally recognized international standard which would be appropriate for the labelling requirement of sardines.[62] On the other hand, the EC argued that the Codex Stand 94 was not appropriate international standard since it was available at the time when the EC regulation was adopted.[63] Concluding that Article 2.4 of the TBT Agreement could apply to the technical regulations that have been adopted before the relevant international standards exist, the panel rejected the EC's argument and concluded in favour of Peru. This decision clarified that the TBT Agreement can be applied to technical regulations that had been existed before the GATT 1994 was adopted if those regulations continue to exist (retrospective application).[64] The decision by the panel was upheld by the Appellate Body too. However,

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[62] See WTO Dispute Settlement Body, *the European Communities – Trade Description of Sardines*, WT/DS231/R, 29 May 2002. para. 7.61.
[63] Ibid., para 7.62.
[64] Ibid., para

the Appellate Body reversed the panel's decision on that the EC bears the burden of proof in order to ensure that the Codex Stan 94 is ineffective and inappropriate to be used as a legal basis for the EU regulation.[65] Instead, the Appellate Body put the burden of proof on Peru to demonstrate the Codex Stan 94 is effective and appropriate measure to fulfil the same purpose as the EU Regulation intended. However, the Appellate Body acknowledged that Peru did provide enough evidence that the Codex Stand 94 is an appropriate international standard and upheld the panel's decision that the EC Regulation was in violation of Article 2.4 of the TBT Agreement.[66]

The second point is the Peru's use of legal technical assistance program set by the WTO. The Advisory Centre on WTO Law (Advisory Centre) was created in 2001 in order to help the WTO developing Member countries in preparing for disputes at the WTO dispute settlement panel and the Appellate Body (Greisberger, 2004). The EC-sardines case was the first case that proves the importance of the Advisory Centre for developing countries that were involved in the dispute that went to the Appellate Body.[67] As mentioned above, Peru was able to win the dispute with the legal assistance by the Advisory Centre.[68] Although the Advisory service is a fee-based service, it is much more affordable to developing countries that often lack financial means to hire private lawyers with which the consulting fee is much higher.[69] This dispute case raised hopes for developing countries or the least developed countries can also benefit from the WTO

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[65] See WTO Appellate Body, *the European Communities – Trade Description of Sardines*, para. 282.
[66] Ibid., para 291.
[67] See Greisberger (2004) for the history and function of the Advisory Centre on WTO Law.
[68] Ibid.,
[69] The fee is based on a scaling basis in that the legal service is provided for the poorer countries at the lower fee. For more detail, see Greisberger (2004).

dispute settlement system despite their lack of human, financial, and institutional capacity in terms of legal affairs.

Summary of Dispute Cases Analysis

The two dispute cases that were reviewed above pose two important lessens for developing countries. First, the lack of legal capacity of developing countries can be overcome by utilizing the Advisory Centre on WTO Law and filing complaints jointly with other countries. In these two dispute cases, the complainants, which are developing countries in these two cases, won the disputes by successfully defending their legal positions. Second, developing countries need to prepare to adopt sustainable economic development practice in their countries. Through the US-Shrimp case, one can notice the trend of the WTO Appellate Body to employ the concept of sustainable development in its decision (Appleton, 1999).

5.4 Summary

While the United States and Canada are the most frequent users of the dispute settlement mechanism at the WTO in pursuit of the SPS and TBT Agreements, developing countries have not disregarded the dispute settlement system. Especially, from 2000 to 2005, ten cases out of 18 dispute cases were brought by developing countries. The WTO developing Member countries have begun to benefit form utilizing the dispute settlement mechanism while they face new challenges due to the increased disputes among developing countries.

As to the dispute cases involving developing countries either as a complainant or a respondent, there are 23 cases that involve developing countries. Among them, panel

and Appellate Body reports were adopted in only two dispute cases, which involved exports of certain shrimp and shrimp products from the four Asian countries to the United States and sardines from Peru to the EC. The lessons that can be learned from these two cases are: 1) that the lack of legal capacity of developing countries can be overcome by utilizing the Advisory Centre on WTO Law and the joint filing of dispute cases with other developing countries and 2) that the sustainable development should be considered in making economic activities. Therefore, financial assistance or other assistance needs to be provided to enhance the effectiveness of the Advisory Centre.

