An Assessment of Technical Barriers in Central American Agricultural and Food Trade

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(ABSTRACT)

This dissertation explores technical regulations (sanitary and phytosanitary (SPS) measures, technical barriers to trade, and geographical indications) in Central American agricultural and food trade. In the first part, a framework to systematically evaluate the broad issues for developing countries is presented. Evaluation of the issues for Central America is based on interviews with about 100 persons in the region and in the United States (US), and on secondary sources. The topic is of significance in Central America, especially when related to SPS measures. The World Trade Organization (WTO) Agreements have had relatively little direct impact in improving Central America's response to technical regulations, while homologous Central American regional institutions may have been more successful, with indirect support from the WTO and the US, in reducing the incidence of illegitimate regulations in intra-regional trade. Central America may implement illegitimate barriers more against others in the region than against the US. Although the Central America Free Trade Agreement (CAFTA) may support Central America's capacity to meet more stringent technical regulations, the improvement may not be sufficiently perceptible.

The potential for Central American greenhouse tomato exports to the US is analytically evaluated in the second part. These tomatoes may be admitted as the ban based on the risk of introduction of the Mediterranean fruit fly is partially lifted, due in part on discussions in the CAFTA negotiations. Mature green, vine-ripe and greenhouse tomatoes are heterogeneous in demand, and vine-ripe tomatoes are but greenhouse tomatoes are not heterogeneous by origin. A static partial equilibrium model is constructed for the US tomato market, where demand is based on multi-stage budgeting and supply is a function of own tomato price. When the Central American greenhouse excess supply function is introduced to the model, the region exports to the US, the aggregate greenhouse quantity increases, and its prices decrease. As greenhouse preference increases, greenhouse quantity and prices also increase. Changes are perceptible but small in the mature green and vine-ripe markets in the expected direction. Access by Central America is particularly beneficial when US consumer preferences shift further toward greenhouse over other tomatoes.

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List of Acronyms

AEOS	Allen partial elasticity of substitution
AMS	Agricultural Marketing Service
APHIS	Animal and Plant Health Service, USDA
BSE	Bovine Spongiform Encephalopathy
CA	Central America
CACM	Central America Common Market
CAFTA	Central America Free Trade Agreement
CAL	California
CBI	Caribbean Basin Initiative
CCRA	Canada Customs and Revenue Agency
CD	Canada
CES	Constant elasticity of substitution
CET	Common External Tariff
CFTA	Canada-US Free Trade Agreement
CITT	Canadian International Trade Tribunal
COMIECO	Council of Ministers of Economic Integration
DSU	Dispute Settlement Understanding
EPA	Environmental Protection Agency
ESL	Extended shelf life (tomato)
EU	European Union
EV	Equivalent variation
FAS	Foreign Agricultural Service
FDA	Food and Drug Administration
FL	Florida
FMD	Foot and mouth disease
FOB	Free on board
FSIS	Food Safety and Inspection Service
FTA	Free Trade Agreement

GAP	Good agricultural practices
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GH	Greenhouse (tomatoes)
GI	Geographical Indications
HACCP	Hazard Analysis and Critical Control Point
HS	Harmonized System
HTSUS	Harmonized Tariff System of the United States
IICA	Inter-American Institute for Cooperation on Agriculture
IPM-CRSP	Integrated Pest Management – Collaborative Research Support Program
IPPC	International Plant Protection Convention
IRR	Import Refusal Report
LTFV	Less than fair value
MCIFT	Measures Contrary to International Free Trade (matrices)
MG	Mature green (tomatoes)
MT	Metric tons
MX	Mexico
NAFTA	North American Free Trade Agreement
NTAE	Nontraditional agricultural export (crops)
NTB	Non-Tariff Barriers to Trade
NTE	National Trade Estimate Report on Foreign Trade Barriers
OIE	International Office of Epizootics
OIRSA	International Regional Organization of Agricultural Health
PPM	Process or Production Methods
PRA	Pest Risk Assessment
S&D	Special and differential (treatment)
SIECA	Central American Secretariat of Economic Integration
SM	Summer
SPS	Sanitary and Phytosanitary (measures)
TBT	Technical Barriers to Trade
TCB	Trade Capacity Building

TED	Turtle Excluder Device
TRIPS	Trade-Related Aspects of Intellectual Property Rights
US	United States
USAID	US Agency for International Development
USDA	US Department of Agriculture
USDOC	United States Department of Commerce
USITC	United States International Trade Commission
USTR	US Trade Representative
vCJD	variant Creutzfeldt-Jakob disease
VR	Vine-ripe (tomatoes)
WT	Winter
WTO	World Trade Organization

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Chapter 1. Preface

1.1. Introduction

This dissertation explores technical barriers in Central American agricultural and food trade. In this dissertation, the term technical barriers or regulations refers to measures that regulate products or their packaging based on product attributes or production and processing methods. In particular, sanitary and phytosanitary (SPS) measures, technical barriers to trade (TBTs) and geographical indications (GIs) are comprised as technical regulations that affect agricultural and food trade.

As the incidence of tariffs is diminishing, the relative weight of non-tariff barriers such as technical regulations is increasing. Reflecting that technical regulations may be welfare enhancing, they are legitimate under the World Trade Organization (WTO) Agreements if these measures are applied truthfully to their goal. However, countries may sometimes be employing these measures with different intent from that permissible by the Agreements, and trade opportunities may be unjustly rebated or abated altogether.

Like any other country open to trade, Central America's Costa Rica, El Salvador, Guatemala, Nicaragua and Honduras are not likely to be completely immune to facing, or susceptible to implementing, technical barriers that illegitimately mitigate trade. In fact, a review of the literature reveals existence of complaints on technical regulations that the region faces and that it imposes to other countries. However, neither a systematic assessment of the broad problem nor a quantitative analysis of a particular problem has been conducted for the region in the area of technical regulation and agricultural and food trade. As such, policy formulation in Central America on this area may lack rigorous analysis, which may imply efficiency loss that could hamper the region's developing countries in fully attaining their economic development goals.

This dissertation presents two papers that aim to fill that knowledge vacuum. The first paper, presented in Part I, surveys technical barriers in Central American agricultural and food trade from a broad point of view. That paper has a broad scope in a couple of ways. First, the subject of study is not restricted to particular traded agricultural and food products, but all such products are considered. As discussion in that paper progresses, several products are mentioned more frequently than others but only to the extent that these products are identified to have particular importance in the context of the overview. The other manner in which the first paper encompasses an overview of the issues is that the assessment is primarily qualitative. Quantitative analysis is employed sparsely, and it only uses minimal descriptive statistics that support a systematic assessment of the problem. Devoting attention of the analysis to verbal description of the issues has assured that many facets of the problems are explored.

Although an overview of the issue is helpful, it is not complete without quantitative analysis of the benefits or costs that overcoming or facing technical regulations implies. Therefore, apart from providing an overview, Part I is used to identify a specific issue that may be amenable for quantitative research in Part II. Since Central America includes five countries, the issue for further research in Part II needed to have relevance for all of them or the largest number of countries possible. A few such products were identified, and tomato for export to the United States (US), whose current ban may partially be lifted by possibly allowing entry of greenhouse grown tomatoes, was chosen as the product of interest for further study due to its large potential gains.

In Part II, therefore, potential gains from Central America's greenhouse tomato export to the US is analyzed quantitatively. The US tomato market is first surveyed to build a model that incorporates an adequate approach to evaluating Central America's potential entry to that greenhouse tomato market. That model is also utilized to study effects in the US tomato market from other recent trends, which would in turn affect Central American producers in the future when greenhouse tomatoes are allowed.

The ensuing two sections provide a brief overview of the dissertation by summarizing the two parts that comprise the present dissertation.

1.2. Summary of Part I

To introduce the subject, the WTO Agreements that discipline technical regulations are introduced in the beginning phase of Part I. Since the most influential technical regulations in agricultural and food trend tend to be the SPS measures, the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) is explained in detail, followed by the Agreement on Technical Barriers to Trade (TBT Agreement) and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement). The overarching General

Agreement on Tariffs and Trade (GATT) is lastly exposited. References in these Agreements on developing countries are especially noted.

The developing country focus is important as developing countries such as those in Central America frequently face complex problems in managing technical regulations in trade. In an ensuing section, therefore, technical regulation issues that developing countries confront are presented in an orderly manner using a proposed framework to analyze them. These issues are first categorized by those that concern developing countries as exporters and others that they commit to as exporters. Under each category, issues are further classified into those that directly relate to the clauses in the relevant WTO Agreements, and others associated with domestic capacity to benefit from or observe the Agreements.

The Central American economy, trade and agricultural and food industry are then the focus of discussion before the proposed analytical framework is applied to the region's problems. This presentation is important in the context of the study as, for instance, the most important trade partners and goods, which are later linked to technical regulation issues that the region faces, are identified.

The chapter that follows presents the principal topic of Part I, which is to analyze technical regulations in Central American agricultural and food trade. Several sources of information were used for the analysis, the most important of which was the interviews conducted in the capital cities of Central America and the US. About 100 persons with knowledge on technical regulations and Central American trade in the private and public sector of those countries and of multilateral institutions were interviewed to obtain their perspectives on the issues. The interview process lasted for over a month over the course of five months in late 2003 and early 2004, when the Central America Free Trade Agreement (CAFTA) negotiations were approaching closure.

Secondary sources, such as documents from the WTO, the Secretariat of Central American Economic Integration (SIECA), the Food and Drug Administration (FDA), the US Trade Representative (USTR), and other sources from the literature and the internet, were also extensively used. These sources allowed obtaining background information prior and consequent to the interviews, and elaborating simple summary numerical data about the incidence of the issues.

The first question that needed to be assessed was the significance of technical regulations in Central American agricultural trade. All interviewees responded affirmatively to the question of whether this was an important issue to the region, and the most important argument provided was the lost opportunity to trade some products due to SPS measures that banned them. In particular, the ban due to the Mediterranean fruit fly (Medfly) was very frequently mentioned as making it impossible to export many plant products such as tomatoes, green peppers, papayas and mangoes. From this argument, another noteworthy point is that SPS measures are the most important of technical regulations for Central American trade.

On the other hand, an argument against the importance of technical regulations in Central American trade can be made from the interviews themselves since the top ten Central American agricultural and food export products were hardly mentioned, implying that products reportedly affected by technical regulations were not important at least in relation to current export value. However, this view masks the lost trade opportunity argument imposed by technical regulations that many interviewees presented. The magnitude of the opportunity cost is difficult to quantify, but this is not a cause for not considering it in the economic impact due to technical regulations.

Another key finding of the study is the impact of the multilateral institutions (i.e. the WTO, Codex Alimentarius Comission, International Office of Epizootics (OIE), and International Plant Protection Convention (IPPC)) and the regional homologues (i.e. SIECA and the International Regional Organization of Agricultural Health (OIRSA)) to the technical regulation and trade issues in Central America. As members of the WTO and signatories to the Agreements, Central American countries have benefited from the Agreements as these provide rules of the game in applying technical regulations. However there is vast evidence that, as a group of small countries, Central America has benefited less from the mechanisms provided by these Agreements than larger members. This is inferred from the region's scarce participation in expensive international SPS fora, the low number of international standards that have been established, the small number of regulatory notifications that it has submitted to the WTO, and the possibility that the US has not implemented regulatory reform that interests Central America, which may partly explain the high number of complaints heard from the interviewees of this study. Furthermore, the lack of provision of a formal dispute resolution mechanism that is accessible to small countries exacerbates the low evaluation of the performance by the multilateral institutions.

Although the extent to which Central America has benefited from the WTO Agreements that relate to technical regulations for the agricultural and food industry is limited in comparison with that for larger countries in the extra-regional scene, the region has benefited relatively more from regional institutions in intra-regional trade. This is appreciated by observing the recently decreasing incidence of technical barriers reported as questionable by countries that face them. However, although regional institutions are to be credited for this achievement, the influence exerted by the US through CAFTA negotiations for the region to unite and reform its technical regulations also deserves credit as these regulations are increasingly harmonized and national regulatory reforms are expected to benefit intra-regional trade. Additionally, the WTO is also partly responsible in promoting efficiency in the use of technical regulations in intra-regional trade since it has provided an international legal framework that has been adopted regionally. Specifically, a regional SPS committee is reported to have resolved multiple SPS trade disputes and a new formal regional dispute resolution mechanism is expected to improve SPS relations in the region even more.

Another finding, although whose accuracy is only partially supported by interview results and data, is that Central American countries may be imposing questionable technical barriers against other countries in the region than against the US. This was expected prior to initiating the research given that Central America knows that its countries have less scientific ability to prove unfounded regulations than the US does, and that the US has more political clout to pursue countries in the region to not impose illegitimate barriers.

Finally, although CAFTA may help to some degree in diminishing the incidence of trade disputes related to technical regulations, in a similar manner by which NAFTA reduced such disputes between the US and Mexico, the effect may not be as substantial as interviewees would like to see. In the case of NAFTA, an SPS Committee where disputes that relate to those issues were aired was established, and the increased communication between US and Mexican SPS officials is attributed for decreasing the incidence of SPS trade disputes between the two countries. CAFTA, if implemented, would also have a similar institutional structure where those issues would be aired, so similar benefits could be expected. Another institutional invention in CAFTA that may favor its evaluation is trade capacity building (TCB), by which the US would provide assistance to Central America to meet challenges under CAFTA, such as improving the region's SPS capacity. An improved SPS capacity in the region may lead to fewer problems it may face when exporting to the US as a low capacity is frequently cited as an impediment to meeting high standards in the US market. Furthermore, a side effect of CAFTA may be an increased flow of foreign investment in the region, which may introduce technological improvements that the region needs in successfully facing certain SPS measures. Finally, as mentioned earlier, regulatory reform that the region may implement as a response to requests by the US to modernize its SPS regulations and to harmonize them are an added benefit due to CAFTA.

Implementation of these measures are important in improving SPS relations between the US and Central America. However, interviewees in the region showed discontent with the absence of a formal dispute resolution mechanism that the region sought to have established given the current lack of an accessible option. Furthermore, they are skeptical of the degree to which the TCB would signify an actual increase in assistance by the US to improve the region's SPS capacity. Given the more than a decade that has elapsed from implementation of NAFTA, the lack of a higher standard in improving SPS relations between the CAFTA signatory countries falls short of interviewee's expectations.

1.3. Summary of Part II

With an overview of technical regulations in Central American agricultural and food trade as a backdrop, the region's potential for exporting greenhouse tomatoes to the US was chosen as the topic of detailed quantitative analysis in Part II. This was chosen as the topic for a few reasons. First, it entails a technical regulation and trade dimension as ripe tomatoes from the region are now banned in the US since tomatoes are carriers of the Medfly, a pest that is present in Central America but reported to be absent in the US. Second, admittance of greenhouse tomatoes would constitute employing a systems approach to risk management, in which a series of measures are implemented to reduce the risk of pest infestation to an acceptable level, in importing tomatoes from a Medfly infected area. The systems approach is a concept that, although slowly implemented, may benefit trade as it follows the WTO SPS Agreement's least-trade restrictiveness principle. Third, Central America's potential success in marketing greenhouse tomatoes to the US would be an important demonstration of CAFTA's benefits for Central America as the possibility for partial lifting of the tomato ban has developed through discussions in the CAFTA SPS Working Group, and the foreign greenhouse investment has been attracted by the improved and permanent US market access conditions that CAFTA is providing to Central America. Fourth, participation in the US tomato market may implicate large gains as tomatoes are the second most traded horticultural product and the US is one of the largest tomato markets.

Prior to constructing an analytical model for the US tomato market, the literature is reviewed. Given that the US tomato market is dominated by trade among NAFTA countries, production, trade and consumption for those countries are briefly presented. Then, since the US tomato demand would be the focus of this study, production characteristics of North American supplying regions are discussed. Concurrently, the focus of study is narrowed to the field-grown tomatoes of mature green and vine-ripe, and greenhouse-grown since the large greenhouse tomatoes that are of interest here are much more readily substituted with those field-grown types that are also larger, and are marketed in larger quantities, than other tomatoes.

With this focus, it is notable that mature green tomatoes from the US, the only important supplier of this type of tomatoes, dominate the winter market, although Mexican vine-ripe imports also have an important share then. In the summer, US vine-ripe producers, who are located closer to larger consumption markets in the US, sell a majority of tomatoes, although mature green sales are also high. Greenhouse tomato quantities, although growing at a higher pace than for other types, are relatively low, and these are consumed more in the summer than in the winter. It is then that Canadian producers influence the US market with a relatively large greenhouse tomato supply, although US producers are still the largest growers of that type of tomato. Incidence of tomato trade policy, which has increasingly declined over recent year, as well as other trends, such as the horizontal and vertical integration and the growing US consumer preference for greenhouse tomatoes, are also introduced. Historical tomato trade disputes among the NAFTA countries and the prospects for Central American greenhouse tomato exports are also discussed later.

An important aspect of the tomato market is evaluated prior to using an analytic model. Specifically, whether tomatoes are homogeneous in consumption or not is studied statistically. That tomatoes may be heterogeneous by type is inferred from the popularity of one type of tomato over another depending on the season. Furthermore, tomatoes may be heterogeneous by origin as evidenced by the popularity of Mexican vine-ripe tomatoes in the winter, while US vine-ripe tomatoes are preferred in the summer. This evaluation is conducted by comparing wholesale prices for the different tomatoes. If wholesale prices differ from one tomato to another, then they are heterogeneous as consumers would see them differently and the price of one tomato would be decided relatively independently to that of the other as each tomato would relate to a different demand function. However, if prices are the same, then it is very likely to be due to consumers that see diverging tomatoes as the same, and there would only be one demand function that establishes a unique price for the tomatoes that are compared.

T-tests of pair-wise comparisons show that all tomatoes are heterogeneous by tomato type. Therefore, consumers perceive tomatoes as different by type. However, the finding for homogeneity by origin for vine-ripe and greenhouse tomatoes is not as consistent. Vine-ripe tomatoes did show firm results that tomatoes are heterogeneous by origin. However, four out of six pair-wise comparisons for greenhouse tomatoes from diverging origins failed to show statistically significant difference. These results would thus tend to support that greenhouse tomatoes are homogeneous by origin.

With these results in mind, and after review of technical literature, a partial equilibrium perfectly competitive US tomato market model is built. On the demand side, weak separability allows developing a multi-stage demand system. At the top level of the utility tree of a representative consumer, consumption choice between tomatoes and all other goods takes place. At the mid level, the choice is between the three different types of tomatoes, and there is a final bottom level for vine-ripe tomatoes that relates to the choice of production origin. Each level has a different elasticity of substitution as a constant elasticity of substitution (CES) utility function is assumed. This structure allows substitution possibilities among different tomatoes. Consumers respond to tomato wholesale prices and income level, while supply is simply assumed as function of the own-producer prices of the US, Mexican and Canadian tomatoes. These equations, along with market clearing conditions, provide the totality of model equations. A benchmark data set is constructed from secondary sources and, along with assumed elasticity values, the model is calibrated to replicate the data. The model is also run to simulate a traditional trade scenario where a tariff is imposed on imports from a particular country, and the general matching of results with known expected outcome reconfirms the model's appropriate behavior. Performance of the model is also confirmed later when a systematic sensitivity analysis shows that the model is mostly robust to changes in assumed elasticity values.

The model was then used to simulate entry of Central American greenhouse tomato to the US market by introducing a Central American greenhouse excess supply function. This supply function is calibrated based on assumed export quantity, producer prices, and supply elasticity.

Results confirm expectations from trade theory: Central America's greenhouse export to the US is positive as it is able to meet the unique wholesale price, the equilibrium greenhouse market quantity increases, and the greenhouse wholesale and producer prices decrease. Although changes are less pronounced, other tomato types also experience the impact as their consumption and prices decrease due to substitution away from these tomatoes. Thus, it is verified that substitution between different tomatoes takes place.

Welfare effects are especially felt in the greenhouse industry, particularly in that of the US that loses millions of US dollars. Producers' welfare losses are especially high in the winter when Central America is expected to export more, and even the US mature green industry may lose much depending on Central America's export capacity and supply and demand elasticities. Large losses for the mature green industry relates to its high volumes in the winter, when Central American imports are expected to be more abundant. Consumers in the US, however, gain much in welfare, which could vary from estimates of US$14 million to US$101 million annually. Net welfare gain in the US could also be substantial from US$6 million to US$48 million.

Another scenario that was evaluated was that of a preference increase for greenhouse tomatoes over that for field-grown tomatoes, as it would have implications for Central American greenhouse exports. The changes in preferences over the different types of tomatoes were calibrated based on recent trends in greenhouse consumption changes.

In the variants of this scenario also, as expected, greenhouse consumption increases although its wholesale price increases. As preference for other tomato types has decreased, their consumption and prices decrease. Welfare increases for greenhouse growers and decreases for other producers. When Central American greenhouse exports are incorporated, the gains for other greenhouse growers are diminished. However, when comparing this scenario to the scenario in which Central American growers enter without the increase in greenhouse preferences, it is notable that all other greenhouse producers are now experiencing positive welfare changes. This may imply that the current increasing trend in greenhouse tomato demand may provide sufficient welfare gains for a larger number of producers than are currently available.

A look at changes in consumer surplus is also useful, although it must be noted that this scenario is not Pareto comparable to the base as preferences have changed. If this comparison is done it could be noted that, although consumers experience losses in the present scenario, their loss without Central American greenhouse exports to the US is higher. Therefore, an increase in the level of greenhouse tomato supply, such as through new entrants like the Central American growers, may be necessary to mitigate unnecessary welfare losses for consumers as they demand for a higher quantity of greenhouse tomatoes.

Part I. A systematic assessment of the incidence of technical regulations in Central American agricultural and food trade

Chapter 2. Introduction

2.1. Introduction

Central America is a region that has made a great leap forward democratically and economically in the 1990's from the politically tumultuous preceding decade. However, its economic growth has stagnated in recent years, in part due to its high dependency on the export sector as a source of growth that makes the region inevitably vulnerable to world economic downturns and to decrease in prices of the region's major export commodities (ECLAC, 2002). These are external shocks that are beyond the control of the Central American governments and private sector. Nonetheless, to benefit the most from openness of the Central American economy to the world, there are factors that these institutions and firms can address. One such issue is the effective management of technical regulations, which includes adequate response to regulations applied in import markets and implementation of a rational domestic technical regulations system.

Application of some types of legitimate technical regulations responds to domestic needs to correct market failures arising from externalities caused by risks associated to or information deficiency of products that are imported or consumed (Roberts, Josling and Orden, 1999). Therefore, technical regulations are potentially welfare-enhancing. Recognizing this, certain clauses related to technical regulations in the World Trade Organization (WTO) Agreements were created to separate their legitimate use from the malpractice of domestic producer protection, thereby justifying and authorizing the implementation of the former when the least-trade-distorting means are used. Facing WTO legal technical regulations in their export markets, developing countries such as those in Central America have two strategies to follow if maintaining affected exports is determined to be feasible. One is to negotiate with the importing country to have the regulation removed or modified, or, when appropriate, to obtain technical assistance that would provide economic gains for the developing country's exports. The other strategy, which is pursued more often, is for the developing country to comply with the regulations using its own resources.

However, because of the nature of constraints that developing countries have, they frequently face more difficulties than developed countries to attain economic feasibility when maintaining affected exports. Some of these constraints are distinct to developing countries and some manifest more severely in these countries. These constraints may be categorized into the paucity of financial and technological resources, of the government's proactive role, and of developed country's cooperation in building developing country's capacity in managing technical regulations. This last element directs attention to another dimension of many technical regulations, that stricter measures are normally applied by developed countries, and developing countries frequently find compliance problematic. This is significant as slightly more of agricultural exports from developing countries are directed to developed country markets (Josling, Roberts and Orden, 2003).

Not all technical regulations that are implemented abide by the WTO Agreements. The WTO Agreements provide mechanisms to lower the incidence of such regulations and for resolving disputes on application of alleged illegitimate regulations. However, experts have argued, and studies have corroborated, that developing countries are in a disadvantaged position to benefit from such mechanisms (Henson et al, 2000). Broad explanations for developing countries' inability to benefit from technical regulation disciplines of the WTO Agreements are parallel to those for their difficulty in meeting technical regulations in export markets. Whichever cause hampers a developing country from making use of the WTO instruments, these countries are often not able to take advantage of the WTO mechanisms to protect the rights for their exports to be freed from disguised protection, and consequently they may lose export opportunities.

Developing countries are not only at the margin of the international framework for benefiting from disciplines on technical regulation set in the WTO Agreements, but also frequently for complying with them (Thornsbury, 1998, p. 143).[1] Deviation from the international framework may be reflected in reduced introduction of agricultural and food products to their markets, which is likely to be promoted by political factors such as excessive producer or consumer interests (Josling, Roberts and Orden, 2003). Such reduced imports possibly lead to efficiency loss, as it is also the case in the presence of political capture by

[1] Data from a study on questionable technical barriers to trade (TBTs) faced by the United States in Thornsbury (1998) indicates that all of the eight countries with the most estimated trade impact to the United States due to questionable TBTs relative to US agricultural export to that country (percent estimated trade impact, PETI) are developing countries.

overseas and import firm influence. However, this last case may lead to too much import, although not in contempt for the international framework.

Compliance with the multilateral framework also poses a challenge to developing countries as protection of intellectual property rights is required for a number of food trademarks known as geographical indications (GIs) (Josling, Roberts and Orden, 2003). Like most intellectual properties, GIs are more likely to benefit developed countries than developing ones, and the latter may face difficulties in abiding by the WTO rules due to scarce domestic resources and international cooperation.

2.2. Scope of the study

The tendency for acting outside of the international technical regulation framework may be greater for smaller developing countries such as those in Central America.[2] In fact, smallness of Central American countries most likely amplifies technical regulation management problems of facing legitimate but strict regulations in export markets, and of making use of and complying with the multilateral framework, due to scarce economies of scale and greater susceptibility to political capture. A corollary to this is that Central American countries may be applying more WTO-incompliant technical regulations among themselves than to other trade partners. Regional institutions that oversee Central American integration efforts exist, but institutional weakness may prevent them from making a contribution by reducing intraregional disputes. However, despite constraints that Central America faces in working with technical regulations, a prospect of mitigating them may be attached to implementation of the Central America Free Trade Agreement (CAFTA), which is negotiated between the United States (US) and Central America.[3]

Anecdotal evidence that Central America is suffering from problems related to management of technical regulations in export markets and in the region is scattered in the literature, presenting a first glance at the problem. Some of this literature addresses the institutional framework for domestic regulation, others mention the magnitude of the general problem, and

[2] The same data from the study by Thornsbury (1998) shows that the top four countries with the greatest PETI and six out of the eight countries with the largest PETI are small developing countries.

[3] In a study of SPS disputes between the US and Mexico, Romano (1998) finds that quality of the SPS regulatory process was improved in Mexico and incidence of SPS barriers between the two countries decreased after implementation of the North America Free Trade Agreement (NAFTA).

still others are data that must be organized and analyzed to be meaningful. However, a comprehensive study on the subject is lacking.[4]

The present study attempts to fill that vacuum by first organizing relevant literature under a proposed framework. Furthermore, this study attempts to add to existing literature by reporting results from interviews with government officials in Central America and in the US as the region's principal trade partner, and with the Central American private sector. The interviews are specifically designed to fill in information vacuum in the literature and to provide perspectives on the issues of technical regulations in Central American agricultural and food trade. Analysis in this study will result in a better appreciation of trade-related technical regulation issues for Central America, which may encourage these countries and development agencies to direct their resources more effectively in improving Central America's capacity to manage technical regulations.

2.3. Objectives of the study

The overall objective of this study is to assess the impact of technical regulations on Central American agricultural and food trade and to identify constraints whose influence need to be mitigated to decrease the negative trade impacts from technical regulations. Identification of strengths in managing technical regulations will also be important to replicate successful experiences. Specific objectives are:

1. to explain the WTO disciplines on technical regulations;
2. to provide a brief background on the Central American economy and agricultural and food industry and trade; and
3. to analyze trade-related technical regulation management problems for Central America, using the literature and results from interviews, and applying a proposed framework.

2.4. Hypotheses of the research

A principal hypothesis of this research is that Central American agricultural and food trade is not significantly affected by technical regulations. Several auxiliary hypotheses to be tested in this study include the following:

[4] Although it places a strong emphasis on domestic sanitary and phytosanitary (SPS) capacity, Bernardo et al (2003) shares a general research orientation that the present study proposes.

1. The WTO Agreements that relate to technical regulations have not significantly influenced Central American agricultural and food trade;
2. Central American regional integration has not been effective in reducing intraregional agricultural and food trade disputes that relate to technical regulations;
3. Central American countries do not require additional institutional, technical and financial capacity to effectively manage technical regulation issues;
4. the incidence of questionable Central American technical regulations affecting imports from regional trade partners is equal to the respective incidence of questionable measures affecting imports from the US; and
5. establishment of the CAFTA will not help to substantially diminish Central American agricultural and food trade disputes related to technical regulations.

2.5. Overview

Opening with a summary of the technical regulation clauses of the WTO Agreements, Chapter 3 illustrates the experiences of developing countries with these regulations and introduces a framework to evaluate the experiences. In Chapter 4, the state of the Central American economy, and the agricultural and food industry and trade are described. Chapter 5 presents the information gathered from the literature and the interviews using the proposed framework, with the objective of systematically assessing the impact of technical regulations for Central America in Chapter 6.

Chapter 3. The multilateral framework of technical regulations and developing countries

3.1 Introduction

Technical regulations treated in this paper are broadly categorized as non-tariff barriers to trade (NTBs). Conceptually, NTBs include technical barriers to trade (TBTs), which in turn embrace as a subset sanitary and phytosanitary (SPS) measures. However, following the definition provided in the WTO Agreements, SPS measures and TBTs are identified differently, as being exclusive to each other. SPS measures and TBTs are two types of technical regulations that are of interest in this study. That these types of regulations are abused as a disguised measure for protection of domestic producers is a concern especially prevalent in agricultural trade, which has an annual global trade value of $600 billion (Josling, Roberts and Orden, 2003). As a result, the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) and the Agreement on Technical Barriers to Trade (TBT Agreement) were legalized in 1994 as part of the WTO Agreements in an attempt to separate the legitimate use of technical regulations from the malpractice of economic protection of domestic producers. These agreements, along with other new provisions resulting from the Uruguay Round and existing fundamental trade principals, have each influenced agricultural and food trade for developing countries to a different extent.

3.2. Conceptual definitions of NTBs, TBTs and SPS measures

Apart from the apparent characteristic of NTBs of being barriers to trade exclusive of tariffs, Beghin and Bureau (2001) identify that the literature attempts to refine the definition of NTBs by narrowing the scope of these measures. According to these authors, however, the literature diverges on the level of scope that it attaches to NTBs. One such definition attributes to NTBs any restrictions that distort international trade. A second concept further refines the scope given in the first definition by excluding those measures whose primary aim is the enhancement of world welfare. Similarly to this concept, another idea narrows the first definition by only referring to those measures that would not have been implemented by a national social planner if all producers were domestic.

Appreciation of the distinction between the three fundamentally different concepts used implicitly or explicitly in different literature to define NTBs is crucial for several reasons. First, these concepts categorize NTBs under an economic framework. Second, TBTs and SPS measures may also be categorized accordingly. Third, it is illuminating to see the concepts through the WTO Agreements and the eyes of regulators at national governments. The WTO Agreements are keen on the first concept as freer trade forms a cornerstone. However, as technical regulations can have welfare enhancing effects globally, the Agreements recognize the importance of the second concept. More precisely, barriers that fall into NTBs under the second concept are what the Agreements intend to classify as WTO illegal barriers to trade. Naturally, regulators at national governments also share a stake in the barriers included in the first and second concepts and demonstrate more interest in the third basis of judgment.

Generically TBTs constitute a subset of NTBs. A partial definition of TBTs suggests that they are distinguished from other NTBs by being regulations and standards regarding the sale of products into national markets (Roberts, Josling and Orden, 1999). Additionally, the TBT Agreement defines technical regulations underling TBTs to be regulations that describe product characteristics or their related processes and production methods (WTO, 1994a). Categorically, SPS measures pertain to a subset of TBTs. Definition of SPS measures in the SPS Agreement can be summarized as any measure that is applied to products entering into a country with the aim to protect human, animal and plant life or health from diseases or contaminated foods, beverages, feedstuffs, animals or plants (WTO, 1994b).

3.3. WTO Agreements on technical regulations related to agricultural and food trade

As negotiations through the General Agreement on Tariffs and Trade (GATT) and the WTO have begun to impose modest disciplines on the incidence of tariffs and other traditional barriers to trade, new forms of NTBs have become conspicuous (Roberts et al, 2001). Thus, the SPS Agreement, which treats the type of TBTs in agricultural and food trade that are most prevalent, and the TBT Agreement, which treat TBTs not encompassed by the SPS Agreement, have become more important in agricultural and food trade.[5]

[5] In the study on questionable technical barriers to trade in Thornsbury (1998), 259 barriers were identified as SPS measures, while only 27 were TBTs and 16 barriers touched on provisions of the GATT. Furthermore, Josling, Roberts and Orden (2003) report that between 1995 and 2001, 2,400 SPS domestic regulations were notified to the

Concurrently, the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), which includes geographical indications that provides producers opportunities for additional revenues and is the other type of technical regulation treated here, was created, and disciplines on technical regulations in the GATT, which provides fundamental principles governing all forms of trade, were maintained. All of these agreements are made enforceable by a dispute resolution mechanism created by an agreement on that matter, the Dispute Settlement Understanding (DSU).

3.3.a. The SPS Agreement

The main thrust behind the enactment of the SPS Agreement (WTO, 1994b) is to ensure distinction of legitimate agricultural and food TBTs related to protection of health and life from those that are disguised means of protection of special interests by establishing rules and procedures that enable the task (Jensen, 2002; Wilson, 2000; Roberts et al, 2001). SPS measures encompassed by this Agreement may dictate an end product criteria, or process or production methods (PPM) applied to the product (Annex A).

3.3.a.i. Legitimization of a SPS measure and risk assessment

The establishment of legitimate SPS measures begins by setting forth the right of WTO members to take necessary SPS measures in protecting human, animal or plant life or health from diseases or contaminated foods, beverages, feedstuffs, animals or plants, provided that these are not inconsistent with the provisions of the Agreement (Art. 2). Prescription of a legitimate SPS measure involves defining an acceptable level of risk derived from a SPS characteristic related to a good, and conducting the relevant risk assessment (Art. 5). The level of acceptable risk chosen and risk assessment results would then indicate the desired SPS standard, which would also be a legitimate SPS barrier as recognized by the Agreement.

The SPS Agreement intends to carefully control the use of risk assessment and the consistency of accepted risk to bolster trade expansion, as the application of risk assessment is restricted to that which bases itself on science. Furthermore, the SPS Agreement intends to assure that all member countries carry out risk assessment in a similar fashion by suggesting the

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WTO (a process or document called notification), while 800 such TBT notifications that reference agricultural products were recieved.

use of methodologies that relevant international organizations recommend. The international organizations identified by the Agreement for this purpose are the Codex Alimentarius Commission, for food safety measures, the International Office of Epizootics (OIE), for animal health measures, and the International Plant Protection Convention (IPPC), for plant health measures. Members must also avoid making distinctions between different measures in terms of the risk they accept. Additionally, if relevant scientific evidence is absent for conducting risk assessment, a member could temporarily adopt a SPS measure, but the member must seek information to set an appropriate level of protection in a reasonable period of time. Finally, as a matter of emphasizing freer trade, the Agreement promotes adoption of the SPS measure that minimizes negative trade effects.

Despite the firm foundation used in legitimizing SPS measures, the chosen basis for legitimization of risk assessment has received mixed reviews. For example, while Roberts, Orden and Josling (1999) conclude that the use of a scientific procedure in establishing legitimacy has reduced degrees of freedom in applying disguised measures of protection, they also criticize risk assessment's skewed weighing against gains from trade and in favor of risk mitigation. They argue that the use of risk assessment, and not cost-benefit analysis, trivializes benefits and inflates costs from imports.

On the other hand, Roberts et al (2001) assert that "the degree of commitment to science as the final arbiter of SPS disputes is far from complete among WTO members" as certain developed country members are more convinced about the use of risk assessment and cost-benefit analysis than others.

3.3.a.ii. Creating the most trade opportunity possible

Apart from the restriction placed on application of risk assessment in that it must be based on science, the SPS Agreement promotes multiple concepts that aim to facilitate trade expansion. These are harmonization, equivalence, regionalization, transparency, and elimination of excessive bureaucratic obstacles.

Harmonization suggests members to "base" their SPS standards on those set by the international organizations mentioned above (Art. 3). The Agreement gives an incentive for countries to adopt harmonized standards, or standards set by international organizations, as these are recognized to constitute legitimate SPS barriers. However, members are permitted to have more stringent standards if they are able to scientifically show the necessity to do so through risk assessment, given that those standards are consistent with other provisions of the Agreement. Therefore, risk assessment plays a part here in validating a measure against a harmonized one.

The SPS Agreement construct of equivalence allows for the possibility that a SPS measure differing from the one required by the importing country be considered as equivalent to the domestic one, given that the different measure achieves the importing country's appropriate level of SPS protection (Art. 4). The Agreement furthermore encourages formulation of bilateral or multilateral agreements on equivalent SPS measures.

The concept of regionalization is exemplified by recognition of pest or disease-free areas and areas of low pest or disease prevalence (Art. 6). These concepts introduce the possibility that SPS measures are adapted to the SPS characteristics of different regions, even within a country. Recognizing such areas permits the import of an agricultural and food product from a particular area of a country not infested by a pest or a disease, even when import from other areas of the same country is not permissible.

The principle of transparency is intended to oblige members to better inform their own SPS standards to interested members (Art. 7). To this end, enquiry points, where SPS regulations and relevant issues could be inquired, are to be established, and when standards substantially different from the international ones are adopted, that information is to be made public through notifications to the WTO by the notification authorities. This rule could only be omitted under urgent circumstances of protecting public health.

The Agreement requires members to eliminate excessive bureaucratic obstacles in the processes of control, inspection and approval of products (more frequently referred to as conformity assessment procedures) with respect to SPS measures by, for example, treating imports as domestic products are treated, notifying exporting members in a timely manner about any relevant information on the process of the product, and limiting information requirement to the minimum possible (Art. 8).

The assessment of Roberts, Orden and Josling (1999) on the performance of trade enhancing components of the SPS Agreement points out that the transparency provision has improved availability of information on SPS measures adopted, even though compliance differs by income level of member countries. Roberts et al (2001) assert that regionalization has created more trade opportunities, even though these opportunities have not been explored to full potential. But Josling, Roberts and Orden (2003) consider that the concept will become increasingly important.

On the other hand, these authors regard that potential benefits from lowered transaction costs due to the application of equivalence are very high. However, the difficulties that even developed countries have in negotiating equivalency agreements have left those gains distant from what is achieved in reality. In theory, although harmonization may compromise regulatory flexibility needed to incorporate country differences in actual risks, tastes, and income levels, positive impact of the universal adoption of harmonization on world welfare may be even greater than that caused by equivalency agreements, since the need for transparency and equivalence would altogether be eliminated (Roberts, Orden and Josling, 1999). However, they find that in practice harmonization has had a low incidence, as, for instance, only 22 percent of high-income countries showed partial or full harmonization of SPS measures as a percentage of their notified ones from 1995 to 1999. Roberts et al (2001) agree with the conclusions that less progress has been made on harmonization and equivalence, and note that the lack of input from international standard setting organizations is partly the cause. Concretely, Josling, Roberts and Orden (2003) assert that the majority of SPS notifications during 1995-2002 point to the nonexistence of relevant international standards.

Overall, a number of experts agree that the SPS Agreement has promoted revision of the domestic SPS regulatory system in many countries to the benefit of a more open trade (Josling, Roberts and Orden, 2003; Roberts et al, 2001; Henson et al, 2000).

3.3.a.iii. Considerations of developing countries

An article in the SPS Agreement promotes the provision of technical assistance to developing countries so the latter achieve exporting products that meet SPS requirements of their exterior markets (Art. 9). A related provision is that of special and differential treatment, which stipulates that in the time frame of application of SPS measures and of compliance of the Agreement, special needs of developing countries should be accounted for, and a phase in period may be granted (Art. 10).

On special considerations for developing countries, Roberts, Orden and Josling (1999) opine that given structural impediments that developing countries face, international assistance is crucial. Moreover, they continue by insisting that differential treatment be focused on the provision of international assistance and not on concession of more lax conditions for meeting SPS standards, since this last approach would give signals to the market about imports from those countries being of lower grade.

Other authors note problems with application of these articles that is a result of their lax wording. Jensen (2002) and Henson and Wilson (2002) bring to attention the vagueness and lack of commitments mandated by the articles on considerations for developing countries. Consequently, developed countries have made few efforts to take considerations of developing countries into account and to provide technical assistance, and developing countries have voiced their dissatisfaction with these results. Jensen (2002) and Henson et al (2000) urge developed countries to commit to the SPS Agreement clauses of technical cooperation and special and differential treatment.[6]

3.3.a.iv. Dispute resolution

A final point to note about the SPS Agreement is that it has two mechanisms, one informal and the other formal, for resolution of disputes. At the first instance, complaints, or "counter notifications", may be submitted by the offended country to a WTO SPS Committee. The SPS Committee was created by the Agreement to provide a forum for negotiations and consultations, for promoting the use and formulation of recommendations by international standards organizations, and for the general purpose of furthering the causes of the SPS Agreement, and meets three to four times a year (Art. 12). This form of dispute resolution has been effective as many cases have been successfully negotiated without having to rely on the formal dispute settlement system (Jensen, 2002).

When informal negotiations do not lead to resolution of the differences, the formal dispute settlement mechanism may be utilized (Art. 11). According to the DSU, formal consultations between the affected parties are held before a panel is formed and decision by the panel is

[6] The issue of special and differential treatment (S&D), including technical assistance, has been emphasized in the Doha round of WTO negotiations that are currently underway. The Doha Declaration, which provides the mandate for negotiations on various subjects and on other work that include implementation on existing agreements, has established that S&D provisions would be reviewed with a view to strengthen them (WTO, 2004a). Special Sessions of the Committee on Trade and Development have thus been established by the Trade Negotiations Committee since March 2002 to make relevant recommendations to the General Council (WTO, 2002c). A session on S&D provisions in the SPS Agreement was held in November 2002, but detailed recommendations have not been made public as negotiations continue.

reviewed by the WTO Appellate Body if so requested. The panel and Appellate Body could reach binding resolutions, so that the Agreement is enforceable.

The dispute resolution mechanism seems to function relatively well with respect to the SPS Agreement, as complainants have won the cases they submitted. To illustrate, during the period 1995-2002, 22 formal requests for consultations that referenced the SPS Agreement were filed (Josling, Roberts and Orden, 2003). Of those, 4 complaints, or 3 cases since 2 complaints are by different countries on the same case (US and Canadian complaint on EU ban on growth hormones), reached the panel and Appellate Body rulings, all in favor of the complainant.[7]

However, implementation of rulings may occasionally surface to be problematic, as the hormones case illustrates. In this case, the EU has not yet complied with the Appellate Body ruling for removal of the hormone ban. This case demonstrates that the WTO may face challenges in resolving disputes that relate to national political sensitivities in powerful countries (Josling, Roberts and Orden, 2003).

3.3.b. The TBT Agreement

A key concept to distinguish goals of the TBT Agreement in agricultural and food trade from those of the SPS Agreement is whether regulations are "risk-reducing", or "non-risk reducing" or "quality-related" (Roberts, Josling and Orden, 1999; Josling, Roberts and Orden, 2003). Clearly, the SPS Agreement addresses risk-reducing regulations as the measures covered intend to regulate risks to animal, plant, or human health. With respect to technical regulations, the TBT Agreement covers non-risk-related attributes such as product quality and method of production. Furthermore, the TBT Agreement intends to regulate mandatory measures, or what the Agreement refers to as technical regulations, as well as voluntary ones, or standards (Annex 1), while the wording in the SPS Agreement seems to direct attention to mandatory measures only (SPS Agreement, Annex A). At the general level, the TBT Agreement emphasizes compliance not only by central governments, but also by local governments and by standard setting bodies. Other differences and similarities between the two Agreements are summarized below, but it is important to note that the two Agreements share a very similar underlying framework.

[7] By the end of 2003, one more complaint (US complaint on Japan's importation restrictions of apples due to fire blight disease-causing organism) had reached the panel and Appellate Body rulings, with a ruling in favor of the complainant (WTO, 2003g).

Article 2 sets the most important clauses of the TBT Agreement. That article sets the legitimate objectives for which technical regulations may be implemented and the method of assessing legitimacy of such a regulation:

> "Such legitimate objectives are, *inter alia:* national security requirements; the prevention of deceptive practices; protection of human health or safety, animal or plant life or health, or the environment. In assessing such risks, relevant elements of consideration are, *inter alia:* available scientific and technical information, related processing technology or intended end-uses of products."

The concept of least trade restrictiveness is also embedded in the article, in a similar manner as in the SPS Agreement. Disciplines on standards are covered in the "Code of Good Practice" (Annex 3), which incorporates many of the principles utilized in disciplining technical regulations. Some analysts note that the wording of legitimate objectives and assessment procedures is less precise than in the SPS Agreement, and that this may enable fulfillment of WTO requirements less stringent for food quality regulations than for food safety regulations (Roberts et al, 2001).

Harmonization is also advanced in this Agreement much in the same manner as in the SPS Agreement in that international standards must be used as a "basis" for setting technical regulations, but divergent regulations may be implemented according to domestic needs. International standards are recognized as legitimate TBTs. However, unlike the SPS Agreement, no specific international standard setting organization is referenced (Josling, Roberts and Orden, 2003). Additionally, recognition of equivalence of regulations is urged in the TBT Agreement.

The principle of transparency appears scattered in Article 2, and Article 10 is wholly devoted to it. Elimination of excessive bureaucratic obstacles is the issue of Articles 5 and 6. Stipulations that make these principals functional are similar to those in the SPS Agreement. Additionally, technical assistance and special and differential treatment of developing countries are covered in Articles 11 and 12, respectively.

The TBT Agreement creates the TBT Committee (Art. 13), in which counter notifications are presented. TBT conflicts between members not solved at this instance may be referred to the Dispute Settlement Body (Art. 14). In enforcing the SPS and TBT Agreements, while 187 counter notifications were received by the SPS Committee between 1995 and 2001, 102 counter notifications related to agricultural and food labeling regulations were received by the TBT Committee in the same period (Josling, Roberts and Orden, 2003).

Experience of food related TBT issues in the dispute settlement mechanism is less numerous than that of SPS issues as only one case has undergone all the dispute settlement process. Peru won this case as a complainant over the EU's control on voluntary claims over labeling of sardines.

3.3.c. The TRIPS Agreement

The principal aim of the TRIPS Agreement is to provide effective protection of trade-related intellectual property rights. This Agreement concerns agricultural and food trade as geographical indications, of which most concern agricultural products, are considered intellectual properties and protection is provided accordingly (Josling, Roberts and Orden, 2003). GIs are indications that a product originates in a particular locality in a country, where the contribution of that location as an origin to an attribute of the product is crucial (Art. 22). Degree of GI protection at the national level differs substantially, and the TRIPS Agreement establishes criteria that these regulations must meet to avoid possible trade conflicts when divergent protection levels and mechanisms are implemented between countries (Josling, Roberts and Orden, 2003).

Article 22 of the TRIPS Agreement obliges national governments to provide protection to GIs and prohibits the use of trademarks in a manner that deceives consumers or that constitutes unfair competition, allowing governments to invalidate such trademarks. Article 23 provides additional protection for GIs in wines and spirits as mention of a GI by other producers in any way is strictly prohibited. Therefore, the use of words such as "kind", "type", "style" or "imitation" with a GI of another product is deemed illegal.

Two exceptions to the protection of GIs are stipulated in Article 24. GI protection does not need to be provided for names indicating product origins whose use has become a custom. As a consequence, the United States is allowed to permit the use of "Champagne" to describe sparkling wine as the name has been recognized as generic term under the US trademark law (Josling, Roberts and Orden, 2003). The other exception is referred to as the "grandfather" provisions for existing products, where a trademark was legalized in an importing country before the TRIPS Agreement came into effect or before GI protection was provided in the exporting country. The terms of this exception is narrower for wines and spirits as those names must have been in continuous use for 10 years prior to the conclusion of the Uruguay Round.

Provisions under the Dispute Settlement Understanding apply for conflict resolution under the TRIPS Agreement (Art. 64). As of May 2003, only one dispute settlement case had been raised that concerned a GI. In that case, the United States complained about the successful cancellation of a beer company's trademark by the Czech Republic in four European countries, as that trademark is a GI for beer from a Czech town (Josling, Roberts and Orden, 2003). The EU considers that GIs are superior in right to trademarks, but the US adheres to the "first-in-time, first-in-right" principle for GI and trademark protection.

The low incidence of formal GI disputes masks the polemical nature of the debate on WTO disciplines on GIs. But a closer look at the dispute settlement case reveals different dimensions of the issue. On the one hand, tension exists between the coalition of countries led by the EU that want to extend the rights to GIs, and those that oppose such initiative, represented by the US and Australia (Josling, Roberts and Orden, 2003). On the other hand, there is uncertainty over the supremacy of trademarks versus GIs. This uncertainty extends over the definition of GIs itself as different WTO members use different versions, and both of these uncertainties make evaluation of initiatives presented by the two sides on the multilateral GI regulation framework less conclusive.

3.3.d. The GATT Agreement

The GATT is important for technical regulations for two reasons. First, it sets general principals that are repeated in the three Agreements discussed. One of these is the most favored nation principal (Art. I). In summary, it states that countries must provide the same treatment to goods originating from all other member countries of the WTO. National treatment is the domestic versus foreign products version of the equal treatment principle (Art. III).

The GATT is also important for legitimizing the SPS, TBT and TRIPS Agreements. Thus, Article XX allows establishment of measures that reference SPS issues, conservation of exhaustible natural resources, prevention of deceptive practices, and protection of intellectual property rights.

3.4. Technical regulations and developing countries

In the 1990s, food exports represented an important share of 13% in total developing countries exports (Wilson, 2000). Although this figure represents a decline from a peak of 20% in the mid-1980s, the presence of comparative advantage in agricultural and food production suggested by analysts alerts to the continued importance of agricultural and food trade for developing countries.

The impact of technical regulation issues within agricultural and food trade for developing countries has been cited in the literature, although this literature is not extensive (Henson, 2002). Emphasis has been placed on implications of technical regulations on developing country exports. In a specific case that was studied by Otsuki, Wilson and Sewadeh (2001), the authors estimate that the EU's new aflatoxin standards would cause African food exporters to lose $340 million in revenue as they claimed not to be in capacity of meeting the new requirements. More generally, in a survey of WTO delegations from low and middle income countries, Henson et al (2000) report that delegates gave the most importance to SPS requirements, followed by other technical requirements, as factors influencing their countries' ability to export agricultural and food products to the EU.

Technical regulation issues that developing countries face in trade are complex. Josling, Roberts and Orden (2003) present a classification scheme that organizes technical regulations under a coherent framework. They propose classifying technical regulations by their goal, attribute focus, breadth, and scope. The first two classification methods have been introduced in this paper. Characterization by goal prescribes distinction between risk-reducing and quality-related measures, and analysis of regulations by attribute focus allows distinction between content and process (or PPM) attributes. Distinguishing regulations by breadth leads to identification of vertical and horizontal measures. Vertical measures are those that apply to a single product or multiple products that are related through the marketing chain. Horizontal measures apply to products that are not necessarily related through the marketing chain. Finally, classification by scope makes distinction between uniform regulations, which apply equally to products of domestic and foreign origin, and specific regulations, which apply only to imported products, often only of certain origins.

Another useful classification of technical regulation issues for developing countries intends to highlight the decisive factors that determine the degree of success in managing these regulations, both as exporters and importers. These factors are present at different dimensions: externally and domestically. External factors are given by the WTO Agreements and their clauses that discipline technical regulations, as these set the rights as exporters and obligations as importers of countries in managing those measures. Domestic factors pertain to actions of private firms in the agricultural and food industry and public institutions that share a stake in it. Although these factors are beyond the reach of the multilateral agricultural and food trade framework, they are basic in determining the degree of success of managing trade-related technical regulations. The discussion below concentrates mainly on issues relating to SPS measures as an illustration.

The distinction proposed by this classification is helpful for developing countries for several reasons. First, it facilitates identification of the availability of specific multilateral legal resources that may possibly be used to present an unresolved case, or in classifying a successful case it intends to explain the primary reasons for which success was achieved. Second, it helps in determining whether the key factors lie within the limits of control of domestic institutions or firms, or beyond them. Third, when key factors are within the control of domestic agents, specific actions that are essential to successful management of technical regulations are identified so that improvements in that area can be planned under an unsuccessful instance.

3.4.a. Concerns as exporters

The nature of technical regulation obstacles that developing countries confront in trading with developed countries may be different from the respective nature associated with trading with other developing countries. For example, developed countries typically impose stricter technical regulations, and the gap with the more lax regulations that developing country producers comply with domestically creates higher compliance costs for exporting to developed country markets (Henson et al, 2000). Perspectives of developing countries as exporters to developed countries are especially discussed in this section.

3.4.a.i. Benefiting from the SPS Agreement as exporters

Although the WTO Agreements are binding, not all clauses impose obligatory action. Distinction between such non-binding clauses and binding clauses in the Agreements is important as, for instance, even if certain technical regulations are found to be in contempt of non-binding clauses, a formal legal challenge on that basis will probably not be successful. In the SPS Agreement, three articles pertain to non-binding clauses. These are harmonization, technical assistance, and special and differential treatment for developing countries. The rest of the principles, although arguably with the exception of equivalence, impose mandatory actions to signatory members of the Agreement.

It is clear that, despite the Agreement's loose reference to them, the non-binding concepts are very important for developing countries in preventing loss of their exports. To illustrate, Henson et al (2000) found from a survey on WTO delegates that developed countries' insufficient account of the needs of developing countries in setting SPS requirements was considered as the most important problem associated with the manner in which the SPS Agreement operates. This consideration was followed by the insufficient time allowed between notification and implementation of the requirements, and the insufficient technical assistance given to developing countries.

Henson et al (2000) note that harmonization can benefit developing countries since closing the gap in divergent technical regulation requirements lowers compliance costs for their producers. In this respect, it is interesting to note that 68% of all high income countries, including non-members of the WTO, are members of both the WTO and the three international standards setting organizations mentioned in the SPS Agreement (Henson et al, 2000). However, few SPS measures in developed countries have been replaced by international standards and consequently developing countries have not been able to make the most of harmonization.

The EU's setting of tight aflatoxin standards provides an illustrative case of the manner in which measures in developed countries can affect export interests in developing countries through possibly disregarding or respecting non-binding clauses of the SPS Agreement (Josling, Roberts and Orden, 2003). Aflatoxins are toxic compounds found on cereals, nuts, vegetables and fruits. In 1999, the EU's new integrated aflatoxin standards came into effect, replacing, in most cases at stricter levels, national standards that were applied by its member countries (Otsuki, Wilson and Sewadeh, 2001). In setting its new standards, the EU made clear that it did not support international standards that were being considered by Codex, thus inviting criticisms on EU's possible contempt for harmonization to international standards by affected exporting developing countries. Some developing countries were also critical of the EU's lack of consideration for the needs of developing countries in setting the standards (Henson et al, 2000).

Brazil nut exporters in Bolivia were among those who foresaw their export opportunities severely diminish as a result of the new EU aflatoxin standards. However, a proactive response by Bolivia led it to initiate bilateral discussions with the European Communities in order to find a solution that was agreeable for both parties. Consequently, the EU included a project to help Bolivia meet the new aflatoxin standards in its development cooperation program, and the EU also had proposed a certification procedure for Bolivian exports, thus possibly fulfilling the technical assistance recommendation in the SPS Agreement (Josling, Roberts and Orden, 2003).

Developing countries have also been challenged in benefiting from binding clauses in the SPS Agreement. These countries have questioned the creation of export opportunities that equivalence arrangements can provide for them given obstacles that even developed countries find hard to overcome (Josling, Roberts and Orden, 2003). This concern is supported by the scarcity of equivalency arrangements involving developing countries. Developing countries further complain that compliance with effective measures is often required instead of equivalence of alternative measures (Josling, Roberts, and Orden, 2003; Jensen, 2002; Henson et al, 2000). Jensen (2002) notes that the crucial constraint preventing developed countries from considering equivalence arrangements is their lack of trust on the SPS management systems of developing countries.

Lack of trust by developed countries is illustrated by Zimbabwe’s conformity assessment problems on fresh horticultural produce exported into the EU (Henson et al, 2000). Zimbabwe’s horticultural produce for export is inspected by its Ministry of Agriculture to verify that the produce is free of pests and diseases prohibited by the EU, and it is sometimes inspected at the EU border too. In this case, contempt for most favored nation may be an issue as horticultural imports from Zimbabwe are presumably inspected more frequently than those from developed countries. Furthermore, certain EU countries may also be disregarding national treatment if claims that lengthy inspection occurs more frequently at Mediterranean countries that have industries competing with Zimbabwe’s imports are precise.

On the other hand, regulatory reform promoted by the SPS Agreement, and especially by the use of science in assessing risk to set the acceptable level, has presumably brought benefits to developing countries. Case law is also promulgating such reform, as the WTO Appellate Body has ruled all three SPS cases that it has evaluated to be in violation of risk assessment clauses. This impetus for reform may be of special importance for developing countries as they are frequently unable to take advantage of mechanisms such as the dispute settlement system (Jensen, 2002).

Partial lifting of a ban imposed by the US on Mexican avocados exemplifies benefits that developing countries may accrue from revision of local SPS systems. The ban was initiated in 1914 when there were no known controls for certain avocado pests prevalent in Mexico but not in the US (Josling, Roberts and Orden, 2003). The Mexican state of Michoacan subsequently developed control methods that made it successful in the export market, and Mexican authorities long argued for lifting of the US ban as associated risks of pest introduction were small. Insistence by Mexican authorities that the ban was not based on risk assessment (but instead on interests to protect the incomes of US avocado growers) was eventually rewarded as the US started limited importation of avocados from Mexico in 1997. Partial success enjoyed under the initial ruling that allowed limited importation from Mexico has subsequently led to increased ease of the import restrictions, possibly fulfilling the least-trade-restrictiveness principle.

The limited importation scheme of avocados from Michoacan in Mexico also seems to have realized the concept of regionalization. But regionalization is generally still a concept with great potential but with few realized benefits for developing countries, as these countries must often first clear domestic constraints that they face.

Compliance with transparency provisions has been satisfactory, as most high, upper-middle and lower-middle income countries had notified their enquiry points and notification authorities by June 1999 (Roberts, Orden and Josling, 1999).[8] However, very few low income countries, most of which are categorized as least developed countries by the WTO, had reported the set up of those institutions. Although least developed countries were not obliged to comply with the provisions of the SPS Agreement until 2000, the lack of a notification authority in many of those countries has likely precluded their exporters to have more detailed information about changing SPS measures in their export markets (Jensen, 2000).

Among high-income countries, 81% had notified one or more changes in SPS regulations by the end of 1998 (Roberts, Orden and Josling, 1999). This seemingly high level of transparency has allowed developing countries to initiate more discussions with developed countries following notifications of new or modified SPS measures, as the debate on the EU’s new aflatoxin standards in the SPS Committee illustrates (Henson et al, 2000; Jensen, 2002).

[8] Income categories as defined in World Bank (2002a).

Furthermore, any information on changes in SPS measures in export markets and subsequent inter-governmental discussion would most likely have been unavailable for developing countries with scarce resources without the SPS Agreement (Jensen, 2002).

However, developing countries voice concerns over the length of time between notification and implementation of new measures, and over the quantity and quality of information contained in the notifications (Henson et al, 2000). As an illustration, in 1997 Ghana had to learn of requirements under the EU's new HACCP (Hazard Analysis Critical Control Points) regulations for fish imports through bilateral contacts with the EU in Brussels.[9] In the end, Ghana did not only obtain information but also a technical assistance offer from the EU. Finally, developing countries complain that developed countries do not take their comments made in counter notifications into account (Jensen, 2002).

3.4.a.ii. Capacity to meet exterior requirements

One theme that analysis of developing country technical regulation issues as an exporter clarifies is that effectiveness of response to external technical regulations is strongly influenced by developing countries' generally low capacity of managing domestic technical regulations. Analysis of domestic factors helps in identifying the exact source of such deficiencies.

Benefiting from the SPS Agreement as an exporter entails duties for the public as well as the private sectors involved. Each sector has specific tasks that the respective sector must conduct in order to successfully export a product that needs to meet a SPS standard. These tasks and their descriptions are summarized in Table 3.1, including those for an importing country.

The public sector has three categories of tasks as an exporting country. One of these categories is the provision of institutional arrangements for technical regulation. This category captures the government's role of providing a regulatory framework and institutional arrangements that enable effective regulation and that allows benefiting from WTO obligations. The existence of a sound SPS regulation system is essential in realizing benefits from the SPS Agreement as exporting firms that also produce for local consumption will be habituated to operating in a regulated environment and governments may be better qualified to conduct competent authority services, which are PPM-based conformity assessment procedures delegated

[9] A HACCP system is a subset of "general quality management systems, and is used to address food safety hazards that can be introduced at different points in the food chain or are difficult to measure" (Unnevehr, 2000).

Table 3.1 Decisive domestic factors in managing trade-related technical regulations

Responsible sector	Decisive factor	Description	Applies to	
			Exporter	Importer
Public	Provision of institutional arrangements for technical regulation	Provision of regulatory framework and institutional arrangements that enables effective regulation, and that allows benefiting from and complying with WTO obligations.	X	X
	Active use of international institutions and channels	Active use of the WTO institutions, standard setting organizations, and bilateral and multilateral channels to communicate domestic regulations, acquire information on exterior regulations, and represent domestic and regional interests.	X	X
	Provision of competent authority services	Provision of functional competent authority conformity assessment services to exporters.	X	
	Control of regulatory capture	Control of regulatory capture by overseas or importing firm, or by domestic producer and consumer interests that distorts import of products.		X
Private	Acquisition and assessment of technical regulation and consumer preferences	Acquisition of information on new technical regulations and changing consumer preferences, and economic assessment of firm response.	X	X
	Attainment of economic feasibility	Attainment of economic feasibility despite constraints placed by new technical regulations and consumer preferences.	X	X
	Access to factors of production	Access to appropriate technology and expertise, and to financial resources that allow investment in those factors for meeting new regulations and consumer preferences.	X	X

Source: Author's classification.

by importing countries to exporting country authorities (Henson et al, 2000). For example, despite the problem of lack of trust by its export market, Zimbabwe found it relatively easy to implement competent authority services required by the EU as it already had a well-developed SPS control system.

The capacity of developing countries to effectively take advantage of binding clauses of the SPS Agreement is dependent on the provision of adequate institutional arrangements. A developing country may not request recognition of regionalization if effective control measures are not provided for where there are insufficient natural impediments for the movements of pests and diseases or where animals move freely across borders (Josling, Roberts and Orden, 2003). Furthermore, although transparency has made information on SPS measures more available, developing countries are sometimes not able to comment on the risk assessment basis of measures addressing new hazards as relevant scientific expertise only exists in developed countries (Henson et al, 2000; Jensen, 2002). The lack of scientific expertise also hampers efforts to participate effectively in international standards organizations and dispute settlement procedures.

Additionally, developing countries lack local surveillance, toxicological and epidemiological data necessary to assess the implications of new measures for their exporters, and to adequately challenge the risk assessment basis of the measures. Henson et al (2000) acknowledge that certain developing countries have the necessary factors to prove possible illegitimacy of SPS measures in developed countries, but the authors also point out that those are typically large countries.

When a regulatory system is in place, it is important that sufficient political support and adequate institutional design accompany the system. To illustrate, when awareness and understanding of government officials on SPS issues is lacking, reaction to notifications may be inadequate (Henson et al, 2000). Furthermore, since administrative responsibilities for a SPS management system normally spans over several government institutions, in many cases the lack of clearly defined functions for each institution and appropriate means of communication between them prevents a smoothly functioning system.

Survey results on WTO delegates in Henson et al (2000) demonstrate the significance of providing adequate institutional arrangements to manage SPS measures. For instance, the insufficient ability to comment on notifications was the number one factor considered as influencing the ability to participate effectively in the SPS Agreement. Some of the other factors considered important were the insufficient ability to demonstrate equivalence of domestic measures, and to assess the scientific justification of developed country requirements.

Finally, it is important to note that lack of trust by developed countries on developing countries' SPS management systems is caused by real deficiencies in those systems (Jensen, 2002). This implication of SPS system deficiency is significant as differential treatment of importers based on real differences in risk is allowed by the SPS Agreement, thus possibly invalidating the case for Zimbabwe's complaint about its problems with conformity assessment presented above.

The other two factors that determine the success of a technical regulation management system may be contemplated as elements of provision of institutional arrangements. However, these two factors are distinguished from the category presented above as they pertain to public functions that serve the special purposes of exporters, whereas domestic institutional arrangements also provide public services for production directed to the local market.[10]

One of the two public service categories specialized for exporters' needs is the active use of international institutions and channels. In facing exterior technical regulations, governments must actively use the WTO institutions, standard setting organizations, and bilateral and other multilateral channels to acquire information on exterior regulations, and represent domestic and regional interests. The constructive negotiation initiated by Bolivia in facing the EU's new aflatoxin regulation and the initiative of obtaining better information on the EU's new HACCP regulations by Ghana constitute successful examples as the efforts led the EU to offer those countries technical assistance.

Data from the SPS Committee gives a more general picture of developing countries' use of an important international institution. Of the 187 counter notifications submitted to the SPS Committee during 1995-2001, developing countries were the complainant in over 40 percent which is slightly less than their 48% share in global food trade (Josling, Roberts and Orden, 2003). On the other hand, over the period November 1995 to September 1998, almost 50 percent of low- and lower-middle income countries attended none of the SPS Committee meetings, and

[10] Notwithstanding, close ties between the domestic and the strictly trade-oriented institutional arrangements are acknowledged. For example, it is evident from the discussion above that shortcomings in the domestic institutional arrangements undermine effectiveness of participation at international institutions. The ensuing discussion focuses on illustrating the importance of trade-oriented institutional arrangements for developing countries.

less than 5 percent attended five or more of these meetings (Henson et al, 2000).[11] The seemingly contradictory data seems to be explained by the almost exclusive use of the counter notification mechanism by richer developing countries such as those of the Cairns Group, as of the 85 times that a developing country acted as a complainant in the SPS Committee meetings from 1995 to March 2001, the Cairns Group countries were responsible in 70 times (Jensen, 2002).[12] African and least developed countries were practically absent as complainants in that period.

To begin with, it should be noted that many developing countries have very small missions in the WTO headquarters at Geneva, and those that do not have permanent missions use staff at their embassies in Brussels or elsewhere in Europe (Henson and Wilson, 2002). These missions typically handle matter related to both WTO and United Nations in Geneva. These facts make very evident the paucity of financial resources that many developing countries face, which does not give room for participating effectively in standard setting organizations or dispute settlement procedures either.

To illustrate with participation at the dispute settlement process, it must be first recognized that developing countries have had their share of participation as, of 22 total complaints submitted by the end of 2002 that referenced the SPS Agreement, developing countries had presented five (Josling, Roberts and Orden, 2003). Furthermore, in the recent years of 1999 to 2002, developing countries have presented more (5) such complaints than developed countries did (2). However, no African or least developed member has yet to submit a formal complaint (Jensen, 2002).

The lack of capacity of many developing countries to participate effectively in international institutions due to resource constraints has several implications. First, these countries feel that their participation can be made productive when they can participate collectively, in which case financial constraints may be mitigated (Henson et al, 2000). Similarly, developing countries may see their expertise deficiency relieved in a WTO complaint if they participate as a partner to a developed country complainant.

Second, many developing countries are skeptical about the extent to which their views are taken into account. For instance, India's still expressed regret over the panel and the Appellate

[11] Only meetings for which participant lists are available are considered.

[12] The Cairns Group is a coalition of 17 agricultural exporting countries who account for one-third of the world's agricultural exports and has been influential in promoting agricultural trade reform (Cairns Group, 2003). Members of the Cairns Group are Argentina, Australia, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Guatemala, Indonesia, Malaysia, New Zealand, Paraguay, the Philippines, South Africa, Thailand and Uruguay.

Body decision which allowed the US to obligate the use of turtle excluder devices (TEDs) to its importers with the aim to reduce accidental deaths of turtles when catching shrimp, reflects developing country skepticism of the dispute settlement procedure (Henson et al, 2000). In that case, a final ruling that the measure infringed GATT Article XX's preamble was reached, but the panel and the Appellate Body allowed imposition of the measure on grounds that the US was providing the TED technology (Josling, Roberts and Orden, 2003).

The other public function provided especially for the needs of firms producing exported products is the competent authority services. The capacity of a developing country to provide these services is becoming increasingly important as process-based SPS regulations are becoming a commonplace (Josling, Roberts and Orden, 2003).

An implication for developing countries of the increased use of such conformity assessment procedures that assess clearance of food safety risk requirements prior to exportation is that rejection costs are less since transportation costs associated with export of products have not been realized when inspected. However, firms face less flexibility in choosing how to produce and, even if they meet the process-standards, they may not be allowed to export if their government lacks the capacity to function as a competent authority approved by the government in the export market (Henson et al, 2000).

To illustrate, the Indian shrimp industry was suspended from exporting for four months, after the EU's inspection in 1997 of a number of production facilities, which had been approved by the competent authority, led to findings of problems with the inspection and approval systems (Henson et al, 2000). Indian shrimp exports, including those of certain production facilities that did meet EU standards, were restarted when new conformity assessment systems that ensured full compliance were in place. The likelihood of failure of a developing country institution to effectively function as a competent authority allows developed countries to question whether imported products have actually cleared their standards, and they may 're-inspect' those products at their borders however duly the process may seem to developing countries.

The private sector has four categories of tasks it must accomplish or of factors that are crucial to effectively manage exterior technical regulations as an exporter. The industry must first acquire sufficient information on the relevant technical regulations, with which it must be able to assess the adequate firm response.[13] Potential problems in this dimension for firms in developing countries abound. WTO delegates from developing countries have pointed out that the agriculture and food industries sometimes have problems obtaining information on SPS requirements (Henson et al, 2000). Additionally, knowledge about the SPS Agreement is not widespread, in which case firms would naturally not be aware of the potential benefits for them (Jensen, 2000).

Firms involved in the affected export good must also be able to attain economic feasibility, assuming that the imposed measure is legitimate, that the correct firm response is taken, and that factor markets are efficient in supporting the response. Assuring profitability is naturally a central problem for private firms, but despite the assumptions listed above, impediments may still present the private sector for an effective management of trade-related technical regulations. For example, even when they are aware of the Agreement and they have a possibly legitimate case against a new measure, firms may see little use of the SPS Agreement as their markets may be too small to merit presenting the case to the national government and the WTO, or the long period that the dispute settlement process takes may discourage them from submitting the case as accessing alternative markets may be more productive (Jensen, 2000). Another example is Bolivia's Brazil nut case, in which the industry may not have been able to maintain its exports to the EU after the new aflatoxin regulations came into effect if it were not for the technical assistance that Bolivia's producers were to receive. This case suggests that economic feasibility may not have been attained in exporting to the EU with the new regulations as, for instance, local financial institutions may not have lent available investment funds to the producers for presumed high risk of the associated operation. The EU's technical assistance may therefore have made the prospects of profitability possible for Bolivian Brazil nut exports.

