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Methodology for Impact Assessment of Free Trade Agreements

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Preface

Asia is witnessing the rapid proliferation of free trade agreements (FTAs). The growing trend of signing FTAs is irreversible in any region of the globe, but especially so in the Asian region. There are a large number of signed, negotiated, and proposed FTAs in Asia. All FTA negotiations should entail the study of the potential impact of the proposed agreement. Also, the more FTAs are signed, the more urgent the need to assess their actual impact. As such, there is a large demand for impact assessment studies of FTAs, both before and after negotiations.

Conducting solid economic studies of FTA impact assessment is particularly important for developing countries, because they need to draw up the necessary adjustment policies to alleviate possible negative effects and maximize possible benefits from FTAs. However, understanding the technical details of an impact assessment methodology is not easy. In most developing countries, specialists who are familiar with econometric theories and models are scarce. Due to the lack of technical knowledge and support, officials sometimes cannot effectively draw relevant policy implications from the economic studies.

While there are many academic textbooks on international trade and economic models, the number of user-friendly publications on methodologies for impact assessment of FTAs that target policy makers is very limited. This book attempts to fill this gap. It intends to serve as a succinct and comprehensive reference for policy makers and researchers who are interested in the impact evaluation of existing and/or proposed FTAs and the theories underlying the evaluation methods.

This publication project was developed based on the actual needs of developing country officials. Whenever the group of authors organized training courses on FTAs, participants specifically requested that the focus of future trainings be on the methodologies for impact assessment studies. Officials repeatedly expressed the urgent need for capacity building in conducting their own studies to avoid relying on the results of studies conducted by others. While this project started as a technical assistance program supporting selected members of the Association of Southeast Asian Nations, we found that compiling various background materials in the form of a book would serve as a convenient reference which would be particularly useful for policy makers in the wider developing world.

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Abbreviations

ADB	–	Asian Development Bank
AEC	–	ASEAN Economic Community
AFTA	–	ASEAN Free Trade Area
APEC	–	Asia-Pacific Economic Cooperation
ASEAN	–	Association of Southeast Asian Nations
CAIP	–	Community Adjustment and Investment Program
CGE	–	computable general equilibrium (model)
DOTS	–	Direction of Trade Statistics
EEC	–	European Economic Community
EPA	–	economic partnership agreement
EU	–	European Union
FDI	–	foreign direct investment
FTA	–	free trade agreement
GDP	–	gross domestic product
GSP	–	generalized system of preferences
GTAP	–	Global Trade Analysis Project
HS	–	Harmonized System
Lao PDR	–	Lao People's Democratic Republic
MFN	–	most favored nation
NADB	–	North American Development Bank
NAFTA	–	North American Free Trade Agreement
PRC	–	People's Republic of China
RCA	–	revealed comparative advantage
RTA	–	regional trading agreement
SAM	–	social accounting matrix
SMART	–	Software for Market Analysis and Restrictions on Trade (model)
TAA	–	Trade Adjustment Assistance (program)
UN	–	United Nations
UNCTAD	–	United Nations Conference on Trade and Development
US	–	United States
WHO	–	World Health Organization
WITS	–	World Integrated Trade Solution
WTO	–	World Trade Organization

Introduction
The Menu for Choice

It is not an exaggeration to say that policy making in connection with free trade agreements (FTAs) should start and end with impact assessment (see ADB 2008, 109–134). At the initial stages of creating an FTA, an assessment of the potential costs and benefits of the prospective FTA is a prerequisite for shaping the FTA's objectives, informing consultations with public and private stakeholders, and formulating effective negotiating strategies. After the FTA is implemented, an assessment of the FTA's actual versus projected impact is necessary for determining whether the FTA's objectives have been met and what adjustments are needed. Not all countries possess the know-how and wherewithal for conducting proper assessments of FTAs. Because of a lack of resources, developing countries may either forgo these evaluations or rely on anecdotal observations and, thus, fail to fully benefit from FTAs.

The purpose of this book is to display the menu of available methods for evaluating the impact of an FTA. The book caters mainly for policy makers from developing countries and attempts to equip these officials with some economic knowledge and techniques that will enable them to conduct their own economic evaluation studies on existing or future FTAs, or at the very least to critically examine the results of impact assessment studies conducted by others. Rather than conducting an assessment of an arbitrary FTA, this book focuses on introducing various methods that are widely used by many economists and researchers to assess the impact of FTAs. The explanations are laid out to be as nonmathematical as possible so that any reader can follow the basic arguments of the book, although some parts are inevitably more technical and contain some sophisticated equations.

This introduction explains the coverage and structure of this book. It attempts to give readers an overview of the kinds of methods discussed in this book and what FTA outcomes can be analyzed by them. It is, however, up to the reader to choose the method which is most relevant and appropriate in evaluating the impact of an existing or proposed FTA, according to the context of the country of interest.

Variety of Methods

Prior to evaluating the potential and actual impact of an FTA, consultations should take place between the government and various stakeholders. It is advisable that the lead agency of FTA negotiations (usually, the trade, commerce, or foreign affairs ministry) conduct domestic consultations with various line ministries, as well as the private sector, to identify possible effects of an FTA, while bearing in mind that protectionist interest groups tend to put pressure on the government to avoid signing FTAs and to provide subsidies to the affected industries once the FTA is in place.

The actual assessment of the potential and actual impacts of an FTA is performed mainly using economic data and methods. In most cases, the consultations and economic analysis are complementary. In situations where feedback from stakeholders and the results of studies are not fully consistent, it is important for policy makers to look into the details and identify the causes of such differences. While stakeholders are constrained by their own interests, study results are also dependent on assumptions employed in the models and the availability of data. Case studies based on structured interviews and/or questionnaire-type business surveys may fill such gaps. Sometimes, studies that aim to identify the necessary policy adjustments are conducted or sponsored by the government and sometimes they are conducted by private institutions, associations, and think tanks. In any case, it is important to conduct theoretically informed and politically neutral studies. At the very least, those directly involved in the FTA negotiations should not lead the FTA evaluation studies.

It is necessary to conduct economic evaluation studies of an FTA both before its negotiation and after its implementation. A clear and accurate understanding of the potential effects of an FTA before its negotiation (ex-ante evaluation) is necessary in deciding the overall negotiation position of the country, based on overall cost–benefit analysis and the identification of what the country can and cannot provide to its FTA partners in the negotiations. Pre-negotiation studies are also helpful to exploit the potential exporting benefits of FTAs and to draw up necessary adjustment policies for sectors which may be negatively affected by FTAs. The results of pre-negotiation impact assessment studies should be reflected effectively in the FTA negotiations. Likewise, assessing the actual impacts of an FTA after its implementation (ex-post evaluation) to examine whether the impacts are within the expected range is also important to draw up further necessary adjustment policies for the affected sectors and to exploit the benefits that are yet to fully materialize. This kind of impact assessment is especially important when the negative effects of the FTA seem to be larger than the positive effects.

There are various kinds of impact evaluation methods, which are usually complementary to each other. This book covers all major methods for ex-ante and ex-post evaluation of an FTA. Some methods focus on effects at the macroeconomic level, while others focus on industry-level impacts. Some are simple indicators constructed from trade data or information obtainable at the customs office, while others are based on sophisticated econometric models. Thus, policy makers should choose and use the most relevant methods to evaluate particular outcomes of FTAs and compare the results obtained by different methods, bearing in mind the strengths and limitations of each method.

At this stage, it may be useful to point out the issues that researchers should consider when conducting impact evaluation studies of FTAs and that officials, especially those from developing countries, should be aware of when using the results from these studies for evidence-based policymaking. First, it is important to understand the underlying assumptions and theories of each economic model when interpreting the results of each study. Because many economic models are devised according to conditions that exist in developed countries, some of the assumptions employed by these models, such as perfect competition and full employment, may not be realistic for some developing countries, especially least developed countries. It is important to carefully interpret the results, bearing in mind that they are conditional upon the assumptions. Second, the paucity or absence of quality data is a critical constraint on conducting any economic analysis of developing economies. Statistical datasets are often incomplete and/or unavailable, and it may be difficult to verify the quality of the data. These data limitations affect the feasibility of using different evaluation methods. For example, sophisticated econometric models demand a lot of data, while simple trade indicators do not. And even if sufficient data exists to make a method feasible, unsatisfactory data quality may make the results of a study unreliable.

Impacts of What and Impacts on What

This book covers methods that evaluate the economic impact of tariff elimination or reduction under FTAs. The central focus of the book is *preferential* tariff elimination or reduction, not *unilateral* tariff elimination or reduction. The discussions mainly focus on the liberalization of trade in goods under FTAs, despite the fact that modern FTAs in Asia cover not only trade in goods but also a wide range of issues such as trade in services, investments, sanitary and phytosanitary and technical barriers to trade, and intellectual property rights.[1] Also, the impacts of non-tariff barriers to trade in goods are not dealt with in this book. Although some economic models, such as the computable general equilibrium (CGE) model, capture impacts of tariff elimination or reduction on sectors other than goods markets, such as services, especially transport, this book does not include a discussion of the impact of liberalization in the field of services and investments per se. This is mainly because the methods to assess the impact of investment and services liberalization have not been well established, unlike the case of goods, and data on services and investment is insufficient to conduct rigorous analysis. The authors recognize that a publication covering impact assessment methodologies of services and investment liberalization will be necessary in the future, given the growing significance of trade in services.[2]

"Impacts on what?" is an important consideration in selecting a relevant method to evaluate the impacts of FTAs. Disagreement on the impact of eliminating or reducing tariffs and the desirability of an FTA sometimes stems from the fact that different analysts emphasize different outcomes of an FTA. Certainly, customs officials' major concern is the FTA's impacts on *tariff revenue*. The business and industrial sector is usually interested in impacts on the level of *domestic production*, either at the aggregated or disaggregated level. The impact on *trade volume* is sometimes emphasized by policy makers and researchers, but this is only one aspect of an FTA. While their views do not usually reach the policy-making process fully, consumers' benefit brought about by FTAs, namely, the reduction in the *import price,* should not be overlooked. Economists usually emphasize the overall *welfare and efficiency gains* at the macro level. It is important to choose the relevant evaluation method based on the primary target of the analysis and carefully compare the benefits and costs of an FTA from various perspectives using different methods.

While this book mainly deals with the economic evaluation of preferential tariff liberalization, the authors recognize that certain significant outcomes of FTAs cannot be fully captured by economic statistics and models. The book briefly touches on these issues. Benefits that are not fully captured by economic models, such as structural reform and economic stability, are critical for the economic development of developing countries. FTAs may be designed to serve these unquantifiable economic or strategic purposes.

Structure of the Book

This book attempts to serve as a succinct and comprehensive reference for policy makers and researchers who are interested in the impact evaluation of existing and/or proposed FTAs and the theories underlying the evaluation methods. It also intends to assist developing-country officials in conducting their own impact evaluation studies of FTAs and/or in critically examining the results of studies conducted by others.

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1 On the modern FTA in Asia, see Plummer (2007).

2 The overviews of impact assessment of services liberalization can be found in ADB (2009).

Chapter 1 introduces the theoretical framework for the economic analysis of an FTA. This chapter provides a concise guide for policy makers on the economic theory underlying FTAs as a basis for understanding the methods for ex-ante and ex-post assessment of FTAs. Partial equilibrium models, especially the Viner model, and general equilibrium models are discussed. Theoretical foundations for the CGE and gravity models are also explained in Chapter 1.

Chapter 2 covers ex-ante methods for economic evaluation of FTAs, while Chapter 3 covers ex-post methods. Ex-ante evaluation methods include various indicators of regional trade interdependence and comparative advantage, the partial equilibrium SMART model and CGE estimation. Ex-post evaluation methods cover FTA preference indicators, such as the utilization rate, extrapolation methods, and the gravity model. The strengths and limitations of each method are also discussed. Reviews of results of various studies on FTA impact and sample estimation results conducted by the authors are also included in these chapters.

Chapter 4 discusses special considerations for developing countries. FTAs bring various benefits that cannot be fully quantified by economic models for contracting parties, especially developing countries. These unquantifiable politico-economic or strategic benefits may be critical for developing countries. Chapter 4 specifically covers benefits associated with structural reform, technology transfer, capacity building, and macroeconomic and political stability, which may be brought about by an FTA if it is designed properly.

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Chapter 1

Theoretical Framework for Economic Analysis of Free Trade Agreements

Preferential trading agreements, such as free trade agreements (FTAs), have both positive and negative effects. This is why they are known as "second-best" initiatives. However, when the "first-best" option (i.e., multilateral liberalization) is unattainable, they provide an alternative vehicle for trade policy. In this chapter, we consider the theoretical effects of such arrangements, and the theoretical foundations of empirical models that can be employed to estimate the potential economic effects of FTAs.

An FTA is a commitment by signatory members to remove tariffs across member states while continuing to maintain independent tariff regimes on imports from outside countries (countries that are not members of the agreement). A customs union goes one step further by uniting tariff regimes. Beyond a customs union, a commitment to free flows of not only goods and services but also factors of production (i.e., labor and capital) is called a "common market." An economic union is generally referred to as a common market with monetary union.

These are textbook definitions. In reality, the borderlines between definitions are blurred. For example, some FTAs exclude agriculture and/or services but may include investment. Some customs unions have many exclusions to the "common external tariff," to the extent that they look like FTAs which happen to have equal tariffs in some sectors. And the European Economic Community was often called a common market when it was little more than a customs union for the first 30 years of its existence. Keeping in mind that these definitions may be slippery, our analysis will focus mostly on FTAs defined in the traditional way, given their predominance among bilateral and regional cooperative groupings in the international trading system. Moreover, the basic principles inherent in an FTA also generally apply to deeper forms of cooperation.[3]

In an FTA, the fact that each member country maintains its own tariff regime with respect to non-member countries raises three important issues. First, an FTA must be based on rules of origin. If there were no rules of origin, then there would be transshipment, where

[3] The analysis of regional integration in a customs union has been extended to the case of an FTA (Krueger 1995, Panagariya and Findlay 1996, and Krishna and Panagariya 2002). These authors show that some of the qualitative results from Viner's customs union model are broadly the same as those from FTA models.

non-member countries would export a good to the member of an FTA with the lowest tariff and then reexport the good to other FTA members, bypassing higher tariff barriers. The FTA would effectively become an unofficial customs union in which each tariff line would have the lowest tariff among the members' tariffs. Rules of origin are, therefore, a necessity for a true FTA, and there may be costs associated with implementing, administering, and complying with these rules (they may also be used as a form of "hidden protection" and distort investment decisions). Second, it is expected that the prices of goods will vary across member countries in an FTA, since FTA members may choose different levels of external tariffs, while they should be equalized in a customs union. Third, although each member of an FTA retains autonomy over its tariff regime against non-member countries, the autonomy may make each government more susceptible to special interest groups at the national level, whereas in a customs union these groups would have to lobby at the regional level to air their interests.

It is the preferential nature of an FTA that primarily concerns economists when analyzing its trade and welfare effects. In general, nondiscriminatory trade liberalization allows countries to export their products if they are the most efficient producers, and to source their imports from the lowest-cost suppliers. This also happens in the context of an FTA in that it allows for a more efficient regional division of labor but, due to the fact that it creates preferences for partner-country producers (who may not be the most efficient), sourcing is not necessarily from the lowest-cost producer. A member country may be able to export its products to another member country simply because it enjoys tariff preferences under the FTA. This suggests that the importing partner will be paying more for its imports; in other words, its terms of trade (the price of exports in terms of imports) will deteriorate.

This chapter provides a concise guide for policy makers on the economic theory of FTAs as a basis for understanding the modeling methods used for the ex-ante and ex-post assessment of FTAs explained in the subsequent chapters. The models used to assess an FTA focus on the agreement's effects on domestic and international prices, trade volumes, consumption, production, and welfare, as these are critical indicators. The chapter begins by presenting the static (one-off) effects of an FTA using the basic conceptual model developed by Jacob Viner (1950). This model contains the fundamental concepts of trade creation and trade diversion. Viner's model is then extended by relaxing some of its assumptions. A major drawback of Viner's model is that it is only concerned with a single market. Therefore, this chapter also presents models of the effects of an FTA in multiple markets (i.e., general equilibrium models). Following the analysis of static effects, this chapter briefly discusses some of the long-term, cumulative effects (i.e., dynamic effects) that are expected to ensue after the creation of an FTA. The chapter also presents the theoretical foundations of two important modeling methods that have become very popular in assessing the effects of an FTA: computable general equilibrium (CGE) models, used in ex-ante assessments, and gravity models, used in ex-post assessments. In order to give some idea of the type of estimates that result from these models, we review some of the empirical literature targeting the economic implications of real-world FTAs with relevance to members of the Association of Southeast Asia Nations (ASEAN) in general, and transitional ASEAN economies in particular.

1.1. Viner's Model and Extensions

Before Viner's model was developed, the conventional wisdom was that regional trading agreements would tend to improve welfare because they included some degree of trade liberalization. Viner's model was important because it debunked this myth, showing that a regional trading agreement could have a negative impact on welfare. His model remains important as an analytical framework because it lays out some conditions that determine when an FTA will be harmful or hurtful. The key concepts in his model are trade creation

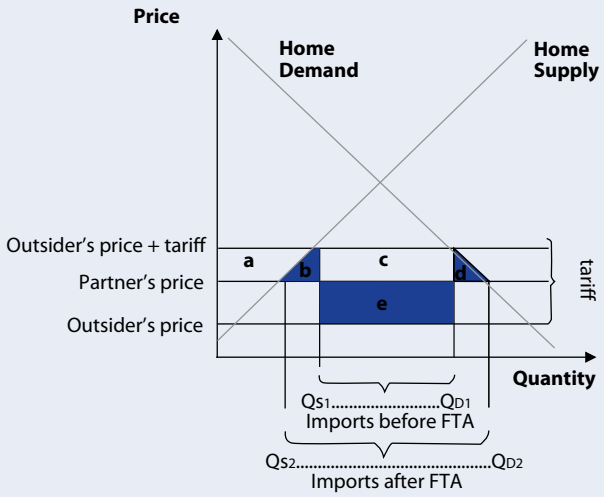
and trade diversion. Briefly, trade creation is the displacement of less efficient national production in favor of more efficient partner-country production, while trade diversion is the displacement of more efficient non-partner imports in favor of less efficient partner-country sourced imports.