Table 5.3 Dispute Cases with Developing Countries either as a complainant or a respondent from 1995 to 2005.

DS Case #	Filing Country /Subject Country	Date for Consul-tation Request	Legal Reference	Description of Dispute	Panel Decision	Appellate Decision	Mutually Agreed Solution
3	Korea /US	April 1995	SPS Articles 2 and 5 /TBT Articles 5 and 6	Measures concerning the testing and inspection of agriculture products	N/A	N/A	N/A
5	Korea /US	May 1995	SPS Articles 2 and 5 /TBT Article 2	Measures Concerning the Shelf-Life of Products	No panel established. A mutually agreed solution was reached in July 1995	N/A	The shelf-life of certain imported goods would be decided by the manufacturers from July 1996.
12	Peru /EC	July 1995	TBT Article 2	Trade Description of Scallops - Peru joined Canada by filing request for consultation in July 1995 on dispute with EC over description requirement of scallops in France. The French order did not permit for description for French scallops to be used for Peruvian ones.	In October 1995, a panel was established jointly with Chile, a joint complainant, following after the separate panel established in July 1995 by the request of Canada. Before the panel report adoption, parties involved reached a mutually agreed solution in July 1996	N/A	The same description for scallops as on French scallops was permitted for the scallops from Peru along with the description of origin of scallops.

DS Case #	Filing Country /Subject Country	Date for Consul-tation Request	Legal Reference	Description of Dispute	Panel Decision	Appellate Decision	Mutually Agreed Solution
14	Chile /EC	July 1995	TBT Article 2	Trade Description of Scallops - Chile joined Canada and Peru by filing request for consultation in July 1995 on dispute with EC over description requirement of scallops in France.	In October 1995, a panel was established jointly with Peru, a joint complainant, following after the separate panel established in July 1995 by the request of Canada. Before the panel report adoption, parties involved reached a mutually agreed solution in July 1996.	N/A	The same description for scallops as on French scallops was permitted for the scallops from Chile along with the description of origin of scallops.
20	Korea /Canada	Nov. 1995	SPS Articles 2 and 5 /TBT Article 2	Regulations on the shelf-life and disinfection method of bottled water	No panel established. A mutually agreed solution was reached in April 1996.	N/A	The import prohibition on ozone-treated bottled water products would be lifted by April 1997 at the latest, and transparency in setting the shelf-life regulation was assured.
41	Korea /US	May 1996	SPS Articles 2, 5 and 8/ TBT Articles 2, 5 and 6	Measures concerning inspection of agricultural products – Same as DS3	No panel/No settlement	N/A	N/A

DS Case #	Filing Country /Subject Country	Date for Consul-tation Request	Legal Reference	Description of Dispute	Panel Decision	Appellate Decision	Mutually Agreed Solution
58	India, Malaysia, Pakistan, Thailand /US	Oct. 1996	GATT Article XX	Import prohibition by the US of certain shrimp and shrimp products. The US Public Law 101-162 regulate that a net that is harmless to turtles should be used for shrimp fishing.	A panel was established in February 1997. India joined the panel as a complainant in April 1997. In May 1998, the panel found in favor of four complainants.	The US notified its appeal against the panel's certain decisions in July 1998. The Appellate Body upheld the panel decision in general, with some reversions of the panel decisions in October 1998.	In October 2000, Malaysia requested to bring the matter to the DSB regarding the US's non-compliance to the Appellate Body's recommendation. In 2001, the panel and the Appellate Body concluded that the modified measure by the US, according to the decisions of the Appellate Body, were consistent with Article XX.
61	Philippines /US	Oct. 1996	TBT Article 2.	Import Prohibition of Certain Shrimp and Shrimp Products	No panel/No settlement	N/A	N/A
96	EC /India	July 1997	SPS Article 2, 3 and 5	EC's complaint on quantitative restrictions on several products by India for balance-of-payment purposes. SPS issue was a minor one.	No panel was established. A Mutually Agreed solution was notified in April 1998.	N/A	India agreed to eliminate the quantitative restrictions in three phases, which would expire in March 2000, 2002, and 2003 respectively.