Deficiencies in production factor markets may present as a hindrance when firms find it necessary to make adjustments to their production or process methods as a result of new exterior technical regulations. Appropriate technology and expertise may be some of those factors associated with market imperfections that result in difficult access to them. Due possibly to limited economies of scale, these factors are sometimes not available locally and must be obtained from abroad, thus raising their costs as factors of production. For example, Henson et al

[13] Similarly, to the extent that voluntary standards which are not legally mandatory can be closely related to consumer preferences, it is important for firms to have the capacity to assess changing consumer preferences (Henson et al, 2000). However, this issue is beyond the scope of this paper.

(2000) report the case of a meat processing company which, in anticipation of India's future regionalized certification for export of fresh and frozen meat to the EU, has had problems obtaining the necessary expertise and equipment to comply with the EU's requirements. The company had to bring experts from Australia and New Zealand and imported the equipment, which increase hiring and purchasing costs compared to a case in which personnel and equipment are available in the domestic market. Developing country government officials recognize the problem illustrated by this example as WTO delegates have identified shortage of technology and expertise as the most important problem in meeting SPS requirements in exporting agricultural and food products to the EU (Henson et al, 2000).

Financial resources may also be crucial as factors of production since large capital investment may be necessary in managing trade-related technical regulations. Like technology and expertise, these resources may also embrace their own market deficiencies, such as scarce economies of scale and market or policy failure, that makes their access arduous. WTO delegates from developing countries have also noted the importance of availability of financial resources to developing country firms (Henson et al, 2000).

3.4.b. Commitments as importers

In developing countries, focus has been directed on extension of market access created by technical regulation disciplines such as the SPS Agreement (Jensen, 2002). However, although the WTO Agreements *obligate* countries to open their borders to more imports, consumers in developing countries may also gain from trade as imports with specific attributes are introduced at lower prices. To the extent that developing countries are characterized as importers, implications for developing countries as exporters to other developing countries are also analyzed in this section.

3.4.b.i.Compliance with the SPS Agreement as importers

Compliance with harmonization by developing countries exposes a mixed story. It is important to first note that, of all low- and lower-middle income countries including non-members of the WTO, only about a third are members of both the WTO and the three international standards setting organizations, while the respective figure is 59% for upper-middle income countries (Henson et al, 2000). Additionally, in the period 1995-1999, partial or full acceptance of international standards as a percentage of total notified measures was higher (38 percent) for lower-middle income countries than developed countries (Josling, Roberts and Orden, 2003). On the other hand, the acceptance rates of international standards by lower-income and upper-middle income countries were lower than that of high income countries.

Reasons for the low adoption of international standards may be found in the manner in which international standards setting organizations operate. Critics point out that standard setting in these organizations has followed interests of developed countries, partly due to the resource constraints that developing countries confront in participating in standards setting meetings (Victor, 1999 cited in Roberts, Orden and Josling, 1999; Henson et al, 2000). The lack of developing countries' voices at these international institutions may thus lead to the establishment of international standards that are far from appropriate for their development levels (Jensen, 2002). To further support the claims of developing countries, international standards are reportedly slower to develop in areas where developed countries do not share their interests.[14]

On implementation of transparency, about half of upper-middle and lower-middle income countries and only 6% of low income countries had notified at least one SPS regulation change by the end of 1998 (Roberts, Josling and Orden, 1999).[15] The rate of notification for lower- and upper-middle income countries is lower than their implementation rates of enquiry points and notification authorities, which were set up at rates higher than 80%. However, it is not straightforward to judge implementation of transparency on the basis of the notification rate for these countries as compared to the respective rate for developed countries, since developing countries may make less changes to SPS regulations or may create only a few new such regulations reflecting the lower priority they place to domestic SPS matters.

The lower significance of domestic SPS issues for developing countries as compared to developed countries, which translates into the typically lower SPS standards in developing countries, is partly reflected in the fewer counter notifications that developing countries have received. For instance, in the period 1995-2001, developing countries received 50 counter notifications from developed countries and 22 from other developing countries, whereas developed countries received 58 and 54 counter notifications from the respective groups (Josling,

[14] For example, international standards for pesticide residues in tropical fruits do not exist (Chan and King, 2000 cited in Jensen, 2002).
[15] It is stressed again that least developed countries, which make up most of low income countries, were not obliged to conform to the SPS Agreement obligations in that period.

Roberts and Orden, 2003). Similarly, of 22 complaints submitted by the end of 2002 that referenced the SPS Agreement, developing countries were respondents in six complaints. However, in the recent years of 1999 to 2002, developing countries have responded to more complaints (4) than developed countries did (3). Additionally in the same recent period, developing countries were responding to more complaints by developing countries (3) than by developed countries (1).

Finally, the lack of expertise and of other resources in general in many developing countries seems to point to the conclusion that the issue for these countries in complying with the clauses which are strongly associated with the application of scientific justification, namely equivalence, risk assessment, regionalization and conformity assessment, is the limited capacity to conduct assessments relevant to those clauses. These issues are thus discussed further in the next section.

3.4.b.ii. Government capacity and willingness to allow imports

It is natural to infer that lack of public resources in many developing countries will hinder them from fulfilling commitments as importers since the scarcity of resources does not even permit them to fully benefit from the rights set in the WTO Agreements as exporters. Therefore, many of the public constraints that developing countries confront as exporters apply to them as importers too. Moreover, to the extent that a frequent source of trade tensions is regulatory capture by producer or consumer interest groups which sometimes lobby for fewer imports, it is important that governments have the capacity to control the influence of these groups (Table 3.1).

As an illustration of the implications of their lower capacity mentioned earlier, developing country governments may not be able to conduct risk assessment to the level that a counterpart in a developed country can achieve. This naturally makes it difficult for them to justify implemented SPS measures (Henson et al, 2000; Jensen, 2002). If challenged by a developed country under such scenario, a developing country may then have to concede defeat even when they have a valid case. In the face of such an obstacle, it is regrettable that few, if any, appropriate international standards for developing countries, which would have safeguarded them from the risk assessment requirement, are being established.

Lack of expertise, as well as scarce financial resources, also affects performance of public personnel at the international scene. For example, developing country officials are frequently intimidated by the complex procedures used at the international standards setting organizations

(Henson et al, 2000). Additionally, many developing countries typically send only one generalist to meetings at international standards setting organizations, while developed countries might send a large team of experts in several areas. Working under these circumstances, it may be comprehensible that these developing countries become skeptical about the extent to which their views are taken into account at international standards organizations since, for instance, they may not be able to afford participation even when a vote is taken, or only a representative without specialized knowledge on the issue may be present at best.

Other shortcomings in the public sector cited in its role of supporting the export sector, such as the lack of adequate public official awareness and political support of SPS regulation issues, of effective control measures for pests and diseases, of a concisely organized SPS regulation management system, and of local surveillance, toxicological and epidemiological data, also prevents setting SPS measures as prescribed by the SPS Agreement.

Still another capacity that developing country governments must have in benefiting from imports is of controlling interest groups from taking advantage of SPS regulations illegitimately to protect their wellbeing at the cost of that of the society as a whole (Roberts, Josling and Orden, 2003). Producer groups may try to exploit these regulations in that manner to maintain the higher profits that they could attain by restricting competition from imports. Consumer groups may have the perception that imported products pose greater health risks than domestically produced products, and thus they may push for protection through unnecessary regulations that may discriminate against imports. In either case, consumers that have to pay higher prices than necessary, and foreign producers of exports whose products are restricted in that market lose.

A country can also lose out when too much imports are let in, although this situation is not likely to lead to a complaint by the trade partner. On the contrary, it may be interests in the trade partner country or domestic importers that capture the government. Domestic producers or consumers may be under-protected as risks from pest infestation, from disease transmission or from chemical poisoning may be greater than the traditional gains from trade. Therefore, it is imperative that the government is able to shield itself from this type of capture as well.

3.5. Conclusions

The WTO SPS and TBT Agreements were implemented under concerns that technical regulations could be misused as substitutes for decreasing tariffs. A central theme of these

Agreements, which share many similar elements, is in establishing the rights of member countries to set regulations that are necessary to, inter alia, protect human, animal and plant health, and the environment, and to prevent deceptive practices to consumers. Another theme of equal weight is the minimization of trade-restrictive impact that associated regulations have. To this end, members are required to back regulations with risk assessments, the use of mechanisms such as harmonization, equivalence, regionalization and transparency is promoted, and a dispute resolution mechanism has been made available. Recognizing that developing countries may face important constraints in benefiting from their clauses, these Agreements urge developed countries to take consideration of the needs in those countries when implementing associated regulations.

Two other agreements relate to technical regulations in agricultural and food trade. The TRIPS Agreement is different from the SPS and TBT Agreements in that it intends to provide protection to GIs, which are considered intellectual properties. The GATT Agreement serves as the basis of principals contained in the SPS, TBT and TRIPS Agreements.

Impact of agricultural and food trade-related technical regulations has been studied in the literature. This literature is reviewed by categorizing presented evidence according to a framework introduced in this chapter, which highlights factors that decide the degree of success of a developing country in managing external technical regulations. According to this framework, the evidence is first classified into that relating to exports or to imports. Under each classification, external and domestic factors are present. External factors are given by the clauses of the WTO Agreements, and domestic factors refer to tasks of the domestic public and private sectors in facing external technical regulations. Analysis of relevant evidence in a developing country using the proposed framework would assist in systematically evaluating the impact of technical regulations in agricultural and food trade.

Chapter 4. Central America: Economy, trade and agricultural and food industry

4.1. Introduction

Central America is a region comprised of very small economies whose growth has declined in recent years. Many of these countries are struggling with their agricultural production partly due to a lack of supporting domestic agricultural policies that contrast with more generous programs in larger, and especially developed, countries, and to a world market that is not amicable to the region's exports. Technical regulations applied at importing countries could sometimes be among policies that are unfavorable to the region's exports.

The ensuing section provides a background on the Central American economy. A description is provided of efforts to economically integrate the region and their impact on trade policy, and on the region's trade, with a focus on intra-regional trade and extra-regional trade with the US and the European Union. Finally, this chapter ends with a description of the Central American agricultural and food sector and trade.

4.2. Central American economy

The isthmus of Central America is shared by seven countries: Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Belize and Panama. Of these, Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua share the common past of belonging to the Federation of Central America as one nation for a little more than a decade in the 19th century.[16] As a result of some degree of hope by these countries to reunify and of international pressure, exemplified by the United States' (US) initiative to form a free trade area with these nations as a region, several institutions have been created to promote regional integration among these five countries. The focus of this paper is on the five Central American countries that share a regional economic institution, the Central American Common Market (CACM). Such emphasis is timely as these countries are hoping to greatly benefit from the Central American Free Trade Agreement (CAFTA) with the US, whose negotiations finished in January 2004.

[16]Belize, the only English speaking country in the region, was territorially part of the Federation since it formed a region of Guatemala. Belize became independent in 1973 following colonial rule by Britain. Panama declared independence from Colombia in 1903. For a history of the region, see, for example, Foster (2000).

Table 4.1 illustrates some basic and economic figures of Central America and its countries. The region is very small and its population is relatively low, with about 420,000 km^2 of land and 35 million inhabitants. Country data show that Guatemala, Honduras and Nicaragua each has about 110,000 km^2 or more of land, in contrast to El Salvador and Costa Rica that each possesses about 50,000 km^2 or less in territory. Guatemala is the most populous country, with a little more than twice the population of each of the second and third most populous countries, Honduras and El Salvador. Nicaragua and Costa Rica follow in the population size spectrum.

The region produced more than $60 billion worth of Gross Domestic Product (GDP) in 2002. GDP per capita was around $1,800 and according to the World Bank country classification by income (World Bank, 2002a), the region as a whole could be classified as a lower-middle income region. If the region is to develop, it must boost its real GDP growth rate to overcome the population grow rate of around 2% (data according to CIA, 2002).

Country level data demonstrate differences in economic characteristics. The largest economy in Central America is that of Guatemala, followed by Costa Rica and El Salvador. Honduras and Nicaragua are the smaller economies in the region. However, when factoring population size, it becomes apparent that Costa Ricans are, on average, the wealthiest people in the region, with the highest GDP per capita of $4,200. El Salvador comes in second, but with only a little more than half of Costa Rica's per capita wealth. Guatemalans have even less wealth, and Honduras and Nicaragua are two of the poorer countries in Latin America with per capita production less than a quarter of Costa Rica's.

Central America is a moderately open economy as measured by its trade (exports plus imports) to GDP ratio of 48% in 2001.[17] The more open economies are Nicaragua, Honduras and Costa Rica with trade to GDP ratios of 90%, 65% and 65%, respectively. The less open economies of El Salvador and Guatemala have respective ratios of about 35%. Costa Rica trades the most in the region, accounting for more than a third of the regional trade value. Guatemala is a smaller trader than Costa Rica, but larger than El Salvador, the latter of which trades at slightly less than half of Costa Rica's trade value. Honduras trades even less, and Nicaragua's trade value is the lowest in the region.

[17] By contrast, trade to GDP ratios of other small but more developed countries are 223% for Hong Kong, 256% for Singapore, 105% for Luxembourg, and 127% for Ireland (Hufbauer, Kotschwar and Wilson, 2003).

Table 4.1: Some basic figures on Central America and its economy, 2002

	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Central America
Area[a] (km^2)	50,700	21,041	109,000	111,900	130,000	422,641
Population[a] (thousands)	3,997.9	6,509.6	11,986.2	7,042.7	5,343.9	34,880.3
GDP[a,f] (million US$)	16,886.5	14,295.8	23,205.5	6,577.5	2,571.4	63,536.7
GDP real growth rate[a,f] (%)	2.8	2.3	2.0	2.0	0.5	2.2
GDP per capita[a,f] (US$)	4,223.8	2,196.1	1,936.0	934.0	481.2	1,821.6
GDP sector share[b,g] (%)						
Agriculture	11	10	23	18	33	18
Industry	37	30	20	32	23	28
Services	52	60	57	50	44	54
Exports[j,h] (million US$)	4,716	1,214	2,413	1,311	532	10,185
Imports[j,h] (million US$)	6,274	3,866	5,607	2,997	1,775	20,518
Ag. exports[j,h] (million US$)	1,696	431	1,297	831	419	4,675
Ag. imports[j,h] (million US$)	488	656	806	537	294	2,781
Foreign transfers[d,h] (million US$)	91.5	2,003.8	966.8	870.8	335.7	4,268.6
Tourism[e,i] (million US$)	1,102	254	518	240	116	2,230

Notes: [f] Estimated figures for 2002. [g] For individual countries, sector shares are for 2000. For Central America, these figures were approximated by the author as the averages of the countries' 2002 GDP weighted figures. [h] Data for 2001. [i] Data for 2000. [j] Export figures do not include those from maquilas and free zones here and throughout this document. Agricultural trade data on this table and throughout the rest of the document excludes forestry but includes fishery, livestock and agro-industry (Chapters 1 through 24 of the Harmonized System).

Source: [a] ECLAC (2003a), [b] CIA (2002), [c] ECLAC (2003b), [d] ECLAC (2002a), [e] World Tourism Organization (2001), [j] SIECA (2003a).

GDP growth in the Central American isthmus has slowed down in the recent years since its highest peak of 5.5% in 1998 (Table 4.2), and the inherent weaknesses of the region explain this result. The region's economic dependency to its export sector as a source of growth has played an important role in the economic slowdown (ECLAC, 2002a). In turn, several factors have contributed to the declining export sector in the recent years: the decelerating US and world economy, the decrease in prices of Central America's major export commodities (particularly coffee and bananas), and the deficiencies in diversification of export commodities.

An endemic and noteworthy factor that has greatly damaged the Central American economy is its vulnerability to natural disasters. Disasters that have hit the region recently are a long period of drought during 1997-1998, Hurricane Mitch that devastated the region in 1998, two earthquakes in 2001 in El Salvador, and another drought that was in place in the region in 2001.[18] It has been estimated that phenomena such as these have caused economic damage valued at $22,450 million in the last 30 years (ECLAC, 2002a). Clearly, natural disasters result in a decline of Central American exports, since agricultural exports, which are almost a half of the total regional exports (see Table 4.1 above), are reduced due to less production.

Table 4.2: Central American GDP real growth rate 1998-2002

Country	1998	1999	2000	2001[a]	2002[b]	Average
Costa Rica	8.3	8.0	2.2	1.0	2.8	4.5
El Salvador	3.8	3.4	2.1	1.9	2.3	2.7
Guatemala	5.1	3.9	3.4	1.8	2.0	3.2
Honduras	3.3	-1.5	4.8	2.7	2.0	2.3
Nicaragua	4.1	7.4	6.0	3.1	0.5	4.2
Central America	5.5	4.6	3.0	1.7	2.2	3.4

Notes: [a] Preliminary. [b] Estimates.
Source: ECLAC (2003a).

Despite these recessive forces for the Central American economy, an increase in private transfers from abroad, mostly comprised of remittances especially from family members of Central Americans in the US, has dampened the downturn for the region. Foreign transfers are equal to more than 30% of the value of total exports (see Table 4.1). These remittances have furthermore increased at a rate of more than 10% annually since 1998 (ECLAC, 2002a). However, the distribution of the remittances is not equal among the countries. El Salvador obtains the largest share at almost half of the Central American total. Guatemala and Honduras each receives about 20% of the total, and the small remaining amount goes to Nicaragua and Costa Rica, the poorest and the wealthiest of the five countries, respectively. For Nicaragua,

[18] The only negative real GDP growth in Table 2 of -1.5% for Honduras in 1999, a year after Hurricane Mitch killed thousands of lives there and destroyed the country accordingly, illustrates the extent to which natural disasters in Central America can affect its economies.

these remittances are about 50% of the value of its total exports, but remittances are less than 2% of the value of exports for Costa Rica.

Another important source of foreign exchange for Central America is tourism (Table 4.1). By far the largest gains in this sector are reaped by Costa Rica, which earns half of the regional receipts. A quarter of tourism receipts goes to Guatemala, and El Salvador and Honduras each receives about half of Guatemala's tourism earnings, and Nicaragua in turn receives about half of El Salvador or Honduras. As a means for foreign exchange earnings, tourism is more important for Costa Rica, Guatemala and Nicaragua, for which countries tourism receipts represent about 20% of exports. For El Salvador and Honduras, the figures are around 10%.

4.3. Trade policy and response

Trade in Central America is partially dictated by the Central American Common Market (CACM). The CACM was created in 1960 with the principal objectives of establishing a common external tariff, free trade in industrial goods and a fiscal incentive scheme for the industrial sector (EU and UNDP, 1999). The import substitution strategy served as model for the CACM in the early years. However, the CACM experienced a tumultuous history, and by the mid-1980's it practically had collapsed along with other regional institutions. The collapse is in part due to political unrest and economic instability in the region, but also to international development institutions that promoted economic reforms in individual countries in the region without respect for regional institutions (EU and UNDP, 1999).

In the 1990's, the CACM experienced a revival, and it came to embrace openness to extra-regional trade and to investment from abroad (EU and UNDP, 1999). Despite the renewed vigor gained by the CACM, trade policy in the CACM has still some mixture of unilateral initiatives by each member country or by subgroups of countries. On the free trade agreement matter, for example, the Central America-Dominican Republic Free Trade Agreement signed in 1998 did not at first include Honduras and Nicaragua (ECLAC, 2002c). As another example, Costa Rica has signed free trade agreements with Mexico, Chile, the Dominican Republic and Canada, and other such agreements are being negotiated. At the other extreme, Honduras only holds an agreement with Mexico.

Countries in the region have also historically diverged on implementation of the common external tariff (CET), which applies to most goods with a few exceptions that include some agricultural products. The intended CET structure is tabulated in Table 4.3. Despite differences in application in previous years, in 2001 application of tariffs on final goods and on inputs was finally standardized after countries that applied different rates converged to those applied by the rest of the countries (ECLAC, 2002c). Some differences still continue to exist in the CET structure on intermediate goods and on capital goods.

Table 4.3: Central American Common External Tariff rate structure

Sector	Tariff (percentage)
Capital goods and inputs	0
Inputs produced in Central America	5
Intermediate goods produced in Central America	10
Final consumption goods	15

Notes: Some exceptions on applications of these rates apply to textiles, confection, shoes, tires and tariffs applied to agricultural products as a result of the Uruguay Round Agreements.
Source: SIECA (2003b).

The average tariff rates applied by sector for the three Central American countries with the largest economies are tabulated in Table 4.4. The agricultural and fishing sector has the highest average tariff in all countries followed by the mining sector, and then by the manufacturing industries sector. Despite some sector wise differences, average tariff levels in general are low at less than 10%. Additionally, although country differences exist in applied tariffs, these are not large. The similar average tariff levels applied by the three countries partly reflect success in recent years that Central American economic integration has enjoyed.

Table 4.4: Average tariff applied by sector (percentage)

Sector[1]	Costa Rica	El Salvador	Guatemala
Agriculture and fishing	9.8	8.6	8.5
Mining	4.6	2.2	2.4
Manufacturing industries	6.8	7.5	6.9
Total	7.0	7.4	7.0

Notes: The three countries reported here are the ones for which the WTO has recently conducted a Trade Policy Review. The figures reported were calculated at different times for different countries (In 2001 for Costa Rica and Guatemala, and in 2003 for El Salvador). [1] ISIC sectors.
Source: WTO (2001a), WTO (2001b), WTO (2003a).

Recent progress in regional economic integration was especially given a boost when in 1996 Guatemala and El Salvador initiated work to realize a customs union, a process to which Nicaragua, Honduras and Costa Rica have joined later. The intention of the project is to bring internal free trade for all goods, and the project has especially moved faster in 1999 after establishing a work plan was agreed. Even though seemingly unjustified barriers to trade are still routinely applied even between these countries, important progress has been made in this initiative by, for instance, harmonizing certain regulations across countries (IDB, 2002).[19] Central American integration is thus expected to be bolstered through this mechanism (ECLAC, 2002c).

Other events are supporting Central American integration. For example, the European Union's insistence on regional integration as the basis for establishing an economic relationship between the two regions has assisted the cause for integration. However, the Central American Free Trade Area (CAFTA) that was in negotiation with the United States since January 2003 may be the most important event in this context, since the United States is the region's largest trade partner.

A look at trade data reveals that Central American trade in all goods totaled over US$30 billion in 2001, with a trade deficit of more than US$10 billion (Table 4.5 and Table 4.6).[20] 40% of the region's trade was with the US, while 10% and 19% was with the EU and within Central America, respectively. The rest of the world combined accounted for 31% of Central American trade as the region's trade partner. The US is responsible for about 40% of trade as both an importer for and as exporter to the region. However, the EU is more important for Central America as an importer, receiving 13% of Central American exports, than as an exporter, shipping 9% of Central American imports.

An important element that has made Central American exports to the US prominent is the Caribbean Basin Initiative (CBI) (Monge-González, Loría-Sagot and González-Vega, 2003). The CBI was first unilaterally adopted in 1984 by the US, and it guarantees tariff-free access (though not access free of non-tariff barriers) to the US market for most Central American exports.[21] With an initial expiration year of 1995, the CBI was later extended by a US legislation

[19] For example, in November 2003, SIECA (Secretariat for Central American Economic Integration) had 16 standing complaints to intraregional barriers to trade in the CACM.

[20] Trade data in this chapter are from SIECA (2003c) and for the year 2001. Data for 2002 is available but, due to a change in the Central American Tariff System (SAC) that followed revision in the Harmonized System, country reporting was not consistent and figures were not comparable across countries. Agricultural trade here includes trade in fishery products, but excludes forestry products. Agricultural trade also includes trade in related processed products.

[21] Monge-González, Loría-Sagot and González-Vega (2003) report that, despite the benefits of tariff-free access provided by the CBI, many Central American agricultural exports to the US face important non-tariff barriers, such as tariff rate quotas, anti-dumping barriers, seasonal tariffs, incremental tariffs and tariff peaks, in the US market.

commonly known as NAFTA (North America Free Trade Agreement) parity until 2008 as a response to Central America's concerns that NAFTA would divert trade with the US away from the region.[22]

Table 4.5: Destination composition of Central American exports in 2001 (million US$)

From / To	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Central America
United States	2,187	223	643	771	141	3,965
Central America	661	722	1,060	211	175	2,829
European Union	831	80	151	201	84	1,347
Others	1,037	189	559	128	132	2,045
Total	4,716	1,214	2,413	1,311	532	10,185

Source: Author's elaboration based on SIECA (2003a).

Table 4.6: Origin composition of Central American imports in 2001 (million US$)

To / From	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Central America
United States	3,261	1,302	1,964	1,262	477	8,266
Central America	307	823	777	562	467	2,936
European Union	656	335	476	197	106	1,770
Others	2,050	1,406	2,390	976	725	7,547
Total	6,274	3,866	5,607	2,997	1,775	20,518

Source: Author's elaboration based on SIECA (2003a).

The large weight of exports to the US emphasizes the dependency and vulnerability of the Central American export sector and the whole economy to fluctuations in economic conditions in the US. The importance of the US market translates into high expectations in Central America for CAFTA negotiations, in which the region partly seeks to make trade benefits provided by the CBI more permanent and secure by switching the basis of benefits from one of a unilateral initiative (CBI) into one of a bilateral agreement (CAFTA).

At the level of individual country in the region, Costa Rica is the only country with a stronger tendency than the regional average to trade with the US and the EU. On the other hand, Costa Rica and Honduras tend to trade less with Central America, whereas El Salvador, Guatemala and Nicaragua tend to trade more with regional partners. In absolute terms, Guatemala trades the most in the region, accounting for 30% of the intra-regional trade, followed

[22] Monge-González, Loría-Sagot and González-Vega (2003) study the issue of US-Central American agricultural trade diversion due to NAFTA but find no important evidence supporting that hypothesis. They conclude that the NAFTA parity was an important factor that avoided diversion of trade between Central America and the US.

closely behind by El Salvador (Table 4.7). Trade between these two countries accounts for 28% of the intra-regional trade. Costa Rican, Honduran and Nicaraguan trade within the region accounts for 17%, 15% and 11%, respectively, of the total regional trade.

Table 4.7: Composition of Central American intra-regional trade in 2001 (million US$)

To \ From	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Central America
Costa Rica	-	95	156	5	37	293
El Salvador	154	-	477	129	76	836
Guatemala	215	323	-	67	23	628
Honduras	125	184	295	-	39	644
Nicaragua	167	120	131	10	-	428
Central America	661	722	1,059	211	174	2,828

Note: Figures are based on export values.
Source: Author's elaboration based on SIECA (2003a).

Table 4.8 tabulates the ten main traded groups of products in Central America and in each country. The region's exports may be characterized as follows. First, the degree of the region's diversification in export products is low, as its top ten product groups occupy 42% of its total export value. This trend is even more pronounced at the country level, where even the top ten product groups for the richer country of Costa Rica share half of its total exports, and the less well-to-do countries of Honduras and Nicaragua have even lower degrees of diversification, as their top ten export product groups share 65.6% and 67.1% of their own total exports, respectively.

Second, the region's agricultural and food exports are considerable, and these exports occupy a greater share in a given country's total exports the less developed the economy is. In this respect, it is indicative that, although Costa Rica, El Salvador and Guatemala all have four food entries in the respective ten main export groups, Costa Rica's top export group is not of agriculture and food. On the other hand, Honduras has 6 agricultural entries in its top ten exports, and all but one of Nicaragua's top ten exports are of agriculture and food. This discussion relates to a common tendency found in other economies in the world that the more developed a country is, the higher the technology that is associated with its export products. That is, Nicaragua and Honduras export relatively more of primary products of the agriculture and food sector, El Salvador and Guatemala export less agricultural and food products and some industrial products

Table 4.8: Ten main traded good groups for Central America (2001)

Exports				Imports			
HS code	Product group	Value (US$ m.)	% of total exports	HS code	Product group	Value (US$ m.)	% of total imports
Central America							
Total	Total of ten main exports	4,223	41.5	Total	Total of ten main imports	6,036	29.4
0803	***Bananas and plantains, fresh or dried***	***921***	***9.0***	2710	Petroleum oils, not crude	1,636	8.0
0901	***Coffee***	***853***	***8.4***	8542	Electronic integrated circuits and microassemblies	945	4.6
8473	Parts & acces of computers and office machines	792	7.8	3004	Medicament mixtures (not 3002, 3005, 3006), put in dosage	745	3.6
1701	***Cane or beet sugar and chemically pure sucrose, in solid form***	***399***	***3.9***	8703	Cars (incl. station wagon)	670	3.3
0306	***Crustaceans***	***290***	***2.8***	2709	Crude petroleum oils	554	2.7
3004	Medicament mixtures (not 3002, 3005, 3006), put in dosage	280	2.7	8704	Trucks, motor vehicles for the transport of goods	473	2.3
9018	Electro-medical apparatus (electro-cardiographs, infra-red ray app, syringes, dental app.)	274	2.7	8471	Automatic data processing machines; optical reader, etc	272	1.3
0804	***Dates, figs, pineapples, mangoes, avocadoes, guavas***	***169***	***1.7***	***2106***	***Food preparations, nes***	***265***	*1.3*
6108	Women's slips, panties, pyjamas, bathrobes, etc., knitted/crocheted	125	1.2	8517	Electric app for line telephony, incl curr line system	244	1.2
3401	Soap; organic surface-active agents, washing & clean preparations, nes	121	1.2	4804	Uncoated kraft paper & paperboard, in rolls/sheets not of hd 48.02/48.03	231	1.1
Costa Rica							
Total	Total of ten main exports	2,358	50.0	Total	Total of ten main imports	2,318	36.9
8473	Parts & acces of computers and office machines	789	16.7	8542	Electronic integrated circuits and microassemblies	928	14.8
0803	***Bananas and plantains, fresh or dried***	***509***	***10.8***	2710	Petroleum oils, not crude	383	6.1
9018	Electro-medical apparatus (electro-cardiographs, infra-red ray app, syringes, dental app.)	272	5.8	8703	Cars (incl. station wagon)	224	3.6
0901	***Coffee***	***169***	***3.6***	3004	Medicament mixtures (not 3002, 3005, 3006), put in dosage	197	3.1
3004	Medicament mixtures (not 3002, 3005, 3006), put in dosage	157	3.3	4804	Uncoated kraft paper & paperboard, in rolls/sheets not of hd 48.02/48.03	125	2.0
0804	***Dates, figs, pineapples, mangoes, avocadoes, guavas***	***144***	***3.1***	8471	Automatic data processing machines; optical reader, etc	114	1.8
6108	Women's slips, panties, pyjamas, bathrobes, etc., knitted/crocheted	100	2.1	8473	Parts & acces of computers and office machines	110	1.8
8543	Electrical mach&app having individual function, nes	77	1.6	3808	Insecticides, fungicides, herbicides packaged for retail sale	84	1.3
2106	***Food preparations, nes***	***71***	***1.5***	3926	Article of plastic nes.	84	1.3
6212	Brassieres, girdles, corsets, braces, suspenders etc & parts	70	1.5	8479	Machines & mech appl having indiv functions, nes	69	1.1

Table 4.8: Ten main traded good groups for Central America (2001) (Continued)

Exports				Imports			
HS code	Product group	Value (US$ m.)	% of total exports	HS code	Product group	Value (US$ m.)	% of total imports
El Salvador							
Total	Total of ten main exports	485	39.8	Total	Total of ten main imports	1,002	25.9
0901	***Coffee***	***115***	***9.5***	2710	Petroleum oils, not crude	262	6.8
1701	***Cane or beet sugar and chemically pure sucrose, in solid form***	***70***	***5.8***	2709	Crude petroleum oils	169	4.4
2710	Petroleum oils, not crude	67	5.5	3004	Medicament mixtures (not 3002, 3005, 3006), put in dosage	122	3.2
3004	Medicament mixtures (not 3002, 3005, 3006), put in dosage	52	4.3	8517	Electric app for line telephony, incl curr line system	90	2.3
4819	Packing containers, of paper, paperboard, cellulose wadding, webs	37	3.0	8703	Cars (incl. station wagon)	84	2.2
2106	***Food preparations, nes***	***35***	***2.9***	8704	Trucks, motor vehicles for the transport of goods	78	2.0
4818	Toilet paper, handkerchiefs, tissues, napkins, table cloths, diapers, etc.	31	2.6	***1005***	***Maize (corn)***	***56***	*1.4*
1704	***Sugar confectionery (incl white choc), not containing cocoa***	***28***	***2.3***	7210	Flat-rolled prod of iron or non-al/s wd>/=600mm,clad, plated or coated	50	1.3
7209	Flat-rolled prod of iron/non-alloy steel wd>/=600mm,cr,not clad	25	2.1	***2106***	***Food preparations, nes***	***46***	*1.2*
3401	Soap; organic surface-active agents, washing & clean preparations, nes	23	1.9	2711	Petroleum gases	46	1.2
Guatemala							
Total	Total of ten main exports	1,162	48.2	Total	Total of ten main imports	1,707	30.5
0901	***Coffee***	***307***	***12.7***	2710	Petroleum oils, not crude	505	9.0
1701	***Cane or beet sugar and chemically pure sucrose, in solid form***	***213***	***8.8***	8703	Cars (incl. station wagon)	260	4.6
0803	***Bananas and plantains, fresh or dried***	***201***	***8.3***	3004	Medicament mixtures (not 3002, 3005, 3006), put in dosage	197	3.5
2709	Crude petroleum oils	101	4.2	8704	Trucks, motor vehicles for the transport of goods	176	3.1
0908	***Nutmeg, mace and cardamoms***	***96***	***4.0***	2709	Crude petroleum oils	158	2.8
3004	Medicament mixtures (not 3002, 3005, 3006), put in dosage	69	2.9	***2106***	***Food preparations, nes***	***99***	*1.8*
7210	Flat-rolled prod of iron or non-al/s wd>/=600mm,clad, plated or coated	53	2.2	8525	Television camera, transmission app for radio-telephony	92	1.6
3808	Insecticides, fungicides, herbicides packaged for retail sale	50	2.1	8517	Electric app for line telephony, incl curr line system	82	1.5
3402	Organic surface-active agents, washing & clean preparations, nes	38	1.6	***1001***	***Wheat and meslin***	***71***	*1.3*
3401	Soap; organic surface-active agents, washing & clean preparations, nes	35	1.5	8471	Petroleum gases	68	1.2

Table 4.8: Ten main traded good groups for Central America (2001) (Continued)

Exports				Imports			
HS code	Product group	Value (US$ m.)	% of total exports	HS code	Product group	Value (US$ m.)	% of total imports
Honduras							
Total	Total of ten main exports	860	65.6	Total	Total of ten main imports	932	31.1
0306	***Crustaceans***	***208***	***15.9***	2710	Petroleum oils, not crude	379	12.6
0803	***Bananas and plantains, fresh or dried***	***198***	***15.1***	8704	Trucks, motor vehicles for the transport of goods	125	4.2
0901	***Coffee***	***164***	***12.5***	3004	Medicament mixtures (not 3002, 3005, 3006), put in dosage	119	4.0
4907	Unused stamps; cheque forms, banknotes ,bond certificates, etc.	58	4.4	***2106***	***Food preparations, nes***	***76***	***2.5***
3401	Soap; organic surface-active agents, washing & clean preparations, nes	51	3.9	8703	Cars (incl. station wagon)	50	1.7
0807	***Melons (including watermelons) & papayas, fresh***	***42***	***3.2***	4819	Packing containers, of paper, paperboard, cellulose wadding, webs	40	1.3
2402	***Cigars, cheroots, cigarillos & cigarettes***	***39***	***3.0***	3808	Insecticides, fungicides, herbicides packaged for retail sale	38	1.3
2608	Zinc ores and concentrates	34	2.6	3923	Plastic packing goods or closures stoppers, lids, caps, closures, plastic containers etc.	36	1.2
6109	T-shirts, singlets and other vests, knitted or crocheted	33	2.5	***1001***	***Wheat and meslin***	***35***	***1.2***
1701	***Cane or beet sugar and chemically pure sucrose, in solid form***	***33***	***2.5***	8701	Tractors (other than tractors of heading no 87.09)	34	1.1
Nicaragua							
Total	Total of ten main exports	357	67.1	Total	Total of ten main imports	605	34.1
0901	***Coffee***	***99***	***18.6***	2709	Crude petroleum oils	182	10.3
1701	***Cane or beet sugar and chemically pure sucrose, in solid form***	***48***	***9.0***	3004	Medicament mixtures (not 3002, 3005, 3006), put in dosage	110	6.2
0202	***Meat or bovine animals, frozen***	***38***	***7.1***	2710	Petroleum oils, not crude	107	6.0
0306	***Crustaceans***	***33***	***6.2***	8703	Cars (incl. station wagon)	52	2.9
1202	***Ground-nuts, not roasted***	***30***	***5.6***	8704	Trucks, motor vehicles for the transport of goods	42	2.4
7108	Gold unwrought or in semi-manuf forms	30	5.6	4011	New pneumatic tires, of rubber	27	1.5
0201	***Meat of bovine animals, fresh or chilled***	***28***	***5.3***	7210	Flat-rolled prod of iron or non-al/s wd>/=600mm,clad, plated or coated	22	1.2
0102	***Live bovine animals***	***27***	***5.1***	3808	Insecticides, fungicides, herbicides packaged for retail sale	22	1.2
0713	***Dried vegetables, shelled***	***13***	***2.4***	8471	Automatic data processing machines; optical reader, etc	22	1.2
0803	***Bananas and plantains, fresh or dried***	***12***	***2.3***	***2106***	***Food preparations, nes***	***20***	***1.1***

Note: Bold italic text indicates agricultural and food products.

Source: Author's elaboration based on SIECA (2003a) such as medicines and processed metals, while Costa Rica's exports include higher technology electronic products such as Intel's microprocessors.

Central America's imports have different characteristics from those of its exports. Oil is an important import group as the region is not endowed with large quantities. The region also imports high technology products such as electric and electronic products, medicines, chemicals and vehicles, which could be used for consumption or as inputs for production. Although the region has a general comparative advantage in production of agricultural and food products, as the high share of foods in its main export groups indicates, certain types of foods, notably some grains and processed foods, are imported.

Finally, a noteworthy sector to mention is that of maquilas and free zones, which, according to some estimates, dominates 45% of total Central American exports.[23] The growth of the maquilas in Central America responds to policies set by governments in the mid 1980s with the intention to increase foreign investment in the region (ECLAC, 2002c). A large proportion of the sector in the region has produced textiles and clothing, which in 1995 represented 80% of total Central American maquila production. More than 90% of the maquila exports are destined to the US (ECLAC, 2002c). Table 4.9 illustrates the importance of the maquila sector in Central America.[24] Honduras has a very high value added maquila industry, which makes it contribute almost 9% to its GDP. At the regional level, the maquila sector share in the regional GDP is 3.2%.

Table 4.9: Central American maquila value added in 2002 (million US$)

	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Central America
Maquila and free zones	491.0	475.3	400.1	559.7	105.2	2,031.3
Share of GDP (%)	2.9	3.3	1.7	8.6	4.2	3.2

Source: ECLAC (2003c).

[23] Maquilas are assembly plants of inputs temporarily imported duty-free for re-exports. Free zones are geographically restricted areas where preferential treatment is applied to corporations to attract foreign investment in industrial production of export goods (ECLAC, 2002c). Maquilas normally locate in free zones. Export figures by SIECA used in this document do not include exports from maquilas and free zones since maquila export figures include value of production inputs that are not recorded at the time of import due to their 'temporary status' in the country. 'Record keeping problems' further add complications for quantifying maquila exports values comparable to other exports (ECLAC, 2002c).

[24] Value added figures are used here to avoid introducing trade data that is inconsistent with what is used elsewhere in this document.

4.4. Agricultural and food production and trade

Sector composition of Central American production indicates that it has a relatively large agriculture sector, with almost 20% of the GDP coming from agriculture (See Table 4.1 and Table 4.10).[25] That figure approaches $10 billion of GDP. Nicaragua has the largest proportion of its national production in agriculture, followed by Guatemala and Honduras. Costa Rica and El Salvador's dependency on domestic agricultural production is only about half the regional average. Table 4.10 shows that the largest agricultural producer is Guatemala, with an output almost half of the regional total. Costa Rica and El Salvador follow behind, at around a third of Guatemala's production. Honduras and Nicaragua produce somewhat less.

Within the broad agricultural sector, other sub sectors such as livestock, forestry, fishery, and game are also embedded. The sub sector of agriculture, here referred to in the narrow sense of the plant producing sector, is the largest sector, representing more than 60% of the production. The livestock sector is responsible for almost a third of the regional broad agricultural production. Forestry, fishery, and other agricultural services combined represent only about 9% of the regional broad agricultural GDP. At the country level, Costa Rica has the largest share of plant growing agriculture production within the agricultural sector production at more than 70%.

Categorizing plant agricultural production into basic grains (i.e. rice, maize, sorghum, beans, wheat, etc.), export crops (mainly coffee, sugar cane and bananas, also referred to as the 'traditional' export crops), and non traditional agriculture (i.e. henequen, balsam, tobacco, horticultural products, fruits and vegetables, etc.), the value added in export crops is the highest at the regional level, almost equaling one-third of the whole agricultural sector production. Nontraditional agricultural production follows next and basic grains last. The heavy weight on traditional export crops is common to the countries, and accentuated for Honduras, except for El Salvador which produces much less relatively in this category but relatively more basic grains. Costa Rica's GDP proportion in basic grains is substantially lower than the regional average, while the opposite is true of its proportion in nontraditional agricultural crops.

Central American export data provides an additional, although partial, look at the impact and characteristics of the region's agricultural production. Of total commodity exports from the

[25] Throughout this chapter, data on agricultural production does not include those of the agro-industry.

Table 4.10: Central American agricultural GDP in 2002 (in 1995 million US$)

	Costa Rica		El Salvador		Guatemala		Honduras		Nicaragua		Central America	
	GDP	(% of total)	GDP	(% of total)	GDP	(% of total)	GDP	(% of total)	GDP	(% of total)	GDP	(% of total)
I. Agriculture	1,214	71	779	59	2,166	59	583	63	573	62	5,314	62
a. Basic grains	*41*	*2*	*265*	*20*	*218*	*6*	*73*	*8*	*245*	*27*	*842*	*10*
b. Export crops	*527*	*31*	*263*	*20*	*1,242*	*34*	*398*	*43*	*226*	*25*	*2,655*	*31*
i. Coffee	*171*	*10*	*185*	*14*	*234*	*6*	*319*	*34*	*145*	*16*	*1,053*	*12*
ii. Sugar cane	*79*	*5*	*77*	*6*	*321*	*9*	*35*	*4*	*57*	*6*	*569*	*7*
iii. Bananas	*276*	*16*	*0*	*0*	*555*	*15*	*43*	*5*	*2*	*0*	*876*	*10*
c. Non traditional	*645*	*38*	*251*	*19*	*706*	*19*	*112*	*12*	*102*	*11*	*1,817*	*21*
II. Livestock	377	22	425	32	1,238	33	177	19	290	32	2,507	29
III. Others	128	7	108	8	298	8	171	18	56	6	761	9
Total (I+II+III)	1,719	100	1,311	100	3,701	100	931	100	920	100	8,582	100

Notes: Figures are preliminary. The ‘III. Others’ category includes a combination of forestry, fishery, game, and agricultural and cattle raising services. Salvadoran banana production figure was not available, and taken to be negligible or zero.
Source: Author’s elaboration based on ECLAC (2004).

region, 45% totaling US$4.7 billion were in agricultural goods, making the agricultural sector a significant contributor in trade (See Table 4.1).

An analysis of the region's agricultural export destinations reveals that the US occupies a slightly more important role than for the region's total exports, while the EU is a much more important export market for agricultural products (receiving 22% of the region's total agricultural exports) than for all export products (See Table 4.11). Intra-regional trade accounts for 17% of total regional agricultural trade. For individual countries, the EU is much more important for Costa Rica than for the rest of the region as an export market, accounting for almost a third of the country's agricultural exports. Guatemala's share of agricultural exports to the EU is particularly low at 11% of its total. Agricultural exports to the US share is more than 60% for Honduras' total, while that market is much less important for El Salvador and Nicaragua. However, the Central American market attracts substantial proportion of exports from El Salvador and Nicaragua, and the contrary is true of exports from Costa Rica and Honduras.

Table 4.11: Destination composition of Central American agricultural exports in 2001 (million US$)

From / To	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Central America
United States	771	113	477	523	116	2,000
Central America	181	171	278	66	119	815
European Union	527	76	146	177	80	1,006
Others	217	71	396	65	104	854
Total	1,696	431	1,297	831	419	4,675

Source: Author's elaboration based on SIECA (2003c).

The region's top two export crops are bananas and coffee, which are also the top export commodities overall (See Table 4.8 and Table 4.12). Together, these crops represent almost 40% of total regional agricultural exports in value. With the addition of sugar cane to this group, the share in total agricultural exports is greater than 45%. The respective figures at the individual country level range from that of 38% for Nicaragua to that of 55% for Guatemala. Crustaceans (lobsters and shrimp) are an important export commodity group in the region too, and especially for Honduras, as these are responsible for 25 percent of total agricultural export value. Honduras' strong fisheries sector certainly contributes to the relatively high share of 17% for the 'others' group in its agricultural GDP (See Table 4.9). El Salvador and Nicaragua export much of the rest of this product category from the region.

Table 4.12: Ten main traded agricultural and food groups for Central America (2001)

Exports				Imports			
HS code	Product group	Value (US$ m.)	% of total ag. exports	HS code	Product group	Value (US$ m.)	% of total ag. imports
Central America							
Total	Total of ten main agricultural exports	3,125	66.8	Total	Total of ten main agricultural imports	1,256	45.2
0803	***Bananas and plantains, fresh or dried***	***921***	***19.7***	2106	Food preparations, nes	265	9.5
0901	***Coffee***	***853***	***18.2***	***1005***	***Maize (corn)***	***204***	***7.3***
1701	***Cane or beet sugar and chemically pure sucrose, in solid form***	***399***	***8.5***	***1001***	***Wheat and meslin***	***195***	***7.0***
0306	***Crustaceans***	***290***	***6.2***	***0402***	***Milk and cream***	***145***	***5.2***
0804	***Dates, figs, pineapples, mangoes, avocadoes, guavas***	***169***	***3.6***	2304	Oil-cake and other solid residues	97	3.5
2106	Food preparations nes	118	2.5	1905	Bread, pastry, cakes, biscuits and other bakers' wares	81	2.9
0807	***Melons (including watermelons) & papayas, fresh***	***118***	***2.5***	***1006***	***Rice***	***79***	***2.8***
0908	***Nutmeg, mace and cardamoms***	***98***	***2.1***	1904	Prepared foods obtained by the swelling or roasting of cereals or cereal products	70	2.5
2009	Fruit and vegetable juices	84	1.8	***1901***	***Malt extract***	***60***	***2.2***
0604	***Foliage, branches and other parts of plants for bouquets or for ornamental purposes***	***75***	***1.6***	1704	Sugar confectionery (incl white choc), not containing cocoa	60	2.2
Costa Rica							
Total	Total of ten main agricultural exports	1,215	71.6	Total	Total of ten main agricultural imports	248	50.8
0803	***Bananas and plantains, fresh or dried***	***509***	***30.0***	***1005***	***Maize (corn)***	***56***	***11.5***
0901	***Coffee***	***169***	***10.0***	***1201***	***Soya beans***	***45***	***9.2***
0804	***Dates, figs, pineapples, mangoes, avocadoes, guavas***	***144***	***8.5***	***1001***	***Wheat and meslin***	***37***	***7.6***
2106	Food preparations, nes	71	4.2	2106	Food preparations, nes	24	4.9
0807	***Melons (including watermelons) & papayas, fresh***	***64***	***3.8***	***0713***	***Dried leguminous vegetables, shelled***	***16***	***3.3***
0604	***Foliage, branches and other parts of plants for bouquets or for ornamental purposes***	***60***	***3.5***	1904	Prepared foods obtained by the swelling or roasting of cereals or cereal products	15	3.1
0602	***Other live plants (including their roots), cuttings and slips; mushroom spawn***	***54***	***3.2***	***0303***	***Fish, frozen, excluding fish fillets and other fish meat of heading No. 03.04***	***14***	***2.9***
0714	***Manioc, arrowroot, salep, Jerusalem artichokes, sweet potatoes and similar roots and tubers***	***52***	***3.1***	***1006***	***Rice***	***14***	***2.9***
2009	Fruit and vegetable juices	47	2.8	1704	Sugar confectionery (incl white choc), not containing cocoa	14	2.9
2007	Jams, fruit jellies, marmalades, fruit or nut puree and fruit or nut pastes	45	2.7	2309	Preparations of a kind used in animal feeding	13	2.7

Table 4.12: Ten main traded agricultural and food groups for Central America (2001) (Continued)

Exports				Imports			
HS code	Product group	Value (US$ m.)	% of total ag. exports	HS code	Product group	Value (US$ m.)	% of total ag. imports
El Salvador							
Total	Total of ten main agricultural exports	335	77.7	Total	Total of ten main agricultural imports	312	47.6
0901	***Coffee***	***115***	***26.7***	***1005***	***Maize (corn)***	***56***	***8.5***
1701	***Cane or beet sugar and chemically pure sucrose, in solid form***	***70***	***16.2***	2106	Food preparations, nes	46	7.0
2106	Food preparations, nes	35	8.1	***0402***	***Milk and cream***	***40***	***6.1***
1704	Sugar confectionery (incl white choc), not containing cocoa	28	6.5	***1001***	***Wheat and meslin***	***36***	***5.5***
2202	Waters, including mineral waters and aerated waters	21	4.9	2304	Oil-cake and other solid residues	33	5.0
0306	***Crustaceans***	***21***	***4.9***	***1511***	***Palm oil and its fractions***	***29***	***4.4***
1905	Bread, pastry, cakes, biscuits and other bakers' wares	13	3.0	0406	Cheese and curd	23	3.5
1904	Prepared foods obtained by the swelling or roasting of cereals or cereal products	12	2.8	***0201***	***Meat of bovine animals, fresh or chilled***	***19***	***2.9***
2009	Fruit and vegetable juices	11	2.6	2103	Sauces and preparations therefore	15	2.3
1102	Cereal flours other than that of wheat or meslin	9	2.1	***0102***	***Live bovine animals***	***15***	***2.3***
Guatemala							
Total	Total of ten main agricultural exports	971	74.9	Total	Total of ten main agricultural imports	429	53.2
0901	***Coffee***	***307***	***23.7***	2106	Food preparations, nes	99	12.3
1701	***Cane or beet sugar and chemically pure sucrose, in solid form***	***213***	***16.4***	***1001***	***Wheat and meslin***	***71***	***8.8***
0803	***Bananas and plantains, fresh or dried***	***201***	***15.5***	***1005***	***Maize (corn)***	***59***	***7.3***
0908	***Nutmeg, mace and cardamoms***	***96***	***7.4***	***0402***	***Milk and cream***	***52***	***6.5***
1904	Prepared foods obtained by the swelling or roasting of cereals or cereal products	34	2.6	2304	Oil-cake and other solid residues	35	4.3
2401	Unmanufactured tobacco; tobacco refuse	33	2.5	1905	Bread, pastry, cakes, biscuits and other bakers' wares	28	3.5
2104	Soups and broths and preparations therefor	27	2.1	2202	Waters, including mineral waters and aerated waters	26	3.2
1905	Bread, pastry, cakes, biscuits and other bakers' wares	24	1.9	1904	Prepared foods obtained by the swelling or roasting of cereals or cereal products	20	2.5
1207	***Other oil seeds and oleaginous fruits***	***19***	***1.5***	1704	Sugar confectionery (incl white choc), not containing cocoa	20	2.5
1511	***Palm oil and its fractions***	***17***	***1.3***	2009	Fruit and vegetable juices	19	2.4

Table 4.12: Ten main traded agricultural and food groups for Central America (2001) (Continued)

Exports				Imports			
HS code	Product group	Value (US$ m.)	% of total ag. exports	HS code	Product group	Value (US$ m.)	% of total ag. imports
Honduras							
Total	Total of ten main agricultural exports	749	90.1	Total	Total of ten main agricultural imports	297	55.3
0306	***Crustaceans***	***208***	***25.0***	2106	Food preparations, nes	76	14.2
0803	***Bananas and plantains, fresh or dried***	***198***	***23.8***	***1001***	***Wheat and meslin***	***35***	***6.5***
0901	***Coffee***	***164***	***19.7***	1904	Prepared foods obtained by the swelling or roasting of cereals or cereal products	18	3.4
0807	***Melons (including watermelons) & papayas, fresh***	***42***	***5.1***	2309	Preparations of a kind used in animal feeding	17	3.2
2402	Cigars, cheroots, cigarillos & cigarettes	39	4.7	2401	Unmanufactured tobacco; tobacco refuse	14	2.6
1701	***Cane or beet sugar and chemically pure sucrose, in solid form***	***33***	***4.0***	***0402***	***Milk and cream***	***34***	***6.3***
1511	***Palm oil and its fractions***	***24***	***2.9***	***1005***	***Maize (corn)***	***30***	***5.6***
0804	***Dates, figs, pineapples, mangoes, avocadoes, guavas***	***18***	***2.2***	***1006***	***Rice***	***28***	***5.2***
2009	Fruit and vegetable juices	12	1.4	2304	Oil-cake and other solid residues	26	4.8
2401	Unmanufactured tobacco; tobacco refuse	11	1.3	1905	Bread, pastry, cakes, biscuits and other bakers' wares	19	3.5
Nicaragua							
Total	Total of ten main agricultural exports	340	81.1	Total	Total of ten main agricultural imports	128	43.5
0901	***Coffee***	***99***	***23.6***	2106	Food preparations, nes	20	6.8
1701	***Cane or beet sugar and chemically pure sucrose, in solid form***	***48***	***11.5***	***1001***	***Wheat and meslin***	***17***	***5.8***
0202	***Meat or bovine animals, frozen***	***38***	***9.1***	***1006***	***Rice***	***15***	***5.1***
0306	***Crustaceans***	***33***	***7.9***	***1901***	***Malt extract***	***13***	***4.4***
1202	***Ground-nuts, not roasted***	***30***	***7.2***	***0402***	***Milk and cream***	***13***	***4.4***
0201	***Meat of bovine animals, fresh or chilled***	***28***	***6.7***	1905	Bread, pastry, cakes, biscuits and other bakers' wares	10	3.4
0102	***Live bovine animals***	***27***	***6.4***	***0102***	***Live bovine animals***	***10***	***3.4***
0713	***Dried vegetables, shelled***	***13***	***3.1***	1904	Prepared foods obtained by the swelling or roasting of cereals or cereal products	10	3.4
0803	***Bananas and plantains, fresh or dried***	***12***	***2.9***	***1511***	***Palm oil and its fractions***	***10***	***3.4***
0406	Cheese and curd	12	2.9	2402	Cigars, cheroots, cigarillos & cigarettes	10	3.4

Note: Bold italic text indicates agricultural and food products with no or little process added to them.
Source: Author's elaboration based on SIECA (2003a).

Other main agricultural export products from the region include fruits and horticultural products, which are considered nontraditional exports. Costa Rica is the forerunner, consistent with this group's high share in its total agricultural GDP, as an exporter of this group of crops, with five entries in its ten main agricultural export products. Guatemala (three entries), Honduras (three entries) and Nicaragua (two entries) follow the lead in exporting nontraditional agricultural export crops. Also noteworthy is the livestock products from Nicaragua. Among meats and live cattle, this group represents more than 20% of Nicaragua's agricultural exports.

Among the region's main agricultural and food exports are highly processed foods of the agro-industry, with two entries among the main export groups. At seven entries, El Salvador has the most entries of this group in its top ten exports, followed by Guatemala (four entries), Costa Rica and Honduras (three entries each), and Nicaragua (one entry).

The lack of diversification in the context of agricultural trade is even more relevant than for the region's trade in all commodities, as Central America's ten main agricultural exports share 67% of total agricultural exports. This problem is more accentuated at the country level, varying from 72% for Costa Rica to 90% for Honduras.[26]

A look at the evolution of Central America's agricultural exports shows a decreasing trend in those revenues in the last few years, with a 25% decrease in 2001 from the value in 1998 (See Table 4.13). Regional agricultural GDP has followed a similar, though less accentuated, decline, as its real growth rate peaked at 5% and has since decreased every year (CEPAL, 2002b). The tendency of falling agricultural export value is more or less shared among the individual countries. The strong tie to the US economy, whose vigorous growth has subsided in the last few years, explains an important part of the decrease in trade. Moreover, a fall in the prices of the top export crops for the region, especially of the traditional export crops of coffee and bananas, has exacerbated the problem. To illustrate, international coffee price has particularly decreased in recent years, and in 2001, its price in the New York market declined by 27.2% (ECLAC, 2002c). The region's emphasis on a handful of export commodities has also worked against stable export earnings.

[26] The regional share of ten main agricultural exports in its total exports is lower than that for individual countries because each country has different ten main agricultural exports and respective share. The weight of each export product within the regional total is therefore deemphasized as compared to respective figures at a country level.

Table 4.13: Evolution of Central American agricultural trade by country (Million US$)

Country	Exports					Imports				
	1997	1998	1999	2000	2001	1997	1998	1999	2000	2001
Costa Rica	2,150	2,371	1,973	1,817	1,696	459	519	466	296	488
El Salvador	762	598	502	579	431	506	516	586	623	656
Guatemala	1,483	1,621	1,475	1,580	1,297	519	567	596	673	806
Honduras	951	1,114	735	871	831	405	457	488	534	537
Nicaragua	462	462	424	538	419	210	270	323	276	294
Central America	5,808	6,166	5,108	5,385	4,675	2,099	2,330	2,459	2,402	2,781

Source: Author's elaboration based on SIECA (2003c).

The decrease in these exports has been especially pronounced for those directed to the EU with a 42% decrease in the period 1998-2001 (Table 4.14). Only those agricultural exports within Central America have experienced an increase in value of 16% in that period.

Table 4.14: Evolution of Central American agricultural trade by trade partner (Million US$)

Trade partner	Exports					Imports				
	1997	1998	1999	2000	2001	1997	1998	1999	2000	2001
United States	2,527	2,616	2,186	2,432	2,001	886	942	978	864	1,026
European Union	1,850	1,743	1,351	1,310	1,006	134	155	131	100	115
Central America	532	686	769	809	815	542	688	741	860	927
Others	899	1,120	801	835	853	537	545	609	578	714
Total	5,808	6,166	5,108	5,385	4,675	2,099	2,330	2,459	2,402	2,781

Source: Author's elaboration based on SIECA (2003c).

The region's agricultural and food imports totaled US$2.8 billion, or 14% of total imports (Table 4.1). The region, as well as all countries but El Salvador, is a net agricultural exporter. The importance of the US as a provider of agricultural products to the region is similar to its importance as an export market, but for Honduras and Costa Rica, imports from the US reaches relatively high proportions that approach a half of these countries' agricultural imports (Table 4.15). Intra-regional trade accounts for a third of the region's imports, and El Salvador and Nicaragua receive a high proportion of their agricultural imports from the region, while the opposite is true for Costa Rica. Finally, agricultural imports from the EU are very scarce, representing about 4% of the region's total, but the respective figure is double the regional average for Costa Rica.

Many of the region's agricultural and food imports are more processed than not (See Table 4.12). To illustrate, the top agricultural and food import group is various food preparations, and four other entries of the ten main imports are processed foods such as oil-cake, bread, and candies. Additionally, the region has more processed good entries in its ten main agricultural imports than in its ten main agricultural exports. These characteristics are also reflected in each Central American country's agricultural import data, except for those for El Salvador. Country data show that most principal processed agricultural and food imports are foods, but some are animal feedstuff and others are tobacco and related products.

Table 4.15: Origin composition of Central American agricultural imports in 2001 (million US$)

From \ To	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Central America
United States	227	218	263	230	88	1,026
Central America	78	291	256	163	139	927
European Union	41	22	27	16	9	115
Others	142	125	260	128	58	713
Total	488	656	806	537	294	2,781

Source: Author's elaboration based on SIECA (2003c).

Grains are another type of principal agricultural products imported by the region. These include corn, wheat, rice and malt extract. The importance of this product category is also reflected in the respective country data, with each country having at least two entries of this category in the respective ten main imported goods data. Additionally, dairy products such as milk and cream are among the main imported food products for the region.

While agricultural exports have decreased, agricultural imports have increased despite a slowdown in the regional economy. From 1998 to 2001, imports rose by almost 20% in value (Table 4.13). Imports from the EU, however, have decreased by 26%, while those from the US increased by 9% during that period (Table 4.14).

4.5. Conclusions

Central America is comprised of five small countries with divergent characteristics. For example, within the region, the country with the largest territory has more than 6 times the land of the smallest country. In another example, the largest economy is almost 10 times the size of the smallest one. Similarly, the average per capita income in the richest country in the region is almost 10 times that of the least affluent country.

Among similarities in country characteristics in agricultural and food trade, such as being net exporters of coffee and net importers of grains, important differences also exist. For example, one country distinguishes itself for being a net agricultural and food importer, and for exporting more processed than raw foods. For that and another country, the most important agricultural and food export market is Central America, rather than the US that is the case for the other countries. For yet another country, the EU is a more important export market than it is for the region, and that country has experienced success in diversifying its export agriculture in nontraditional crops.

Although to different extent, Central American countries are all open to trade. In promoting economic growth, these countries have exploited opportunities in the external sector, but they also have recently experienced setbacks from exposure to international markets. Adverse conditions in export markets, along with scarce preparations to mitigate such situations, have led to a slow down in economic growth in Central America.

In an effort to improve its position in the international scene, such as by enabling better economies of scale, the region has long maintained efforts to integrate the region. Progress has been slow at times, but countries have in recent years made firm moves to approach a customs union. The region’s trade partners have also contributed for its stronger cohesion through mechanisms such as the CAFTA negotiations in which the US asked Central America to negotiate as a block. Expectations are high that initiatives such as the regional customs union and CAFTA will help in reinvigorating the economies.

Chapter 5. Trade-related technical regulation issues in Central America

5.1. Introduction

Central America has accumulated much experience in technical regulations in trade. The experiences that allow analysis of the region's management capacity are detailed in this chapter. To that end, the impact of international institutions such as the WTO and the standard setting institutions that it acknowledges is presented to assess the degree to which the region has benefited from these institutions and has fulfilled commitments made with them. The Central American regional institutions are presented since they have been influential, and in some respects more so than the global multilateral institutions, in defining the incidence of technical regulations in Central American trade.

An introduction to the national institutional structure is helpful for a clearer picture of the players involved in technical regulations. Additionally, the management capacity of these institutions is of interest insofar as it affects trade opportunities for the food sector. Overview of Central American national institutions and their management capacity is thus provided.

For an initial assessment of trade restriction issues, indicators may be constructed from import rejection and trade dispute data. With an aim to subsequently present Central American agricultural and food trade restriction issues that relate to technical regulations, the region's relation with US SPS institutions is first documented.[27] Trade restriction issues are then presented in two formats. First, for a group of issues, statistical data is used for characterization of trade restriction where this was possible. Second, acknowledging that different sides have diverging views on restriction issues, these are described as perceived by interviewees contacted for the purpose of this research and as documented by texts publicly made available.

Emphasis of the interviews was placed on opinions on issues directly related to trade restriction in the countries involved, but broader issues of interest for the present study were also considered as it was found that the literature provided relatively little or sparse information on

[27] Relations with EU institutions are not presented in this document as experience on trade-related technical regulation issues with the EU is scarce and the issues are not of great concern for the region.

them.[28] Therefore, although much result from the interviews is reported in section "5.5.b. Perceptions on issues" below, input from interviewees is also scattered elsewhere throughout this chapter. A final section in this chapter brings together a summary of findings from the interviews.

To provide an orientation to the discussions, an interview instrument (attached in Appendix A) was constructed, and it contains topics that help in describing the Central American agricultural and food trade-related technical regulation issues under the framework introduced in the previous chapter. In general terms, the instrument guides interviewees to reveal their opinions on the importance of technical regulations in trade and the impact of international institutions and CAFTA on trade-related technical regulation issues.

The vast majority of interviews were conducted in the capital cities of the US and of the five Central American countries with persons whose work relates to technical regulations in the context of Central American agricultural and food trade. The interviews were conducted during the period September 2003 through January 2004.[29] Table 5.1 shows the dates when interviews were conducted. Given the relative scarcity of information in the literature on the subject of the present research, interview objectives in the first two months were especially directed towards comprehending the overall scenario of the research problem under the guidance of the interview instrument. With a general comprehension of the issues, subsequent interviews were realized to verify understanding of the issues and to fill information gaps for topics that were identified to be of especial importance but where insufficient data was initially gathered.

Table 5.1: Interview schedule

Country	2003				2004
	September	October	November	December	January
Costa Rica					14-16
El Salvador		6-10, 15-17			
Guatemala	29, 30	1-3		8, 9[a]	
Honduras					8, 9
Nicaragua					12, 13
United States	10-12		24, 25		

Notes: The numbers in the cells correspond to the dates when interviews were conducted. [a] Interviews via phone conversations.

[28] Bernardo et al (2003) provided perhaps the most helpful information especially in the beginning phase of this research for an initial understanding of the issues.

[29] The interview period was one in which CAFTA negotiations were coming to an end and important decisions were being made, making the interviews valuable and timely. A small number of interviews were made via phone conversation as noted in Table 4.1.

Most interviewees were selected by identifying first the institutions and then the persons in those institutions that oversee Central American trade-related technical regulation matters.[30] Some interviewees, however, were identified as a result of references provided through earlier interviewees.[31] A list of the interviewees is attached as Appendix B. A breakdown of the number of interviewees by the interviewee's country of residence and the type of his or her organization is presented in Table 5.2. As the focus of this research is Central America, more professionals of the region were interviewed than those from the US. Within the region, more interviews were made in the larger economies. In the US, most interviews were made with local public officials, while private organizations and firms, research institutions, international and regional public institutions, and embassies and affiliated institutions were also frequently visited in Central America. In all, almost 100 persons were interviewed.

Table 5.2: Summary of interviewees by type of organization

Country	Local organizations			Foreign organizations		Total
	Government institutions	Private organizations	Not for profit organizations	International institutions	Government institutions	
Costa Rica	4	10	4	1	1	20
El Salvador	6	3	4	4	2	19
Guatemala	11	4	0	4	4	23
Honduras	1	5	0	0	4	10
Nicaragua	5	4	0	0	2	11
Sub-total	*27*	*26*	*8*	*9*	*13*	*83*
United States	11	0	0	1	1	13
Total	38	26	8	10	14	96

A few results from the interviews are noteworthy of mentioning at this point. First, technical regulations were reported to be very important by interviewees.[32] To substantiate their claim, it is noteworthy that of a total of 16 intraregional trade disputes pending resolution as of November 2003, 7 were related to technical regulations in agricultural and food trade.[33] Second, SPS issues heavily outweigh TBT issues, which in turn outweigh GI issues in importance for Central

[30] For this purpose, Bernardo et al (2003), IICA (1999), USDA (2002), USDA (2003a-c), and especially the internet were consulted intensively.
[31] Additionally, most interviewees in Nicaragua and Costa Rica, where many were from the private sector, were suggested by contact persons in the respective countries.
[32] The interviewees generally shared a fine level of knowledge of the issues, which helps to demonstrate, in addition to their importance, the existence of a wide awareness on trade-related technical regulation matters.
[33] It is recognized that many trade disputes classified here as related to technical regulations can also be conceived as those of trade facilitation, which is one of the four issues emphasized at a 1996 WTO Singapore meeting. Trade facilitation refers to streamlining import and export procedures.

American trade.[34] Another manner to interpret this result is that risk-reducing regulations have been of more concern than quality-related regulations. The intraregional dispute data emphasizes this point as all pending cases involve complaints against SPS measures. Furthermore, Central American interviewees were scarcely concerned about technical regulations in the EU as interpreted by their extremely rare mention of related problems with that region. Some interviewees went as far as to think that the US imposes more questionable regulations than the EU.[35] Due to these findings, the rest of the discussion in this chapter places emphasis on the description of trade-related SPS issues for Central America with the US and with intraregional trade partners, although a few TBT matters are presented where they merit attention.

5.2. Use and impact of international institutions

International institutions may be influential on trade-related technical regulations as they may provide the rules of the game for individual countries in setting regulations and may judge on country compliance with the rules. These institutions may also serve as a forum where countries discuss issues of interest to them or where parameters, in the form of international standards, are established. For Central America, there are two types of international institutions that affect its agricultural and food trade and technical regulations. These are the multilateral institutions such as the WTO and the standard setting institutions, and the regional institutions.

[34] There were a few emerging voluntary TBT issues that were brought up by interviewees, mostly in Costa Rica. One such issue is organic certification in products such as bananas and beef for exports to either the US or the EU. Another issue is sometimes collectively called good agricultural practices (GAP), which may reference concerns on product quality, fair trade (respect of labor conditions), environmental protection and animal welfare (respect of treatment of animals). An example of a GAP is the EUREPGAP (Euro Retailer Produce Working Group Good Agricultural Practices) for horticultural products. Although the issue was not brought to attention by any interviewee, it is noteworthy that some coffee producers in Central America are attempting to elude the impact of low international prices by entering into the more lucrative yet small market of certified coffee in quality, or environmental- or labor-friendly production. As for a case related to GIs, only one was mentioned as having a future possibility in requesting GI protection. This was the case of *pupusas* that originate in El Salvador, which may be described as small calzone-style round tortillas with cheese, pork skin or other fillings inside.

[35] Supporting the low incidence of complaints against SPS measures imposed by the EU, it is interesting to note that, although Central American agricultural and food exports to the EU are a half in value of respective exports to the US (see Table 4.9), interviewees expressed substantially less complaints against measures in the EU. When asked, many interviewees could not immediately reply with specific cases in which the EU had rejected Central American exports.

5.2.a. The WTO and standard setting institutions

All Central American countries are members of the WTO since 1995. They are also members of the international organizations mentioned by the WTO SPS Agreement, namely, the OIE, IPPC and Codex Alimentarius (Bernardo et al, 2003).

According to Central American officials, country participation at the WTO SPS Committee meetings is regular (Bernardo et al, 2003).[36] The SPS Committee meetings are attended by the country director or sub-director of the animal and plant health service. Additionally, Central American officials attend meetings at the OIE regularly, but less so at the IPPC (Bernardo et al, 2003). Participation at CODEX meetings is sporadic, due to the large number and to the specificity of the meetings that make them costly to attend. Costa Rica's efforts to have a representation at the CODEX meetings are noteworthy, as it delegates participation to the private sector with interest at specific meetings.

Abiding by the legal duty, all Central American countries have established both SPS notification authorities and enquiry points (WTO, 2003c; WTO, 2003d). Table 5.3 presents the number of SPS notifications that Central America has made by year. In the first couple of years of operation of the WTO SPS Agreement, the region hardly submitted notifications, but the number later increased and in most years, the region has submitted at least 10 notifications. By September 2003, Central America had made 97 notifications, of which El Salvador had made the most, followed by Costa Rica, Guatemala and Honduras. Nicaragua had yet to submit a SPS notification.[37] For comparison purposes, WTO members had submitted more than 2,400 notifications between 1995 and 2001 (Josling, Roberts and Orden, 2003).