1.1.1. Viner's Model

Figure 1.1 illustrates demand and supply of a certain good in the domestic market of a country that plans to join an FTA.[4] We will refer to this country as the "home" country, other FTA-member countries as "partner" countries, and non-member countries as "outsiders." Further, we assume for the moment that the home country is small in an economic sense, meaning that it is unable to influence international prices (and, therefore, can always buy its imports at a constant price from abroad). Before the FTA, the home country imposes a tariff on all imports of the good regardless of the source. The tariff in this model can be expressed as either a specific tariff (i.e., a certain amount of money per unit imported), or ad valorem (a percentage of price).[5] Tariff revenue is simply the tariff multiplied by the quantity of imports. We also assume that the outsider is more efficient at producing the good than either the home or partner countries and, therefore, its price is the lowest among the three countries.

Before the FTA, domestic producers supply Q_{S1} units of the good, and local consumers purchase Q_{D1} units, which is the sum of Q_{S1} domestically produced units plus imported units from the outsider, who is able to supply the product at a lower price than the partner country. However, after joining the FTA, the removal of the tariff on imports from the FTA partner makes these imports cheaper than those from the outsider to the consumer. As consumers now face a lower price, they purchase more, at Q_{D2}. The country now sources all of its imports from an FTA partner rather than an outsider. The lower domestic price causes local production to shrink and domestic producers now supply only Q_{S2} units of the good.

Figure 1.1 Viner's Model of a Free Trade Agreement



FTA = free trade agreement.
Source: Authors.

[4] The exposition here follows the partial equilibrium analysis in Johnson (1960).

[5] For an ad valorem tariff, the analysis needs to be only slightly modified for the same qualitative results.

The trade creation effect, as strictly defined by Viner, is the reduction in domestic production that is now met by more-efficient imports, $Q_{S1} - Q_{S2}$. In addition, as the FTA lowers the domestic price, there is a rise in consumption, $Q_{D2} - Q_{D1}$, that is also satisfied by increased imports. We can define gross trade creation as the change in imports due to the FTA, $Q_{D2} - Q_{S2}$, minus $Q_{D1} - Q_{S1}$. This is the sum of the production and consumption effects of the FTA. On the other hand, the FTA also causes trade diversion because the imports previously sourced from the outsider, $Q_{D1} - Q_{S1}$, are displaced by imports from the partner country. The country loses tariff revenue on this quantity of imports. The shifting of the source of imports from the outsider to the FTA partner occurs because the FTA makes imports from member countries cheaper relative to those from non-member countries.

To understand the welfare effects of an FTA on the home country, we have to look at changes in producer surplus, consumer surplus, and tariff revenue. Producer surplus captures how much domestic producers benefit from selling their output in the market and is represented as the area above the supply curve but below the market price. Consumer surplus measures the consumers' net benefit from the market and is represented in the diagram as the area below the demand curve but above the market price. The net welfare effect of the FTA in the home country is the combined effect of the changes in producer surplus, consumer surplus, and tariff revenue.

In Figure 1.1, the loss in producer surplus corresponds to the trapezoid ***a***, while the gain in consumer surplus is the sum of the areas ***a***, ***b***, ***c***, and ***d***. The loss in tariff revenue is the total area of rectangles ***c*** and ***e***. So, the net welfare effect of the FTA is (***b*** + ***d*** – ***e***). Areas ***b*** and ***d*** show the net gains from trade creation. Area ***b*** represents the gain from switching from higher-cost domestic output to lower-cost imports. Area ***d*** represents a gain from being able to consume more of the good given the lower price of imports. Area ***e*** shows the net loss from trade diversion. Area of ***e*** depends on the original quantity of imports and the difference between the partner's and outsider's prices exclusive of tariffs. It is an efficiency loss because the discriminatory tariff regime under the FTA causes the country to lose tariff revenue while forgoing the lowest-cost imports. If the sum of the efficiency gains, as represented by the areas ***b*** + ***d***, is larger than the efficiency loss shown by area ***e*** then the FTA is beneficial to the home country in question. Otherwise, the net welfare effect is negative. The Viner model thus shows that the net welfare effect of an FTA on an importing country is ambiguous.

For the policy maker, the Viner model provides some guidelines on which aspects to focus on when judging the net welfare effect of an FTA in a particular sector. The difference between the FTA's efficiency gains (***b*** + ***d***) and the efficiency loss (***e***) tends to be positive

(i) the closer the partner country's and outsider's prices are;
(ii) the higher the home country's initial import tariff is;
(iii) the smaller the home country's initial imports from the outsider are compared to the expected increase in imports from the partner country;
(iv) the more responsive home supply and demand, and therefore import demand, are to a price drop; and
(v) the more countries there are participating in the FTA because it is more likely that a partner country's price is closer to the outsider's price.

1.1.2. Extensions to Viner's Model

The Vinerian analysis above contains several assumptions, which we now relax in order to extend the model. First, there is the assumption that the lowest-cost source of imports is an outsider. If this is changed to make the partner country the cheapest import source, then it would be easy to show that the FTA would only have a trade creation effect because imports would come from that partner country before and after the FTA, i.e., there would

be no trade diversion. So, the FTA would be unambiguously beneficial to the home country. In other words, the FTA would have the same effect as nondiscriminatory liberalization.

Second, there is the assumption that the home country imposes a nondiscriminatory tariff before the FTA. If, before the FTA, the home country imposed different tariff rates on imports from different sources, then there could be three outcomes depending on the relative prices inclusive of tariffs of the FTA partner and outsider: (i) if, before the FTA, the partner's price inclusive of tariff was lower than the outsider's price inclusive of tariff, then there would only be trade creation; (ii) if, before the FTA, the partner's price inclusive of tariff was higher than the outsider's price inclusive of tariff and, after the FTA, the partner's tariff-free price still remained higher than the outsider's price inclusive of tariff, then the FTA would have no effect on the home country; and (iii) if, before the FTA, the partner's price inclusive of tariff was higher than the outsider's price inclusive of tariff and, after the FTA, the partner's tariff-free price was lower than the outsider's price inclusive of tariff, then the FTA would cause both trade creation and trade diversion in the home country.

Third, the model assumes that the importing country is small in an economic sense and each foreign exporter's supply is at a single price. This assumption implies that a country always imports a good from only one foreign country and never from multiple countries. This assumption is not realistic in the case of a good with multiple varieties; but, even in the case of a homogeneous good, a country may import from many sources—both FTA members and non-member countries—because any one source is unable to fulfill the country's demand. The assumption also implies that the importer's terms of trade do not change in relation to a particular trade partner. Multiple sources of imports and changes in terms of trade are possible if the importing country's demand is large enough to influence the prices at which foreign exporters supply their goods.

1.2. General Equilibrium Models

Many other authors have contributed to the theory of FTAs since Viner's pioneering work. The Vinerian analysis now fits into a broader theory called the general theory of second best by Lipsey and Lancaster (1956). This theory holds that, given a distorted economic system, eliminating one set of distortions does not guarantee an improvement in overall economic welfare so long as other economic distortions remain unchanged. In the context of an FTA, this theory implies that reducing tariffs on a discriminatory basis may not improve welfare for individual countries or the world economy because some tariffs are maintained.

Modern authors have been able to study FTAs in the context of many goods, whereas the Viner model concerns only a single good. By focusing on the market for just one imported good, the Viner model ignores any interaction with other goods' markets and changes in the terms of trade due to export price changes. In this section, we first present a few influential multiple-good models (i.e., general equilibrium models) based on work by Meade (1955), Lipsey (1970), and Wonnacott and Wonnacott (1982). These models produce a rich set of analytical results about the welfare consequences of regional trading agreements. We then present a useful general framework to evaluate the welfare impact of an FTA as formulated by Lloyd and Maclaren (2004). This section concludes with a discussion of the Kemp–Wan theorem about the feasibility of creating an efficient regional agreement.

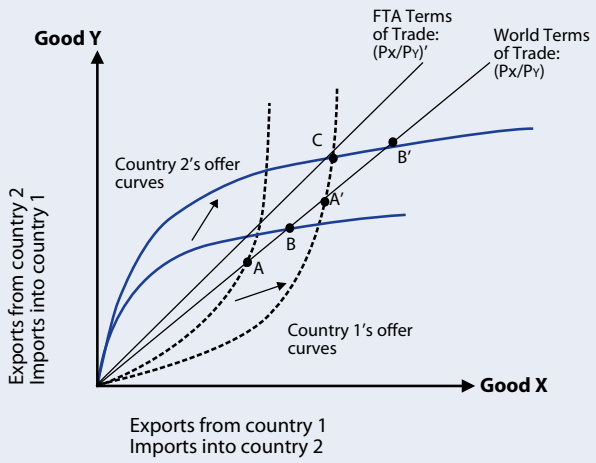
1.2.1. Meade–Lipsey and Wonnacott–Wonnacott Models

To simplify the analysis, we consider only two goods: good X and good Y. Assuming trade is balanced, a country will export one good and import the other. The model will consider

changes in the terms of trade due to both import demand and export supply. This is an important aspect of FTAs that is covered in general equilibrium models but usually missing from Vinerian analyses. To represent the international interaction of markets in the model, we will use an analytical device called a trade offer curve. A trade offer curve records the quantity of one good that a country is willing to export to the world market in exchange for an imported quantity of another good given the terms of trade, which is the relative price of exports to imports. Figure 1.2 illustrates trade offer curves for two countries. Country 1 exports good X and imports good Y and has dashed offer curves. Country 2 exports good Y and imports good X and has solid offer curves. The offer curve for each country has the typical shape of sloping upwards and bending back toward the axis of the imported good.[6] The terms of trade are represented in Figure 1.2 by the slopes of rays from the origin (i.e., Px/Py for country 1 and the inverse ratio for country 2). Without loss of generality, we assume that (i) countries 1 and 2 are small in relation to outsiders, hence their trading volumes have no influence on world prices; and (ii) the post-FTA external tariffs are high enough to eliminate all trade with outsiders. The pre-FTA traded quantities are shown as point A for country 1 and point B for country 2.

Figure 1.2 also shows the effects of an FTA between the two countries. The FTA shifts both countries' offer curves to the northeast because intra-bloc trade liberalization increases the desired quantities of imports and exports at any given terms of trade.[7] As external tariffs are prohibitive, both countries do not trade with outsiders after the FTA and trade only with each other. The intra-bloc (FTA) terms of trade are then determined by the intersection of the new trade offer curves at point C. By comparing the FTA terms of trade with the world terms of trade, we can see that the terms of trade move in favor of country 1 and against country 2.

Figure 1.2 Meade–Lipsey Model of a Free Trade Agreement



FTA = free trade agreement.
Source: Authors.

[6] The upward slope of the offer curve says that as the relative price of imports falls, the country is willing to export more for additional quantities of imports. This implies that the demand for imports is price elastic. If demand for imports becomes price inelastic at low import prices, then the offer curve bends back.

[7] The size of the shift will depend on the size of the initial tariff, preferences, production technology, and factor endowments.

From the perspective of country 1, the FTA represents an improvement as it moves from point A to C, increasing its volume of tradable goods and improving its terms of trade.[8] Moreover, point C is better than country 1 can achieve by unilaterally eliminating its tariff and thus moving to A'. The FTA is the best alternative for country 1 since its terms of trade are more favorable under the FTA. However, as the FTA has changed the terms of trade adversely for country 2, the FTA is not the best alternative for country 2. It is not known how country 2's welfare at C (i.e., after the FTA) compares with its original position, but it is clear that if country 2 unilaterally eliminates its tariffs and moves to point B' it will be better off compared to points B and C. Therefore, it would be in country 2's interest to simply remove its tariffs instead of joining the FTA.

From the perspective of the FTA as a whole, it can be shown mathematically that country 2's loss from joining the FTA instead of unilaterally removing its tariffs is larger than country 1's gain from the FTA compared to unilaterally removing its tariffs. So, although country 1 would like country 2 to join the FTA, country 1's gain would not be enough to compensate for country 2's loss. This illustrates a fundamental problem in the creation of trading agreements: as a group, countries are better off unilaterally eliminating their tariffs instead of offering preferences. In this situation, even if country 1 transferred all its welfare gains as a side-payment to country 2 in order to form an FTA, this would still be less than country 2's welfare gain from unilaterally liberalizing trade.

However, as Wonnacott and Wonnacott (1981) show, if the world (i.e., outsiders) has import tariffs or there are transport costs on trade with the world, then an FTA may actually be the dominant strategy for both countries. To see this, consider Figure 1.3, which shows three rays from the origin, depicting the world terms of trade. The steepest ray shows the world terms of trade when the world either imposes tariffs on its imports of good Y or country 2 has to pay the transport costs of exporting good Y to the world. The tariff or transport cost, in effect, depresses the price on good Y that exporters from country 2 receive. The flattest ray shows the world terms of trade when the world either imposes tariffs on its imports of good X or country 1 has to pay transport costs in order to export good X to the world. Its slope can be understood using a similar logic as that for the steepest ray. Thus, trade barriers to the world create a wedge between the world terms of trade as seen by countries 1 and 2.

Prior to the FTA, countries 1 and 2 have the option of trading with the world or each other. To simplify the analysis, we assume that these countries choose to trade only with each other before the FTA.[9] Figure 1.3 shows this because the intersection of the countries' initial offer curves at C represents a higher level of welfare than point A for country 1 and point B for country 2, which both represent trading with the world. Figure 1.3 also shows that, after the FTA, both countries still continue trading with each other instead of with the world because point C' represents a higher level of welfare than points A' and B', which both represent unilateral rather than preferential trade liberalization by each country. Therefore, both countries will choose to join the FTA. We obtain this result because the intersection point of the post-FTA offer curves lies in the wedge formed between the rays illustrating the world terms of trade as seen by each country. The FTA may improve the welfare of both member countries and be a better strategy than unilaterally liberalizing trade because, under a regime in which trade is liberalized unilaterally, the world may not reciprocate and may maintain trade barriers, causing additional trade between the world and the FTA members to be distorted.

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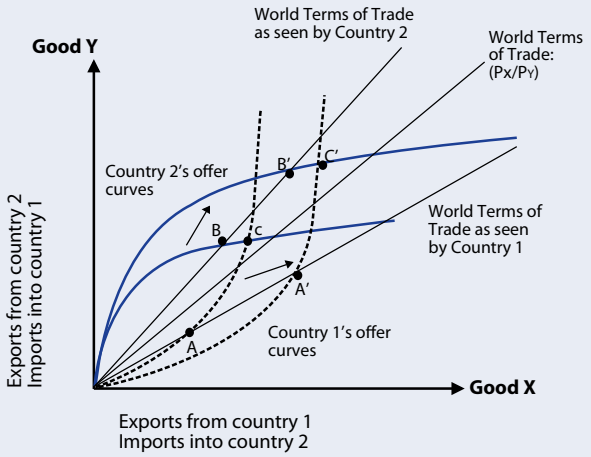
[8] In this model, for any shift of the offer curve away from the origin, a higher volume of tradables at the same terms of trade is associated with higher welfare. Further, any point that is higher on the same offer curve is also associated with higher welfare.

[9] The main analytical results do not change if we allow the countries to trade with the world before the FTA.

Figure 1.3 **Wonnacott–Wonnacott Model of a Free Trade Agreement with Tariffs or Transport Costs on Exports to the World**



Source: Authors.

The main conclusion from this analysis is that a group of small countries may gain from an FTA rather than unilateral trade liberalization if outsiders have high trade barriers against them or the group faces high transport costs in exporting to outsiders. This is one explanation for the formation of FTAs among countries that are geographically close but distant as a group from outsiders. Wonnacott and Wonnacott (1981) also point out that countries do not engage in FTAs simply to reduce their own tariffs, they do it to open up access to their FTA partners' markets. If access to a partner's market is relatively more valuable than access to outsiders' markets, then an FTA produces gains for its members. A simple illustration can underscore this point. Suppose there are three economies in the world: the European Union (EU), Nepal, and the United States (US). Let us assume in this world that the US and the EU account for 49% of the global market each, whereas Nepal accounts for 2%. If the US had an FTA with the EU, the EU would be forced to lower its barriers to imports from the US, thereby leading to an increase in demand from the US. Clearly, the marginal effects of trade diversion due to the exclusion of Nepal in the FTA would be far less than the positive economic effects of greater access to the EU.

Note that we have assumed that the countries forming FTAs in these models are small, which by definition does not allow the world's terms of trade to change. If trade between the group of countries and the world were substantial enough to influence the world's terms of trade, then an FTA would be one means for the group to achieve more favorable terms of trade vis-à-vis the world. By using external tariffs, these countries would reduce their demand for imports from the world, which by the assumption of balanced trade, would reduce these countries' supply of exports to the world. The price of their exports would rise while the price of their imports would fall. The substantial size of the FTA, therefore, implies the possibility to improve the collective terms of trade and greater bargaining power in trade negotiations. An improvement in the terms of trade for the FTA does not, however, imply that all countries in the FTA will benefit. A member would stand a better chance of benefiting from terms of trade improvement after the FTA if the FTA as a whole was a net exporter to the world of the member's export goods, and a net importer from the world of the member's import goods.