DS Case #	Filing Country /Subject Country	Date for Consul-tation Request	Legal Reference	Description of Dispute	Panel Decision	Appellate Decision	Mutually Agreed Solution
133	Switzerland /Slovak Republic	May 1998	SPS Article 5.	Measures Concerning the Importation of Dairy Products and the Transit of Cattle	No panel/No settlement	N/A	N/A
134	India /EC	May 1998	SPS Article 2/TBT Article 2	Restrictions on Certain Import Duties on Rice	No panel/No settlement	N/A	N/A
203	US /Mexico	July 2000	SPS Article 2.2, 2.3, 3, 5.1, 5.6, 7, and 8 /TBT Article 2 and 5	Measures Affecting Trade in Live Swine	No panel/No settlement	N/A	N/A
205	Thailand /Egypt	Sept. 2000	SPS Article 2, 3 and 5 and Annex B paragraph 2 and 5.	Import Prohibition on Canned Tuna with Soybean Oil No settlement	No panel/No settlement	N/A	N/A
231	Peru /EC	March 2001	TBT Articles 2 and 12	Trade Description of Sardines	A panel was established in July 2001. In May 2002, the panel found the EC's measure inconsistent with TBT Article 2.4.	In June 2002, EC filed appeal against the panel's decision. In September 2002, the Appellate Body upheld the Panel's findings	Mutually Agreed Solution

DS Case #	Filing Country /Subject Country	Date for Consul-tation Request	Legal Reference	Description of Dispute	Panel Decision	Appellate Decision	Mutually Agreed Solution
237	Ecuador /Turkey	Aug. 2001	SPS Articles 2, 3, and 8 and Annexes B and C.	Certain Import Procedures for Fresh Fruit	A panel was established in July 2002, but the composition of the panel was suspended. In November 2002, a mutually agreed solution was reached.	N/A	A mutually Agreed Solution
256	Hungary /Turkey	May 2002	SPS Articles 2.2, 2.3, 5.1, 5.2, 5.6, 6.1, 6.2 and 7 and Annex B	Import Ban on Pet Food	No panel/No settlement	N/A	N/A
263	Argentina /EC	Sept. 2002	TBT Articles 2 and 12	Measures Affecting Imports of Wine	No panel/No settlement	N/A	N/A
270	Philippines /Australia	Oct. 2002	SPS Articles 2, 3, 4, 5, 6 and 10	Certain Measures Affecting the Importation of Fresh Fruit and Vegetables	In August 2003, a panel was established.		
271	Philippines /Australia	Oct. 2002	SPS Articles 2, 3, 4, 5, 6 and 10	Certain Measures Affecting the Importation of Fresh Pineapple	No panel/No settlement	N/A	N/A

DS Case #	Filing Country /Subject Country	Date for Consul-tation Request	Legal Reference	Description of Dispute	Panel Decision	Appellate Decision	Mutually Agreed Solution
279	EC /India	Dec. 2002	SPS 2, 3, 5, 7 and 8 /TBT Article 2 /GATT Articles XX and XXI	Import Restrictions Maintained under the Export and Import Policy 2002-2007	No panel/No settlement	N/A	N/A
284	Nicaragua /Mexico	March20 03	SPS Articles 2, 5, 7 and Annex B para. 1.	Certain Measures Preventing the Importation of Black Beans	No panel/No settlement The case withdrew in March 2004.	N/A	N/A
293	EC /Argentina	May 2003	SPS Articles 2, 5, 7, 8 and 10 and Annexes B and C /TBT Articles 2, 5 and 12	Measures Affecting the Approval and Marketing of Biotech Products	In August 2003, a joint panel was established with the US and Canada as complainants. The panel report was postponed to Dec. 2005 due to the complexities of the case.	N/A	N/A

DS Case #	Filing Country /Subject Country	Date for Consul-tation Request	Legal Reference	Description of Dispute	Panel Decision	Appellate Decision	Mutually Agreed Solution
297	Hungary /Croatia	July 2003	GATT Article XX /SPS Articles 2, 3, 5, 6, 7 and Annex B	Measures Affecting Imports of Live Animals and Meat Products	No panel/No settlement	N/A	N/A

Source: The dispute settlement panel and Appellate Body reports and the website of the Dispute Settlement Gateway of the WTO at http://www.wto.org/english/tratop_e/dispu_e/dispu_e.htm.