A closer look at the Central American SPS notifications by regulatory goal of the notified regulation reveals that plant protection measures have been notified the most, followed by animal health, and food safety and others (Table 5.4).[38] The higher number of notifications regarding plant protection measures is consistent with the higher incidence of Central American trade in plant products than in animal products. This emphasis on plant protection regulations is

[36] IICA (Inter-American Institute for Cooperation on Agriculture), along with the USDA, has made participation by Central American SPS authorities to a few meetings possible in recent years by providing necessary funds (WTO, 2003f).

[37] By December 2003, Nicaragua had made 18 notifications. Furthermore, by that time El Salvador and Honduras had added 9 and 1 notifications, respectively.

[38] Appendix 3 provides a summary of the Central American notifications available on the WTO website. See notes for that table about some issues regarding the notifications, which implies the use of caution in analyzing the notifications.

especially evident for Costa Rica and Guatemala, which are the region's largest exporters of plant products and they therefore may have stronger vested interests in implementing phytosanitary measures.

Table 5.3: Number of Central American SPS notifications by year

Year	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Total
1995	0	0	0	0	0	0
1996	0	2	1	1	0	4
1997	19	1	0	1	0	21
1998	2	15	0	0	0	17
1999	1	11	5	0	0	17
2000	0	2	0	1	0	3
2001	2	4	3	1	0	10
2002	4	10	0	0	0	14
2003[1]	0	0	11	0	0	11
Total	28	45	20	4	0	97

Notes: [1] Through September 2003.
Source: Author's elaboration based on WTO (1996-2003a).

On the other hand, despite being relatively low, the number of animal health-related notifications is disproportionately high compared to the incidence of trade in animal products. Notifications that reference food safety concerns are also unexpectedly high for these countries with presumably scarce resources to devote for protection of human health. The high number of notifications that refer to food safety and animal health is especially clear for El Salvador which has more reference to each of these objectives than to plant protection.

Finally, it is worthwhile to observe the scarcity of international standards relevant to the notified measures as reported by the countries (See Appendix C, which summarizes information on SPS notifications available on the WTO website). Of the 85 Central American notifications in Appendix C, 61 (or 72% of total notifications) reported not having a reference international standard. Central America seems to be especially concerned with the low number (17) of existing international plant protection standards, a problem that partly originates from the long period of a few years that drafting to approval of a new measure can take (Bernardo et al, 2003). On the other hand, despite not a commonplace in the region, an interesting note is that Costa Rica has been proposing Codex standards for products of its interest.[39]

[39] For example, Costa Rica developed the Codex norm for *chayote*, a vegetable, and is working on setting pineapple standards (Bernardo et al, 2003).

Table 5.4: Number of Central American SPS notifications by regulatory goal, 1996-2003

Country	Regulatory goal			
	Food safety	Animal health	Plant protection	Others[1]
Costa Rica	5	5	11	5
El Salvador	19	22	18	10
Guatemala	3	6	15	11
Honduras	1	2	1	2
Total	28	35	45	28

Notes: Nicaragua is not reported as it has not made an SPS notification. Regulatory goal classification is as indicated in the objective of the regulation by the notifying country. In a few notifications, the given information did not fit the classification presented above, in which case the author categorized it according to information given elsewhere in the document. 11 notifications for Costa Rica and one for El Salvador are not taken into account here as they are not available on the WTO website. The sum of the total row exceeds the number of Central American notifications as many notifications cite multiple regulatory goals (See Appendix C). [1] The other two objectives are to 'protect humans from animal/plant pest or disease' and to 'protect territory from other damage from pests'.

Source: Author's elaboration based on WTO (1996-2003b).

Another measure of participation at the SPS committee is the number of counter notifications filed. In this respect, Central America has filed only one counter notification to date, which is a miniscule number as compared to the 187 counter notifications presented by all member countries by 2001 (WTO, 2003e; Josling, Roberts and Orden, 2003).[40] On the receiving side, Central American countries have responded to four counter notifications (WTO, 2003e). One of these counter notifications involves Central American countries on both the submission and reception sides, by which in November 2002 Costa Rica complained about Honduras' ban on Costa Rican poultry imports (WTO, 2003e). The issue drew attention as Argentina, Chile and Thailand supported Costa Rica's concerns. In October 1996, another counter notification was raised by the US against poultry regulations in El Salvador, Honduras and other small countries.

[40] However, in April of 2003 Nicaragua voiced its share of concern with the US complaint against Mexican restrictions on importation of beans (WTO, 2003h). Mexico attributed suspension of importation to its plant health regulations, but the US saw no evidence of plant health risks. Nicaragua was not able to export beans to Mexico since 1998 and had further concerns that Mexico violated the principles of transparency and most favored nation (IICA, 2003a; WTO, 2003i). Nicaragua pursued this concern further, and it is noteworthy that it became the first Central American country to request for consultation under the WTO DSU on an SPS issue. As a result, by July 2003 Nicaraguan export of beans to Mexico was resumed. A Nicaraguan interviewee for this study emphasized that support from the Advisory Centre on WTO Law (ACWL) in Geneva was crucial as Nicaragua obtained legal advise in preparing the case. The ACWL was created in 2001 and is a fund created for developing countries to overcome financial and legal barriers when participating in the DSU (Jensen, 2002). The level of contribution to the ACWL and of charges due to its services differ depending on the incomes of the associated countries.

This last dispute has not been resolved, and the two cases are reviewed in more detail further below.[41]

Through interviews, Central American professionals knowledgeable on technical regulations expressed their views on the impact of global international institutions to the region. Many interviewees said that the related WTO Agreements benefited the region mostly by promoting a regulatory reform in their countries, through which technical regulations were reviewed and modified to conform to the requirements under the Agreements.

There were, however, some that believed that the Agreements did not prove fruitful for the region. Notably, an interviewee considered these Agreements as unjust to Central America as they provided a legal pretext for developed countries to establish disguised means to protect their producers. According to this line of thought, developed countries know that developing countries that presumably have low capacity to conduct risk assessment cannot successfully oppose technical regulations even if they are set unfaithfully to the WTO Agreements. Developed countries would then be able to use such regulations to limit imports from developing countries and protect their producers. Even among those who considered that the Agreements were beneficial to Central America in principle, there were numerous interviewees with the view that expectations have not been met since application of the Agreements has been inconsistent as many developed and developing countries alike have not abided by them. Furthermore, the opinion expressed by many professionals that the WTO dispute resolution mechanism is too costly for countries in the region may be summarized by an interviewee comment affirming that, in order for Central America to present a trade complaint in a particular product to the WTO, that product "would have to belong to either the banana or coffee sector", which are the exporting sectors with the largest incomes of the region.

5.2.b. The Central American regional institutions

At the regional level, the Council of Ministers of Economic Integration (COMIECO), which is the maximum authority of the Central American Subsystem of Economic Integration,

[41] According to interviewees for this study, Costa Rican poultry imports to Honduras was resumed by November 2003.One of the other two counter notifications faced by Central America is the US complaint on Honduran import restrictions on rice. The other one is Uruguay's complaint on restrictions on imported meat into El Salvador. Both issues are reported to have been resolved (WTO, 2003e).

has worked on various fronts to further the creation of the customs union especially since 1999.[42] The regional institutional framework for trade-related technical regulations has been influenced through adaptation of a regional regulatory framework, promotion of regional harmonization of measures and creation of mechanisms that support resolution of trade disputes.

On the institutional framework, regional legislation of counterpart agreements to the WTO regulations, which include the Central American Regulations on Sanitary and Phytosanitary Measures and Procedures, and the Central American Regulations on Measures of Normalization, Metrology and Authorization Procedures, were both approved in 1999.[43] The Protocol of Modification to the Central American Agreement for Protection of the Industrial Property had been approved earlier in 1994. These agreements include certain enhancements to their multilateral counterparts which, for example, promote regional regulatory harmonization, create regional committees and enable possession of rights to geographical indications for any qualified product, but in essence, they reiterate the respective WTO Agreements.

With the leadership of COMIECO, some measures to advance regional harmonization of technical regulations have been taken. Most notably, all countries in the region have agreed on the mutual recognition of sanitary permits for processed foods.[44] Other measures such as labeling and nutritional fortification of wheat flour have also been harmonized although with a varied level of participation by the countries involved.[45]

Harmonization of the regulation to nutritionally fortified wheat flour has aided to resolve a trade dispute between El Salvador and Guatemala, the partners with the largest trade value in the region.[46] This case also offers a rare TBT-related contention in the region. The case started when Guatemala banned imports of wheat flour from El Salvador because of the lack of nutritional fortification. El Salvador presented a complaint at SIECA in February 2002 (See Appendix D).

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[42] The universe of institutions that govern all aspects of Central American integration is called the Central American System of Integration (SICA).

[43] Both regulations were approved through COMIECO Resolution No. 37-99.

[44] An agreement was reached on this through COMIECO Resolution No. 80-2001 and No. 92-2002. This is the only relevant harmonization regulation that Costa Rica has signed. Costa Rica's reluctance to harmonize at the regional level may be interpreted as the Central American reflection of the global problem of few harmonization efforts by developed countries.

[45] Representatives from Guatemala, Honduras and Nicaragua for the technical committee discussing the issue have agreed on unified labeling for canned foods. Representatives from all countries but Costa Rica have agreed on labeling for alcoholic beverages. Technical representatives from all five countries have agreed on the fortification regulation on wheat flour, but Costa Rica is the only country that did not sign the COMIECO Resolution No. 94-2002.

[46] This case is presented as number ES/GU/3 in Appendix 5.

However, the issue was resolved soon after both countries signed the resolution that regionally harmonized fortification requirements for wheat flour in September 2002.

Sometimes with the help of harmonized regulations, there has been much recent progress in the resolution of regional trade disputes that relate to technical regulations. Regional institutions have again been central in this task. When countries have trade complaints against regional partners and resolution cannot be reached through bilateral exchange, complainants present their cases to the SIECA (Central American System of Economic Integration).[47] SIECA has two roles in handling a dispute: One of emitting a judgment on the case and one of a mediator that expedites the resolution process. As a judge, it studies the case and presents a non-binding legal judgment on whether regional regulations have been infringed.[48] As a mediator, SIECA maintains a record of trade disputes, follows them up, and assures that they are aired at the inter-institutional meetings of the Directors of Integration, Customs, Health, Animal Health, Plant Health and Terrestrial Transport, where many disputes have been resolved.

At the annual inter-institutional meetings, directors from each country of governmental departments suggested by the name of the meetings convene to discuss issues related to the conformation of the customs union. One such issue is the elimination of all trade disputes as a prerequisite to create the customs union.[49] In that spirit, trade disputes are discussed in the inter-institutional meetings similar to the manner in which they are discussed in the WTO SPS or TBT Committee following counter notifications. Table 5.5 summarizes the status of the complaints for the period November 2001 through November 2003 as reported by SIECA (2001-2003).[50]

Taking into account that many other complaints must have been filed from the period January through October 2001 that is not covered by the data in Table 5.5, it can be appreciated that new SPS and TBT complaints are diminishing in time, with only one new complaint

[47] SIECA is the regional institution in charge of economic matters and provides administrative and technical support to COMIECO.
[48] According to the SIECA official interviewed on this matter, the institution emits a resolution in only three days since its reception of a complaint. As SIECA does not have scientific capacity, it does not consider compliance of technical matters. SIECA started emitting a legal judgment in 2003.
[49] A deadline to eliminate trade disputes was first set at the end of 2002, and when it was not met, the deadline was moved to the end of 2003.
[50] These complaints are reported approximately monthly in the form of matrices of “Measures Contrary to Intraregional Free Trade (MCIFT)”. The matrices dating back to November 2001 can be found through a search on the virtual library on SIECA’s website.

reported in 2003.[51] Similarly, the total number of complaints that were under consideration and of complaints whose resolution was pending in a given year is diminishing in time. Without putting much emphasis on the point, Central American interviewees also supported the idea that intraregional trade disputes were decreasing.[52] Although some trade disputes are resolved through bilateral communication that is maintained between countries involved even after a complaint is submitted to the SIECA, a higher number of trade disputes are reportedly resolved as a result of the inter-institutional meetings. The near future for resolution of trade disputes is also bright as a formal dispute resolution mechanism whose final decisions are binding has just been established early in 2003. [53]

Table 5.5: Intra-regional agricultural and food trade-related complaints on technical regulations by status

Year	Number of complaints				
	Under consideration			Resolved	Pending
	Carried over	New	Total		
2001	-	11	11	1	10
2002	10	18	28	18	10
2003	10	1	11	4	7
Total	-	30	-	23	-

Source: Author's elaboration based on SIECA (2003c). See notes for Appendix D, where disputes are summarized.

A regional technical institution that has had a role in trade-related SPS regulations in Central America is the International Regional Organization of Agricultural Health (OIRSA). Created in 1953, OIRSA is in charge of the regional coordination of SPS regulations (OIRSA, 2003).[54] It is an observer organization in the WTO SPS Committee and has representations in all Central American countries.

[51] Trade disputes in all areas are decreasing too, as there were 63 total disputes reported when they were first systematically recorded by SIECA in 1999, and there are now only 16 remaining to be resolved.
[52] Opinion on this point by interviewees is important as not all disputes that emerge may be reported.
[53] In a similar manner to the WTO DSU, the regional dispute resolution mechanism first relies on bilateral consultations between the countries involved and then on intervention either by COMIECO or an arbitral tribunal. Decisions made by the arbitral tribunal are final and, if not followed, the opposing country is allowed to suspend trade benefits that would compensate for the damages recognized by the arbitral tribunal. Disputes that have been effective at the time of establishment of the mechanism are not applicable for consideration. Similarity of this mechanism to the multilateral counterpart indicates again that WTO Agreements have cast influence in Central American institutions.
[54] In addition to the five Central American countries, Mexico and Panama are the founders of the institution. Belize became a member later.

One way in which OIRSA has been influential in the area is by providing personnel that conduct SPS inspections at ports-of-entry in Guatemala and Honduras (Bernardo et al, 2003). By doing so, OIRSA has filled in a demand created by Guatemala's and Honduras' lack of financial and technical resources to conduct effective SPS inspections at the border. OIRSA has also used its technical skill to assist Central American countries in the elaboration of 20 to 30 pest risk assessments (PRAs). PRAs are studies that are conducted to evaluate the risks that importation of specific agricultural and food products pose to plants in the agricultural sector and wildlife from introduction of pests that are not prevalent in the importing country. PRAs conducted under supervision by OIRSA reportedly account for many of the PRAs conducted in the region to back domestic regulations.

A PRA whose elaboration was assisted by OIRSA was momentous to the resolution of another trade dispute between Guatemala and El Salvador. In this case, Guatemala filed a complaint at SIECA in July 2002 when El Salvador banned all coconut imports from Guatemala due to lethal yellowing disease, a disease that is easily detectable by sight.[55] OIRSA offered assistance to the countries by elaborating a PRA, which concluded that El Salvador could import coconuts from the southern region of Escuintla in Guatemala without posing a great risk of diffusion of the disease into the country (Bernardo et al, 2003). El Salvador eventually adopted the measure suggested by the scientific assessment, and the Guatemalan complaint was withdrawn in April 2003.

5.3. National institutions and management capacities

In many respects, Central American countries share similar agricultural trade-related institutional and legislative structures. Table 5.6 summarizes the similarities. Each country has a ministry of agriculture, under which the animal and plant health authority (or authorities in the case of Costa Rica) lies. A corresponding animal and plant health law (two laws for Costa Rica), which provides a general framework, is also in place.

Human health issues in general are generally overseen by a ministry of health, which harbors the national food safety inspection authority. A general law that exclusively attends food safety issues does not exist in Central America, but each country has a generic health law that references food safety. Though less numerous than for the case of the animal and plant health

[55] This case is referenced as number GU/ES/7 in Appendix 5.

Table 5.6: Central American agricultural and food trade-related authorities and legislation

Country	Agriculture - Animal and plant health		Human Health - Food safety	
	Authority	Legislation	Authority	Legislation
Costa Rica	Ministry of Agriculture and Livestock		Ministry of Health	General Law of Health (1973)
	- Directorate of Phytosanitary Protection Service - Directorate of Animal Health	- Animal Health Law (1978) - General Law of Phytosanitary Protection (1997)	- Directorate of Registers and Controls	
El Salvador	Ministry of Agriculture and Livestock		Ministry of Public Health and Social Assistance	Health Code (1982)
	- General Directorate of Plant and Animal Health	- Plant and Animal Health Law (1995)	- Department of Environmental Health	
Guatemala	Ministry of Agriculture, Livestock and Food		Ministry of Public Health and Social Assistance	Health Code (1997)
	- Unit of Norms and Regulations	- General Animal and Plant Health Law (1998)	- Department of Registration and Control of Food	
Honduras	Secretariat of Agriculture and Livestock		Secretariat of Health	Health Code (1991)
	- National Agricultural and Livestock Health Service	- Phytosanitary and Animal Health Law (1994)	- Division of Food Control	
Nicaragua	Ministry of Agriculture and Forestry		Ministry of Health	General Law of Health (2002)
	- General Directorate of Agricultural and Livestock Protection and Health	- Basic Law of Animal Health and Vegetable Health (2003)	- Directorate of Technical regulation	

Country	Economy, industry and trade - Trade policy and negotiation	- Trade administration	- Standard setting	- Consumer protection	
	Authority	Authority	Authority	Authority	Legislation
Costa Rica	Ministry of Trade		Ministry of the Economy, Industry and Trade		
	- Directorate of Trade Negotiations	- Directorate of Trade Agreement Application	- National office of Norms and Units of Measure	- Area of Consumer Support	- Law for the Effective Prot'n of the Consumer (1995)
El Salvador	Ministry of Economy				
	- Directorate of Trade Policy	- Directorate of Trade Agreement Administration	- National Science and Technology Council	- General Directorate of Consumer Protection	- Consumer Protection Law (1996)
Guatemala	Ministry of Economy				
	- Directorate of Trade Policy	- Directorate of Trade Administration	- Guatemalan Norms Commission	- Dir. of Att'n and Assistance to the Consumer	- Consumer and User Protection Law (2003)
Honduras	Secretariat of Economy and Trade				
	- Directorate of CA Int'n and Trade Policy	- Directorate of Agreement Administration	- Inter-inst'l Commission of Normalization	- Directorate of Consumer Protection	- Consumer Protection Law (1989)
Nicaragua	Ministry of Promotion, Industry and Commerce				
	- Directorate of Trade Negotiations	- Directorate of Integration and Trade Administration	- Dir. of Tech., Normalization and Metrology	- Directorate of Consumer Protection	- Consumer Protection Law (1994)

Notes: The year in which a law was created or last modified is in parenthesis. Source: Bernardo et al (2003); IICA (1999); USDA (2002); USDA (2003a-c), web pages of respective institutions.

law, several food safety regulations and standards that treat specific risks or products coexist in each country.[56] Food safety is also treated from the perspective of consumer protection in all countries through a respective law.

Another important institution is the ministry of economy, industry and trade, or the two ministries, in the case of Costa Rica, that share tasks of overseeing those issues. Two sections in the economy (or, for Costa Rica, trade) ministry handle trade matters: One of trade policy and negotiation and another of trade administration. The ministries of economy in Central America also set food safety standards and oversee food safety from the perspective of consumer protection as mentioned above.

Description of additional features that differentiate between the SPS-related sections under the ministries of agriculture and health leads to a more detailed characterization of the Central American SPS institutional structures. To begin, despite the characterization above, it is noteworthy that the ministry of agriculture regulates raw agricultural products such as produce, grains and meats, whereas the ministry of health has authority on regulation of processed food. The combination of this feature and the manner in which SPS authority is attributed among the institutions has resulted in an ambiguity as to whether food safety regulation in raw foods is the responsibility of the food safety institution under the ministry of health (because of its jurisdiction in food safety), or of the animal and plant health institution under the ministry of agriculture (because of its duty to regulate raw foods). Relevant national laws do not provide support to clarify this confusion and each SPS institution claims its right to regulate. The ambiguity in authority thus becomes a source of inter-institutional coordination failure (IICA, 1999).

Another distinction between the SPS institutions in the two ministries refers to their relative size to each other, which reflects the importance given to each institution. The animal and health institution is larger, with more related legislation, than the food safety institution.[57] SPS capacities of these institutions are proportionate to their sizes. For example, zoosanitary and phytosanitary inspection for imports is, though not thoroughly, conducted at principal ports of entry to the respective country where relevant permits are checked, whereas the food safety

[56] Appendix 3, which summarizes country notifications of regulations to the WTO SPS Committee, provides a general idea of Central America's specific food safety and animal and plant health law and regulations.
[57] Outside of the public sector, it is indicative too that consumer protection groups that work in the food safety area are very rare in the region.

institution only has resources to randomly inspect products at retail stores (Bernardo et al, 2003).[58] Additionally, while risk assessment for animal and plant health has been conducted, experience with food safety-related risk assessment is scarce.

Differences aside, a characteristic that applies to both the food safety and the animal and plant health authorities is the lack of resources that they face. The scarcity of resources in managing technical regulations is revealed in several dimensions. For instance, lack of personnel limits consistent enforcement of technical regulations, border inspection efforts and pest and disease surveillance work (Bernardo et al, 2003; Alford et al, 2003). Modern laboratory equipment is also reported to be in demand. Furthermore, as mentioned earlier, risk assessments have been conducted in the region, but these are very few in number.

Another resource-related concern is the lack of continuity in government officials that work in SPS matters (Bernardo et al, 2003). Officials are difficult to retain in Central America partly due to resource constraints that do not permit them to be rewarded according to their capacity and as a result, those with better performance are pulled out to the private sector. Frequent changes in the party in government after elections also affect tenure of officials as newly appointed higher ranked officials change staff in their charge. When officials change, accumulated know-how on technical regulations in export markets is lost for the institution and must be rebuilt.

Despite the generalized lack of SPS resources in Central America, Costa Rica and Guatemala possess stronger SPS initiatives, especially in attending export crops (Bernardo et al, 2003). Stronger SPS institutions in Costa Rica are to be expected first due to its higher wealth, and the strength of those institutions may partly explain its ability to attain a larger weight in absolute terms in the region as agricultural exporter to developed country markets of the US and the EU. As a result of better access to higher value added markets, for example, Costa Rica's plant health service has been able to economically self sustain most of its operations by charging for its services (Bernardo et al, 2003).[59] Even in its weakest SPS area, Costa Rica also

[58] Only a one-time registration of processed foods needs to be done by the food safety institution for subsequent imports to be admitted.

[59] Additionally, Costa Rica's success in animal health control is symbolized by its status as the only country in Central America, and one of a handful in the world, to be recognized by the US as free of Newcastle, an avian disease. Interviewees in the Costa Rican private sector for the present study also corroborated on the sound capacity of their SPS authorities, and studies support this finding on the export, import and domestic fronts of SPS management (Pomareda, 2002; Bernardo et al, 2003; USDA, 2003a). Coordination among the public, private and research institutions is also sound as illustrated by the case of an 18-inch maximum-length US regulation for

distinguishes itself by making efforts for progress by establishing the Integrated Commission for Food Safety with representation from the public, private and other sectors and it has food labeling regulations that are enforced well (USDA, 2003a).

While Costa Rica's strength in SPS management is spread throughout the public and private sectors, it is the private sector that demonstrates leadership in Guatemala. The Guatemalan private sector has learned through bitter experiences of rejections of goods at their import markets, at times resulting in a practically total demise of an industry (See the Guatemalan raspberry case below). However, through these situations, the sector has appreciated the importance of working together with local government institutions as well as SPS institutions in importing countries (Bernardo et al, 2003).

Although Central American interviewees did not emphasize much the point, it is noteworthy that most US interviewees showed thoughtfulness that the low SPS capacity in much of the region impeded some of their exports to meet the high SPS standards in the US. Furthermore, some US interviewees also noted what may be interpreted as a difference in cultural practices that affect the degree of success in fulfilling requirements prior to initiating the import of products. For example, it was expressed that there had been experiences where, in obtaining import permits, interested Central American parties were personally given the paperwork and detailed instructions to follow for filling in the paperwork. Nonetheless, these parties would subsequently fail to present the filled out information, thus abandoning the process, or, when they do submit the information, certain requirements would be missing. A similar point made by a few US interviewees relates to the presumed scarce entrepreneurship in Central America. US interviewees with this opinion would argue that ideas may be lacking to overcome reportedly legitimate SPS measures in the US.[60] Some interviewees on the Central American side seconded that opinion, and several of those persons would also add that private sector comprehension of the importance and of the nature of SPS measures was deficient.

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ornamental plants discussed below, where a national university has taken the task to carry out PRAs for the pathogens indicated by the US.

[60] A concrete example that was mentioned is the lack of a private sector initiative in making substantive efforts to have an area reportedly free of the Mediterranean fruit fly recognized as such by the US for improved export opportunities.

5.4. Institutional SPS relations with the US

The US has three institutions with important SPS inspection responsibilities: the Food and Drug Administration (FDA), the Food Safety and Inspection Service (FSIS) and the Animal and Plant Health Service (APHIS). Although FDA belongs to the Department of Health and Human Services and FSIS to the Department of Agriculture (USDA), they are both in charge of overseeing food safety issues, with the difference that FSIS oversees meat, poultry and egg products, and FDA the rest of agricultural and food products.[61] On the other hand, APHIS is commissioned to administer all zoosanitary and phytosanitary concerns.

Interaction between Central American and US government officials is frequent and occurs via different channels (Bernardo et al, 2003). One channel of interaction is through the US SPS representations in Central America. For example, APHIS has had a representation in Guatemala for decades, through which it conducts surveillance on pests of interest to the US. The Guatemalan private sector has taken advantage of that presence and has made discussions with local APHIS officials on numerous measures that restrict its exports to the US (Bernardo et al, 2003). Even without a permanent presence in the region such as the one that APHIS has, FDA and FSIS make regular visits to and interact with their homologues in the region. Central American officials also visit SPS institutions in the US, especially with the intent to lobby for admittance of crop exports from their countries, accompanied by representatives of the interested private sector.

An important part of the institutional interaction related to technical regulation matters in the US-Central American trade refers to cooperation issues. In this context, the US has provided cooperation over many years to Central America. For instance, the APHIS Guatemala office cooperates as a counterpart in the administration of the Mediterranean fruit fly control program (Bernardo et al, 2003). In another case, the USDA has recently allocated funds for PRAs for three priority products that El Salvador looks to obtain import admission into the US. The US SPS institutions have also provided numerous seminars and workshops (WTO, 2000-2003). The United States Agency for International Development (USAID) has additionally conducted SPS-related technical cooperation projects in the region, such as the Integrated Pest Management

[61] Nonetheless, some exceptions apply as to the jurisdiction of FDA and FSIS. For example, FDA takes charge on meat or poultry products when the cooked meat or poultry content is below 2%. The Environmental Protection Agency (EPA) is also an institution that relates to the US food safety system insofar as it sets the pesticide residue limits in foods.

Collaborative Research Support Program (IPM-CRSP) project, providing US researchers that have helped Guatemalan farmers to export produce that meet US SPS standards.[62] For example, in the snow peas case, the this project has helped with some success to provide measures that decrease dependence on pesticides and thus, to decrease rejection rates (Julian, Sullivan and Sanchez, 2000).

With the onset of CAFTA negotiations, new possibilities of US cooperation in SPS issues have presented. Specifically, the US president requested $47 million for capacity building in the region, representing a 74% increase over 2002, as part of the 2003 budget request. Trade capacity building (TCB) projects for the region would include SPS components such as "assistance to strengthen science-based food safety inspection systems" (USTR, 2003c). Within the CAFTA negotiation framework, TCB projects are the focus of discussion of the cooperation committee, while SPS issues are discussed in the SPS working group.

When CAFTA becomes effective, the SPS working group will be succeeded by a SPS Committee, under which SPS issues of concern for the countries will be discussed in a manner similar to the WTO SPS Committee. Because of this, some Central American interviewees were optimistic that there could be less SPS-related trade disputes with the US as officials in both sides will come to a better mutual understanding of the institutions involved.[63]

On the other hand, CAFTA negotiators agreed against having a dispute resolution mechanism for SPS matters. Central American interviewees, and especially those in the private sector, showed disappointment to that result. Their disappointment was due to their inability, because of the high costs that participation in those institutions implies for them, to benefit from alternative institutions such as the WTO dispute resolution mechanism and the WTO SPS Committee which could help in resolving their SPS-related complaints. Interviewees with this view were furthermore pessimistic that the incidence of SPS-related trade disputes with the US

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[62] The present study is also funded by the USAID IPM-CRSP project.

[63] Under this spirit, it is noteworthy that, as a result of Guatemala's request in the CAFTA SPS Working Group to prioritize their admittance to the US, APHIS is making efforts to speed up the risk assessment process for ripe tomatoes and green peppers from all Central America. It is expected that these crops will be admitted under a systems approach, which would include production under greenhouses. The possibility of exporting these crops into the US market is much anticipated in all Central America as illustrated by new investments in greenhouses and related production facilities in El Salvador for US $25 million and in Nicaragua for US$10 million. Guatemala is reported to have even more greenhouse-related investment for these crops. On the other hand, it is interesting to note that US interviewees were less optimistic on the view that CAFTA is an opportunitiy for Central America and the US to have better SPS-related relations, and most thought that even with CAFTA, SPS issues will be as significant impediments to trade.

would diminish with CAFTA. Several interviewees contrasted the situation with the case of Mexico, for which further institutional engagement with the US through NAFTA has not provided an opportunity for Mexican poultry exports to the US.

Contrary to the less optimistic view on CAFTA, and although intraregional trade seemed to be an issue of less importance for most, some interviewees in the region acknowledged that CAFTA negotiations have already provided benefits to the region by pushing it for a further economic integration. This has presumably occurred since the US is negotiating CAFTA with Central America as a block, and Central America has been forced to unite as a consequence. A US interviewee also mentioned another manner by which regional trade may benefit from CAFTA. According to that view, the US insistence on streamlining regulations and making them more transparent would also benefit intraregional trade.[64]

5.5. Agricultural and food trade restriction issues

The central interest of this paper is to assess whether and how technical regulations are affecting Central American agricultural and food trade. Answering that question in an objective manner is not a simple task for two reasons. First, quantification of the effects of technical regulations on trade is an incipient area that may need further development even when a particular product is the interest of such a research (Henson, 2002). Second, the scope of this study is very wide as it covers all agricultural and food products that Central America trades, or could potentially trade but is not doing so as technical regulations present as impediments. Therefore, a holistic qualitative approach is used to assess the issue of interest.

Under the approach taken in this section, factual information related to trade restriction due to technical regulations is first summarized and analyzed. By so doing, an attempt is made to provide some answers to the questions: How often are products rejected at the border? How much importance does that represent in overall agricultural and food trade? What are the characteristics of the products rejected at the border? How often does a country receive trade complaints from another? What are the characteristics of the complaints made?

After factual information is presented, information that may be considered as more subjective is described in a summary format. Much of this information comes from interviews

[64] See 4.5.b.ii. and 4.5.b.iii. below for further discussion on issues that the US asks Central America in SPS issues.

and also from the literature, such as documents that summarize trade complaints. Perceptions expressed through these interviews and documents are also contrasted to the more objective data.

5.5.a. Numerical data analysis on issues

Very few statistical data is readily available in an attempt to impartially analyze trade restriction issues that arise from technical regulations (Henson et al, 2000). Statistical data of this sort must usually be made from raw information that may exist on restriction issues such as rejection of imports and trade disputes. In this section, import refusal and trade complaint information is converted to and summarized in statistical formats to assess the impact of technical regulations on agricultural and food trade.

5.5.a.i. FDA Import Refusal Report data

One of the few publicly available sources of import rejection data is the monthly FDA Import Refusal Reports (IRR) (FDA, 2003). The IRR presents data on agricultural and food products that the FDA refused entry into the US due to food safety and to certain TBT concerns.[65] The data contains information such as the name of the manufacturer of the product refused for entry and the country of origin of the manufacturer, and data for the most recently available 12-month period is made available on the internet.[66]

Table 5.7 presents a summary of FDA's import refusal statistics during November 2002 through October 2003 for Central America and, for reference purposes, for a few of the largest trade partners to the US. Within Central America, Guatemala had by far the most import refusals, followed by Costa Rica and Honduras. Comparing to the reference group, Central American countries had substantially fewer refusals. However, when the number of refusals is normalized by the respective US import value of agricultural and fisheries products to produce a refusal rate,

[65] Drugs and medical equipment refused for entry are also recorded as the FDA has that responsibility under the Food, Drug and Cosmetic Act. Some TBT reasons for detention by the FDA are the lack of labeling, which ranges from nutritional labeling to English language requirement for labels, and of compliance with administrative procedures such as manufacturer's registration and filing of relevant information. For examples of detailed reasons for refusals, see Table 4.10 below.

[66] It is important to point that analysis of import rejections using FDA data does not provide a complete picture of food safety problems in imported products to the US for several reasons (Allshouse, Buzby, Harvey and Zorn, 2003; Caswell and Wang, 2001). First, FDA data is count data and does not provide value of rejected imports. Second, only a small sample of imports, whose sample size is determined by associated import risk, is actually inspected. This means that inspection and enforcement efforts are concentrated on areas with higher risks and that not all products with food safety problems are refused for import.

different results are obtained. Within Central America, Costa Rica was by far the country that had the least refusal rate per value of agricultural imports into the US at less than a hundred refusals per billion dollars of exports. Guatemala, Honduras and Nicaragua shared roughly similar refusal rates at around the regional average value. El Salvador, on the other hand, had a very high refusal rate among the countries in the region approaching 500 refusals per billion dollars of exports to the US.

Table 5.7: US import refusal statistics due to food safety and TBT reasons

Country	Number of refusals[1]	US agricultural and fisheries imports[2] (US$ million)	Refusal rate (per US$ billion imports)
Costa Rica	67	884	76
El Salvador	40	83	482
Guatemala	134	703	191
Honduras	60	366	164
Nicaragua	25	180	139
Central America	*326*	*2,217*	*147*
Canada	1,573	12,397	127
Germany	434	779	557
Japan	763	496	1,537
Mexico	2,017	5,891	342

Notes: Data for the period November 2002 through October 2003. [1] Includes import refusals for drug and medical equipment. [2] Annual data for 2002 from USDA's BICO database (USDA, 2003d).
Source: Author's elaboration based on FDA (2003).

Comparing these results to those for the reference countries, interesting points present. First, only Canada had a lower refusal rate than the Central American average. Mexico had a refusal rate that was more than twice of the regional one, Germany's was more than thrice, and Japan's was more than 10 times.[67] Another interesting finding from the data is that Costa Rica

[67] It is possible that more refusals for the reference countries are for drugs and medical equipment, in which case their real number of food import refusals and the food import refusal rates are lower than the tabulated results. Even so, however, the differences in refusal rates seem to be large enough that the general conclusion that many reference countries have higher refusal rates is not likely to be changed. In fact, a study that uses a similar methodology and similar FDA data but for seafood products shows similar results in that Canada has a lower detention rate and Japan a higher detention rate than Central American seafood (Allshouse, Buzby, Harvey and Zorn, 2003). The maintained deduction that imports from most of the reference countries experience more refusals is further supported by the high likelihood, given that the reference countries are some of the largest trade partners for the US, that an average shipment from these countries is larger in quantity and in value than a respective shipment from Central America, which implies that the refusal rate that reflects the value of refused imports would also be larger for the reference countries.

had a refusal rate that was even lower than that for Canada. This data therefore supports the general conclusion that most Central American countries faced fewer problems than many reference countries for compliance with FDA regulations in exporting to the US in the period under study.

Focusing attention on Central American foods refused for import into the US by type of food, it can be appreciated from Table 5.8 that produce and seeds were rejected the most.[68] Almost all of rejected seed exports to the US were from Guatemala, mainly in the form of snow peas (Table 5.9). Produce rejections were most prominent for Costa Rica (especially coriander) and Guatemala (especially blackberries). Despite the small value in processed food exports, the associated number of rejections was also significant, followed by seafood rejections. While Guatemala produced processed food, principally in the form of soups, that suffered the most numerous rejections, Honduras and Costa Rica produced seafood, mainly shrimp and swordfish, with the highest number of rejections. Finally, dairy products, mainly cheese, from El Salvador, Honduras and Nicaragua faced numerous import rejections into the US.

Table 5.8: FDA import refusals by type of food

Food type	Country of origin					
	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Total
Produce	30	0	20	8	2	60
Seeds	1	0	59	3	0	63
Seafood	14	7	8	17	5	51
Dairy products	2	9	1	19	12	43
Processed foods	8	10	30	7	3	58
Beverages	0	13	6	2	1	22
Others	0	0	0	1	1	2
Total	55	39	124	57	24	299

Notes: Data for the period November 2002 through October 2003.
Source: Author's elaboration based on FDA (2003).

[68] Refusal data for Tables 4.8 through 4.10 are exclusively for foods and excludes drugs and medical equipment.

Table 5.9: Principal foods refused for import by FDA

Food type	Country of origin				
	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua
Produce	Coriander		Blackberries	Okra	
Seeds			Snow peas		
Seafood	Swordfish			Shrimp	
Dairy products		Cheese		Cheese	Cheese
Processed foods			Soups		
Beverages		Soft drinks			

Notes: Data for the period November 2002 through October 2003.
Source: Author's elaboration based on FDA (2003).

A look at the reasons for which FDA refused imports of foods from Central America reveals that incompliance to labeling regulations was the most prominent (Table 5.10). More than a half of refusals due to labeling problems were experienced by Guatemalan exports.[69] Despite its highest agricultural and food export value in the region, Costa Rica has the lowest number of rejection due to labeling problems, which in turn suggests a very low rejection rate due to incompliance with labeling regulations.

Table 5.10: FDA import refusals by reason

Category of reason for refusal	Country of origin					
	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Total
Labeling	4	28 (12)	69 (37)	23 (18)	12 (7)	136 (78)
Pesticide residues	24	0	64	8	0	96
Colorant	0	8	1	0	0	9
Poisonous	3	1	0	2	2	8
Filthy/insanitary	13	13	6	15	10	57
Aflatoxin	0	0	1	0	0	1
Microbiological cont'n	2	10	5	25	8	50
Administrative req't	12	12	21	5	2	52
Total	58	72 (56)	167 (135)	78 (73)	34 (29)	409 (351)

Notes: Data for the period November 2002 through October 2003. The total number of refusal reason categories is greater than the number of refusals as one refusal may be due to multiple refusal reason categories. Numbers in parentheses refer to the citing of distinct category of reasons for a given refusal (ie, given a refusal, a category is counted only once even when multiple reasons within a category are cited).
Source: Author's elaboration based on FDA (2003).

[69] Some of the reported reasons for refusal were aggregated into categories. In Table 4.10, several labeling violations were aggregated into a 'labeling' category, filthy and insanitary into 'filth/insanitary', salmonella and bacterial into 'microbiological contamination', and several related reasons into 'administrative requirements'. Therefore, a given product could be refused due to multiple reasons within the same category of reason. The numbers in parenthesis refer to the number of reasons responsible for refusal when reasons within the same category are counted only once for a given product. This number is not reported when it coincides with the number resulting from counting each distinct reason. The discussion in the text refers to the numbers that are not in parenthesis.

The next important category of reasons for import refusal was pesticide residues. Again, a disproportionately large number of refusals were experienced by Guatemalan exports, followed by exports from Costa Rica and Honduras. Naturally, pesticide residue problems were inherent in many of the produce and seeds refused for imports from those countries. Filthy/insanitary was the next important problem, where Honduras faced many rejections, followed by Costa Rica and El Salvador. Microbiological contamination and incompliance with administrative requirements were each almost as equally problematic. Honduras had a high incidence of problems with microbiological contamination while Guatemala faced the most refusals due to incompliance with administrative requirements.

5.5.a.ii. Trade complaint data

An analysis of import refusals for US exports to Central America and for intraregional trade would be ideal. However, according to Central American SPS authorities interviewed, import rejection data is not recorded due mostly to the lack of resources to sustain the task. Another manner in which trade restriction issues can be characterized is by using information on trade complaints against Central American technical regulations. For US complaints, the yearly National Trade Estimate Report on Foreign Trade Barriers (NTE report) published by the United States Trade Representative (USTR) on the internet may the most appropriate source of information (USTR, 2003b).[70] Table 5.11 summarizes the number of US trade complaints on Central American technical regulations related to agricultural and food trade as reported in the 2003 publication of the NTE report.[71]

The US had 7 complaints against Central American technical regulations related to agricultural and food trade in 2002.[72,73] Of those, El Salvador received the most complaints,

[70] The NTE report presents only significant barriers that US exports face in their largest markets. Principal barriers in all Central American countries are included in the report. The document states that reported barriers include those that are inconsistent with international trading rules. Complaints are not clearly identified as such, as the report discusses other matters such as regulations and customs procedures that differ from those of the US but that the language in the report does not seem to criticize them as being potentially WTO-incompliant. Therefore, identifying complaints from text of the report necessarily involved some degree of judgment.

[71] Text in the report implies that most complaints are against foreign measures imposed in the year previous to the publication year of the report, unless otherwise noted. Therefore, those complaints presumed to be for the year 2002 are mainly considered in the present study.

[72] As in the case of import refusal data, care should be used for analysis of statistical data on complaints as these are count data that do not allow distinction of the magnitude of a complaint versus that of another.

[73] For comparison purposes, the US had 9 complaints against Central America (2 against each of Costa Rica, El Salvador and Guatemala, and 3 against Honduras) according to the 1996 USDA Survey of Technical Barriers to U.S.

followed by Honduras, and Costa Rica and Guatemala. Nicaragua received no complaints from the US, possibly due in large part to the low US export value to Nicaragua as this reduces the prospects for economic feasibility of airing a complaint. Besides Nicaragua, Central American countries imported from the US somewhat similar values of agricultural and food products, which means that the country that had the most complaint against, El Salvador, had also the highest rate of reception of complaint as calculated by normalizing the number of complaints received with the value of imports from the US. Similarly, Honduras had the second highest rate of complaint reception and Costa Rica and Guatemala the third.

Table 5.11: Central American rates of reception of US trade complaints on technical regulations (2002)

Importer	Number of complaints under consideration	Agricultural and food imports from the US (US$ million)	Rate of complaint reception (per US$ billion imports)
Costa Rica	1	227	4
El Salvador	3	218	14
Guatemala	1	263	4
Honduras	2	230	9
Nicaragua	0	88	0
Total	7	1,026	7

Notes: Although the complaints presumably refer to measures in place in 2002, SIECA import data is for 2001 due to cross-country inconsistencies in 2002 trade data.
Source: Author’s elaboration based on USTR (2003b) and SIECA (2003a).

Although using a different source of information by necessity, complaints in intraregional trade (i.e., complaints presented by a Central American importer against any other Central American exporters) may be analyzed in an analogous manner. As presented earlier, the centralized source of information for intraregional trade disputes is the matrices of Measures Contrary to Intraregional Free Trade (MCIFT matrices). The number of complaints related to technical regulations in intraregional agricultural and food trade that were in consideration during 2002 is reported by the country receiving the complaint in Table 5.12.

Agricultural Exports, which is described in Thornsburry (1998). The survey conducted by the USDA Economic Research Service and the Foreign Agriculture Service was based on expert opinion and intended to identify questionable technical barriers to US agricultural exports in 1996 that caused losses to US firms and that were potentially subject to challenge under the WTO Agreements. The close magnitude in the number of complaints in this survey as compared to the one inferred from the NTE report helps to validate the judgment made in identifying complaints from the report.

There were 28 trade complaints that were of concern in 2002, of which El Salvador and Honduras received the most (9 complaints each). Guatemala received the next highest number of complaints (6) followed by Nicaragua (2) and Costa Rica (2). Taking into account the value of agricultural and food imports from the region, the Central American average rate of complaint reception was 30 complaints per US$ billion of regional imports. Cross country data reveals that Honduras had by far the highest rate of complaint reception at 55 complaints per US$ billion of imports, followed by rates for the other countries that were around 30 (31 for El Salvador and 26 for Costa Rica) and below (23 for Guatemala and 14 for Nicaragua).

Table 5.12: Central American intra-regional trade complaints received due to violating technical regulations (2002 data, with 2003 data in parentheses)

Importer	Number of complaints under consideration	Intra-regional agricultural and food imports (US$ million)	Rate of complaint reception (per US$ billion imports)
Costa Rica	2 (0)	78	26 (0)
El Salvador	9 (2)	291	31 (7)
Guatemala	6 (1)	256	23 (4)
Honduras	9 (7)	163	55 (43)
Nicaragua	2 (1)	139	14 (7)
Total	28 (11)	927	30 (12)

Notes: Although the complaints refer to measures enforced in place in 2002, SIECA import data is for 2001 due to cross-country inconsistencies in 2002 trade data. 2003 data in parentheses is for those complaints reported up to the November 2003 edition of the SIECA MCIFT matrix.
Source: Author's elaboration based on SIECA (2003c) and SIECA (2003a).

As explained earlier, Central American agricultural and food trade disputes related to technical regulations have decreased in recent years. Table 5.12 reports complaints under consideration in 2003 in parentheses. That data reflects the lower number of complaints in each country in 2003 than in 2002. In 2003 Honduras still had the highest number of complaints received under consideration (7), followed by El Salvador (2). Guatemala and Nicaragua had only one complaint received under consideration, while Costa Rica had not received any complaint. The 2003 data shows that rates of complaint reception dropped substantially for all countries. However, Honduras' rate was the only one that did not decrease as much, staying high at 43. Rates for other countries decreased substantially to bring down the average rate to 13 complaints received under consideration per US$ billion of imports.

Although this type of analysis must be conducted with great care due to the different characteristics of the information source used, statistics on trade complaints received by Central

American countries from the US may be contrasted with those received from regional partners.[74] Such analysis first shows that in 2002, all Central American countries received much fewer complaints from the US than from regional partners and that country and regional rates of complaint reception were also lower for complaints made by the US. Secondly, El Salvador and Honduras figure as the countries with the highest rates of complaint reception, while Costa Rica, Guatemala and Nicaragua had relatively moderate rates. If comparison was made between rates due to US complaints in 2002 with rates due to Central American complaints in 2003, however, it is noteworthy that rates due to Central American complaints are getting closer to respective rates due to US complaints. Additionally, it must be emphasized that three countries (Costa Rica, El Salvador and Guatemala) had rates due to Central American complaints that were equal or lower in value to respective rates due to US complaints.

Turning attention exclusively to analysis of intraregional disputes in further detail, Table 5.13 tabulates intraregional complaints by complainant and receptor of complaint for the period November 2001 through November 2003. Over this period, Honduras has received the most complaints, mostly from Costa Rica, El Salvador and Guatemala. Nicaragua has only filed one complaint against Honduras, in part reflecting the low Nicaraguan export value to Honduras (See Table 5.5). El Salvador has received the second highest number of complaints, mostly from Guatemala. On the other hand, El Salvador has filed almost as many complaints as it has received, mostly against Guatemala and Honduras. Salvadoran interchange of complaints with Guatemala equals roughly a third of the regional complaints and is the highest among any regional trade partners, a pattern that is mirrored in total trade between these countries. Guatemala and Nicaragua have received about the same number of complaints, but Nicaragua has received many complaints from its own largest trade partner, Costa Rica. On the complaint submission side, Guatemala has been much more active than Nicaragua in voicing its complaints. Finally, Costa Rica has received only two complaints, presumably in part due to the small value of agricultural and food imports it receives from the region. It is a much more active participant

[74] Care should be used in comparing between the complaint statistics in the NTE report and in the MCIFT matrices as the criteria used to report a complaint in the two reports may be very different (i.e., it is possible that a given type of complaint may be reported under one of the two reports, but not on the other and vice versa). This could be the case, for example, given the difference in the ease of reporting. It may be argued that the US has an advantage in reporting a complaint since its government itself prepares the report. Additionally, it is reminded that since these are both count data, the magnitude of the trade restriction effect is not perceivable.

as a complainant, however, in the regional trade scene, directing most of its complaints against Honduras and Nicaragua.

Table 5.13: Intra-regional agricultural and food trade-related SPS and TBT complaints by country

Receptor of complaint	Complainant					
	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Total
Costa Rica	-	1	0	0	1	2
El Salvador	1	-	8	0	0	9
Guatemala	0	3	-	2	1	6
Honduras	3	3	3	-	1	10
Nicaragua	2	1	0	0	-	3
Total	6	8	11	2	3	30

Notes: Complaints under consideration for the period November 2001 through November 2003 are included. See notes for Appendix D, where each dispute is summarized .
Source: Author's elaboration based on SIECA (2003c).

Studying intraregional complaints by complaint type, it is clear that regulations that reference animal products were the most commonly questioned measures, despite the presumably low representation of animal products in intraregional trade. This result is also perplexing as many questioned regulations on animal products respond to food safety concerns, which presumably is the last of the three types of SPS concerns (i.e., food safety, animal health and plant health) that the region would have the capacity to attend. Plant products were the next most referenced product types of regulations that received complaints. Regulations on processed foods received very little complaints in the intraregional trade.

Table 5.14: Intra-regional agricultural and food trade-related technical complaints by affected product type

Plant products	Animal products	Processed foods	Total
13	16	2	31

Notes: Information given on the MCIFT matrices was frequently insufficient to construct this table, for which a SIECA official was contacted for clarification. Processed foods include those that go through more intensive processes. For example, wheat, milk and cold meats are not included under processed foods but alcoholic beverages are. There is one more total complaint reported here as the complaint GU/HN/2 in Appendix D refers to a regulation that affects both plant and animal products.
Source: Author's elaboration based on SIECA's MCIFT matrices.

5.5.b. Perceptions on issues

Although data analyzed in the previous section provides a picture of technical restriction issues in Central American trade, the characterization made is partial for several reasons. For example, the FDA import rejections only consider those refused due exclusively to food safety and some TBT issues, and foods that contain high animal product content are not encompassed. Naturally, analysis of import rejections by Central American countries, for the objective of protecting animal and plant health, and for animal products is lacking. Similarly, trade dispute data analysis in the previous section does not refer to complaints by Central American countries against the US. This section intends to cover technical regulations in Central American agricultural and food trade with a wider scope.

Another characteristic of information gathered through interviews is worthy of mention. Although some data collected from interviewees were factual, other information was better described as opinions whose veracity may be questioned. Therefore, this type of information is presumed to be somewhat arbitrary. This point is clearly not made here to discredit the value of opinions expressed by interviewees for the purpose of this research as different opinions necessarily exist because not all facts are available to all interviewees and because diverging circumstances surrounding an interviewee affect the process of creating an opinion. To begin with, the lack of availability of all facts is arguably the single most important reason to conduct interviews in an effort to objectively analyze trade restriction issues. In other words, alongside the presumption of variation of opinions expressed by interviewees, it is also presumed that opinions will aid in finding an objective assessment of the issues.

Opinions by specific regional groups of persons on particular geographical trade topics are presented in the next three subsections as described further below, but certain characterization arising from the opinions, and with the aid of the data discussed above, can be made for an introduction. First, establishing the impact of technical regulations in Central American agricultural and food trade is not a straightforward task. For example, while the top three export foods for Central America (i.e., bananas, coffee and sugar) were not mentioned to have much problem in meeting technical regulation requirements in the US, many products exported at smaller quantities (i.e., snow peas, berries, *loroco*, papayas, mangoes, cheese, poultry, meat, etc.)

were reportedly affected in various manners.[75] Consequently, it can be argued that the impact of technical regulations in the US on Central American exports is relatively moderate.[76] However, this affirmation could not be made if Central American exports with great potential face strong restrictions that are not overcome. This is especially an important point when considering that while nontraditional agricultural export (NTAE) crops seem to have a potential for the future, many of the crops that face rejections at US borders are categorized into this type. The production growth rate in Central America for these crops from 1995 to 2002 was 34% when the respective figure for traditional export crops was only 4%, which illustrates the potential that NTAE crops have (Figures elaborated by the author based on ECLAC (2004)).[77]

Second, although most compliance problems reported in Central American exports to the US were related to deficiency in product attributes (i.e., rejections at the border), difficulties in fulfilling requirements related to process and production methods (PPM) were also widely cited. PPM-related US regulations that were brought to attention by Central American interviewees include those prescribing the need of plant inspection or of recognition of a regulatory system as equivalent by FSIS, or of recognition of an area as free of the Mediterranean fly or of exporting (possibly in the future) under a systems approach as approved by APHIS.[78] The requirement for traceability, with which a particular product at the retail level can be traced back through its production and marketing chain, is also categorized as related to PPM.[79] In intraregional trade,

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[75] Nonetheless, a proposed regulation notified by Germany in June 2003 may have a significant impact on Central American exports of coffee. That measure intends to regulate, on safety grounds, the Ocratoxin A MRLs (maximum residue levels) in soluble and roasted coffee (WTO, 2003j). Colombia presented a counter notification, arguing that the measure was discriminatory since it did not specify MRLs for other foods, such as beer, which are widely consumed and also contain a substantial amount of Ocratoxin A (WTO, 2003k). It also stated that application of the measure could result in the loss of entire shipments of coffee (IICA, 2003b). Other coffee exporters, including El Salvador and Guatemala, supported Colombia's position. The European Commission expressed, on behalf of Germany, that it would review the concerns and would respond. Although this case could present as a great problem for agricultural exports from the region, the positive side is that the large size of the coffee sector may allow the region to formally present a complaint if it becomes necessary to do so.

[76] In a similar manner, the impact of Central American technical regulation problems for US exports and intraregional trade may also be considered to be moderate as the US and intraregional complaints relate to a limited number of products (i.e., rice, poultry, meat, pork, some unspecified processed foods, etc.).

[77] These figures should be used with caution as they were constructed aggregating country information on what each country refers to as "traditional" and "nontraditional" export crops, and definitions differ according to the reporter.

[78] A systems approach to risk management is an approach that specifies a set of process standards that minimizes the risk of trade-related externalities of a commodity (Josling, Roberts and Orden, 2004).

[79] Most of the voluntary TBT standards discussed in a footnote at the beginning of this chapter, such as those that concern labor conditions, environmental protection and animal welfare objectives, also fall in the category of PPM-based measures.

PPM-related trade restriction is especially reflected in delays of plant or slaughterhouse inspections for poultry, meat or pork products.

Third, complaints on alleged negligence by export markets in applying some of the more innovative principles presented by the SPS or TBT Agreements were also frequent. These complaints include those against the lack of application of harmonization and equivalence. Producers were those among the particularly keen to complain against the lack of harmonization efforts, especially by developed countries, since it results in higher compliance costs as products may have to be differentiated by market.[80] The lack of recognition by developed countries of Central American regulations as equivalent to their own was also sometimes referred to during the interviews. This point especially relates to the difficulty that countries in the region have in obtaining recognition by FSIS authorities of the regulatory system that assures a certain level of food safety on meat, poultry and pork products.

In any trade relation, disputes frequently arise when a country expresses concerns about exports that are restricted entry into another country. That is, trade restriction concerns usually arise when insufficient exports of a country of interest are perceived to be allowed into a foreign market and rarely when few imports are flowing into a country of interest. Interviews for the present study revealed that trade restriction concerns expressed followed a similar pattern, and many interviewees conveyed concerns about exports of countries of their interest facing barriers. When asked about concerns expressed by trade partners to the countries of interest of the interviewees, they would sometimes turn to defend their position as importers imposing trade restrictive measures.[81] Following this pattern, concerns expressed by Central American countries for importing into the US are first summarized, along with defensive arguments made by the US. Similarly, US concerns for importing into Central America follow, after which Central American

[80] Despite this widely-held optimistic view on harmonization that is also cited elsewhere in the literature, there was an interesting interviewee comment pointing that international standards were frequently adopted in Central America to impede trade, instead of creating more of it. The argument seems to be that, where the default state is a lack of regulation, Central American regulators may adopt international standards where they see opportunity to restrict trade.

[81] It is also noteworthy that either when expressing concerns as exporters or when defending position as importers, most interviewees did not reveal possible deficiencies in domestic decisive factors but emphasized either complaints against measures maintained in the export market or legitimacy of the measure imposed by the country of interest for the interviewee.

concerns for importing into regional trade partners are reported.[82] Description of concerns is accompanied by specific trade disputes that illustrate the points made.

5.5.b.i. Central American perceptions on trade with the US

Central American complaints for importing into the US may be summarized as follows: Unjust and complex US regulations, arbitrariness of US port-of-entry inspectors, and concerns arising from asymmetry of trade relations.[83] A few US technical regulations that allegedly impede Central American agricultural and food exports to the US in an unfair manner were mentioned during the interviews. Perhaps the single issue that was most repeatedly communicated as a great problem was the length of time APHIS took to conduct PRAs previous to allowing imports of plant products into the US. Clearly the concrete concern for Central America is the opportunity cost that potential exporters of plant products bear in the five years that APHIS reportedly takes on average to finish PRAs to admit products that are found to be innocuous to the US, or to admit risk-posing products under specified conditions intended to lower risks (Bernardo et al, 2003).[84]

Table 5.15 summarizes the number of PRA requests that APHIS has received by Central American countries by status.[85] At the aggregate level, a possible interpretation of the data is that of the total requests, many have been completed. On the other hand, an important number of requests are also either pending or active, but not completed.[86] Concretely, Central America is waiting for admittance of 18 plant products into the US, the time during which export opportunities are not captured by those in the business. However, the information given by the table may be deceiving as there reportedly is a backlog of requests, suggesting the possibility that

[82] Some counter arguments by Central American countries as importers are included in the text. Most of these counter arguments basically reinforce their position that they apply their measures in a legitimate manner.

[83] Although various regulations were claimed to be questionable by Central American interviewees, only those that seemed to have some technical justification are reported here, unless otherwise noted.

[84] Central American countries have their processes of admitting agricultural products for imports, but these only take a few months at most (Bernardo et al, 2003). The large gap that exist between the required time for assessments for admittance in both sides provides another argument for the concern expressed by Central America. Complaints on response time by APHIS was also aired as related to a petition by Honduras to have an area on its Atlantic Coast recognized as free of the Medfly, which would provide new export opportunities to the US. According to Honduran interviewees, APHIS has not responded even after 7 years since the request was made.

[85] A list, along with the status, of the Central American PRAs that APHIS has conducted or is conducting is available on http://www.aphis.usda.gov/ppq/pra/. Unfortunately, the exact meaning of a status is not clear from that site.

[86] The APHIS website does not provide information on when a particular request was logged on to its system or on when a PRA for a given request was completed.

numerous requests that are even before the ‘pending’ phase exist (Bernardo et al, 2003). That could potentially add a considerable number of requests that Central America is waiting to have processed.

Table 5.15: Number of PRA requests submitted by Central American countries by status

Country	Status			
	Pending	Active	Completed	Total
Costa Rica	0	1	3	4
El Salvador	0	0	11	11
Guatemala	2	3	6	11
Honduras	5	0	15	20
Nicaragua	1	2	8	11
Central America[1]	0	4	0	4
Total	8	10	43	61

Notes: [1] PRAs conducted for Central America as a region.
Source: Author’s elaboration based on APHIS website on PRAs (http://www.aphis.usda.gov/ppq/pra/. Accessed December 6, 2003).

Plant products are the most important components of Central American agricultural and food exports to the US, as these accounted for US$ 1,368 million of exports , or 68% of the US$2 billion total agricultural and food exports to the US in 2001 (SIECA, 2003a).[87] As such, many Central American countries have invested much effort in trying to open new market opportunities in the US.[88] As part of these efforts, these countries have lobbied through their embassies in the US to shorten the time that products undergo a PRA process, revealing the political dimension entailed in admittance of a product (Bernardo et al, 2003). Another manner in which countries wanting to export plant products to the US could abbreviate the PRA process is by conducting a PRA on its own and presenting it to APHIS, which in turn would evaluate the assessment and make a final decision. Developed countries utilize this mechanism for an expeditious PRA process, such as in the case of Spanish oranges whose PRA process took a comparatively short time of one and a half years. However, the low SPS capacity in Central

[87] Products represented as plant products include those under the HS section II (Vegetable products).
[88] Even El Salvador, for whom relatively more exports are inclined towards prepared foods and are directed towards the regional market, highly anticipated the news that fresh *loroco*, a flower used in the preparation of Salvadoran ethnic foods, was admitted for importation to the US in 2003 (Bernardo et al, 2003). Other products, many of them being ethnic foods intended for the large Central American population in the US, that countries in the region long awaited, or are looking, for admittance include cashew (El Salvador), papaya (Guatemala), rambutan (Honduras), and pitahaya (Nicaragua).

America suggests that the region does not have this option, and in fact, APHIS does not accept PRAs conducted by countries in the region (Bernardo et al, 2003).

In defense of the long timeframe for the PRA process, some US interviewees expressed concerns of the presence of certain pests in Central America. This concern is especially strong for fruit flies, whose avoidance of introduction into the US is of significant importance (Vo et al, 2003). To illustrate, one of the main tasks of the APHIS office in Guatemala is to cooperate with Guatemala in maintaining the southern most barrier for the area free of the Mediterranean fruit fly (Medfly) (Bernardo et al, 2003). Although it experiences occasional outbreaks reportedly arising from illegally introduced carriers of the pest, the US declares itself free of the Medfly as it presumably has efficient control measures against the pest.[89] In another defense, APHIS has also responded to the region's concerns on the PRA backlog problem by recently increasing staff of its PRA unit (Bernardo et al, 2003).[90]

Despite arguments made by the US, it is noteworthy that, if taken to the DSU, Central America's case may be supported by the WTO based on case law. Specifically, when Canada formally challenged Australia's ban on salmon imports through the WTO DSU, the panel and the Appellate Body ordered Australia to remove the ban since it was not based on risk assessment (WTO, 1999). The same ruling can be made on the "temporary" US ban on Central American imports of many plant products as the measure is not based on specific PRAs. Furthermore, as in the Canadian salmon complaint, WTO arbitration that decides time for compliance may concede the US less than a year to remove the ban, regardless of the time it needs to conduct a PRA.

A consequence of the short term impasse in APHIS decisions on admissibility of new crops is that most Central American interviewees considered that the US does not extend enough cooperation to overcome the PRA backlog problem and others that the interviewees from the region considered to be unjust. Perhaps this opinion partly led some Central American interviewees to consider that numerous technical regulations in the US had the unfaithful intention of restricting exports from the region.[91] For instance, an interviewee mentioned a view

[89] Mexico also experiences sporadic outbreaks for the same reason but is also reportedly free of the Medfly.
[90] According to interviewees with knowledge on the workings of APHIS, acceptance of PRAs conducted outside of APHIS was also begun as a measure to relieve the backlog problem. Additionally, APHIS has recently started to conduct PRAs with a territorial coverage greater than the country level, thus enabling a single assessment for multiple countries. This is reflected in the presence of PRAs with Central America as a focus and in the still "active" status of those PRAs in Table 4.15.
[91] In this study, this opinion is neither discarded as unfounded nor accepted as correct since, although no sound basis was found to support most Central American complaints of this type, it may only be that the region's low SPS

that, after US tariffs for most Central American goods were lowered with the Caribbean Basin Initiative (CBI), non-tariff barriers such as stricter SPS measures were set up to substitute for the reduced tariff rates.[92]

Many of the other regulations questioned by Central America refer rather to those that apply to specific products.[93] The pesticide residue allowance, or the maximum level of pesticide residues that is permitted on foods, for snow peas is an example, and one that is akin to the problem that the PRA poses to Central America by discriminating against developing countries with low technical capacity and with strong resource constraints. The Environmental Protection Agency (EPA) is responsible for assigning the pesticide residue allowance. A pesticide residue allowance is set for a crop type after a request for that action is submitted by an interested party. Producers of crops consumed in the US have an interest in having the EPA set a pesticide residue allowance as the default is zero residues, which could mean that a pesticide cannot be used at all on a crop. Although the preparation of pesticide tolerance requests involves very technical work, crop exporters from developing countries frequently do not need to be concerned about presenting a petition themselves as producers of the same crop type in the US or from other countries may have already worked to have a positive tolerance level set.

In the case of snow peas, however, no pesticide allowance has been set for using chlorothalonil, a widely used fungicide in Guatemalan production of the crop. As a result, the pesticide tolerance level for chlorothalonil in snow peas is zero and, as data presented earlier in

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capacity does not allow them to present a convincing case to support illegitimacy of US measures. Nevertheless, one of the more convincing case that the region may have, although without specific scientific evidence, is the restriction that the US imposes on poultry imports. The US currently allows imports of poultry from only four countries in the world (Canada, Great Britain, France and Israel), a fact for which many Central American interviewees have difficulty in finding a sound explanation. Some Central American interviewees expressed concerns that emanate from the presumption that this and a number of other US SPS regulations in fact lacked scientific basis. One comment refuted the view that entrepreneurship was lacking by arguing that it is the continuous implementation of illegitimate SPS measures that suppressed that ability in the region. Another comment referred to the concern that illegal SPS barriers compounded the harmful effects that US production subsidies exert on Central American agriculture. These comments may naturally become valid if US SPS measures are indeed unjustified.

[92] Narrod, Malcolm and Kost (2000) support the opinion that SPS enforcement actions by the US increased in the 1980s, although they attribute it to the increased consumer concerns on the health impact from food consumption, and especially for pesticide residues in foods.

[93] Aside from the example explained in the text below, another illustrative case is the maximum length (18 inches) that the US admits for ornamental plants to be admitted under the Fish and Wildlife Act. US officials claim that the intention of the regulation is to avoid introducing exotic diseases into the US, the risk of which reportedly increases with the length of a plant. Central American officials see this regulation as an illegitimate barrier to trade as the US justification is claimed not to be based on science. This complaint, presented mainly by Costa Rica, was under discussion at the CAFTA SPS Working Group, and as of January 2004, APHIS decided that it required PRAs conducted for 25 pathogens that have the potential to pose risk. Costa Rica claims that there are only three such pathogens, but has taken the initiative to conduct the necessary PRAs.

this study shows, Guatemalan snow peas have been refused entry into the US market numerous times. Guatemalan producers have tried in 1997 to have EPA set a tolerance, but due to technical deficiencies of the petition, the request was not admitted (Bernardo et al, 2003).[94]

Another complaint related to US institutions that was frequently expressed by Central America was the complexity of the SPS regulations and institutions. Regulations in the US are very numerous and it represents a strenuous task for the small Central American countries to identify SPS regulations that are pertinent to a specific product, raising the initial cost of exporting a product. The exception reported above where, despite the status of FSIS as the meat and poultry inspection authority, FDA regulates those products with meat or poultry content below 2% illustrates the intricacy of US regulations. Import requirement for meat products also depends on the agency that overseas the product as FSIS requires the exporting country to be recognized as having an equivalent SPS system first, while the FDA does not have such pre-export requirements other than relatively simple administrative ones (Calvin, 2003).

According to Central American interviewees, smaller firms there are more likely to have greater difficulty in obtaining even the basic regulatory information they need to introduce their products successfully to the US market. This view seems to be supported by the FDA import rejection data as interviewees confirmed upon a brief inspection of the raw data that most offenders of labeling regulations, which are very likely the simpler ones to comply with, were not larger companies.[95]

Central America has also expressed concerns about the alleged discretionary manner by which US ports-of-entry officials enforce SPS regulations. One way in which these officials can adversely affect SPS regulations that apply to a particular imported product is by classifying the product under a tariff classification that is associated with stricter SPS measures. Some interviewees expressed that cheese exports sometimes suffer from this sort of problems. Similar types of problems at US ports-of-entry were reported, where a distinct product would have a

[94] As an EPA official indicated, pesticide producers oftentimes cooperate technically in presenting a petition for pesticide tolerance. However, Guatemalan producers were not able to find such cooperation but instead, they contracted specialists from the US and funded the study themselves. Consequently, in 2003 a new petition was presented to the EPA, which is being reviewed and a response is expected in 2004. Although self-finance was available for the study in this case, even a Costa Rican interviewee has indicated that the process of having a pesticide tolerance set is too expensive.

[95] Following the logic presented by the interviewees, and as labeling regulation violation is not nearly the most important reason for rejection of Costa Rican exports to the US, even smaller Costa Rican firms may be well informed about US regulations.

varied degree of difficulty, from no impediment to rejection, to be permitted to enter the US market. The incidence of this problem would depend on the port-of-entry through which, and the occasion when, a product was sought for entry. Given concerns on discretionary behavior of US ports-of-entry officials, a very high number of Central American interviewees were suspicious on the extent to which the Bioterrorism Act, which allows FDA officials to detain food imports suspected to be intentionally contaminated by biological agents that are intended to pose human health risks, would give US officials more rights to make decisions that are not consistently applied in time and across ports-of-entries.

A frequently expressed keyword related to the CAFTA negotiations by Central American interviewees was asymmetry, a concept that reflects the large gap in myriad socioeconomic characteristics between the US and Central America. These characteristics include the scale of the countries in geographical, population and economic dimensions, the development level in terms of per capita wealth, distributional structure and strengths of institutions, and the resulting national political clout in international relations.[96] It is recognized that this is a catchall concept, the consideration of which is reflected by the special and differential treatment principle of the SPS Agreement, that may help to explain the roots of many Central American complaints. A few recurrent complaints that relate to asymmetry and that have not been raised above are highlighted here.

One concern expressed by interviewees in the region that arguably sprang due to an asymmetry characteristic is the lack of a dispute resolution mechanism for SPS complaints, as discussed above. A case that illustrates several dimensions of the asymmetry characteristics, including the anxiety of the Central American private sector in not having a CAFTA dispute resolution mechanism, is the Guatemalan raspberries and Cyclospora case (Calvin, 2003; Calvin, Flores, and Foster, 2003). In 1996, based on epidemiological studies FDA suspected that Guatemalan raspberries, whose exports to the US had been steadily increasing, were the source of hundreds of human illness due to Cyclospora, a protozoan parasite. Although FDA was not able to physically observe Cyclospora on a Guatemalan raspberry until 2000 and although scientific certainty of that finding is still questioned by many in Guatemala, in 1997 FDA issued

[96] To illustrate with an incident not related to SPS issues but associated with the CAFTA negotiations, soon after joining, El Salvador, Guatemala and Costa Rica withdrew from membership to the G-21 group of developing countries that formed in 2003 to collectively lobby for developed countries to substantially lower subsidies that they provide to their farmers. It is widely believed that the US pressured these countries out of that group if they wanted to maintain themselves in the CAFTA negotiating group.

an import alert for Guatemalan raspberries, by which their entry into the US was denied. Since 1999 raspberries produced under a mandatory program to clear food safety requirements have been admitted to the US, but the industry has practically been eliminated as the 85 growers in 1996 had been reduced to only 3 in 2002.

Incidents like this illustrate the possible impact that a dispute resolution mechanism, perhaps in combination with an increased level of technical assistance, may have, since less trade restrictive measures may be found as better alternatives to a ban. The absence of such a mechanism may make it more probable that Central American countries would be forced to follow the decisions made by the US, which may sometimes be inadequate especially if not founded from the beginning on hard science.[97] Furthermore, referring to cases such as this, an interviewee expressed that the loss of employment and the decrease in the welfare by the rural poor is rarely raised as a concern, although this population had a share of more than 30% of the total population in Central America (1999 ECLAC figure as cited in Pomareda (2003)).