1.2.2. Lloyd–Maclaren Model

The models in the previous sections are useful if it is only necessary to predict the direction that a country's welfare will take following an FTA. However, they do not lend themselves readily to the practical estimation of the magnitude of changes in a country's welfare. They are neither sufficiently general to account for the variety of traded commodities and trade policies, nor flexible enough in terms of assumptions, and they lack specific formulations. For these reasons, modern quantitative analyses of the welfare effects of FTAs rely on theoretical models that have higher dimensions in terms of commodities and trading partners, and a general equilibrium framework (Lloyd and Schweinberger 1988, Grinols and Wong 1991, Baldwin and Venables 1995, Lloyd and Maclaren 2004, Kowalcyzk and Riezman 2009). These theoretical models encompass many details about the structure of production, consumption, and trade in an economy in order to provide very general and rich analyses of trade policy.

To quantify the welfare effects of an FTA, these models identify how much expenditure would be required following an FTA to restore the welfare of households to the level that existed before the FTA. If this amount is positive, then the FTA must have reduced welfare by that amount. If this amount is negative, i.e., money needs to be taken away from households, then the FTA must have raised welfare by that amount. Under a tractable set of assumptions, the models can relate this FTA welfare measure to changes in key indicators, such as trade volumes, terms of trade, production, and consumption, and other indicators. As long as statistics on these key indicators are available, the practical application of these models is feasible and relatively easy. To quantify the welfare effects of an FTA, an analyst need only know how national welfare in these models corresponds to the key indicators.

As an example, we describe a model of welfare changes from regional trading agreements devised by Lloyd and Maclaren (2004). This model of an open economy contains border taxes or subsidies that result in divergences between domestic prices, $\boldsymbol{p}$, and international prices, $\boldsymbol{p}^*$.[10] The vectors $\boldsymbol{p}$ and $\boldsymbol{p}^*$ are vectors over commodities. For example, an import tariff on a certain good raises the good's domestic price above the international price, while an import subsidy pushes a good's domestic price below the international price. The model is also capable of accounting for export-related border measures, e.g., export taxes and subsidies, and non-tariff trade barriers. These border measures result in government revenue from tariffs but government spending on trade subsidies. Let $\boldsymbol{m}$ be a vector denoting the economy's trade volumes, where for a commodity i, $m_i > 0$ means there are net imports of the commodity and $m_i < 0$, net exports of the commodity. Multiplying $\boldsymbol{m}$ with the difference between domestic and international prices $(\boldsymbol{p} - \boldsymbol{p}^*)$, we obtain an expression for the government's net trade tax revenue, that is trade tax revenue minus the cost of trade subsdies, $(\boldsymbol{p} - \boldsymbol{p}^*)\boldsymbol{m}$. Without loss of generality, this model assumes that the economy is characterized by constant returns to scale, perfect competition, and a fixed number of goods.

The value of domestic production in this economy is represented by a revenue or gross domestic product (GDP) function, $g(\boldsymbol{p},\boldsymbol{v})$. This is the maximum revenue that profit-maximizing producers in the country attain given domestic prices, $\boldsymbol{p}$, and the economy's factor endowments, $\boldsymbol{v}$, which is a vector of factors of production that are available in an economy. All the revenue in this economy accrues to households because they supply the factors of production. The total income of households in this economy is the sum of the value of domestic production and net trade tax revenue, because it is assumed that the government makes lump-sum distributions to households of any net revenue from border measures. To represent household expenditure, the model utilizes an expenditure function, $e(\boldsymbol{p},\boldsymbol{u})$, which

[10] All variables in bold and italics, such as $\boldsymbol{p}$ and $\boldsymbol{p}^*$ in this model, are vectors.

shows the minimum amount of total household expenditure at domestic prices to attain a certain level of welfare, $\boldsymbol{u}$, which is a vector over households. This minimum expenditure increases for a higher specified welfare level.[11]

Let $\boldsymbol{B}$ be the difference between the minimum total household expenditure at domestic prices, $\boldsymbol{p}$, for a specified welfare level, $\boldsymbol{u}$, and total household income.

$$\boldsymbol{B} = e(\boldsymbol{p},\boldsymbol{u}) - g(\boldsymbol{p},\boldsymbol{v}) - (\boldsymbol{p} - \boldsymbol{p}^*)\boldsymbol{m}(\boldsymbol{p},\boldsymbol{v},\boldsymbol{u}) \tag{1}$$

where e is the economy's expenditure function, g is the total revenue function, and $(\boldsymbol{p} - \boldsymbol{p}^*)\boldsymbol{m}$ is net trade tax revenue. The volume of trade, $\boldsymbol{m}$, is defined as the difference between the consumption and production choices of this economy at domestic prices. Here it is a function of domestic prices, factor endowments, and the specified level of welfare. The function $\boldsymbol{B}$ is the monetary amount needed to allow households to reach a specified level of welfare after the households have received income from national production and the net trade tax revenue has been distributed lump sum to them. The function B is known as the distorted trade expenditure function (Lloyd and Schweinberger 1988) because it also represents the trade balance valued at world prices under market distortions.[12] If there are no foreign transfers of capital into this economy, then $\boldsymbol{B}$ is equal to zero and all imports must be paid with export revenue. If there is a net foreign transfer of capital into (out of) the economy, then $\boldsymbol{B}$ is larger (smaller) than zero and there is a trade deficit (surplus).

A regional trading agreement (RTA) changes the level of market distortions on tradable commodities. It affects the domestic and international prices that a country faces, and these price changes, in turn, affect the total income of households in the economy because the value and composition of domestic production and the net trade tax revenue collected by government are impacted. To obtain a monetary measure of the change in welfare due to the RTA, we consider how much must be paid or taken away from households in the post-RTA situation if their welfare is to remain at the pre-RTA level when tariffs are removed preferentially. In practical terms, we will compute the difference in $\boldsymbol{B}$ with pre- versus post-agreement prices, keeping welfare constant at the pre-agreement level. The welfare impact of the RTA is simply the negative of the change in $\boldsymbol{B}$.

Let the superscript *1* indicate the pre-agreement level of a variable and superscript *2*, the variable's post-agreement level. So, for example, $\boldsymbol{p}^1$ and $\boldsymbol{p}^{1*}$ are domestic and international prices respectively before the regional agreement and $\boldsymbol{p}^2$ and $\boldsymbol{p}^{2*}$ are those after the agreement.

$$\begin{aligned}\text{Welfare Impact} &= -[\boldsymbol{B}(\boldsymbol{p}^2,\boldsymbol{p}^{2*},\boldsymbol{v},\boldsymbol{u}^1) - \boldsymbol{B}(\boldsymbol{p}^1,\boldsymbol{p}^{1*},\boldsymbol{v},\boldsymbol{u}^1)] \\ &= -\{[e(\boldsymbol{p}^2,\boldsymbol{u}^1) - g(\boldsymbol{p}^2,\boldsymbol{v})] - [e(\boldsymbol{p}^1,\boldsymbol{u}^1) - g(\boldsymbol{p}^1,\boldsymbol{v})] \\ &\quad - [(\boldsymbol{p}^2 - \boldsymbol{p}^{2*})\boldsymbol{m}^2(\boldsymbol{p}^2,\boldsymbol{v},\boldsymbol{u}^1) - (\boldsymbol{p}^1 - \boldsymbol{p}^{1*})\boldsymbol{m}^1(\boldsymbol{p}^1,\boldsymbol{v},\boldsymbol{u}^1)]\}\end{aligned} \tag{2}$$

The expression for the welfare impact of an RTA comprises the difference between the economy's expenditure and revenue functions at post- and pre-agreement prices, respectively, and the change in net trade tax revenue. The expenditure and revenue functions

[11] We use the terms national spending and total expenditure by households interchangeably.

[12] The market distortions in this model are the tariffs and subsidies on imports and exports. Since, by definition, $e(\boldsymbol{p},\boldsymbol{u}) - g(\boldsymbol{p},\boldsymbol{v}) / \boldsymbol{pm}$, therefore $\boldsymbol{B} = \boldsymbol{p}^*\boldsymbol{m}$. So, to be more precise, $\boldsymbol{B}$ is the value of net imports at world prices.

have a special property in relation to domestic prices.[13] Keeping the specified level of welfare u and the economy's endowments v constant, changes in the value of the expenditure function due to a variation in domestic prices can be approximated as the product of the domestic price changes and the initial consumption choice, while changes in the value of the revenue function can be approximated as the product of the domestic price changes and the initial production choice. Given how trade m is defined in this model, this implies that the difference between the economy's expenditure and revenue functions at post-RTA and pre-RTA prices is approximately the domestic price changes due to the RTA multiplied by the initial level of trade volume $(p^2 - p^1)\, m^1$.

The expression for the change in net trade revenue due to the RTA can be decomposed into volume and price effects as follows:

$$\begin{aligned}(p^2 - p^{2*})m^2 - (p^1 - p^{1*})m^1 &= (p^1 - p^{1*})(m^2 - m^1) + [(p^2 - p^{2*}) - (p^1 - p^{1*})]m^1 \\ &\quad + [(p^2 - p^{2*}) + (p^1 - p^{1*})](m^2 - m^1) \\ &\cong (p^1 - p^{1*})(m^2 - m^1) + [(p^2 - p^{2*}) - (p^1 - p^{1*})]m^1 \end{aligned} \tag{3}$$

If the second-order term is ignored, combining expressions (2) and (3), we can therefore derive:

$$\text{Welfare Impact} \cong (p^1 - p^{1*})(m^2 - m^1) - (p^{2*} - p^{1*})m^1 \tag{4}$$

The first term in expression (4) shows that an RTA increases welfare if there is an increase in the (initial border tax-weighted) volume of trade. If there are no export taxes or subsidies in the economy, this term is the initial tariff-weighted change in the volume of imports. The second term in expression (4) shows that an RTA will reduce welfare if there is an increase in the (initial volume-weighted) international prices of imports or a fall in the (initial volume-weighted) international prices of exports. This term represents the FTA's terms of trade effects. The expression for the terms of trade effects can be separated into intra-bloc and extra-bloc effects. The welfare impact as stated in expression (4) can be used to estimate an FTA's welfare effects if statistics on trade volumes and border taxes and subsidies are available.

The model just illustrated applies to a very general neoclassical economy, which is essentially founded on optimizing behavior by all agents. The model allows the study of multiple goods, factors, and households. Moreover, it is valid for production structures with traded intermediate inputs, and specific and nonspecific inputs. The model does, however, assume away noncompetitive behavior and economies of scale. Extending it to incorporate these features is possible but involves more sophisticated theory (see Baldwin and Venables 1995).

1.2.3. Kemp–Wan Theorem

In this section, we consider whether an economic arrangement such as a customs union or FTA can always be efficient if constructed correctly. This question is at the heart of the Kemp–Wan Theorem (1976) and in the extension to FTAs by Panagariya and Krishna (2002). The proposition is simple and requires three elements. First, countries in the regional agreement need to implement a set of external tariffs such that the imports from outsider countries do not change; i.e., if there is potential trade diversion from one outsider market, then

[13] Proof of this property utilizes Shepherd's and Hotelling's lemmas.

external tariffs would have to be lowered to ensure that the discrimination inherent in the regional agreement does not change trade with that market. Second, the regional agreement would have to embrace total internal free trade, thereby leading to greater efficiency through trade creation. Third, since it is theoretically possible that some countries in the regional agreement would be worse off with this arrangement (e.g., depending on the effects of the external tariffs), there would have to be a compensation mechanism, such that any country that loses would have to be fully compensated. Hence, Kemp and Wan showed that, in theory, it is always possible to form a regional agreement that maintains or improves the welfare of its individual members, creates a net improvement for the group, and does not harm the rest of the world.

While for many years this was thought to be merely a theoretical possibility without much relevance for policy makers, the embrace of the idea of "open regionalism," especially in the context of Asia-Pacific Economic Cooperation (APEC), has led to an increase in its popularity. Open regionalism is a nondiscriminatory approach to regionalism characterized by concerted liberalization of trade barriers within the grouping that would also be extended to outsiders. This approach would, therefore, have no trade diversion, as it would be nondiscriminatory, and yet it would have trade creation and, hence, would be unambiguously efficient. Although intriguing from an economic perspective, there are at least two problems with this type of open regionalism in the real world. First, from a political perspective, it is somewhat ingenuous to expect that RTA members would extend liberalization efforts to outsiders without any reciprocity. Second, within regional agreements, it is difficult, if not impossible, to implement a compensation mechanism, which would be necessary in order to ensure the type of outcomes sought by Kemp and Wan.

1.3. Dynamic Effects of Free Trade Agreements

So far, we have focused on the static (i.e., one-time) changes with the introduction of an FTA. We have ignored any dynamic (i.e., medium- and long-term) implications of FTAs. Because the dynamic effects of an FTA may be more substantial and pervasive, it is important to consider what they are and how they affect a country's welfare. We will consider some of the most important dynamic effects in the context of FTAs: economies of scale and variety, technology transfer and foreign direct investment (FDI), and structural policy change and reform, as well as competitiveness and long-run growth effects.

1.3.1. Economies of Scale and Variety

Economies of scale are defined as the reduction in average costs as output expands. Economies of scale may occur because of improved technical efficiency in large-scale production, more capability to spread administrative costs and overhead over a bigger operation, bulk discounts from suppliers, or better logistics because of larger volumes. Economies of scale exist in the production of some agricultural, natural resource intensive, and manufacturing sectors, as well as services. By creating a larger market for firms operating in partner countries, an FTA will allow producers to take advantage of a larger customer base and, hence, produce at a lower average cost on all sales. Firms will even be able to lower prices for existing customers—the "cost-reduction effect" (Corden 1972). As a result, these firms will become more competitive not only at home but also in foreign markets. Customers in each member country will also enjoy more variety in terms of the goods they can purchase because the larger market created by the FTA allows firms to sell in more markets and, given economies of scale, introduce new varieties that were too costly and unprofitable before the FTA.

1.3.2. Impacts on Foreign Direct Investment

Bilateral and regional FTA formation attracts long-term, risk-sharing investment flows by creating a more integrated marketplace within which multinational corporations can enjoy a regional division of labor with low transaction costs and exploit economies of scale. The patterns of FDI that follow the creation of an FTA may be similar to the effects of trade creation and trade diversion. A multinational corporation that believes an FTA will lead to greater economic dynamism may be compelled to invest more in one of the members, thus resulting in "investment creation." An FTA may induce more FDI flows into the region by multinationals that are headquartered outside the region. An FTA may also induce intra-bloc investment by multinationals with a regional origin.

However, if the multinational decides to invest in the member country not because of a perceived increase in dynamism but because it will now have preferential access to the FTA market, then we have "investment diversion." In other words, although investing in an outsider country might have been more cost effective, the multinational diverts investment to the FTA because of this regional accord. The motivation would be the same as in "tariff hopping" FDI. We might add here that there is a similar effect of investment diversion in terms of the problems associated with rules of origin discussed earlier in the chapter. If rules of origin are restrictive, it may create an incentive for a multinational corporation to increase the proportion of value-added of production of a good within the confines of an FTA than would otherwise have been the case. For example, the rule of origin on automobiles in the North American Free Trade Agreement (NAFTA) is 62.5% value added. Thus, if, say, a Korean car manufacturer moves intermediate production from Indonesia to Mexico, it may be able to meet the value-added requirements of NAFTA and thereby gain free access to the US market. While this may make sense from the point of view of the Korean manufacturer and Mexico may welcome the additional FDI, investment is diverted from the most efficient country (Indonesia), thereby hurting Indonesia as well as global efficiency.

1.3.3. Structural Policy Change and Reform

Although traditionally focused on commercial policy at the border, increasingly FTAs are effecting deeper integration by addressing behind-the-border measures. Examples of these behind-the-border areas are quality standards, as well as complex measures specific to the service sectors; laws related to corporate and public governance; customs procedures; the national treatment of partner-country investors; competition policy, including the reform of state-owned enterprises; and other "sensitive sectors" with important links to the rest of the economy. The inclusion of these nontraditional areas in FTAs shows how instrumental these agreements have become in shaping and harmonizing the national economic policies of members. An FTA allows like-minded countries to address these nontraditional areas that improve the business environment by reducing costs, leveling the playing field for foreign investors, and pushing policy reforms toward best practices (Plummer 2007). Doing so at the multilateral level would be extremely difficult, if not impossible, because of diverse interests. In the Association of Southeast Asian Nations (ASEAN), this is being done within the context of the ASEAN Economic Community.

1.3.4. Competitiveness and Long-Run Growth Effects

Although trade liberalization in an FTA is preferential, the reduction in trade barriers still allows members to benefit from healthy increased intra-bloc competition. Increased exposure to competition from partner countries weeds out less productive firms and favors more productive ones. It also gives firms an incentive to invest in more efficient productive pro-

cesses and technology. For each member economy and for the FTA as a whole, these competitive forces may improve structural efficiency and resource allocation as different members specialize in the production of different final and intermediate commodities. All the effects of increased competition on productivity and efficiency combine to raise FTA members' long-run growth prospects.