Chapter 6 Conclusion and Policy Implications

In this dissertation, I attempted to measure the institutional capacity of exporting countries to overcome the negative impact of standards and technical regulations (STRs) on food and agriculture trade in a quantitative way. This dissertation developed the four dimensions of standard-related, institutional capacity: *Informational*, *Conformity*, *Enforcement*, and *International Standard-Setting*. These measures are incorporated into a gravity model to investigate whether these capacities offset the negative effects of Aflatoxin B1 standards on food and agricultural product trade. In addition, I reviewed the legal disputes related to food and agricultural STRs at the WTO Dispute Settlement Body. In this chapter, I conclude the dissertation with policy implication and further research direction.

6.1 Conclusion

I conclude this dissertation with three sections. First, I sum up the outcomes of major analysis, the impact of aflatoxin B1 and institutional capacity on food and agricultural trade. Second, I recap the regression analysis on which gravity model specification is more appropriate one. Lastly, I summarize the lessons learned from the legal dispute analysis.

6.1.1 Impact of Aflatoxin B1 and institutional capacity on trade of cereal or nut products

Food and agricultural STRs and the lack of institutional capacity to comply with these STRs have become a serious concern to developing countries since foods and agriculture products are the most important export items for them. There have been some efforts to measure quantitatively the impact of STRs on food and agricultural trade. However, attempts to investigate the impact of institutional capacity in a quantitative way were left out. I fill this gap by providing a preliminary start in this investigation, developing measures of informational capacity, conformity capacity, enforcement capacity, and international standard-setting capacity.

The result of this dissertation confirms the significant impact of Aflatoxin B1 on exports of developing countries even after controlling for four institutional capacity variables and updating to a more recent year than previous studies. Therefore, the research support for the argument that safety standards and regulations in importing countries need to be relaxed at least up to the level of international standards.[70] In addition to the outcome of STRs, the result of institutional capacity has also expected outcome: that is, the institutional capacity of developing countries has positive impact on their exports of agriculture products. However, the regression analysis shows that types of institutional capacity that are statistically significant vary across different categories of agriculture products. Having said the inconsistency of the institutional capacity results, I can conclude that the dissertation tentatively suggests that the dimensions of institutional

[70] This argument has been rigorously made by Otsuki, Wilson, and Sewadeh (2001a).

capacity that are most important in overcoming standards in food and agricultural products are informational and conformity capacity.

In the case of informational capacity, I must admit that information capacity is a proxy. Consequently, there is some risk that I have captured 'closeness' in a gravity sense or 'connectedness' in an informational sense rather than institutional capacity itself. Nevertheless, given the 'closeness' and 'connectedness' aspects of institutions as a means of overcoming transactions costs, this is not completely off the mark. In the case of conformity capacity, I am on firmer ground, with an explicit measure of a relevant certification status. These results hold across two food and agricultural product categories.

6.1.2 The four different gravity model specifications

I compared the regression results of four different specifications developed in Chapter 2 and the Section 1 of Chapter 4 in order to see which specification is more valid to investigate the bilateral trade flow. As a conclusion of discussion on which gravity model specification is more valid, one can find that the specification both with GDP and population (or GDP per capita) turns out to be the most valid. This conclusion is based on two facts: 1) the four different specifications do produce different results on the coefficients of the four institutional capacity variables although the outcomes on other non-traditional gravity model variables (STRs) remain relatively unchanged and 2) the higher score of adjusted R-square is the highest on the specification with both GDP and population.

6.1.3 The legal disputes

While the United States and Canada are the most frequent users of the dispute settlement mechanism at the WTO in pursuit of the SPS and TBT Agreements, developing countries have not disregarded the dispute settlement system. Especially, from 2000 to 2005, ten cases out of 18 dispute cases were brought by developing countries. The WTO developing Member countries have begun to benefit form utilizing the dispute settlement mechanism while they face new challenges due to the increased disputes among developing countries.

As to the dispute cases involving developing countries either as a complainant or a respondent, there are 23 cases that involve developing countries. Among them, panel and Appellate Body reports were adopted in only two dispute cases, which involved exports of certain shrimp and shrimp products from the four Asian countries to the United States and sardines from Peru to the EC. The lessons that can be learned from these two cases are: 1) that the lack of legal capacity of developing countries can be overcome by utilizing the Advisory Centre on WTO Law and the joint filing of dispute cases with other developing countries and 2) that the sustainable development should be considered in making economic activities. Therefore, financial assistance or other assistance needs to be provided to enhance the effectiveness of the Advisory Centre.