Some Central American interviewees also expressed complaints against the lack of consistency in the US export inspection for products that head to Central America. For instance, aflatoxin has been found in wheat imports to Nicaragua despite USDA certificates were attached to the products (Bernardo et al, 2003). In another incident, chicken parts, fresh meat and canned products have been found to be expired according to the labels on the products. An interviewee expressed the opinion that it was a common practice that the US may be sending higher-risk or lower-quality products to Central America. The large difference in the level of institutional development that exist between the US and Central America was pointed out as a reason for which the situation in question takes place, as the US may be shipping out products whose risk or

[97] Another case in which asymmetry characteristics have forced Central American producers to accept a possibly excessive US regulation followed the BSE (Bovine Spongiform Encephalopathy) outbreak in cows in the US. BSE has been linked to cause the fatal human disease called variant Creutzfeldt-Jakob disease (vCJD) (Josling, Roberts and Orden, 2004). On January 8, FSIS made public four new regulations, to be implemented on January 12, to reduce the risk of introduction of the BSE agent in meat for human consumption (FSIS, 2004). The controversial regulation that is expressed as a concern by a few Central American interviewees refers to the specified material, such as skull, brain, eyes and vertebral column, which may contain the BSE agent with the potential to cause the vCJD. That regulation indicates that these risk materials must be removed, segregated and disposed of “so that they cannot possibly enter the food chain” (FSIS, 2004). This regulation applies to all slaughterhouses without regards to whether the cows they handle are free of BSE, thus inviting objections by the Central American interviewees. The concern is that separate process facilities may have to be secured as a result of this regulation, where meat that comply with the US regulation would be processed in one facility, and the rest of the meat that do not have to meet the requirements, and which can thus be produced at a lower cost, would be handled in another. Finally, the short timeframe provided for compliance (five days) was also an object of concern.

quality level is not accepted under US standards but is accepted, or at least sometimes not rejected, by Central America.

In concluding this section, it is worth mentioning that variability by country in perceptions was present. This was notably the case for Costa Rica, whose higher SPS capacity than the rest of the countries in the region has steered it away from problems that other countries commonly hold. Concretely, although concerns on the Bioterrorism Act, the lack of a dispute resolution mechanism in CAFTA, and on a few specific regulations or procedures were brought up, these were not presented with as much intensity as issues expressed in other Central American countries, which symbolizes that Costa Rica has finer management capacity of the issues.[98] It is representative of this performance that no Costa Rican interviewee complained about the APHIS PRA process or about the complexity of US regulations.

5.5.b.ii. US perceptions on trade with Central America

US interviewees had also complaints against Central America, which may be categorized as mainly of two types: Overly bureaucratic procedures and allegedly illegitimate SPS regulations. These concerns are well documented in a letter on CAFTA negotiation issues written by the US Senate Finance Committee chairman and ranking member, Charles Grassley and Max Baucus, and directed to USTR ambassador Zoellick (Grassley and Baucus, 2003). A specific issue that the senators urged the USTR is that the US should make the system wide acceptance of the US beef and pork inspection by Central America a top priority SPS issue in the CAFTA negotiations.

The issue in this case is that currently when a US beef or pork exporter wants to export to Central America, legislation in the countries requires that each US plant where production of the imported food takes place to be inspected and to be approved. However, there are over 6,000 plants that produce meats in the US and, given Central America's lack of resources, the US is concerned that countries in the region do not have the capacity to inspect all potential exporters

[98] The regulation of most interest and concern for Costa Rica is the 18-inch maximum length requirement explained earlier in this section, and the procedure that was complained against at least by one interviewee is the reported lack of response by FSIS to provide equivalence to the Costa Rican poultry inspection and control system. The lack of recognition by FSIS is the only impediment for Costa Rica to export poultry to the US as the country fulfills the only other requirement of being recognized as free of the Newcastle disease.

in an expeditious manner.[99] On the other hand, as mentioned earlier, when a Central American producer wants to export those products, the US legislation only requires equivalence of the *regulatory system* that overseas production of beef and pork products, and not all plants may need to be inspected.[100] The US is consequently asking Central America to adopt a beef and pork import approval mechanism based on an equivalence concept like that of the US to increase the number of plants that could export to the region. As of December 2003, Costa Rica is the only country in the region to incorporate in its legislation the possibility of an equivalence-based approval system.

Other less far-reaching bureaucratic obstacles related to technical regulations in Central America are the focus of US complaints (See Appendix E, which briefly summarizes each complaint presented in USTR (2003b)). In one instance, the US claims that Costa Rica's process of obtaining SPS documentation is cumbersome and lengthy, which results in lost earnings for owners of shipments. In another situation, the US complains about a Guatemalan regulation that requires separate registration of food products with identical composition when they differ by size or form. The problem for the US is that trained personnel on the Guatemalan side is lacking, so the process is lengthy. Honduras' pork, poultry and dairy imports from the US presents another case as difficult certification requirements are placed.

The US claims that certain SPS regulations implemented in Central America are not justified by the WTO SPS Agreement. The most pronounced of those claims may have been made as a counter notification in the WTO SPS Committee in 1996 against El Salvador and Honduras (WTO, 1996).[101] The US complained that these countries banned US poultry imports on the basis that they were contaminated with salmonella, against which El Salvador and Honduras applied zero-tolerance. According to the US, salmonella is endemic in any established

[99] A concrete US complaint of this type has been documented for poultry products (USTR, 2003b). Imports of US poultry were banned in January 2001 when Costa Rica initiated enforcement of an existing regulation that requires plants to first be inspected and be approved for their products to be admitted into the country. Costa Rica inspected five plants in November 2001 and approved four of them in December 2001.

[100] In short, this is the same equivalence concept as the one treated in the WTO SPS Agreement. That is, the US reviews if the Central American control and inspection system of beef and pork products is equivalent to that in the US in that a similar level of food safety is assured in the products. More concretely, institutional arrangements such as regulations and enforcement capacity is reviewed, and a sample of production facilities are inspected insofar as necessary to confirm the general level of food safety that is assured. In the case of Central America, however, the US may inspect all plants as their number is very low.

[101] Other countries, Chile, the Czech Republic and Slovakia, were also implicated in the same complaint. This is the only SPS-related complaint of any form that the US has submitted against any Central American country to the WTO.

poultry producing country and it considers that the principle of national treatment is not abided by El Salvador and Honduras as they do not enforce the same regulation for domestic production. This complaint is one that has a long history and is still effective.[102]

Another long standing US complaint is the fumigation of grains by Central American countries (Bernardo et al, 2003). In the case of El Salvador, it requires rice imports to be free of Tilletia Barclayana to avoid fumigation at the border at the cost of the importer (USTR, 2003b). The US is concerned of the cost that the alleged unfair fumigation adds to the price of the product.

Contrary to US measures that are backed by legislation or regulation, the US argues that many SPS measures in Central America do not have legal or regulatory basis and respond to unprompted pressure exerted by producer groups to protect their sectors. This pressure allegedly surges spontaneously as the need for protection arises, such as when local production is abundant, and recedes when imports are needed to bring down the upward pressure in price. Many US interviewees claimed that, in the periods following favorable local production, without regards to the absence of legislation or regulation that backs such measures, Central America would impose SPS measures to protect the gains of local producers. This is perhaps the most important of the alleged concerns for the US, as the previously mentioned senators' letter alludes to the problem by asking the USTR to emphasize the importance to Central American officials to make their "SPS policies science-based, transparent, and predictable, and thus WTO-compliant" (Grassley and Baucus, 2003).

The US perception that Central American measures lack in transparency seems to be supported by the lack of notification from countries in the region to the WTO. For example, the US claims that Honduras seldom reports changes in SPS regulations (USTR, 2003b).[103] On the other hand, even when a Central American country has made relatively numerous notifications, it may fail to report regulations that affect a key import product. For instance, the US claims that El Salvador failed to notify its regulation on rice imports regarding Tilletia Barclayana (USTR, 2003b).

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[102] As it can be seen in Appendix 4, the complaint still appears in the 2003 issue of the USTR NTE Report.
[103] This claim seems to be supported by data in Table 4.3

5.5.b.iii. Central American perceptions on intraregional trade

Central American complaints against regional trade partners are similar in type to allegations that the US maintains against the region. However, as it was reviewed in the previous section, given a specific level of trade, the incidence of complaints in intraregional trade seems to be higher than that of US complaints against regional countries, and this perception was shared by many interviewees in the region. Despite that finding, it is interesting to note that specific complaints against intraregional trade were not raised as often as those against the US by the interviewees.[104]

Among the 30 recent intraregional disputes presented in Appendix D, the poultry dispute between Costa Rica and Honduras is presented here in further detail as it illustrates several points.[105] As referenced earlier in this document, this case is the first and only one that any Central American country has presented as a counter notification to the WTO SPS Committee.

In November 2002, after exhausting bilateral and regional means to resolve the dispute, Costa Rica reported to the WTO SPS Committee that, in March 2002, Honduras prohibited imports of poultry meat from countries that were not free from avian influenza, Newcastle disease, avian infectious laryngotracheitis and avian salmonellosis. Honduras declared itself free of these diseases after a reportedly successful eradication program was started in 2000, but it did not recognize Costa Rica as free of them as it claimed that Costa Rica did not allow it to conduct the necessary inspections.[106] As a result, Costa Rican poultry imports to Honduras were banned.

Costa Rica claims that Honduras has not conducted a relevant risk assessment, and that there is no scientific evidence that avian infectious laryngotracheitis and avian salmonellosis may be transmitted through trade in poultry products. Although international standards do not exist for those diseases, this last claim is supported by the scientific opinion of the OIE (WTO, 2002a). Perhaps most important of all, however, Costa Rica has doubts on Honduras' self-declaration of its disease-free status. Currently, the OIE does not have a list of disease-free countries for the

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[104] Central American interviewees may not have raised as many trade concerns against regional partners as compared to those against the US for several reasons. The period when the interviews were conducted was at the height of the CAFTA negotiations, reason for which interviewees were more involved at daily basis with trade issues with the US. Another explanation is that trade disputes with the US account for much higher losses than intraregional trade disputes entail, and interests of the interviewees may be dictated by this parameter.
[105] This case is referenced as number CR/HN/2 in Appendix 5.
[106] Despite the low number of Honduran notifications, the lack of notification of this measure is not an issue as the document WTO (2000) supports the measure. Of the four diseases, avian infectious laryngotracheitis and avian salmonellosis are considered as List B diseases by the OIE. List B diseases are those with potentially less serious impacts as compared to those of the List A, which include avian influenza and Newcastle disease.

diseases in question for any country in the world, which provides each country the discretion for such declaration. Honduras, on the other hand, claims that it has consistently run an avian health program, which is reported on an OIE publication and which has allowed it to attain the disease-free status (WTO, 2002b). In this manner, and even after numerous meetings between officials from both sides, the dispute could not be resolved through the use of international mechanisms. Trade was finally resumed by November 2003 after a Honduran court reportedly ruled against the measure, following a lawsuit presented by a local importer that complained the loss it was incurring by not being able to introduce poultry products from Costa Rica.

The poultry dispute between Costa Rica and Nicaragua emphasizes several points. First, the poultry sector is one in which much trade conflict with respect to technical regulations occurs and one whose participants are vocal. This observation also applies to Central American trade with the US, as both sides have voiced concerns. Second, Costa Rica's higher SPS standards, which is evidenced in section 5.3, may present as a cause for friction in intraregional trade. As an interviewee explained it, the APHIS recognition in 1997 of Costa Rica as the only country in Central America to be free of the Newcastle disease may have marked the beginning of the intraregional poultry trade conflict. In a region with difficulties in implementing the WTO Agreements especially in its early years of application, Costa Rica's consequent intent to conduct risk assessments on imports from regional partners were reportedly not well received, and that may shed light to the closure of several neighboring borders to Costa Rican poultry exports in subsequent years.

Third, Central America may be at its turning point where it begins to utilize WTO mechanisms for resolving trade conflicts related to technical regulations. This point is bolstered by the fact that Nicaragua used the consultation phase of the WTO DSU, as explained in section 5.2.b. Along this line, it is encouraging that a Nicaraguan interviewee commented that her country would, after exhausting other possibilities, probably now be more inclined to present another dispute at the WTO if necessary. However, despite optimism on the use of international mechanisms, that the poultry dispute between Costa Rica and Honduras was not resolved with the support of international institutions but by local institutions in Honduras may be a reminder of the small impact that the international institutions have on the region. Another indication of the low level of utility that international institutions provide for the region may be reflected in their inactivity on clarifying pest or disease status of the countries involved. An argument can be made that, if an international standard setting institution worked in declaring the level of pest or disease of a country, the leeway for a country to make an unfaithful case to implement an SPS measure would be curtailed. In the case at present, nevertheless, international standard setting institutions did not provide such assistance and the disease status of the importing country remains obscure.[107]

5.6. Summary of interviews

In this research, secondary sources (i.e., various WTO documents, SIECA MCIFT matrices, FDA IRRs, USTR NTE reports, the internet, and the literature), and data elaborated from them, is extensively used to study the hypotheses of this research. However, the main source of primary information is the interviews conducted with about 100 persons with knowledge of the issue at hand. Due to the broad scope of this study, results from the interviews are dispersed throughout this chapter together with secondary information that supports or refutes their findings.

This section presents a summary of the interviews conducted in Central America to provide a coherent picture of their implications, with an emphasis on notable points that were primarily learned from the interview process. Since interview results are a collection of information that requires an effort to make a unified sense out of, a systematic analysis of the information as grouped together is attempted. Some repetition of previously reported results is inevitable but such redundancy is minimized.

The analysis proceeded as follows. First, tables summarizing the most prevalent issues raised in each Central American country were created using interview notes. These tables are presented in Appendix F. The tables were then reviewed to identify the most notable ideas learned from the interviews. A synthesis of such analysis follows.

[107] Another case in which discretion provided to Central American countries in declaring a disease-free status has resulted in an important source of conflict is one related to a Guatemalan complaint against Honduran ban on potatoes (GU/HN/3 in Appendix 5). Late in 2001, Honduras banned the imports of Guatemalan potatoes, claiming the presence of potato cyst nematode. Guatemala assures that the disease is not present there, but Honduras claims that Guatemala does not allow it to conduct inspections of potato fields (Bernardo et al, 2003). To aggravate matters, El Salvador followed suit to the Honduran claim and banned potato for imports or for transit through its territory (GU/ES/2 and GU/ES/3 in Appendix 5). Although contentions with El Salvador were resolved relatively swiftly in a matter of a few months, the Guatemalan dispute with Honduras is one of the only seven that remain to November 2003.

One of the main ideas learned from the interview process relates to the importance of SPS measures, the most prominent of technical regulations, for Central American agricultural trade. In the present context, the region's strong interest in SPS measures first derives from their links to NTAE crops and small farmers, which have importance of their own.

Central America is a region that depends a substantial amount of its exports, about 45%, on agricultural goods (See section 4.4.). Of agricultural exports, traditional export crops (i.e., coffee, bananas and sugar cane) account for almost 50% of total agricultural export value, with the remaining half shared by numerous products that include NTAE crops. The region's heavy reliance on three traditional export crops for foreign exchange earning is of significance when international prices for two of those crops (coffee and bananas) have declined in recent years. An importance of NTAE crops consequently derives from Central America's need to diversify its trade offer to mitigate potentially detrimental macroeconomic implications.

Aside from the macroeconomic effects, an important microeconomic implication of the falling traditional export crop prices may be the possible subsequent loss of employment for rural laborers in those sectors that are primarily owned by large firms. However, rural welfare is also sensitive to impact on small farmers. Employment as a source of income for small farmers is of concern for Central America as the rural poor accounts for more than 30% of total population in the region (1999 ECLAC figure as cited in Pomareda (2003)). Small farmers have few employment opportunities as an interviewee in Guatemala pointed out, presumably due to the sparsely inhabited rural setting in which they live and to the abundance of their type of labor force characterized with low human capital. NTAE crops are in turn also important in providing attractive work opportunities to small farmers since, as an interview noted, these crops are produced mainly by small farmers due to their reported production characteristic of decreasing economies to scale.

Under this scenario, SPS measures are important for Central American trade as they frequently apply to NTAE crops but seldom to traditional export crops, as revealed by interviewees' comments (See section 5.5.b.). An implication is then that, if Central America is to increase NTAE crop production to diminish its reliance on traditional export crops as a source of foreign exchange, the region would have to face the challenge of strict SPS regulations. The region would also have to confront those regulations if it wants to protect small farmers in the NTAE sector from losing their employment, as alternatives such as selling in their domestic markets are much less profitable. Furthermore, a particular challenge in protecting small farmers from the impact of SPS regulations in export markets may present due to the reportedly low SPS capacity of these farmers, as an interviewee noted.

An insight gained from interviewees who repeatedly prioritized comments on SPS regulations in trade with the US is that the utmost concern is in trade with the US. Central American concern on rejection of NTAE crops is also presumed to be stronger in that trade relation, which is now mostly dictated by the CBI and may be replaced by the CAFTA. In this context, another reason lending importance to SPS measures is the high incidence of SPS regulations that apply to Central American exports in relation to the respective low tariffs. Low tariffs under CBI or CAFTA may not be of much benefit for some NTAE crops in the region since, echoing a comment by an interviewee, the compounded effect of NTBs such as SPS measures and subsidies in the US, together with the region's low SPS capacity as noted in section 5.3., may leave little room for comparative advantage.

Before the interviews, it was perceived by the few literature and internet resources that SPS measures were of interest for the region's trade. For example, SIECA data showing that 7 out of 16 intraregional disputes by November 2003 related to complaints on SPS measures supported this view. Furthermore, the high NTBs in general in CBI is discussed in Monge-González, Loría-Sagot and González-Vega (2003). However, how they were of interest for the region and the importance of SPS measures in particular in CBI and CAFTA were not clear until several interviews were conducted.

Several insights on the WTO SPS Agreement and Central America were also obtained through interviews. First, it is of interest to note that many interviewees evaluated the Agreement's intention and application separately (See section 5.2.a.). On evaluating the intention, although some disagreed as reported earlier, most interviewees coincided that the Agreement provided "a good framework". However, opinions on the Agreement as implemented in practice differed, possibly primarily due to the lack of access by Central American countries to WTO mechanisms.

The generally favorable evaluation of the Agreement's intention seems to suggest that the principles of the Agreement enjoys acceptance in Central America. On the other hand, divergence in opinion on its application may be a reflection that the system created by the

Agreement is not functioning smoothly. Clear evidence of a hardly well-functioning institution is provided by, for instance, the lack of Nicaraguan notifications by September 2003 (See section 5.2.a.). However, from the Central American viewpoint, a perceived lack of application of the special and differential (S&D) treatment by its developed country trade partners may be the most important sign of a deficient operation.

Complaints by Central American interviewees often can be interpreted to relate to the scarce application of the S&D treatment. Most notably, interviewees repeatedly complained about a lack or slowness of response from the US on requests for PRAs (such as for *loroco* produced in El Salvador), pest-free recognition of a specified area in their countries (such as Medfly-free area in Honduras), equivalence recognition (such as in poultry production for Costa Rica) and setting of pesticide tolerance level (such as for chlorothalonil for Guatemalan snow peas) (See section 5.5.b.i.). From the US point of view, given scarce resources to attend this type of requests from countries wanting to export to it, it is probably rational to prioritize requests submitted by larger countries whose more voluminous exports have more impact in the US economy. However, from the Central American stance, the US is not applying the principle of S&D treatment as the US is not taking the needs of Central America into consideration. In the case of pesticide tolerance setting, the argument of lack of S&D treatment by the US can probably be applied not only to the slow timeframe of response, but also to a seemingly deficient provision of technical assistance by the US to overcome the impasse. That is, Central American countries seem to necessitate such assistance to attain the setting of pesticide tolerance, but the US is not providing the needed international cooperation.

Although one way to interpret the scarce US response to Central American requests is by relating it to the principle of S&D treatment, another principle can be associated in describing many of the situations aired by Central American interviewees. This is the least-trade-restrictiveness principle. While Central America awaits for US response in the situations described above, export of affected products from the region is oftentimes banned. This is the case for *loroco* before obtaining admissibility after the PRA process and Costa Rican exports of poultry while it is waiting for confirmation that the US will inspect the country's poultry system. In a similar manner, exports of snow peas containing any amount of chlorothalonil is banned from the US before the EPA sets a pesticide tolerance level. It may well be argued that least-trade-restrictive measures are not adopted by the US when using a ban as a default import regime while it conducts risk assessment. The US may argue that it is applying the precautionary principle while it conducts risk assessment but, as described in section 5.5.b.i., the numerous years it takes to respond with risk assessment would probably be judged as too long by WTO arbitration to begin with, and that time is probably too long to be considered an adequate period during which precautionary measures may be implemented.

That Central America's greatest concern, i.e., the slow response time by the US, may be illegitimate not only by the S&D treatment principle but also by the least-trade-restrictiveness principle is significant because, while the S&D treatment principle is not enforceable, the least-trade-restrictiveness clause is binding.[108] If the least-trade-restrictiveness principle is violated by the US when it bans Central American products for the multiple years that it takes to respond to Central America, then the US would be disregarding the WTO SPS Agreement.

It is interesting to comment on the basis of the US decision to delay responding to Central American requests since the US is most likely taking such decision as a result of strategic thinking. A key consideration is the limited resources that the US government has to attend numerous requests that it receives. In response, the US government probably prioritizes requests by larger trade partners, as mentioned above. However, a strategic reason to do so other than the interest in attending larger countries for the larger economic benefits from trading with them is that these countries are more likely to present a legal challenge against the US if the US failed to attend their requests. The scarce ability of Central American countries to present disputes at the WTO has been discussed (See section 5.2.a.). It is natural to expect that the US will disregard or put a low priority on at least some of the requests from the region as Central America is not likely to submit a formal complaint at the WTO.

An extension to this analysis following the increasing demonstration by Central America to submit challenges at the WTO in recent years may indicate that the US may be forced to start answering to requests from the region to avoid facing legal battles (See section 5.5.b.iii.). Nonetheless, even when Central American complaints are starting to appear at the WTO, they have been directed towards other developing countries (namely Honduras and Mexico). Strategic thinking on the part of Central America, that challenging the US could in the end result costly due to possible retaliatory action, is likely to restrain the region from formally questioning the

[108] However, it is noteworthy that discussion on strengthening the S&D treatment principle is underway during the Doha negotiations. See section 2.3.a.iii.

US stance. To illustrate with an example from outside of the SPS dimension, Central America has already shown to refrain from rejecting a position taken by the US with respect to agricultural subsidies and their effects on trade when the three countries in the region that were members of the G-21 group withdrew their memberships (See section 5.5.b.i.). Consequently, Central America may continue to present little threat to the US, and the US may decide not to improve its attention of SPS-related requests.

Implications of the lack of US input to Central American inquiries are in order. Whenever it has a chance, Central America may look for a mechanism that forces the US to respond to Central American petitions. During CAFTA negotiations, for instance, a priority issue for the region was to obtain a binding dispute resolution mechanism (See section 5.4.). Failing to negotiate creation of that mechanism, Central American interviewees revealed that the region sought unsuccessfully to include in the CAFTA text specification of a maximum period during which SPS-related requests would be attended.

Persons in Central America affected by the lack of US response may feel a sense of frustration, as a Honduran interviewee admitted to. That frustration may lead to some degree of retaliatory action by Central America, where countries in the region decide not to comply with parts of the Agreement. Judging from input by US interviewees, the region may not be posing the same type of problems that the US is giving to Central America. That is, no complaint was raised by any US interviewee that the region was not responding to SPS-related requests. However, the US senators' implication that SPS policies in Central America are not "science-based, transparent, and predictable, and thus WTO-compliant" may be correct at least in some instances (See section 5.5.b.ii.). One of the most obvious of these instances may be the lack of Nicaraguan notifications as commented above, and the small number of notifications by Honduras.

The preceding analysis presents cases in favor and disfavor of both the US and Central America. A point that the discussion demonstrates is that both the US and Central America could be at fault in abiding by the WTO SPS Agreement. Recognizing this is important because oftentimes it may be more facile to accept the stance taken by the country with more resources and sophistication, while the position of the side having less is rejected. The tendency to agree with the resourceful side may also owe it to clearer cases of violation of the Agreement by the opposing side. However, it must also be recognized that the resourceful country may use its strengths to deviate from the Agreement in an ingenious manner, and the opposing side may not have the means to decipher the convoluted feat to present a convincing case. Concretely, Central America's low SPS capacity may not allow it to find potential violations to the SPS Agreement that the US may be committing due to the sophisticated maneuvers that the US may be employing in neglecting the Agreement.

In the preceding analysis where adherence to the SPS Agreement is evaluated, only cases that can be judged with some certainty were reviewed. However, assessment of trade disputes is a task many times involving obscurity in that facts may not be easily separated from allegations that do not factual basis. Often, this obscurity is created by the lack of certainty of the status of a pest or disease associated with a product that is exported or imported to a particular country. For example, in intraregional trade, a central theme in the case of poultry exports from Costa Rica to Honduras involved Costa Rica's incredulity of Honduras' claimed disease free status on four diseases (See section 5.5.b.iii.). A similar scenario, but with an importing country doubting on the pest status of an exporter, is that of Guatemala's claim to be free of the potato cyst nematode in exporting to Honduras. Comparable cases are repeatedly found in the region's trade with the US. For example, the US doubts that El Salvador and Honduras are free of salmonella in imposing a poultry ban on the US. Similarly, some Central American interviewees have challenged the US claim that it is free of the Medfly. Moreover, in Guatemala, there are those who questioned the FDA finding that Guatemalan raspberries were contaminated with Cyclospora (See section 5.5.b.i.). This finding was allegedly not based on scientific studies with high certainty. In all, resolving these disputes could be of substance because trade is frequently completely halted while the disease status remains obscure. Furthermore, the existence of many cases in which an exporting or importing country mistrusts the pest or disease status of its trade partner seems to indicate that there is room for a third party to intervene to make a clarification. This point is further discussed in the next chapter.

Analysis on external factors in Central American exports to the US led to the conclusion that the S&D treatment and least-trade-restrictiveness principles were perhaps underutilized. In that trade relation, the domestic factor that may primarily be limited is "Acquisition and assessment of technical regulation and consumer preferences" by the private sector, or what some interviewees referred to as a lack of entrepreneurship or awareness in the region, as this factor was the most commonly mentioned. How this lack of entrepreneurship or awareness has limited Central America's ability to face SPS measures in the US was described earlier (See section 5.3.). For example, a few persons argued that the high incidence of FDA labeling regulation violations for exports from the region owed it to the lack of knowledge of TBT regulations in the US by exporters. A Salvadoran interviewee noted that some exporters simply place labels that only comply with domestic regulations in El Salvador. A Nicaraguan interviewee stated that this type of exporters simply neglect compliance in the hope of evading detection. In general, many interviewees thought that the Central American private sector had a deficient knowledge of technical regulations in the US.

It is interesting to note that a few interviewees argued to the contrary, that entrepreneurship was not lacking in Central America but that allegedly illegitimate SPS barriers in the US made it difficult for exports from the region to access that market (See section 5.5.b.i.). However, more interviewees acknowledged the importance of raising awareness and entrepreneurial ability in Central America to confront SPS measures.

Some comments made on voluntary standards may be adequately interpreted as relating to the foregoing discussion on the lack of awareness and entrepreneurship in the region. It was commented in a few countries that voluntary standards were becoming increasingly more obligatory. This opinion presumably refers to a situation in which compliance with voluntary standards is becoming de facto prerequisite to the sale of some products, especially in developed countries. For Central American exports, the best illustrative case is probably that of coffee. As mentioned earlier, international price for coffee has substantially decreased in recent years and as a result, exporters are looking for ways to attain higher prices. One way to do so is by selling their coffee as a differentiated product in the specialized coffee markets, where products such as fair trade or environmental friendly (shade-grown coffee) products are traded (See section 5.1.). These specialized coffees can be identified as such after fulfillment of coffee producers to respective voluntary standards. Some Central American coffee producers have reportedly started to utilize these markets for their continued business, while some others are shutting down their operations. Thus, a lack of awareness of voluntary standards and of entrepreneurial ability to detect where business opportunity is may result in substantial economic implications.

In discussing SPS capacity in the region and its implication for compliance with SPS regulations in the US, the case of Costa Rica has frequently been mentioned throughout this chapter as a special case in Central America. Specifically, Costa Rica has been presented as possessing a considerably higher capacity than that of the other Central American countries, which has allowed it to often successfully face SPS regulations in the US. Costa Rica's higher performance than the rest of the region coincides with its higher per capita wealth, and the contribution of this factor may probably not be understated. However, interviews in Costa Rica alerted on the possible importance of Costa Rican government's deliberate actions in maintaining the country's high SPS performance.

Although interviewees did not mention it directly, conversation with Costa Rican professionals indicated that its government had a well defined strategy for sustaining a high export-related SPS capacity, especially for plant products. For example, a Costa Rican government official indicated that requesting the setting of pesticide tolerance to the EPA was too expensive, which implied that Costa Rica chooses to export crops that do not require extending requests for pesticide tolerance. That Costa Rica may intentionally choose to avoid requesting pesticide tolerance is important, as Guatemala has learned through the snow peas-chlorothalonil case how burdensome extending such request is (See section 5.5.b.i.). In another illustration, although not evidenced by the interview process, the number of PRA requests submitted by Costa Rica is the lowest in Central America (See Table 5.15). Similarly to the case of pesticide tolerance request, and knowing that the PRA process entails a long process, Costa Rica may purposefully be refraining from exporting crops that require requesting PRAs. In relation to pest risk management, it is important to mention that Costa Rica is also aware that its climatic conditions are favorable to the growth of pests of interest to the US. Under such scenario, an interviewee mentioned that Costa Rica's use of pesticides has necessarily been among the highest in Latin America in order to maintain phytosanitary acceptance of its products by the US. However, Costa Rica seems to implement a rational use of pesticides with food-safety wise acceptance of its crops in the US market in mind as, although its FDA pesticide-residue related import refusals is relatively high in the region as acknowledged by an interviewee, it experiences less than half of refusals due to pesticide residues than Guatemala does (See Table 5.10).

Finally, another indication of Costa Rica's support for exporting with low incidence of SPS problems is its support of small and medium farmers, as mentioned by several interviewees. As mentioned earlier, small farmers were reportedly the most likely to face difficulties with SPS regulations in markets such as the US. That the Costa Rican government has especially supported small agricultural firms is then important in improving its export-related SPS capacity. An indication of Costa Rica's prioritization on assistance to small farmers may lie behind the country's very low number of FDA import refusals due to labeling regulation violation (See Table 5.10). Most Central American interviewees agreed that offenders of FDA labeling regulations were likely smaller firms (See section 5.5.b.i.). Consequently, Costa Rica's low number of rejection due to labeling regulation violation may illustrate the success of its support of small firms. These firms may consequently be in a better position than similar firms in other countries in the region to comply with labeling (and other) regulations.

A probable Costa Rican government's strategy as described in the foregoing discussion may have been a key to the country's prosperous agricultural export capacity. However, Costa Rica has not only been able to manage traditional technical regulations, but it also has explored frontier issues of voluntary standards, such as organic farming, as evidenced by some Costa Rican interviewees' experience in exporting organic products. Furthermore, Costa Rica's thriving export agriculture has attracted international attention, resulting in the capture of a high amount of foreign agricultural investment in 2003 that was previously employed in Guatemala. It may be concluded that Costa Rica has placed itself in a virtuous circle of management of technical regulations, as the new investment would further improve its SPS management capacity.

The virtuous circle in which Costa Rica seems to find itself may have created confidence among persons working in the export industry that they can confront technical regulations. This was notable from differences in opinions expressed by Costa Rican interviewees as opposed to most others in the region. For example, many Costa Ricans only referred to technical regulations as "regulations that exporters needed to comply with", as opposed to illegitimate measures or burdensome even if legitimate. Another opinion which reflected Costa Rica's high confidence in facing SPS issues relates to that on the lack of a dispute resolution mechanism for SPS issues in CAFTA. The issue did not seem to be of interest for a couple of interviewees, with one of them responding not having thought about the absence of the mechanism. Costa Rican interviewee's confidence in meeting SPS regulations in trade may be summarized in an interviewee commenting that the country has a comparative advantage in exporting to markets with more SPS regulations. In evaluating this comment, it is important to recognize that Costa Rica has had its difficulties in facing SPS issues in trade, such as with poultry to Honduras and the US, and with ornamental plants to the US (See sections 5.5.b.i. and 5.5.b.iii.). The case of maximum ornamental plant length may especially be notable here as Costa Rica has had to request a PRA to APHIS, whereas the country may normally decide to avoid doing so. However, the SPS problems that Costa Rica faces, especially in exporting to the US, seem far less numerous than those that other countries in the region confront. On the other hand, Costa Rica's successful cases in managing SPS issues in trade are more conspicuous than the other countries'. Therefore, that Costa Rica possesses a comparative advantage in exporting to markets with stricter SPS issues may not be an overstatement.

A final note on Costa Rica refers to its relation with other countries in the region in view of the country's particular status in the region. The manner in which, according to a Costa Rican interviewee, a long-running regional poultry trade war may have started with Costa Rica's superior disease status was discussed earlier (See section 5.5.b.iii.). Another contentious episode that relates to SPS issues was pointed out by a Costa Rican interviewee, who noted that Costa Rica had thrived for a long time to set a binding dispute resolution mechanism in regional trade. According to that interviewee, other countries in the region did not show interest in creating such an institution under SIECA, reportedly due to a lack of custom to depend on a strong rule of law in their respective countries. A binding dispute resolution mechanism has finally come in force in 2003, but this episode demonstrates how the diverging level in SPS capacity and development between Costa Rica and the other countries in the region has sometimes resulted in conflict.

On intraregional trade, a few insights were aired that shed light on why questionable regulations may be implemented. An interviewee noted that, due to similar production conditions in Central America, farmers simultaneously produce the same crops. This made domestic producers to ask the government of a potential importing country for protection from imports. However, according to that interviewee, even tariffs, presumably at the maximum levels that are accorded with the WTO or regional partners, would not provide enough protection in many instances as imports still appear in the domestic market. Governments would then consequently recur to the use of SPS measures to halt trade in affected products. In the words of the interviewee, “SPS directors (in Central America) feel obliged to protect (their producers)”. It is claimed that this type of scenario is more often seen with animal products than with plant products. This opinion may coincide with the higher number of animal health regulation notifications to the WTO than proportional to the share of trade in animal products against plant products (See section 5.2.a.).

Other interviewees expressed opinions on the long term implications of such intraregional trade relation. An outcome, according to one view, of longstanding intraregional trade with the discussed characteristics is that a gentleman’s pact is in place among countries, whereby producers of particular products agree not to introduce them into countries of other producers. In this manner, trade disputes can be avoided before they occur. The interviewee who mentioned this scenario thought it especially applies to poultry trade. Another interviewee suggested that the number of trade disputes had reached a “stable equilibrium” after diminishing recently. This opinion would imply that further reduction in the number of intraregional disputes may not be realized.

As a last summary note on the interviews, what CAFTA means for SPS issues and Central American trade is analyzed. It is noteworthy that many interviewees expressed that, in a broad sense, CAFTA represents for Central America the securement of trade concessions provided under the CBI as these unilateral concessions are replaced by a bilateral FTA. More narrowly in the context of technical regulations and agricultural trade, three themes present to illustrate the importance of CAFTA. One is the perception that the US is utilizing CAFTA to enforce the WTO SPS Agreement, as claimed by several interviewees. This opinion may partly be supported by the letter written by two US senators asking their negotiators to urge Central American countries to abide by the Agreement (See section 5.5.b.ii.).

Another point of interest in CAFTA as related to SPS issues for Central America relates to the first point. As a consequence of closer scrutiny by the US of SPS regulations in Central America some longstanding regulations may be dismantled. This may lead some producers in the region to experience increased competition from imports from the US, possibly resulting in the loss of rural employment sources and a deteriorated unemployment situation. Consequently, several Central American interviewees emphasized the importance of safeguards and phase-out periods for sensitive sectors. An interviewee noted that, if these mechanisms were not set appropriately, SPS barriers in Central America that could be considered as questionable could continue to be implemented to protect domestic industries.

A third summarizing point on CAFTA is associated with the systems approach (See section 5.5.b.). Several interviewees in Central America mentioned systems approach as a new mechanism that will be available for the region in exporting specified crops to the US. The most notable of crops that may receive the benefit of exporting under a systems approach may be tomatoes and green peppers as most of the region is interested in these crops and a large market opportunity is present in the US. However, other crops, such as *pitahaya* and papaya from Nicaragua, could also be subject to export under systems approach. The increased application of the systems approach for US imports from the region would most likely benefit Central America as the current ban on many products could be replaced by less-trade-restrictive treatments. It is furthermore noteworthy that the increased export opportunities created by the use of systems approach in Central America is attracting new foreign investment in a few countries, namely in the case of tomatoes and green peppers.

Chapter 6. Discussion

6.1. Introduction

A series of evidence and perceptions that aid in evaluating the principal and auxiliary hypotheses of this study were presented in the previous chapter. In this chapter, those inputs are utilized to first construct an assessment of the auxiliary hypotheses, whose results would in turn help in evaluating the principal hypothesis. Finally, policy implications, future research needs and general comments are provided as a conclusion of this paper.

6.2. Evaluation of auxiliary hypotheses

In Chapter 2, five auxiliary hypotheses were established to lead the research in this document. The five hypotheses relate to testing the impact of the WTO Agreements, the impact of the regional institutions, the incidence of the level of SPS capacity in the region, the presence of differences in the incidence of questionable regulations in the region against imports from the US as compared to the incidence against intraregional imports, and the prospects of CAFTA for Central American agricultural and food trade-related technical regulations. Each auxiliary hypothesis is restated below, followed by its assessment.

6.2.a. Impact of the WTO Agreements

Hypothesis1. The WTO Agreements that relate to technical regulations have not significantly influenced Central American agricultural and food trade.

Although diverging conclusions may be derived from analyzing each evidence, a single decision to only partially reject the hypothesis can be made by evaluating it through numerous indications. The strongest element that aids in a clear rejection of the hypothesis may be found in the framework of the regional institutions that regulate the use of trade-related technical regulations, which has adopted as its point of reference the WTO Agreements on technical regulations (See section 5.2.b.). As reviewed, many intraregional trade disputes have been resolved, and progressively less disputes are arising. Naturally the WTO Agreements that serve as reference have had a role in the decreasing incidence of intraregional disputes. A case which clearly demonstrates this argument is the Guatemalan complaint against Salvadoran ban of coconuts, which without the regionalization principle created by the WTO SPS Agreement, it may not have seen the light of resolution at the end of the contention tunnel. That the WTO Agreements have in principle served as an appropriate framework is also backed by comments made by most interviewees supporting the ideas and mechanisms stipulated in the Agreements (See section 5.6.).

Another argument rejecting the hypothesis of the absence of the WTO Agreements' influence is the presumed presence of a regulatory reform in Central America as well as in its trade partners. As reported in section 5.2.a., many Central American interviewees expressed the belief that SPS and TBT regulations in their countries were aligned with the exigencies of the Agreements, following regulatory reform promoted by those Agreements. However, important evidence exists to counter that position. That is, while Central America has made 45 notifications on new or modified technical regulations related to plant health, only about 25 risk assessments have been reportedly conducted (See section 5.2.b.). Although it is possible that some regulations in the region have adopted international standards and are thus exempt from the risk assessment requirement, it is reminded that there are likely to be numerous other technical regulations that the region has not notified, which would strengthen the argument that many, if not most, regulations in the region are not backed by risk assessment. That there are likely to be numerous regulations that have not been notified is especially supported by the low number of submissions made by a couple of countries, namely, Honduras and Nicaragua (See Table 5.3).

As for regulatory reform in its largest trade partner, boosted by a check and balance system created by the WTO Agreements, the US may have accompanied the global move to accommodate its technical regulations. However, the Agreements do not seem to have created an important check and balance system for trade relations between the US and Central America since Central America has not been able to effectively utilize the SPS Committee, and much less the WTO dispute resolution mechanism, as illustrated by the fact that the region has only presented one counter notification, and only with one dispute has the region made use of the DSU (See section 5.2.a.).[109] Therefore, the US may have participated in a reform of regulations

[109] On the other side, although its influence on Central America is presumably stronger than partner countries in the region as analyzed below, the US does not seem to have served as a trade partner that *substantially* "checks" the

that are of interest of its principal trade partners, but not of regulations, or of aspects of those regulations, that negatively affect its small trade partners such as those in Central America. Many types of technical regulations in the US that Central America is most concerned about serve to validate this point, as developed country partners of the US may have much less trouble in working through the PRA process or in dealing with large SPS bureaucracies. This point could be summarized as indicative of the deficient application of the special and differential treatment by the US to adequately meet the needs of Central American countries, as further discussed below (See section 5.6.). However, the possibility that the US may not be respecting binding principles of the SPS Agreement, such as the least-trade-restrictiveness clause, in trading with the region has also been discussed, and this adds to the interpretation of the lack of regulatory reform in the US.

S&D treatment, or the provision of technical assistance is one of the principles in the WTO Agreements related to technical regulations whose effective realization could aid the region the most in reducing the incidence of technical regulations in trade. As it has been mentioned repeatedly, many indications point to the lack of resources in Central America to allow it to successfully export products sensitive to technical requirements. Technical assistance is a mechanism that is oftentimes expected to help a developing country overcome a barrier presented by a stringent technical regulation, as it is in the cooperation program extended by the EU to Bolivian Brazil nut producers.

The US has provided technical assistance to Central America, but, as reported in section 5.5.b.i., perception in the region is that not enough has been done. This Central American perception may partly arise from the scarce reparation for the damages caused by what seem to be unjust barriers placed by the US, such as the long PRA process. Correction of the longer PRA process for developing than developed countries, which may well be ruled illegitimate by a WTO panel as the basis for the delay does not seem to be due to a higher risk but rather due to resource constraints by APHIS, should probably be a starting point for a technical assistance program provided by the US. Similarly, the absence of support to establish pesticide tolerance level may also be considered as a priority cooperation issue by the US.

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legitimacy of technical regulations in Central America since the magnitude of that trade is of relatively small importance for the US. This would partly explain why a regulatory reform with wide impact may not have occurred in Central America.

Furthermore, as it was reviewed, the scarce use of international organizations extends to the use of international standard setting organizations as most of Central America has not been successful in this dimension (See section 5.2.a.). However, and although these concerns were not especially expressed by the Central American interviewees, a principal and urgent concern for the region that relates to international standard setting organizations may be of a different nature. On the one hand, given indications of low technical capacity and resources in the region as further analyzed below, the high rate of 72% of notifications that do not have international standards as reference must present a challenge as it is expected that many of its regulations are backed by risk assessments. Similarly, international standard setting organizations also owe it to Central America in certain cases, subsequent to establishing international standards, to clarify the pest and disease status of countries (See section 5.6.). This could result in a substantial contribution to resolving disputes where the disease status itself is a source of contention such as the Costa Rica-Honduras poultry and the Guatemala-Honduras potato cases. In short, if more could be expected from the WTO institutions to help in promoting trade in the region, the international standard setting organizations have even more room for contribution.

Considerations on cross-country differences also help in assessing the hypothesis. Costa Rica is not the country with the most notifications made, as it may have been presumed to be when considering its development level. However, there is evidence, presented in sections 5.2.a., 5.5.b.i. and 5.5.b.iii., to suggest that it has the capacity to conduct risk assessments, and that capacity is presumably utilized to back its own regulations. Costa Rica has also been able to participate more frequently at relevant international institutions. Although El Salvador has made the most notifications, the scarce SPS capacity in countries other than Costa Rica does not seem to allow them to have risk assessment-based technical regulations. The situation in Honduras and Nicaragua may be the most preoccupying as these countries have barely made a few notifications.[110]

In all, although it is to be admitted that Central America has benefited to some extent from the WTO Agreements on technical regulations, it probably has not enjoyed as much as developed and larger developing countries have. The lack of substantial benefits to the region of the WTO Agreements may be reflected on a wide discordance among interviewees on evaluation of the application of the Agreements, as opposed to a common acceptance of their framework

[110] Again, Nicaragua has recently made a series of notifications as evidenced in section 4.2.a.

(See section 5.6.). The hypothesis that trade for the region has not been substantially influenced by those Agreements is thus, although it may not be appropriate to fully accept it, only partially rejected.

6.2.b. Impact of the regional institutions

Hypothesis 2. Central American regional integration has not been effective in reducing intraregional agricultural and food trade disputes that relate to technical regulations.

The stated hypothesis on regional institutions was established in the initial phase of this research following general expectations that institutions in developing countries were characterized by fragility. The fragile nature of those institutions, it was hypothesized, would not help substantially in diminishing trade disputes related to technical regulations. However, these expectations were gradually found not to be correct, as the evidence presented earlier attests.

In section 5.2.b., it is illustrated how intraregional agricultural and food trade disputes related to technical regulations seem to have been in decline in recent years as the numbers of new and total complaints under consideration in a given year, and of pending complaints as of end of year are presumed to be diminishing. Central American interviewees, although seemingly not emphasizing the situation, also corroborated on the impression of diminishing intraregional disputes.

As for the reasons for the decline in the intraregional disputes, it is reminded from the discussion on the evaluation of hypothesis 1 above that some influence of the relevant WTO Agreements is acknowledged as those agreements have served as a backbone of the regional legal framework on trade-related technical regulations. Nonetheless, it must be repeated too that most multilateral institutions with relevance for trade-related technical regulations have mostly not been readily accessible for Central American countries for mediation of trade disputes or for the use of international standards.

On the other hand, there is much correspondence between the recent initiatives for regional integration and the diminishing trade disputes. Regional integration in the economic dimension has taken the form of a project to create a customs union. The specific tasks of harmonization and of elimination of trade disputes have clearly propelled the resolution of trade contentions. That many contentions have been reported to be cleared at the inter-institutional meetings lends credence to the claim that regional institutions have been responsible for the resolution of intraregional disputes. The more technical OIRSA has also been influential as it has provided scarce technical expertise in the region to back technical regulations with risk assessments.

It is additionally of importance to recognize a few points about the two intraregional cases that were successfully resolved and were presented in section 5.2.b. (i.e., the Guatemalan ban on Salvadoran wheat flour imports and the Salvadoran ban on Guatemalan coconut) as they help to confirm a few points made in other studies on developing countries and technical regulations. First, harmonization of regulations and recognition of regionalization are two types of tools that are accessible for Central America and that can provide them important benefits from trade. Second, when detection of a disease does not involve technical complexity, developing countries could be open to withdraw unnecessarily restrictive SPS barriers. This point emphasizes the importance of improving the SPS capacity of a developing country even from a self-centered developed country point of view, as doing so may result in opening an export market in a developing country.

Institutions of the Central American integration have recently proved as an effective substitute for the WTO institutions as far as intraregional trade is concerned. The hypothesis on the lack of effect of these institutions is thus rejected.

6.2.c. Incidence of the SPS capacity

Hypothesis 3. Central American countries do not require additional institutional, technical and financial capacity to effectively manage technical regulation issues.

Indications that point to problems in Central America to manage technical regulation issues have been presented. The influence of external constraints in restricting trade for the region has also been discussed. The focus of this section is to determine whether domestic constraints have had an impact in the restriction of Central American agricultural and food trade and related issues.

On evaluating institutional capacity, it is noteworthy first that the basic institutional infrastructure exists in Central America (See section 5.3.). Food safety is not given as much importance as animal and plant health issues, but it may not be necessary to stress on a fortification program of the food safety system for the export industry as, at least when contrasting to the total agricultural and food exports, trade restriction due to this cause is evidently not of a great concern. Violations of labeling requirements and of maximum pesticide residue levels are accentuated, but an effective program that reduces compliance problems with labeling regulations may be implemented inexpensively and with relative ease.

The lack of entrepreneurship and government support may be institutional factors that merit more attention in Central America (See section 5.6.). In the private sector, it may sometimes be the case, as made clear through interviews, that the importance of technical regulations is not well appreciated as foods that do not comply with US SPS regulations are sometimes shipped. On the other hand, the management of technical regulations seems to be a task that also requires support from the public sector. The Costa Rican experience, where the country likely relied on a strong public strategy, may have demonstrated that point, but solid public assistance seems to be lacking in other countries in the region.

Another serious deficiency in Central American domestic capacity may arise out of its inherent technical traits. This point may best be illustrated by the fact that APHIS does not recognize PRAs conducted in the region unless experts from the US are involved in the preparation (See section 5.5.b.i.). In other words, although some capacity to conduct PRAs exists in the region as a few have been conducted, a higher level of technical capacity may be desired to decrease the impact of technical regulations for the region.

Notwithstanding the influence of the deficiencies in the institutional and technical dimensions, perhaps the greatest deficiency is in the region's financial capacity. As reported in section 5.3., the lack of this capacity has disabled the region from retaining experienced personnel, from purchasing laboratory equipment and from establishing pest and disease surveillance work. It is also illustrative that even a Costa Rican interviewee mentioned that submitting a formal technical request to EPA to have a pesticide tolerance level set is too expensive (See section 5.5.b.i).

The impact of such inadequacy of resources seems to have been of considerable magnitude. Most important of all, the admission of many plant products has been delayed due to the long

PRA process. Similarly, crops that use pesticides whose tolerance levels have not been established are frequently detained as the levels are set at zero. Since they may not have enough technical arguments and resources, Central American countries may furthermore not be able to present complaints against the US on these regulations and against possible discretionary behavior by US port-of-entry officials that follows a determined pattern, even if it believed that these measures and behavior are illegitimate by the WTO Agreements. Results from this research also indicate that Central America, and especially the less affluent countries in the region, is generally not able to advance its interests in international forums. Similarly, the region may not be fulfilling in a sufficient manner the WTO transparency obligations to notify new or modified technical regulations.

One way to interpret the evidence that intraregional disputes are decreasing is that Central America can overcome external constraints if collective action can be reached through international institutions. The reduction in those disputes is also evidence that regulatory capture can be controlled in many instances. This may be a valid argument since the finding of a higher incidence of intraregional complaints than US complaints against the region is peculiar if technical regulations were presumed to be implemented on scientific basis as Central American countries share relatively similar pest and disease conditions and the level of development among them do not vary as substantially as that between the region and the US. The result to the contrary consequently may point to the possibility that technical regulations are sometimes used as disguised means to protect domestic producers in Central America.

At a country-wise basis, it is reminded that Costa Rica’s capacity was found to be above that of the rest of the Central American countries, and this seems to explain in large part its ability to more adequately manage technical regulation issues in trade. Another point emphasized by Costa Rica’s successful experience is, despite its strong initiatives to excel, that performance in managing technical regulations may substantially be determined by a country’s level of development, as more resources may be available to devote in the management of technical regulations. That a higher development level than one that all Central American countries but Costa Rica have achieved may be, although not sufficient, necessary for success underscores the need for further technical assistance to mitigate difficulties the region faces in managing technical regulations.

On the other hand, although its public sector may be as weak as that in El Salvador, Honduras and Nicaragua, the Guatemalan private sector may be learning through important, although bitter, experiences of having a history of managing crop rejections (i.e., the raspberries and the snow peas cases in section 5.5.b.i.). This is encouraging as the Guatemalan private sector may gradually be acquiring a higher level of entrepreneurship necessary for technical regulation management, which was sometimes pointed out as lacking in the region. The efforts by that sector may also demonstrate the rising awareness in these issues.

The importance of capacity related to technical regulation issues may be the most distinguishing feature when comparing intraregional trade and Central American trade with the US. Therefore, an effective management of technical regulation issues with the US, where most products are presumably rejected for technical reasons, would imply the necessity of additional technical regulation-related capacity. By extrapolating, that additional capacity would be needed to manage technical regulation issues related to the use of multilateral institutions as the WTO Agreements imply. Consequently, the hypothesis that Central America does not require further capacity to effectively manage technical regulation issues is rejected in those two dimensions.

6.2.d. Equality in incidence of questionable regulations

Hypothesis 4. The incidence of questionable Central American technical regulations affecting imports from regional trade partners is equal to the respective incidence of questionable measures affecting imports from the US.

The hypothesis on a presumed difference in incidence of US and Central American disputes against countries in the region was established as it was presumed in the beginning phase of this research that, although Central America may tend to impose more questionable technical regulations than developed or larger developing countries, the US has more resources to keep questionable measures established by the region in check than countries in the region (See section 1.2.). To test this hypothesis, perceptions by Central American interviewees that are presumed to know more than their US counterparts about measures in the region are relied on. Additionally, technical regulations referenced by trade complaints as reported by the US and

Central American national governments in the respective reports reviewed in section 5.5.a.ii. are acknowledged to be of questionable nature for the purpose of evaluating the present hypothesis.

It is clear that if the hypothesis was evaluated using trade complaint reception data for 2002 and the perceptions of the interviewees, it would be rejected as Central American trade complaint reception rates for each country and for the region as a whole due to US claims are lower than those due to Central American claims. A somewhat different picture emerges when the hypothesis is evaluated using 2003 data for intraregional trade complaint reception data since rates due to Central American complaints are equal to or lower than those due to US complaints for three countries in the region. This would still reject the hypothesis, but a different perspective would present. That is, although deficiencies exist in this analysis as pointed out earlier, it is possible that intraregional complaints have diminished as significantly in recent years as for a few countries to have complaint reception rates due to regional claims lower than that due to US claims.

Perceptions by interviewees paralleled the finding above that Central American countries placed more questionable measures against regional partners than to the US (See section 5.5.b.iii.). Therefore, the hypothesis on equality in incidence of disputes is rejected with evidence given by the two sources.

6.2.e. Prospect due to CAFTA

Hypothesis 5. Establishment of the CAFTA will not help to substantially diminish Central American agricultural and food trade disputes related to technical regulations.

Because of some similarities between Mexico and Central America, Central America could learn from the experiences of Mexico from NAFTA as to what the region could expect from CAFTA. Romano (1998) claims that Mexico improved its regulatory process and that incidence of SPS disputes diminished given the increased communication between US and Mexican officials through the NAFTA SPS Committee. Here, an evaluation is attempted on whether Central America can expect similar benefits from CAFTA.

As with NAFTA, if implemented, CAFTA will have an SPS Committee where complaints will be aired. Much like in NAFTA then, it would be expected that communication between US and Central American officials would increase under CAFTA, and the incidence of SPS barriers could subsequently decrease. An argument can be made that prospects on cooperation could even be better under CAFTA than under NAFTA because of the additional mechanism of trade capacity building (TCB), by which the US is presumed to provide technical assistance to the region in areas such as the strengthening of SPS capacity. Concrete projects such as one directed to provide better access to information on labeling requirements in the US to smaller firms in Central America could then be realized. The FDA IRR data provides a clue as to the considerable impact that projects such as this one could increase exports from the region. More broadly, the US could attempt to make information on its complex regulations, which in the eyes of the small Central American countries seem even more complicated, more readily available to the region.

An unintended effect due to CAFTA is noteworthy as part of the benefits it has brought to Central America. Because the US asked to negotiate with the region as a group, regional integration seems to have been bolstered by bringing trade partners together. The US insistence on streamlining technical regulations in the region may also provide spin off benefits to intraregional trade (See interview results in section 5.4.).

Central America, however, is not without reservations as to the presence of substantial benefits in CAFTA. First, unlike with Central American regional institutions, there will not be a dispute resolution mechanism under CAFTA for SPS issues. This is comprehensively a great concern for Central America as, although an understanding could be reached for small disputes through the CAFTA SPS Committee, the most high profile disputes may not be resolved. Such concern by the region seems to be reflecting an asymmetry in political clout of the US and the region, as the contentious Guatemalan raspberry and Cyclospora case illustrates. Concretely, in the absence of a formal dispute resolution mechanism, asymmetry between the trade partners may force Central America to accept measures taken by the US and suffer losses that, if the US was to incur, may not mean much to it.

Another source for which Central America has shown discontent is the presumed shortage of technical assistance that will be provided by the US under CAFTA. It is a fact that the US has delivered technical assistance to the region for a long time. However, as it has been explained above, there is much perception that even under CAFTA, the US is not providing enough technical assistance. The US is to be recognized for its innovation in incorporating a technical assistance program along with a free trade agreement such as CAFTA. It is nevertheless disappointing that its concrete offer is leaving analysts knowledgeable on the subject much to desire.

Time has elapsed since the evaluation by Romano (1998) of the benefits of NAFTA on trade-related technical regulations, and, as the fact that the WTO Doha Round of negotiations has also been called the Development Round demonstrates, the degree of success of trade negotiations seems to be increasingly measured in terms of the market access opportunities created for developing countries. On technical regulation matters, CAFTA may be an innovative FTA by, in addition to the SPS Committee, creating a parallel mechanism to promote technical assistance opportunities. However, the lack of a dispute resolution mechanism in SPS matters represents lack of progress since NAFTA, and the prospects that much new technical assistance will actually be delivered is weak. Therefore, the hypothesis that CAFTA will not substantially diminish the incidence of technical regulations in Central American agricultural and food trade is only partially rejected.

6.3. Evaluation of the principal hypothesis

The principal hypothesis of this research is restated:

Principal hypothesis: Central American agricultural and food trade is not significantly affected by technical regulations.

Through testing of auxiliary hypotheses, the impact of institutions on Central America's degree of success in managing technical regulations was reviewed. Specifically, the incidence of multilateral, regional, domestic and US institutions was evaluated. Additionally, an international political economy dimension of the theme was explored by assessing the possibility of a difference in incidence of technical regulations in trade.

Evaluation of the first series of hypotheses led to the conclusion that international institutions have influenced the degree to which Central America can manage trade-related technical regulations to some extent. However, in intraregional trade, regional institutions seem to have considerably diminished the impact of technical regulations in trade. As to the region's trade with the US, the somewhat limited role of the multilateral institutions for Central America implies that trade with the US may not have seen important diminishment of the incidence of technical regulations as Central America has not been able to clear its complaints against the US. The previously higher incidence of complaints by regional trade partners than by the US against Central American countries does emphasize, on the one hand, that those countries recognize that the US has more ability to utilize multilateral institutions to try to resolve disputes with the region. On the other hand, the diminishing intraregional complaint reception rates emphasize that regional institutions have the capacity to serve as a more efficient communication channel than the multilateral institutions for Central America.

To assess the principal hypothesis, it is important to review comments by interviewees and their implications that support the idea that technical regulations substantially affect trade (See sections 5.1., 5.5.b. and 5.6.). First, interviewees expressed that technical regulations are very important in Central American agricultural trade. Second, the evidently high degree of impact of technical regulations on the increasingly important NTAE crops accentuates high significance of the issue. Third, the reportedly high incidence of US SPS measures against low US tariffs on Central American imports strengthens the argument.

Additionally as mentioned earlier, that Central American trade is emphasized by intraregional trade dispute data, which showed that almost half of all trade disputes could be regarded as resulting from technical regulations. The letter by US senators emphasizing the importance of the WTO SPS Agreement to their CAFTA negotiators is also significant in evaluating the hypothesis. The summation of this evidence suggests that technical regulations have a great impact on Central American agricultural and food trade. The principal hypothesis is thus rejected.

6.4. Conclusions

Several themes around Central America’s management of technical regulations in agricultural and food trade were explored in this paper. As a result, an important policy implication seems to emerge, which suggests that the US needs to devote more resources in several fronts to improve Central American capacity in management of agricultural and food trade-related technical regulations. The first front is in ameliorating attention to requests by the region for admissibility of new crops, whereby the possibly WTO-incompliant PRA process would have to be streamlined. More resources may then need to be dedicated to APHIS to overcome the backlog problem. Another area in which the US could effectively increase its resources is on training inspectors at its ports-of-entry to enable them making decisions that are more consistent over time and across entry points. This type of program could help in attaining a less-contentious relation with Central America as its concerns related to the Bioterrorism Act could be mitigated.

Another front in which the US may devote its resources is in providing more technical assistance for Central America to overcome its difficulties in facing technical regulation issues. This idea is emphasized by evidence in this study pointing that the region, although perhaps except for Costa Rica to some extent, needs technical assistance as its level of development does not seem to allow it to effectively manage trade-related technical regulations. Further technical assistance in this area may not only benefit exports of the region to the US, but it may provide a basis for its enhanced understanding of technical regulations in the US. Likewise, the private sector in Central America may become more accepting of not having a dispute resolution mechanism in CAFTA if substantial technical assistance is provided as technical regulations may become a less important trade barrier. Thus, an adequate level of technical assistance may also alleviate the perceived need of the Central American private sector to have a CAFTA SPS dispute resolution mechanism. The perceived lack of US cooperation, which could also be regarded as the perceived deficiency in willingness by the US to comply with the technical assistance principle of the WTO SPS Agreement, may also be transformed into a more favorable one.

The US may also see its interests advanced by further technical assistance as the region will be in a better capacity to improve implementation of its domestic technical regulations. A more sound implementation of its domestic technical regulations may translate into Central America imposing less questionable barriers to trade, which could increase US exports to the region. Furthermore, leadership by the US in abiding by the WTO Agreements as pointed out above could also be a factor in pursuing the region to implement a more thorough regulatory reform that could lead to less impediments to its imports.

Technical assistance may especially be directed for cooperation in conducting PRAs and in establishing pesticide tolerance levels, which are tasks that require both high level of expertise scarce in the region and much financial resources. Technical assistance in making details of US technical regulations readily accessible to relevant actors in the Central American private and public sectors would also go a long way, with perhaps a special topical emphasis on labeling regulations that were found to be problematic from the compliance point of view. As for the type of exporter that needs this type of knowledge, smaller ones may need to be prioritized, but large exporters that have recurrent violation problems with particular regulations may also be incorporated in such technical assistance program.

Future research work is in order to better understand how Central American management of trade-related technical regulations can be improved. One way in which further comprehension of the issues can be advanced is by studying the general issues presented in this paper in more depth. For example, trade restriction data presented in section 5.5.a. could be analyzed in more detail, such as for a longer period of time than one year or by utilizing a different set of data. Assessment of the FDA, USTR and SIECA data for a longer timeframe would consolidate findings. On the other hand, as APHIS and FSIS collect import refusal data for different reasons than that for the FDA, a close look at that data would reveal new information. Additional field work with the intention to identify more specifically the factors that determine import refusals, or their diminishment, would also be beneficial as technical assistance needs could be focused. Field work could also be used to identify new market opportunities arising out of CAFTA, such as ripe tomatoes and green peppers touched briefly in section 5.4., or out of emerging issues in voluntary standards, such as products certified due to quality, organic-, fair trade- or environmental-production traits mentioned in section 5.1.

Quantification of the impact of technical regulations is also useful as the importance of these issues can be ascertained. In this sense, the overall impact of import refusals on Central American agricultural and food trade can be assessed. Specific products of interest can also be selected for a more detailed analysis. The magnitude of new market opportunities can also be evaluated as it is attempted for the future of ripe tomato exports to the US in the following paper presented in this dissertation.

The present paper presents a critical appraisal of the WTO, the related multilateral institutions and of CAFTA. Despite the conclusion of the low performance of the WTO Agreements for Central America, prospective is good for the future as Central America is starting to use the mechanisms. It is also encouraging for the region that the WTO is putting efforts to improve implementation of the special and differential treatment provisions as these are under discussion in the Doha Round (See section 3.3.a.iii). A successful end to this negotiation may bring much benefit in the form of further technical assistance as well as more consideration by the US and other developed countries in setting technical regulations. As the case of investments in production of ripe tomatoes and green peppers represents, CAFTA is bringing some new investments that may help the region to overcome technical regulations in the US (See section 3.4.). If investments of this type are to occur intensively and in other crops, prospective of CAFTA may also be raised than what is expected following earlier analysis.

Part II. Central America’s potential incursion into the NAFTA dominated heterogeneous US tomato market

Chapter 7. Introduction

7.1. Introduction

As it was shown to be the case with the North America Free Trade Agreement (NAFTA), the Central America Free Trade Agreement (CAFTA) may decrease the incidence of technical regulations in trade as enhanced communication between officials in charge of sanitary and phytosanitary (SPS) issues may lead to improved mutual understanding and accompanying modification in regulations. Central America has expectations that this change, along with a decreased level of other trade barriers, will create new opportunities for its agricultural exports to the United States (US).

A case in point is that of ripe tomatoes for fresh consumption, which were presented by Guatemalan delegates of the CAFTA SPS Working Group as a priority crop to obtain admissibility into the US. Although the US allows imports of green tomatoes from Central America, it currently bans ripe tomatoes from the region due to prevalence of the Medfly (Mediterranean fruit fly). Ripe tomatoes can be carriers of the Medfly, and the US is free of the pest that could be destructive to many crops (McAvoy, 2004). However, after negotiations in the CAFTA SPS working group, greenhouse-produced tomatoes from Central America may become admissible to the US as this technology is associated with lower risk of pest infestation of the crop due to production conditions that allow improved pest control.

Potential benefits as an exporter in participating in the US tomato market cannot be overstated. To illustrate, tomato is the second most important commodity in the global vegetable market with a 15% share (Guajardo and Elizondo, 2003). Additionally, while being the second largest producer and consumer after China, the US is the largest importer of fresh tomatoes in the world, importing US$1 billion in 2003 (Foreign Agricultural Service (FAS), 2004). Increasingly more US imports of fresh tomatoes come from NAFTA partners of Mexico and Canada, whose combined exports account for almost 90% of total fresh tomatoes imported. While possibilities of large economic opportunities or losses in the US tomato market partly explains occurrence of trade disputes among the three NAFTA countries, such as several US-Mexico field-grown tomato quarrels and an US-Canada greenhouse dispute, the US market also presents potential gains for Central American producers as new entrants to the market.

Recognizing the opportunity, Central America also showed interest in greenhouse tomatoes for export into the US and the request for admissibility of the crop became a regional priority. As a result, Animal and Plant Health Inspection Service (APHIS) is formulating a proposed regulation on greenhouse tomato imports from Central America. Admissibility of Central American tomatoes is expected in the future under a systems approach, in which a series of measures are implemented to reduce the risk of pest infestation due to the imported crop to an acceptable level. The systems approach is likely to include various components, aside from production of tomatoes under greenhouses.

In anticipation of admittance to the US market, much foreign investment has been recently made in greenhouses in El Salvador and Nicaragua. Expansion of greenhouse tomato production by foreign firms is also planned in other Central American countries. Guatemala reportedly already has a substantial production capacity in greenhouse tomatoes.

A consideration on the demand side adds another dimension of interest for analyzing implications of Central American greenhouse tomato exports to the US. In recent years, the US market has seen an increase in retail demand for fresh tomatoes of higher quality and that are more consistent in volume (Cook, 2002; NCSU-CALS, 2004). Greenhouse tomatoes respond to this market need as production characteristics allow for more precise quality control than that afforded by field tomato production. To illustrate the growth in demand for greenhouse tomatoes, some industry sources estimate their share in total US fresh tomato consumption will increase to 30 to 40% from the 12% share in 2000 (NCSU-CALS, 2004; Cook, 2002). This trend may be supported by the presumption that consumption of high quality greenhouse tomatoes will rise as the consumer’s income level increases (Lucier, Lin, Allshouse and Kantor, 2000). Therefore, prospects for Central American exports of greenhouse tomatoes may be bright.

Prior to formulating an analytical model for the US tomato market, it is crucial to obtain a firm understanding on US consumers’ perception as to their degree of differentiation by tomato type and production origin. As revealed by divergent growth rates for greenhouse tomatoes against that for field-grown tomatoes in the US, the US tomato market may constitute of heterogeneous products in consumers’ preferences by production method. Among the large round tomatoes that are the focus of this study, field-grown tomatoes may further be categorized into two principal types: the mature green and vine-ripe tomatoes. Yet another manner by which tomatoes may be heterogeneous products in the US, after an inspection of their wholesale price data, is by their production origin. In general, tomato prices from the US or Canada seem to be higher than those from Mexico.

Even if recognition of this tomato type-origin differentiation on the demand side proves to be unnecessary, it is important to note it on the supply side as the US tomato market is dynamic and the composition of tomato type-origin is continually changing. A case in point is the possible effects on the US market of a reported rise in Mexican greenhouse tomato production that is substituting its field-grown tomato production (Cook, 2002). Such constant evolution surrounding the US tomato market suggests that, before delving into Central America's possibility in exporting to the US, players in the US tomato market and associated decisive events should be reviewed and analyzed.

7.2. Objectives of the study

The present research has the following objectives:

1. To understand the structure of the US, and NAFTA, tomato market;
2. To study the equilibrium price, quantity and welfare effects of changes in supply levels and consumer preferences by tomato type and production origin on the US tomato market; and
3. To analyze the potential of Central American greenhouse tomato exports to the US when the phytosanitary ban to tomatoes from the region is partially lifted.

7.3. Hypotheses and suppositions of the research

The following null hypothesis will be tested in this study:

1. Tomatoes are homogeneous products by type and origin in the US market.

Additionally, simulation models will be employed to quantify the following scenarios:

1. As the US imposes a tariff on Mexican tomato imports, their quantities and prices decrease, and those for tomatoes from other NAFTA countries increase;
2. A partial lifting of the US phytosanitary ban on Central American tomatoes will lead to a substantial increase in exports of Central American greenhouse tomatoes and to a large welfare effect on the US tomato market; and
3. As US consumer preferences for greenhouse tomatoes increase relative to those for field-grown tomatoes, their consumption and prices increase.

7.4. Overview

Chapter 8 presents the past, present and possible future of the US tomato market, with an added description on the prospect for Central American exports. That chapter also includes an analysis of the degree of consumers' perception of product differentiation in the US tomato market. Chapter 9 begins with a review of the literature on the US tomato market, NAFTA tomato trade and the impact of SPS measures on trade. That discussion is followed by a description of the methodology used in this paper to analyze the impact of possible shocks to the NAFTA tomato trade, one of which is the introduction of Central American competition in the US market. Chapter 10 follows with results of those analyses and Chapter 11 ends this study with concluding remarks.

Chapter 8. Evolution of the US and NAFTA tomato markets

8.1 Introduction

This chapter presents background material that describes the US tomato market. Tomatoes include numerous variations among those that are intended for consumption as fresh product and others that are further processed before their final use. The next section briefly illustrates the importance of the aggregate, including fresh as well as processing, and fresh US tomato markets within NAFTA countries and production regions and seasons.

Further description of the US tomato market continues in the subsequent sections, but with a special focus on three types of fresh tomatoes that are considered in this study: mature green, vine-ripe and greenhouse tomatoes. This description comprises of a discussion on features that shape recent trends in US production, trade and consumption, with an emphasis on differences across tomato production origin, type and harvest season. Next, variation in producer and wholesale prices is studied using data aggregated over certain time periods but disaggregated across national borders and along tomato characteristics. Heterogeneity in wholesale prices is evaluated. A review of historical tomato trade disputes ends the analysis of the US tomato market with NAFTA in mind. Finally, Central American tomato production and trade are considered as the region may become a future tomato trade partner for the US.

8.2. Overview of the North American tomato markets

8.2.a. Aggregate tomato market quantities

Table 8.1 summarizes basic NAFTA tomato statistics in 1999, which consider all types of fresh as well as processed tomatoes. The US is the largest tomato market in the NAFTA area as it produces, imports and consumes the most, with nearly 20 times Canada’s and more than five times Mexico’s production, almost fives times Canada’s and more than 50 times Mexico’s import quantity, and almost 14 times Canada’s and nearly eight times Mexico’s consumption. Being the second largest exporter worldwide, Mexico’s excess supply illustrates its position within the NAFTA tomato market with an amount almost four times of the US and more than eight times Canada’s. Mexico is also the only net tomato exporter in North America.