1.4. Theoretical Foundations for Computable General Equilibrium and Gravity Model

The second-best nature of FTAs suggests that empirical analysis is necessary in order to anticipate the possible economic consequences of any given FTA (ex-ante analysis) and to analyze the effects of an FTA once it is already in place (ex-post analysis). The literature is replete with such studies, in terms of both partial and general equilibrium analysis. The ex-ante models are the most common due to both supply and demand reasons: they are easier to simulate—since ex-post models have to come up with a counterfactual scenario that tends to be extremely tricky to form—and policy makers are more interested in being informed of the potential economic effects of an accord that they are considering to make, rather than the economic implications of an accord that they made several years ago.

In this section, we discuss computable general equilibrium (CGE) and gravity models of estimating the economic effects of an FTA. These two approaches are commonly used in assessing the impacts of trade policy, with CGE models being used for ex-ante analysis and gravity models being used for ex-post analysis. We finish the section by giving actual examples of the type of results derived from these models in the literature in order to offer some idea of their potential.

1.4.1. Foundations for Computable General Equilibrium Analysis

For analytical tractability, theoretical models of FTAs have usually restricted the number of countries and goods in the analysis. They have also ignored characteristics like economies of scale or imperfectly competitive markets for the most part. To overcome these limitations and to provide more relevant policy advice, researchers have turned to computer-based modeling. This type of modeling can include any number of commodities and partner countries or economic features provided there are no data or memory restrictions. These computer-based models frequently perform general equilibrium analysis with many dimensions. General equilibrium analysis takes account of all the important interactions between markets and can give more complete and precise answers to policy questions.

There are several reasons to use CGE models for the analysis of FTAs. First, CGE modeling is based on explicit assumptions in a framework consistent with microeconomic theory. Second, as CGE models produce quantitative results that are clear and exact, policy makers can more easily assess who gains and who loses from an FTA. Third, as an FTA involves changes in trade policy in multiple markets, the analysis may be too complex using algebraic or geometric methods. Lastly, CGE analysis may generate fresh insights about the role of certain economic assumptions in determining the results of an FTA.

The remaining models in this chapter are general equilibrium models that focused only on the price and trade linkages between two international markets. There are several other ways by which one market is linked to other markets. A change in the price of a good in a particular market will affect the quantity demanded for related consumption goods (substitutes or complements) and the demand for production inputs, such as raw materials, labor, machinery, and factory premises. In turn, this may change the incomes of different households and their

demand for other goods and services, some of which may be imported. This may also change the government's budget, particularly in terms of tax revenue and government subsidies. For an open economy, equilibrium must also hold in terms of the balance of payments.

The crux of general equilibrium analysis is that no market remains with excess demand or supply, i.e., circular flows of income and expenditure must all be balanced. To achieve market equilibrium, prices are assumed to adjust until demand for factors of production equals available endowments, consumers have chosen the desired basket of goods given their incomes, and firms have chosen production levels that maximize their profits. Because an FTA introduces a set of policy changes in an economy, CGE models simulate an economy where markets have adjusted and a new general equilibrium has been reached. The effect of an FTA can be estimated by comparing welfare under the old equilibrium with that under the new equilibrium.

A CGE analysis is a study of these market linkages using mathematical modeling and real-world data from a benchmark year. The mathematical modeling is based on a set of neoclassical economic assumptions about the motivation of agents in the economy, market structure, consumer preferences, production technology, and market equilibrium conditions. These assumptions are coded in mathematical functions and equations, which contain parameters that capture important behavioral relationships. In a CGE model, most of these parameters are elasticities (i.e., they measure the responsiveness of one variable to changes in another) or share parameters, such as the share of consumption demand in aggregate demand. Some of these parameters will have known values while others will have to be calibrated in the mathematical model with real-world data. Calibration is a step in CGE analysis when values are selected to make the CGE model's output agree with real-world data from the benchmark year.

A CGE model essentially captures demand and supply in each sector and the linkages among sectors. The model has exogenous variables (i.e., variables that have given values determined outside the model) and endogenous variables (i.e., variables that are solved within the model). In the analysis of an FTA, the exogenous variables typically correspond to the trade policy variables, elasticities, and share parameters. The rest of the variables in a CGE model of an FTA are endogenous variables, such as prices, import and export volumes, household income, tariff revenue, consumer surplus, and producer surplus.

1.4.1.1. Characteristics of Agents in a Typical Computable General Equilibrium Model

A CGE model will typically have three agents: firms, consumers, and government. Firms produce output, which is purchased by consumers and the government. Firms are profit maximizers and use market prices in deciding how much output to produce and with which inputs. In the typical CGE model, each sector has only one firm that produces a single good. The sector's production is represented by a production function, which shows the relationship between inputs and output. Various functional forms, such as the Cobb–Douglas, Leontief, or constant elasticity of substitution functions, may be used to model production in a CGE model.[14] These production functions are usually assumed to exhibit constant returns to scale and to be weakly separable between primary factors and intermediate

[14] A general Cobb–Douglas production function is $y = A\prod_{i=1,n} x_i^{\alpha_i}$, where y is the quantity of output, x_i is the quantity of input i, A is a scalar for productivity, and α_i is a parameter for each factor used. A general constant elasticity of substitution production function is $y = A\left[\sum(\alpha_i x_i)^{\rho}\right]^{\frac{1}{\rho}}$ where y is the quantity of output, x_i is the quantity o input i, A is a scalar for productivity, α_i is a parameter for each factor used, and ρ is a parameter related to the elasticity of substitution. A general Leontief production function is $y = \min\left(\frac{x_1}{\alpha_1}, \ldots, \frac{x_n}{\alpha_n}\right)$ where y is the quantity of output, x_i is the quantity of input i, and α_i is a parameter.

inputs.[15] Further, these production functions will include parameters called elasticities of substitution, which define the substitutability of one input for another. The elasticities of substitution are therefore an important determinant of demand for various inputs.[16] In addition, production in a CGE model typically involves a multilevel or nested production process. The use of a nested structure allows for differing elasticities for each pair of factors and makes it easier to incorporate intermediate inputs into the analysis.

Consumers are often modeled with reference to a representative household. Market prices factor into the decisions of the representative household (i.e., consumers' decisions) on how much of each good to purchase. Consumers are utility maximizers and their preferences are captured by utility functions, which include parameters that capture the elasticities of substitution between final goods. Consumers also act as factor owners in a CGE model. They are endowed with capital, land, labor, and other factors of production. Based on market prices, they supply their factors and receive income in return. This income is used to purchase goods, pay direct taxes (e.g., income tax) and indirect taxes (e.g., import tariffs and sales tax) and, in dynamic CGE models, some of this income may be saved.

In a CGE model, the government administers only market-related policies, such as taxes, subsidies, trade tariffs, and quotas. The government is often assumed not to have an objective function. For this reason, and because the effects of government policies are of primary interest, policy variables often enter exogenously into CGE models.

1.4.1.2. Computable General Equilibrium Models of International Trade and Free Trade Agreements

Commonly, CGE models are used to evaluate the effects of trade policy because policy makers require quantitative assessments of the impacts of any policy in order to make decisions. As we have seen, economic theory only provides qualitative conclusions, which are sometimes ambiguous. For example, in the case of FTAs, trade creation and trade diversion have opposing effects on welfare, so the net effect may be positive or negative. CGE models provide an empirical foundation for policy analysis that can quantify the magnitudes of the effects identified by theory, and suggest the likely net welfare effect.

In CGE models of international trade, the set of goods available to firms, consumers, and government includes imported goods. For a particular good, the imported and domestically produced varieties are typically modeled as substitutable but not perfect substitutes. Besides relative prices, the choice between the domestic and the foreign variety of a good depends on a parameter known as the Armington elasticity. This parameter distinguishes goods by their national origin and captures the substitutability between goods from different countries. Armington elasticities are of key importance in determining the impact of trade policy in CGE models. They also produce more realistic trade responses than models without national differentiation. Further, the use of these elasticities results in intra-industry

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[15] Separability is a mathematical property of a function. When it is assumed that production functions are weakly separable between primary and intermediate inputs, this implies that the marginal rate of substitution between any pair of primary factors is independent of the amount of intermediate inputs used. In other words, the demand for any two primary factors depends only on the price ratio of primary factors, and is independent from prices of intermediate inputs.

[16] If a Leontief function is used to represent production, then there is no substitutability between inputs. If the Cobb–Douglas function is used to represent production, then the elasticity of substitution between inputs is equal to 1, i.e., a 1% reduction in the use of one input needs to be offset by a 1% increase in the use of another input to maintain a given level of output. For more flexibility, modelers often use the constant elasticity of substitution function, which allows them to choose any value for the elasticity of substitution.

Table 1.1 Summary of Free Trade Agreement Effects Generated by Computable General Equilibrium Models

Impact on welfare: Yes (estimated via equivalent or compensating variation)
Impact on production: Yes (disaggregated and aggregated)
Impact on factor returns: Yes (e.g., effects on skilled and unskilled labor, capital, land)
Impact on price: Yes (by sector, terms of trade)
Impact on trade volume: Yes (aggregated and disaggregated, imports and exports, changes in trade balances)
Impact on custom income: Yes
Impact on "dynamic" variables: Depends (some models don't; some include economies of scale/imperfect competition, changes in capital flows, foreign direct investment, productivity spillovers)

trade (i.e., a country imports and exports different varieties of the same good). Another advantage of the Armington assumption is that complete specialization does not occur.

To simulate an FTA, the CGE modeler must first make sure that the model is producing outcomes that match the actual observed values of endogenous variables, such as prices or trade volumes, to recreate the baseline situation. Once this is achieved, simulating an FTA is simply a matter of setting trade barriers to zero between FTA partners in the model and running the model to produce new estimates. The simulation represents what the economy would look like if the FTA had occurred. By comparing post-FTA outcomes with the baseline situation, the modeler can study (i) changes in welfare (changes in consumer and producer surplus or other welfare indicators, such as equivalent variation); (ii) changes in the terms of trade of each partner and the FTA as a whole; (iii) changes in production by sector; (iv) changes in the returns to the factors of production (i.e., labor by skill, capital, landowners); and (v) changes in imports and exports by sector and by partner. Table 1.1 summarizes the effects of key economic variables of any FTA that can be simulated by a CGE model. The modeler may also wish to compare the potential effects of different possible FTAs with different partners, different scenarios that may include or exclude different sectors, or combinations of trade agreements. By comparing the welfare outcomes of all scenarios, a policy maker would be able to determine the scenario that benefits a country the most.

1.4.1.3 Limitations of Computable General Equilibrium Analysis of Free Trade Agreements

The use of CGE analysis entails a number of problems. First, the data requirements for CGE analysis of FTAs are extensive, and frequently certain data items are arbitrarily picked by the modeler. Second, the model's results may be very sensitive to the assumptions and data used. To address these first two concerns, almost all CGE exercises include a sensitivity analysis to obtain a range of results based on different assumptions or data. In this way, the modeler can check the robustness of the results. A third problem with CGE analysis is the lack of a time dimension. A CGE analysis of an FTA will not provide results on how long it will take for economies to adjust and reach the new equilibrium. Recent work in CGE modeling has attempted to include some dynamic effects via financial markets, but it is a long way from capturing the dynamic features that are most relevant to FTAs. Fourth, it is difficult to model certain non-tariff barriers to trade, such as sanitary, phytosanitary, and technical barriers, or customs issues if these are included in an FTA. Moreover, incorporating the level of production on trade in services is challenging due to the lack of data. Last, while some modelers have tried to endogenize productivity spillovers in CGE models—which we believe to be extremely important—this is an extremely complicated operation.

1.4.2. Foundations for the Gravity Model

The ASEAN Free Trade Area (AFTA) has mainly been in place for the original ASEAN countries for the past several years. What have been its effects on trade flows? Answering this question requires a very different approach from a CGE model: we already know what happened, but what would have happened in the absence of AFTA? Ex-post approaches answer this question by attempting to estimate what would have happened to trade flows if there had been no FTA. Thus, they must create a counterfactual scenario to which the actual flows can be compared. In this way we can estimate how much of the changes in trade flows can be attributed to AFTA. Like CGE models, gravity models have been extremely popular in the literature. The widespread use of gravity models in trade analysis is due to their high explanatory power of real-world data.

Briefly, gravity models are econometric models that attempt to explain bilateral import demand (X_{ij}) with a variety of explanatory variables, e.g., income of the importing country (Y_i), income of the exporting country (Y_j), per capita income of the importing country (N_i), per capita income of exporting countries (N_j), a variable that accounts for the distance between the importing and exporting countries (D_{ij}), and a vector of additional variables that may be employed if thought to be relevant (V_z).[17] Expressed in logarithmic form, a characteristic gravity model of bilateral trade takes on the form:

$$\ln X_{ij} = A + \delta_1 \ln (Y_i * Y_j) + \delta_2 \ln (N_i * N_j) + \delta_3 \ln D_{ij} + \delta_z \ln V_z + \ln e_{ij} \quad (5)$$

where

i = importing country;
j = exporting country;
A = intercept;
δ_i = coefficients of the explanatory variables
$\ln e_{ij}$ = lognormal error term[18]

Table 1.2 Summary of Free Trade Agreement Effects Generated by Gravity Models

Impact on welfare: No (estimated via equivalent or compensating variation)
Impact on production: Yes (disaggregated and aggregated)
Impact on factor returns: No (e.g., effects on skilled and unskilled labor, capital, land)
Impact on price: No (by sector, terms of trade)
Impact on trade volume: Yes (aggregated and disaggregated, imports and exports, changes in trade balances)
Impact on custom income: No
Impact on "dynamic" variables: Yes (effects are captured via regional binary variables)

[17] Here, these could be to delineate a common border through a binary variable, whether countries have a fixed exchange rate or monetary union, even cultural variables. As discussed in the text, we could also include a binary variable for an FTA or customs union.

[18] Standard trade theory would suggest that the coefficients of the explanatory variables would have the following signs: $\delta 1 > 0$, $\delta 2 > 0$, $\delta 3 < 0$, and the rest would depend on the vector of additional explanatory variables.

1.4.2.1. Gravity Models and Free Trade Agreement Assessment

Gravity models can be used to assess FTAs by including a binary variable in the baseline specification, as in (5), indicating whether or not a pair of trading countries belongs to an FTA. This variable, in essence, captures the difference between actual flows and the counterfactual, which is the amount of trade explained by variables in the baseline specification. We can estimate whether or not an FTA has had a statistically significant effect on trade flows using this variable. If it is significant and positive, we can deduce that the FTA has indeed had a positive effect on trade flows, with a magnitude relating to the size of its coefficients.[19] This, however, is an inference about the FTA's effect on total trade flows and not whether the statistically significant effect is due to trade creation, trade diversion, or both. To estimate these effects separately, another binary variable would need to be included. With this extended specification, the binary variable for observations where both the importing and exporting countries are members of the FTA would capture trade creation, while the second binary variable for observations where one of the trading partners is not a party to the FTA would capture trade diversion.

1.4.2.2. Limitations of Gravity Models

The policy maker needs to be careful when interpreting any results from gravity model estimations. The estimated effect of an FTA is only as good as the data used for the estimations. If the data are unreliable, the results of the gravity model will also be unreliable. Another important limitation is in the specification of the gravity model. The baseline gravity model makes the assumption that the counterfactual level of bilateral trade depends only on the included economic features of a given pair of countries. However, the set of baseline variables may not produce a credible counterfactual either because important variables are omitted or there is measurement error. For example, the distance variable in the baseline specification is intended to measure the effect of trade costs on trade flows. Obviously, simple distance measures do not fully reflect trade costs, which are determined by many other factors, such as infrastructure quality and border waiting times. A further limitation is that the FTA binary variables are extremely basic indicators of regional integration policy. They do not capture the breadth and depth of an FTA, but simply whether or not it exists and which countries are involved. Given their roughness, these simple binary variables may falsely attribute increased trade to an FTA because they are likely to be correlated with other factors, such as regional production sharing, technology diffusion, intraregional travel, or diplomatic efforts, that may be the true drivers of increased regional trade.

1.5. Concluding Remarks

In this chapter, we considered the theoretical effects of FTAs and the theoretical foundation of some empirical models that can be employed to estimate their potential economic effects. Partial equilibrium models (e.g., Viner's model) and general equilibrium models were explained in the context of analyzing the impacts of FTA. We also noted that some of the most important effects of FTAs, such as the dynamic effects, are often excluded from formal modeling but, in effect, could prove to be most important to developing countries on the path to outward-oriented economic development. It is important to underscore that FTAs need to be accompanied by complementary policy reforms pertinent to making these agreements effective (Chapter 4).

[19] We have to be careful to remember that this is a semi-log function and, hence, need to take care in interpreting the estimate coefficient on binary variables, which are obviously not in log form.

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Chapter 2

Methods for Ex-Ante Economic Evaluation of Free Trade Agreements

In theory, the net welfare effect of a free trade agreement (FTA) is ambiguous (Viner 1950, Lipsey 1970, and Panagariya 2000). To determine how much a proposed FTA is worth, policy makers must turn to empirical methods. This chapter provides practical methods to policy makers for evaluating the potential economic effects of an FTA, defined as the preferential liberalization of trade within a group of countries. The chapter discusses how to apply three methods: trade indicators, SMART (software for market analysis and restrictions on trade) in WITS (world integrated trade solution), and the GTAP (Global Trade Analysis Project) model. The chapter identifies the different aspects of an FTA that each method can evaluate, describes data sources and software requirements, specifies how to interpret the output from each method, and discusses the strengths and limitations of each method. To illustrate each method, examples are given using real-world data of their application to the European Union (EU), the North American Free Trade Agreement (NAFTA), and members of the Association of Southeast Asian Nations (ASEAN), particularly Cambodia, the Lao People's Democratic Republic (Lao PDR), and Viet Nam.