6.2 Policy Implication

Quantitative investigation on the effect of institutional capacity could provide policy makers in the international trade and development community with invaluable information regarding how to help developing countries, especially low-income ones, to

get benefits from food and agricultural trade without making consumers in importing countries worse off significantly. The outcome of this study can provide support for the argument that international development agencies and donors need to do more in providing assistance for institutional capacity building activities in the field of food and agriculture STRs in developing countries.

International development agencies have helped developing countries to set up systems to comply with the WTO Agreements and international sanitary and phytosanitary standards. But, their efforts may have not been good enough to assist developing countries to be competitive in the international market of agriculture products. As we can see in the result of this study, developing countries still face a serious trade barrier caused by STRs to their exports. International development agencies may focus on building the STR-related infrastructure and capacity to run this infrastructure. An exclusive focus on establishing enforcement systems might not constitute a complete assistance package to farmers and food producers in developing countries. Attention must be given to informational and conformity capacities as well.

One approach to helping developing countries to enhance their conformity capacity is to give technical assistance through professional intermediary NGOs. Through her argument on NGOs as "entrepreneurial economic entities," Meyer (1995) claimed that professional intermediary NGOs can provide benefits to both the local people and the international community (p. 1280). In the case of food safety regulations, professional intermediary NGOs can provide technology to farmers and producers of developing countries to comply with food and agriculture STRs in the markets of importing countries

and help increasing human capacity by training them how to utilize and maintain those technologies properly.

The financial and technical assistance to the Advisory Centre on the WTO Law also need to be increased since the Advisory Centre has proved to be an effective tool for developing countries in preparing legal disputes at the WTO DSB. In addition, the cooperation among developing countries, which share same interest, could be another effective way to prepare legal disputes at the WTO.

6.3 Future Research Direction

It is not sure whether the result of this paper can be generalized to other product groups or to other country groups. The regression results do seem sensitive to the choice of product category and the composition of countries. It is also important to remember that agriculture policy, such as domestic subsidy, in certain importing countries may significantly affect the trade flow of agriculture products. This factor is not covered in this paper. In addition, interpretation of the result of this paper needs to be done with care since the data does not directly measure institutional capacity that deals with aflatoxin B1 standards on agriculture products. However, I still believe that four variables of institutional capacity in this paper capture the proximity of institutional capacity that deal with STRs on food and agricultural products.

Further research needs to be done. Especially, studies on factors that affect STRs-related institutional capacity need to be carried out. This kind of study can be done through case studies. A case study needs to be conducted on the role of public and private

sectors, the coordination within and between public and private sectors, and international influence.

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Appendix A. Tables

Table 3.2 Data Year and Definition of Enterprises or Establishments*

Exporters	Year	Definition
Albania	2001	Enterprises with 5 or more employees are completely enumerated. A sample is used for enterprises with 1-4 employees. Total number is sum of available data
Austria	2000	All enterprises
Belgium	2000	All enterprises
Botswana	2001	licensed establishments with one or more paid employees
Brazil	2001	Local unit with 5 or more persons engaged
Bulgaria	2001	
Canada	2001	All establishments
China	2001	All state-owned industrial enterprises and non-state-owned industrial enterprises with annual sales higher than 5 million yuan
Colombia	2000	Establishments with 10 or more persons engaged
Costa Rica	2001	Number of establishments and employees relate to enterprises with at least one employee registered under the social security scheme
Croatia	2001	Legal entities
Cyprus	2001	All establishments in the Government controlled areas, with adjustments on the basis of the results of the 1992 census
Denmark	2000	All establishments with any number of employees in manufacturing
Ecuador	2001	Establishments with 10 or more persons engaged
Egypt	2002	
Estonia	2001	
Georgia	2001	
Germany	2001	All enterprises.
Hungary	2000	Enterprises with 5 or more employees
India	2001	Factories using power and employing 10 or more workers on any day of the reference period and all factories employing 20 or more workers
Ireland	2000	All establishments engaged in industrial activity which have on average three or more persons engaged during the year
Israel	2001	All establishments with 5 or more persons engaged
Italy	2000	All enterprises. Multi-unit enterprises with more than 250 persons engaged are required to furnish data separately for each unit
Japan	2001	All private establishments classified under manufacturing
Jordan	2001	All establishments
Kuwait	2001	All Industrial establishments in the private and public sectors, including establishments with joint private and public ownership
Kyrgyzstan	2001	All enterprises operating under an independent regime and enterprises operating under a non-industrial organization regime
Latvia	2001	All establishments with industrial production, excluding individual