Table 8.1: Basic North American tomato statistics, 1999 (MT)

	Production	Exports	Imports	Consumption
United States	13,338,753	170,873	740,656	13,126,589
Mexico	2,416,175	665,441	12,521	1,643,800
Canada	684,023	80,130	162,510	936,320

Source: Author's elaboration based on Food and Agriculture Organization (FAO) figures as referenced by the Economic Research Service (ERS) (2003).

Note: For a given country, numerical relationships among columns do not coincide (i.e., consumption does not equal production minus exports plus imports). This is presumably due to independent data collection by the different sources that may have divergent objective, scope and method of data collection.

8.2.b. Fresh tomato production

Focusing attention on the US fresh tomato market that excludes tomatoes for processing and some specialty and greenhouse tomatoes, US production has been stable at around 1.7 million MT since 1999 (See Table 8.2).[111] Geographically, Florida accounts for approximately 40% of US fresh tomato production, followed by California with 30%. Other states such as Ohio, Tennessee and Virginia are the next three largest fresh tomato producers in the US and with less than 7% of total production.

Table 8.2: US fresh tomato production by state, 1998-2002 (MT)

	1998	1999	2000	2001	2002
California	447,273	520,000	527,273	466,364	525,000
Florida	634,182	719,091	716,364	677,636	654,545
Ohio	33,409	46,727	51,136	88,500	112,682
Tennessee	40,727	37,636	51,409	22,500	60,273
Virginia	52,318	67,364	58,500	65,591	69,091
Others[1]	275,182	278,955	307,364	294,273	273,955
Total	1,483,091	1,669,773	1,712,045	1,614,864	1,695,545

Note: [1] Other states with less production include Alabama, Arizona, Georgia, Indiana, Maryland, Michigan, New Jersey, New York, North Carolina, Pennsylvania, South Carolina and Texas.

Source: Author's elaboration based on National Agricultural Statistics Service (NASS) figures as referenced by ERS (2003).

Differences in climate explain diverging production volumes by state. The period in a year suitable for field tomato production depends on climate, and Florida can afford outdoor production during winter months when temperature in the rest of the states is too low (See Figure

[111] Greenhouse tomatoes were excluded since the United States Department of Agriculture (USDA) currently does not account for greenhouse production in its data collection.

8.1).[112] Californian production, and even more so production in the rest of US, takes place mostly in the summer. Taking advantage of its capacity for climate control, greenhouse production is spread year-round across multiple states with little production as compared to field tomato production.

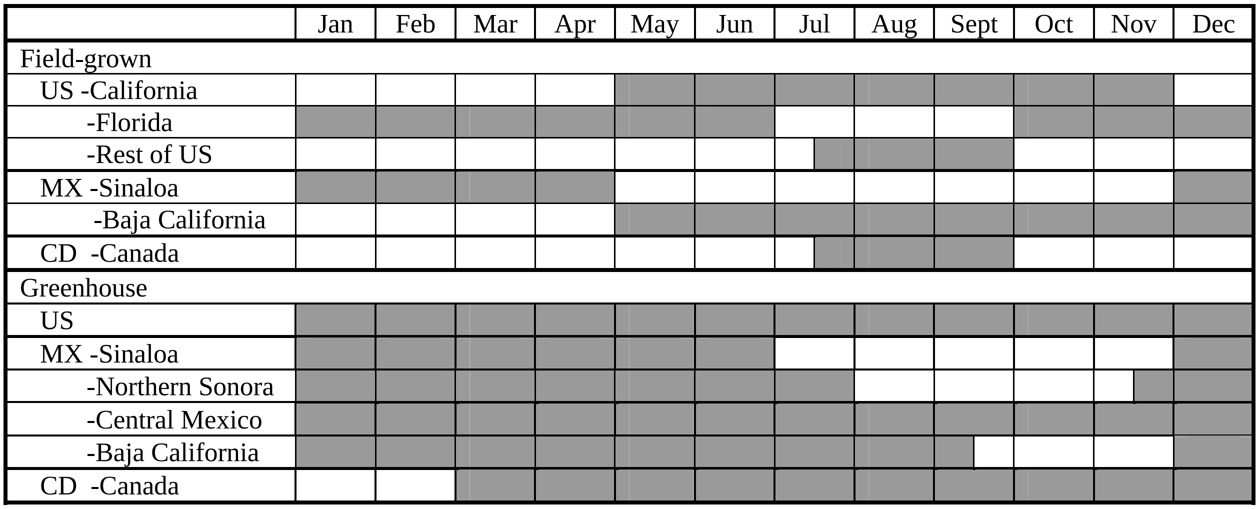

Figure 8.1: North American fresh tomato shipping seasons by state

Notes: Shaded periods correspond to shipping seasons. Most of the US greenhouse industry does not produce year-round, but there is year-round production collectively.

Source: Cook (2002).

8.3. The US mature green, vine-ripe and greenhouse tomato market

The focus of this study is on large and round type fresh market tomatoes; namely two types of field-grown tomatoes, the mature green and the vine-ripe tomatoes, and the beefsteak greenhouse-grown tomatoes.[113] All small tomatoes, such as the plum (or Roma), cherry and grape are excluded as are all tomatoes for further processing. A commonly made distinction between field-grown and greenhouse tomatoes, and also between the field-grown mature green and vine-ripe is followed in this research. Furthermore, tomatoes are distinguished by their production regions: the US, Mexico and Canada; and by harvest season: winter and summer. Such discrimination among these products is made because, although their fruit sizes may be

[112] From Figure 8.1 on, notation, including those in tables, is as follows: MX – Mexico, and CD – Canada.

[113] The mature green tomatoes are so called as they have a green color when picked at an early stage in their maturity (Bierlen and Grunewald, 1995; Cook, 2002). The natural de-greening process of these tomatoes is either accelerated or delayed by applying ethylene gas (Peschard-Sverdrup, 1996). Vine-ripe tomatoes are harvested at a later stage in maturity than mature green tomatoes are, when their color is changing from green (Cook, 2002).

comparable, production costs and product quality, especially in terms of appearance and taste, likely differ across those factors.

To illustrate on the supply side, greenhouse tomatoes cost more to produce as they require larger investments in greenhouse structures and, commonly, climate control and hydroponic equipments (USITC, 2002). Investments in greenhouse production allow improved tomato product quality control and prolonged production season. Another reason to distinguish greenhouse production from field-grown production is that producers of greenhouse tomatoes differ from field tomato producers, especially in the US (USITC, 2002). Similarly, distinction of tomatoes by production region is justified since labor costs, technology and growing season differ among the US, Mexico and Canada (Plunkett, 1996). That growing seasons differ among production regions naturally implies that production costs diverge by season given a tomato type within a production region.

As to demand side concerns, field tomatoes, and especially the mature greens, usually sell for less and are easier to slice (USITC, 2002). These factors are said to be responsible for domination by field-grown, and in particular the mature green, tomatoes in the foodservice sector but not in the retail sector (Cook, 2002). Additionally greenhouse tomatoes are reportedly associated with better taste as they redden more than field tomatoes. Consumers in the US may prefer tomatoes that are grown closer to them as those tomatoes tend to be fresher (Bierlen and Grunewald, 1995). However, distance to the US market is not the only geographic trait that favors growers as production conditions in Mexico, a relatively distant production region from the massive consumption areas in the eastern US, have allowed exploiting benefits from a new crop technology since about a decade ago (Plunkett, 1996). Consumers may also prefer a given tomato type-origin combination in one season but change preferences in the other (Bierlen and Grunewald, 1995). That diverging product quality leads to differing consumer preferences for these products, as concluded in several studies, is formally tested below in the next section.

8.3.a. Production

Data on US fresh tomato production quantities for the domestic market by tomato type (mature green, vine-ripe and greenhouse) and season of interest for this study is not readily available and must be estimated based on primary data from the literature (Lucier et al, 2000). Table 8.3 presents the results of such estimation for the 2001 winter through 2003 summer seasons (See Appendix G for an explanation of the estimation procedure). The two seasons in this study are defined as winter (December through April) and summer (May through November). These season definitions are similar to those in the literature (Gunter and Ames, 1997; Peschard-Sverdrup, 1996; Jordan and VanSickle, 1995; Baylis, 2003).

Table 8.3: 2001-2003 seasonal US fresh tomato production estimates for domestic supply by type (MT)

Type	Mature green	Vine-ripe	Greenhouse[1]	Total
Year	01/02			
Winter	523,463	62,268	49,500	657,243
Summer	410,553	560,409	115,500	1,064,449
Total	934,015	622,677	165,000	1,721,692
Year	02/03			
Winter	364,577	54,160	-	494,427
Summer	447,827	487,443	-	1,024,581
Total	812,405	541,603	-	1,519,008

Note: See Appendix G for estimation method. [1] Greenhouse production data is not enumerated by the USDA, and this estimate is based on communication with Lucier (2004). Annual variation is unknown.
Source: Author's calculation based on NASS (2003), Cook (2002), FAS (2004), Lucier (2004) and Agricultural Marketing Service (AMS) (2004).

Mature green tomatoes are produced year-round in the US, accounting for more than 50% share of the total production of tomatoes for fresh consumption in the US (Table 8.3). Vine-ripe tomatoes account for approximately 35% of total US fresh tomato production, and greenhouse tomatoes account for 15% of total production. The production share of mature greens is especially high during the winter when the foodservice sector purchase share is higher than in the summer, and mature greens represent around 75% of total tomato production (Cook, 2002; Bierlen and Grunewald, 1995). Although its year-round production volume is not large and expansion in planted area is reportedly not increasing due to high capital costs and augmented competition from Canadian imports, greenhouse production volume approaches that of vine-ripes during the winter (Cook, 2002). Vine-ripe production supercedes mature green production in the summer months, reaching a share of around 40%, as consumers demand more of this higher-quality product than mature greens (Bierlen and Grunewald, 1995).

8.3.b. Trade

Most tomato imports to the US come from Mexico and Canada (See Table 8.4). Imports from NAFTA trade partners have been steadily increasing, as the share of imports from Mexico and Canada over all tomato imports was around 90% in 1999 but 95% in 2003. On the other hand, imports from other countries, consisting mainly of the Netherlands, Spain and Israel, have decreased steadily. Total vine-ripe imports seem to have stabilized since 2000, while total tomato and greenhouse tomato imports are increasing.

Table 8.4: US fresh tomato imports from the world by origin, 1999-2003 (MT)

Origin / Year	1999	2000	2001	2002	2003
Mexico and Canada					
Vine-ripe[1]	367,993	330,521	358,718	333,125	356,991
Greenhouse[2]	18,176	75,925	91,922	118,276	154,165
Total	386,169	406,446	450,640	451,401	511,156
Rest of the world					
Vine-ripe[1]	35,823	18,564	16,898	13,124	7,484
Greenhouse[2]	9,459	19,079	21,043	21,539	15,327
Total	45,282	37,643	37,941	34,663	22,811
World total					
Vine-ripe[1]	403,815	349,084	375,617	346,248	364,474
Greenhouse[2]	27,636	95,005	112,964	139,816	169,493
Total	431,451	444,089	488,581	486,064	533,967

Notes: [1]Vine-ripe tomatoes include products under Harmonized Tariff System of the United States (HTSUS) codes 0702.00.20.99, 0702.00.40.99 and 0702.00.60.99. Although tomatoes included under those codes are classified as "other tomatoes", Cook (2005), Lucier (2004) and McCarty (2004) inform that the vast majority of those are vine-ripe tomatoes. [2]Greenhouse tomatoes include products under HTSUS codes 0702.00.20.10 and 0702.00.60.10.

Source: Author's calculation based on FAS (2004).

Table 8.5 presents imports from Mexico and Canada by tomato type and by season for the 2001/2002 and 2002/2003 seasonal years. Mexico exports mainly vine-ripe tomatoes to the US during the winter months. Mexico's winter supply of vine-ripe tomatoes in the US is much larger than the corresponding US domestic production and rivals US production of mature greens (See Table 8.3). Multiple studies such as Plunkett (1996) and Peschard-Sverdrup (1996) attribute Mexico's success in selling its vine-ripe tomatoes in the US to the adoption of several new production technologies in the mid-1990s. Among these technologies, the most notable is the extended shelf-life (ESL) variety of vine-ripe tomato, so called since it lasts longer than Florida's mature green tomatoes on the wholesaler's or retailer's shelf.[114] ESL tomatoes are qualitatively improved as compared to the mature green tomatoes, especially in terms of appearance. Another important reason for the surge in Mexican imports to the US that is frequently cited is Mexico's 1994 peso devaluation (Lucier, 2002; Plunkett, 1996; Gunter and Ames, 1998; VanSickle, Evans, and Emerson, 2003; Padilla-Bernal and Thilmany, 2000). Furthermore, VanSickle et al (2003) argue that NAFTA provisions promoting investment across countries have helped in increasing Mexican exports as US growers lost comparative advantage in technological innovation. Mexico's state of Sinaloa is the main supplier of vine-ripe tomatoes in the winter and is responsible for a majority of Mexican tomato exports, followed by Baja California that ships its products in the summer (See Figure 8.1).

Table 8.5: Seasonal US fresh tomato imports from North America by type-origin, 2001-2003 seasons (MT)

Origin	Mexico			Canada			Total
Type	Vine-ripe	Greenhouse	Total	Vine-ripe	Greenhouse	Total	
Year	01/02						
Winter	216,754	27,881	244,635	0	13,630	13,630	258,265
Summer	80,196	12,717	92,913	23,744	62,071	85,815	178,728
Total	296,950	40,598	337,548	23,744	75,701	99,445	436,993
Year	02/03						
Winter	264,247	40,184	304,430	0	20,708	20,708	325,138
Summer	69,667	17,421	87,087	33,374	73,475	106,849	193,936
Total	333,914	57,605	391,517	33,374	94,183	127,557	519,074

Note: The totals of imports from Mexico and Canada in this table do not coincide with those in Table 8.4 since this table uses a yearly period of December to November, whereas the earlier table uses the calendar year. Canadian vine-ripe tomato import in the winter is reported to be positive but very small at around 200 MT. Considering that Canada is not able to produce field-grown tomatoes during the winter due to its low ambient temperatures, the positive import value is attributed to reporting error and is assumed to be zero.
Source: Author's calculation based on FAS (2004).

Canada exports mainly greenhouse tomatoes to the US during the summer months. It is interesting to note that in 2002/03, Canada exported more tomatoes to the US during the summer than did Mexico for the same time period (See Table 8.5). Canadian exports have also expanded drastically in recent years with new investments in greenhouse facilities, as its 1999 exports to the US only equaled 14,448 MT. However, the rate of expansion in planted area may be decreasing as rising energy costs in Canada may dampen investor's profits from greenhouse production (FAS, 2001b). Partly as a result of the high energy costs, the center of North

[114] Other newly adopted technologies include drip irrigation, fertigation, plastic mulch and planed stakes.

American greenhouse industry may shift from Canada to Mexico, where field grown production is substituted by greenhouse production, although the incipient greenhouse industry is mostly low-tech now as many greenhouse growers use soil and not hydroponic medium for planting (Cook, 2002). Most of the Canadian greenhouse tomatoes are produced in Ontario, followed by British Columbia (FAS, 2001a).

8.3.c. Trade policies

The incidence of US trade policies on Mexican tomatoes is generally not viewed as important as tariffs have been low relative to tomato import prices even before NAFTA came into effect (Lucier, 2002; Gunter and Ames, 1998; Plunkett, 1996; Padilla-Bernal and Thilmany, 2000). The maximum seasonal tariff is 4.6 cents per kilogram, which only constitutes 5% of the winter Mexican vine-ripe producer price average over the 2001-2003 seasons. Some seasonal tariffs were eliminated in 1998 and, for the rest of the seasons, a tariff-rate quota (TRQ) was in effect but was eliminated in 2003. A minimum price floor for imported Mexican tomatoes, which was negotiated between the US and Mexican producers and is discussed in section 8.2.c. below, has been in effect since 1995. However, statistical results in Baylis (2003) indicate that its effect on trade is small in the summer and ambiguous in the winter.

US trade policies on Canadian imports are not significant as tariff rates have decreased to zero since 1998, except for momentary increases due to imposition of antidumping duties (Lucier, 2002; See section 8.5. below).

8.3.d. Other trends

A notable trend in the North American vegetable market is the continuing horizontal and vertical integration (Calvin and Barrios, 1998; Cook, 2002; Thompson and Wilson, 1997). Producers that can supply year-round are in demand by wholesalers, and producers of all types of tomatoes from the US, Mexico and Canada are increasingly cooperating across borders to satisfy that demand. Furthermore, following their longtime experience in selling to the US market, Mexican growers are increasingly distributing their tomatoes through US distributors that they own (Calvin and Barrios, 1998). Such vertical integration is allowing Mexican growers to assure quality of their products.

On the demand side, US per capita consumption of tomatoes has increased by 40% over the last two decades (Lucier et al, 2000). Consumption has especially increased for the high quality tomatoes such as the vine-ripe and greenhouse varieties (Thompson, 2003; Lucier et al, 2000). For instance, from 1997 to 1999, retail volume of greenhouse tomatoes in six metropolitan areas grew by an average of 100%, while that for field grown tomatoes decreased by 23%. Lucier et al (2000) found that per capita tomato consumption is not considerably dependent on consumer's location within the US (whether by region or by degree of urbanization), racial/ethnic makeup, age and gender. However, they found evidence that high-income households may be responsible for an uneven growth by tomato type in retail sales, as per capita tomato consumption for these households is disproportionately higher than that for lower-income groups and as wealthier groups can afford higher-quality higher-priced products.

8.4. Producer and wholesale price heterogeneity

Analysis of the US mature green, vine-ripe and greenhouse tomato market is advanced in this section by studying average producer and wholesale prices for the winter 2001 through summer 2002. Price data is averaged over these two seasonal years with the aim to obtain a representative set of prices. These prices are of interest as producers and consumers (or retailers or the food service sector) respond to producer and wholesale prices in making their respective production and consumption decisions. As with the case of tomato production volume, prices are studied by tomato origin, type and shipping season since tomatoes are assumed to differ across those parameters. Much of the producer and wholesale price data is not readily available and must be estimated from existing data. This estimation procedure is detailed in Appendix H.

Differences in prices are first evaluated visually by comparing the values of calculated average producer and wholesale prices. That consumers perceive tomatoes differently by their type and origin is less certain than the expectation that producer prices, which reflect costs of production, vary across those parameters. Furthermore, whether tomatoes are heterogeneous products for the consumer by type and production origin has important implications in constructing an analytic model in the following chapter. Therefore wholesale price heterogeneity is statistically tested to evaluate that hypothesis. Finding wholesale price heterogeneity would support the hypothesis that consumers in the US perceive tomatoes as different according to their tomato type and origin.

For clarification on the use of estimates in this section, a brief digression is made on the derivation method of the price estimates. Table 8.6 summarizes data source for the estimated producer and wholesale prices and marketing margins, or the differences between wholesale and producer prices.[115] It is apparent from that table that the majority of price data is derived from secondary data referenced in Appendix H, represented by "Data" in Table 8.6, while most of the marketing margins are derived from subtracting corresponding wholesale price from producer price, denoted by "=WP – PP".

Table 8.6: Summary of sources for price estimates

	US			MX		CD	
	MG	VR	GH	VR	GH	VR*	GH
Producer price (PP)	Data	Data	=WP – CD/GH/MM	Data	Data	Data	Data
Wholesale price (WP)	Data	Data	Data	Data	Data	=PP + US/VR/MM	Data
Marketing margin (MM)	=WP−PP	=WP−PP	=CD/GH/MM	=WP−PP	=WP−PP	=US/VR/MM	=WP−PP

Notes: When not preceded by other acronyms, WP and PP refer to wholesale and producer prices, respectively, in the corresponding column. Combinations of acronyms mean what they are expected. For instance, CD/GH/MM means Canadian greenhouse marketing margin. * Only Canadian vine-ripe prices in the summer are considered since these tomatoes are assumed not to be produced in the winter (See notes to Table 8.5).

Two exceptions are the US greenhouse producer price and marketing margin, and the summer Canadian vine-ripe wholesale price and marketing margin.[116] Given the lack of secondary data that allow estimation of those prices, marketing margin for US greenhouse tomatoes is assumed to equal the corresponding Canadian value, while the marketing margin for Canadian vine-ripe tomato is assumed to equal the corresponding US value (See Appendix H). For estimating US greenhouse producer price, the assumed marketing margin value is subtracted from the wholesale price estimated from data, while summer Canadian vine-ripe wholesale price is computed by adding marketing margin to the corresponding producer price. Because the Canadian vine-ripe wholesale price estimate is not derived directly from data that is specific to that tomato, it is not incorporated in the statistical tests of price differences in section 8.4.b. Similarly, since US greenhouse and Canadian vine-ripe marketing margins are not calculated

[115] From Table 8.6 on, notation is as follows: MG – mature green, VR – vine-ripe, and GH – greenhouse tomatoes.
[116] Only summer data is considered for Canadian vine-ripe prices since this tomato is assumed not to be produced in the winter. See notes to Table 8.5.

independently from data specific to those tomatoes, although tabulated, they are not considered for marketing margin data analysis in section 8.4.c.

8.4.a. Magnitude comparisons of prices

Seasonal US tomato prices estimated by the method in Appendix H are presented in Table 8.7. The lowest producer prices are for Mexican vine-ripe tomatoes in the winter and US mature greens in the summer, while the highest are for US and Canadian greenhouse tomatoes in the winter and summer, respectively. Mexican vine-ripe tomatoes have the next lowest producer prices, followed by Mexican greenhouse tomatoes in the winter and US vine-ripe tomatoes in the summer. Greenhouse producer prices are the highest within each of the three countries. In all cases but for Mexican greenhouse tomatoes, producer prices in the winter are higher than their respective summer prices. Lower prices in the summer may be the result of higher supply levels. Mexican greenhouse tomatoes may have higher summer prices since energy costs to cool production facilities may be considerable in hotter months.

Table 8.7: Prices for tomatoes sold in the US, 2001-2003 season average (US$/kg)

Origin	US			MX		CD	
Type	MG	VR	GH	VR	GH	VR	GH
Producer prices							
Winter	0.86	1.41	2.17	0.85	1.27	-	2.02
Summer	0.69	1.09	1.62	0.74	1.46	1.69	1.70
Wholesale prices							
Winter	1.33	1.77	2.70	1.55	2.66	-	2.55
Summer	1.14	1.39	1.81	1.56	1.77	1.99	1.89

Notes: US greenhouse tomato producer price and Canadian greenhouse wholesale price figures were calculated using marketing margins as detailed in Appendix H.
Source: Author's calculation based on FAS (2004) and AMS (2004).

Comparison across countries of vine-ripe tomato producer prices reveals that US price in the winter is higher and Canadian price in the summer is the highest, while Mexican price is lower in the winter and the lowest in the summer. For greenhouse tomatoes, Mexican prices are less than the others in both seasons, but US price is higher than Canadian in the winter while the opposite is true in the summer.

The largest wholesale prices are for US greenhouse in the winter or Canadian vine-ripe tomatoes in the summer. The smallest wholesale prices, on the other hand, belong to US mature greens in both seasons. Vine-ripe wholesale prices are mostly less than greenhouse prices within a given origin, except for the Canadian case in the summer where the reverse is true. Winter wholesale prices are higher than summer prices in all cases but, as for producer prices, the Mexican vine-ripe prices. For vine-ripe tomatoes, a cross-country analysis suggests that US tomato price is higher than Mexico's in the winter. In the summer, Canadian price is the highest, but Mexican vine-ripe tomatoes follow next and US tomatoes at the end. A similar comparison for greenhouse tomatoes in the winter shows that the wholesale price ranking is US, Mexico and Canada, from high value to low. In the summer, the order is Canada, US and Mexico. In conclusion, ranking of producer or wholesale prices by magnitude presents more expected and consistent results in comparisons between tomato types within a producing origin than between producing origins for a given tomato type.

8.4.b. Statistical test of wholesale price differences

In the context of the present study, formally evaluating whether consumers discriminate tomatoes from different origins and types in the two production seasons is important.[117] One way to evaluate that hypothesis is by comparing consumer wholesale prices of tomatoes with different characteristics using t-tests for differences in their means. If prices for tomato origin-type combinations are different then it can be safely said that consumers discriminate these products since prices for divergent tomatoes are likely to be set relatively independently as each tomato faces a distinct demand function.

Several studies have previously addressed the issue of price heterogeneity in tomatoes. Bierlen and Grunewald (1995) compared tomato consumer prices, represented by shipping-point prices normalized by tomato consumer price index, of three sizes of mature greens and two sizes of vine-ripe tomatoes in three seasons. They used monthly US data between 1985 and 1991, and found ambiguous results that, of 21 pair-wise comparisons between mature green and vine-ripe tomatoes, 9 pairs were statistically different. In another study, Thompson (2003) computed t-statistics for differences in retail prices of regular (presumably mature green and vine-ripe tomatoes) and greenhouse tomatoes in six metropolitan areas in the US. Using weekly prices for 1997 through 1999, all comparisons in the metropolitan areas of study showed statistically significant differences in the prices of regular and greenhouse tomatoes. VanSickle et al (2003)

[117] Prices are not compared across seasons since that comparison is not available to consumers.

use a different methodology to evaluate price heterogeneity among tomato types. Their research, based on the principle that prices of perfectly homogeneous goods must move together perfectly, found that mature green and vine-ripe tomatoes were perfectly homogeneous. However, field-grown and greenhouse tomatoes were not perfectly homogeneous. None of the three studies recognized tomato origin in their comparisons.

As in Bierlen and Grunewald (1995) and Thompson (2003), (weighted) average wholesale prices of the tomato origin-type-season combinations are statistically compared in this study using two-tailed t tests. The null hypothesis of the tests is that the average wholesale prices of the tomato origin-type-season combinations compared are equal, and the alternative hypothesis is that they are not. Formally, these hypotheses can be stated as:

$$H_0 : WP_{tij} = WP_{tru},$$

$$H_A : WP_{tij} \neq WP_{tru},$$

$$\forall\,(t;i;\,j) \neq (t;r;u), \text{ and } (t;i;\,j) \text{ and } (t;r;u) =$$

$$(WT,SM;MG;US);(WT,SM;VR;US,MX);(WT,SM;GH;US,MX,CD),$$

where WP_{tij} is the wholesale price in season *t* of tomato type *i* from origin *j*, WT stands for winter and SM for summer. To conduct these tests, weighted variance was calculated for each tomato origin-type-season combination whose wholesale price was directly derived from data and not indirectly by using marketing margins.[118] These results are shown in Table 8.8. Divergence in the number of observations between different tomato origin-type-season combinations is notable. Nonetheless, sufficient number of observations to conduct statistical analysis seems to exist for all tomato origin-type-season combinations.

Table 8.9 presents t-statistics for differences in wholesale prices of within-season pair wise combinations. The eight comparisons within the same origin, represented by the numbers in italics in Table 8.9, show that all tomato prices are different from the other pair compared as t-statistics demonstrate statistical significance at α =0.01. This result suggests that, for instance, consumers perceive US mature greens as different from US vine-ripe tomatoes both in the winter

[118] Canadian vine-ripe tomato is not included in this analysis since its wholesale prices were derived based on the sum of its producer prices and assumed marketing margins. See the introduction of section 8.4 and Appendix H.

or summer. Heterogeneity of tomatoes within each origin and season is thus supported from these tests.

Table 8.8: Wholesale price statistics

Origin	US			MX		CD
Type	MG	VR	GH	VR	GH	GH
Winter						
Weighted mean	1.33	1.77	2.70	1.55	2.66	2.55
Weighted variance	0.4717	0.1450	0.2970	0.1726	0.2658	0.2985
No. of observations	652	93	84	611	258	138
Summer						
Weighted mean	1.14	1.39	1.81	1.56	1.77	1.89
Weighted variance	0.2514	0.2414	0.0261	0.0764	0.1137	0.0408
No. of observations	873	471	120	381	89	556

Source: Author's calculation based on AMS (2004).

Table 8.9: T-tests for differences in wholesale prices within season

			US		MX		CD
			VR	GH	VR	GH	GH
Winter	US	MG	*-6.15*	*-17.68*	-6.97	-28.22	-19.68
		VR		*-13.27*	4.87	-15.17	-11.92
		GH			22.89	**0.66**	**2.02**
	Mexico	VR				*-33.41*	-24.00
		GH					**1.97**
Summer	US	MG	*-8.84*	*-14.46*	-15.39	-11.52	-33.68
		VR		*-9.13*	-6.00	-6.90	-21.94
		GH			9.26	**1.14**	-4.34
	Mexico	VR				*-6.05*	-21.20
		GH					-4.89

Notes: Numbers in boldface indicate mean prices are *not* significantly different at α =0.01 level. Numbers in boldface and underline indicate prices are *not* significantly different at α =0.05 level. Positive values indicate price for the tomato origin-type-season combination for that row is larger than that for the corresponding column, and vice versa. Numbers in italics represent comparisons within a country of origin. Cells within the same thick borders present comparisons within the same tomato type.

Source: Author's calculation based on AMS (2004).

A comparison of prices within the same type but between countries, as represented by the eight figures within thick borders in Table 8.9, indicate that four pairs are statistically not different. Of these eight comparisons, two include vine-ripe price pairs of the US and Mexico that show statistical difference from each compared price at α =0.01. The other six price comparisons are for greenhouse tomatoes, with results showing that four pairs are not statistically different at α =0.01 and two of them are not different at α =0.05. Greenhouse tomato prices seem not to differ significantly especially during the winter, when all three price pairs are not different at least at α =0.01. Greenhouse tomatoes may thus be homogeneous goods.

Summarizing, that most tomatoes, except for the greenhouse variety, seem to be heterogeneous products suggests that the tomato origin-type differentiation by consumers proposed in this study is mostly adequate. Greenhouse tomatoes have higher prices than vine-ripe tomatoes, which in turn are more expensive than the mature green variety. While consumers do not consider greenhouse tomatoes to be different by origin, among vine-ripe tomatoes, those from the US are the most expensive in the winter, and the Mexican variety takes that place in the summer.

8.4.c. Marketing margins

To finalize this section, a few comments on marketing margins derived from wholesale and producer price data are in order. In this study, marketing margins are derived by subtracting producer price from wholesale price for each tomato combination. Since producer price is the payment received by the grower for sale of the product, and wholesale price is the payment that a wholesaler makes to purchase that product, marketing margins include all costs to market tomatoes from the point of sale for the producer to the purchasing point by the wholesaler. Specifically, transportation, processing and transaction costs during the marketing process are elements of marketing margins.

These marketing margin values are presented in Table 8.10. The lowest average annual marketing margin is for US vine-ripe tomatoes at US$0.33/kg.[119] This may reflect proximity of vine-ripe production regions (California and possibly states such as Ohio, Tennessee and Virginia) to large consumption markets. The next lowest average marketing margin is that of Canadian greenhouse tomatoes at US$0.36/kg, followed by that for mature green tomatoes at US$0.46.[120] Finally, as it is expected due to longer distances from the large US consumption markets, Mexican growers have the largest average marketing margins at US$0.76/kg and US$0.85/kg for vine-ripe and greenhouse tomatoes, respectively. Marketing margin is smaller during the summer for all but Mexican vine tomatoes.

[119] It is noted that, since Canadian vine-ripe marketing margin is not obtained directly from data, it is not considered in comparisons in this section. See the introduction of section 8.4 and Appendix H for more details.
[120] It is noted, similarly to footnote 116, that US greenhouse tomato marketing margins are the same as those for Canada and are not included in this discussion. See the introduction of section 8.4 and Appendix H.

Table 8.10: US tomato marketing margins, 2001-2003 season average (US$/kg)

Origin	US			MX		CD	
Type	MG	VR	GH	VR	GH	VR	GH
Winter	0.47	0.36	0.53	0.70	1.39	-	0.53
Summer	0.45	0.30	0.19	0.82	0.31	0.30	0.19
Average	0.46	0.33	0.36	0.76	0.85	0.30	0.36

Note: n/a means data not available. As discussed at the beginning of section 8.4, marketing margin values for US greenhouse and Canadian vine-ripe tomatoes have been imputed as explained in Appendix H, and as a result, summer margin for Canadian vine-ripe tomatoes equals that for US vine-ripe tomatoes, and margins for US greenhouse tomatoes equal those for Canadian greenhouse tomatoes.
Source: Author's calculation based on FAS (2004) and AMS (2004).

Given the generalizations made here by averaging seasonal values, it is important to make note that, while marketing margin values for mature green and vine-ripe tomatoes generally do not vary greatly by season, values for greenhouse tomatoes do have large seasonal differences. This difference is US$1.08/kg and US$0.34/kg for Mexican and Canadian greenhouse tomatoes, respectively, while the largest seasonal difference in marketing margins for field-grown tomatoes is US$0.12/kg for Mexican vine-ripe tomatoes. The high winter marketing margins for greenhouse tomatoes make a strong contrast with their very low summer marketing margins. To illustrate, Mexican and Canadian greenhouse marketing margins in the winter are US$1.39/kg and US$0.53/kg, respectively, while the same are only US$0.31/kg and US$0.19/kg in the summer, respectively. Particularly, of all marketing margins the winter Mexican greenhouse marketing margin is the highest value then, while the Canadian greenhouse marketing margin is the lowest in the summer.

8.5. Historical trade disputes

Tomato trade in North America, especially during the winter, has been a contentious topic for decades. To illustrate, after Mexico became a major player in the US market, Florida producers filed the first antidumping petition against surging Mexican imports in 1978 (VanSickle et al, 2003).[121] Filing of the petition followed removal of a stricter grade, size, quality and maturity order for imported tomatoes than for domestic tomatoes, and subsequent failed

[121] Under US trade law, a domestic industry that feels injured by unfair competition can file a petition to request relief. The US Department of Commerce and the US International Trade Commission are involved in the investigations that follow submission of petitions. The US domestic industry is protected by trade laws for antidumping, countervailing duty, intellectual property right infringement, global, special, and China safeguard (USDOC, 2004a; USITC, 2004).

political attempts by the US winter tomato industry to establish new trade barriers (Thompson and Wilson, 1997). That first petition was withdrawn that same year following pressure from the Carter administration, but it was resubmitted the following year as Mexican imports resurged. Although the US Department of Commerce (USDOC) determined they were not dumping, Mexican tomato growers restricted their exports by self-imposing minimum quality standards to successfully lower the level of competition (VanSickle et al, 2003).

Following the 1994 peso devaluation, US tomato growers filed a petition with the United States International Trade Commission (USITC) requesting relief from increased fresh tomato imports from Mexico (VanSickle et al, 2003). In the provisional phase of its investigation, USITC ruled against the petition as USITC did not recognize a winter tomato industry as petitioners wanted to be defined. Perceiving that they could not win the case due to the negative provisional ruling, the petitioners withdrew their case.

However, the US tomato industry again filed a new petition for relief with the USITC and an antidumping petition with the USDOC when Mexican imports increased again in the 1995-1996 winter season. Although the petitions acknowledged the US tomato industry as a whole, as USITC had suggested in the previous case, USITC again ruled against the petition indicating that imports did not inflict serious injury to the US industry. However, the standard for judging injury in an antidumping petition is lower than that in a petition for relief, and in the same year the USDOC preliminarily determined that Mexican tomatoes were sold in the US at less than fair value (LTFV) (VanSickle et al, 2003).

The antidumping investigation was suspended later in 1996 when the USDOC negotiated a suspension agreement that determined a minimum price floor on imported Mexican tomatoes at about 45.59 cents per kilogram. This reference price is for comparison with FOB price at US ports of entry for Mexican tomatoes, i.e. McAllen, Nogales, Otay Mesa, to be shipped to consumption markets (USDOC, 2002).[122] That floor price was maintained until 1998, when two separate prices were set for the winter (about 46.47 cents per kilogram) and summer (about 37.92 cents per kilogram) (Baylis, 2003). In 2002, the suspension agreement was annulled and the 1996 antidumping investigation was reinitiated momentarily as a number of Mexican shippers refused to observe the minimum reference prices. However, a new agreement that reinstated the

[122] This reference price is low even when comparing to the Mexican vine-ripe domestic producer prices in Table 8.6. However, it is noted that the reference price has occasionally been binding as Mexican tomato prices have dropped below that price (Baylis, 2003).

same seasonal reference prices and stopped the antidumping investigation was signed among the parties later that year (USDOC, 2003).

Although more recent than those between US and Mexican producers, conflicts have also risen recently between US and Canadian tomato growers during the summer. In 2001, a group of US greenhouse growers filed an antidumping petition with the USITC and USDOC, alleging that Canadian greenhouse imports were injuring the domestic industry by their sales in the US at LTFV (VanSickle et al, 2003). In its preliminary ruling the same year, the USITC determined that the merchandise subject to investigation, which was determined by the USDOC to be imported Canadian greenhouse tomatoes, was materially injuring the domestic "like" industry of greenhouse tomatoes. Given this preliminary outcome, USDOC proceeded to investigate whether Canadian greenhouse tomatoes were sold in the US at LTFV, while USITC continued evaluating whether the domestic industry of the like product was being injured. Having confirmed Canadian greenhouse tomato sales at LTFV in the US, the USDOC momentarily imposed antidumping duties (Durnford, 2002).

Before coming to its final ruling in 2002, the USITC reversed its preliminary definition for the domestic like industry to include producer of all fresh tomatoes without discriminating the production process (VanSickle et al, 2003). This change led to the final rule that the US like industry was not materially injured by Canadian greenhouse tomatoes sold at LTFV as the volume and change in volume of Canadian imports were relatively small to impact the US fresh tomato market or industry.

The Canadian tomato industry did not stay inactive in the tomato trade dispute. Reportedly, the Canadian industry contemplated reaching a suspension agreement similar to that between Mexican growers and the USDOC (Brown, 2001). But instead, immediately following the USITC preliminary ruling, the Canadian industry requested an investigation of dumping by the US field-grown tomato industry to the Canada Customs and Revenue Agency (CCRA) and the Canadian International Trade Tribunal (CITT) (USTR, 2002; Simon, 2001; Durnford, 2002). As in the US complaint, the CCRA found that US tomatoes were sold at LTFV in Canada and temporarily imposed antidumping duties (Offner, 2002). Similarly to the USITC decision, however, the CITT ruled that US imports were not injuring the Canadian industry due to tomatoes sold at LTFV. With rulings on the absence of injury in both the US and Canada, antidumping duties were withdrawn in the two countries and the so-called 'US-Canada tomato war' came to a conclusion.

8.6. Possible future Central American greenhouse exports

Given its warm climate year round that may allow them to compete in the US winter tomato market, relative proximity to the US and low cost of labor, Central American tomato producers believe that their exports to the US may be successful. Central America collectively has a trade surplus in tomatoes when fresh as well as processing tomatoes are considered (Table 8.11). The region's export and production volumes are about half of Canada's, but Central America's share of exports in production at 20% is higher than that of Canada at 16%. The vast majority of tomato trade in Central America is intra-regional trade, with the majority of imports into El Salvador constituting most tomatoes shipped from Guatemala, Honduras and Nicaragua (SIECA, 2003a).[123] However, as regional consumption is less than production, there is some surplus that is marketed outside the region. Average annual export FOB (free on board) price for all Central American tomatoes has oscillated roughly between US$0.10 per kilogram and US$0.20 per kilogram in recent years (SIECA, 2003a).

Table 8.11: Basic tomato statistics in North and Central America, 2001

	Exports (MT)	Imports (MT)	Production (MT)	Harvested area (ha)	Consumption[1] (MT)
United States	205,486	823,541	10,022,791	161,526	13,126,589
Mexico	771,508	48,798	2,187,514	74,451	1,643,800
Canada	106,691	172,624	671,670	8,573	936,320
Central America	61,119	49,087	303,088	13,793	249,965
Costa Rica	506	1	49,850	1,413	28,860
El Salvador	290	47,358	21,545	850	46,732
Guatemala	46,229	406	175,317	6,580	127,405
Honduras	11,600	660	49,862	4,500	44,535
Nicaragua	2,494	1,068	6,514	450	2,433

Note: [1] Consumption figures are for 1999.
Source: Author's elaboration based on FAO figures as referenced by the ERS (2003).

Tomato harvested area in Central America was higher than Canada's by more than 50% in 2001 (See Table 8.11). Information on Central American production volumes by tomato type is not readily available but according to Martinez (2001), the majority of tomato acreage in the

[123] Although data reliability may be questioned as intraregional export and import quantities differ by about 17%, SIECA (2003c) shows that more than 97% of Central American trade has intraregional origins and destinations.

region except Costa Rica is dedicated to tomatoes that are sold for fresh consumption. The next largest category of harvested tomatoes is the plum tomatoes planted mostly in Guatemala. Some production of fresh market tomatoes exist in Guatemala, El Salvador and Honduras, but the largest acreage lies in Costa Rica.

As discussed in the first study of this dissertation, the US asserts that it is free of the Mediterranean fruit fly (Medfly), a pest that is destructive to many fruits and vegetables, while Central America is not (Vo, Enkerlin, Miller, Ortiz, and Perez, 2003; McAvoy, 2004). Because ripe tomatoes may be Medfly carriers, and exercising its right under the WTO SPS Agreement, the US bans imports of ripe tomatoes from Central America. The SPS Agreement, on the other hand, obligates the use of least trade-restrictive measures to assure a freer trade. The systems approach to risk management realizes that principle as it makes the importation of otherwise banned products possible by obligating the use of process standards to reduce the risk of pest infestation (Josling, Roberts and Orden, 2004).

Discussions in the CAFTA SPS working group, held parallel to CAFTA negotiations, centered on applying the least trade-restrictiveness principle in US-Central American trade. Interviews conducted in Central America for the first study of this dissertation made it clear that currently banned ripe tomatoes were a priority product for Central America to probe its possibility of introduction to the US market, and thus, the issue was treated in the CAFTA SPS working group. As a result of discussions among the US and Central American phytosanitary officials, the US Animal Plant Health Inspection Agency (APHIS) is conducting a pest risk assessment (PRA) to determine a series of systems approach measures that reduces the risk of pest infestation to an acceptable level when ripe tomato imports from Central America are allowed.

Preliminarily, the systems approach associated with Central American ripe tomato imports to the US is expected to mandate greenhouse production of the products under facilities registered by APHIS-approved local institutions, observation of a number of pests below an established maximum captured at traps with given specifications both inside and outside the facilities, and packing specifications for the final product while in transit from the production facility to the US (Snell, 2004; APHIS, 2002). Capturing a number of pests above the reference level in the vicinity of a facility would depose the owner of the right to export products from that facility to the US until corrective measures are implemented and approved. These specifications may be similar to those currently in place for tomatoes from Spain and Morocco (APHIS, 2002). However, APHIS does not foresee mandating restrictions similar to those imposed to Spanish and Moroccan imports on their import season or production region to Central American greenhouse tomatoes (Snell, 2004). Restricting importation to limited US regions is not considered either.

Responding to the future possibility of exporting greenhouse tomatoes to the US, and aided by the improved certainty that implementation of CAFTA would bring as US trade policies against the region would become more predictable, foreign investment in new greenhouse facilities has recently taken place Central America. In El Salvador, for example, 19 hectares of high-technology greenhouse facility, where beefsteak tomatoes are produced, were built in 2003 (La Prensa, 2004). Initial potential annual exports to the US from that facility is estimated at 18 thousand MT, equivalent to 6% of the US market current volume, sold at US$0.44 per kilogram in terms of FOB price in Central America (Moneda, 2003). Moreover, the same investors have constructed, although at smaller scale, new greenhouse infrastructure for tomatoes in Nicaragua. Guatemala is reported to have already existing investment in greenhouse production. Central American Greenhouse growers are anxiously waiting for the partial lifting of the US ban on Central American tomatoes.

8.4. Conclusions

This study differentiates tomatoes in three dimensions for analyzing the US tomato market: production origin, tomato type and harvest season. Tomatoes from three production regions (US, Mexico and Canada), of three types (mature green, vine-ripe and greenhouse tomatoes), and in two harvest seasons (winter and summer) are considered. Although similarities remain, categorizing tomatoes in that manner allows discriminating them on the grounds of production, consumption and trade characteristics in the US market. For example, mature green tomatoes grown in the US are the types most produced and consumed in the US, particularly during the winter. On the other hand, vine-ripe tomatoes are the most popularly produced in North America and consumed in the US in the summer. However, Mexican vine-ripe imports have long rivaled mature greens in the US winter tomato market, and greenhouse tomatoes, especially those from Canada, are progressively occupying a larger share in the summer. Changes in tomato composition across origin, tomato type and season illustrate the dynamic nature of the US tomato market, where numerous trade disputes between North American countries have taken place. Analyzing the impact of continuing trends is thus useful to evaluate the possible future of the US tomato market.

An analysis of tomato producer and wholesale prices, with data collected and appropriately adjusted to allow examination within the framework proposed in this study, lead to some preliminary conclusions. In summary, as expected, producer prices were lower than wholesale prices, prices in a given country were lowest for mature greens, followed by vine-ripes and greenhouse tomatoes, and winter prices were mostly higher than summer prices. However, given a tomato type, and although Mexican tomato prices tended to be lower than those from the US or Canada, there was a less clear tendency in the ranking of tomato prices by value from different origins. Statistical analysis demonstrated that all wholesale prices, except for notable exceptions of greenhouse prices, were different from other prices in pair wise comparisons. These results support the hypothesis that tomatoes are heterogeneous products across variables considered in this study.

Central America may have a latent capacity to supply tomatoes to the US. Due to SPS discussions parallel to CAFTA negotiations, SPS measures against introduction of the Medfly to the US could be eased, possibly resulting in imports of Central American greenhouse tomatoes to the US. Additionally owing to CAFTA negotiations, investments that could cover the region's weakness in resource and technical constraints are starting to flow into the region. These events may present an opportunity to realize the region's potential as a tomato producer, which is a topic that is further evaluated in the next chapters.

Chapter 9. Analytical framework for the US tomato market

9.1. Introduction

In this chapter, a model to analyze the US fresh tomato market is formulated and a methodology to utilize that model is presented. A review of the relevant literature is presented first. Detailed description of the perfectly competitive, static partial equilibrium model follows. Then, the methodology employed to calibrate the base model, which is a last critical step prior to utilizing it for simulation, is minutely explained. Calibrated values are also reported. With the base model in place, the section that follows discusses three scenarios chosen for simulation based on perceived significance to development of the US tomato market. Before concluding the chapter, a couple of analysis procedures that allow studying the welfare dimension of simulation results and test robustness of chosen parameters are presented. Quantitative analysis is conducted using mostly GAMS, along with Microsoft Excel.

9.2. Literature review

Thirteen papers were identified to relate to the present study. These are broadly categorized into four research themes: homogeneous tomato trade, US-Mexican tomato market integration, type-wise heterogeneous tomato market, and SPS measures, trade, and type- and origin-wise heterogeneous market models. These papers are described here in order to contemplate their methodologies and findings in formulating an analytical model for this study.

9.2.a. Homogeneous tomato trade

Four studies have examined trade of tomatoes as a homogeneous good by tomato type. Guajardo and Elizondo (2003) use a spatial equilibrium framework with endogenous prices to model world tomato production and trade under a mix of scenarios varying from perfectly free trade to inclusion of diverging levels of transportation costs and tariffs. Among their findings is that transportation costs and tariffs have a substantial impact on tomato trade. Additionally they conclude from simulation results that, contrary to most opinions and findings in other studies, Mexico owes it to NAFTA for becoming the principal tomato exporter to the US.

The other three studies on the homogeneous tomato trade use econometric approaches for analysis and focus on tomato trade in North America. Baylis (2003) studies multidirectional tomato trade among the US, Mexico and Canada, and US imports of tomatoes from the rest of the world and tomato paste from Mexico using a reduced form model. The results of her study, which permit evaluating effects of the Mexican tomato reference price in the US, partially supports the hypothesis that the reference price in the US induced Canada, and the rest of the world in the summer, to export more tomatoes to the US than otherwise. Such trade creation took place as tomato prices in the US were maintained artificially higher. However, Mexican imports to the US did not decrease in the summer with the reference price, and they ambiguously decreased during the winter. Baylis (2003) also finds some evidence, again at an ambiguous level, that the US reference price was making Mexican tomato producers to divert their products from export to tomato paste production.

Gunter and Ames (1997) use structural models to estimate inverse US demand and supply of winter tomatoes from Florida and Mexico. They find that demand for Florida tomatoes has decreased over time and that Florida tomato supply has decreased with the implementation of NAFTA, although there is no associated increase in Mexican supply. Results also suggest that Mexican excess supply to the US is responsive to domestic tomato prices in Mexico as producers respond to prices in both the US and Mexico. Mexican excess supply also responds as expected to exchange rate, which supports the idea that the 1994 peso devaluation was a principal cause for the increase in Mexican tomato imports to the US.

Padilla-Bernal and Thilmany (2000) also use structural form models and estimate US demand for Mexican tomatoes, Mexican excess supply and the role of associated transaction costs. Although they concede that autocorrelation could not be corrected in their demand model and results should be interpreted with caution, they contemplate the result that current Mexican tomato demand volume is positively affected by the level in the previous year to be indicative of an institutionalized trade relationship. On the other hand, contrary to results from Gunter and Ames (1997), Mexican excess supply in Padilla-Bernal and Thilmany (2000) did not show significant response to exchange rate or the US entry border price of tomatoes. Expectedly, however, tariffs did not influence either Mexican supply or transaction costs as their observed levels were very low. Transaction costs, or the difference between CIF and FOB prices for Mexican tomatoes, were positively affected by the volume of Mexican imports and their FOB shipping point prices in Mexico, and were negatively influenced by the peso to US dollar real exchange rate.

9.2.b. US-Mexico tomato market integration

Whether US and Mexican tomato markets are integrated is the subject of interest for two papers. Jordan and VanSickle (1995) analyze integration of Florida and Mexican shipping tomato markets, or the co-movement of prices in the two markets, in the winter using structural as well as reduced form models. They find that, although the two markets are integrated, price transmission is not asymmetric as price changes in Florida are more expeditiously transmitted to Mexico than in the opposite direction. In the US winter market modeled as an oligopoly, results suggest that Florida is the price leader and its current prices significantly depend on their own past values.

Unlike Jordan and VanSickle (1995), Padilla-Bernal and Thilmany (2003) examine market integration between Sinaloa (Mexico) and Florida shipping points and several terminal (wholesale) markets in the US and Mexico for two types of tomatoes. Using a model that allows computing the probability that different market conditions may exist between the shipping and terminal markets, Padilla-Bernal and Thilmany (2003) find that Sinaloa is more integrated with US terminal markets than with those in Mexico since competitive equilibrium market conditions are more likely to exist in the former relation. However, integration of the Sinaloa market with the Chicago terminal market is relatively low, and Florida was even less likely to be integrated with Chicago. The authors attribute Chicago’s little integration to its distance from shipping points, and also note that Florida has been losing market share there. Another interesting result from this study is that the plum tomato markets are generally less integrated vertically than the Sinaloa vine-ripe or the Florida mature green tomatoes.

9.2.c. Type-wise heterogeneous tomato market

Sexton, Zhang and Chalfant (2003), among the five papers that distinguish tomato types in their analysis, study whether mature green and vine-ripe retailers implement efficient pricing. Analyzing retailers’ behavior as buyers from grower-shippers and sellers to consumers using the switching regression model and observing the elasticities of demand the seller faces, respectively, they conclude that Florida’s mature green growers have been able to maintain a minimum selling price to retailers. Additionally, Sexton et al (2003) infer that tomato retailers are marking up their selling prices in excess of marginal costs, but they are not exercising their market power to the full extent possible, perhaps because of competition among retailers. An important finding from this paper on cross-price elasticities of demand for mature green and vine-ripe tomatoes with plum (Roma) tomatoes is that plum tomatoes are not an important substitute for the larger field-grown tomatoes as elasticities were statistically significant in a minority of cases.

Adelaja, Brumfield, and Lininger (1990) examine New Jersey consumer differentiation of local from other tomatoes by separately estimating their demand functions using the double log functional form. Results showed that own price and cross price elasticities of demand for local tomatoes are smaller and income elasticity greater in absolute value than those for other tomatoes, suggesting that local tomatoes are perceived as higher quality and more unique than the others. Another result suggests that consumers also differentiate products between locally grown and those produced in distant markets.

In a study that tests whether price incentives exist to supply higher quality tomatoes from locations close to consumption markets, Bierlen and Grunewald (1995) use a hedonic price model to separately estimate mature green and vine-ripe tomato demands. They find that less than half of comparisons between price premiums on different tomatoes in distinct seasons indicate statistical difference. Tomato attributes that more clearly define price difference between tomato types are geographical location and tomato size, with tomatoes produced at origins closer to large markets and having greater sizes enjoying more statistically significant greater price premiums.

Using retail data, Thompson (2003) uses the almost ideal demand model and its quadratic variant to estimate conditional demand elasticities of various tomato types, without distinguishing production origin or season. He finds that estimated own-price elasticities are relatively large in absolute value, while cross price elasticities are low. In particular, he concludes that, a reduction in greenhouse tomato prices can lead to further increase in its own sales and, although the effect may be relatively small, to a reduction in field-grown tomato sales.

The question of whether the USITC applied the concept of “domestic like product” rigorously in two tomato trade disputes is studied by VanSickle et al (2003). Concretely, they analyze whether decisions made by USITC that US mature green tomatoes are like products of Mexican vine-ripes, and that US field-grown tomatoes are like products of Canadian greenhouse products are economically sound. VanSickle et al (2003) determine that, using the methodology applied in Jordan and VanSickle (1995) which tests for product homogeneity by examining whether prices move together, mature green and vine-ripe tomatoes are integrated but field-grown and greenhouse tomatoes are not. Consequently, in the two disputes whose final rule critically depended on definition of the "domestic like-product", VanSickle et al (2003) conclude that the USITC counted with a sound economic basis to support its decision on the 1996 Mexican petition for relief that favored Mexico, but that was not the case on the 2001 Canadian greenhouse antidumping investigation that favored Canadian producers.

9.2.d. SPS measures, trade, and type- and origin-wise heterogeneous market models

The last two research papers relate to SPS measures, trade, and type and origin-wise heterogeneous market models, and are discussed in more detail than others as methods used in these two papers are particularly useful for the present study. Peterson and Orden (2003) quantify the effects of removal of tariffs, tariff-rate quotas and sanitary regulations on world poultry trade. In the perfectly competitive spatial partial equilibrium model, there are eight regions that export as well as import poultry. In this manner the model explicitly considers the possibilities of trade deflection as sanitary bans change trade flows among multiple countries. The model furthermore considers poultry as heterogeneous products, dividing them into "high-value" (mostly white meat) and "low-value" (mostly dark meat), and these products are also heterogeneous across countries. Although poultry is differentiated by product quality, the industry supply function recognizes that both products are manufactured in the same process. This is a novelty in the poultry trade literature too as earlier studies aggregated all poultry into one category or, even when they were considered heterogeneous within a country, they were homogeneous within a given category across different countries (Peterson and Orden, 2003).

Poultry demand is assumed to be dictated by a group of representative consumers whose demand function is weakly separable. A preference structure with four levels is assumed. At the first level, the consumer chooses between poultry and everything else. Among poultry, the consumer can choose from low-value and high-value products. At the third stage, the consumer chooses between domestically produced poultry and imports, and the fourth level represents the consumer's decision on the country of origin for imports. At each level, substitution possibilities are represented by respective elasticities. Therefore, there is an elasticity of substitution at the first level between poultry and all other goods. At the second level, there is an elasticity that captures substitutability between high-value and low-value poultry, and so on.

The preference structure is specifically represented by a nested Constant Elasticity of Substitution (CES) utility function, which is commonly used in empirical models of trade issues (Peterson, 2004). The main advantage of using this form of utility function is that it is parsimonious in the number of parameters that need to be specified. The principal drawback of this approach is that demand is assumed to be homothetic. On the supply side, given scarce information on response to prices and available technology, linear aggregate poultry production functions are assumed and scenarios are created to test model outcomes.

Peterson (2004) investigates the impact of removing a partial ban on Mexican avocado imports into the US. In doing so, the study uses a static partial equilibrium model with three supply regions (California, Mexico and Chile) and two demand regions located in the US, consisting of the states where imports of Mexican avocados are allowed during a six-month period of partial admission, and the rest of the states where imports are unconditionally banned. Reflecting the seasonal admission of Mexican avocados, two time periods are incorporated such that they separate the seasons during which Mexican avocados are admitted or not.

Similar to Peterson and Orden (2003), the existence of a representative consumer whose CES demand function is weakly separable is assumed, and substitution possibilities are represented by respective elasticities. The preference structure, however, only has two levels, with comparison between avocados and all other goods at the first level and between avocados from California, Mexico or Chile at the second level. Moreover, on the supply side, Peterson (2004) notes that since avocados may be left on the trees for up to eight months before harvesting, a Constant Elasticity of Transformation (CET) production function is appropriate for modeling. Like the CES, this function is parsimonious in the number of parameters. Finally, market clearing conditions are imposed.

9.3. Model description

The perfectly competitive market model used by Peterson (2004) is largely adopted in this research due to similarity of the problems examined. As the potential Central American beefsteak greenhouse tomato exports to the US are of primary interest in this study, the US greenhouse tomato market is studied. However, beefsteak greenhouse tomatoes have similar uses, such as in salads, sandwiches or other meals, to field-grown tomatoes of similar sizes, i.e., mature green and vine-ripe tomatoes. Furthermore, USITC (2002) finds substitutability between large greenhouse and mature green and vine-ripe tomatoes. Therefore, these three types of tomatoes, which are consumed as fresh products, are considered for analysis.

Smaller tomatoes (plum, cherry and grape) and tomatoes for processing are excluded from this study since their use is somewhat different from larger tomatoes as the former are consumed without slicing and are eaten as a whole (cherry and grape tomatoes), cooked at home into paste (plum) or industrially processed before their final sale (Lemmerman, 2004). The many statistically insignificant cross-price elasticities of demand for field-grown tomatoes with plum tomatoes found by Sexton et al (2003) support the ongoing argument. Furthermore, the small magnitude of cherry tomato retail sale in six metropolitan markets reported by Thompson (2003) as compared to field or greenhouse tomatoes, with respective ratios of almost one to ten and five, respectively, implies that excluding cherry tomatoes from the analysis would not drastically change analysis results. Thus, only the three types of large round tomatoes for fresh consumption are analyzed in this study, although they are treated as heterogeneous products by type as justified by statistical results discussed in the previous chapter.

The static partial equilibrium model in this study first simulates US tomato market conditions using recent data as a benchmark. Since the vast majority of tomatoes consumed in the US originate in the US, Mexico and Canada, these are the three production regions contemplated. Distinction of tomatoes by these three origins for vine-ripe tomatoes has also been justified by analysis in the previous chapter, since it was shown that consumers in the US discriminate vine-ripe tomatoes by their production origin. The US is not divided into multiple demand regions, as Lucier et al (2004) found no substantial regional difference in US tomato consumption and, unlike the avocado case in Peterson (2004), no import region restriction is expected to be imposed for Central American greenhouse tomatoes (Snell, 2004).

Furthermore, the market is analyzed in two seasons: winter that runs from December through April and summer from May through November. Although no import period restriction is expected to be imposed for Central American greenhouse tomatoes, stratifying the year into those two seasons permits examination of two temporal consumption markets. The winter market is dominated by the foodservice sector that prefers mature green tomatoes, although consumer purchase of vine-ripe tomatoes is significant (Cook, 2002; Bierlen and Grunewald, 1995). The summer market is dictated by retail purchases of primarily vine-ripe tomatoes, although Canadian greenhouse tomatoes are increasingly becoming popular.

9.3.a. Demand

The demand for tomatoes in the US is derived from a weakly separable utility function for a single representative consumer. The assumption of weak separability will allow demand for tomatoes to be specified as a function of tomato prices, a tomato price index, and total expenditure. The utility function is assumed to consist of two main partitions: tomatoes and everything else. Because of the heterogeneity in prices for the different tomato types, and between supply regions for vine-ripe tomatoes, the tomato partition is further divided by tomato type (mature green, vine-rips and greenhouse), and supply region for vine-ripe tomatoes.

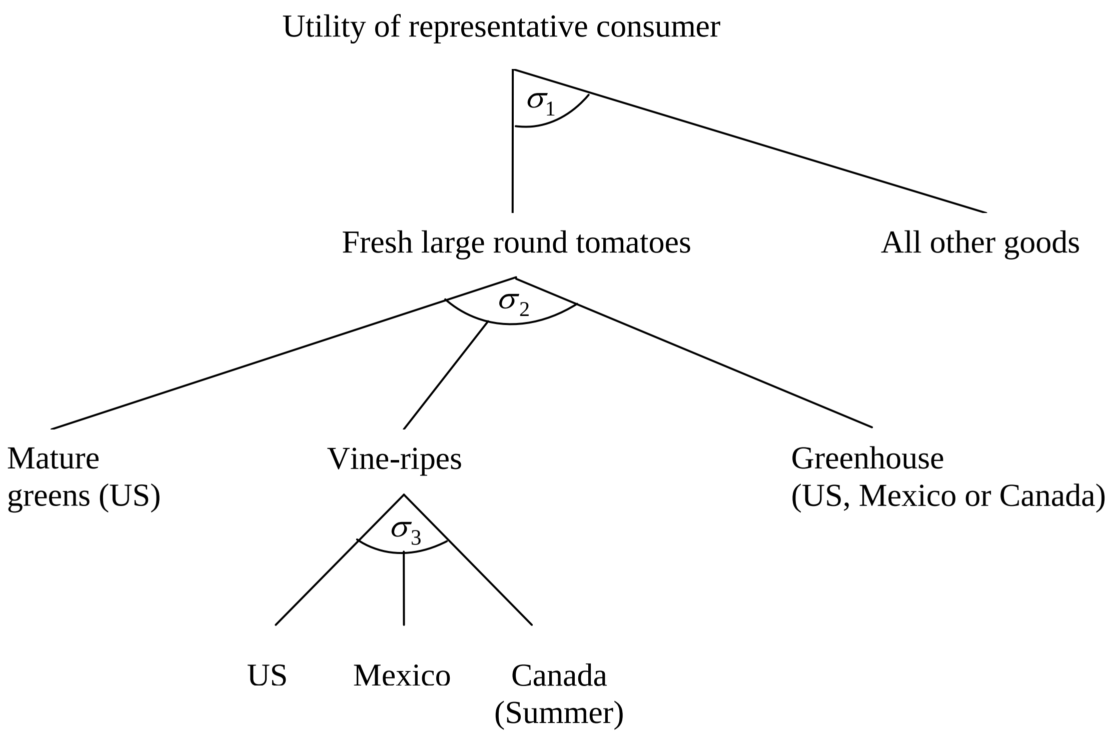

Figure 9.1. Preference structure for representative consumer

Figure 9.1 shows the assumed preference structure for the representative consumer. There are three different substitution possibilities in consumption. The parameter σ_1 represents substitution possibility between fresh large round tomatoes and all other goods; σ_2 represents substitution between mature green, vine-ripe, and greenhouse tomatoes; and σ_3 represents the substitution possibility between vine-ripe tomatoes from different supply regions. The parameter σ_3 can also be thought of as the Armington parameter for this model.

To implement the preference structure in Figure 9.1, a nested Constant Elasticity of Substitution (CES) utility function is specified. This functional form is chosen because it is parsimonious in the number of parameters needed to make the model operational: only values for σ_1, σ_2, and σ_3 are required to be specified

The utility function for the representative consumer and the resulting uncompensated demand, and price index functions are as follows:

$$U = \left\{ a^{1/\sigma_1} \left\{ \sum_i b_i^{1/\sigma_2} q_i^{(\sigma_2-1)/\sigma_2} + b_{VR}{}^{1/\sigma_2} \left\{ \sum_j c_{VRj}{}^{1/\sigma_3} q_{VRj}{}^{(\sigma_3-1)/\sigma_3} \right\}^{\frac{\sigma_3(\sigma_2-1)}{\sigma_2(\sigma_3-1)}} \right\}^{\frac{\sigma_2(\sigma_1-1)}{\sigma_1(\sigma_2-1)}} + (1-a)^{1/\sigma_1} QE^{(\sigma_1-1)/\sigma_1} \right\}^{\frac{\sigma_1}{\sigma_1-1}},$$
$$i = MG, GH,\ j = US, MX, CD, \quad (9.1)$$

$$q_i = \frac{b_i P_i^{-\sigma_2} a P_T^{\sigma_2-\sigma_1} I}{a P_T^{1-\sigma_1} + (1-a) PE^{1-\sigma_1}},\ \ i = MG, GH, \quad (9.2a)$$

$$q_{VRj} = \frac{c_{VRj}(p_{VRj} + m_{VRj})^{-\sigma_3} b_{VR} P_{VR}{}^{\sigma_3-\sigma_2} a P_T^{\sigma_2-\sigma_1} I}{a P_T^{1-\sigma_1} + (1-a) PE^{1-\sigma_1}},\ j = US, MX, CD, \quad (9.2b)$$

$$P_{MG} = p_{MG} + m_{MG}, \quad (9.3a)$$

$$P_{GH} = p_{GHj} + m_{GHj},\ \ j = US, MX, CD, \quad (9.3b)$$

$$P_{VR} = \left\{ \sum_j c_{VRj}(p_{VRj} + m_{VRj})^{1-\sigma_3} \right\}^{\frac{1}{1-\sigma_3}},\ j = US, MX, CD, \text{ and} \quad (9.3c)$$

$$P_T = \left\{ \sum_i b_i P_i^{1-\sigma_2} + b_{VR} \left\{ \sum_j c_{VRj} (p_{VRj} + m_{VRj})^{1-\sigma_3} \right\}^{\frac{1-\sigma_2}{1-\sigma_3}} \right\}^{\frac{1}{1-\sigma_2}}, i = MG, GH, j = US, MX, CD, \qquad (9.4)$$

where q_{ij} is the quantity of the ith tomato type from the jth origin, QE is the aggregate quantity of all other goods consumed, p_{ij} is the producer price of the ith tomato from the jth origin, m_{ij} is the fixed marketing margin of the ith tomato from the jth origin, P_{VR} is the wholesale price index for the vine-ripe tomato, P_i is the wholesale price for the ith tomato type, P_T is the aggregate tomato price index, I is per-capita income, PE is the aggregate price of all other goods, and a, b_i, and c_{VRj} are demand shift parameters that relate to the top, middle and bottom levels of the utility tree in Figure 9.1, respectively. Note that, since it is assumed that mature greens are only produced in the US and consumers do not discriminate greenhouse tomatoes by their origin, there is no j index for mature green and greenhouse quantity and price variables. Note also that the equations above are presented without taking into account seasonal variations in the model for ease of exposition, with the most important difference being the lack of Canadian vine-ripe import in the winter.

The role of demand shift paramteres could be observed by noting that the utility function that only considers the top level substitution possibility takes the form:

$$U = \left\{ a^{1/\sigma_1} q_T^{(\sigma_1 - 1)/\sigma_1} + (1-a)^{1/\sigma_1} QE^{(\sigma_1 - 1)/\sigma_1} \right\}^{\frac{\sigma_1}{\sigma_1 - 1}}, \qquad (9.5)$$

where q_T is the aggregate tomato quantity. The higher the value of a, the demand shift parameter for aggregate tomatoes, the more the representative consumer would tend to consume aggregate tomatoes and the less the consumer would consume all other goods. Similarly, b_i is the demand shift parameter for the ith tomato type over other tomato types and c_{ij} is the demand shift parameter for the ith tomato type from the jth origin over those from elsewhere within the same tomato type, as those parameters are used in constructing the utility functions that only consider the middle and bottom levels, respectively.

Another feature made apparent from comparing equations (9.1) and (9.5) is that the former is derived from successive substitution of the quantity indices for an expression containing q_{ij}, as the quantity indices for the ith tomato type and aggregate tomatoes are respectively defined as:

$$q_i = \left\{ \sum_j c_{ij}{}^{1/\sigma_3} q_{ij}{}^{(\sigma_3 - 1)/\sigma_3} \right\}^{\frac{\sigma_3}{(\sigma_3 - 1)}}, \text{ and} \tag{9.6}$$

$$q_T = \left\{ \sum_i b_i{}^{1/\sigma_2} q_i{}^{(\sigma_2 - 1)/\sigma_2} \right\}^{\frac{\sigma_2}{(\sigma_2 - 1)}} = \left\{ \sum_i b_i{}^{1/\sigma_2} \left\{ \sum_j c_{ij}{}^{1/\sigma_3} q_{ij}{}^{(\sigma_3 - 1)/\sigma_3} \right\}^{\frac{\sigma_3(\sigma_2 - 1)}{\sigma_2(\sigma_3 - 1)}} \right\}^{\frac{\sigma_2}{(\sigma_2 - 1)}}. \tag{9.7}$$

Similarly, successive substitution of the conditional income (expenditure) term in the bottom-level demand equation for income expressions at higher levels leads to derivation of equation (9.2). The higher-level income terms are simply the products of the price and quantity indices at the respective levels:

$$I_i = P_i q_i = \left\{ \sum_j c_{ij} (p_{ij} + m_{ij})^{1-\sigma_3} \right\}^{\frac{1}{1-\sigma_3}} \left\{ \sum_j c_{ij}{}^{1/\sigma_3} q_{ij}{}^{(\sigma_3 - 1)/\sigma_3} \right\}^{\frac{\sigma_3}{(\sigma_3 - 1)}}, \text{ and} \tag{9.8}$$

$$I_T = P_T q_T = \left\{ \sum_i b_i \left\{ \sum_j c_{ij} (p_{ij} + m_{ij})^{1-\sigma_3} \right\}^{\frac{1-\sigma_2}{1-\sigma_3}} \right\}^{\frac{1}{1-\sigma_2}} \left\{ \sum_i b_i{}^{1/\sigma_2} \left\{ \sum_j c_{ij}{}^{1/\sigma_3} q_{ij}{}^{(\sigma_3 - 1)/\sigma_3} \right\}^{\frac{\sigma_3(\sigma_2 - 1)}{\sigma_2(\sigma_3 - 1)}} \right\}^{\frac{\sigma_2}{(\sigma_2 - 1)}}, \tag{9.9}$$

where I_i and I_T are conditional income spent for the ith tomato and for all tomatoes, respectively. The aggregate tomato price index expression in equation (9.4) was obtained likewise by using the expression in equation (9.3). Time subscripts have been suppressed for simplicity in all equations.