The three methods differ mainly in terms of the questions about a proposed FTA that each can answer. Broader and more multifaceted questions will require more sophisticated, data-intensive methods. All of the methods require some trade data, which come at different levels of aggregation and are bilateral in nature. The choice of aggregation level and trade partners will depend on the questions being asked.

The first section of this chapter presents the simplest method, which uses trade indicators to draw specific inferences about the potential effects of joining an FTA. The trade indicators focus on the following questions:

(i) To what extent is trade intraregional?
(ii) What is the comparative advantage of each FTA member?
(iii) Are a country's exports of a good regionally oriented?
(iv) How complementary is trade between a given pair of FTA members?
(v) How similar are the exports of a given pair of FTA members?

The main advantage of the method is that the data requirements are minimal, and therefore this method is easy to implement. However, the main drawback of trade indicators is that they do not provide precise numbers that quantify the effects of an FTA on trade, production, consumption, or welfare.

The second section presents a method grounded in microeconomic theory that provides some quantification of the economic effects of an FTA in an individual market. Policy makers may be interested in a particular market for its economic size, political importance, or for other reasons. This method can provide numeric answers to the following questions:

(i) How much will imports increase?
(ii) How much will exports from regional partners increase?
(iii) How much will exports from outsiders decrease?
(iv) How much will tariff revenue fall?

Besides trade data, this method requires data on the initial tariff protection and values for certain behavioral parameters. The main advantage of this method is that it can quantify the effects of an FTA in a specific market at the most disaggregated level. The main disadvantage of this method is that it is a partial equilibrium method, meaning that it ignores interactions with other markets.

The third section in this chapter presents the most sophisticated method of evaluating a proposed FTA. The method is based on a general equilibrium model—a model where all markets clear and interactions between them are accounted for. The method essentially simulates a real-world scenario and introduces a policy shock such as an FTA. By studying the simulated changes caused by the FTA, this method is able to answer the following questions:

(i) How does real gross domestic product (GDP) change in a country that joins an FTA?
(ii) How does the country's trade balance change?
(iii) How do the country's terms of trade change?
(iv) How do import and export prices in a particular sector change?
(v) How do output and trade in different sectors within the country change?
(vi) Is there trade diversion?
(vii) How does the country's welfare change?
(viii) Where do these welfare effects come from?

The main advantage of this third method is that, given FTA-related policy changes in various markets, the analysis can quantitatively capture the effects of these changes on all markets, rather than just one market. However, this comes at a cost of modeling complexity and substantial data requirements.

In general, the choice between methods will depend on which questions the policy maker wishes to answer as well as data availability.

2.1. Trade Indicators to Evaluate the Potential Economic Effects of a Free Trade Agreement

A trade indicator is an index or a ratio used to describe and assess the state of trade flows and trade patterns of a particular economy (Mikic and Gilbert 2007). These indicators are easily

constructed with a country's trade statistics, which are readily available from national statistical offices or international sources (Box 2.1).[20] In this section, we present indicators of regional trade interdependence, revealed comparative advantage, regional orientation of a country's exports, and similarity or complementarity of a country's exports with other trading partners. Given the simplicity of these indicators, they can be used at the initial stage of any trade policy decision-making process, including the decision on whether or not to join an FTA. An important caveat is that these indicators cannot determine the causes of a particular state or trend in trade flows.

Box 2.1 International Database for Trade Statistics

Direction of Trade Statistics

The Direction of Trade Statistics (DOTS) online system contains total bilateral and multilateral export and import data, which are available via subscription.[a] The DOTS is based on the DOT CD-ROM browser product. It covers more than 190 economies of the International Monetary Fund. In addition to country data, DOTS provides the world's exports and imports data—the sum of all countries' total exports and imports. DOTS data are available in annual, quarterly, and monthly series from 1980 onward.

DOTS data are regularly updated for at least 49 countries, comprising all advanced economies and the 18 developing and emerging economies which have represented four-fifths of the value of recorded world exports and imports in recent years. For these countries, monthly data are made available on a regular basis (i.e., with a delay of 4 months or less from the current month). Other countries report monthly data to the International Monetary Fund that are less current, and are compiled and made available on a quarterly or annual frequency. The database also includes some other countries' data reported to the United Nations (UN) Statistics Division, and the Comext database maintained by Eurostat (the statistical office of the European Union). For countries that do not have reported trade with their partners during a specific period, estimates are provided based on partners' data. Partners' data are adjusted using a cost insurance and freight–free on board conversion factor of 1.10 to allow for the cost of freight and insurance.[b] No estimate is provided for trade flows between countries where data are unavailable for both trading partners during the last 10 years.

The only major limitation of DOTS is that it does not have commodity-level data.

United Nations Commodity Trade Statistics Database

The UN Commodity Trade (Comtrade) Statistics Database contains detailed imports and exports statistics, which are available via subscription and free online query. There is no limitation on the number of queries but there is a download limit of 50,000 per data query.[c] To date, there are 248 economies listed in the database. The listing identifies the availability of data in terms of years, commodity classifications, and commodity level disaggregations.[d] Available years range from 1962 to 2009. Classifications are available according to the following: Harmonized System (HS) classification 92, HS 96, HS 2000, HS 2002, and HS 2007; Standard International Trade Classification; and classification based on Broad Economic Categories. The value, in US dollars, of trade at the commodity level is available in total, two-digit, four-digit, and six-digit levels. The six-digit-level data are available in terms of both value and volume (kilograms).

The database is continuously updated (although there is no indicated date as to when the data are being updated). Whenever trade data are received from the national authorities on trade statistics of each country, they are standardized by the UN Statistics Division and then added to the UN Comtrade. Other countries' data are also taken from sources, such as the Organisation for Economic Co-operation and Development and the International Trade Centre (ITC). The database does not contain estimates for missing data.

continued on next page

[20] The United Nations Commodity Trade (Comtrade) Statistical Database http://comtrade.un.org/ is used most often for trade data, especially for disaggregated information. The World Trade Organization and the International Monetary Fund's Direction of Trade Statistics are good sources for aggregated trade data.

Box 2.1 *continued*

Users should be aware of the limitations of the database, which include the following:[e]

- The values of the reported detailed commodity data (two-digit, four-digit, and six-digit) do not necessarily sum to the total trade for a given country dataset.
- Although there are available data in recent classifications, e.g., HS 2007, not all countries report under such classification. The database does not estimate data for countries that do not report in recent classifications.
- When the database converts data from a more recent to an older classification, it may occur that some of the converted commodity codes contain more or fewer products than the official commodity heading implies. The database does not make adjustments for these cases.

International Trade Centre

The ITC produces Trade Map, an online product whose subscription is free for developing countries. The database contains monthly, quarterly, and annual export and import data for 148 countries in 2000–2009. However, monthly and quarterly data are limited to total exports and imports and given for a smaller number of countries. The annual data are available in HS two-digit, HS four-digit, and HS six-digit levels. The ITC sometimes uses mirror data (i.e., the trade partners' data) in cases where there are no reported data for a certain country. These details are available in the reference materials of the database.[f] The data are sourced from countries' statistical authorities and UN Comtrade.

The database also features:[g]

- analysis of present export markets,
- preselection of priority markets,
- an overview of competitors in global and specific markets,
- a review of opportunities for product diversification in a specific market,
- identification of existing and potential bilateral trade with any partner country, and
- information on tariffs.

[a] The introduction to the database is available at www2.imfstatistics.org/DOT/DOTIntro.htm
[b] The detailed estimation procedures are available at www2.imfstatistics.org/DOT/DOTEstim.htm
[c] The free online query can be accessed at http://comtrade.un.org/
[d] Data availability in Comtrade is available at http://comtrade.un.org/db/mr/daReportersResults.aspx
[e] For further details, see http://comtrade.un.org/db/help/uReadMeFirst.aspx
[f] The details of data availability from the ITC are available at www.trademap.org/stDataAvailability.aspx
[g] The details of these features can be found on the ITC website: www.intracen.org/marketanalysis/TradeMap.aspx?mn=0&sm=0 6

Source: http://comtrade.un.org/ and www.trademap.org/

2.1.1. Indicators of Regional Trade Interdependence

Before the formation of an FTA, it is important to know the extent to which countries in a proposed FTA already trade with each other. Trade here refers to the sum of imports and exports. Intraregional trade share and regional trade intensity are the indicators normally used as measures of existing trade interdependence. This section discusses these two indicators and introduces the regional trade introversion index.

For each indicator, a high value may indicate that countries in the proposed FTA have lower trade costs with each other relative to trade with non-FTA countries. Here, trade costs are interpreted broadly to include all costs incurred in getting a good to the final user other than the marginal cost of producing the good itself, including transport costs (both in freight and time), policy barriers (tariffs and non-tariff barriers), information costs, contract enforcement costs, costs associated with the use of different currencies, legal and regulatory costs, and local distribution costs (wholesale and retail). If a high value is indeed due to lower trade costs, then an FTA may be beneficial as it encourages trade between "natural" trading partners. Conversely, if a low ratio is due to higher trade costs, then an FTA may be harmful as it promotes "unnatural" trade.

2.1.1.1. Intraregional Trade Share

The intraregional trade share is defined as the ratio of trade between countries in the proposed region over the total trade of all these countries. This indicator shows the relative importance of trade within the region compared to the total trade of all regional members. The intraregional trade share of region *i* in mathematical form is:

$$\text{Intraregional Trade Share}_i = \frac{T_{ii}}{T_i}$$

where

T_{ii} = exports of region *i* to region *i* plus imports of region *i* from region *i*
T_i = total exports of region *i* to the world plus total imports of region *i* from the world

The exports of region *i* to region *i* should be equal to the imports of region *i* from region *i*. Therefore, the numerator of this indicator can simply be twice the exports of region *i* to region *i*, or twice the imports of region *i* from region *i*. This indicator is simple to calculate and can be used by a single country or a group of countries to measure the regional direction of trade.

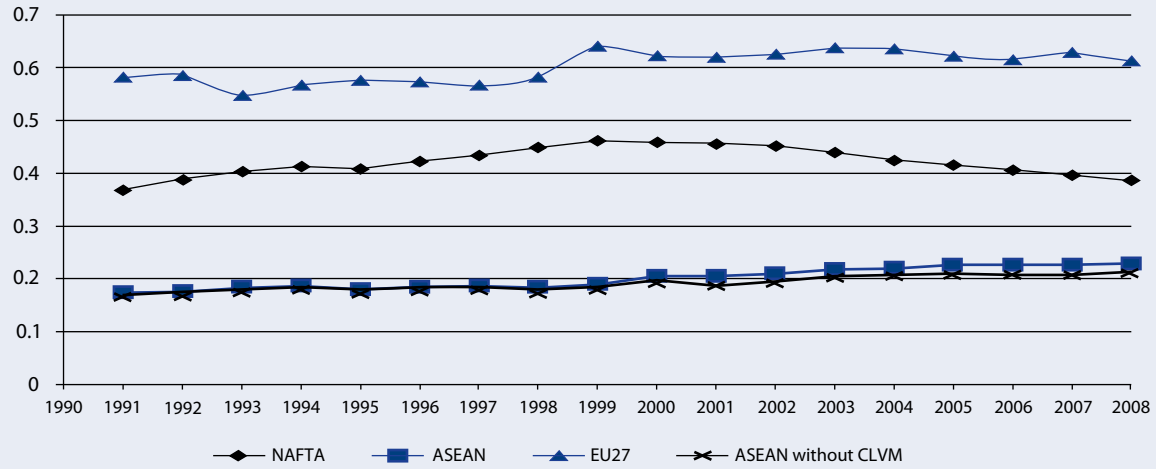
However, there are two important problems in its use, as shown by Anderson and Norheim (1993). First, even if there were no regional bias in trade between members, the intraregional trade share would tend to be higher simply because there are more member countries. To see why, consider what happens to the intraregional trade share if a region were simply split into more countries, thus keeping the region's trade with outsiders constant. Intraregional trade would increase because certain erstwhile domestic transactions would now become regional export and import flows. As this increase would raise the numerator more than the denominator of the intraregional trade share, the indicator would also increase. Second, the higher the share of the region's total trade out of world trade, the more likely it is that regional members will be trading with each other and the less likely it is that they will do so with non-member countries. The intraregional trade share would be higher simply because members conduct more of the world's trade regardless of trading partner.[21] When making comparisons of the intraregional trade share over time or across groups of countries, it is important to note if membership of the regional grouping changes and to compare how a region's total trade grows in relation to the world's total trade.

Figure 2.1 shows trends in the intraregional trade shares of three regional groupings: ASEAN, the EU27, and NAFTA. Trade data was used for 1990–2008 for all members of the regional groupings in 2008, even though membership of each regional grouping expanded during the 2 decades.[22] Therefore, the membership of each group is fixed in the calculations. It is clear that, on average, the share for the EU27 is larger than that for NAFTA, which in turn is larger than that for ASEAN. This shows that the higher the group's share of world trade, the higher the intraregional share tends to be. Nevertheless, looking at the intraregional trade shares over time, we can see that there is a slightly increasing trend for ASEAN from 17% in 1991 to 22% in 2008, a stabilizing trend for the EU27 over the same period, and a decreasing trend for NAFTA since 2001. Did the new members of ASEAN (Cambodia, the Lao PDR, Myanmar, and Viet Nam)

[21] For example, if the world were considered as a single region, then the intraregional trade share would be equal to one, the maximum value.

[22] The EU had 12 members in 1990. Austria, Finland, and Sweden joined in 1995, followed by 10 new members (mainly Eastern European countries) in 2004, and Bulgaria and Romania in 2007. NAFTA was signed in 1994. Prior to that, Canada and the US had signed a bilateral FTA in 1989. ASEAN comprised six member countries in 1990, and over the 1990s membership expanded to include Viet Nam (1995), the Lao PDR and Myanmar (1997), and Cambodia (1999).

Figure 2.1 **Intraregional Trade Shares of ASEAN, the EU27, and NAFTA, 1990–2008**



ASEAN = Association of Southeast Asian Nations; CLVM = Cambodia, Lao People's Democratic Republic, Viet Nam, and Myanmar; EU = European Union; NAFTA = North American Free Trade Agreement.

Source: Author's computations with data sourced from the United Nations Commodity Trade (UN Comtrade) Statistics Database.

contribute to the increasing intra-ASEAN trend? As shown in Figure 2.1, the trend is almost identical if the new members are excluded from the computations.[23] Although the total trade of these four new members increased from less than 1% of ASEAN's total trade in 2000 to about 9% in 2008 (ASEAN Statistical Yearbook 2008), the trade of the ASEAN-6 (Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore, and Thailand) is the primary driver of increasing intraregional trade.

2.1.1.2. Intraregional Trade Intensity

Intraregional trade intensity is defined as the intraregional trade share divided by the share of the region's total trade in world trade.[24] The numerator—the intraregional trade share—can be thought of as the probability that any $1 worth of total trade of regional members is an intraregional transaction. The denominator—the region's total trade share in world trade—can be thought of as the probability that any $1 worth of world trade is a transaction involving at least one regional member. The closer the numerator and denominator are in value (i.e., the closer the intraregional trade intensity is to the value of 1), then the more neutral the regional members' trade is.[25] In other words, the region tends to not have any bias toward trading between its members or with outsiders. If the indicator is more than 1, then the region has a bias toward trading within itself; if the indicator is less than 1, then the region has a bias toward trading with outsiders. The intraregional trade intensity will tend to rise when the share of a region's trade within itself rises faster than its share of world trade.

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[23] The bulk of trade data for Cambodia and Viet Nam is from 1999 onward. There is very little trade data for Myanmar and none for the Lao PDR.

[24] This ratio is also called the "relative" measure of trade intensity (Petri 1993) because intraregional trade is measured relative to the region's share of world trade.

[25] This is in terms of "geographic neutrality" (Kunimoto 1977). Geographic neutrality is defined as the absence of a trading bias with any country or region, so each trade transaction involves a country or region according to its share in world trade. For example, suppose a region's share of world trade is 10%. If geographic neutrality holds, then 10% of all trade transactions conducted by a regional member must involve another regional member. In other words, the assumption of geographic neutrality implies that the intraregional trade share equals the region's share of world trade.

The formula for the intraregional trade intensity is:[26]

$$\text{Intraregional Trade Intensity}_i = \frac{\left(T_{ii} / T_i\right)}{\left(T_i / T_w\right)}$$

where

T_{ii} = exports of region i to region i plus imports of region i from region i
T_i = total exports of region i to the world plus total imports of region i from the world
T_W = total world exports plus total world imports, which can be twice the value of world exports or twice the value of world imports since the value of world exports should equal world imports

Box 2.2 Database for Trade Integration Indicators

Asia Regional Integration Centre

One of the Asia Regional Integration Centre (ARIC) databases is the integration indicators database, which is accessible for free at the ARIC website.[a] Trade data for countries and groups in Asia and the Pacific can be generated under the integration indicators database for the period 1990–2009. The available trade data are total annual exports and imports for period 1990–2009, which are sourced from the Direction of Trade Statistics (DOTS) online, and annual Harmonized System (HS) 1996 two-digit commodity level exports and imports for period 1996–2009, which are sourced from the United Nations Commodity Trade (Comtrade) Statistics Database.

The important value added of the database is that users can generate measures of regional integration—intraregional trade share, intraregional trade intensity index, trade intensity index, export share, and export intensity index—for countries and groups in Asia and the Pacific for the period 1990–2009.[b] The integration indicators in the database can be generated for a country or region paired with another country or region.