Exporters	Year	Definition
		producers
Lithuania	2001	All operating industrial enterprises including individual enterprises with annual revenue of 5000,000 Litas or more
Luxembourg	2000	
Malawi	2001	
Malaysia	2001	Establishments with 30 or more employees are completely enumerated. For establishments with less than 30 employees data refer to overall estimates of the manufacturing sector based on a stratified sampling technique
Malta	2001	All manufacturing establishments
Mauritius	2001	Establishments with 10 or more persons engaged
Mexico	2000	All establishments
Mongolia	2000	All establishments
Morocco	2001	All establishments
Mozambique	2000	All registered establishments
Netherlands	2000	All enterprises
New Zealand	2000	Establishments with paid employees
Norway	2001	All establishments, except enterprises with individual proprietorship where the owner is working alone or with an employee less than half year
Panama	2001	All establishments. Total number is sum of available data
Poland	2000	All economic units
Portugal	2000	All enterprises
Qatar	2001	Establishments with 10 or more persons engaged
Rep. of Korea	2001	Establishments with 5 or more employees
Rep. of Moldova	2001	All self-sustained establishments
Romania	2001	State enterprises under the direction of the central governments
Senegal	2001	All establishments excluding handicrafts
Singapore	2001	All establishments in the private sector with 10 or more persons engaged
Slovenia	2001	Enterprises founded according to Companies Act and Slovene Accounting Standards were included
Spain	2000	All units employing one or more persons
Sri Lanka	2000	Establishments with 5 or more persons engaged
Sweden	2001	All enterprises included in the business register
Thailand	2000	Sampled establishments with 10 or more persons engaged
Tunisia	2001	Enterprises with 6 or more employees

Exporters	Year	Definition
Turkey	2000	
Ukraine	2001	All establishments
United Kingdom	2000	All establishments

Source: The International Yearbook of Industrial Statistics, 2004 edition, by the United Nations Industrial Development Organization (UNIDO).

* According to the UNIDO, establishment is referred as "a unit that engages, under a single ownership or control, in one, or predominantly one, kind of activity at a single location; for example, workshop or factory" while enterprise is rather lager concept, which usually means a corporation.

Table 3.3 The IC Score on Food and Agriculture STRs: 30 Developed Countries

Exporters	INF	CON	ENF	INT	TOTAL
Singapore	0.57	0.87	1.00	0.50	2.94
Israel	0.56	0.80	1.00	0.50	2.86
Ireland	0.55	0.77	0.83	0.70	2.86
Canada	0.64	0.22	1.00	0.80	2.65
Norway	0.61	0.16	1.00	0.80	2.56
United Kingdom	0.60	0.40	0.83	0.70	2.53
Netherlands	0.60	0.28	0.83	0.80	2.52
New Zealand	0.61	0.09	1.00	0.80	2.49
Austria	0.57	0.16	1.00	0.70	2.43
Rep. of Korea	0.60	0.17	0.83	0.80	2.40
Sweden	0.60	0.07	1.00	0.70	2.37
Spain	0.49	0.11	1.00	0.70	2.30
Germany	0.58	0.18	0.83	0.70	2.29
Belgium	0.55	0.12	1.00	0.60	2.27
Japan	0.56	0.09	1.00	0.60	2.24
Denmark	0.60	0.10	0.83	0.70	2.23
Italy	0.53	0.09	0.83	0.60	2.04
Portugal	0.48	0.03	1.00	0.50	2.01
Luxembourg	0.54	0.11	0.83	0.50	1.98
Slovenia	0.54	0.17	0.67	0.50	1.87
Cyprus	0.48	0.05	0.50	0.70	1.73
Kuwait	0.37	0.02	0.17	0.50	1.05
Australia	0.62	N/A	0.83	0.80	N/A
Bahrain	0.44	N/A	0.50	0.30	N/A
Finland	0.61	N/A	1.00	0.70	N/A
France	0.54	N/A	1.00	0.60	N/A
Greece	0.47	N/A	0.50	0.70	N/A
Iceland	0.65	N/A	0.83	0.30	N/A
Switzerland	0.54	N/A	1.00	0.60	N/A
USA	0.49	N/A	1.00	0.80	N/A