9.3.b. Supply

The supply of a tomato type from a given region is assumed to be a linear function of the producer price for that tomato type during that time period.[124] For example, the US supply of mature green tomatoes during the winter is assumed to be a linear function of the US producer price of mature green tomatoes during the winter. The supply functions for tomatoes produced in Mexico and Canada are assumed to be excess supply functions. Concretely:

$$y_{1MG} = \delta_{1MG} + \beta_{1MG} p_{1MG}, \tag{9.10a}$$

$$y_{1VRl} = \delta_{1VRl} + \beta_{1VRl} p_{1VRl}, \; l = US, MX, \tag{9.10b}$$

$$y_{1GHj} = \delta_{1GHj} + \beta_{1GHj} p_{1GHj}, \; j = US, MX, CD, \tag{9.10c}$$

$$y_{2MG} = \delta_{2MG} + \beta_{2MG} p_{2MG}, \text{ and} \tag{9.11a}$$

$$y_{2ij} = \delta_{2ij} + \beta_{2ij} p_{2ij}, \; (i; j) = (VR, GH; US, MX, CD), \tag{9.11b}$$

where y_{1ij} and y_{2ij} are the supply of the *i*th tomato in the *j*th producer region in time periods 1 and 2, or winter and summer, respectively, p_{1ij} and p_{2ij} are producer price of the *i*th tomato in the *j*th producer region in time periods 1 and 2, and δ_{1ij}, δ_{2ij}, β_{1ij} and β_{2ij} are parameters. An implicit assumption of the production functions above is that each producer only grows one type of tomatoes as each profit maximizing supply equation only takes price of the respective tomato into account. This assumption reflects evidence that there is little, if any, overlap in US producers of field-grown and greenhouse tomatoes (USITC, 2002). Also supporting this assumption is data that suggests the major producing states in the US for mature green tomatoes, i.e., Florida and California, are different than the major producing states vine-ripe tomatoes (Cook, 2002).

[124] Effect of the suspension agreement for Mexican tomatoes is not considered in the Mexican supply functions as the minimum price floor that is set is not very low when compared to the Mexican producer prices used in this model (See section 8.5). Therefore, only a negligible effect of the minimum price floor is expected in this model.

9.3.c. Summary of model equations

Table 9.1 provides a complete list of all equations and variables in the model. In addition to equations (9.2a), (9.2b), (9.3a), (9.3b), (9.3c), (9.4), (9.10a), (9.10b), (9.10c), (9.11a) and (9.11b), market clearing conditions have been added. Since equations (9.2a) and (9.2b) are for a representative consumer, population is multiplied to them to calculate demand in the whole consumption region. The price index for all other goods, which is held constant due to the partial equilibrium assumption, is arbitrarily set equal to one. This setting does not affect model results. There are 43 equations to solve 43 endogenous variables. Additionally, there are 16 exogenous variables.

9.4. Data

Mature green, vine-ripe and greenhouse tomato quantity and price data in the US market presented in Chapter 8, except for greenhouse wholesale price data, are utilized as benchmark data to construct an initial equilibrium. This data is summarized in Table 9.2. Quantity data was derived by averaging the two-year data shown in Table 8.3 and Table 8.5. All producer and wholesale prices but those for greenhouse tomatoes are as shown in Table 8.7. Following the finding in the previous chapter that greenhouse tomatoes are mostly homogeneous by origin, unique average seasonal greenhouse wholesale prices weighted by the number of observations were calculated using AMS data for all three countries. Values of US$2.64 for the winter and US$1.87 for the summer were computed. Observations for multiple years were used for derivation of the benchmark data to smooth out data that may reflect unusual events, such as draughts and extreme currency devaluations (Peterson, 2004). Data for a third year previous to the oldest observation year was not used since it showed relatively large Canadian vine-ripe imports to the US in the winter, leaving questions on data reliability.

Additionally, per-capita income and population data was obtained from the USDOC Bureau of Economic Analysis (BEA) (USDOC, 2004b). As quarterly data was reported for population, weights were multiplied to quarterly data according to the number of months represented in the quarters used to compute each seasonal data.

Table 9.1: Tomato model equations and variables

Equations	No. of equations
<u>Consumer demand</u>	
Time period 1 $q_{1i} = pop\left\{\frac{b_{1i}P_i^{-\sigma_2} a_1 P_{1T}^{\sigma_2-\sigma_1} I_1}{a_1 P_{1T}^{1-\sigma_1} + (1-a_1)}\right\}, \ i = MG, GH$ $q_{1VRl} = pop\left\{\frac{c_{1VRl}(p_{1VRl}+m_{1VRl})^{-\sigma_3} b_{1VR} P_{1VR}{}^{\sigma_3-\sigma_2} a_1 P_{1T}^{\sigma_2-\sigma_1} I_1}{a_1 P_{1T}^{1-\sigma_1}+(1-a_1)}\right\}, l = US, MX$	4
Time period 2 $q_{2i} = pop\left\{\frac{b_{2i}P_i^{-\sigma_2} a_2 P_{1T}^{\sigma_2-\sigma_1} I_2}{a_2 P_{2T}^{1-\sigma_1} + (1-a_2)}\right\}, \ i = MG, GH$ $q_{2VRj} = pop\left\{\frac{c_{2VRj}(p_{2VRj}+m_{2VRj})^{-\sigma_3} b_{2VR} P_{2VR}{}^{\sigma_3-\sigma_2} a_2 P_{2T}^{\sigma_2-\sigma_1} I_2}{a_2 P_{2T}^{1-\sigma_1}+(1-a_2)}\right\}, \quad j = US, MX, CD$	5
<u>Aggregate tomato demand price indices</u>	
Time period 1 $P_{1T} = \left\{\sum_i b_{1i}P_{1i}{}^{1-\sigma_2} + b_{1VR}\left\{\sum_l c_{1VRl}(p_{1VRl}+m_{1VRl})^{1-\sigma_3}\right\}^{\frac{1-\sigma_2}{1-\sigma_3}}\right\}^{\frac{1}{1-\sigma_2}},$ $i = MG, GH, l = US, MX$	1
Time period 2 $P_{2T} = \left\{\sum_i b_{2i}P_{2i}{}^{1-\sigma_2} + b_{2VR}\left\{\sum_j c_{2VRj}(p_{2VRj}+m_{2VRj})^{1-\sigma_3}\right\}^{\frac{1-\sigma_2}{1-\sigma_3}}\right\}^{\frac{1}{1-\sigma_2}},$ $i = MG, GH, \ j = US, MX, CD$	1
<u>Mature green and greenhouse tomato wholesale price</u>	
Time period 1 $P_{1MG} = p_{1MG} + m_{1MG}\,,$ $P_{1GH} = p_{1GHj} + m_{1GHj}\,, \ j = US, MX, CD$	4
Time period 2 $P_{2MG} = p_{2MG} + m_{2MG}\,,$ $P_{2GH} = p_{2GHj} + m_{2GHj}\,, \ j = US, MX, CD$	4

Table 9.1: Continued

Equations	No. of equations
Tomato type demand price indices	
Time period 1 $P_{1VR} = \left\{ \sum_{l} c_{1VRl} (p_{1VRl} + m_{1VRl})^{1-\sigma_3} \right\}^{\frac{1}{1-\sigma_3}}, l = US, MX$	1
Time period 2 $P_{1VR} = \left\{ \sum_{j} c_{1VRj} (p_{1VRj} + m_{1VRj})^{1-\sigma_3} \right\}^{\frac{1}{1-\sigma_3}}, \ j = US, MX, CD$	1
Tomato supply	
Time period 1 $y_{1MG} = \delta_{1MG} + \beta_{1MG} p_{1MG}$ $y_{1VRl} = \delta_{1VRl} + \beta_{1VRl} p_{1VRl}, \ l = US, MX,$ $y_{1GHj} = \delta_{1GHj} + \beta_{1GHj} p_{1GHj}, \ j = US, MX, CD,$	6
Time period 2 $y_{2MG} = \delta_{2MG} + \beta_{2MG} p_{2MG}$ $y_{1VRl} = \delta_{1VRl} + \beta_{1VRl} p_{1VRl}, \ j = US, MX, CD,$ $y_{1GHj} = \delta_{1GHj} + \beta_{1GHj} p_{1GHj}, \ j = US, MX, CD,$	7
Market clearing conditions	
Time period 1 $y_{1MG} = q_{1MG}$ $y_{1VRl} = q_{1VRl}, l = US, MX,$ $\sum_{j} y_{1GHj} = q_{1GH}, j = US, MX, CD$	4
Time period 2 $y_{2MG} = q_{2MG}$ $y_{2VRj} = q_{2VRj}, j = US, MX, CD,$ $\sum_{j} y_{2GHj} = q_{2GH}, j = US, MX, CD$	5
Total	43

Table 9.1: Continued

Model variables	Definition	No. of variables
Endogenous		
q_{1MG}, q_{1VRl}, q_{1GH}, q_{2MG}, q_{2VRj}, q_{2GH}	Quantity of tomato types from region *j* consumed in time periods 1 and 2	9
P_{1T}, P_{2T}	Aggregate tomato price indices in time periods 1 and 2	2
P_{1VR}, P_{2VR}	Price indices of vine-ripe tomatoes in time periods 1 and 2	2
P_{1MG}, P_{1GH}, P_{2MG}, P_{2GH}	Wholesale prices of mature green and greenhouse tomatoes in periods 1 and 2	4
p_{1MG}, p_{1VRl}, p_{1GHj}, p_{2MG}, p_{2VRj}, p_{2GHj}	Producer price of tomato types from supply region *j* or *l* in time periods 1 and 2	13
y_{1MG}, y_{1VRl}, y_{1GHj}, y_{2MG}, y_{2VRj}, y_{2GHj}	Supply of tomato types from region *j* or *l* in time periods 1 and 2	13
Total		43
Exogenous		
pop	Population in the US	1
I_1, I_2	Per-capita income in the US in time periods 1 and 2	2
m_{1MG}, m_{1VRl}, m_{1GHj}, m_{2MG}, m_{2VRj}, m_{2GHj}	Fixed marketing margin for mature green tomatoes and *i*th tomato type from supply region *j* in time periods 1 and 2	13
Total		16

Notes: Time period 1 refers to December through April, while time period 2 includes May through November.
Acronyms: Tomato types: MG – Mature green, VR – Vine-ripes, GH – Greenhouse.
Production regions: US – United States, MX – Mexico, CD – Canada.

9.5. Model calibration

The parameters in the model (σ_1, σ_2, σ_3, a, b_i, c_{VRj}, δ_{MG}, δ_{ij}, β_{MG}, and β_{ij}) are chosen to replicate the benchmark prices and quantities, and demand and supply elasticities to create a base model. This section presents the calibration procedure and accompanying results.

9.5.a. Demand elasticities and parameters

On the demand side, elasticities of substitution are first calibrated as detailed below, after which calibrated values are presented. Demand shift parameter values can then be obtained according to the method contained in the section that follows.[125]

[125] Appendix I provides further detail on this section, including the procedure to obtain budget shares, and resulting values of budget shares and Allen partial elasticities of substitution described here. Illustration of the procedure to calibrate demand parameters is also presented.

Table 9.2: Benchmark price and quantity data

	US				MX			CD		
	MG	VR	GH	Total	VR	GH	Total	VR	GH	Total
Quantity demanded (MT)										
Winter	444,020	58,214	49,500	551,734	240,500	34,032	274,532	-	17,169	17,169
Summer	429,190	523,926	115,500	1,068,616	74,931	15,069	90,000	28,559	67,773	96,332
Total	873,210	582,140	165,000	1,620,350	315,431	49,101	364,532	28,559	84,942	113,501
Producer prices (US$/kg)										
Winter	0.86	1.41	2.17		0.85	1.27		-	2.02	
Summer	0.69	1.09	1.62		0.74	1.46		1.69	1.70	
Wholesale prices (US$/kg)										
Winter	1.33	1.77	2.64		1.55	2.64		-	2.64	
Summer	1.14	1.39	1.87		1.56	1.87		1.99	1.87	
Per-capita income (US$/person)										
Winter	11,325									
Summer	16,174									
Population (Thousands)	289,425									

Table 9.3: Tomato demand own-price elasticity estimates in the literature

Source	Elasticity estimates
Thompson (2003)	Regular tomato: (WA) -1.094, (H) -1.418, (L) -0.64 Greenhouse tomato: (WA) -1.226, (H) -3.08, (L) -0.48
Sexton et al (2003)	Vine-ripe tomatoes: (A) -0.803, (H) -1.590, (L) -0.145 Mature-green tomatoes: (A) -0.883, (H) -1.600, (L) -0.396
Adelaja et al (1990)	Jersey tomatoes: -0.1308 Non-Jersey tomatoes: -0.2245

Notes: (WA) denotes averages weighted by sales volumes, (A) denotes simple averages, (H) denotes high value, and (L) denotes low value among the estimates that are presented. Only values reported as statistically significant are considered.

9.5.a.i. Elasticities of substitution

On the demand side, the elasticities of substitution are chosen to yield a set of estimated demand elasticities from the literature. Thompson (2003), Sexton et al (2003) and Adelaja et al (1990) provide elasticity estimates at retail level for tomatoes by type without regards to tomato origin or seasonal differences. Table 9.3 provides a summary of elasticity estimates in those studies. Each study uses a distinct manner of aggregating tomatoes. However, the degrees to which tomatoes classified differently respond to prices vary as the maginitude of the elasticities differ. Estimates in Thompson (2003) are the highest, followed by those in Sexton et al (2003) and Adelaja et al (2003). Greenhouse tomatoes have higher price elasticities of demand than regular (field-grown) tomatoes, while vine-ripe and mature green tomatoes have similar elasticity estimates. Closer observation of the retail price data in Sexton et al (2003) may explain the higher elasticities for mature greens, as their mean price is higher than that for vine-ripe tomatoes.[126]

For the present study, given the absence of wholesale level demand elasticity estimates, values from these papers are taken directly. It is acknowledged that, since the percentage change in price is smaller at the wholesale level due to smaller prices than at the retail level, this assumption may overestimate the wholesale level elasticity. To assure consistency in the elasticity values used, only values from Thompson (2003), which computes elasticity values for the three tomato types in this study, are used. However, since Thompson (2003) does not compute separate values for mature green and vine-ripe tomatoes, these two types are assumed to have the same elasticity values, which is the value for regular tomatoes. Therefore, the mature green, vine-ripe and greenhouse tomato demand elasticities at the wholesale level used here are -1.094, -1.094, and -1.226, respectively.

The elasticities of substitution are now calibrated in the following manner. Based on Peterson (2004), who cites Keller (1990) as his source, the formulas for the own-price Allen partial elasticities of substitution (AEOS) for the three tomato types of US origin are:

$$\sigma_{MG,MG} = -[\sigma_2(s_{MG}^{-1} - s_T^{-1}) + \sigma_1(s_T^{-1} - 1)], \tag{9.12a}$$

[126] The reason for which mean retail price for mature green tomatoes was higher is not discussed in Sexton et al (2003) and is consequently not clear as the reverse result would be expected. However, it could be deduced that consumer preferences reflected by the data used for computing the mean retail price are not representative of the aggregate US preferences.

$$\sigma_{VR-US,VR-US} = -[\sigma_3(s_{VR-US}^{-1} - s_{VR}^{-1}) + \sigma_2(s_{VR}^{-1} - s_T^{-1}) + \sigma_1(s_T^{-1} - 1)], \text{ and} \tag{9.12b}$$

$$\sigma_{GH,GH} = -[\sigma_2(s_{GH}^{-1} - s_T^{-1}) + \sigma_1(s_T^{-1} - 1)], \tag{9.12c}$$

where $\sigma_{i,i}$, and $\sigma_{i-j,i-j}$ are the own-price AEOS of the *i*th or *i-j*th tomato, respectively, s_T is the budget share of tomatoes, and s_i and s_{i-j} are the budget share of the *i*th or *i-j*th tomato, respectively. It is emphasized that the AEOS equations for mature green and greenhouse tomatoes do not involve the bottom-level elasticity of substitution since all mature green tomatoes are assumed to originate in the US and greenhouse tomatoes are not discriminated by origin, and thus only AEOS expressions at the mid-level can be constructed. Using the elasticity form of the Slutsky decomposition, and the homotheticity of the CES function used in the model for this research:

$$\varepsilon_{MG} = s_{MG}(\sigma_{MG,MG} - \eta_{MG}) = s_{MG}(\sigma_{MG,MG} - 1), \text{ therefore,}$$

$$\sigma_{MG,MG} = \frac{\varepsilon_{MG}}{s_{MG}} + 1. \tag{9.13a}$$

Similarly,

$$\sigma_{VR-US,VR-US} = \frac{\varepsilon_{VR-US}}{s_{VR-US}} + 1, \text{ and} \tag{9.13b}$$

$$\sigma_{GH,GH} = \frac{\varepsilon_{GH}}{s_{GH}} + 1, \tag{9.13c}$$

where η_i and η_{i-j} are the income elasticity of demand for the *i*th or *i-j*th tomato. Equations (9.13a) and (9.13c) allow determining the AEOS terms for mature green and greenhouse tomatoes in equations (9.12a) and (9.12c). However, to use equation (9.13b) in calculating $\sigma_{VR-US,VR-US}$, the demand elasticity for US vine-ripe tomatoes, ε_{VR-US}, must be computed. This can be achieved by assuming that the slopes of the vine-ripe tomato demand curve and the demand curve for US vine-ripe tomatoes are equal, which permits deriving the following relationship:

$$\varepsilon_{VR-US} = \varepsilon_{VR} \frac{Q_{VR}}{Q_{VR-US}},$$

where $Q_{VR\text{-}US}$ and Q_{VR} are the quantities of US vine-ripe and aggregate vine-ripe tomatoes, respectively. ε_{VR-US} is thus computed to be 1.740, the associated AEOS can be calculated from equation (9.13.b), and the three equations (9.12) allow computation of the three elasticities of substitution.

Although they are not explicitly used in the model, price elasticities of demand can be calculated for reference based on elasticities of substitution. Price elasticities are computed to confirm and evaluate the degrees of own- and cross-price elasticities of demand for tomatoes at all levels of the utility tree in Figure 9.1. According to citation by Peterson (2004) of Keller (1990), the mid-level AEOS that correspond to the cross-price elasticities can be computed by:

$$\sigma_{r,k} = \sigma_2 s_T^{-1} - \sigma_1 (s_T^{-1} - 1), r = MG, VR, GH \neq k. \tag{9.14}$$

Then, using the elasticity form of the Slutsky decomposition and the homotheticity of the CES utility function, the own- and cross-price elasticities of demand for tomato types at the mid level of the utility tree can be obtained:

$$\varepsilon_{r,k} = s_k(\sigma_{r,k} - \eta_i) = s_k(\sigma_{r,k} - 1), r = k \text{ or } r \neq k. \tag{9.15}$$

Similarly for the bottom level of the utility tree, the own and cross AEOS are:

$$\sigma_{VRj,VRj} = -[-\sigma_3(s_{VRj}^{-1} - s_{VR}^{-1}) + \sigma_2(s_{VR}^{-1} - s_T^{-1}) + \sigma_1(s_T^{-1} - 1)], \text{ and} \tag{9.16}$$

$$\sigma_{VRj,VRl} = \sigma_3 s_{VR}^{-1} - \sigma_2(s_{VR}^{-1} - s_T^{-1}) - \sigma_1(s_T^{-1} - 1), j \neq l. \tag{9.17}$$

Equation (9.16) is the general form of equation (9.12b). The own- and cross-price elasticities at the bottom level are then:

$$\varepsilon_{VRj,VRu} = s_{VRu}(\sigma_{VRj,VRu} - \eta_{VRj}) = s_{VRu}(\sigma_{VRj,VRu} - 1),\ j = u \text{ or } j \neq u\ .$$

For the top level:

$$\sigma_T = -\sigma_1\left(s_T^{-1} - 1\right),$$

therefore,

$$\varepsilon_T = s_T(\sigma_{TT} - \eta_T) = s_T(\sigma_{TT} - 1),\ j = u \text{ or } j \neq u\ .$$

9.5.a.ii. Calibrated elasticity values

Table 9.4 presents the calibrated elasticities of substitution and their implied price elasticities at the mid and bottom levels. The top level elasticity of substitution is low, indicating that tomatoes and all other goods are substitutable but at a low degree. As expected, the three types of tomatoes are much better substitutes among themselves than aggregate tomatoes and all other goods are since the mid level elasticity of substitution is much larger than that at the top level. The bottom level elasticity of substitution is even greater than that for the mid level, suggesting that consumers are willing to substitute among vine-ripe tomatoes from different origins more readily than among divergent tomato types. This result also follows expectations previous to calibration.

Several points on the calculated implied demand elasticities are worth mentioning. Starting with own-price elasticity values, first it can be confirmed that the calculations are likely to be correct since the mature green, US vine-ripe, and greenhouse own-price elasticities values with which the calibration procedure began fall between the respective winter and summer values presented in Table 9.4. Second, all tomatoes are elastic with respect to own prices. The higher own-price elasticities for vine-ripe tomatoes from diverging origins than for tomato types again follow expectations.

Table 9.4: Calibrated and implied demand elasticity values

<table>
<tr><td colspan="7">Elasticities of substitution</td></tr>
<tr><td colspan="3">Top level (σ_1)</td><td colspan="2">Mid level (σ_2)</td><td colspan="2">Bottom level (σ_3)</td></tr>
<tr><td colspan="3">0.49</td><td colspan="2">1.4</td><td colspan="2">2.9</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td colspan="7">Implied price elasticities</td></tr>
<tr><td colspan="2" rowspan="2">Tomato type/origin</td><td rowspan="2">MG</td><td colspan="3">VR</td><td rowspan="2">GH</td></tr>
<tr><td>US</td><td>MX</td><td>CD</td></tr>
<tr><td colspan="2"></td><td colspan="5">Winter</td></tr>
<tr><td colspan="2">MG</td><td>-1.0</td><td>0.07</td><td>0.26</td><td>-</td><td>0.18</td></tr>
<tr><td rowspan="3">VR</td><td>US</td><td>0.41</td><td>-2.5</td><td>1.4</td><td>-</td><td>0.18</td></tr>
<tr><td>MX</td><td>0.41</td><td>0.38</td><td>-1.5</td><td>-</td><td>0.18</td></tr>
<tr><td>CD</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td colspan="2">GH</td><td>0.41</td><td>0.07</td><td>0.26</td><td>-</td><td>-1.2</td></tr>
<tr><td colspan="2"></td><td colspan="5">Summer</td></tr>
<tr><td colspan="2">MG</td><td>-1.2</td><td>0.38</td><td>0.06</td><td>0.03</td><td>0.19</td></tr>
<tr><td rowspan="3">VR</td><td>US</td><td>0.26</td><td>-1.3</td><td>0.25</td><td>0.12</td><td>0.19</td></tr>
<tr><td>MX</td><td>0.26</td><td>1.6</td><td>-2.6</td><td>0.12</td><td>0.19</td></tr>
<tr><td>CD</td><td>0.26</td><td>1.6</td><td>0.25</td><td>-2.7</td><td>0.19</td></tr>
<tr><td colspan="2">GH</td><td>0.26</td><td>0.38</td><td>0.06</td><td>0.03</td><td>-1.2</td></tr>
</table>

As to cross-price elasticity values, first all cross-price elasticities are positive, implying that tomatoes are substitutes. This is an important point for the model as it is based on the assumption that tomatoes are substitutes. Second, cross-price elasticity values are mostly smaller in magnitude than related own-price elasticities, which is a finding that coincides with other studies such as Thompson (2003) and Adelaja et al (1990). This suggests that tomato quantities are more responsive to changes in their own prices than to variations in prices of other tomato types or origins.

9.5.a.iii. Demand shift parameters

With the values of σ_1, σ_2 and σ_3 defined, the demand shift parameters c_{1VRl}, c_{2VRj}, b_{1k}, b_{2k}, a_1 and a_2 ($k = MG, VR, GH$, $l = US, MX$, $j = US, MX, CD,$) can be calculated by solving a system of nonlinear equations for each time period. The *c*'s are first computed by solving a system of three conditional demand equations. These equations are conditional because the expenditure on all vine-ripe tomatoes is held constant. Only one equation in the winter and two in the summer must be resolved as the restriction that *c*'s must equal to one for vine-ripe tomatoes in a given time period is imposed. It is noted again that there are no *c* coefficients for mature greens or greenhouse tomatoes since they are only produced in the US or consumers do not see them different by origin. The system of equations is:

$$\frac{q_{VRl}}{pop} = \frac{c_{VRl}(p_{VRl} + m_{VRl})^{-\sigma_3} I_{VR}}{\left[\sum_l c_{VRl}(p_{VRl} + m_{VRl})^{1-\sigma_3}\right] + \left(1 - \sum_l c_{VRl}\right)\left(p_{VR,CD} + m_{VR,CD}\right)^{1-\sigma_3}}, \quad l = US, MX \;, \tag{9.18}$$

where I_{VR} is the conditional expenditure for vine-ripe tomatoes.[127]

It is pointed that, since the utility of a representative consumer is considered, the per-capita demand is used in equation (9.18). Furthermore, the time period index in all the variables are suppressed for the equations in this and the next section for ease of exposition.

The values of the parameters b_{1k} and b_{2k} are determined by solving the following equations:

$$q_{MG} = \frac{b_{MG} P_{MG}{}^{-\sigma_2} I_T}{\sum_n b_n P_n{}^{1-\sigma_2} + \left(1 - \sum_n b_n\right) P_{GH}^{1-\sigma_2}}, n = MG, VR \text{, and} \tag{9.19a}$$

$$q_{VR} = \frac{b_{VR} P_{VR}^{-\sigma_2} I_T}{\sum_n b_n P_n^{1-\sigma_2} + \left(1 - \sum_n b_n\right) P_{GH}^{1-\sigma_2}}, n = MG, VR \,, \tag{9.19b}$$

where q_k is the CES quantity aggregator and I_T is the conditional expenditure for all tomatoes. In turn, a_1 and a_2, or the top-level shift parameters in period 1 and 2, respectively, can be computed by solving:

$$q_T = \frac{a P_T^{-\sigma_1} I}{a P_T^{1-\sigma_1} + (1 - a)}, \tag{9.20}$$

where q_T is as defined in equation (9.12).

Calibrated demand shift parameter values are presented in Table 9.5.

[127] Note that in the winter, there is no Canadian vine-ripe import. Therefore, only one equation needs to be solved to calibrate the bottom-level vine-ripe parameters.

Table 9.5: Calibrated demand parameter values

Level	Winter			Summer		
Top level (a)	0.0003			0.0003		
Mid level	MG	VR	GH	MG	VR	GH
(b_i)	0.41	0.35	0.24	0.25	0.51	0.23
Bottom level	US	MX	CD	US	MX	CD
(c_{VRj})	0.26	0.74	-	0.74	0.15	0.11

9.5.b. Supply elasticities and parameters

Plausible estimates on tomato supply elasticities are not available in the literature.[128] In studies of the US avocado market and SPS regulations, Romano (1998) uses a supply elasticity of 0.35 for all producers of all types of avocados in both seasons. Peterson (2003) uses that value for his short-run scenario, and also uses 1.3 for his long-run scenario. Elasticity estimates for other field-grown vegetables are available and presented in Table 9.6. A simple average of the five short-run elasticities in that table gives an approximate value of 0.40. Given a lack of more precise estimate of supply elasticities for field-grown tomatoes, this value is used for short-run US mature green and vine-ripe tomato supply elasticity, while 1.4 is used for their long-run supply elasticity.[129] More inelastic supply is expected for greenhouse tomatoes, especially in the long-run, since larger investments are needed to expand production. Therefore, short- and long-run supply elasticities of 0.20 and 1.1, respectively, are assumed for US greenhouse supply elasticities.

As in Peterson (2004), domestic supply elasticities are adjusted to conform to the excess supply functions of countries exporting to the US by multiplying the national production supply elasticity by the inverse of the export share in national production. For Mexican tomatoes mostly consisting of vine-ripe tomatoes, Plunkett (1996) notes that about 83% of national production takes place in Sinaloa and Baja California, where the vast majority of the Mexican exports

[128] Tomato supply elasticity has been calculated by Weliwita and Govindasamy (1997) but their negative supply elasticity estimate (-0.169) is not plausible.

[129] Although the higher supply elasticities are referred to as long run supply elasticities, it is acknowledged they may be more appropriately referred to as medium run supply elasticities as in the long run, supply is likely to be perfectly elastic.

originate, and more than half (assumed to be 60% in this study) and an even larger share (assumed at 75%) of Sinaloa and Baja California production, respectively, is exported. The weighted average of the export shares from the two Mexican states is assumed to be 65%. Therefore, the Mexican vine-ripe export share in its production is assumed to be 55% (approximately equal to 83%*65%). As for Canadian greenhouse production, 50% was exported to the US in 1999 (FAS, 2001b). Assuming that export shares in each country are equal across tomato types, Mexican and Canadian vine-ripe tomato excess supply elasticities are estimated to be 0.73 and 0.80 in the short-run, and 2.6 and 2.8 in the long-run, respectively, while Mexican and Canadian greenhouse tomato excess supply elasticities are assumed to be 0.36 and 0.40 in the short-run, and 2.0 and 2.2 in the long-run, respectively. Assumed supply elasticity values are summarized in Table 9.7.

Table 9.6: Vegetable supply own-price elasticity estimates in the literature

Source	Elasticity estimate	Crop	Observations
Ornelas and Shumway (1993)	0.374 (SR)	Carrots	Estimates for Texas production using annual data for the period 1951 to 1986.
	0.166 (SR)	Cantaloupes	
	0.216 (SR)	Onions	
	0.597 (SR)	Watermelons	
Lohr and Park (1992)	0.672 (SR) 1.414 (LR)	Lettuce (organic)	Estimates for California, Oregon and Washington production using weekly data for 1989. Simple averages for results of two models are presented here.

Notes: (SR) stands for short-run, and (LR) stands for long-run. Only estimates that are statistically significant from zero are reported.

Table 9.7: Assumed values for supply elasticity

Origin	US			MX		CD	
Type	MG	VR	GH	VR	GH	VR	GH
Short-run	0.40	0.40	0.20	0.73	0.36	0.80	0.40
Long-run	1.4	1.4	1.1	2.6	2.0	2.8	2.2

With supply elasticities for all tomato origin-type combination defined, β_{1MG}, β_{2MG}, β_{1VRj}, β_{1GHj}, β_{2VRj} and β_{2GHj}, or slopes of the supply functions, are calculated as:

$$\beta_{MG} = \eta_{MG} \frac{q_{MG}}{p_{MG}},$$

$$\beta_{VRj} = \eta_{VRj} \frac{q_{VRj}}{p_{VRj}}, \text{ and}$$

$$\beta_{GHj} = \eta_{GHj} \frac{q_{GHj}}{p_{GHj}}$$

where η_{ij} is the supply, or excess supply, elasticity for the *i*th tomato type originating from the *j*th country, respectively, and the other variables are as defined above. The supply function intercepts δ_{1ij} and δ_{2ij} are calculated using equations (9.10) and (9.11), and benchmark data. These calibrated supply parameters are tabulated in Table 9.8.

Table 9.8: Calibrated supply parameter values

Origin	US			MX		CD	
Type	MG	VR	GH	VR	GH	VR	GH
Short-run							
Intercept							
Winter	266	35	40	66	22	-	10
Summer	258	314	92	20	9.6	5.7	41
Slope							
Winter	207	17	4.6	206	9.7	-	3.4
Summer	249	192	14	74	3.8	14	16
Long-run							
Intercept							
Winter	-178	-23	-5.0	-372	-34	-	-21
Summer	-172	-210	-12	-116	-15	-51	-81
Slope							
Winter	723	58	25	720	54	-	19
Summer	871	673	79	258	21	47	88

9.6. Simulation scenarios

Using the model above with calibrated parameters as a base, three simulation scenarios are run. One such scenario is the introduction of Central America as a greenhouse tomato exporter to the US, but two other scenarios are also considered in this study in the context of NAFTA trade.

9.6.a. Imposition of tariff on Mexican tomatoes (Scenario 1)

The first scenario considered in this study is designed to evaluate performance of the constructed model. A classical hypothetical setting, whose expected results are well known, is imposed on the model to contrast expected and actual results. Concretely, a 10% tariff is imposed on all Mexican tomato imports to the US. It is acknowledged that tariffs have not been a determinant of tomato trade in NAFTA countries in recent years and they are not expected to be in the foreseeable future, but this scenario could test adequacy of the model.

The 10% tariff is applied on Mexican producer prices.[130] Then, since trade theory dictates that a tariff creates a wedge between the supply and demand prices of the affected good, the tariff will add to the marketing margin in distancing the wholesale price from the producer price. The rest of the model is left intact, and a new equilibrium is sought by running the model with the new condition.

9.6.b. Entry of Central American greenhouse imports (Scenario 2)

In the second scenario, Central American greenhouse tomato imports are allowed into the US as a result of the partial easing of the current phytosanitary ban. To implement this change into the base model, a Central American greenhouse tomato excess supply function must be introduced. This supply function is calibrated in a manner similar to functions for North American greenhouse producers. That is, assumed values are used for supply elasticity and, since actual data do not still exist, also for supply quantity and prices. The same domestic elasticity values as for North American greenhouse producers, i.e. 0.20 in the short run and 1.1 in the long run, are assumed for Central America, and these are adjusted for the excess supply function as was done for Canadian and greenhouse tomatoes. Since approximately 80% is planned to be exported to the US, the Central American greenhouse excess supply elasticity is 0.25 in the short run and 1.4 in the long run (Rabinovich, 2005). Producer price is assumed at 88% of Mexico's based on industry estimates that 15% of total greenhouse production cost is labor and labor is less expensive in the region than in Mexico by about 20% (Rabinovich, 2005). Therefore, producer price is US$1.12/kg in the winter and US$1.28/kg in the summer.

[130] It must be noted that, since producer price as defined in this study is not the CIF price of Mexican tomatoes at US ports of entry but the value of the exportable product in the country of origin that does not include any marketing costs, the effect of the tariff may be underestimated. See Appendix H for the definition of producer price that follows the definition for customs import value in FAS (2004).

As for export volume, Moneda (2003) reports that this is projected at18 thousand MT annually from El Salvador's recently built facility, which is presumed to be the only one from which tomatoes allowed for sale in the US market will be produced in that country. Since uncertainty on the actual export volume from all Central America exists, although along with information that Central American countries aside from El Salvador also may have about the same export capacity as El Salvador's, two cases are considered in this scenario based on a couple of possible export quantities.[131] In the first case of low supply scenario, or scenario 2a, only El Salvador achieves exporting the 18 thousand MT annually that is reported as its capacity. Under a high supply scenario (scenario 2b), three countries in the region that have the same export capacity as that of El Salvador, including itself, market greenhouse tomatoes in the US, or the region has a total excess supply capacity of 54 thousand MT. It may be noted that this upper bound approximates Mexico's current greenhouse tomato export quantity to the US. The assumed export quantities are divided seasonally by assuming that 70% is exported in the winter, emulating Mexico's seasonal distribution. With this data, Central America's excess supply function can be calibrated for the two cases.

In running the simulations it may be noted that, since greenhouse tomatoes are assumed to be homogeneous by production origin, wholesale price for Central American greenhouse tomatoes is assumed to equal that for the same tomato type produced in the North American countries. Therefore, marketing margins for Central American greenhouse tomatoes are just the unique wholesale price minus the assumed producer price in each season. These are US$1.52/kg and US$0.59/kg in the winter and summer, respectively. These assumptions allow running the model in which greenhouse tomatoes originating from Central America enter the US market. The assumed data used for Central American greenhouse is summarized in Table 9.9.

Table 9.9: Assumed market data for Central American greenhouse tomatoes

	Quantity (thousand MT)		Producer price ($/kg)	Wholesale price ($/kg)	Marketing mar. ($/kg)	Supply elasticity	
	Low supply	High supply				Short run	Long run
Winter	12.6	37.8	1.12	2.64	1.52	0.25	1.4
Summer	5.4	16.2	1.28	1.87	0.59		
Annual	18.0	54.0					

Notes: Wholesale price is the same for US, Mexican and Canadian values. Marketing margin is wholesale price minus producer price.

[131] Krigsvold (2005) reports that each of Costa Rica, Guatemala and Honduras also has about 20 hectares of greenhouse tomato production facilities, which approximately equals that of El Salvador's. Nicaragua reportedly has smaller export capacity.

9.6.c. Preference increase for greenhouse tomato (Scenario 3)

Finally, the last scenario evaluates market changes when preference for greenhouse tomatoes increases by more than for field-grown tomatoes of mature green and vine-ripe tomatoes. It is reminded that high quality tomatoes, especially greenhouse tomatoes, have recently experienced a large boost in sales volume (Cook, 2002; Thompson, 2003). However, the boost in sales may have come about not only from an increase in preference, but also from decrease in wholesale price or from increased expenditure on greenhouse tomatoes. An objective of employing the present scenario is then to isolate the effects of change in preferences for diverging tomato categories, i.e. field-grown and greenhouse, on equilibrium quantities and prices from other effects. Contrasting results from this scenario to recent trends in market quantity and prices may reveal significance of the skewed preference increase for greenhouse tomato as opposed to other determinants of market changes.

Knowing the rate at which demand shift parameters for each tomato category has changed would help in setting up a hypothetical scenario based on recent evidence to evaluate consequent quantity and price changes. Recent change in equilibrium quantities for divergent tomato categories may provide indication on the direction of change for associated demand shift parameters, but they do not directly reflect parameter changes since, as noted above, movements in quantity values may reflect response to other economic variables and the relation between demand shift parameters and associated quantities is nonlinear. Therefore, the approach used here is to first, based on assumed new equilibrium tomato category quantities desired by consumers, recalibrate the mid-level tomato type demand shift parameters. The model is then run with all but the mid-level demand shift parameters unchanged.

Since, as noted in section 8.3.a, periodic sales data by tomato type of interest for the present study is not available for the US market, FAS (2004) import quantity data from Mexico and Canada from 2000 to 2003 was used to calculate average annual changes for the tomato categories of field-grown and greenhouse.[132] Data for several years was used to mitigate effects of unusual years. Still, it is recognized that using import data as a base for calculating possible quantity changes for all tomato suppliers in the US market may bias the results towards greater

[132] Mature green and vine-ripe tomato imports, of which the vast majority is vine-ripe tomatoes, are aggregated in the same field-grown category since they cannot be identified separately from the FAS (2004) data. See note 1 for Table 8.4 for an explanation of the HTSUS codes that are identified as field-grown and greenhouse tomatoes.

fluctuations than if domestic supply was considered as domestic supply is presumably more inelastic than foreign excess supply and domestic supply dominates market share for all tomatoes.

Table 9.10 presents the percentage changes for tomato category quantities for tomatoes coming from Mexico and Canada. It is notable that field-grown tomatoes have experienced declining imports in many recent years and especially in the summer, while greenhouse imports have grown substantially every year. It is possible that field-grown imports in the summer are being substituted by domestic production, while, as analysts have pointed out, greenhouse imports are substituting domestic tomatoes.

Table 9.10: Percentage import quantity changes by tomato category

	Field-grown tomatoes (MG,VR)				Greenhouse tomatoes (GH)			
	2001	2002	2003	Average	2001	2002	2003	Average
Winter	20%	-14%	22%	9%	38%	25%	47%	37%
Summer	-10%	-5%	-1%	-5%	14%	31%	22%	22%

For this simulation, average percentage changes for each tomato category and season in Table 9.10 are applied to respective base quantities, after which mid-level demand shift parameters are recalibrated. Aside from adjusting quantity values, aggregate tomato expenditure is also modified to fit the new demand pattern since otherwise changes in demand shift parameters would be overestimated. The simulation is run for two cases: one in which Central American greenhouse imports have not initiated (scenario 3a), and one in which it has, assuming a low supply case for Central American greenhouse tomatoes (scenario 3b). Scenario 3a is relevant for NAFTA countries as increase in greenhouse preference is an ongoing trend. Scenario 3b, on the other hand, is also a case study worthy of attention as the two shocks that are treated there may be some of the most influential for the US tomato market in the coming years. The combined effects may thus be of value for analysis.

9.7. Analysis procedure

Values for parameters and equilibrium quantities and prices, and their changes, are evaluated for the base model and three simulation scenarios. Additionally, changes in welfare are examined, while stability of model predictions relative to parameter values is assessed as follows.

9.7.a. Consumer welfare analysis

Aside from equilibrium and quantity analysis on the scenarios above, change in welfare is studied. The change in producer surplus is straightforward given the production functions used. To quantify the change in US consumer surplus, the concept of equivalent variation (EV) is used as in Peterson (2004). EV is defined as the additional income, measured at initial prices, equivalent to the proposed change in terms of its impact on utility. Formally, EV is defined as:

$$EV = e(p^0, u^1) - e(p^0, u^0),$$

where e is the expenditure function, p^0 is the base price vector, u^0 is the base utility level, and u^1 is the utility level attained from the proposed change. The expenditure function can be derived from the utility function in equation (9.1) and is defined as:

$$e(p,u) = \left\{ a\left(\sum_i b_i P_i^{1-\sigma_2} + b_{VR}\left(\sum_j c_{VRj}\left[p_{VRj} + m_{VRj} \right]^{1-\sigma_3} \right)^{\frac{1-\sigma_2}{1-\sigma_3}} \right)^{\frac{1-\sigma_1}{1-\sigma_2}} + (1-a)PE^{1-\sigma_1} \right\}^{\frac{1}{1-\sigma_1}} u\,, \qquad (9.21)$$

$$i = MG, GH,\ j = US, MX, CD.$$

Since the expenditure function is linear in utility, EV for the representative consumer is:

$$EV = \left\{ a\left(\sum_i b_i \left(P_i^0\right)^{1-\sigma_2} + b_{VR}\left(\sum_j c_{VRj}\left[p_{VRj}^0 + m_{VRj} \right]^{1-\sigma_3} \right)^{\frac{1-\sigma_2}{1-\sigma_3}} \right)^{\frac{1-\sigma_1}{1-\sigma_2}} + (1-a)\left(PE^0\right)^{1-\sigma_1} \right\}^{\frac{1}{1-\sigma_1}} \left(u^1 - u^0\right),$$

$$i = MG, GH,\ j = US, MX, CD, \qquad (9.22)$$

where base period prices and utility are denoted by a 0 superscript. Utility levels can be calculated from the indirect utility function derived from equation (9.21). Since EV in equation (9.22) is for a representative consumer, the total level of EV is derived by multiplying that equation by the population.

9.7.b. Sensitivity analysis

As it is apparent in section 9.5 above, the values of demand and supply elasticities are uncertain as they are not values determined precisely for the data of this study and they are estimates from other studies. A sensitivity analysis is consequently conducted to evaluate changes in the levels of variables as a result of varying parameter values. Following Arndt (1996), this analysis is conducted using symmetric order three Gaussian quadratures. Quadratures are parameter values that have been methodically varied and are used for sensitivity analysis. This procedure is employed to exercise systematic sensitivity analysis, instead of utilizing randomly selected parameters. The procedure is applicable to parameters viewed as random variables of symmetric and independent distribution.

The following procedure is employed to choose sets of random exogenous variables. Let n be the number of exogenous variables to be included in the sensitivity analysis. Let $\Gamma_k = (\gamma_{k1}, \gamma_{k2}, ..., \gamma_{kn})$ be the kth quadrature point, where k = 1, 2, …, 2n, and is the number of necessary solves of the model to have a systematic sensitivity analysis. Let r = 1, 2, …, z such that z is the highest integer that does not exceed n/2. Then, elements of the Γ matrix may be obtained:

$$\gamma_{k,2r-1} = \sqrt{2}\cos\left[\frac{(2r-1)k\pi}{n}\right], \text{ and}$$

$$\gamma_{k,2r} = \sqrt{2}\sin\left[\frac{(2r-1)k\pi}{n}\right].$$

If n is an odd number, then $\gamma_{kn} = (-1)^k$. The values for the quadrature are then determined as:

$$\Phi = \mu + \Gamma\sqrt{\Sigma},$$

where Φ is a (2n x n) matrix of values for the exogenous variables, μ is a (2n x n) matrix of the means of exogenous variables, Γ is a (2n x n) matrix defined above, and Σ is a (n x n) variance-covariance matrix for the exogenous variables. As it is assumed in the case at hand, Σ is a diagonal matrix when all of the exogenous variables are independent.

An important advantage of using order three Gaussian quadratures is that it only requires 2*n* solutions of the model for it to be systematic. This extremely low number of solves needed contrasts with that needed for Monte Carlo analysis, a popular approach used for systematic sensitivity analysis, as the latter may typically require thousands of solve. Furthermore, the procedure to obtain the quadrature with an order three Gaussian quadratures is simple, while accuracy of sensitivity analysis rivals that of higher order quadratures or Monte Carlo methods.

The 2*n* sets of *n* random variable parameter values are used in a base model to compute variation in the endogenous variables of equilibrium quantities, prices and welfare. The last scenario evaluated, the long run case of scenario 3b, is chosen as the base to conduct sensitivity analysis. Using the procedure presented above, a quadrature is constructed for five parameters whose variation is tested: the three elasticities of substitution (σ_1, σ_2 and σ_3) and the supply elasticities (η_{MG} and $\eta_{i,US}$).[133] Sufficient information on the distributions of these parameters is not available, and the uniform distribution was assumed. The mean, minimum and maximum values assumed for each parameter is presented in Table 9.11. It is noted that Mexican and Canadian excess supply elasticities are adjusted based on the values of US supply elasticities for the respective tomato type (η_{MG} and $\eta_{i,US}$) using the procedure in section 9.5.b above.

Table 9.11: Assumed uniform distribution statistics for exogenous parameters included in sensitivity analysis

Parameter	Minimum	Mean	Maximum
σ_1	0.2468	0.4936	0.7404
σ_2	0.708	1.416	2.124
σ_3	1.429	2.858	4.287
η_{MG}, η_{VR-US}	0.7	1.4	2.1
η_{GH-US}	0.55	1.1	1.65

[133] Although the number of parameters to be tested implies having ten runs, only seven were used as three of the runs possibly implied complementarity between the vine-ripe tomatoes from different origins given that the elasticity of substitution for those goods was smaller than the elasticity of substitution between tomato types in those runs.

9.8. Conclusions

A review of literature related to this study reveals that much research has been conducted on the US tomato market but, with its particular approach, this study can contribute to further understanding of the subject. The model presented in this study takes into account the differences in demand and production characteristics of diverging combinations of tomato origin-type-season by employing a heterogeneous product model for tomato types and for vine-ripe tomato origins. The perfectly competitive market model that is analyzed in a static partial equilibrium context adopts data presented in the last chapter as a base, and the model is calibrated to replicate the benchmark scenario.

The base model is then utilized to simulate future scenarios that have been identified as having impact on the US tomato market. The first one, in which a tariff is imposed on Mexican tomatoes, is employed to test performance of the constructed model. The second scenario treats the main subject of this paper: market effects of entry of Central American greenhouse tomatoes to the US. Finally, the last one examines an ongoing trend in the US tomato market, where consumers' preference for greenhouse tomatoes seems to be growing at a higher pace than for field-grown tomatoes. Equilibrium quantities, prices and welfare effects of these scenarios from the base model are analyzed, and a systematic sensitivity analysis is conducted to test stability of the model in relation to parameter values.

Chapter 10. Results and discussion

10.1. Introduction

Results of simulation as previously described, along with their implications, are discussed in this chapter. Prior to that discussion a conceptual framework, which is used for analyzing market changes when shocks present, is introduced. Each of the ensuing three sections presenting the scenarios starts with a conceptual analysis of the market movements originating from a shock that is particular to the scenario.

Simulation results from the three scenarios, i.e. imposition of US tariff on Mexican tomatoes, entry of Central American greenhouse tomatoes to the US market, and relative preference increase for greenhouse tomatoes as opposed to that for field-grown tomatoes, are consequently discussed. As explained in section 9.5.b, all scenarios, including sub-scenarios, are evaluated under assumed short- and long-run supply cases, where assumed supply elasticities change. Scenario results are first compared to expected results from the conceptual analysis outcome to test plausibility. Additionally, quantitative results are studied more minutely to analyze them in view of specific scenario settings. Finally, to evaluate robustness of the model, a sensitivity analysis is conducted.

10.2. Conceptual framework

Since the model employed treats greenhouse tomatoes as homogeneous by origin while tomato types and vine-ripe tomatoes by origin are heterogeneous, the two cases must be analyzed separately. Figure 10.1 first presents a conceptual framework, which is an adaptation of the basic theoretical three pane trade diagram under partial equilibrium, to analyze market changes for homogeneous goods, or greenhouse tomatoes for the employed model. The left and right most panes represent the home and foreign country markets, or those for the US and Mexico or Canada, respectively. Following convention, the case in which only one foreign country trades with a home country is first analyzed.

Focusing first on the home country, the supply function is represented by the upward sloping curve S, while demand is represented by the downward sloping curve D. Considering first an autarkic situation, in which the home country produces exactly all greenhouse tomatoes

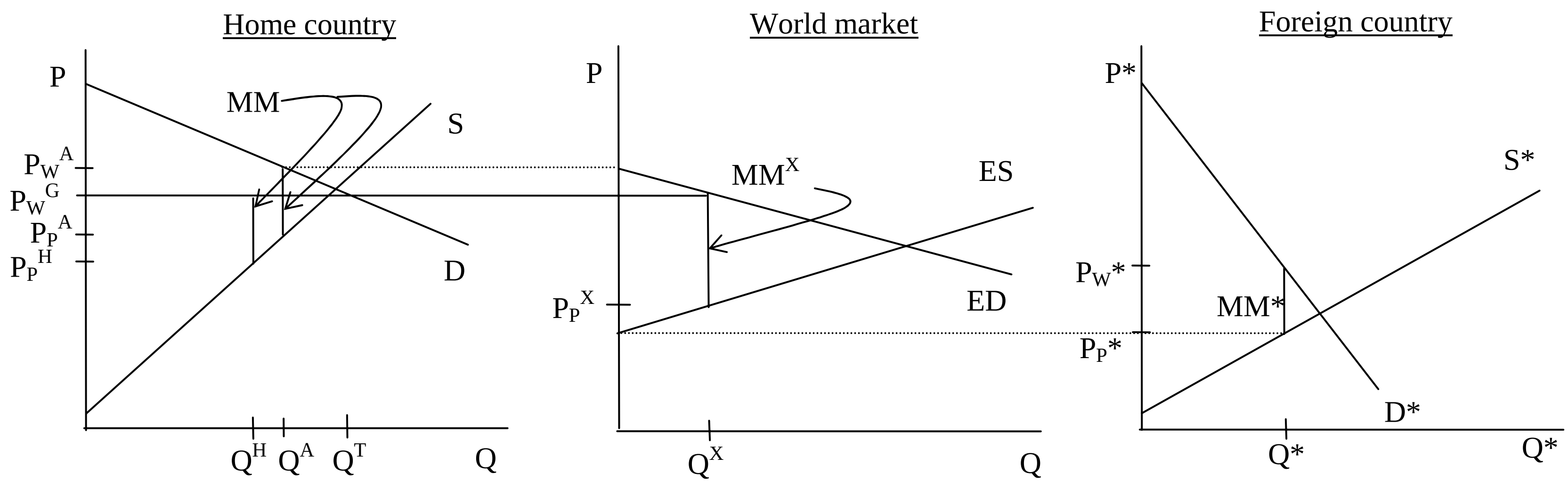

Figure 10.1: Conceptual framework for trade in homogeneous goods

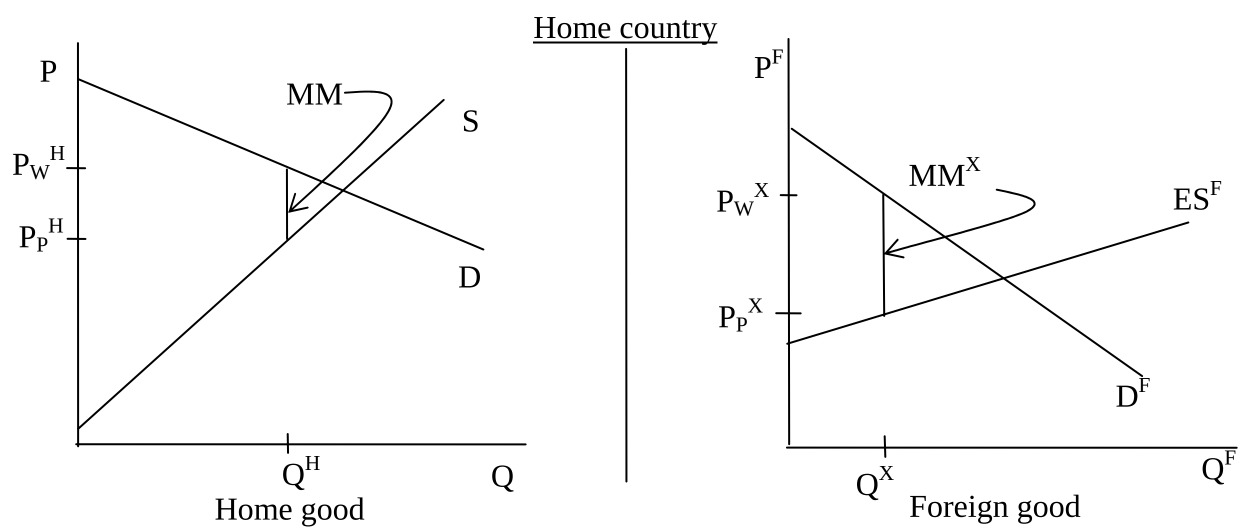

Figure 10.2: Conceptual framework for trade in heterogeneous goods

that it consumes and does not trade, equilibrium is at quantity Q^A, producer price P_P^A, and wholesale price P_W^A, where the fixed marketing margin MM separates the producer and wholesale prices. A similar description applies to the foreign country with supply and demand curves S* and D*, and equilibrium quantity, producer and wholesale prices and fixed marketing margin at Q*, P_P*, P_W* and MM*, respectively.[134]

When trade is allowed between the home and foreign countries, the latter exports greenhouse tomatoes to the home country since, as depicted in Figure 10.1, the foreign wholesale price is lower than the home wholesale price. Additionally, a single world wholesale price for the homogeneous greenhouse tomatoes is established. This world price and the quantity that the foreign country exports are set in the world market represented in the mid pane. In the world market, excess supply by the foreign country, or the quantitative difference between its supply and demand at given prices, is denoted by ES. The excess supply function has a world market quantity value of zero at the autarky equilibrium producer price in the foreign country, P_P*, since at that price the foreign country produces exactly all that it consumes. However, at higher prices the foreign country is able to supply progressively larger positive quantities of greenhouse tomatoes to the world market, so its excess supply function is upward sloping. In a similar manner, the home country's excess demand function, ED, returns a zero quantity value at its autarky equilibrium wholesale price, P_W^A. At lower prices the excess demand function returns progressively greater positive quantities of greenhouse tomatoes, so it is a downward sloping curve. The equilibrium export quantity for the foreign country, Q^X, is then set where the equilibrium world wholesale price, P_W^G, and equilibrium export producer price for the foreign country, P_P^G, are separated by the fixed export marketing margin, MM^X.

In the home country, the new unique world wholesale price, P_W^G, is lower than the autarky equilibrium wholesale price, P_W^A. Domestic supply then decreases from the autarky case to Q^H, since, given the lower wholesale price and its fixed marketing margin, the domestic producer price is forced down from P_P^A to P_P^H. However, total supply increases from only the domestic production under autarky, Q^A, to Q^T, or the quantity where domestic demand intersects P_W^G. As

[134] Since market changes in the foreign country are not of interest in the current model, these are not further described.

expected, Q^T equals the sum of domestic supply, Q^H, and imports from the foreign country, Q^X.[135]

When a second or more foreign countries are introduced, each country would have a separate world market for its supply. The product with the lowest wholesale price in its domestic market would finally determine the world wholesale price but first, the world market for the product with the highest equilibrium price in its domestic market is evaluated. The excess supply function of this most expensive product is crossed with the excess demand function from the home country. The excess demand function from that world market is then crossed with the excess supply function of the next highest priced product in its world market. The excess demand function is thus modified consecutively until it is crossed at the final world market with the excess supply function of the least expensive product at its domestic market. The wholesale price determined at this world market is then the world wholesale price.

For heterogeneous goods such as the diverging tomato types and vine-ripe tomatoes by different origins, market changes occur more independently than for among homogeneous goods. Figure 10.2 illustrates the two markets within the home market for heterogeneous goods. The home good market has a similar setting as in the autarky case for homogeneous goods, where the domestic demand and supply and the marketing margin for the home good determine the equilibrium quantity and wholesale and producer prices. For the foreign good, there is now a home country market as the home country attributes a distinct demand function for that product.[136] In the foreign good market, the demand function for, and the excess supply function and the marketing margin of, the foreign good determine the equilibrium. Demand functions in the home and foreign good markets are particular to each good, so equilibrium is established independently in this sense in the two markets. However, as these goods are substitutes although imperfectly so, market changes for one good affects equilibrium in the other good as explained in each scenario below.[137]

[135] For ease of exposition, note that an expansion effect, by which the decreased wholesale price decreases aggregate tomato group expenditure but increases real income, and a substitution effect, by which consumers substitute away from tomatoes with increased price, are not considered in this and the illustration for changes in the heterogeneous market, but they are contemplated in discussion of the next section.

[136] The foreign good home market under the heterogeneous product assumption may be contemplated as a combination of the home and world markets under the heterogeneous good model, without the home supply and world market excess demand functions.

[137] Again, the expansion and substitution effects are not contemplated in this discussion.

10.3. Imposition of tariff on Mexican tomatoes (Scenario 1)

In this scenario, a 10% tariff on Mexican vine-ripe and greenhouse tomato producer prices is imposed. In effect, this increases the current spread between the wholesale and producer prices, or the marketing margins, by 10% of the producer price.

First focusing on impact on the greenhouse tomatoes, using the conceptual framework for homogeneous goods developed in the previous section, Figure 10.3 illustrates market impact under this scenario as a tariff is applied to Mexican greenhouse tomatoes. Starting from a free trade scenario between only the US and Mexico without Canada at first, demand function in the US is originally D_1, and the corresponding excess supply function is ES_1. Then, initial equilibrium quantity and producer price for US and Mexican production are Q^{H1} and P_P^{H1}, and Q^{X1} and P_P^{X1}, respectively, while equilibrium wholesale price is P_W^{G1}. Aggregately, consumption is at Q^{T1}, which is the sum of Q^{H1} and Q^{X1}.

The tariff imposed on Mexican greenhouse tomatoes, T, adds to the marketing margin, MM^X, to separate equilibrium producer and producer prices. Temporarily, and as a result of a direct tariff effect, equilibrium Mexican quantity and producer price decrease to $Q^{X'}$ and $P^{X'}$, respectively, while equilibrium US quantity, producer price and uniform wholesale price increase to $Q^{H'}$, $P_P^{H'}$ and $P_W^{G'}$, respectively. Aggregate consumption falls temporarily to $Q^{T'}$. These changes, however, are only temporary since, using a weakly separable preference structure, changes in greenhouse quantity and wholesale price induce changes in aggregate tomato expenditure and in real per capita income, which in turn shift the greenhouse demand function. Since aggregate tomato demand is inelastic, the first effect will increase the aggregate tomato expenditure, while real per capita income decreases. Additionally, the substitution effect with other tomato types shifts the demand down as greenhouse tomatoes with a tariff are now more expensive than before. The expenditure increase effect is expected to be stronger than the real per capita decrease effect, but the negative substitution effect is likely to prevail. Consequently, the demand and excess demand functions decrease to D_2 and ED_2. At those levels, the uniform wholesale price, P_W^{G2}, is established at the Mexican greenhouse export quantity, Q^{X2}, where the price spread between wholesale price and producer price, P_P^{X2}, is MM^X + T. The domestic market has final equilibrium quantity and producer price of Q^{H2} and P_H^{H2} and aggregate greenhouse quantity is Q^{T2}. When incorporating Canadian greenhouse tomatoes, market movements for the Canadian product would be similar to those for the US product as demand for

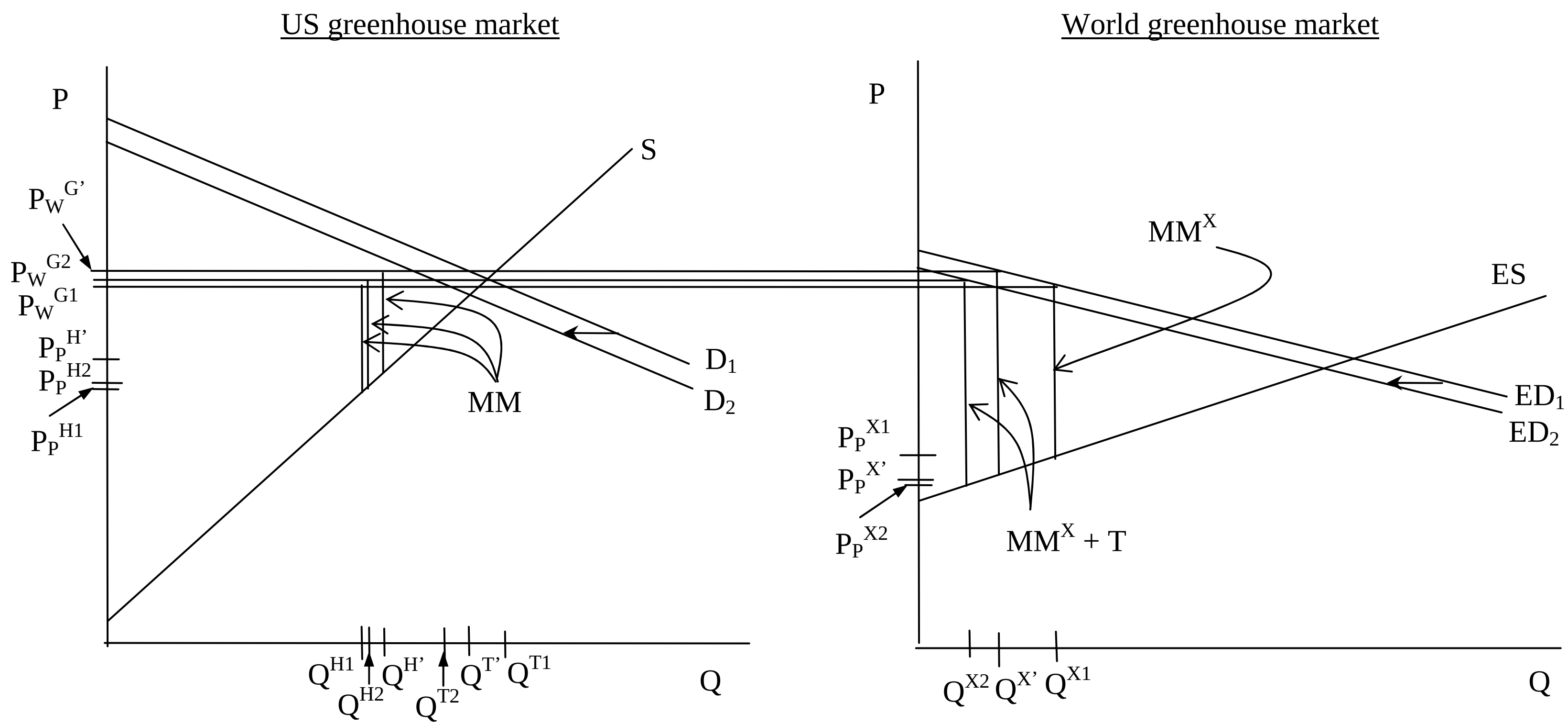

Figure 10.3: Scenario 1 impact on greenhouse tomatoes (homogeneous goods)

and supply of the Canadian product follows increased wholesale price. That is, Canadian greenhouse quantity and producer price increase with the higher wholesale price due to the combination of effects.[138]

Turning attention to vine-ripe tomatoes from different origins, Figure 10.4 illustrates market changes for heterogeneous goods with the impact of tariff on Mexican products. The initial equilibrium and nomenclature are similar to those in Figure 10.3, except that now wholesale prices of the US and Mexican products, P_W^{H1} and P_W^{X1}, are independent of each other. Market changes for the Mexican product are similar to the one in Figure 10.3 to the extent that the tariff effect decreases the Mexican quantity and producer price while increasing its wholesale price. Additionally, the expansion and substitution effects, which shift demand for the Mexican product, may further decrease its quantity and producer price and may decrease its wholesale price.

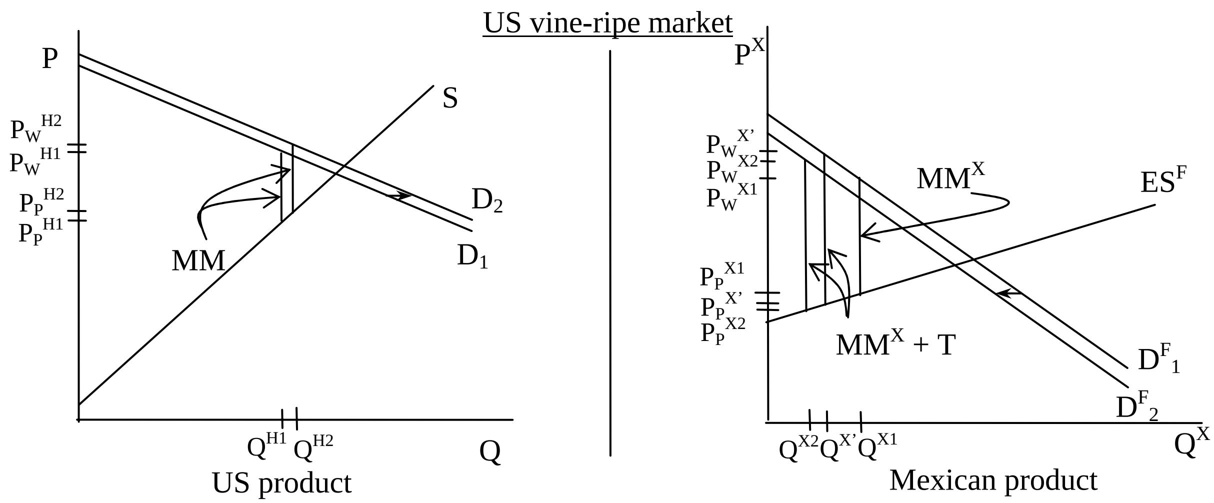

Figure 10.4: Scenario 1 impact on vine-ripe tomatoes and tomato types (heterogeneous goods)

[138] It is recognized that there is a conceptual difference in how the new wholesale price is set between the cases where the Canadian or Mexican product is less expensive in the respective domestic market, as it is the world market for the less expensive product that finally determines the world wholesale price. If the Mexican product is the less expensive product, then it sets the new wholesale price after imposition of the tariff and the Canadian tomato only follows that higher price. However, if the Canadian product is less expensive, then the excess demand function for the Canadian tomato shifts up reflecting the tariff that reduces consumption of the Mexican product. Then the new wholesale price would be set in the world market for the Canadian good by moving to a higher equilibrium quantity that separates the wholesale and Canadian producer prices by the Canadian marketing margin.

Market changes may be less pronounced for the US product as, due to its independent price formation, it is not directly affected by the tariff effect. Instead, it only benefits from the expansion effect, which may shift demand down, and the substitution effect, which would increase demand since the wholesale price for this tomato has dropped relative to that of Mexican vine-ripe tomatoes. Assuming that the substitution effect is larger than the expansion effect, the US vine-ripe demand curve shifts up and its quantity and producer and wholesale prices rise. It is noted that the same market changes as for the US product are predicted for the Canadian product since its demand function may also be shifted up.

Table 10.1 presents equilibrium level results for the base and scenarios 1 and 2, and Table 10.2 presents equilibrium result percentage changes for each simulation scenario from the base. Overall, these simulation results follow expectations as Mexican equilibrium quantities decrease for both tomato types in both seasons when comparing to the base scenario, while those for US and Canada increase. Mexican tomato wholesale prices increase as a response to the tariff, and Mexican tomato producer prices decrease to absorb some of the impact. As Mexican greenhouse tomatoes are displaced by growers from other countries, greenhouse wholesale and producer prices for the other growers increase. As consumers substitute away from the Mexican vine-ripe tomatoes that are priced higher than before, quantity and wholesale and producer prices of tomatoes from other countries increase. Welfare changes also seem to be concordant with predictions from the conceptual model.

10.3.a. Short run scenario

Focusing on the short run scenario in more detail, the absolute value of the rate of decrease for Mexican tomato quantities is greater than the rates of increase for tomatoes from the US or Canada as expected. Mexican vine-ripe tomato quantities decrease by a higher volume and percentage than its greenhouse tomato quantities in each season. This result is likely to be explained by the higher demand elasticity (for example, -1.47 against -1.23 in the summer) and higher supply elasticity (0.73 and 0.36, respectively) in magnitude for Mexican vine-ripe than for greenhouse tomatoes.

The percentage decrease in quantity across seasons for a particular Mexican tomato type is greater in the summer than in the winter. Although for Mexican vine-ripe tomatoes the more elastic summer demand function and higher cross-price elasticity explains this, for greenhouse tomatoes that are associated with about equal demand elasticity across seasons the relatively larger Mexican greenhouse tariff increase in the summer due to higher initial Mexican greenhouse producer price (US$1.46/kg) than in the winter (US$1.27/kg) explains this. Notwithstanding the larger percentage quantity decrease in the summer for Mexican tomatoes, decrease in magnitude is greater in the winter, but this is due to much larger quantities in that season.

For tomatoes from the US and Canada, the rate of increase in quantity is always the greatest or greater for vine-ripe tomatoes within a given country due to higher supply elasticities for this tomato type and the substitution effect. For a given tomato type, Canadian tomatoes have higher percentage change in quantities. This is because, given a tomato type, the demand shift has the same magnitude regardless of the tomato origin, so Canadian tomatoes receive higher impact in percentage terms due to lower quantities than US tomatoes. Finally, contrary to the Mexican case, rates of quantity change are greater in the winter than in the summer. The higher wholesale price increase in the winter leads to this result, which, for vine-ripe tomatoes, is due to the more inelastic Mexican tomato demand. The reason in the greenhouse case is likely to be due to a more rapid increase in elasticity for the Mexican excess supply function than the excess demand function in the winter as quantity decreases from initial equilibrium.

As for producer prices, the largest rates of change in absolute value are observed for Mexican tomatoes, which helps in confirming that the sum of the expansion and substitution effects is negative. However, unlike the larger rates of quantity change that were attributed to Mexican vine-ripe tomatoes, Mexican greenhouse tomatoes experience higher rates of producer price decrease due to the more inelastic associated supply elasticity relative to excess demand elasticity. On the other hand, as was the case with the quantity rates of decrease, the producer price decline percentages are higher in the summer than in the winter. In the case of vine-ripe tomatoes, this is clearly due to the more elastic Mexican demand function in the summer. For greenhouse tomatoes, in an opposite manner to the mechanism of larger wholesale price increase in the winter, it is likely to be due to a more rapid increase in elasticity for the Mexican excess demand function than the excess supply function in the summer as quantity decreases from initial equilibrium.

For the other countries, the tomato type that experiences the highest or higher producer price growth rate within a country depends on the country. Vine-ripe tomatoes experience the highest growth rate of the three tomato types in both seasons for the US, while Canadian greenhouse tomatoes have a higher percentage growth than the vine-ripe tomatoes in the summer. These variations can again, once the reasons for variations in quantities have been established, be deduced using the associated supply elasticities. Therefore, for example, Canadian greenhouse tomato producer price in the summer has increased by more than that for its vine-ripe counterpart because, although greenhouse quantity has increased by less, its supply is less elastic, so the producer price variation is higher in this case.

In terms of magnitude, greenhouse tomatoes always have the larger producer price increases due to the more inelastic supply or excess supply. For a given tomato type across countries, the rise in producer price is higher for the greenhouse tomatoes from Canada than those from the US in the winter. This is likely due to the lower Canadian greenhouse tomato producer price in that season as, for a shock with the same magnitude, the smaller value would suffer greater percentage change. In fact, when examining the increase in magnitude, both tomatoes experience an increase by US$0.04/kg, and any greenhouse price change is the same for any origin as the wholesale price is uniform for all and marketing margins do not change over time. However, in the summer US vine-ripe and greenhouse tomatoes experience higher producer price growth rates and the same cause is identified for these results. Finally, and again as it was the case for quantity rate changes, producer price percentage increases for US and Canadian tomatoes are higher in the winter than in the summer.