The Regional Integration Knowledge System

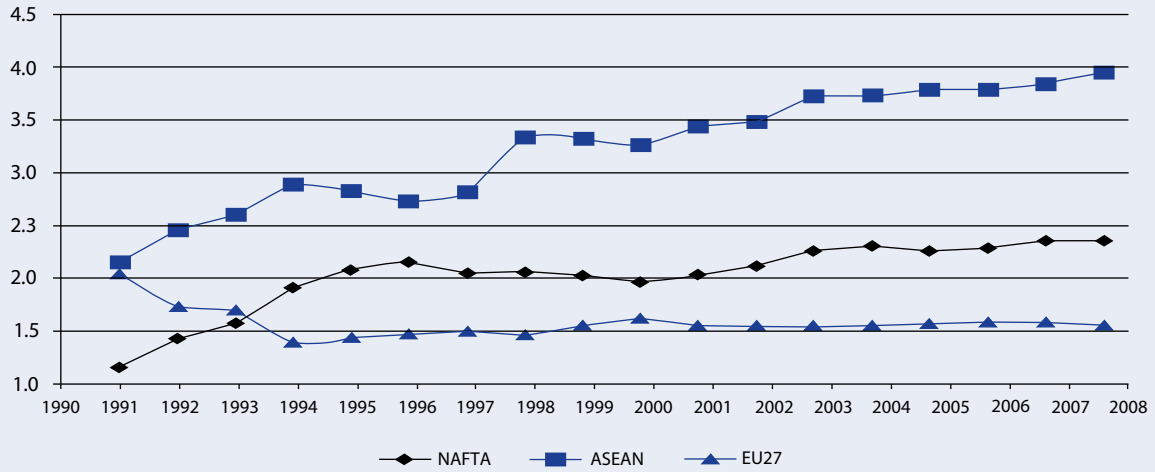
The Regional Integration Knowledge System (RIKS) is a web-based portal on regional integration, targeting a relatively broad public, with students worldwide being the main category of user. The database contains qualitative information, statistical data, and indicators on selected regional arrangements, and includes links to other databases. RIKS has quantitative data for more than 60 regional arrangements, covering the period 1970–2005 for most of these regions.[c] Currently, the indicators include regional gross domestic product, regional share in world gross domestic product, regional population, regional share in world population, intraregional trade share, intraregional trade intensity index, and symmetric trade introversion index. The indicators can also be generated for regions customized by users (i.e., users can set up a region or a group of countries and generate indicators for the group).

[a] The trade indicators database is available at www.aric.adb.org/indicator.php
[b] Explanatory notes on the integration indicators and other available indicators can be found at www.aric.adb.org/integration_indicators_technotes.php
[c] The RIKS database may be accessed at www.cris.unu.edu/riks/web/data

Source: ADB. Asia Regional Integration Center Website (http://aric.adb.org/) and Regional Integration Knowledge System Platform (www.cris.unu.edu/riks/web/)

[26] Anderson and Norheim (1993) propose a correction to the intraregional trade intensity formula so that the index is precisely equal to one when regional trade is geographically neutral. To perform this correction, the denominator (T_i/T_W) is replaced by $[(T_i - 1/n^* T_i)/(T_W - 1/n^*T_i)]$, where n is the number of countries in the regional grouping. This correction is most useful if countries in the regional grouping each have a similar value of total trade. If not, the formula provided is sufficient.

Figure 2.2 **Intraregional Trade Intensity Indices of ASEAN, the EU27, and NAFTA, 1990–2008**



ASEAN = Association of Southeast Asian Nations, EU = European Union, NAFTA = North American Free Trade Agreement.

Source: Author's computations with data sourced from the United Nations Commodity Trade (UN Comtrade) Statistics Database.

Figure 2.2 shows the evolution of the intraregional trade intensity indices of ASEAN, the EU27, and NAFTA between 1990 and 2008. We observe that all three regions have a bias toward trading amongst themselves because their index values exceed 1. The ASEAN region's index rose while the EU27's index stayed constant for the much of the 2 decades, during which both regions' world trade shares were quite stable at around 6% for ASEAN and 40% for the EU27. As such, the rise in intra-ASEAN trade intensity was due to growth in intra-ASEAN trade, while intra-EU trade intensity hovered at 1.5 because intra-EU trade did not change much. During this period, the world trade share of NAFTA fell and the intraregional trade intensity of NAFTA rose. This trend was due to a shrinking share of world trade as intra-NAFTA trade did not rise much over the period.

The intraregional trade intensity index has some limitations which affect its use and interpretation (Iapadre 2006). First, the maximum value of the index is a decreasing function of the region's total trade. Therefore, indices computed for different regions and/or periods are not perfectly comparable with each other given their different ranges. Second, the range below the threshold value of 1 is much smaller than above 1, which makes index changes in different parts of the range incomparable. Third, the index may be inconsistent with its complementary indicator—the extraregional trade intensity index.[27] The extraregional trade intensity index measures the trade intensity of countries in the region with those outside. Mathematically, it is possible for both the intraregional and extraregional trade intensity indices to move in the same direction over time. This creates a problem of interpretation because regional trade cannot be simultaneously biased toward countries within the region and those outside.

2.1.1.3. Regional Trade Introversion Index

Given the problems of the previous two regional trade interdependence indicators, Iapadre (2006) has proposed the regional trade introversion index to measure the relative intensity of regional

[27] The formula for the extraregional trade intensity index is equivalent to (1 – Intraregional Trade Share)/(1 – Region's Share of World Trade).

trading versus trading with outsiders. In this index, intraregional trade intensity (HI_i) and extraregional trade intensity (HE_i) are functions of the region's share of outsiders' total trade and not of world trade as in the previous trade intensity index. The index's range is –1 to 1 and it is independent of the size of the region.[28] The index rises (or falls) only if the intensity of intraregional trade grows more (or less) rapidly than that of extraregional trade. If the index is equal to zero, then the region's trade is geographically neutral. If it is more than zero, then the region's trade has an intraregional bias; if it is less than zero, then the region's trade has an extraregional bias.

The formula for the regional trade introversion index is:

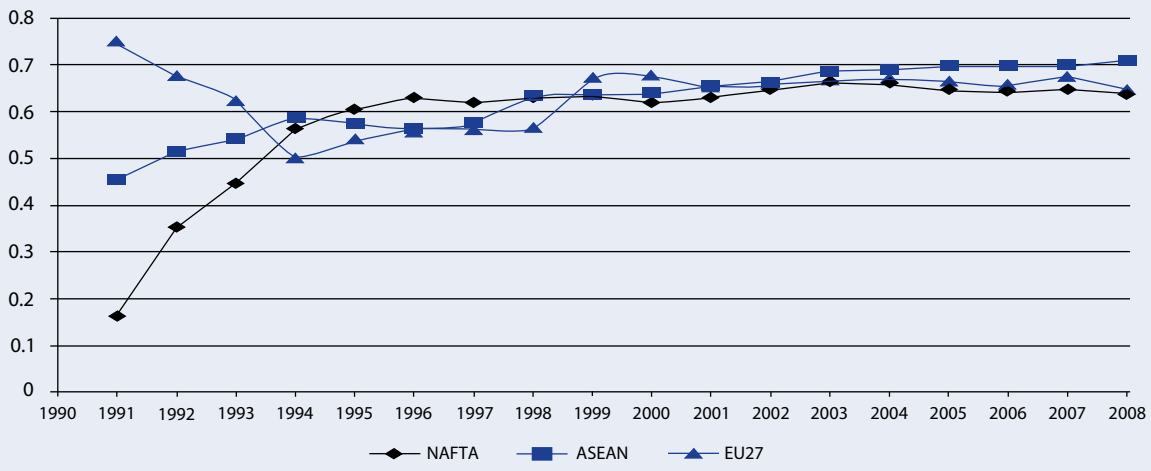
$$\text{Regional Trade Introversion Index}_i = \frac{(HI_i - HE_i)}{(HI_i + HE_i)}$$

where

$HI_i = (T_{ii} / T_i)/ (T_{Oi} / T_O)$ and $HE_i = [1 - (T_{ii} / T_i)]/[1 - (T_{Oi} / T_O)]$
T_{ii} = exports of region i to region i plus imports of region i from region i
T_i = total exports of region i to the world plus total imports of region i from the world
T_{Oi} = exports of region i to outsiders plus imports of region i from outsiders
T_O = total exports of outsiders plus total imports of outsiders

Figure 2.3 graphs the regional trade introversion indices for ASEAN, the EU27, and NAFTA from 1990 to 2008. The indices for all the three regions hover at 0.65 over most of the period, which points to intraregional biases in trade. In the early 1990s, the EU27 index fell because the trade of the original EU12 turned inwards due to the Single European Act's mandate to establish a common market by 1992, shifting EU trade away from the countries that would later become EU members. In contrast, trade among the countries that would form the NAFTA and ASEAN blocs intensified in the early 1990s amid the negotiations for and in anticipation of the NAFTA and AFTA agreements signed in 1992. After 1993, as the graph shows, all three regions display similar increasing trends in intraregional trade.

Figure 2.3 Trade Introversion Indices of ASEAN, the EU27, and NAFTA, 1990–2008



ASEAN = Association of Southeast Asian Nations, EU = European Union, NAFTA = North American Free Trade Agreement.
Source: Author's computations with data sourced from the United Nations Commodity Trade (UN Comtrade) Statistics Database.

[28] The index is made symmetric around zero through a bilinear transformation of the ratio between the intra- and extraregional trade intensity indices.

2.1.2. Indicators of Comparative Advantage, Regional Orientation, Trade Complementarity, and Export Similarity

If a country plans to join an FTA, it should have an idea of which of its sectors are relatively efficient. These sectors are most likely to have export potential. The sectors that are relatively inefficient are most likely to see increased imports. The country may also be interested in the extent to which the trade of all countries planning to join the FTA is complementary or similar. If trade is complementary (i.e., when one country exports products that another country imports), then the FTA is likely to be beneficial. If trade is similar (i.e., when two or more countries export similar products), then the FTA may not yield much benefit. This section presents indicators to broadly assess the potential effect of an FTA on a particular sector in a country that plans to join an FTA. For illustrative purposes, we will use trade data provided by the UN Comtrade database for ASEAN countries, the People's Republic of China (PRC), and Japan at the aggregate level and the Harmonized System (HS) 85 category (electrical machinery and equipment and parts, telecommunication equipment and parts, sound recorders, and television recorders) from the year 2000. This two-digit HS category accounts for the largest share of ASEAN exports in terms of value. In most cases, data was unavailable for Brunei Darussalam, the Lao PDR, Myanmar, and Viet Nam.

2.1.2.1. Revealed Comparative Advantage

International trade theory states that gains from trade come from specialization in a country's area of comparative advantage (i.e., sectors in which a country produces relatively more efficiently). The revealed comparative advantage (RCA) index, introduced by Balassa (1965), can be used to discover the products in which a country has a comparative advantage. It is defined as the ratio of a country's share of the commodity in the country's total exports to the share of world exports of the commodity in total world exports. A country is said to have a revealed comparative advantage if the value of the index exceeds 1 and a revealed comparative disadvantage if the index's value is below 1. The larger the difference between countries' RCA indices, the more suitable they are as FTA partners.

The formula for the RCA index is:

$$\text{Revealed Comparative Advantage}_{cg} = \frac{\left(X_{cg} / X_{c}\right)}{\left(X_{Wg} / X_{W}\right)}$$

where

X_{cg} = exports of good g by country c
X_{c} = total exports of country c
X_{Wg} = world exports of good g
X_{W} = total world exports

For example, in the HS 85 category of goods, the RCA indices of ASEAN countries, the PRC, and Japan in the year 2000 are, in decreasing order, the Philippines (3.33), Singapore (2.46), Malaysia (2.37), Japan (1.55), Thailand (1.39), the PRC (1.14), Indonesia (0.64), and Cambodia (0.00). By this index, the Philippines and Singapore are the most efficient in producing goods classified under HS 85, while Cambodia and Indonesia are the least efficient. An FTA would benefit the former two countries as they have the largest export potential, while also benefitting the latter two since increased imports would displace inefficient domestic production.

2.1.2.2. Regional Orientation

The regional orientation index tells us whether a country's exports of a product are more oriented toward a particular region than to other destinations. It is defined as the ratio of

two shares. The numerator is the share of the country's exports of the product to the region of interest in the country's total exports to the region. The denominator is the share of the country's exports of the product to other countries in the country's total exports to other countries. If the index has a value greater than 1, this implies that the country has a regional bias in exports of the product. Conversely, if the index is less than 1, then the country has no regional bias. The index can be combined with the RCA index to discover which commodities markets may experience trade diversion after an FTA. If a country's RCA index is less than 1 and its regional orientation index is more than 1, then an FTA between the country and the region may cause trade diversion.

The formula for the regional orientation index is:

$$\text{Regional Orientation}_{cgr} = \frac{\left(X_{cgr} / X_{cr}\right)}{\left(X_{cg\text{-}r} / X_{c\text{-}r}\right)}$$

where

X_{cgr} = exports of good g by country c to region r
X_{cr} = total exports of country c to region r
$X_{cg\text{-}r}$ = exports of good g by country c to countries outside region
$X_{c\text{-}r}$ = total exports of good g to countries outside region r

Continuing with our example, we measure the ASEAN regional orientation of exports by individual ASEAN countries, the PRC, and Japan in the HS 85 category of goods. The computed regional orientation indices for the year 2000 are Cambodia (4.06), Indonesia (2.58), Japan (1.50), the PRC (1.31), the Philippines (1.24), Singapore (1.21), Malaysia (1.13), and Thailand (1.04). The computed values for all countries are above 1, which shows that all of these countries directed more of their HS 85 exports to the ASEAN region than to other countries. The previous section showed that Cambodia and Indonesia did not have a comparative advantage in producing goods from the HS 85 category in 2000. The high values for their regional orientation indices in the same year indicate that there may be trade diversion, i.e., Cambodia and Indonesia are replacing non-ASEAN countries as the source of ASEAN imports of HS 85 goods.

2.1.2.3. Complementarity

This index measures the degree to which the export pattern of one country matches the import pattern of a region. It is defined as 1 minus the sum of the absolute value of the difference between the import category shares of the region and the export shares of the country divided in half.

The formula for the complementarity index is:

$$\text{Complementarity}_{cgr} = 1 - \left\{ \frac{\sum_{\vartheta} abs\left[\left(M_{rg} / M_{r}\right) - \left(X_{cg} / X_{c}\right)\right]}{2} \right\}$$

where

M_{rg} = imports of good g by region r
M_{r} = total imports of region r
X_{cg} = exports of good g by country c
X_{c} = total exports by country c

The index takes a value between 0 and 1, with 0 indicating no overlap and 1 indicating a perfect match in the import–export pattern. A high degree of complementarity may indicate more favorable prospects for a successful trade arrangement.

To illustrate, we will individually compute the complementarity between exports from ASEAN countries, the PRC, and Japan with ASEAN imports in the year 2000 at the HS one-digit level (i.e., HS 0 to HS 9). The calculated complementarity indices are Malaysia (0.84), Japan (0.80), Singapore (0.79), Thailand (0.79), the Philippines (0.73), the PRC (0.69), Indonesia (0.55), and Cambodia (0.08). The results show that all these countries, except for Cambodia, have exports that match well with ASEAN's imports. We can infer that trade liberalization between the countries with high index values and ASEAN partners is likely to create gains as their exports match ASEAN's import demand.

2.1.2.4. Export Similarity

This index captures the degree of similarity between the export profiles of one country and other countries in a region. It is defined as the sum over export categories of the smaller export share, comparing the export share of the country with that of other countries in the region.

The formula for the export similarity index is:

$$\text{Export Similarity}_{cgr} = \sum_{g} min\left[\left(X_{rg}/X_{r}\right),\left(X_{cg}/X_{c}\right)\right]$$

where

X_{rg} = exports of good g by region r
X_{r} = total exports of region r
X_{cg} = exports of good g by country c
X_{c} = total exports by country c

The index ranges between 0 and 1, with 0 indicating no overlap in the export profiles (i.e., the country is not a competitor with other countries in the region) and 1 indicating perfect overlap. The more similar the export profiles are, the more likely it is that there will be limited potential for gains from interindustry trade with a regional trading arrangement. This index does not consider gains from intra-industry trade.

We compute the similarity index for the exports of individual ASEAN countries, the PRC, and Japan in relation to the exports of other ASEAN countries over HS one-digit categories. The export similarity values are Malaysia (0.88), Japan (0.77), Thailand (0.77), Singapore (0.76), the Philippines (0.73), the PRC (0.70), Indonesia (0.51), and Cambodia (0.12). Except for Cambodia and Indonesia, these countries have similar export structures compared with the ASEAN export structure. As such, gains from interindustry trade with further ASEAN trade liberalization may arise because of Cambodia's and Indonesia's export dissimilarity to the rest of ASEAN exports.

2.1.3. Strengths and Limitations of Trade Indicators

The main strengths of using trade indicators is that they are relatively easy to understand, their data requirements are easily satisfied, and their computation is straightforward.[29]

[29] Some of these trade indicators may be found already computed on the following websites International Trade Centre: www.itracen.org/menus/countries.htm; World Bank: www.worldbank.org/globaloutlook; UNCTAD: http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx?sCS_referer=&sCS_ChosenLang=en; and ARIC: http://aric.adb.org/indicator.php

However, their main limitation is that, since these indicators are atheoretical, interpretation of the results may be difficult. In addition, for the indicators presented in the trade indicators section, the results may be meaningless if the indicators are computed for trade categories that are too aggregated or unsuitably classified. To obtain more relevant information from these trade indicators, trade data could be reclassified according to a country's production structure and the computations could be performed at a more disaggregated level. Finally, these trade indicators are able to answer only a limited number of specific questions regarding an FTA.