Table 3.4 The IC Score on Food and Agriculture STRs: 86 Developing Countries

Exporters	INF	CON	ENF	INT	TOTAL
Mexico	0.42	0.39	1.00	1.00	2.81
China	0.37	0.37	1.00	0.80	2.55
Hungary	0.47	0.43	0.83	0.80	2.54
Thailand	0.42	0.19	1.00	0.80	2.40
Brazil	0.43	0.07	1.00	0.90	2.39
Malaysia	0.50	0.17	0.83	0.80	2.29
Estonia	0.54	0.05	1.00	0.70	2.29
Bulgaria	0.44	0.02	1.00	0.80	2.26
Costa Rica	0.42	0.01	1.00	0.80	2.23
Morocco	0.29	0.02	1.00	0.90	2.21
Tunisia	0.34	0.02	1.00	0.80	2.16
India	0.30	0.05	1.00	0.80	2.15
Turkey	0.38	0.27	0.67	0.80	2.11
Malta	0.47	0.06	0.83	0.70	2.06
Mauritius	0.41	0.19	0.83	0.60	2.03
Kenya	0.33	0.03	0.83	0.80	2.00
Romania	0.34	0.04	1.00	0.60	1.98
Ecuador	0.39	0.02	1.00	0.50	1.92
Poland	0.46	0.01	0.83	0.60	1.90
Panama	0.40	0.03	0.50	0.90	1.83
Egypt	0.32	0.06	0.83	0.50	1.71
Colombia	0.38	0.15	0.50	0.60	1.63
Sri Lanka	0.38	0.01	0.83	0.40	1.62
Botswana	0.36	0.00	0.50	0.70	1.56
Jordan	0.40	0.02	0.83	0.30	1.55
Senegal	0.22	0.02	0.50	0.80	1.54
Mongolia	0.40	0.00	0.67	0.40	1.47
Latvia	0.45	0.01	0.67	0.30	1.43
Croatia	0.44	0.02	0.33	0.60	1.39
Malawi	0.31	0.01	0.67	0.40	1.39
Kyrgyzstan	0.40	0.00	0.67	0.20	1.27
Georgia	0.41	0.00	0.50	0.30	1.21
Lithuania	0.45	0.06	0.17	0.50	1.18
Albania	0.37	0.00	0.33	0.40	1.10
Mozambique	0.20	0.00	0.33	0.40	0.93
Rep. of Moldova	0.36	0.01	0.00	0.40	0.77
Angola	0.22	N/A	0.00	0.50	N/A
Antigua and Barbuda	0.41	N/A	0.17	0.30	N/A
Argentina	0.47	N/A	0.83	0.90	N/A
Bangladesh	0.25	N/A	0.50	0.60	N/A
Barbados	0.44	N/A	0.83	0.60	N/A