A comparison of the changes in Mexican tomato quantities and prices demonstrate that producer price percentage changes are larger than quantity changes. For example, Mexican vine-ripe producer price in the winter decreases by 4.25%, while its quantity decreases by 3.09%. The tendency for producer price to change by more than the rate of change of quantity reflects inelastic supply functions, and this applies to supply functions of all other tomatoes as well.

As for wholesale prices, it is first important to note that the changes in magnitude for US and Canadian tomatoes are the same as for those for corresponding producer prices as the marketing margins are fixed. The largest increases are for Mexican vine-ripe tomatoes as the direct effect of the tariff is large. Vine-ripe tomatoes experience larger rates of wholesale price increase in general than other tomato types, but in the summer this is not always the case as vine-ripe tomatoes from the US and Canada experience lower rates than for greenhouse tomatoes. Furthermore, vine-ripe tomatoes from the US experience larger percentage increase in wholesale prices than Canada’s. Rates of wholesale price increase are larger in the winter than in the summer. Finally, comparing the rates of change in quantity and corresponding wholesale prices, only quantity rates of changes for Mexican vine-ripe tomatoes are higher than rates of changes in wholesale prices. Greenhouse wholesale price increase is mitigated as, although Mexican tariff exerts a strong upward pressure, the excess demand function Mexican greenhouse tomatoes face is very elastic.

Changes in tomato quantity and price indices summarize the variations that occur. First looking at the tomato type indices, quantity indices show increase for mature green tomatoes, while vine-ripe and greenhouse tomatoes decrease. This is consistent with expected results based on analysis using the conceptual framework. Percent changes for tomato type wholesale price indices confirm that vine-ripe and greenhouse tomatoes experience stronger changes than mature green tomatoes as the former are the tomato types that receive the tariff impact more directly and are influenced by the tariff, expansion and substitution effects to varying degrees. Furthermore, the magnitude of percentage changes is larger in the winter since Mexican tomatoes have a larger share then. Rates of change for aggregate tomato quantity indices show that equilibrium tomato quantities in the aggregate have decreased, while prices have increased. The magnitude of the changes is higher in the winter than in the summer, and the rise in prices is higher than the decrease in quantities.

As a result of these changes, Mexican producers suffer welfare losses, while US and Canadian producers gain. In general, producer welfare changes are larger in the winter, and Mexican producers lose US$11 million then, while they suffer a US$5 million loss in the summer. In both seasons, Mexican vine-ripe producers suffer larger losses than greenhouse growers since vine-ripe producers supply more in quantity. As for those who gain, mature green producers experience the largest boost in the winter with US$4 million. US greenhouse growers receive the next highest welfare increase, followed by US vine-ripe producers who also receive a welfare increase of more than US$1.5 million in the winter. The gain for Canadian greenhouse growers is relatively small. In the summer, US vine-ripe producers gain the most at US$2.4 million, although this is not as large a gain as that for mature green growers in the winter. Producer welfare gains in the summer are less for other, and especially for mature green, growers than in the winter. Among Canadian growers, who gain much less than US counterparts, greenhouse producers gain more.

US consumers lose in welfare as a result of higher wholesale prices. This loss is especially pronounced in the winter at US$20 million, but even in the summer they lose US$7 million. Net decrease that includes producer as well as consumer welfare in the US is also greater in the winter at US$12.5 million, and US$3 million in the summer.

Summarizing, Mexican vine-ripe tomato growers suffer the most in absolute terms in both seasons as the drop in producer welfare is higher than for greenhouse tomatoes due to higher vine-ripe equilibrium quantities, although Mexican greenhouse producers suffer from larger percentage decrease in producer prices. In the US, vine-ripe producers receive the highest percentage increase in quantity and producer prices in both seasons, but mature green growers in the winter and vine-ripe producers in the summer experience the largest gain. Benefits that Canadian producers perceive from scenario 1 are relatively small in both seasons. As for US consumers, their losses are particularly large in the winter, when Mexican vine-ripe tomato wholesale price increases by almost 3% and US vine-ripe and greenhouse wholesale prices rise by about 1.5%, due to which vine-ripe tomato consumption decreases by 2% and that for greenhouse tomatoes by 0.6%. Although the drop in consumer welfare is less in the summer since participation of Mexican tomatoes in the US market is smaller then, net US welfare decreases in both seasons.

10.3.b. Long run scenario

In the long run case of the Mexican tomato tariff scenario, although direction of change in equilibrium quantities and prices from the short run scenario are preserved, differences in the magnitudes of change are observed as supply is now assumed to be elastic for all tomatoes. As a result, all percentage changes in equilibrium quantity are larger in magnitude than in the short run. Another difference with the short run is that Mexican greenhouse tomatoes now experience a larger percentage decrease than respective vine-ripe quantities, which is likely due to the more elastic supply function intensifying quantity decrease for greenhouse tomatoes that have higher producer prices than for vine-ripe tomatoes. This effect is also important in explaining the now much larger quantity increase for greenhouse than vine-ripe tomatoes in a given country, as the ratio of rise in greenhouse quantity to wholesale price is now larger. However, given a tomato type for the US or Canada, Canadian tomatoes still experience larger percentage increases, and the magnitude of percentage changes for all tomatoes are larger in the winter than in the summer.

Which of the short and long run cases has the larger percentage change in producer price depends on the specific tomato type-origin combination in a given season. For Mexican tomatoes, that this percentage change is larger in the short run can be generalized as the supply function has become more elastic relative to the demand function in the long run, so price changes are relatively reflected more in the wholesale prices than in the producer prices. However, for other tomatoes, this ordering is irregular. Within a given country, producer price changes are, as before, higher in absolute value for greenhouse tomatoes for all countries. Within a given tomato type, whether tomatoes from the US or Canada have the higher percentage changes is dependent on the tomato type, origin and season as it was the case in the short run. Finally, while percentage producer price changes for Mexican tomatoes are higher in the summer since vine-ripe demand is more elastic and greenhouse producer price is higher then, the opposite applies to tomatoes from the other countries since greenhouse wholesale price or Mexican vine-ripe wholesale price increase is higher in the winter.

The magnitude of wholesale price percentage change is not larger for the short or long run case for all tomatoes. However, as it was the case in the short run, Mexican tomatoes have the largest percentage increase in wholesale prices. Between mature green and vine-ripe tomatoes from the US, vine-ripe tomatoes experience larger rates of wholesale price increase in both seasons as it is the case in the short run. This can be explained by the higher demand shift effect that vine-ripe tomatoes receive than the mature green tomatoes, which can also be explained as the higher substitution possibility that US vine-ripe tomatoes have over mature green tomatoes from Mexican vine-ripe tomatoes. Wholesale price rates of increase are also larger in the winter than in the summer as before.

All absolute values of tomato type quantity index rate of change are larger in the long run than in the short run, but this generalization does not apply to tomato type wholesale price indices as the percentage increase for mature green tomatoes is larger in the short run in both seasons and the opposite applies to vine-ripe and greenhouse tomatoes. For tomatoes in the aggregate, both quantity and wholesale price index changes are larger in the long run.

In summary, greenhouse producers from the three countries perceive the largest percentage changes in producer prices and, especially, quantities, with the difference that Mexican producers suffer negative changes while US and Canadian producers experience positive gains. However, only in the summer do Mexican greenhouse producers suffer from larger welfare

Table 10.1: Equilibrium simulation 1 and 2 results

Season	Origin	Type	Base	Scenario 1		Scenario 2a		Scenario 2b	
				Short run	Long run	Short run	Long run	Short run	Long run
Quantity (MT)									
Winter	US	MG	444,020	445,875	448,791	441,282	442,193	436,556	439,360
		VR	58,214	58,660	59,780	57,937	58,021	57,459	57,722
		GH	49,500	49,662	50,871	48,648	47,522	47,334	44,590
		Total	551,734	554,198	559,442	547,867	547,736	541,349	541,671
	MX	VR	240,500	233,070	228,612	238,073	239,205	233,882	237,199
		GH	34,032	33,222	30,507	32,213	29,807	29,405	23,545
		Total	274,532	266,293	259,119	270,286	269,012	263,287	260,744
	CD	GH	17,169	17,290	18,191	16,534	15,695	15,555	13,510
	CA	GH	0	-	-	12,075	11,381	33,794	28,719
Summer	US	MG	429,190	429,676	430,410	428,422	428,600	426,937	427,477
		VR	523,926	524,801	526,783	523,167	523,299	521,699	522,104
		GH	115,500	115,594	116,355	115,005	114,169	114,077	111,675
		Total	1,068,616	1,070,070	1,073,548	1,066,595	1,066,068	1,062,713	1,061,256
	MX	VR	74,931	71,904	69,399	74,681	74,779	74,197	74,490
		GH	15,069	14,593	12,534	14,939	14,718	14,694	14,062
		Total	90,000	86,497	81,932	89,620	89,498	88,891	88,551
	CD	VR	28,559	28,637	28,776	28,491	28,511	28,360	28,421
		GH	67,773	67,877	68,729	67,220	66,284	66,181	63,495
		Total	96,332	96,514	97,505	95,711	94,796	94,542	91,915
	CA	GH	0	-	-	5,363	5,302	15,884	15,351
Producer price (US$/kg)									
Winter	US	MG	0.86	0.87	0.87	0.85	0.86	0.82	0.85
		VR	1.41	1.44	1.44	1.39	1.41	1.36	1.40
		GH	2.17	2.21	2.22	1.98	2.09	1.70	1.97
	MX	VR	0.85	0.81	0.83	0.84	0.85	0.82	0.85
		GH	1.27	1.19	1.20	1.08	1.19	0.80	1.07
	CD	GH	2.02	2.06	2.07	1.83	1.94	1.55	1.82
	CA	GH	-	-	-	0.93	1.04	0.65	0.92
Summer	US	MG	0.69	0.69	0.69	0.69	0.69	0.68	0.69
		VR	1.09	1.09	1.09	1.09	1.09	1.08	1.09
		GH	1.62	1.63	1.63	1.59	1.60	1.52	1.57
	MX	VR	0.74	0.70	0.72	0.74	0.74	0.73	0.74
		GH	1.46	1.33	1.34	1.43	1.44	1.36	1.41
	CD	VR	1.69	1.70	1.69	1.69	1.69	1.68	1.69
		GH	1.70	1.71	1.71	1.67	1.68	1.60	1.65
	CA	GH	-	-	-	1.25	1.26	1.18	1.23
Wholesale price (US$/kg)									
Winter	US	MG	1.33	1.34	1.34	1.32	1.33	1.29	1.32
		VR	1.77	1.80	1.80	1.75	1.77	1.72	1.76
	MX	VR	1.55	1.60	1.62	1.54	1.55	1.52	1.55
	GH		2.64	2.68	2.69	2.45	2.56	2.17	2.44
Summer	US	MG	1.14	1.14	1.14	1.14	1.14	1.13	1.14
		VR	1.39	1.39	1.39	1.39	1.39	1.38	1.39
	MX	VR	1.56	1.59	1.61	1.56	1.56	1.55	1.56
	CD	VR	1.99	2.00	1.99	1.99	1.99	1.98	1.99
	GH		1.87	1.88	1.88	1.84	1.85	1.77	1.82

Table 10.1: Equilibrium simulation 1 and 2 results (Continued)

	Origin	Type	Base	Scenario 1 Short run	Scenario 1 Long run	Scenario 2a Short run	Scenario 2a Long run	Scenario 2b Short run	Scenario 2b Long run
Tomato type quantity indices									
Winter	MG		1.534	1.541	1.551	1.525	1.528	1.508	1.518
	VR		1.028	1.004	0.994	1.018	1.023	1.003	1.015
	GH		0.348	0.346	0.344	0.378	0.361	0.436	0.381
Summer	MG		1.483	1.485	1.487	1.480	1.481	1.475	1.477
	VR		2.140	2.132	2.129	2.136	2.137	2.129	2.131
	GH		0.685	0.684	0.683	0.700	0.693	0.728	0.707
Tomato type wholesale price indices									
Winter	MG		1.33	1.34	1.34	1.32	1.33	1.29	1.32
	VR		1.60	1.64	1.66	1.59	1.60	1.57	1.59
	GH		2.64	2.68	2.69	2.45	2.56	2.17	2.44
Summer	MG		1.14	1.14	1.14	1.14	1.14	1.13	1.14
	VR		1.46	1.46	1.47	1.45	1.46	1.45	1.45
	GH		1.87	1.88	1.88	1.84	1.85	1.77	1.82
Aggregate tomato quantity indices									
Winter			2.786	2.766	2.760	2.817	2.796	2.871	2.812
Summer			4.219	4.211	4.209	4.232	4.224	4.257	4.234
Aggregate tomato wholesale price indices									
Winter			1.65	1.68	1.68	1.62	1.64	1.56	1.62
Summer			1.44	1.45	1.45	1.43	1.44	1.42	1.43
Producer welfare changes (US$ millions)									
Winter	US	MG	-	3.997	2.946	-5.869	-1.120	-15.913	-2.848
		VR	-	1.579	1.599	-0.974	-0.194	-2.644	-0.494
		GH	-	1.763	2.742	-9.163	-3.824	-22.991	-9.206
		Total	-	7.339	7.287	-16.005	-5.138	-41.548	-12.547
	MX	VR	-	-8.549	-3.872	-2.822	-0.431	-7.628	-1.095
		GH	-	-2.795	-2.123	-6.184	-2.516	-15.062	-5.633
		Total	-	-11.345	-5.994	-9.007	-2.948	-22.690	-6.728
	CD	GH	-	0.613	0.966	-3.146	-1.295	-7.769	-3.002
	CA	GH	-	-	-	10.044	3.465	20.046	6.722
Summer	US	MG	-	0.839	0.602	-1.323	-0.291	-3.877	-0.843
		VR	-	2.385	2.230	-2.066	-0.488	-6.056	-1.416
		GH	-	0.758	1.264	-3.998	-1.949	-11.455	-5.541
		Total	-	3.982	4.096	-7.387	-2.728	-21.388	-7.799
	MX	VR	-	-3.018	-1.549	-0.254	-0.044	-1.485	-0.128
		GH	-	-1.880	-1.695	-0.520	-0.253	-0.744	-0.710
		Total	-	-4.898	-3.244	-0.775	-0.297	-2.229	-0.839
	CD	VR	-	0.165	0.132	-0.143	-0.029	-0.418	-0.083
		GH	-	0.445	0.744	-2.341	-1.138	-6.684	-3.201
		Total	-	0.610	0.876	-2.484	-1.166	-7.102	-3.285
	CA	GH	-	-	-	5.861	2.069	16.543	5.711
Consumer and net welfare changes in the US (US$ millions)									
Winter	Equivalent var.		-	-19.869	-25.689	29.265	9.829	79.620	25.061
	Net change		-	-12.530	-18.402	13.260	4.690	38.072	12.514
Summer	Equivalent var.		-	-6.801	-8.757	10.738	4.236	31.499	12.295
	Net change		-	-2.820	-4.660	3.351	1.508	10.112	4.496

Table 10.2: Equilibrium simulation 1 and 2 percentage changes

Season	Origin	Type	Scenario 1		Scenario 2a		Scenario 2b	
			Short run	Long run	Short run	Long run	Short run	Long run
Quantity (MT)								
Winter	US	MG	0.42%	1.07%	-0.62%	-0.41%	-1.68%	-1.05%
		VR	0.77%	2.69%	-0.48%	-0.33%	-1.30%	-0.85%
		GH	0.33%	2.77%	-1.72%	-4.00%	-4.38%	-9.92%
		Total	0.45%	1.40%	-0.70%	-0.72%	-1.88%	-1.82%
	MX	VR	-3.09%	-4.94%	-1.01%	-0.54%	-2.75%	-1.37%
		GH	-2.38%	-10.36%	-5.34%	-12.41%	-13.60%	-30.82%
		Total	-3.00%	-5.61%	-1.55%	-2.01%	-4.10%	-5.02%
	CD	GH	0.70%	5.95%	-3.70%	-8.59%	-9.40%	-21.31%
Summer	US	MG	0.11%	0.28%	-0.18%	-0.14%	-0.52%	-0.40%
		VR	0.17%	0.55%	-0.14%	-0.12%	-0.43%	-0.35%
		GH	0.08%	0.74%	-0.43%	-1.15%	-1.23%	-3.31%
		Total	0.14%	0.46%	-0.19%	-0.24%	-0.55%	-0.69%
	MX	VR	-4.04%	-7.38%	-0.33%	-0.20%	-0.98%	-0.59%
		GH	-3.16%	-16.82%	-0.86%	-2.33%	-2.49%	-6.68%
		Total	-3.89%	-8.96%	-0.42%	-0.56%	-1.23%	-1.61%
	CD	VR	0.27%	0.76%	-0.24%	-0.17%	-0.70%	-0.48%
		GH	0.15%	1.41%	-0.82%	-2.20%	-2.35%	-6.31%
		Total	0.19%	1.22%	-0.64%	-1.59%	-1.86%	-4.59%
Producer price (US$/kg)								
Winter	US	MG	1.05%	0.77%	-1.55%	-0.29%	-1.55%	-0.74%
		VR	1.91%	1.92%	-1.19%	-0.23%	-1.19%	-0.60%
		GH	1.64%	2.52%	-8.60%	-3.63%	-21.88%	-9.02%
	MX	VR	-4.25%	-1.94%	-1.39%	-0.21%	-3.79%	-0.54%
		GH	-6.54%	-5.18%	-14.70%	-6.20%	-37.39%	-15.41%
	CD	GH	1.76%	2.70%	-9.24%	-3.90%	-23.51%	-9.69%
Summer	US	MG	0.29%	0.20%	-0.45%	-0.10%	-1.32%	-0.29%
		VR	0.42%	0.39%	-0.36%	-0.08%	-1.06%	-0.25%
		GH	0.41%	0.67%	-2.14%	-1.05%	-6.16%	-3.01%
	MX	VR	-5.55%	-2.91%	-0.46%	-0.08%	-1.35%	-0.23%
		GH	-8.68%	-8.41%	-2.38%	-1.16%	-6.84%	-3.34%
	CD	VR	0.34%	0.27%	-0.30%	-0.06%	-0.87%	-0.17%
		GH	0.39%	0.64%	-2.04%	-1.00%	-5.87%	-2.87%
Wholesale price (US$/kg)								
Winter	US	MG	0.68%	0.50%	-1.00%	-0.19%	-2.71%	-0.48%
		VR	1.53%	1.53%	-0.95%	-0.19%	-2.58%	-0.48%
	MX	VR	2.92%	4.31%	-0.76%	-0.12%	-2.08%	-0.30%
	GH		1.35%	2.07%	-7.07%	-2.98%	-17.99%	-7.41%
Summer	US	MG	0.18%	0.12%	-0.27%	-0.06%	-0.80%	-0.18%
		VR	0.33%	0.30%	-0.28%	-0.06%	-0.83%	-0.19%
	MX	VR	1.85%	3.23%	-0.22%	-0.04%	-0.64%	-0.11%
	CD	VR	0.29%	0.23%	-0.25%	-0.05%	-0.74%	-0.15%
	GH		0.35%	0.58%	-1.86%	-0.91%	-5.34%	-2.61%

Table 10.2: Equilibrium simulation 1 and 2 percentage changes (Continued)

	Origin	Type	Scenario 1		Scenario 2a		Scenario 2b	
			Short run	Long run	Short run	Long run	Short run	Long run
Tomato type quantity indices								
Winter	MG		0.46%	1.11%	-0.59%	-0.39%	-1.69%	-1.04%
	VR		-2.33%	-3.31%	-0.97%	-0.49%	-2.43%	-1.26%
	GH		-0.57%	-1.15%	8.62%	3.74%	25.29%	9.48%
Summer	MG		0.13%	0.27%	-0.20%	-0.13%	-0.54%	-0.40%
	VR		-0.37%	-0.51%	-0.19%	-0.14%	-0.51%	-0.42%
	GH		-0.15%	-0.29%	2.19%	1.17%	6.28%	3.21%
Tomato type wholesale price indices								
Winter	MG		0.68%	0.53%	-0.98%	-0.23%	-2.71%	-0.45%
	VR		2.62%	3.69%	-0.81%	-0.13%	-2.19%	-0.38%
	GH		1.36%	2.08%	-7.08%	-2.99%	-17.99%	-7.42%
Summer	MG		0.18%	0.09%	-0.26%	-0.09%	-0.79%	-0.18%
	VR		0.55%	0.69%	-0.21%	0.00%	-0.76%	-0.14%
	GH		0.37%	0.59%	-1.87%	-0.91%	-5.35%	-2.62%
Aggregate tomato quantity indices								
Winter			-0.72%	-0.93%	1.11%	0.36%	3.05%	0.93%
Summer			-0.19%	-0.24%	0.31%	0.12%	0.90%	0.36%
Aggregate tomato wholesale price indices								
Winter			1.51%	1.94%	-2.18%	-0.73%	-5.87%	-1.88%
Summer			0.42%	0.49%	-0.62%	-0.21%	-1.80%	-0.69%

Note: Changes are those calculated from the base scenario.

losses in magnitude than their domestic vine-ripe counterparts. As in the short run, the grower group with the largest gain is of the US mature green tomatoes in the winter, and vine-ripe producers gain the most in the summer. Welfare changes for Canadian producers are again small. Consumers in the US suffer more in the long run due to larger increases in wholesale prices for vine-ripe and greenhouse tomatoes, which in turn lead to their lower quantities in this scenario. Welfare loss for consumers, as well as for the US economy as a whole, is again larger in the winter. In effect, the differences in welfare losses for different groups in this against the short run case indicate that lower Mexican producer losses and gains from mature green and vine-ripe growers in the US and Canada are partially transferred to losses for consumers and greenhouse producers from the US and Canada. This scenario allowed confirmation of the model’s adequate behavior as all price and quantity changes from the initial equilibrium could be explained in a plausible manner using expected changes from analysis of the conceptual framework.

10.4. Entry of Central American greenhouse tomatoes

For the second simulation in this research, greenhouse tomatoes from Central America are admitted to the US market. This is done by introducing an excess US demand function for

Central American greenhouse tomatoes, calibrated using assumed elasticities and production quantities and prices.

Conceptually, the addition of Central American supply can be analyzed with a few modifications to Figure 10.1. As the home country, or the US, has new trade with Central America, the excess supply function shifts up due to the entry. This temporarily decreases prices and increases Central American and aggregate greenhouse quantity. For US greenhouse tomatoes, equilibrium quantity and producer price decrease from Q^H and P_P^H to other levels as a response to the new lower wholesale price.

In the second round of effects, demand shifts due to the expansion and substitution effects. The greenhouse wholesale price decrease is likely to induce a weaker real income increase effect than aggregate tomato expenditure decrease effect, but this net expansion effect is possibly weaker than the positive substitution effect. This would shift the greenhouse demand and excess demand curves up and would force the Central American export quantity and producer and wholesale prices up, also increasing US quantity and producer price. Mexican and Canadian tomatoes would generally follow market movements similar to those for the US greenhouse tomatoes.

For other tomato types, the net effect of the Central American greenhouse entry would be felt through shift in their demand functions. The expansion effect may tend to shift these demand curves up, but the substitution effect, which would do the opposite as consumers substitute away from the mature green and vine-ripe tomatoes that have experienced a relative price increase, is likely to prevail. As a result, equilibrium quantity and producer and wholesale prices for tomatoes other than greenhouse decrease.

Table 10.1 shows the quantity and price magnitudes obtained after running the second simulation under the low and high supply scenarios for Central American greenhouse tomatoes. As expected, quantities and producer and wholesale prices for all tomatoes from the US, Mexico and Canada decrease. Therefore, mature green and vine-ripe tomatoes decrease in quantity. However, the large quantity increase for Central American greenhouse tomatoes helps in pushing the aggregate greenhouse quantity up. Because of this large greenhouse quantity increase, aggregate tomato quantity increases. Wholesale prices and producer prices for all original producers also decrease. Producer welfare analysis shows that greenhouse producers from NAFTA countries are the most affected by Central American tomatoes as expected since these are the most immediately substitutable products, and they receive quantity and producer and wholesale price decreases from both the entry and expansion effects. Welfare changes can vary from relatively low to high according to the Central American export capacity level assumed and the short versus long run supply assumptions. These results generally accord with predictions from the conceptual model.

10.4.a. Low supply scenario (Scenario 2a)

In the low supply scenario, only one country from Central America is assumed to export greenhouse tomatoes to the US at the hypothesized elasticity, quantity and producer prices. In the short run case of this scenario, Central America attains exporting 12 thousand MT of greenhouse tomatoes to the US in the winter and 5 thousand MT in the summer, thus almost achieving the 18 thousand MT that Central American industry sources inform they would be able to export annually (Moneda, 2003). In the winter US mature green growers suffer the most impact from this change in magnitude by losing about 2.7 thousand MT in quantity, which nevertheless only represents less than 1% loss in percentage change. It is Mexican greenhouse growers that experience the largest percentage quantity loss in the winter of 5%, although at a magnitude of 1.8 thousand MT this represents less than mature green or Mexican vine-ripe producers' loss. In the summer, both US and Canadian greenhouse producers lose about 0.5 thousand MT in sales, which represents much smaller loss than those experienced in the winter. In general, changes are larger in the winter than in the summer as Central America is assumed to export more in the winter.

Reflecting inelastic supply of growers, the percentage decline in producer prices for growers other than those in Central America are all larger than respective decline for quantities. This decline is especially pronounced for Mexican greenhouse tomatoes in the winter at 15%, which represents a decline of US$0.19/kg. Since only one greenhouse wholesale price exists and marketing margin is fixed, this magnitude of decline in producer price applies to greenhouse tomatoes from all countries in a given season and supply elasticity value. The higher percentage decline for Mexican producer price is due to its lowest initial value. The decrease in the summer is less in both magnitude at US$0.03/kg and in percentage change at 2%. The wholesale price decrease is also highest for greenhouse tomatoes at the same magnitude as those for producer prices and at 7% and 2% in percentage terms in the winter and summer, respectively.

Tomato type quantity and wholesale price index changes demonstrate that, in the winter, greenhouse tomato quantity increases by 9%, while its wholesale price decreases by 7%, reflecting the quantity increase effect of the demand and supply shift up. These changes are the highest of all tomato types and of the two seasons. Changes for tomatoes in the aggregate are also greater in the winter, but inelastic demand is observed as expected from the inelastic aggregate tomato demand function. To illustrate, while aggregate tomato quantity index increases by 1% in the winter, the corresponding wholesale price index decreases by 2%.

Central American greenhouse producers gain much, US$10 million in the winter and US$6 million in the summer, from their entry to the US market. The producer group that loses the most from Central America's greenhouse tomato entry is the US greenhouse growers, whose losses amount to US$13 million annually. Most of these losses, or US$9 million, are borne in the winter, when other groups also suffer more. Since the decrease in producer price is uniform across greenhouse producers from different regions, the highest welfare loss for US growers among those in North America is due to the larger quantity base from which they experience the loss. In comparison, Central American greenhouse producers gain almost as much as US growers lose both annually and by season from their entry to the US market.

The next producer group that loses the most in the winter, when most producer welfare loss is registered, is the Mexican greenhouse growers, who lose US$6 million. This group is followed very closely by the mature green producers in terms of magnitude of producer welfare loss. Canadian greenhouse producers lose about US$3 million in the winter, and only a little less in the summer as they lose more than US$2 million then. Therefore, in terms of winter to summer ratio, Canadian greenhouse growers lose relatively more in the summer than other producers. This could be expected as Canadian producers show more capacity to market their tomatoes in the summer, and they have more to lose then.

Consumers in the US earn US$40 million annually in welfare due to Central America's entry into their market. Most of this, US$29 million, is received in the winter and net welfare gain in the US is positive at US$13 million then. In the summer too, net welfare gain is positive at US$3 million.

Under the same scenario in the long run, Central America achieves exporting a little less than before at 16.7 thousand MT annually, of which 11 thousand MT are exported in the winter. For greenhouse producers from other countries, the loss in their quantity market share is magnified from the short run scenario, while producers of other tomatoes recuperate quantity market share relative to the short run scenario. The most notable examples are for Mexican producers in the winter. Mexican greenhouse producers now lose 4 thousand MT and are the group with the greatest loss, when it lost 1.8 thousand MT in the short run. On the other hand, Mexican vine-ripe producers are now only losing 1.3 thousand MT, when in the short run they lost 2.4 thousand MT. The higher loss in the long run for North American greenhouse growers can be explained by the stronger effect the more elastic greenhouse supply curve has in mitigating the producer price decrease.

As a result of the more elastic supply curves, producer and wholesale price decreases are much smaller for all tomatoes in the long run than in the short run, to the point that the vast majority of prices decrease at a rate of around 1% or less. In magnitude, the largest decrease is US$0.08 for winter greenhouse tomatoes. Expectedly, Central America supplies tomatoes at a higher producer price than in the short run, at US$1.04/kg in the winter and US$1.26/kg in the summer. As a result of these changes, both tomato type and aggregate tomato quantity and wholesale price index changes are less pronounced in the long run.

Welfare changes from the base scenario are also less pronounced in the long run. Central American greenhouse producers only gain US$3.5 million annually, and US greenhouse growers lose a little more than that at US$5 million annually. Welfare loss in that industry for Mexico and Canada is also relatively small below US$3 million. An interesting note here, however, is that the Canadian industry is now losing almost as much in welfare in the summer as in the winter, when it was losing much more in the winter under the short run. This is likely to be due to the greater influence exerted by the stronger effect of producer price decrease in the winter under the short run, while in the long run, the effect of the larger quantity base in the summer turns more important as the price decrease is not as significant any more. Consumer welfare increase is relatively small at US$14 million annually, and net welfare increases by only US$6 million.

10.4.b. High supply scenario (Scenario 2b)

As Central America's export capacity is assumed to be triple the estimate provided by industry sources for El Salvador, several differences from the low supply scenario are detected in the present scenario. The short run case under the high supply scenario is first contrasted against the corresponding case in the low supply scenario.

Importantly for Central American greenhouse producers, they would achieve exporting 50 thousand MT annually, of which 34 thousand MT would be exported during the winter. This export capacity would be very similar to that of Mexico's current level. For tomato producers from other countries, the impact of decrease in their quantities is expectedly greater in the high supply scenario than in the low supply scenario. For example, mature green producers now lose 10 thousand MT annually, with most of it in the summer. Mexican growers follow with large quantity losses in the winter, with vine-ripe growers experiencing a 7 thousand MT loss and greenhouse growers losing 5 thousand MT. US greenhouse producers also lose 2 thousand MT in that season and a little less in the summer, while US vine-ripe growers see a small decline in the winter but a 2 thousand MT drop in the summer.

Central American greenhouse producer price is only US$0.65/kg in the winter. This may be very low value as compared to other countries' current levels, but it may be plausible given Central American industry estimates that their FOB value may even be lower at around US$0.44/kg (See section 8.6). Changes in producer and wholesale prices, both in magnitude and in percentage changes, are more pronounced in the high supply scenario for all tomatoes too. Greenhouse tomato producer and wholesale prices especially experience a large drop of US$0.47/kg in the winter. Even in the summer, the drop is significant at US$0.10/kg. Mature green and vine-ripe tomatoes in the winter also experience important decrease of US$0.03/kg to US$0.05/kg, respectively. Quantity and wholesale price indices also demonstrate larger changes in this high supply scenario. As in the low supply short run scenario, greenhouse quantity and wholesale price indices experience the largest changes, with the former increasing by 25% and the latter decreasing by 18% in the winter. Corresponding changes in the summer are smaller, but still significant at 6% and 5%, respectively. In the aggregate, tomato quantity increases by 3% in the winter and tomato wholesale price decreases by 6%.

Central American greenhouse producers again benefit much from their entry to the US as their total welfare gain in the winter is US$20 million, while it is US$17 million in the summer. These figures show a diminished seasonal difference in producer welfare gain as opposed to the low supply scenario, with the relatively larger percentage gain in the summer made possible by the producer price in the high supply scenario, US$1.18/kg, which is not extremely lower than that in the low supply scenario, US$1.25/kg. This is contrasted to the case in the winter, where the high supply scenario producer price, US$0.65/kg, is much lower than that in the low supply scenario, US$0.93/kg.

US greenhouse producers are again the group with the greatest welfare loss, now with US$23 million in the winter alone. Other producers that also experience losses greater than US$10 million are US mature green and Mexican greenhouse growers, with the former now suffering greater losses than the latter, in the winter and US greenhouse producers in the summer. Most other producer groups suffer from welfare losses in the order of millions, especially in the winter. Consumer welfare gain is US$80 million in the winter and US$31 million in the summer. Net welfare gain therefore amounts to US$38 million in the winter and US$10 million in the summer.

In the long run, Central America now exports 29 thousand MT in greenhouse tomatoes in the winter and 15 thousand MT in the summer, so the percentage increase as compared from the low supply long run scenario is greater in the summer than in the winter. Quantity losses experienced by growers are high, and especially so for Mexican greenhouse growers in the winter, followed by losses for US greenhouse and mature green growers in the winter. In the summer, US and Canadian greenhouse growers suffer losses around 4 thousand MT each.

Price decreases are very large for winter greenhouse growers at US$0.20/kg, and smaller in the summer at US$0.05/kg. Other tomatoes experience decline by less than US$0.01/kg. Quantity and wholesale price indices for tomato types and aggregate tomatoes show mostly results expected based on individual tomato quantity and price results, and, as in the comparison between the two cases of the low supply scenario, the long run case shows more attenuated changes than the short run scenario.

Although their welfare gain is not as substantial as in the short run scenario, Central American producers still acquire US$7 million in the winter and about US$6 million in the summer. A point of interest about these results is that the more Central America manages to export to the US and the longer the run, these producers gain relatively more in the summer than in the winter although they export more in the winter. Contrary to this situation, Canadian greenhouse producers now lose more in the summer when they export more, at US$3.2 million, than in the winter, at US$3.0 million. Seasonal difference in consumer welfare gain also shrinks as it is US$ 25 million in the winter and US$12 million in the summer. Net welfare gain by season is US$13 million and US$4 million, respectively.

Summarizing results for the Central American greenhouse entry scenario, the impact in both the low and high supply forms is absorbed more within the greenhouse tomato market in the long run than in the short run as changes are more noticeable within that industry. Furthermore, although the winter mature green industry is vulnerable to Central America's entry to the tomato market in the short run, the effect may not be perceived as much in the long run and especially if the region's export level is low. Compared to the welfare loss for mature green producers, US vine-ripe producers' loss is not great, particularly in the winter. However, if Central America achieves supplying high quantities of greenhouse tomatoes, US vine-ripe producers would suffer important losses, particularly in the short run. Canadian greenhouse producers would also suffer higher welfare losses in the summer than in the winter the more abundant Central America's greenhouse exports are.

10.5. Preference increase for greenhouse tomato

In the third and final simulation, a scenario is considered where the increase in consumer demand for greenhouse tomatoes is stronger than that for field-grown tomatoes. First looking at changes in the greenhouse market, Figure 10.1 can again be used to guide the discussion. The starting point is at the trade equilibrium between the home country (US) and a foreign country that exports greenhouse tomatoes to the US. Then, as consumer preference for greenhouse tomatoes increases, the greenhouse demand function shifts up. As a result, quantities and producer prices for greenhouse tomatoes from all countries and greenhouse wholesale price increase. For mature green and vine-ripe tomatoes the demand curves shift down since preference for those tomatoes has decreased, so their quantities and producer and wholesale prices decrease.

The expansion effect, however, may be positive as the aggregate tomato expenditure may increase although real income would decrease since consumers are consuming more of the more expensive greenhouse tomatoes. On the other hand the substitution effect is negative for greenhouse tomatoes as some consumers would substitute away from the now more expensive greenhouse tomatoes. The sum of these effects, however, is expected to be smaller than the direct preference change effect. The same changes are expected for multiple foreign goods as to the one considered for illustration here.

Given that, unlike in previous scenarios, mid level demand shift parameter values used for the present scenario differ from those in the base case, these new values are presented. It is reminded that, to simulate an increase in greenhouse tomato demand, mid level tomato type demand shift parameters are recalibrated using assumed new equilibrium quantities and associated higher tomato expenditure as consumers lean towards consuming more greenhouse tomatoes and less mature green and vine-ripe tomatoes. These new quantities are calculated based on assumed percentage changes from the base quantities, which differ by season: a 9% and a 37% increase for field-grown and greenhouse tomatoes, respectively, in the winter, and a -5% and a 22% respective changes in the summer. Table 10.3 presents the original and recalibrated mid level demand shift parameter values, and percentage change of recalibrated from original values.

Table 10.3: Recalibrated mid level demand shift parameter (b_i) values

Parameter (b_i) value	Winter			Summer		
	MG	VR	GH	MG	VR	GH
Original values	0.405	0.352	0.243	0.252	0.514	0.234
Recalibrated values	0.381	0.332	0.287	0.236	0.482	0.282
Change from original	-6%	-6%	18%	-6%	-6%	21%

As expected, demand shift parameters for greenhouse tomatoes increase in both seasons, although percentage increase in parameter values are less than that for the respective quantities. Furthermore, although percentage increase in greenhouse tomato quantity is larger in the winter, respective increase in demand shift parameter value is larger in the summer. Given that the percentage decrease in field-grown tomato quantity is the same across seasons, the larger percentage increase for greenhouse parameter in the summer is explained by the similar percentage-point base difference between the field-grown and greenhouse tomato percentage increase in quantities in both seasons. The difference is 28 percentage points in the winter and 27 percentage points in the summer. Therefore, the relative rate of change applied between the two tomato types is about the same across seasons. However, the base quantities for which the rates of change are applied are greater in the summer than in the winter. Thus, the resulting difference in magnitude between the field-grown and greenhouse tomatoes is larger in the summer, which is reflected in larger percentage point difference in the change for field-grown and greenhouse parameter values.[139]

Simulation results are tabulated in Table 10.4, and percentage change of those values from the base scenario are presented in Table 10.5. Directions of change for the tabulated values are common in both cases considered in this scenario, prior to and consequent to Central American greenhouse tomato entry to the US. Greenhouse quantities, and producer and wholesale prices increase in all countries, and those for other tomatoes decrease. Looking at tomatoes as a whole, their quantity increases while their wholesale price decreases. Naturally, greenhouse producers from all countries gain in welfare, while producers of other tomatoes lose. Consumers experience large losses in welfare, and those are larger than gains experienced by some US producers as net welfare change is negative. In general, these changes concur with expectations based on analytical evaluation.

10.5.a. Prior to Central American greenhouse entry (Scenario 3a)

For the first case in scenario 3, a scenario without Central American greenhouse in the US market is contemplated. First looking at the short run case results, in the winter the most notable change in quantity is a positive change of 3 thousand MT for Mexican greenhouse tomatoes, which represents a 9% increase from the base. However, even larger increases in value are observed in the summer, when Canadian and US greenhouse quantities increase by 4 thousand MT and 3.5 thousand MT, respectively. Large quantity losses are also registered in the summer, with a decrease of 4.4 thousand MT for each of US mature green and vine-ripe tomato quantities. In the winter, it is mature green and Mexican vine-ripe tomato quantities that decline the most at 2.6 thousand MT and 2.3 thousand MT, respectively.

Price-wise, greenhouse tomatoes experience the largest changes, with increases of US$0.31/kg in the winter and US$0.25/kg in the summer. These represent the most percentage changes in producer price for Mexican greenhouse tomatoes, with an increase in the winter of 24% and in the summer of 17%. Prices for other tomatoes suffer losses but at decreases in

[139] It is recognized that the percentage point difference in changes in the parameter values across tomatoes of different production methods may have been more pronounced in the winter due to the larger spread in wholesale prices then, with greenhouse tomatoes being more expensive. That may lead to the belief that the greenhouse parameter may have to increase more in the winter if, despite relatively higher prices in the winter, consumption relative to field-grown tomatoes is increasing at about the same rate in the summer. However, as evidenced in the recalibration results, the higher magnitude of tomato quantities in the summer proves to be a more significant factor in determining higher growth rate for the greenhouse parameter in this case.

magnitude of less than US$0.03/kg. The same tomatoes that suffer the most quantity decrease in each season, i.e. mature green and Mexican vine-ripe tomatoes in the winter and mature green and US vine-ripe tomatoes in the summer, experience larger drops in prices. In the aggregate tomato quantities drop by around 2% in quantity in both seasons, but price increases by around 4%.

US greenhouse producers experience the largest welfare gain in both seasons, valued at US$15 million in the winter and US$29 million in the summer. The next group that gains the most is Mexican greenhouse growers in the winter with US$11 million in the winter and Canadian greenhouse growers in the summer with US$17 million. US mature green producers lose the most in the winter at US$6 million, and US vine-ripe producers take that role in the summer with a US$12 million loss, but even in the summer mature green producers experience the second largest loss of US$8 million. Compared to the combined US producer welfare gain of around US$9 million in each season, consumer welfare loss is very large at around US$60 million in each season.[140] As a result, the US suffers a net welfare loss of about US$51 million in each season.

In the long run, quantity changes are more pronounced than in the short run, although the opposite applies to price changes. The largest quantity gain in the winter is again enjoyed by Mexican greenhouse growers, but now at a larger magnitude of 7 thousand MT. US and Canadian greenhouse growers now benefit from a more important quantity gain of 3 thousand MT, but US and Canadian growers gain even more at around 10.5 thousand MT in the summer. Losses are larger too for mature green growers at 8 thousand MT and for Mexican vine-ripe growers at 6 thousand MT in the winter, and for US mature green and vine-ripe producers at around 11.5 thousand MT in the summer.

Price changes are smaller, with greenhouse prices increasing by US$0.14/kg in the winter and by US$0.13/kg in the summer. Other price changes are now only within US$0.02/kg. In the aggregate, quantity decreases are less pronounced now at around -1.5% in each season. Aggregate tomato prices rise by a little less than 3% on seasonal average. Producer welfare changes are now lower too with the largest gain now, that for US greenhouse growers of US$22

[140] It is recognized that this scenario is not Pareto comparable with the base scenario since consumer preferences have changed, implying that consumer welfare is not comparable across the scenarios. However, these comparisons are still made, with the previous point in mind, to consistently use the same base scenario as for the previous simulations.

Table 10.4: Equilibrium simulation 3 and sensitivity analysis results

Season	Origin	Type	Base	Scenario 3a		Scenario 3b		Sensitivity analysis	
				Short run	Long run	Short run	Long run	Mean	Std Dev
Quantity (MT)									
Winter	US	MG	444,020	441,371	435,621	438,249	433,329	432,698	1.341
		VR	58,214	57,946	57,326	57,630	57,084	57,061	0.150
		GH	49,500	50,905	52,957	49,937	50,676	50,713	0.105
		Total	551,734	550,221	545,904	545,816	541,088	540,472	1.482
	MX	VR	240,500	238,151	234,557	235,384	232,940	232,420	0.853
		GH	34,032	37,033	41,416	34,965	36,544	36,623	0.225
		Total	274,532	275,184	275,973	270,348	269,484	269,043	1.019
	CD	GH	17,169	18,216	19,745	17,494	18,045	18,073	0.079
	CA	GH	0	-	-	12,869	13,325	13,348	0.065
Summer	US	MG	429,190	424,760	417,821	423,889	417,107	416,216	1.355
		VR	523,926	519,549	511,827	518,688	511,067	510,230	1.692
		GH	115,500	119,029	125,510	118,461	124,004	124,683	0.269
		Total	1,068,616	1,063,337	1,055,157	1,061,037	1,052,177	1,051,130	2.932
	MX	VR	74,931	73,488	72,012	73,204	71,829	71,436	0.409
		GH	15,069	15,997	17,703	15,848	17,307	17,486	0.071
		Total	90,000	89,485	89,715	89,052	89,136	88,922	0.462
	CD	VR	28,559	28,168	27,643	28,091	27,585	27,494	0.106
		GH	67,773	71,719	78,967	71,084	77,283	78,043	0.301
		Total	96,332	99,887	106,609	99,175	104,868	105,536	0.341
	CA	GH	0	-	-	5,619	6,029	6,079	0.020
Producer price (US$/kg)									
Winter	US	MG	0.86	0.85	0.84	0.83	0.85	0.84	0.005
		VR	1.41	1.39	1.39	1.37	1.39	1.39	0.005
		GH	2.17	2.48	2.31	2.27	2.22	2.22	0.020
	MX	VR	0.85	0.84	0.84	0.83	0.84	0.84	0.005
		GH	1.27	1.58	1.41	1.37	1.32	1.32	0.020
	CD	GH	2.02	2.33	2.16	2.12	2.07	2.07	0.020
	CA	GH	-	-	-	1.22	1.17	1.17	0.020
Summer	US	MG	0.69	0.67	0.68	0.67	0.68	0.67	0.005
		VR	1.09	1.07	1.07	1.06	1.07	1.07	0.006
		GH	1.62	1.87	1.75	1.83	1.73	1.73	0.040
	MX	VR	0.74	0.72	0.73	0.72	0.73	0.72	0.006
		GH	1.46	1.71	1.59	1.67	1.57	1.57	0.040
	CD	VR	1.69	1.66	1.67	1.66	1.67	1.66	0.008
		GH	1.70	1.95	1.83	1.91	1.81	1.81	0.040
	CA	GH	-	-	-	1.49	1.39	1.39	0.040
Wholesale price (US$/kg)									
Winter	US	MG	1.33	1.32	1.32	1.30	1.32	1.31	0.005
		VR	1.77	1.75	1.75	1.73	1.75	1.75	0.005
	MX	VR	1.55	1.54	1.54	1.53	1.54	1.54	0.005
	GH		2.64	2.95	2.78	2.74	2.69	2.69	0.020
Summer	US	MG	1.14	1.12	1.13	1.12	1.13	1.12	0.005
		VR	1.39	1.37	1.37	1.36	1.37	1.37	0.006
	MX	VR	1.56	1.54	1.55	1.54	1.55	1.54	0.006
	CD	VR	1.99	1.96	1.97	1.96	1.97	1.96	0.008
	GH		1.87	2.12	2.00	2.08	1.98	1.98	0.040

Table 10.4: Equilibrium simulation 3 and sensitivity analysis results (Continued)

Season	Origin	Type	Base	Scenario 3a		Scenario 3b		Sensitivity analysis	
				Short run	Long run	Short run	Long run	Mean	Std Dev
Tomato type quantity indices									
Winter	MG		1.534	1.525	1.505	1.514	1.497	1.495	0.004
	VR		1.028	1.019	1.004	1.008	0.998	0.995	0.005
	GH		0.348	0.367	0.394	0.398	0.410	0.410	0.002
Summer	MG		1.483	1.468	1.444	1.465	1.441	1.438	0.005
	VR		2.140	2.118	2.085	2.114	2.081	2.069	0.017
	GH		0.685	0.714	0.768	0.729	0.776	0.782	0.003
Tomato type wholesale price indices									
Winter	MG		1.33	1.32	1.32	1.30	1.32	1.31	0.005
	VR		1.60	1.59	1.59	1.57	1.59	1.59	0.005
	GH		2.64	2.95	2.78	2.74	2.69	2.69	0.020
Summer	MG		1.14	1.12	1.13	1.12	1.13	1.12	0.005
	VR		1.46	1.43	1.44	1.43	1.44	1.44	0.010
	GH		1.87	2.12	2.00	2.08	1.98	1.98	0.040
Aggregate tomato quantity indices									
Winter			2.786	2.726	2.743	2.761	2.756	2.770	0.037
Summer			4.219	4.148	4.171	4.162	4.177	4.182	0.037
Aggregate tomato wholesale price indices									
Winter			1.65	1.73	1.70	1.68	1.69	1.68	0.015
Summer			1.44	1.49	1.48	1.48	1.47	1.47	0.005
Producer welfare changes (US$ millions)									
Winter	US	MG	-	-5.679	-5.110	-12.327	-6.488	-7.960	2.168
		VR	-	-0.942	-0.887	-2.047	-1.127	-1.321	0.315
		GH	-	15.457	7.058	4.757	2.347	2.370	1.002
		Total	-	8.835	1.060	-9.617	-5.268	-6.911	2.991
	MX	VR	-	-2.731	-1.960	-5.916	-2.485	-3.141	1.090
		GH	-	10.940	5.197	3.301	1.654	1.672	0.711
		Total	-	8.209	3.237	-2.615	-0.831	-1.469	1.548
	CD	GH	-	5.447	2.543	1.658	0.825	0.834	0.354
	CA	GH	-	-	-	13.566	5.017	3.814	3.014
Summer	US	MG	-	-7.603	-5.529	-9.088	-5.872	-7.317	2.021
		VR	-	-11.878	-9.311	-14.202	-9.889	-12.121	2.996
		GH	-	29.019	15.380	24.287	12.985	13.549	4.834
		Total	-	9.538	0.540	0.997	-2.776	-5.890	7.800
	MX	VR	-	-1.455	-0.832	-1.737	-0.883	-1.182	0.438
		GH	-	3.844	2.091	3.209	1.755	1.837	0.657
		Total	-	2.389	1.259	1.472	0.872	0.654	0.942
	CD	VR	-	-0.820	-0.544	-0.980	-0.578	-0.741	0.232
		GH	-	17.260	9.364	14.414	7.864	8.228	2.944
		Total	-	16.440	8.820	13.435	7.286	7.487	3.041
	CA	GH	-	-	-	7.192	2.780	2.215	1.581
Consumer and net welfare changes in the US (US$ millions)									
Winter	Equivalent var.		-	-59.497	-42.103	-25.091	-29.385	-26.271	4.103
	Net change		-	-50.662	-41.043	-34.708	-34.654	-33.181	1.126
Summer	Equivalent var.		-	-61.371	-41.028	-48.796	-35.735	-32.299	12.079
	Net change		-	-51.833	-40.488	-47.799	-38.510	-38.188	4.759

Table 10.5: Equilibrium simulation 3 percentage changes

Season	Origin	Type	Scenario 3a		Scenario 3b	
			Short run	Long run	Short run	Long run
Quantity (MT)						
Winter	US	MG	-0.60%	-1.89%	-1.30%	-2.41%
		VR	-0.46%	-1.53%	-1.00%	-1.94%
		GH	2.84%	6.98%	0.88%	2.38%
		Total	-0.27%	-1.06%	-1.07%	-1.93%
	MX	VR	-0.98%	-2.47%	-2.13%	-3.14%
		GH	8.82%	21.70%	2.74%	7.38%
		Total	0.24%	0.52%	-1.52%	-1.84%
	CD	GH	6.10%	15.00%	1.89%	5.10%
Summer	US	MG	-1.03%	-2.65%	-1.24%	-2.82%
		VR	-0.84%	-2.31%	-1.00%	-2.45%
		GH	3.06%	8.67%	2.56%	7.36%
		Total	-0.49%	-1.26%	-0.71%	-1.54%
	MX	VR	-1.93%	-3.90%	-2.30%	-4.14%
		GH	6.16%	17.48%	5.17%	14.85%
		Total	-0.57%	-0.32%	-1.05%	-0.96%
	CD	VR	-1.37%	-3.21%	-1.64%	-3.41%
		GH	5.82%	16.52%	4.89%	14.03%
		Total	3.69%	10.67%	2.95%	8.86%
Producer price (US$/kg)						
Winter	US	MG	-1.49%	-1.35%	-3.24%	-1.72%
		VR	-1.15%	-1.09%	-2.50%	-1.39%
		GH	14.19%	6.35%	4.41%	2.16%
	MX	VR	-1.34%	-0.98%	-2.93%	-1.24%
		GH	24.24%	10.85%	7.54%	3.69%
	CD	GH	15.24%	6.82%	4.74%	2.32%
Summer	US	MG	-2.58%	-1.90%	-3.09%	-2.01%
		VR	-2.09%	-1.65%	-2.50%	-1.75%
		GH	15.28%	7.88%	12.81%	6.69%
	MX	VR	-2.65%	-1.53%	-3.18%	-1.62%
		GH	16.95%	8.74%	14.22%	7.42%
	CD	VR	-1.71%	-1.15%	-2.05%	-1.22%
		GH	14.56%	7.51%	12.21%	6.38%
Wholesale price (US$/kg)						
Winter	US	MG	-0.96%	-0.87%	-2.10%	-1.11%
		VR	-0.92%	-0.87%	-1.99%	-1.11%
	MX	VR	-0.74%	-0.54%	-1.61%	-0.68%
	GH		11.66%	5.22%	3.63%	1.78%
Summer	US	MG	-1.56%	-1.15%	-1.87%	-1.22%
		VR	-1.64%	-1.29%	-1.96%	-1.37%
	MX	VR	-1.26%	-0.72%	-1.51%	-0.77%
	CD	VR	-1.45%	-0.97%	-1.74%	-1.04%
	GH		13.24%	6.82%	11.10%	5.80%

Table 10.5: Equilibrium simulation 3 percentage changes (Continued)

	Origin	Type	Scenario 3a		Scenario 3b	
			Short run	Long run	Short run	Long run
Tomato type quantity indices						
Winter	MG		-0.59%	-1.89%	-1.30%	-2.41%
	VR		-0.88%	-2.33%	-1.95%	-2.92%
	GH		5.46%	13.22%	14.37%	17.82%
Summer	MG		-1.01%	-2.63%	-1.21%	-2.83%
	VR		-1.03%	-2.57%	-1.21%	-2.76%
	GH		4.23%	12.12%	6.42%	13.28%
Tomato type wholesale price indices						
Winter	MG		-0.98%	-0.90%	-2.11%	-1.13%
	VR		-0.81%	-0.63%	-1.69%	-0.75%
	GH		11.67%	5.23%	3.64%	1.78%
Summer	MG		-1.58%	-1.14%	-1.84%	-1.23%
	VR		-1.51%	-1.17%	-1.85%	-1.24%
	GH		13.21%	6.84%	11.12%	5.78%
Aggregate tomato quantity indices						
Winter			-2.15%	-1.54%	-0.90%	-1.08%
Summer			-1.68%	-1.14%	-1.35%	-1.00%
Aggregate tomato wholesale price indices						
Winter			4.54%	3.21%	1.88%	2.24%
Summer			3.53%	2.36%	2.77%	2.01%

Note: Changes are those calculated from the base scenario.

million year round, being only about half of the corresponding value in the short run case. Gains for other greenhouse producers are also reduced to about half of corresponding values in the short run. The welfare losses experienced by negatively affected growers in the greenhouse preference increase scenario, however, are not as sensitive to the values used for supply elasticities as, for example, US mature green producer welfare loss is still more than US$5 million in the winter, and that for US vine-ripe producers in the summer is still US$9 million in the summer. As a result, total producer welfare in each country is less positive under this than the long run case. Decrease in US consumer welfare loss is also not as drastic and this group suffers losses of around US$41.5 million in each season, which is not very different from US net welfare change as its total producer welfare change is not very large.

10.5.b. Concurrent with Central American greenhouse entry (Scenario 3b)

In the second case of this scenario, preference for greenhouse tomatoes increases relative to field-grown tomatoes at the same time that Central American greenhouse tomatoes are allowed to the US market. Tables 10.4 and 10.5 show that quantity gains for North American greenhouse growers are now less than in the short run case of scenario 3a, especially in the winter. To illustrate, Mexican greenhouse growers in the winter are now gaining only one thousand MT against the 3 thousand MT that they gained in the earlier scenario. In the summer too, US and Canadian greenhouse growers are gaining less in quantity than before, but the differences are not as large as in the winter. On the other hand, the magnitude of the quantity losses suffered by mature green and vine-ripe growers is magnified in this case than in the short run of scenario 3a. For example, while US mature green growers lost 3 thousand MT in the winter before, they are now losing 6 thousand MT. It is noteworthy that Central American greenhouse quantities are greater in this scenario than the comparable entry scenario without greenhouse preference increase (scenario 2a short run case). The positive difference is about 0.8 thousand MT in the winter and 0.3 thousand MT in the summer. Because of this increase in greenhouse quantities, the greenhouse quantity index increase is higher, especially in the winter, for this scenario than for the last one.

Price changes follow a similar pattern to that for quantity changes when compared with scenario 3a, i.e. greenhouse price increases are more moderate and price decreases for other tomatoes are stronger. Greenhouse producer prices increase as in the last scenario, but the boost is by only US$0.10/kg. Drop in prices for other tomatoes is now less than US$0.04/kg. Compared with the short run of scenario 2a, Central American greenhouse producer prices attain higher values in both seasons at US$1.22/kg in the winter and US$1.49/kg in the summer. However, Central American entry helps in keeping greenhouse wholesale price lower than in scenario 3a, as these values are only US$2.74/kg in the winter and US$2.08/kg in the summer now as opposed to respective values that are US$2.95/kg and US$2.12/kg in scenario 3a. Mitigation of impact from the greenhouse preference increase, particularly in the winter, can also be seen by comparing the aggregate tomato indices for this scenario and scenario 3a. For example, while aggregate tomato price index increased by 4.5% in the winter for scenario 3a, the respective change in this scenario is 2%.

Producer welfare changes are more pronounced for field-grown tomato growers, who experienced negative changes in scenario 3a. In the winter where these negative changes are stronger, mature green producers are now losing US$12 million. On the other hand, the large welfare gain that US greenhouse growers had in the winter in scenario 3a has diminished to US$5 million. Notwithstanding the losses that North American greenhouse growers suffer from the Central American entry, comparing the positive greenhouse producer welfare results from this scenario to corresponding ones in scenario 2a that show negative values demonstrates that the greenhouse preference increase provides producers sufficient gains that are maintained even when Central American greenhouse producers enter the US. As for comparison of Central American producer welfare changes between these two scenarios, they obtain larger gains in the present scenario.

As price and quantity changes are attenuated versus scenario 3a, consumer welfare losses are lower, and particularly in the winter when welfare loss is now US$25 million against the US$49 million in the summer. However, as US total welfare change is negative in the winter and positive but small in the summer, net welfare gain is largely negative at US$82 million.

Finally in the long run, as in the long run case of scenario3a, quantity changes tend to be larger and price changes smaller than the short run case of scenario 3b. For example, mature green growers have around 11 thousand MT loss in each season, and US greenhouse producers now sell 8.5 thousand MT more in the summer. Greenhouse price changes are now lower at US$0.05/kg and US$0.11/kg in the winter and summer, respectively. Other price changes are also lower at less than US$0.02/kg. Seasonal aggregate tomato price indices show that changes are higher in the winter than in the summer, reverting back to a tendency that was turned only in the short run case of scenario 3b. It is also interesting to note that, in comparison to corresponding changes in the short run case of the present scenario 3b, percentage changes are higher in the winter case of this scenario for both of aggregate tomato quantity and wholesale price indices but the opposite is true in the summer, i.e. changes are larger in the short run case.

All producer welfare changes are smaller in the long run than in the short run. Differences in producer surplus change are particularly pronounced for Central American greenhouse growers, who experience much less positive surplus increases. Consumer welfare decreases by around US$30 million in each season, and net welfare decrease is a few million dollars more than that as US producer welfare changes are negative in each season.

Overall when preference for greenhouse tomatoes increases, the mature green industry experiences large welfare losses in both seasons, although losses by the US vine-ripe industry in the summer are higher than the mature green growers then. These losses are exacerbated when the Central American greenhouse producers enter the US market. Welfare gains made in the US greenhouse industry, however, help dampen effects of these scenarios to the aggregate US tomato industry, although Central American entry particularly decreases welfare gains for US greenhouse growers in the winter. The Canadian greenhouse industry makes substantial welfare gains in the summer. Although consumer welfare change is negative throughout this scenario, Central American participation in the US greenhouse market mitigates losses for consumers to a large extent and also to US net welfare.

10.6. Sensitivity analysis

To conduct a systematic sensitivity analysis, symmetric order three Gaussian quadratures were used to vary elasticities of substitution and supply values in the long run case of scenario 3b. Means and standard deviations of the resulting runs are displayed in Table 10.4, which show that most means are very close, if not equal, to the base (scenario 3b long run case) values. Most standard deviation values are low relative to the base values, implying that the majority of results are robust to variations in the chosen parameters. However, many means for producer welfare changes are not very close, and some of those standard deviations are high relative to means. The standard deviation for summer equivalent variation value is also high. This may be due to the numerous calculation errors that are accumulated in deriving those values. Results for welfare changes should thus be used cautiously, but other results are robust to changes in the parameter values.

10.7. Conclusions

In the three simulations presented, a tariff was imposed on Mexican tomatoes, Central American greenhouse tomatoes were introduced to the US market, and consumer preferences for greenhouse tomatoes were increased. A few common themes emerge from these simulations. First, market changes for a particular tomato type affects markets for other tomato types. Mature green growers gained the most in the winter from imposition of a tariff on Mexican vine-ripe and greenhouse tomatoes, and US vine-ripe producers lost the most in the summer when preference for greenhouse tomatoes increased. This also points out the large magnitude of losses or gains that the US tomato industry faces when shocks to its markets present. Another case in point along this discussion is that for the US greenhouse industry, which experiences the largest gains year-round when consumers' preference for greenhouse tomatoes rises. This finding is also interesting as it is contrary to most analysts' opinions that are not amenable to this idea. According to other findings from this model, even if Central American greenhouse tomatoes participate in the US market, US greenhouse growers can still experience large gains given that greenhouse preference increase is considerable.

A notable point from scenario 3 is that, given that preference for greenhouse tomatoes is increasing in the US as conjectured by analysts and partly evidenced by data, increase in supply for these tomatoes may have to be promoted to avoid imposing unnecessary costs to consumers. This conclusion may be drawn by the finding that Central American entry to the US market helped in mitigating loss in consumer welfare due to increased preference for greenhouse tomatoes. Although the USDA may promote increase in US production of this crop to fulfill consumers' needs, it may be more cost effective to allow imports of greenhouse tomatoes from Central America to increase supply. Additional discussion considering these results is developed in the next chapter.

Sensitivity analysis using order three Gaussian quadratures demonstrates that means are very close to the scenario 3b long run base, and standard deviations are low relative to the vast majority of means. This suggests that the model is robust to varying parameter values. Some exceptions to this stability were found with particular producer surplus values, but those values were relatively less significant than most others due to their low levels.

Chapter 11. Summary and conclusions

11.1. Introduction

Results from quantitative analysis in this study are summarized and conclusions are drawn in this chapter. This is achieved by first recalling the hypothesis and scenarios to be quantified, which were elaborated at the beginning of the study, and evaluating them based on analytical evidence. Then, implications for policy making and further research are inferred from the material presented in this study.

11.2. Evaluation of hypothesis and scenarios

One hypothesis and three scenarios that relate to the US tomato market were briefly presented at the beginning of this study to center the present research on them. Each hypothesis and scenario is restated, after which it is evaluated in view of the results.

11.2.a. Homogeneity of tomatoes

Hypothesis 1: Tomatoes are homogeneous products by type and origin in the US market.

Statistical tests were conducted in section 8.4.b to evaluate hypothesis 1. The premise of the test is that, if tomatoes are homogeneous then their wholesale prices should be statistically indistinguishable regardless of the tomato type or origin since consumers do not appreciate them as different. If consumers were to consider tomatoes of divergent types and origins as unequal, then differences in their wholesale price would reflect that. This is because consumers would have a divergent demand curve against each product's supply curve, and price for each differentiated product would be established more independently than if a particular product was considered as only a part of a large group of products. In the case of homogeneous products, where consumers do not discriminate products that may have different characteristics, demand is represented by a unique demand curve against supply curves for multiple countries, and price would be set according to the supplier that offers the lowest price. As a result, wholesale price for homogeneous products would be identical.

Test results from section 8.4.b are clear in that consumers view tomatoes as different by type. That is, mature green tomatoes are considered different from vine-ripe tomatoes, which are in turn differentiated from greenhouse tomatoes, and these tomatoes are also distinguished from mature green tomatoes. These results are so consistent that all of 22 pair-wise comparisons of wholesale prices used in t-tests showed statistically significant difference even at the significance level of 0.01.

Test results for pair-wise comparisons of the same tomato type by different origins show different results. For vine-ripe tomatoes, two comparisons were available with one in each season for US and Mexican vine-ripe tomatoes. Both results show that wholesale prices for these tomatoes differ even at the significance level of 0.01. However, for greenhouse tomatoes, of six pair-wise comparisons with three in each season, two pairs compared are not significantly different at the 0.05 level, and four at the 0.01 level. Of these comparisons, all three comparisons are not statistically significantly different at the 0.01 level and one at the 0.05 level in the winter, and although only one is statistically not different in the summer, it is so even at the 0.05 level. Therefore, although wholesale price difference between tomatoes from different origins is much clearer in the winter than in the summer, it can be said that greenhouse tomatoes are homogeneous by origin.

A digression is made on the point of origin-homogeneity for greenhouse tomatoes while vine-ripe tomatoes are origin-heterogeneous, which is one of the most interesting finding in this study. That vine-ripe tomatoes may be distinguished by consumers is hinted in the literature, as analysts suggest that Mexican products are the preferred of vine-ripe tomatoes in the summer, while US vine-ripe tomatoes are the most preferred in the summer. The finding in this research then has confirmed rigorously that vine-ripe tomatoes from the US and Mexico are viewed as different and Canadian vine-ripe tomatoes are also considered as distinct.

This result for vine-ripe tomatoes makes it even more intriguing that greenhouse tomatoes are homogeneous by origin. Although analysts have commented on the growing greenhouse tomato imports from Canada, they are not arguing, unlike for vine-ripe tomatoes, that greenhouse tomatoes from any of the three North American countries stands out from the rest as a result of factors such as technological advantage.[141] The explanation for the unique price may then be that,

[141] It is recalled from section 8.3.b that a large proportion of Mexican greenhouse growers do not utilize greenhouse technology, such as hydroponics and climate control, to its full extent, which makes these products inferior to those

since the greenhouse growing environment can be better controlled than for field-grown tomatoes, greenhouse product quality may be very similar across production origins. Thus, consumers acknowledge this by recognizing greenhouse tomatoes from all origins as the same product.

In conclusion, tomatoes are heterogeneous by type and, for vine-ripe tomatoes, also by origin. Greenhouse tomatoes are homogeneous by origin. The null hypothesis is then mostly, although not completely, rejected.

11.2.b. Incidence of tariff on Mexican tomatoes

Scenario 1: As the US imposes a tariff on Mexican tomato imports, their quantities and prices decrease, and those for tomatoes from other NAFTA countries increase.

Using the model built in this research, simulations were run to quantify this and the rest of the scenarios. The model was constructed incorporating evaluation result from hypothesis 1. That is, the result that tomatoes are heterogeneous by type and by origin for vine-ripe tomatoes, but not for greenhouse tomatoes, was included. As a result, the model distinguishes tomato demand according to those characteristics and also supply by tomato types and origins.

Simulation results in section 10.3 confirm that Mexican tomato imports, regardless of the tomato type, and their producer price decrease as a result of the tariff, thus rejecting that part of the hypothesis. For tomatoes from the US and Canada, quantities and producer and wholesale prices increase. Therefore, that section of the hypothesis is also rejected. Mexican vine-ripe wholesale price in the US increases as expected too. As such, this part of the hypothesis is also rejected. Therefore, the scenario was successfully quantified.

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planted in a fully equipped facility. However, these Mexican low-tech greenhouse tomatoes may not be categorized as greenhouse tomatoes under the FAS and AMS price data used, so they may not depreciate Mexican greenhouse wholesale price data and thus, Mexican price may equal US and Canadian price. In other words, if low-tech Mexican greenhouse wholesale price is not considered in the Mexican greenhouse data, the incorporation would lower greenhouse wholesale price from that country and it may not equal wholesale price from the US and Canada any more.

11.2.c. Impact of introduction of Central American greenhouse tomatoes

Scenario 2: A partial lifting of the US phytosanitary ban on Central American tomatoes will lead to a substantial increase in exports of Central American greenhouse tomatoes and to a large welfare effect on the US tomato market.

This scenario was investigated in section 10.4. A Central American excess supply function for greenhouse tomatoes was constructed from assumed data, and that function was added to the US tomato market. Lower and upper bounds on supply capacity were assumed. Under the simulations, Central America's exports could be considered as substantial as it achieves 17 to 43 thousand MT annually, which could near Mexico's current capacity. Therefore, the partial lifting may lead to a substantial increase in the region's greenhouse tomato exports.

As for welfare changes in the US tomato market, these vary from -US$7 million to -US$63 million for US producers, from US$14 million to US$110 million for US consumers, and from US$6 million to US$48 million for net US welfare annually. For Mexican producers, welfare decreases by US$3 million to US$23 million, and the decline is from US$2 million to US$15 million for Canadian producers. The welfare effect may thus be largely dependent on the actual export capacity for Central America and the supply elasticity. Overall, the simulation successfully quantified the scenario.

11.2.d. Effect of increase in greenhouse tomato preference

Scenario 3: As US consumer preferences for greenhouse tomatoes increase relative to those for field-grown tomatoes, their consumption and prices increase.

This scenario is quantified with the simulation in section 10.5. As preference for greenhouse tomatoes is increased according to recent trends, greenhouse consumption and prices increase as expected from conceptual models too. Therefore, the scenario is successfully quantified.

11.3. Policy implications

Several points that imply policy prescription emerge from this study's outcome. The first simulation shows the large welfare gains that the US has probably benefited from as it has decreased tariff levels from more than a decade ago to a level of zero tariff. That simulation supports this idea by demonstrating effects of a 10% tariff on Mexican tomato producer prices, which undervalues the actual effects on a full tariff to CIF prices. Under such a scenario, the US would be gaining at least US$14 million less in net welfare as compared to now. Although the US currently has a suspension agreement with Mexican producers, which in effect may limit tomato imports from that country to some extent, other trade barriers are considered low or nonexistent. In order for the US to continue benefiting from efficiency gains, it should maintain incidence of its trade policy low.

Second, it was shown in simulation 3b that Central America's entry to the US greenhouse tomato market may not only create competition for the domestic greenhouse industry, but it could also dampen possible welfare loss for consumers that are increasingly demanding more greenhouse tomatoes. As the increase in preference for greenhouse tomatoes over that for other tomato types is eminent, a possible lack of increased supply to sustain demand levels may deteriorate consumer welfare as wholesale price surges. Prospects for expansion of US production capacity is reported as weak, so increased supply through more imports may be the most cost effective way to ascertain that welfare losses, if they are to emerge, are kept to a minimum. Therefore, the US may consider adopting measures to allow more imports from its NAFTA or CAFTA trade partners that have comparative advantage in providing tomatoes due to their relative proximity to the US. In this sense, the systems approach that the US contemplates employing to greenhouse tomatoes from Central America is a measure that merits attention.

Finally, the magnitude of welfare gain for US greenhouse growers when preference for this tomato type increases is notable, especially in contrast to analysts' comments that suggest poor prospect for that industry. The large welfare gain is due to the size of US greenhouse tomato sales, a unique wholesale price for products from all origins, and a fixed marketing margin. As a result, the greater the sales volume, the more abundant the welfare gain is. However, the same principle also works to the contrary, and the US greenhouse industry would suffer larger losses than its Mexican and Canadian counterparts when greenhouse prices decrease. This could result from, for example, an eminent increase in greenhouse tomato supply. To avoid such situation, the US greenhouse industry may consider implementing measures to distinguish its product from the rest by, for instance, using a special packaging or developing greenhouse varieties that are better accepted to the foodservice industry in terms of cutting characteristics and costs, without sacrificing quality.