2.2. Estimating the Potential Economic Effects of a Free Trade Agreement in an Individual Market

Often, policy makers are interested in how an FTA will affect production, consumption, and trade flows in the domestic market for a single commodity. Policy makers may want to focus on this commodity because, for example, its trade is significant in the country's trade balance, it generates substantial tariff revenue, it employs a large share of the country's workforce, its output contributes significantly to gross domestic product (GDP), or firms in the sector may be important political players. Some of the trade indicators discussed in the previous section may provide partial answers to questions about the economic effects of an FTA in an individual market, but for a more comprehensive analysis we have to turn to a simulation model that is based on standard microeconomic theory and supports trade policy analysis.

We will consider a model that uses the partial equilibrium approach, focusing on only one market. The main advantage of the partial equilibrium versus the general equilibrium approach which analyzes all markets simultaneously, is that relatively few data items are necessary. The only required data for a partial equilibrium analysis of an FTA are trade flows, the trade policy (e.g., tariffs), and values for some behavioral parameters (mainly elasticities). Another advantage is that it permits an analysis at a fairly disaggregated level, so the policy maker can focus on a specific commodity. On the other hand, the partial equilibrium approach may miss important interactions and feedback among various markets. For example, a lower tariff on computer motherboards might also increase the import of power supply units or video cards as these are complements in production.

2.2.1. The SMART Model

In this section, we describe the framework of a partial equilibrium model known as the SMART (Software for Market Analysis and Restrictions on Trade) model that can be used in assessing the trade, tariff revenue, and welfare effects of an FTA. This model and the simulation tools are part of the World Integrated Trade Solution (WITS) trade database and software suite provided jointly by the World Bank and the United Nations Conference on Trade and Development.

The SMART model focuses on the changes in imports into a particular market when there is a change in trade policy. The demand side of the market in SMART is based on the Armington assumption that commodities are differentiated by their country of origin. This assumption implies that, for a particular commodity, imports from one country are an imperfect substitute for imports from another country. Thus, even though an FTA entails preferential trade liberalization, import demand does not completely shift to a source from within the FTA. The SMART model also assumes that consumers' demand is decided in a two-stage optimization process that involves allocating their spending by commodity and by national variety. At the first stage, consumers decide how much to spend on the commodity given

changes in the price index of this commodity. The relationship between changes in the price index and the impact on import demand for this commodity is determined by a given import demand elasticity. At the second stage, the chosen level of spending for this commodity is allocated among the different national varieties, depending on the relative price of each variety. The extent of the between-variety response to a change in the relative price is determined by the substitution elasticity.

Different countries compete to supply (export to) the market and the model simulates changes in the composition and volume of imports into that market after a tariff reduction or another change in trade policy. The degree of responsiveness of each foreign exporter's supply to changes in the price is known as the export supply elasticity. The SMART model, by default, assumes that the export supply elasticity of each foreign country is infinite, which implies that each foreign country can export as much of the good as possible at a certain price. This assumption may be appropriate for an importing country whose import quantity is too small to affect the prices of foreign exporters (i.e., the price-taker assumption). If changes in the country's import quantity can have a price effect on the foreign exporter, SMART can operate with a finite export supply elasticity, but the value of this parameter must be found and incorporated into the analysis.

In the SMART model, an FTA will affect both the price index of the commodity and the relative prices of the different national varieties. To illustrate, suppose there are three countries: A, B, and C. A imports a good from B and C, but A is forming an FTA only with B. Reducing the tariff on imports from partner B will lower the domestic price of the variety coming from B and the price index of the commodity. Domestic consumers will therefore want to purchase and import more of the commodity.[30] The cheaper price of imports from B relative to C also causes consumers to switch sourcing their imports from C to B.[31] This substitution of imports is perfectly balanced in the SMART model so that the substitution does not affect the overall imported quantity, but simply reallocates market shares among foreign partners based on the new relative prices. The FTA does, however, result in an increase in imports from the country or countries benefiting from preferential trade because of lower prices. In sum, the importing country will experience an increase in imports, FTA export partners will have an increase in exports, and outsiders will see their exports of the commodity fall.[32] Besides trade effects, SMART can calculate changes in tariff revenue as well.

SMART requires the following data, which can be extracted from WITS or imported from alternative sources of information, for the simulation of an FTA: (i) the import value from each foreign partner, (ii) the tariff faced by each foreign partner, (iii) the import demand elasticity for the commodity, (iv) the export supply elasticity for the commodity, and (v) the substitution elasticity between varieties of the commodity. Note that SMART accepts just one import demand elasticity for the commodity, not one for each national variety. Moreover, the export supply elasticity must be the same for all foreign exporters of the commodity. SMART also expects that the substitution elasticity is the same for any pair of varieties of the commodity.

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30 This is called a trade creation effect in the SMART model, but it is not equivalent to Viner's definition of trade creation.

31 This is called a trade diversion effect in the SMART model, although it does not exactly correspond to Viner's definition of trade diversion.

32 If the analysis includes finite export supply elasticities, then as the FTA increases the import demand of national varieties that have preferential tariffs, there will be an increase in the prices of these national varieties, which will temper the final quantities of imports demanded of the commodity from these beneficiary countries.

2.2.2. Example of Motorcycle Market in the Lao People's Democratic Republic

We used the SMART model to capture the economic effects of preferential tariff liberalization in the Lao PDR's motorcycle import market (HS 871120). We reduced the Lao PDR's tariffs to zero for motorcycle imports from ASEAN countries to simulate what would have happened if the Lao PDR had liberalized this market for ASEAN partners in the year 2000. We keep the preexisting Laotian motorcycle tariffs on non-ASEAN countries at the same levels.

Data from WITS show that all of the Lao PDR's motorcycle imports in 2000 had a 40% import duty imposed regardless of national origin. Table 2.1 shows that Thailand was the largest source of the Lao PDR's motorcycle imports (with a 93% market share) followed by the PRC, Japan, Denmark, the Republic of Korea, and France. For the simulation, import tariffs are reduced to zero for Thailand. All other countries continue to face a 40% tariff. We assume that the Lao PDR's motorcycle market is too small to affect foreign export prices, so the foreign export supply elasticity is infinite. The WITS database provides the following values for the behavioral parameters: (i) import demand elasticity for the commodity (1.5) and (ii) substitution elasticity between varieties of the commodity (0.69). As these elasticities were estimated using annual data, any simulated changes can be thought to occur within a year. Table 2.1 contains the simulation results. All non-ASEAN exporters suffer a drop in their exports to the Lao PDR. The total reduction of the Lao PDR's motorcycle imports from non-ASEAN exporters is $792,000, which results in a tariff revenue loss of $322,000. However, there is an increase in the Lao PDR's motorcycle imports from Thailand of $6,156,000 ($33,272,000 – $27,116,000).

To approximate the increase in Laotian consumer surplus from additional imported Thai motorcycles, we can use the following formula: ½*Initial Ad Valorem Tariff on Imports*Increase in Imports, which yields ½*0.4*$6,156,000 = $1,231,200. If the increase in consumer surplus on additional imports from FTA partners is smaller than the loss in tariff revenue from non-FTA partners, then the net welfare effect of the FTA is negative for the market being studied. In the example, the increase in consumer surplus due to more imports from FTA partners is $1,231,200, which is larger than the loss in tariff revenue from non-FTA partners of $322,000. Therefore, we cannot rule out the possibility that the FTA may be beneficial for the Laotian motorcycle market. Note that we cannot say for sure that the FTA is beneficial because we are unable to compute the loss in consumer surplus due to reduced motorcycle imports from non-FTA partners. Furthermore, the SMART calculations do not account for changes in the Lao PDR's motorcycle assembly industry, for which imported motorcycle parts enter duty free already.

Table 2.1 **Exports into the Lao People's Democratic Republic's Motorcycle Market** ($'000)

Exporter	Tariff Line Code	Exports Year 2000	Simulated Exports	Simulated Changes in Tariff Revenue
PRC	871120	1,425	881	(218)
Denmark	871120	228	145	(33)
France	871120	6	4	(1)
Japan	871120	438	277	(65)
Korea, Republic of	871120	38	24	(6)
Thailand	871120	27,116	33,272	(10,847)

( ) = negative, Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.
Source: World Bank. 2010. World Integrated Trade Solution. http://data.worldbank.org/data-catalog/wits

2.2.3. Strengths and Limitations of the SMART Model

The strengths of the SMART model are that it is easily learned and implemented together with the WITS database, it yields important quantitative results on the trade and tariff revenue effects of an FTA, and the analysis can be performed at the most disaggregated level of trade data. However, the main limitation of the SMART model is that it is a partial equilibrium model, which means the results of the model are limited to the direct effects of a trade policy change only in one market. The model, therefore, ignores the indirect effects of trade policy changes in other markets (interindustry effects) and feedback effects (the effects due to a trade policy change in a particular market that spill over to related markets and return to affect the original market). In addition, SMART does not return results on an FTA's effects on domestic production, which may be of interest to policy makers, nor does it consider the possibility of new foreign exporting countries serving the domestic market. Finally, SMART's results may be sensitive to the modeling assumptions and parameter values used. Although SMART does not provide a built-in sensitivity analysis, users may perform this manually by changing parameter values over a reasonable range. Table 2.2 summarizes the essential characteristics of the SMART model and provides notes on implementing SMART in a developing country context.

Table 2.2 **The SMART Model, Free Trade Agreement Analysis, and Developing Countries**

Item	Values and Variables	Notes on Implementation from a Developing Country Perspective
Assumptions in the SMART Model	Imports are differentiated by national origin (the Armington assumption). Therefore, an FTA does not shift all trade from non members to members.	This is justified as countries often import different varieties from different countries because of quality differences.
	The default foreign export supply elasticity is infinite, but SMART will accept a finite export supply elasticity.	Most developing countries are price takers in world markets, justifying an infinite foreign export supply elasticity.
	The import demand elasticity is the same for each national variety of the imported commodity. The export supply elasticity is the same for all foreign exporters of the commodity. The substitution elasticity is the same for any pair of varieties of the commodity.	Constraining these elasticities to be the same may not be realistic, but it reduces the number of required parameter values and facilitates the analysis. This is important for developing countries that may lack expertise in this type of analysis.
Data included in the WITS database	Combines Comtrade, TRAINS, and WTO data on trade and tariff, para-tariff, and non-tariff trade barriers from more than 170 countries; includes parameter values for elasticities.	If a developing country has more timely or reliable data, then it can supplement or replace the WITS trade and trade-barrier data used for the analysis.
Important parameters	(i) Import-demand elasticity (ii) Substitution elasticity	These parameter values in SMART were estimated by the World Bank. They may be less reliable for developing countries. These values may be replaced by more accurate or reasonable ones.
Output of the SMART model	Changes in import value and tariff revenue are given for a single good by national source.	The changes in import value are measures of trade creation and diversion. (SMART does not consider new sources of imports.)

Comtrade = United Nations Commodity Trade Statistics Database, FTA = free trade agreement, SMART = Software for Market Analysis and Restrictions on Trade, TRAINS = Trade Analysis and Information System, WITS = World Integrated Trade Solution, WTO = World Trade Organization.

Source: Authors.

2.3. Computable General Equilibrium Estimation of the Potential Economic Effects of a Free Trade Agreement

The partial equilibrium analysis of an FTA captures, essentially, the effects of a tariff reduction in a single import market. However, FTA negotiations, in practice, encompass the removal of trade barriers across several sectors at the same time. To capture all the effects of multi-sectoral trade liberalization, a general equilibrium approach is necessary. A general equilibrium approach would reveal not only the direct effects of tariff reductions in individual markets, but also any indirect changes in related markets.

For example, consider a tariff reduction on motor vehicles. A partial equilibrium analysis would simply focus on the direct effects on the motor vehicle market: a reduced import price and increased imports. A general equilibrium analysis would account for any broader effects on the economy. It would trace how a lower tariff on motor vehicles affects the demand for substitutes (e.g., bicycles or train rides) or complementary goods (e.g., petroleum or tires). It would also consider how reducing the tariff on motor vehicles affects input markets that are related to the domestic production of motor vehicles.

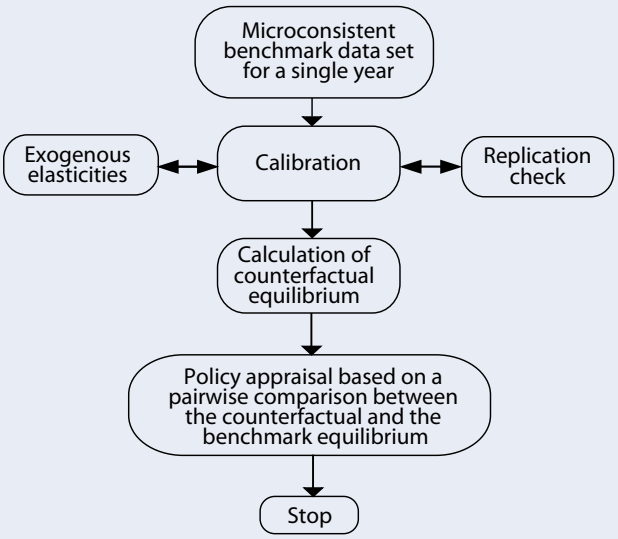
Cheaper imported motor vehicles would replace domestic production and, therefore, the demand for workers, machines, and raw materials. Changes in the prices of these inputs would depend on how important the domestic motor vehicle industry was in the employment of these inputs. For example, if the domestic motor vehicle industry was the major purchaser of domestic steel and the main employer of workers, then the price of domestic steel would fall and workers in steel factories would face wage cuts, thus lowering labor income. These workers could reduce their consumption demand for various goods, including demand for motor vehicles, which would be an income effect. The tariff reduction in motor vehicles might also produce a feedback effect. The increase in imports of motor vehicles at the expense of domestically produced motor vehicles could cause lower demand for domestic inputs and, therefore, a drop in input prices. This could, in turn, motivate domestic producers of motor vehicles to restore some of their output. Finally, the lower tariff would imply lower government revenue and, possibly, lower government spending, some of which might be in the form of sector-specific subsidies.

As shown in the motor vehicle example, the indirect effects of a single tariff reduction may be quite complex. The complexity increases with the number of trade policies and markets involved. As FTAs cover multiple sectors and various trade reforms, they are often simulated using computable general equilibrium (CGE) modeling. This modeling technique relies on standard microeconomic theory for rigor and consistency as well as computer algorithms for model-solving.

Figure 2.4 shows how a typical CGE analysis is conducted. To begin, the analyst needs to organize a dataset about the economy (or economies) concerned from a benchmark year. The data needed for a CGE analysis comes mainly from national input–output tables that are organized into a social accounting matrix (SAM). A SAM extends the sectoral information in national input–output tables to include data on the components of aggregate demand—consumption, investment, government spending, and the external sector including exports and imports. The dataset should be consistent, meaning that the numbers reflect an equilibrium as specified in the CGE model. Equilibrium in a CGE model is defined as the set of values for all variables in the model that equates demand and supply in all markets.

Next, the analyst will need to enter values for the parameters of the model. These parameters comprise price, income, and substitution elasticities. These elasticities measure the sensitivity

Figure 2.4 **The Process of Computable General Equilibrium Analysis**



Source: Shoven, J. B ., and Whalley, J. 1992. *Applying General Equilibrium*. Cambridge, United Kingdom: Cambridge University Press.

of producers and consumers to relative price and income changes. Their values, therefore, can have an important influence on the outcome of a CGE simulation. Some of these parameters will have values that are derived from statistical studies in the literature, while any parameters whose values remain unknown will have to be calibrated. Calibration involves computing values for the set of parameters whose values are unknown so that the analyst can reproduce the SAM values from the benchmark year. Once all parameter values in the model are set, the analyst must perform a replication check to verify that the equilibrium solution—the set of prices that clear all markets—reproduces the SAM data from the benchmark year.

Lastly, the analyst changes the values of any exogenous variable or variables to simulate policy changes in the correctly specified CGE model from the previous step, thus yielding a new equilibrium. This new equilibrium is known as the counterfactual equilibrium. By comparing the simulated changes between the benchmark and counterfactual equilibria, the analyst can make inferences about the potential effects and desirability of the simulated policy changes.[33] In a CGE analysis of trade policy, the analyst would typically study changes in output, exports and imports, factor prices, and welfare.

2.3.1. The GTAP Model

The Global Trade Analysis Project (GTAP) model, originally formulated by Hertel (1997), is the most widely used CGE model for analyzing trade policy.[34] The model is multi-market, with markets for final goods, intermediate goods, traded goods, and factors of production. It is also multiregional, with a region representing a country or a group of countries. The quantity of endowments—land, skilled labor, unskilled labor, natural resources, and initial capital—in each region is fixed exogenously within the GTAP model. The main agents in this

[33] Studying any changes in the levels of the endogenous variables from one equilibrium to another is known as a comparative static analysis or a counterfactual analysis.

[34] The theory underlying the GTAP model is based on the ORANI model of the Australian economy, developed by Dixon et al. (1982).

Box 2.3 Various Study Results by Computable General Equilibrium Models

To give an idea of the magnitude of the effects generated by the computable general equilibrium (CGE) model, we briefly review a few studies of various free trade agreements (FTAs) and economic cooperation initiatives in the Association of Southeast Asian Nations (ASEAN) and the Asian region. Lee, Roland-Holst, and van der Mensbrugghe (2001) estimate the likely impact of Asia-Pacific Economic Cooperation (APEC) trade liberalization on real gross domestic product, sectoral output, exports, and imports. Their model predicts that real gross domestic product would increase by about $42 billion for developed APEC member economies and $83 billion for developing APEC member economies. Overall, APEC trade liberalization would produce trade expansion in most product categories. Park (2008) considers the impact of various potential East Asian FTA strategies. He models several different FTA scenarios, including the ASEAN Free Trade Area (AFTA) and ASEAN agreements with Northeast Asian partners. He finds that AFTA will generate a positive effect for ASEAN economies, but that their gains from trade would rise if it were to couple ASEAN integration with other Asian regional trade agreements.