Exporters	INF	CON	ENF	INT	TOTAL
Belarus	0.42	N/A	0.33	0.10	N/A
Belize	0.40	N/A	0.33	0.40	N/A
Benin	0.20	N/A	0.67	0.40	N/A
Bolivia	0.42	N/A	1.00	0.50	N/A
Burkina Faso	0.15	N/A	0.33	0.30	N/A
Cameroon	0.29	N/A	1.00	0.50	N/A
Central African Rep.	0.19	N/A	0.17	0.30	N/A
Chad	0.20	N/A	0.00	0.30	N/A
Chile	0.47	N/A	0.33	0.90	N/A
Congo	0.27	N/A	0.00	0.30	N/A
Czech Rep.	0.44	N/A	0.83	0.80	N/A
Dominica	0.37	N/A	0.83	0.30	N/A
Dominican Rep.	0.37	N/A	0.83	0.60	N/A
El Salvador	0.37	N/A	1.00	0.50	N/A
Fiji	0.38	N/A	0.67	0.40	N/A
Gabon	0.33	N/A	0.50	0.50	N/A
Ghana	0.30	N/A	1.00	0.70	N/A
Grenada	0.38	N/A	0.67	0.40	N/A
Guatemala	0.32	N/A	0.67	0.80	N/A
Guinea	0.17	N/A	0.33	0.40	N/A
Guyana	0.45	N/A	0.33	0.40	N/A
Honduras	0.33	N/A	0.67	0.50	N/A
Indonesia	0.37	N/A	0.67	0.80	N/A
Jamaica	0.40	N/A	0.50	0.20	N/A
Madagascar	0.28	N/A	0.67	0.40	N/A
Mali	0.16	N/A	0.33	0.40	N/A
Namibia	0.36	N/A	0.50	0.50	N/A
Niger	0.12	N/A	0.83	0.40	N/A
Nigeria	0.25	N/A	1.00	0.60	N/A
Pakistan	0.23	N/A	0.67	0.40	N/A
Papua New Guinea	0.27	N/A	0.83	0.50	N/A
Paraguay	0.38	N/A	0.67	0.70	N/A
Peru	0.44	N/A	1.00	0.80	N/A
Philippines	0.42	N/A	0.67	0.70	N/A
Sierra Leone	0.23	N/A	0.00	0.40	N/A
Slovakia	0.45	N/A	0.67	0.70	N/A
South Africa	0.41	N/A	0.83	0.80	N/A
Swaziland	0.32	N/A	0.67	0.50	N/A
Trinidad and Tobago	0.41	N/A	0.67	0.40	N/A
Uganda	0.30	N/A	0.67	0.60	N/A
United Rep. of Tanzania	0.26	N/A	0.67	0.50	N/A
Uruguay	0.44	N/A	0.67	1.00	N/A

Exporters	INF	CON	ENF	INT	TOTAL
Venezuela	0.33	N/A	1.00	0.30	N/A
Zambia	0.30	N/A	0.50	0.30	N/A
Zimbabwe	0.32	N/A	0.50	0.60	N/A

Appendix B. The TBT Agreement

The Agreement on Technical Barriers to Trade (TBT) consists of 15 articles and 3 Annexes. Article 1 clarifies relationships with other WTO Agreements. Article 2, 3, and 4 are composed of provisions related to the preparation, adoption, and application of standards and technical regulations (STRs). Article 5, 6, 7, 8, and 9 cover conformity issues including the procedure and recognition of conformity assessment by the governments of the WTO Member countries and other related organizations. Article 10 addresses the issue of transparency. Article 10 elucidates guidelines for information exchange among the WTO Member countries about STRs and conformity assessment procedures in their countries. For example, Article 10 requires each WTO Member country to have an entry point to answer questions from other countries and interested third parties on its STRs and conformity assessment system.

Article 11 and 12 cover the issues that developing countries are concerned about. These two articles set guidelines for technical assistance as well as special and differential treatment for the developing WTO Member countries. Article 13 and 14 provide guidelines for the operation of the Committee on Technical Barriers to Trade and the procedure of consultation and dispute settlement among the WTO Member countries. Article 15 covers the procedure to review the implementation of the TBT Agreement.

The application procedure guidelines of the TBT Agreement are illustrated in Appendix 3, the Code of Good Practice for the Preparation, Adoption, and Application of Standard (Code of Good Practice). Code of Good Practice demonstrates the requirements that standardizing bodies in the WTO Member countries need to follow for the

preparation, adoption, and application of standards. It is open to any standardizing body, including non-governmental organizations or local government agencies, within a country (Appendix 3 of the TBT Agreement).

The process for consultations and dispute settlements under the TBT Agreement is specified in Article 14 of the TBT Agreement. Dispute settlement processes under the TBT Agreement follow the provisions of Articles XXII and XXIII of the GATT 1994. A technical expert group may be established at the request of a party to a dispute (Article 14.2 of the TBT Agreement). Annex 2 of the TBT Agreement specifies the details of technical expert groups. The dispute settlement procedure under the SPS Agreement follows the same requirements as in the TBT Agreement except that the SPS Agreement does not have any specific provisions for the details of a technical expert group.

CURRICULUM VITAE

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