11.4. Further research

As there are questions that are beyond the scope of this study but would be useful to have the answers, and the model employed in this research may benefit from certain modifications, topics of further research are discussed. One issue that could further be analyzed is why statistical test results showed greenhouse tomatoes to be more convincingly homogeneous in the winter than in the summer. Given that most statistics that test homogeneity for greenhouse tomatoes provide positive results, this may only be due to data or its manipulation issues such as data set that is not representative of the market or to the weighing of the data by the number of observations. If actual demand characteristics are behind the seasonal difference, then a possible explanation is that the winter demand, which is relatively influenced more by the foodservice sector, does not differentiate between the tomato origins, although the summer demand, where individual consumers dominate, does as there may actually be quality difference according to production origin. Which of the two explanations deserve more credit needs to be explored.

This research may also benefit from estimating the importance of two cost components that vary according to the production origin. These are labor and transportation costs, and incidence of the latter is likely to have significant implications especially for Central America. Labor cost is likely to interest all countries that supply tomatoes to the US. Although it must be recognized that labor cost may be less important for a relatively capital intensive industry as greenhouse production is, it must also be recalled that transnational enterprises move their capital across boarders in search for reducing production costs in an increasingly competitive global economy. On the other hand, the farther production facilities are situated from the large US market, transportation costs naturally will be higher. Therefore, although less expensive labor may attract greenhouse investment to Central America, the increase in transportation costs may make multinational firms to rethink such decision. Importance of these components in the greenhouse production cost structure is therefore useful to identify. Furthermore, this identification process may also clarify implications for modeling the US tomato market.

Other improvements to the model presented in this research are also possible. Elasticities of demand and supply used here depend on the literature, which used different data sources for their approximation or only used assumed values. In particular, demand elasticities are for retail prices and not for wholesale prices, and appropriate supply elasticities for this study could not be found. Although sensitivity analysis shows that, for the given supposed elasticity averages and standard deviations the model is mostly robust to changes in those parameters, rigorously calculated elasticity values cannot fully be substituted by assumed values.

The supply functions that are very simple in their current form as they only respond to own-price changes can further be improved by, for example, reflecting changes for producer prices of other tomatoes. Naturally a complication in this endeavor is that cross-price supply elasticities are not readily known, but, if these are also calculated along with own-price supply elasticities using the data in this research as explained in the last paragraph, then this task would be feasible. Having supply functions that respond to cross-prices would not only be suitable for assessing the effects of production substitution of vine-ripe with greenhouse tomatoes in Mexico as reported, but this model improvement would also be appropriate in incorporating the increasingly integrated North American tomato industry across borders.

Finally, although analysts point that its relevance may be low, the US-Mexico suspension agreement may need to be evaluated analytically to asses its effects on the US tomato market. In this area, only Baylis (2003) has contributed with quantitative analysis to its understanding. As results in that study pointed to ambiguous effects, and analysts do not credit the agreement in significantly distorting the US tomato market, the suspension agreement was not modeled in this study. However, if further research finds substantial impact from this agreement, then the present model should be modified to reflect that type of finding.

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Appendix A. Interview instrument

Overview

The present, evolution and future of:

- Importance of technical regulations (SPS, TBT and GIs) compared to tariffs and other non-tariff measures (for example, seasonal tariffs, import quotas, tariff-rate quotas, automatic licensing procedures, anti-dumping actions, increased tariffs).

SPS issues/TBT issues

- Specific issues of most impact (contentious and successful) for exports and imports:
  - General description of the issues
    - Regulatory goal (Animal health, plant health, food safety, product quality, compatibility, conservation)
    - Market restriction (Market access, market expansion, market retention)
    - Policy instrument (Ban, partial ban, process standards, product standards, package standards, information requirements)
    - Processing level (Bulk, intermediate, final-unprocessed, final-processed)
    - Product category (Fruits and vegetables, grains and seed, livestock and poultry, other categories)
    - Geographic region (US, EU, CACM, others)
  - Identification of the critical point (Infringed/fulfilled WTO Agreement clause and/or domestic key factor managed successfully/unsuccessfully)
  - Data on impact (for each specific issue and overall agricultural trade with relation to technical regulations)
    - Market access (Estimated export/import potential value and product destination/origin)
    - Market expansion (Number of times and value detained, and product destination/origin)
    - Market retention (Estimated export/import value affected and product destination/origin)

GI issues

- Specific issues of most impact for exports and imports
  - General description of the issues
    - Processing level (Bulk, intermediate, final-unprocessed, final-processed)
    - Product category (Fruits and vegetables, grains and seed, livestock and poultry, other categories)
    - Geographic region (US, EU, CACM, others)
  - Identification of the critical point (Infringed/fulfilled WTO Agreement clause and/or domestic key factor managed successfully/unsuccessfully)
  - Data
    - Estimated additional export/import potential value and product destination/origin

Conclusions

The present, evolution and future of:

- Relative importance among the types of technical regulations (SPS, TBT and GIs)
- Relative importance of regulations versus voluntary standards
- Characterization of issues by export destination/import origin (US, EU, CACM)
- Characterization of domestic capacity to manage SPS, TBT and GI issues
- The role of the WTO SPS, TBT and TRIPS Agreements in:
    - Benefiting CA countries
    - Promoting regulatory reform
- Role of regional integration to manage SPS, TBT and GI issues
- Role of CAFTA:
    - Resolution of contentious trade issues related to technical regulations
        - Improvement of CA capacity
        - Estimated change in trade (Market access, market expansion, market retention)
    - On significance of technical regulations
    - Relative importance among types of regulations
    - Relative importance of regulations versus voluntary standards
    - General change in characterization of US-CA trade affected by technical regulations

Appendix B: List of interviewees

Costa Rica (January 14-16, 2004)

Name	Title	Institution
Local government institutions		
José Joaquín Oreamuno	Director, Animal Health Directorate	Ministry of Agriculture and Livestock (MAG)
Alexis Sandí	Sub-director, Animal Health Directorate	MAG
Sergio Abarca Monge	General Director, Phytosanitary Service	MAG
Walter Ruiz	Vice-minister	MAG
Private organizations		
Bart de Lange		Costa Rican Association of Floriculturists (ACOFLOR)
Jorge Benavides	Administrative Manager	BCS Eko-Garantie (Certifier of voluntary standards)
Humberto González	Inspector	BCS Eko-Garantie
Rebeca Sequeira	Executive, Technical Management Department	Costa Rican Chamber of Commerce (CADEXCO)
Alejandro Hernández	Executive Diretor	Costa Rican National Chamber of Poultry Producers
Luis Diego Obando	Agricultural Economist	Livestock Corporation (CORFOGA)
Gerardo Vargas	Project Manager	CORFOGA
Frans Wielemaker	Organic Program Manager	Dole
Michael Boasson	Director	Exportaciones Norteñas (Exporter of nontraditional products)
Erick Quirós	President	Costa Rican National Chamber of Milk Producers (PROLECHE)
International and regional institutions		
Kevin Walker	Director, Agricultural Health and Food Safety	Inter-American Institute for Cooperation in Agriculture (IICA)
Not for Profit Organizations		
Greivin Hernández	Researcher	International Center of Political Economy (CINPE)
Donald Miranda	Associate Researcher	CINPE
Fernando Sáenz	Agricultural Economist	CINPE
Randall Arce		CINPE
Foreign government institutions		
Mark Dulin	Attaché	Animal and Plant Health Inspection Service (APHIS)

El Salvador (October 6-17, 2003)

Name	Title	Institution
Local government institutions		
Amy Angel	Advisor to the Minister	Ministry of Agriculture
Rafael Arévalo	Director, Plant and Animal Health	Ministry of Agriculture
José Soriano	Inspector, Plant and Animal Health	Ministry of Agriculture
Alexis Hernandez	Trade Policy	Ministry of Economy
René Salazar	Director, Trade Agreement Administration	Ministry of Economy
Ana Urbina	Chief, Environmental Health	Ministry of Health
Private organizations		
Ricardo Esmahan	Executive Director	Salvadoran Agricultural and Agro-Industrial Chamber (CAMAGRO)
Ana Leonor Pocasangre	Technical Manager	Salvadoran Corporation of Exporters (COEXPORT)
Giora Rabinovich	Manager for Latin America	Rizk Alla Brothers, Ltd.
International and regional institutions		
Ed Ayers	Agricultural Health Regional Specialist	Inter-American Institute of Cooperation for Agriculture (IICA)
Juan José May	Technical Director, Plant Health	Regional International Organization for Agricultural Health (OIRSA)
Edwin Aragón	Trade and SPS Measures Advisor	OIRSA
Plutarco Echegoyén	Risk Analysis Advisor	OIRSA
Not for Profit Organizations		
Samuel Salazar	Executive Director	Foundation for the Innovation of Agricultural Technology (FIAGRO)
Carlos Orellana	Chief, International Economy	Salvadoran Foundation for Economic and Social Development (FUSADES)
Emma Arauz	Director, Trade Promotion	FUSADES
Eduardo Padilla	Director, Laboratory of Integral Quality	FUSADES
Foreign government institutions		
William Patterson	Director, Natural Resources	US Agency for International Development (USAID)
Rafael Cuellar	Project Manager, Natural Resources	USAID

Guatemala (September 30 - October 3, 2003)

Name	Title	Institution
Local government institutions		
Bernardo López	Coordinator, Policy and Strategic Information	Ministry of Agriculture
Mario Aldana	Coordinator, Norms and Regulations	Ministry of Agriculture
Guillermo Calzia	Advisor, Norms and Regulations	Ministry of Agriculture
Magin Beteta	Chief, Guatemalan Norms Commission (COGUANOR)	Ministry of Economy
Hector Herrera	Staff, COGUANOR	Ministry of Economy
Magda Pineda	Advisor, Trade Policy	Ministry of Economy
Alexander Cutz	Director, Trade Administration	Ministry of Economy
Clara Lucero	Chief of Economic Agreement Application, Trade Administration	Ministry of Economy
Fernando Arceyuz	Chief, Technical regulations and Control	Ministry of Health
Adam Franco	Staff, Technical regulations and Control	Ministry of Health
David Fuentes	Staff, Technical regulations and Control	Ministry of Health
Private organizations		
Hernan Sarmiento	Staff	Guatemalan Association of Non-Traditional Exports (AGEXPRONT)
Ricardo Frohmader	Agricultural Specialist	Chemonics
Luis Calderón	Coordinator	IPM-CRSP Central American site
Jaime Soza	Executive Director	Agricultural and Environmental Integral Protection Program (PIPAA)
International and regional institutions		
Mynor Estrada	Assistant Representative	Food and Agriculture Organization (FAO)
Benjamín Jara	Representative	IICA
Indhira Vaquerano	Consultant, Customs Union Permits Technical Group	Central American Secretariat of Economic Integration (SIECA)
Edna Valenzuela[1]		SIECA
Foreign government institutions		
Stephen Huete	Agricultural Counselor	Foreign Agricultural Service (FAS)
Douglas Ovalle	Agricultural Specialist	FAS
Hans Dietrich Bernhard	Trade Attaché	German Embassy
Brian Rudert	Director, Agricultural Development	USAID

Note: [1] Interview through two phone conversations.

Honduras (January 8 and 9, 2004)

Name	Title	Institution
Local government institutions		
Lizardo Reyes	Director, National Agricultural Health Service (SENASA)	Ministry of Agriculture
Private organizations		
Federico Fiallos	CAFTA negotiator	
Francisco Rodas	Technical Manager	Honduran Association of Poultry Producers (ANAVIH)
Daniel Menjivar		ANAVIH
José Enrique Mejía	Trade Policy Manager	Honduran Private Sector Council (COHEP)
Marco Polo Micheleti		COHEP
Foreign government institutions		
José Ortiz		APHIS
Ana Gómez	Agricultural specialist	FAS
Thomas Hastings	Economic Affairs Attaché	US Embassy
Leyla de Gaytan		USAID

Nicaragua (January 12 and 13, 2004)

Name	Title	Institution
Local government institutions		
Jorge Molina Lacayo	Executive Director	Center for Export Paperwork (CETREX)
Celio Barreto	Advisor	Institute of Rural Development (IDR)
Mario González	Chief of inspectors, Directorate of Animal Health	Ministry of Agriculture and Forestry (MAGFOR)
Julio Hernández	Director of Plant Health	MAGFOR
Urania Ráudez	Directorate of International Organizations	Ministry of Promotion, Industry and Trade (MIFIC)
Private organizations		
Jorge Brenes	General Manager	Association of Nicaraguan Exports of Nontraditional Products (APENN)
Roberto Brenes	Former General Manager	APENN
German Brenes		ICI (Processor and distributor of meat)
Augusto Meléndez	Veterinary Advisor	Nuevo Carnic (A slaughterhouse)
Foreign government institutions		
Steve Olive	Trade and Agribusiness Office	USAID
Christina Olive	Sub-Director, Program Planning and Coordination Office	USAID

US (September 10-12 and November 24 and 25, 2003)

Name	Title	Institution
Local government institutions		
Maritza Colón-Pulano[1]	Deputy Director SPS Affairs	US Trade Representative Office (USTR)
Debbie Subera-Wiggin	Policy Analyst, Center For Food Safety and Applied Nutrition	Food and Drug Administration (FDA)
James Schaub	Director, Office of Risk Assessment & Cost-Benefit Analysis	Office of the Chief Economist, US Department of Agriculture (USDA)
Clare Narrod	Visiting Scientist, Office of Risk Assessment & Cost-Benefit Analysis	Office of the Chief Economist, USDA
Roger Mireles	International Economist, International Trade Policy	FAS
Charles Marston	Policy Analyst, International Trade Policy	FAS
Catherine Fulton	Director for Trade Policy, Western Hemisphere	Animal and Plant Health Inspection Service (APHIS)
Trang Vo	Supervisory Economist, Policy and Program Development	APHIS
Robert Tuverson	Senior Equivalence Officer	Food Safety and Inspection Service (FSIS)
Mary Frances Lowe	Program Advisor, Office of Pesticide Programs	Environmental Protection Agency (EPA)
John Shoaff	Advisor, Office of Prevention, Pesticides & Toxic Substances	EPA
International and regional institutions		
Carlos Felipe Jaramillo	Lead Economist, Central America Management	The World Bank
Foreign government institutions		
Enilson Solano	Counselor for Economic Affairs	Embassy of El Salvador

[1] Interviewed twice.

Appendix C. Objectives, harmonization status and description of Central American SPS notifications

Notifying country: Costa Rica[2]

Doc. (G/SPS/ N/)	Pub. date	Objective[1]				Int'l standard absent	Affected product and issue
		Food Safety	Animal Health	Plant Prot'n	Others		
CRI/1	*June 97*	*x*	*x*			*x*	*Chloramphenicol-based veterinary drugs*
CRI/9	June 97	x					Plants; permissible pesticide residues
CRI/10	June 97	x	x		x	x	Plants; analysis procedures of residues
CRI/11	June 97			x		x	Imported seeds; quarantine pest control
CRI/12	June 97			x		x	Processed plants; import requirements
CRI/16	June 97			x			Certain plant prod's; importation requirements
CRI/18	June 97			x			Plants for propagation; import requirements
CRI/19	June 97			x		x	Fruits, vegetables, tubers; import requirements
CRI/20	Mar. 98			x		x	Plant prod's; verification proc's at origin
CRI/21	Mar. 98	x	x		x		Vegetables; pesticide residue sampling proc's
CRI/22	June 99			x		x	Various seeds; import requirements
CRI/23	Mar. 01	x	x		x		Bovine; BSE
CRI/24	June 01			x	x	x	Plant prod's harboring pests; import reqt's
CRI/25	Jan. 02			x		x	Cucurbitaceae seeds; watermelon fruit blotch
CRI/26	May 02		x		x	x	Var. meats; plant inspection regulations
CRI/27	June 02			x		x	Melon, watermelon seeds; wfb
CRI/28	July 02			x		x	Var. prod's; pink or hibiscus mealy bug (regionalization for products from FL, USA)

Notes: Notifications in italics indicate those that, despite having been received by the WTO Secretariat, the author has identified questions on the appropriateness of their inclusion according to the definition of SPS measures in the SPS Agreement. [1]Regulatory goal classification is as indicated in the objective of the regulation by the notifying country. In a few notifications, the given information did not fit the classification presented above, in which case the author categorized it according to information given elsewhere in the document. [2] 11 notifications for Costa Rica and one for El Salvador are not reported here as they are not on the WTO website.

Source: Author's elaboration based on WTO (1996-2003b)

Notifying country: El Salvador[2]

Doc. (G/SPS/N/)	Pub. date	Objective[1]				Int'l standard absent	Affected product and issue
		Food Safety	Animal Health	Plant Prot'n	Others		
SLV/1	Nov. 96			x		x	Coconut; lethal yellowing
SLV/2	Dec. 96		x			x	Swine; classical swine fever
SLV/3	July 97		x			x	Poultry; Newcastle, avian influenza
SLV/4	Jan. 98	x					Water; consumption standards
SLV/5	*July 98*	*x*		*x*		*x*	*Pesticides; labeling*
SLV/6	July 98			x		x	Plants, plant prod's; transport requirements
SLV/7	July 98			x		x	Plants, plant prod's; import requirements
SLV/8	July 98			x		x	Specified plants, plant prod's; khapra beetle
SLV/10	July 98	x	x			x	Animal feed ; minimum plant specifications
SLV/11	*July 98*	*x*	*x*			*x*	*Veterinary medicines; registration req'ts*
SLV/12	July 98	x	x			x	Dairy produce; zoosanitary requirements
SLV/13	July 98	x	x			x	Meat, prod's; import spec's, insp'n proc's
SLV/14	July 98		x			x	Live swine; classic swine fever control
SLV/15	July 98		x			x	Live bovine; import req's and proc's
SLV/16	July 98		x			x	Live swine; import req's and proc's
SLV/17	July 98	x				x	All meats, prod's; spec's for human cons'n
SLV/18	July 98	x				x	Dairy prod's; pasteurization
SLV/19	May 99	x					Bottled water; specifications
SLV/20	Aug. 99		x			x	Live equine; import requirements
SLV/21	Aug. 99		x			x	Poultry, prod's; import requirements
SLV/22	*Aug. 99*	*x*		*x*		*x*	*Pesticides; specifications*
SLV/23	*Aug. 99*		*x*	*x*			*Calcium nitrate fertilizer specifications*
SLV/24	*Aug. 99*		*x*	*x*		*x*	*Ammonium phosphate fertilizer specifications*
SLV/25	Aug. 99		x			x	Live bovine; bovine brucellosis control proc's
SLV/26	*Aug. 99*		*x*	*x*		*x*	*Enriched superphosphate fertilizer spec's*
SLV/27	*Aug. 99*		*x*	*x*		*x*	*Compound fertilizer specifications*
SLV/28	*Oct. 99*	*x*				*x*	*Milk; control of deceptive marketing practices*
SLV/29	Nov. 99			x	x	x	Various plant prod's; Mealy bug
SLV/30	Mar. 00			x	x	x	Various plant prod's;Mealy bug(same as prev)
SLV/31	Sept. 00	x				x	Poultry, prod's; import requirements
SLV/32	Apr. 01	x				codex adapt'n	Fats, oils; requirements for use in food prep'n

Notifying country: El Salvador (Continued)

Doc. (G/SPS/ N/)	Pub. date	Objective[1]				Int'l standard absent	Affected product and issue
		Food Safety	Animal Health	Plant Prot'n	Others		
SLV/33	Apr. 01	x				x	Vodka; human consumption requirements
SLV/34	Apr. 01	x				x	Spirits; human consumption requirements
SLV/35	Dec. 01	x				coguano adapt'n	Non-carb'd soft drink; consumpt'n req's
SLV/36	Jan. 02		x				Fowl; low pathogenic avian influenza
SLV/37	Jan. 02		x				Cattle; tuberculosis, brucellosis control
SLV/38	Apr. 02			x	x	x	Seeds, fruiting plants; prod'n, imp't req'ts
SLV/39	*Apr. 02*	*x*	*x*	*x*	*x*		*Ag. inputs; registration, insp'n requ'ts*
SLV/40	Apr. 02		x		x		All animals, prod's; var. animal health proc's
SLV/41	*Apr. 02*	*x*	*x*	*x*	*x*		*Organic prod's; req'ts, insp'ns, accred'ns*
SLV/42	*Apr. 02*	*x*	*x*	*x*	*x*		*All prod's, ag. inputs; health accred'n proc's*
SLV/43	Apr. 02			x	x		Plants, prod's, ag. inputs; var. requirements
SLV/44	Apr. 02				x		All prod's, ag. inputs; quarantine proc's
SLV/45	May 02			x	x	x	Rice seeds; unspecified pests

Notes: See notes for Costa Rica's table.
Source: Author's elaboration based on WTO (1996-2003b).

Notifying country: Guatemala

Doc. (G/SPS/ N/)	Pub. date	Objective[1]				Int'l standard absent	Affected product and issue
		Food Safety	Animal Health	Plant Prot'n	Others		
GTM/1	Feb. 96			x		x	Onions; ditylenchus dipsaci and others.
GTM/2	Mar. 99			x		x	Mediterranean fruit fly host fruit; pest-free m.
GTM/3	Mar. 99			x		x	Plant prod's, seeds; import requirements
GTM/4	Mar. 99			x		x	Plant prod's; PRA guidelines
GTM/5	May 99			x		x	Citrus fruit; import requirements
GTM/6	June 99			x		x	Vegetable pro's; Mealy bug
GTM/7	Mar. 01		x			x	Poultry prod's; avian influenza, high or low p.
GTM/8	Apr. 01		x				Var. animals, feedstuff; FMD
GTM/9	Apr. 01	x	x	x	x		Animals susceptible of BSE; import ban
GTM/10	Aug. 03				x	x	All plants, animals; general health prot'n procs
GTM/11	Aug. 03		x	x	x	x	All plants, animals; general health prot'n procs
GTM/12	*Aug. 03*	*x*	*x*	*x*	*x*	*x*	*GMOs; various experimental trial req'ts*
GTM/13	Aug. 03			x	x	x	Var. fruit plant prod's; var. requirements
GTM/14	Aug. 03			x	x	x	Var. citrus plant prod's; var. requirements
GTM/15	Aug. 03			x	x	x	Var. plant prod's; pink hibiscus mealy bug
GTM/16	Aug. 03			x	x	x	Var. plant prod's; var. requirements
GTM/17	Aug. 03		x		x	x	Animals, hydrobiological products; im't req'ts
GTM/18	Aug. 03	x				x	Hydrobiological products; plant requirements
GTM/19	Aug. 03			x	x	x	Var. plant prod's; pepper fruit fly
GTM/20	Aug. 03			x	x	x	Mediterranean fruit fly host fruits; pest-free m.

Notes: See notes for Costa Rica's table.
Source: Author's elaboration based on WTO (1996-2003

Notifying country: Honduras

Doc. (G/SPS/ N/)	Pub. date	Objective[1]				Int'l standard absent	Affected product and issue
		Food Safety	Animal Health	Plant Prot'n	Others		
HND/1	Nov. 96			x			Rice; fumigation for Tilletia Barclayana
HND/2	Apr. 97				x		Poultry; salmonella
HND/3	Oct. 00	x	x		x		Var. fowl, prod's; var. diseases
HND/4	May 01		x				Poultry, prod's; ban on Salvadoran poultry

Notes: See notes for Costa Rica's table.
Source: Author's elaboration based on WTO (1996-2003b).

Appendix D. Intraregional agricultural and food trade-related SPS and TBT complaints

Receptor of complaint	Case number	Description	Dates	
			Complaint[1]	Resolution[2]
Complainant: Costa Rica				
El Salvador	CR/ES/1	El Salvador has not finalized inspection of certain Costa Rican factories, an inspection report has not been sent for a plant, and a cold meat plant has not been recertified, impeding exports.	11/8/01	2/27/02
Honduras	CR/HN/1	Honduras requires original import permits for Costa Rican products that are in transit in its territory, which are normally given at the importing country.	11/8/01	2/27/02
	CR/HN/2	Honduras has not finalized inspection of certain Costa Rican poultry plants, it has not finalized inspection reports, or it claims that import permits are expired, impeding Costa Rican poultry exports.	4/18/02	Pending
	CR/HN/3	Honduras requires a phytosanitary permit for international transit for Costa Rican products that transit through its territory to Guatemala.	8/8/02	3/13/03
Nicaragua	CR/NI/1	Effective November 1, Nicaragua will impose a measure that requires a certificate by a competent authority indicating whether imported foods are made from GMOs.	11/8/01	12/5/01
	CR/NI/2	Nicaragua has not finalized reports on inspections made in June and July of 2000 on poultry product factories, due to which Costa Rica cannot export respective products.	11/8/01	Pending
Complainant: El Salvador				
Costa Rica	ES/CR/1	Costa Rica imposes obstacles for a Salvadoran company that exports poultry products despite compliance with sanitary requirements.	8/8/02	8/8/02
Guatemala	ES/GU/1	Guatemala's Law of Alcohol and Alcoholic Beverages contains obstacles to trade for Salvadoran products.	2/27/02	1/8/03
	ES/GU/2	Guatemala emits zoosanitary permits for Salvadoran poultry products, which they immediately revoke.	2/27/02	2/27/02
	ES/GU/3	Guatemala requires Salvadoran wheat flour to be stored in customs until administrative and quality inspection procedures are conducted.	2/27/02	11/4/02
Honduras	ES/HN/1	Honduras requires poultry used for production in a Salvadoran cold meat plant to be of Honduran origin, claiming existence of avian influenza in El Salvador.	2/27/02	Pending
	ES/HN/2	Honduras conditioned imports of Salvadoran powder milk on certification of the production and bottling plants.	2/27/02	7/2/03
	ES/HN/3	Honduras requires a phytosanitary permit for international transit for Salvadoran products.	4/9/03	Pending
Nicaragua	ES/NI/1	Nicaragua imposes obstacles for a Salvadoran company that exports poultry products despite compliance with sanitary requirements.	8/8/02	8/8/02

Appendix D. (Continued)

Receptor of complaint	Case number	Complaint	Dates	
Complainant: Guatemala				
El Salvador	GU/ES/1	El Salvador rejected issuing phytosanitary permits to Guatemalan rice, impeding imports.	11/8/01	2/27/02
	GU/ES/2	El Salvador allows transit of Guatemalan potato through its territory to Nicaragua with phytosanitary restrictions due to an alleged risk.	11/8/01	1/10/02
	GU/ES/3	El Salvador banned transit of Guatemalan potato through its territory due to alleged risk of potato cyst nematode declared by Honduras.	2/27/02	2/27/02
	GU/ES/4	El Salvador banned Guatemalan live swine and its products alleging risk of classic swine pest.	2/27/02	Pending
	GU/ES/5	El Salvador banned Guatemalan poultry products alleging avian influenza risk.	2/27/02	2/27/02
	GU/ES/6	El Salvador threats to issue a technical standard that would ban Guatemalan vodka imports if their methanol content does not abide by Guatemalan standards.	2/27/02	2/27/02
	GU/ES/7	El Salvador banned Guatemalan coconut imports due to lethal yellowing in the Atlantic Coast, but later admitted imports from a Pacific Coast region.	7/3/02	4/9/03
	GU/ES/8	El Salvador rejected import permits for wheat flour, impeding imports.	11/4/02	11/4/02
Honduras	GU/HN/1	Honduras does not accept mutual recognition of dairy products.	11/8/01	2/27/02
	GU/HN/2	Honduras requires original phytozoosanitary import permits for Guatemalan products that are in transit in its territory, which are normally given at the importing country.	11/8/01	2/27/02
	GU/HN/3	Honduras banned Guatemalan potato imports alleging potato cyst nematode.	11/8/01	Pending
Complainant: Honduras				
Guatemala	HN/GU/1	Guatemala banned Honduran dairy products despite having import certificates.	8/8/02	8/8/02
	HN/GU/2	Guatemala has not finalized inspection reports of Honduran quail and meat plants, impeding exports.	8/8/02	8/8/02
Complainant: Nicaragua				
Costa Rica	NI/CR/1	Costa Rica issues an import permit for Nicaraguan rice and wheat after a cumbersome bureaucratic procedure that lasts for more than 2 weeks.	12/5/01	2/27/02
Guatemala	NI/GU/1	Guatemala does not issue import permits for Nicaraguan poultry products, impeding imports.	12/5/01	2/27/02
Honduras	NI/HN/1	Honduras does not issue certifications to slaughterhouses and dairy producers, impeding imports.	10/2/02	Pending

Notes: The cases presented here are those that appear on SIECA's matrices of "Measures Contrary to the Intraregional Free Trade (MCIFT)" published between November 2001 and November 2003. [1] Date of publication of SIECA's MCIT matrix on which the complaint first appeared for the period of time the MCIFT matrices were available. [2] Date of publication of SIECA's MCIFT matrix on which the complaint last appeared. If the complaint appeared on the last available matrix, it is assumed not to be resolved.

Source: Author's elaboration based on SIECA's MCIFT matrix.

Appendix E. US complaints on Central American agricultural and food trade-related SPS and TBT regulations (2002)

Receptor of complaint	Case number	Description
Costa Rica	US/CR/1	Costa Rica's process of obtaining standard SPS documentation is often cumbersome and lengthy, resulting in lost earnings for owners of shipments.
El Salvador	US/ES/1	El Salvador has placed alleged arbitrary sanitary measures, which are reportedly not applied to domestic products, on US poultry imports.
	US/ES/2	El Salvador requires rice imports from the US to be certified free of Tilletia Barclayana to avoid fumigation at the cost of the importer.
	US/ES/3	El Salvador rejects imports of some processed foods that its laboratory analysis finds food safety problems, although the products were approved in the US.
Guatemala	US/GU/1	Guatemala requires separate registration of products with identical composition if size or form varies, a process which is lengthy as trained personnel is lacking.
Honduras	US/HN/1	Honduras has maintained a poultry import ban for some time.
	US/HN/2	Honduras has imposed SPS restrictions to the importation of pork, poultry and dairy products.

Source: Author's elaboration based on USTR (2003b).

Appendix F. Most prevalent issues in interviews by country

Costa Rica	
Issue	Description
High governmental and private sector SPS capacity	High governmental SPS capacity was cited in export certification, control of phytosanitary measures, risk assessment, and in supporting the creation of new international standards such as EurepGap. It is important to note that high capacity in these areas may not only have come from the country's higher wealth, but also from the government's prioritization of actions to support agricultural, and especially plant, exports.* The government's initiative to maintain Costa Rica's agricultural export opportunities open is perceived by, for example, its aggressive participation in international meetings such as in establishing standards like the EurepGap.* Knowledge of the country's strengths and weaknesses is essential in establishing a SPS system that allows successful exports. Comments by Costa Rican government officials demonstrated awareness of their advantages and disadvantages.* One of these comments referred to the request for pesticide tolerance to the US EPA as being too expensive, whereby Costa Rica presumably chooses to export crops for which pesticide tolerance has already been set.* This strategy would avoid bitter experiences such as the one that Guatemala has had in the snow peas and chlorothalonil case (See section 5.5.b.i.). In another example, Costa Rica also seems to avoid exporting crops for which a PRA must be conducted, as the country has sent APHIS the lowest number of PRA requests in the region (See Table 5.15). Again, avoiding having to ask for PRAs mitigates potential SPS-related problems in exporting to the US. Finally, an interviewee noted that the Costa Rican government has supported small and medium agricultural firms.* This may be an important initiative in the context of SPS issues as nontraditional agricultural exporters, who frequently face technical regulation issues in exporting to the US, are presumably mostly small and medium firms (See summary table for Guatemala). In summary, the evidence may point that Costa Rica has established a firm SPS strategy that has allowed it to successfully export many agricultural products to the US. As a result of the high Costa Rican SPS capacity, the private sector elaborates products with higher safety and quality, because of which more foreign investment for export products was reportedly obtained. Specifically, an interviewee commented that in 2003 much agricultural and food international investment was diverted from Guatemala to Costa Rica.* Consequently, Costa Rica is said to have a comparative advantage in managing technical regulations as reported below.

Appendix F. Costa Rica (Continued)

Issue	Description
High confidence in meeting legitimate technical regulations	Unlike most interviewees in other countries, many Costa Rican private sector interviewees do not view the majority of SPS measures as disguised means of protection.* For example, SPS measures in their export markets were just referred to as “regulations that exporters need to comply with” instead of as, for instance, burdensome measures even if legitimate.* Contrary to viewing SPS measures as unwanted, and perhaps owing to Costa Rica’s high SPS capacity, an interviewee welcomed them and expressed that Costa Rica has competitive advantage in exporting to markets with stricter regulations.* This is not to say that no complaint against SPS measures in other countries was raised. Most notably, the poultry sector has doubts about the legitimacy of trade restricting measures or practices implemented in the US and Honduras (See sections 5.5.b.i. and 5.5.b.iii.). Additionally, although Costa Rica may avoid requesting PRAs in most cases, it has found it necessary to submit such a request in the ornamental plant length case. Moreover, at least a few interviewees expressed some concern for the possibility of introducing discretion with the Bioterrorism Act, and one interviewee referred to compliance with the Act’s provisions such as the one that requires notification of shipments prior to shipping as “an important challenge”. However, the general level of concern for technical regulations in export markets seemed to be lower in Costa Rica than in other countries in the region.* The scarce concern of not being able to meet SPS regulations was also presumably revealed by a few private sector interviewees who showed relative indifference to the lack of a SPS-related dispute resolution mechanism in CAFTA.* To illustrate this point, when asked whether the lack of a dispute resolution mechanism on SPS issues in CAFTA was a concern, one interviewee replied “I haven’t thought about it”.* Success stories in exporting to the US include, among others, pineapples (within the third category of main Costa Rican agricultural exports) and melons (within the fifth category) (See Table 3.12).
Friction with regional partners due to developmental gap	* A consequence of Costa Rica’s higher wealth and SPS capacity that differentiates it from other countries in the region is that trade relations with neighboring countries may be more contentious than if Costa Rica’s development level was similar to the others’. For example, some Costa Rican interviewees expressed dissatisfaction with the lack of intention by regional partners in fortifying the legal status of regional institutions. Specifically, those interviewees reported the country’s longstanding efforts to establish a binding formal regional trade dispute resolution mechanism under SIECA, which others objected for a long time and which has at last come into reality (See section 5.2.b.). It was noted that the difference in stance in this issue may be partly due to a difference in the level of rule of law that was accustomed to in countries in the region, with a higher level found in Costa Rica.

Appendix F. Costa Rica (Continued)

Issue	Description
Friction with regional partners due to developmental gap (Continued)	* A sector-specific dispute that partly relates to the divergent developmental level in the region may be that of the poultry trade (See section 5.5.b.iii.). It may be the case that, as a Costa Rican interviewee explained, trade partners in the region did not welcome Costa Rica's attempt to conduct risk assessment on intraregional poultry imports after the country's high SPS capacity allowed it to be recognized by the US as the only country in the region that was free of the Newcastle disease in 1997. Costa Rica's attempt may have marked the beginning of Central America's multilateral "poultry trade war" that has lasted for years and has prompted Costa Rica to present a counter notification against Honduras at the WTO SPS Committee. With respect to the poultry dispute with Honduras and the Costa Rican perception of weakness in intraregional institutions such as SIECA, it is notable that an interviewee considered the present reestablishment of trade as lacking certainty since he considered that Honduras can impede Costa Rican imports at any time under any reason considered by Costa Rica to be unjustified.
Organic farming and its high costs	Specific issues related to organic farming were raised much more frequently in Costa Rica than in other Central American countries as Costa Rica reportedly has more organic acreage. Organic farming was reported as being costly due to a lack of harmonized standards, high certification costs, and difficulty in achieving a balance with SPS regulations in importing markets. For example, an interviewee commented that the use of ethylene gas for ripening was permitted by the US organic standard but not by that in the EU, which makes it necessary for a firm to produce under separate conditions according to the market or to concentrate on one market.* Certification is costly as many organic farms are small. Finally, some examples to illustrate the balance between organic standards and SPS regulations were brought up by interviewees. In one illustration, it was reminded that even if organic products were certified as such, they still had to comply with SPS regulations in the importing country.* Therefore, if a pest of interest was found among imported products, the whole organic shipment may become regular product if it was fumigated.* The organic status also makes it more difficult to eradicate pests onsite as the use of pesticides is normally not permitted. Despite the reported problems in organic farming, Costa Rica's high incidence in this activity may be a reflection of its stronger capacity to export to the US and the EU, where organic product demand is higher (See Table 3.11).

Note: Paragraphs starting with, or sentences ending with a * indicate data which was primarily obtained through the interview process.

El Salvador	
Issue	Description
Alleged arbitrariness of US customs procedures	Many interviewees protested against alleged arbitrary actions by US customs officials, especially in relation to their tariff classification of Salvadoran cheese that results in application of divergent SPS measures (See section 5.5.b.i.).* In this manner, a particular type of cheese can reportedly be accepted or rejected according to the tariff classification that a customs official happens to assign to a consignment, and the assignment was said to vary systematically over time and over ports-of-entry.* The claimed lack of uniformity by customs officials in identifying products was said to be a trade facilitation issue that needed to be improved. This Salvadoran complaint was supported by a few interviewees in other countries in the region. The action by US customs officials may also be a cause for concern by many Salvadorans and other Central Americans that the Bioterrorism Act could be used in a discretionary manner, as the Act allows customs officials to detain imports suspected of intentional biological contamination that poses human health risks (See section 5.5.b.i.).
Priority products of concern/ interest in trade with the US	A relatively small number of products was identified as being of main concern or interest for Salvadoran interviewees in technical regulations and trade with the US. The small number may reflect the smallest agricultural export value to the US in the region (See Table 3.11). Contrary to a consequently expected low interest on the issues, however, interviewees were clear in expressing their stake in technical regulation issues, as it was the case in Guatemala and Honduras. The presence of high interest in technical regulation issues in trade with the US may partly be explained by the highest refusal rate by the FDA in the region (See Table 5.7). Most notable among the products for which the interviewees showed interest in referring to was dairy products, mainly cheese, as described above. Salvadoran cheese is among products with the most FDA refusals in the region (See Table 5.9). Due to its numerous refusals in the past Salvadoran cheese is under FDA's automatic detention, which detains all imports, instead of a sample of them, for inspection. Technical assistance to improve export performance for cheese, along with the presence of FDA officials in El Salvador for guidance, was voiced by an interviewee. Poultry was presented as another product of concern in exporting to the US, as imports are permitted from only four countries in the world that do not include any Central American country (See section 5.5.b.i.). Interviewees considered that Salvadoran poultry was competitive for exporting into the US, but reportedly illegitimate US SPS barriers do not give hope for exporting. It is interesting to note that the US also faces SPS barriers for its poultry exports to El Salvador (See section 5.5.b.ii.).

Appendix F. El Salvador (Continued)

Issue	Description
Priority products of concern/ interest in trade with the US (Continued)	* Classic swine fever deters Salvadoran pork from entering the US. Another ethnic product that was frequently mentioned was *loroco*, which recently obtained admissibility after about 5 years of waiting period to clear APHIS' PRA process (See section 5.5.b.i.). Many interviewees lamented the lack of a formal SPS dispute resolution mechanism where cases that have posed market access difficulties to El Salvador could be evaluated (See section 5.4).* On a positive note, as in Nicaragua, green peppers and tomatoes were mentioned as products with prospects under CAFTA negotiations as their conditional admittance to the US may be made possible under a systems approach and the admittance process may be speeded up (See section 5.4).*
Necessity to raise the level of awareness on SPS issues	* There were many opinions that both the public and private sectors' awareness on SPS issues had to be raised. Political support on SPS initiatives is reportedly low, and the private sector needed to know technical requirements in the US better. To illustrate the problem, an interviewee mentioned that labeling regulation violations were high since "some producers put any label that only complies with domestic regulations when exporting". In another interviewee's words, "the private sector needs to find solutions". * The necessity, as expressed by many interviewees, to raise the level of awareness on technical regulations (and voluntary standards) may be relevant to another comment frequently made, that voluntary standards were becoming more obligatory. This type of opinion was also expressed by interviewees in other countries. Presumably this opinion refers to the increasing difficulty of selling products, especially in developed countries, that do not comply with particular voluntary standards. A case in point for Central America is that of coffee, whose fall in international prices has forced some producers to seek specialty coffee markets that can be accessed by complying with voluntary standards such as those of fair-trade and environmental friendly (shade-grown coffee) (See sections 3.4. and 5.1.). In this case, voluntary standards may practically becoming obligatory for many coffee firms to survive in the business, and lack of awareness of the importance of markets created by such standards may mean the loss of an important opportunity for a firm.
Peculiarities on intraregional trade	Some peculiarities of intraregional trade that, contrary to the reduction in trade disputes, highlight problem areas were mentioned. An interviewee noted that part of the reason for reduction of disputes was that there was a "gentlemen's agreement" to not intent exporting into other producers' domestic market, thus avoiding a possibility for conflict.* This characterization was said to especially apply in poultry trade. Another interviewee depicted the lowering of disputes as one in which a "stable equilibrium" had been reached, so that there may not be any more reduction in the number of disputes.* On another dimension of

Appendix F. El Salvador (Continued)

Issue	Description
Peculiarities on intraregional trade (Continued)	intraregional trade, it was mentioned that border control in Central America was deficient, because of which diseases can be transmitted with ease. This point may add to an idea that the basis for imposing many SPS measures among most of the countries in the region could be questionable as an importing country may be likely to already have the disease in question.

Note: See notes for Costa Rica.

Guatemala	
Issue	Description
WTO SPS Agreement in Guatemala	* In Guatemala, as in other countries in the region, many interviewees shared the opinion that the SPS Agreement was “a good framework” that had promoted regulatory reform in member countries. An interviewee appreciated his country’s membership in the WTO and the invaluable information that his country was able to gather by attending the SPS Committee meetings in Geneva (See section 5.2.a.). However, Guatemala’s struggle to utilize the Agreement was also revealed. For example, Guatemala only began to notify a somewhat substantial number of measures in 1999, and the majority of new and modified regulations previous to that year were not reported to the WTO (See Table 5.3.). It was also pointed out that many of the SPS government officials did not even know the Agreement.* Similarly, these officials would not know “how to compose a letter to the WTO” in cases where such communication was necessary, such as when presenting a counter notification or when defending the country’s measures.* Furthermore, Guatemala’s, and other Central American countries’, recent participation at the WTO SPS Committee meetings have only been made possible with funding by the USDA and IICA (See section 5.2.a.).
Medfly as a basis for US ban of Guatemalan products	* Guatemalan interviewees were very aware of US concerns of introducing the Medfly through imports from Guatemala (See section 5.5.b.i.). The Medfly, which can be carried by a variety of fruits and vegetables from Guatemala, such as mango, papaya, green peppers and tomatoes, was described by an interviewee as “the first barrier to export” to the US. Many interviewees questioned the veracity of the US claim that it is free of the Medfly, noting that there were outbreaks in Florida, Arizona and California. These interviewees believed that the outbreaks were not due to pest-carrying imports into the US but to Medfly population that has been established there, thus invalidating legitimacy of the US measure. The US has admitted Peten, a remote area in Guatemala bordering Mexico and where the US has cooperated to eradicate the pest, as free of the Medfly. Consequently, some crops grown there are allowed to the US with more ease. However, for the most part Guatemalan products that could be susceptible to carrying the Medfly must first clear the long PRA process (See section 5.5.b.i.). A notable side effect of Guatemala’s struggle to export products that suffer from pests and diseases such as the Medfly is that farmers combat the intruders, usually with an intensive use of chemicals such as pesticides. Such strategy was reported even in Costa Rica where, next to Guatemala, a relatively

Appendix F: Guatemala (Continued)

Issue	Description
Medfly as a basis for US ban of Guatemalan products (Continued)	high US refusal rate among Central American countries was found due to pesticide residues (See Table 5.10). However, unlike Costa Rica, it seems that Guatemala has not come to successfully attend the pesticide rejection problem or the agricultural sector that seems to struggle the most with SPS-related problems (See summary table for Costa Rica).
NTAE crops, small producers and SPS issues	* A few interviewees pointed out the significance of the fact that NTAE crops were the most subjected to technical regulations and were suffering losses from frequently failing to comply with them (See section 5.5.b.). First, although their share in exports is still lower than that of traditional export crops, NTAE crops are promoted to lower economic dependency on a few traditional export crops. Second, sustaining NTAE crop production is important for welfare in the rural areas as most producers involved are small and poor farmers that may not have means to avoid the impact of reduced farm income from rejected exports as, for example, other employment options may be limited. That many farmers affected by SPS measures are small is also of importance in relation to their low SPS management capacity. To illustrate, an interviewee noted that capacity to conduct PRAs was limited in Central America, and especially among small and medium firms. In summary, small farmers are vulnerable in facing SPS measures threefold: Because their crops are more likely to be regulated, their SPS capacity is especially low, and they may have limited employment alternatives.
Specific issues of concern/interest in trade	A myriad of specific trade complaints were aired by interviewees but those that refer to exports to the US, reflecting its highest share as a receptor of Guatemalan exports, were mentioned more frequently than others (See Table 3.11). Among the most notable was the raspberries-Cyclospora case (See section 5.5.b.i.). The perception by many interviewees in this case was that the US did not obtain firm results to support its ban, as a US government official reportedly admitted that accuracy of the particular test used was only 30%.* Therefore, it was thought that the US was only trying to protect the economic interests of Californian producers. Many interviewees also lamented the snow peas-chlorothalonil case, in that it was claimed that the US unjustly had not set the pesticide tolerance level, and the ornamental plant case (See section 5.5.b.i.). Poultry, as for most other Central American countries, is also a product that has been contentious for Guatemalan trade (See also summary tables for Costa Rica and El Salvador). Finally, greenhouse green pepper and tomato exports to the US were said to be products with prospects in the future (See section 5.4.).*

Note: See notes for Costa Rica.

Honduras	
Issue	Description
Lack of application of the WTO SPS Agreement	* A few interviewees argued that the WTO SPS Agreement was not applied adequately, even by developed countries. An interviewee added that, contrary to its spirit, the Agreement has especially been abused "to close borders". Violation of transparency, equivalence recognition and least trade restrictiveness principles were especially noted. Special attention was paid in describing the slow response time by the US in attending Honduran request to recognize the country as free of the Newcastle disease and a region that is free of the Medfly (See section 5.5.b.i.). US legislation reportedly does not specify a response time for such requests, and this was interpreted to represent a lack of transparency. Agreeing on a response timeframe for SPS-related requests and for resolving SPS disputes was noted to have been a priority issue for Central American countries in CAFTA negotiations, but an agreement could not be reached with the US. The lack of US concern on this issue was noted as a source of frustration for the region as the US expects prompt response on SPS issues from Central America when requested. This issue was characterized as one in which symmetry was lacking, and was echoed in the words of a Guatemalan interviewee (See section 5.5.b.i.). As a result of alleged violation of the SPS Agreement by export markets, an interviewee noted that Honduran exporters are discouraged to export as they are unable to overcome reportedly illegitimate SPS measures.* In all, an interviewee thought that the SPS Agreement has not helped in having more trade. To the contrary, there was an opinion that the SPS Agreement was formulated to inhibit imports into developed countries.* This view was also reflected in opinions of a few interviewees in other countries (See section 5.2.a.).
Importance of SPS measures in CBI and CAFTA	Although CBI and CAFTA provide low-tariff access for many Central American agricultural products to the US market, the high level of NTBs, including SPS measures, was noted (See sections 3.3. and 5.5.b.i.). It was expressed that this fact, compounded with effects of subsidies in the US and the region's generally low SPS capacity, meant that Central America could not take full advantage of the low tariffs. A historical perspective on this matter was provided by a comment that, in the past, bananas occupied a much higher share in agricultural exports than they do now. Traditional agricultural export crops such as bananas usually do not face technical regulation problems in Central American trade, so technical regulations were not of such concern for Honduras as they are nowadays where its agriculture is more diversified (See section 5.5.b.).

Appendix F: Honduras (Continued)

Issue	Description
Low level of technical assistance through CAFTA TCB	* Interviewees expressed opinions that TCB funds were only reoriented from related activities and thus did not represent new funds, were lowered from initially reported levels, or were too low to make an impact (See section 5.4.). Most interviewees that talked about TCB thought that more cooperation than promised was needed. This point is reflected by a comment, also found during interviews in other countries, that under CAFTA, Central America may face technical problems in adjusting its SPS capacity to compete with products from the US under new trade rules. It is noteworthy that the US has provided important technical assistance related to trade and SPS issues in the region (See section 5.4.). In the case of Honduras, the US cooperated in eliminating or reducing the incidence of poultry diseases, including the Newcastle.* However, this example illustrates a point made by an interviewee that international cooperation should be well focused. Efficacy of the US-assisted program may be called into question since, as illustrated above, the US does not seem to follow with a next step to recognize Honduras as free of the Newcastle disease.

Note: See notes for Costa Rica.

Nicaragua	
Issue	Description
Evolution of Central American trade and SPS measures	* Many opinions on Central American trade were expressed (See section 5.2.b.). An interviewee expressed that intraregional trade was the most problematic, another thought that "95% of all trade disputes were for political reasons", and an exporter representative expressed that his firm was not exporting to a particular country in the region due to "too many (SPS-related) problems" that the importing government places. Concretely, interviewees expressed that border inspections and documentation requirements were used as disguised means to protect domestic production interests. A private sector interviewee that exports to other countries in the region expressed that his firm was "habituated" to work in such environment. Opinions that regional partners imposed more questionable technical regulations are partially supported by the higher complaint reception rate due to complaints by countries in the region than that due to US complaints (See section 5.5.a.ii.). The opinion that international standards were adopted in the region to impede, rather than allow, more imports is also insightful in understanding the ingenuity utilized in the region to possibly restrict trade.* On the other hand, one of the aforementioned interviewees said that recent progress in regional integration has improved trade relations in the region and that they could further improve.* The presence of such recent progress is partially supported by the decreasing complaint reception rate for complaints by countries in the region. As a concrete example where integration has moved ahead, progress in regional harmonization was cited by several interviewees.*
The meaning of CAFTA	In a broad sense, several interviewees expressed that CAFTA provided a permanent framework under which preferential market access benefits under the CBI were secured as a free trade agreement replaced a unilateral initiative. Relative to technical regulations, three issues were emphasized as having special impact. One such issue is, as communicated by an interviewee, the US petition to the region to better comply with WTO Agreements that relate to technical regulations.* That the region is possibly lagging behind in complying with the Agreements is implied by, for example, Nicaragua's lack of notifications to the WTO SPS Committee by September 2003. The preoccupation by the US for the region to comply with the WTO Agreements is reflected by the letter by US senators as presented earlier (See section 5.5.b.ii.). The importance of safeguards and phase-out periods was noted by an interviewee. In the context of technical regulations, an adequate setting of these mechanisms may be important so that these regulations are not

Appendix F: Nicaragua (Continued)

Issue	Description
The meaning of CAFTA (Continued)	incorrectly used to protect local production as some interviewees expressed as a concern. * On a positive note, systems approach was frequently cited by interviewees as an innovative instrument that the region will be able to use in obtaining admissibility of several crops to the US through CAFTA negotiations. Crops of interest to Nicaragua that could be subjected to systems approach are *pitahaya*, papaya, green peppers and tomatoes, all of which are potential carriers of the Medfly. The new possibility of admissibility with systems approach is one of the concrete manners by which CAFTA was seen as an opportunity for Nicaragua. It is interesting to note that Nicaraguan interviewees on average seemed to express a more optimistic attitude towards CAFTA.* Although interviewees did not highlight this point, this optimism may partly be reflected by the country's relatively low FDA import refusal rate, which is the second lowest in the region following Costa Rica, and by the lack of important technical-regulation-related trade complaints by the US (See Table 5.7 and Appendix E.).
Benefits and obligations under the WTO	Some interviewees noted that the WTO Agreements had brought benefits to Nicaragua but that countries were still placing many illegitimate technical regulations, especially within the region as described above. Relative to benefiting from the special and differential treatment principle, for example, there was a complaint by an exporter of beef that the new USDA BSE regulations regarding beef processing did not consider his company's needs to reconvert its plant (See section 5.5.b.i.).* Furthermore, that interviewee considered the regulations to be overly restrictive and thus in violation of the least-trade-restrictiveness principle, and was unhappy that the US was presumably imposing its will utilizing its political clout.* In general, an exporter claimed that national governments placed SPS barriers when they were not interested in importing a particular product. While Nicaragua may not have been fully benefiting from the WTO Agreements, there are also indications that the country was not fulfilling its commitments. For example, Nicaragua had not notified any measure to the WTO SPS Committee by September 2003 (See section 5.2.a). An interesting note is that, following Nicaragua's share of concern with the US on the bean case against Mexico, a WTO official visited the country in mid 2003 to request that the country notify its SPS measures.* Nicaragua followed with notification of 18 measures. Aside from revealing Nicaragua's incompliance with the WTO SPS Agreement, this case illustrates that the system created by the Agreement may not be functioning smoothly.*

Appendix F: Nicaragua (Continued)

Issue	Description
Entrepreneurship as a determinant of low SPS capacity	Several interviewees acknowledged that a low entrepreneurship in Nicaragua contributed to its low SPS capacity. An interviewee thought, on the question as to why violation of US labeling regulations was the most numerous reason for FDA import refusal for most countries in the region, that infringing exporters simply think that they “can get away with” failing to comply with those regulations, and thus decide to neglect them. As a result, many exporters do not have a good knowledge of regulations in their export markets.

Note: See notes for Costa Rica.

Appendix G. Estimation of seasonal US fresh tomato production for domestic supply by type

Although it is recognized that plum, or Roma, tomatoes may be accounted for in the data, annual tomato production statistics from the National Agricultural Statistics Service (NASS) (2003) are taken as the combined production volume for field tomatoes of mature green and vine-ripe tomatoes as the share of plum tomatoes within total tomato production is unknown. This assumption is likely not to affect subsequent analyses as plum tomato production volume is low.[1] The shares of mature green and vine-ripe tomatoes are not known either, but several hints from the literature lead to their estimation.

First, it is reemphasized that the share of total US tomato production is approximately 30%, 40% and 30% for California, Florida and the rest of the states, respectively (See discussion for Table 8.2). California's tomato production share by type is distributed in the following manner: mature green (57%), vine-ripes (25%), plum (17%) and other tomatoes (1%) (Cook, 2002). The ratio of California's mature green and vine-ripe production is then about 7 to 3. Cook (2002) suggests that Florida's mature green production may be around 90% of its total tomato production, and the rest (10%) is mostly dedicated to vine-ripes as Florida is not a large greenhouse producer and it presumably does not produce much of smaller types of tomatoes. In the rest of the states, Cook (2002) notes that the majority, here arbitrarily understood to be about 90%, of their production is in vine-ripes. As for Florida, the share of specialty tomatoes is presumably low in these states, and the share of mature greens is subjectively set at 7% of their total production.

To obtain estimates of the shares of regional mature green production in US field tomato production, the shares in the US production of regional production in California, Florida and the rest of the states (30%, 40% and 30%) are multiplied by the shares of mature green production within the mature green and vine-ripe tomato group in each region (70%, 90% and 7%, respectively). These figures yield 21%, 36% and 2% as the shares of mature green production of California, Florida and the rest of the states, respectively, in the US (mature green and vine-ripe) tomato production. The national share of mature green production is thus calculated by adding

[1] Precise information on plum tomato production is not readily available. Nevertheless, Cook (2002) reports that plum tomatoes account for 17% of Californian tomato production, but the share in production in other states is seemingly low. Therefore, US production of plum tomatoes is presumed to be small.

the regional shares of mature greens in the national production. That sum results in a national mature green share of about 60% versus 40% for vine-ripes, or the remainder of 100%. Then, the mature green and vine-ripe production quantities for US consumption are computed by subtracting the mature green and vine-ripe export quantities, obtained from the Foreign Agricultural Service (FAS) (2004), from the aggregate mature green and vine-ripe production quantities, and by multiplying by the respective share for each type of tomato.

Seasonal share of combined mature green and vine-ripe production was estimated to compute seasonal shares of each tomato type. Monthly production figures could not be retrieved from NASS (2003). Therefore, monthly tomato production from the Agricultural Marketing Service (AMS) (2004), which includes tomato output from representative states, was used in such a manner to assume that the monthly share of production in annual output registered by NASS equaled to AMS monthly production share. After calculating monthly production, seasonal production is the sum of production in the months corresponding to each season.

To disaggregate the seasonal share of mature green from vine-ripe production, note in Figure 8.1 that all tomato production in California and the rest of the US takes place during the summer (May through November). Conducting calculations as the ones above for mature green shares, it can be estimated that Florida, California and the rest of the states account for about 4%, 9% and 28% of the vine-ripe production in national tomato (i.e., mature green and vine-ripe) production. Consequently, 90% (or (9+28)/(4+9+28)) of all vine-ripe production takes place in either California or the rest of the states. Therefore, summer vine-ripe production accounts for 90% of yearly vine-ripe production. Mature green production amount in each season can then be calculated by subtracting vine-ripe production from each total seasonal tomato production volume.

Since total US greenhouse production is not enumerated, an estimate was obtained through personal communication with Lucier (2004). This annual estimate was 165 thousand MT. Greenhouse seasonal production is estimated by using available monthly Canadian greenhouse tomato import figures, converted into seasonal quantities, and assuming that US production share in each season is proportional to Canadian import volume. This assumption may be justified because US production season is presumably close to that of Canada and Canadian share of exports in its production may presumed to be constant (Cook, 2002). Following this procedure, it was assumed that 30% of annual US greenhouse tomato production took place in the winter and 70% in the summer.

Appendix H. Estimation of seasonal producer and wholesale prices by type and origin

Two sources of data were used to obtain producer price data: Agricultural Marketing Service (AMS) (2004) and FAS (2004). Monthly producer prices for both Mexican and Canadian (CD) greenhouse tomatoes (GH) and vine-ripe tomatoes (VR) are obtained from FAS (2004) for the period December 2001 to November 2003. These prices were obtained by dividing respective monthly customs import value, which is the “price actually paid or payable for merchandise when sold for exportation to the United States, excluding U.S. import duties, freight, insurance, and other charges incurred in bringing the merchandise to the United States”, by monthly quantities (FAS, 2004). Monthly prices were then averaged over values for months in a given season.

The US tomato producer prices are computed using weekly AMS (2004) FOB shipping point data for California and Florida tomatoes from December 2001 to November 2003. Several different tomato configurations, containers and grades were utilized for each tomato type. Table H.1 summarizes the specifications selected for calculating seasonal prices. US greenhouse (US-GH) producer price data was not available since AMS does not currently collect those prices. The most frequently reported tomato configurations were selected for each tomato type. As prices for each configuration were usually given as a range, a simple average of that range was calculated to come up with a weekly price for a given origin-type-configuration tomato combination. Sometimes a representative price of the week was reported following the word ‘mostly’. If this price was available, it was used instead of the average price. A price range would also be sometimes provided following the word ‘mostly’, in which case a simple average of that range was taken to be the corresponding weekly price.

Monthly tomato producer price data was computed as the simple average of all available prices for weeks with Mondays that fall under a given month. That monthly data was then converted to seasonal data by averaging prices for months corresponding to each season and weighing them by the number of observations in the corresponding month for the two tomato seasonal years. Seasonal container data was converted to price per kilogram. This procedure for calculating seasonal prices was used as data availability varied substantially across months.

Table H.1: Summary of selected tomato specifications for AMS producer price data collection

Origin	Type	Selected specifications		
		Configurations	Container (weight)	Grade
US	MG	5x6, 6x6, 6x7 for FL; extra large, large and medium for CAL	25 lb carton	85% US One or better only when specified
	VR	4x4, 4x5, 5x5, 5x6	2 layer flat or 2 layer carton (20 lbs)	

Not all weekly observations for all tomato types and all configurations were available, and some weeks lacked any data at all. Table H.2 summarizes the actual and possible numbers of observations for AMS producer prices, which illustrates the level of data availability. The possible number of observations is the number of weeks considered (105) multiplied by the number of configurations considered multiplied by the number of production origins considered. For example, for US-MG, the number of possible observations is 105*3*2 = 630. Only about one-half of all possible data combinations were available for US-MG and US-VR tomatoes. Tomato origin-type combinations with greater sales volumes tended to have more observations. In turn, sales volumes frequently depended on the season.

Table H.2: Number of possible and actual observations of AMS producer prices

Origin	US	
Type	MG	VR
Actual number	309	196
Possible number	630	420
Actual/possible	49%	47%

All wholesale prices, with the exception of those for CD-VR tomatoes, were computed using weekly data from AMS (2004). AMS collects wholesale price data from several markets in the US. Of 15 markets available, six markets were selected to represent tomato wholesale prices in the US. These are Los Angeles, CA; Atlanta, GA; Chicago, IL; New York, NY; Seattle, WA; and Boston, MA. Selection was made to include larger markets and those that offered more data for tomato types associated with scarce data, i.e., GH tomatoes. As in the case of producer prices obtained from AMS (2004), tomatoes with particular specifications were selected to compute representative monthly prices first. These specifications are presented on Table H.3. For tomato origin-type configurations whose both producer and wholesale prices were calculated using AMS data, the same configurations were used in both procedures.

Table H.3: Summary of selected tomato specifications for wholesale price data collection

Origin	Type	Selected specifications			
		Configurations	Container (weight)	Origin state	Others
US	MG	5x6, 6x6, 6x7 for FL; extra large, large and medium for CAL	25 lb carton	CAL and/or FL	85% US One or better only when specified
	VR	4x4, 4x5, 5x5, 5x6	2 layer flat or 2 layer carton (20 lbs)	CAL and/or FL	
	GH	18s, 20s, 25s, 28s, 30s, 35s, 39s	15 lb flats or carton	Mostly AZ; sometimes CA, CO, FL, NM, NY, PA, TX	
MX	VR	4x4, 4x5, 5x5, 5x6	2 layer flat or 2 layer carton (20 lbs)		
	GH	18s, 20s, 25s, 28s, 30s, 35s, 39s	15 lb flats or carton		Sometimes not hydroponic
CD	GH	18s, 20s, 25s, 28s, 30s, 35s, 39s	15 lb flats or carton	Mostly Ontario; British Columbia if not available	

Seasonal wholesale prices were derived in a manner similar to producer prices from AMS (2004). Monthly prices were calculated by taking the simple average of all available weekly prices in a given month. Monthly prices were then weighted by the number of observations in the corresponding month and averaged over months for the two seasonal years. Again, that monthly container price was converted to monthly price per kilogram of tomato.

Similar comments to those made to AMS producer prices as to availability of data are noted for wholesale price data. Not all data was available for any tomato origin-type combination (See Table H.4). The combination with the most data availability was US-MG and the least available was US-GH. In general, wholesale price data for greenhouse tomatoes was deficient.

Table H.4: Number of possible and actual observations of AMS wholesale prices

Origin	US			MX		CD
Type	MG	VR	GH	VR	GH	GH
Actual number	1,525	564	204	992	347	694
Possible number	1,890	2,520	4,410	2,520	4,410	4,410
Actual/possible	81%	22%	5%	39%	9%	16%

As noted above, US-GH producer and CD-VR wholesale prices could not be computed as data was completely unavailable. To fill that gap, available marketing margins, or the difference between wholesale and producer prices, are utilized. Concretely, it is assumed that marketing margins, tabulated on Table H.5, for US and Canadian tomatoes with missing data set are the same. This assumption is justified by the conjecture that Canadian and US marketing margins may not differ by much as differences in transaction costs for marketing tomatoes may not be large. These transactions costs may not differ much since transportation costs may not be much larger for Canadian firms. Furthermore, marketing practices of Canadian firms for marketing tomatoes in the US may be as efficient as those of their US counterparts, in which case Canadian firms would not be incurring higher marketing costs. These assumptions can partially be supported by comparing MX-GH marketing margins to those for CD-GH tomatoes, with the former being higher by an average of US$0.49/kg (See Table H.5). A similar comparison of MX-VR marketing margins to those for US-VR also leads to the conclusion that Mexican values are higher by an average of US$0.43/kg. These comparisons at lead to a possible conclusion that US and Canadian marketing margins are lower than those for Mexico. Following the assumption that missing US or Canadian marketing margins equal the actual corresponding values in the other country, the missing estimates for US-GH producer prices are computed by subtracting CD-GH marketing margins from US-GH wholesale prices. Similarly, CD-VR wholesale price was derived by adding US-VR marketing margins to CD-VR producer price. Marketing margins with imputed values are presented on Table 8.10 in Chapter 8.

Table H.5: US tomato marketing margins, 2001-2003 season average (US$/kg)

Origin	US			MX		CD	
Type	MG	VR	GH	VR	GH	VR	GH
Winter	0.47	0.36	n/a	0.70	1.39	-	0.53
Summer	0.45	0.30	n/a	0.82	0.31	n/a	0.19

Note: n/a means data not available.
Source: Author’s calculation based on FAS (2004) and AMS (2004).

Appendix I. Illustration for calibrating demand-related elasticities and parameters

Allen partial elasticities of substitution (AEOS) in equations (9.12) are calculated using assumed demand elasticities and budget shares. The budget share of a given *i*th or *i*-*j*th tomato is calculated by dividing the product of its wholesale price and respective quantity by the product of the population and the per-capita income. Mathematically:

$$s_T = \frac{q_{MG}\left(p_{MG} + m_{MG}\right) + \sum_l q_{VRl}\left(p_{VRl} + m_{VRl}\right) + \sum_j q_{GHj}\left(p_{GH} + m_{GH}\right)}{pop \cdot I}, \quad l = US, MX;\ j = US, MX, CD,$$

$$s_{MG} = \frac{q_{MG}\left(p_{MG} + m_{MG}\right)}{pop \cdot I}, \ l = US, MX;\ j = US, MX, CD,$$

$$s_{VR} = \frac{\sum_l q_{VRl}\left(p_{VRl} + m_{VRl}\right)}{pop \cdot I}, \ l = US, MX \ ,$$

$$s_{GH} = \frac{\sum_j q_{GHj}\left(p_{GH} + m_{GH}\right)}{pop \cdot I}, \ j = US, MX, CD,$$

and

$$s_{VR-l} = \frac{q_{VRl}\left(p_{VRl} + m_{VRl}\right)}{pop \cdot I},$$

where all notation is as explained in Chapter 9. The resulting budget shares, calculated using Excel, are reported on Table I.1.

Table I.1: Budget shares

Level	Winter			Summer		
Top level (s_T)	4.07E-04			3.75E-04		
Mid level	MG	VR	GH	MG	VR	GH
(s_i)	1.80E-04	1.45E-04	8.18E-05	1.05E-04	1.93E-04	7.75E-05
Bottom level ($s_{i\text{-}j}$)	US	MX	CD	US	MX	CD
VR	3.14E-05	1.14E-04	0.00E-00	1.56E-04	2.50E-05	1.21E-05
GH	4.08E-05	2.76E-05	1.34E-05	4.44E-05	5.69E-06	2.74E-05

For the *i*th or *i-j*th tomato whose demand elasticity is known, its budget share and demand elasticity can be used to compute the AEOS as in equations (9.13). For other *i*th or *i-j*th tomatoes, budget shares and elasticities of substitution calculated by using equations (9.12) are used to determine their AEOS values. Microsoft Excel was used to calculate these values. To illustrate, the own-price AEOS for mature green tomatoes in the winter (period 1) is calculated as:

$$\sigma_{MG,MG} = -[\sigma_2 (s_{MG}^{-1} - s_T^{-1}) + \sigma_1 (s_T^{-1} - 1)] =$$

$$-[1.20(1/1.80\text{E-}04 - 1/4.07\text{E-}04) + 0.0709(1/4.07\text{E-}04 - 1)] = 3{,}877\,.$$

Table I.2 summarizes resulting AEOS values that are used in calibrating elasticities of substitution or computing implied demand elasticities. These AEOS values can be used to calculate the implied elasticities as described in section 3.5.a.iii.

Next, demand parameters are calibrated. Here, calibration procedure for the bottom-level vine-ripe tomato parameters in the winter is shown. From equation (9.18):

$$\frac{q_{1VR,US}}{pop} = \frac{c_{1VR,US}(p_{1VR,US} + m_{1VR,US})^{-\sigma_3} I_{1VR}}{c_{1VR,US}(p_{1VR,US} + m_{1VR,US})^{1-\sigma_3} + (1 - c_{1VR,US})(p_{1VR,MX} + m_{1VR,MX})^{1-\sigma_3}}, \qquad \text{(I.1)}$$

where

$$I_{1VR} = \frac{\sum_l (p_{1VR,l} + m_{1VR,l}) q_{1VR,l}}{pop} (l = US, MX) = \frac{(1.77 \cdot 58.214) + (1.55 \cdot 240.500)}{289.425} = 1.65,$$

Table I.2: AEOS values

Level		Winter			Summer		
Mid level ($\sigma_{r,k}$)		MG	VR	GH	MG	VR	GH
MG		-3,877	2,767	2,767	-8,448	3,005	3,005
VR		2,767	-5,480	2,767	3,005	-3,206	3,005
GH		2,767	2,767	-11,875	3,005	3,005	-12,433
Bottom level ($\sigma_{ij,ij}$ and $\sigma_{ij,il}$)		US	MX	CD	US	MX	CD
VR	US	-44,781	5,385	-	-5,160	4,976	4,976
	MX	5,385	-8,484	-	4,976	-58,047	4,976
	CD	-	-	-	4,976	4,976	-124,918
GH	US	-31,261	7,415	7,415	-27,603	7,906	7,906
	MX	7,415	-49,688	7,415	7,906	-269,037	7,906
	CD	7,415	7,415	-110,621	7,906	7,906	-49,586

and is per capita conditional expenditure on all vine-ripe tomatoes. Other notation is as presented in section 3.5.a.iii. Substituting all the values into equation (I.1),

$$\frac{58.214}{289.425} = \frac{c_{1VR,US} 1.77^{-1.58} \cdot 1.65}{c_{1VR,US} 1.77^{1-1.58} + \left(1 - c_{1VR,US}\right) 1.13^{1-1.58}} \text{ .} \qquad \text{(I.2)}$$

Equation (I.2) has one unknown variable, suggesting that it can be solved using a non-linear solver. GAMS is used to solve this equation, and others that are presented in section 9.5.a.iii, simultaneously and the solutions for the demand shift parameters are obtained.

Vita

Takayoshi José Yamagiwa was born on October 2, 1973 in Yokohama, Japan. After graduating with a Bachelor of Science degree in Biological Systems Engineering at Virginia Tech in May 1996, he continued his studies and earned a Masters of Science degree in Agricultural and Applied Economics at Virginia Tech in May 1998. He then moved to El Salvador and worked at the Salvadoran government's Environmental Fund (FONAES) as Planning Manager until September 1998, and began his work at the Salvadoran Foundation for Economic and Social Development (FUSADES) as Environmental Analyst of its think tank department. In May 2000, Takayoshi left FUSADES and started working at the Japan International Cooperation Agency (JICA) El Salvador office as Technical Cooperation Advisor. With the beginning of his PhD in Economics program in August 2001, he left his work and country and moved to Virginia, USA. After completion of his PhD program in May 2005, Takayoshi will return to El Salvador and continue his career there. Takayoshi is married to Yohana and they are blessed with Ignacio, their beloved son.