Larger results are obtained when CGE models include "dynamic" features and modern elements of FTAs that go beyond the mere focus on tariff and non-tariff-barrier liberalization to include trade facilitation, "best practices," and other behind-the-border measures. Brooks, Roland-Holst, and Zhai (2005) run simulations to show the important differences between "traditional estimates" (induced by liberalization of tariff and tariff-equivalent non-tariff barriers) of gains due to trade liberalization in Asia (Scenario 1) and more general trade cost-reduction effects such as improving customs clearance, lowering transaction costs, and facilitating international market access (Scenario 2). They find that under Scenario 1, real income rises in the range of 0.9%–2.9% for East Asia, 1.9%–6.6% for Southeast Asia, and 0.3%–0.6% for South Asia. Such magnitudes are fairly standard in the literature. Under Scenario 2, the gains are much larger: 8.1%–53.8% for East Asia, 35.5%–116.6% for Southeast Asia, and 10.4%–22.4% for South Asia. The lesson here is that the removal of traditional trade measures—tariffs and non-tariff barriers—is likely to be less significant in improving efficiency and welfare for FTA partners than trade facilitation initiatives.

Finally, in estimating the potential effects of the ASEAN Economic Community (AEC), Plummer and Chia (2009) use a CGE model and other techniques to show that there are large attendant benefits to creating a unified market in Southeast Asia, including for the "CLV" countries—Cambodia, the Lao People's Democratic Republic, and Viet Nam. They find that (i) ASEAN economic welfare should rise by 5.3%, or $69 billion, which is more than six times what the estimated effect of completing AFTA would be; (ii) all ASEAN countries gain from the AEC project, though obviously some gain more than others—Cambodian welfare rises by 6.3%, whereas the Lao People's Democratic Republic gains by 3.6% and Viet Nam by 2.8%; (iii) the AEC will lead to a robust expansion in ASEAN trade in goods, with exports outpacing imports in all but three manufacturing sectors; and (iv) extending the AEC to include "+1" agreements with its East Asian neighbours increases the aggregate welfare benefits to ASEAN by two-thirds, and by an additional one-third if the United States and the European Union are added. This is particularly important for Viet Nam as it gains the least under the AEC scenario. The extension of the AEC to other East Asian partners, the European Union, and the United States makes Viet Nam the biggest beneficiary from economic cooperation.

Source: Lee, H, D. Roland-Holst, and D. van der Mensbrugghe. 2001. General Equilibrium Assessments of Trade Liberalization in APEC Countries. In M. Dutta et al., eds. *Restructuring of Asian Economies for the New Millennium*, Volume 9B. Amsterdam: Elsevier; Park, I. 2008. Regional Trade Agreements in East Asia: Will They Be Sustainable? Mimeo, February. http://mpra.ub.uni-muenchen.de/5068/1/MPRA_paper_5068.pdf; Brooks, D., D. Roland-Holst, and F. Zhai. 2005. Asia's Long-Term Growth and Integration: Reaching beyond Trade Policy Barriers. *ADB ERD Policy Brief No. 38*, September; and Plummer, M. and S.Y. Chia. 2009. *Realizing the ASEAN Economic Community: A Comprehensive Assessment*. Singapore: Institute of Southeast Asian Studies.

model are producers, consumers, and the government. These agents are styled according to standard neoclassical axioms, but the GTAP model contains particular production and utility functions.[35] Furthermore, the model assumes perfect competition, and that prices will

[35] GTAP uses nested constant elasticity of substitution and Leontief functions to model the production technology, which implies constant returns to scale. The model uses nested Cobb–Douglas and constant difference in elasticity functions to capture the contribution of private, government, and savings demand to regional demand, and the claims of each of these three areas represent a constant share of income (Hertel 1997, Chapter 2).

adjust to clear all markets. As the labor supply within each region is fixed and not mobile across regions, market clearing implies that there is no unemployment.

Regions can trade with each other in the GTAP model. International trade in the GTAP model involves the shipping of commodities from a source to a destination region by an international transport sector which buys transport inputs from various regions. Importers buy the transport services, and the cost of transport creates the wedge between the free-on-board price of commodities and their cost, insurance, and freight price. Both the transport sector and importers satisfy zero profit conditions in equilibrium because of perfect competition. In addition, international trade is characterized by the Armington assumption, which implies substitutability, albeit imperfect, between varieties of a good by national origin. As such, GTAP simulations do not result in perfect specialization across countries. Given balance of payments equilibrium, each region's trade balance is equal and opposite to its capital account balance, which is the difference between its domestic savings and investment.[36] Because the basic GTAP model is static (i.e., there is no time dimension and, therefore, no dynamics for variables such as savings or investment), the GTAP model features a "global bank" that collects funds from regions that are net savers and invests them in regions that are net investors until the marginal investment equates the expected rates of return from all regions.

The GTAP model also houses a database that currently contains SAMs for 113 countries and regions; production, endowment, and bilateral trade data; and values for all parameters in the GTAP model (Box 2.4).[37] The ready availability of this information and related software makes implementing the GTAP model easy. For a CGE analysis of trade policies such as import-tariff reductions in an FTA, a combination of user-friendly, menu-driven software such as *AggGTAP* and *RunGTAP* can be used to obtain results. These two software programs were created specifically for use with the GTAP database, and they make CGE analysis convenient. Although the GTAP model and database are suitable for a wide range of trade policy analyses, the model, data, and/or parameters may have to be modified for the simulation of complex trade (e.g., tariff-rate quotas, export subsidies, service trade barriers, technical trade barriers, overlapping FTAs) or other policies such as investment, migration, or energy policies.[38] To illustrate how simple, yet comprehensive, a CGE analysis can be with the tools provided by GTAP, we will consider the case of the FTA among ASEAN countries, focusing on the effects of preferential trade liberalization on the newest members.

2.3.2. Example of Computable General Equilibrium Analysis of a Free Trade Agreement: GTAP Simulation of the Effects of the ASEAN Free Trade Area on Cambodia, the Lao People's Democratic Republic, and Viet Nam

To focus attention on certain countries, the data for a CGE analysis is often aggregated by regions, sectors, and factors. In this example, the data on the 113 countries provided in the GTAP database are aggregated into 13 regions: 9 ASEAN countries (excluding Brunei Darussalam because it is not in the GTAP database); the PRC; Japan; the rest of East Asia (including Hong Kong, China; the Republic of Korea; and Taipei,China); and the rest of the world. The GTAP database contains data on 57 sectors, which have been aggregated into 10 sectors according to the nature of outputs (Table 2.3). In the analysis below, we will refer

[36] The GTAP model ignores unilateral transfers and gifts between countries.

[37] The current version of the GTAP database is version 7. It can be accessed for a fee, although some previous versions are free. More information about the GTAP database and the GTAP model can be found at www.gtap.agecon.purdue.edu/

[38] In GTAP, policy measures are modeled as ad valorem price wedges. These price wedges can be between the domestic and world market prices (border measures) or between domestic producer and consumer prices (output taxes or subsidies).

Box 2.4 Country Coverage of the GTAP Database

The Global Trade Analysis Project (GTAP) database (version 7) has complete macroeconomic and input–output (I–O) data for 94 countries. These countries are known as primary regions. Countries with macroeconomic data but no I–O data are grouped into regional composites (there are in total 19 regional groups). For example, Brunei Darussalam and Timor-Leste, for which GTAP has macroeconomic data but does not have national I–O tables, are grouped into a region called "Rest of Southeast Asia." GTAP then estimates I–O data for the composite region using a matching procedure between the individual countries in the composite region and primary regions in the same geographic area, under the strong assumption that endowments, production, and consumption of countries in the composite group are similar to those of the primary regions. For example, Cambodia and Singapore are used for the estimates on I–O data of a group consisting of Brunei Darussalam and Timor-Leste. The I–O table for each composite region is constructed by combining the I–O data from the primary region tables summed according to the gross domestic product share weights (see GTAP documentation, Chapter 8F, for more information about this procedure). As such, if a country is a primary region in GTAP, then simulation results at the national level can be obtained. If a country is in a regional composite, then simulation results can only be obtained at the regional level and not for the individual country.

For the 94 countries with complete macroeconomic and I–O data, Appendix 2.1 provides information about the source or sources and period of each country's dataset. Appendix 2.2 contains the composition of each regional composite and the correspondence between each regional composite and primary regions. The appendix also provides the gross domestic product share weights assigned to each primary region in constructing I–O data for each regional composite.

Source: Badri Narayanan G. and Terrie L. Walmsley, Editors (2008). *Global Trade, Assistance, and Production: The GTAP 7 Data Base*, Center for Global Trade Analysis, Purdue University. www.gtap.agecon.purdue.edu/databases/v7/v7_doco.asp

Table 2.3 Aggregation of GTAP Sectors

Aggregated Sectors		Disaggregated Sectors
1	Grains and Crops	Paddy rice; wheat; cereal grains not elsewhere classified (nec.); vegetables, fruit, nuts; oil seeds; sugarcane, sugar beet; plant-based fibers; crops nec.; processed rice
2	Livestock and Meat Products	Cattle, sheep, goats, horses; animal products nec; raw milk; wool, silk-worm cocoons; meat; meat products nec.
3	Mining and Extraction	Forestry; fishing; coal; oil; gas; minerals nec.
4	Processed Food	Vegetable oils and fats; dairy products; sugar; food products nec; beverages and tobacco products
5	Textiles and Clothing	Textiles; wearing apparel
6	Light Manufacturing	Leather products; wood products; paper products, publishing; metal products; motor vehicles and parts; transport equipment nec; manufactures nec.
7	Heavy Manufacturing	Petroleum, coal products; chemical, rubber, plastic products; mineral products nec; ferrous metals; metals nec; electronic equipment; machinery and equipment nec.
8	Utilities and Construction	Electricity; gas manufacture, distribution; water; construction
9	Transport and Communication	Trade; transport nec; sea transport; air transport; communication
10	Other Services	Financial services nec; insurance; business services nec; recreation and other services; public administration, defense, health, education; dwellings

GTAP = Global Trade Analysis Project.

Source: GTAP Data Bases: GTAP 7 Data Base. https://www.gtap.agecon.purdue.edu/databases/v7/default.asp

to the first three aggregated sectors as primary, the next four as secondary, and the final three as tertiary.

The five factors included in the GTAP database are land, natural resources, unskilled labor, skilled labor, and capital. These are left disaggregated in this example. In the GTAP model, land and natural resources are assumed to be perfectly immobile between sectors, but unskilled labor, skilled labor, and capital are perfectly mobile.[39] The benchmark year for this CGE analysis is 2004 as the data from the GTAP database is from the same year. We perform a simulation of the ASEAN FTA. Our scenario is simply that the ad valorem tariffs on imports from ASEAN countries into other ASEAN countries are all reduced to zero. For our simulation, the closure (i.e., the treatment of equilibrium in the model) used is the standard GTAP multiregional general equilibrium closure. The solution algorithm used is the Gragg 4 8 12 method with automatic accuracy to get a high level of precision in the results.

2.3.2.1. Simulated Aggregate Effects

Table 2.4 reports aggregated ad valorem import tariffs used in the simulation. They have been aggregated to get a broad overview of patterns of import protection in ASEAN countries. The most protected sectors are processed food and grains and crops, while the least protected is mining and extraction. Singapore, being a free intermediary center of trade and transshipment of goods, does not have any import tariffs. As there is no data in the GTAP database on trade barriers on services, we do not have any tariffs for utilities and construction, transport and communication, and other services.[40]

Table 2.4 **ASEAN Ad Valorem Import Tariffs, 2004**

	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam
Grains and Crops	8	5	8	49	3	12	0	25	8
Meat and Livestock	12	2	7	1	4	9	0	5	9
Mining and Extraction	7	1	1	1	1	2	0	2	3
Processed Food	16	9	20	45	8	4	0	30	30
Textile and Clothing	11	4	7	9	7	4	0	14	18
Light Manufacturing	20	5	16	10	4	5	0	10	14
Heavy Manufacturing	14	2	6	2	3	2	0	4	5
Utilities and Construction	…	…	…	…	…	…	…	…	…
Transport and Communication	…	…	…	…	…	…	…	…	…

… = not available, ASEAN = Association of Southeast Asian Nations, Lao PDR = Lao People's Democratic Republic.

Notes:
1. The numbers in the table do not include non-tariff barriers.
2. The tariff for each country's sector is an aggregation that first takes the trade-weighted average tariff over each subsector for each partner and then takes the simple average over all partners.
3. The GTAP variable used for the ad valorem import tariffs is *rTMS*.

Source: GTAP Data Bases: GTAP 7 Data Base. www.gtap.agecon.purdue.edu/databases/v7/default.asp

[39] The degree of intersectoral mobility of each factor may be adjusted in GTAPAgg.

[40] The GTAP database does, however, have data on trade in services.

Table 2.5 shows the simulated aggregate effects of the ASEAN FTA. In terms of real GDP, the ASEAN FTA causes an absolute percentage change of no more than 0.2% in all ASEAN countries and almost no change in the PRC, Japan, the rest of East Asia, and the rest of the world. It is interesting to note that, as a result of the ASEAN FTA, there is a contraction of real GDP in the new ASEAN members (particularly in Viet Nam) and Thailand, but an expansion of real GDP in the other ASEAN members (particularly in the Lao PDR). As for trade, all ASEAN countries experience an increase in export values and volumes, with Singapore's trade expansion being the highest. All ASEAN countries have a larger increase in imports than in exports, worsening their trade balances, but it is important to note that the pre-simulation trade balances in 2004 of all ASEAN countries were in surplus except for the Lao PDR, Myanmar, and Viet Nam. For non-ASEAN countries, the results show that exports from the PRC and the rest of East Asia shrink, while Japan's exports increase. This indicates that the ASEAN FTA causes some degree of trade diversion from the PRC and the rest of East Asia. The imports of non-ASEAN countries are also shown to fall. As for the terms of trade, the simulation results in an improvement for six out of the nine ASEAN countries (particularly for Cambodia), but a deterioration for non-ASEAN countries. As a whole, the ASEAN FTA causes an improvement in the ASEAN region's terms of trade.

2.3.2.2. Simulated Sectoral Effects

To illustrate the sectoral effects of the ASEAN FTA and keep the analysis tractable, we will focus on two countries: Cambodia and Viet Nam. These two countries were selected because they are two of the newer ASEAN members and the simulation results in the largest negative percentage reductions in their real GDP, even though they have some of the highest pre-simulation levels of import protection. In the analysis below, we will not consider changes in the tertiary sector because of a lack of data on trade barriers and uncertainty over the quality of data.

Table 2.5 Simulated Aggregate Effects of the ASEAN Free Trade Agreement on Gross Domestic Product and Trade

Aggregate Effects	Change in Real GDP (%)	Change in Export Value ($ Million)	Change in Import Value ($ Million)	Change in Export Volume (%)	Change in Import Volume (%)	Change in Terms of Trade (%)
Cambodia	(0.10)	327.5	377.8	5.92	11.62	1.60
PRC	0.00	(462.2)	(551.9)	(0.04)	(0.12)	(0.05)
Indonesia	0.03	1,321.3	1,481.1	1.29	1.84	0.13
Japan	0.00	189.0	(563.8)	0.07	(0.13)	(0.06)
Lao PDR	0.18	70.7	104.0	10.76	10.87	(0.30)
Malaysia	0.16	1,198.9	1,611.4	0.65	1.36	(0.02)
Myanmar	(0.01)	58.4	73.3	2.00	2.14	(0.15)
Philippines	0.09	562.1	721.9	0.82	1.41	0.21
Singapore	0.05	1,865.2	2,076.2	0.50	1.26	0.61
Thailand	(0.03)	453.8	3,601.2	(0.25)	3.47	0.59
Viet Nam	(0.20)	668.8	1,500.6	1.83	4.00	0.13
Rest of East Asia	0.00	(295.3)	(332.8)	(0.01)	(0.08)	(0.04)
Rest of the World	0.00	287.2	(3,101.4)	0.02	(0.04)	(0.01)

( ) = negative, GDP = gross domestic product, PRC = People's Republic of China, Lao PDR = Lao People's Democratic Republic.

Notes: The GTAP variables used are: (i) *qgdp* for Real GDP, (ii) *VXWD* for export value, (iii) *VIWS* for import value, (iv) *VXWD* for the initial level of exports and *VIWS* for the initial level of imports and *DQXS* for the volume change in exports and imports, and (v) *tot* for the terms of trade.

Source: Author's results from a GTAP simulation.

Table 2.6 **Simulated Sectoral Effects of the ASEAN Free Trade Agreement on Cambodia** (% change)

Cambodia	Domestic Output	Export Price	Export Volume	Import Price	Import Volume
Grains and Crops	14.73	0.47	421.22	(0.03)	1.15
Livestock and Meat Products	(8.19)	0.24	(77.17)	(0.11)	1.41
Mining and Extraction	(4.17)	(0.03)	40.99	(0.03)	(0.12)
Processed Food	(22.31)	0.10	5.15	(0.15)	0.25
Textiles and Clothing	0.78	0.00	1.77	(0.04)	0.04
Light Manufacturing	(4.85)	(0.02)	9.32	(0.09)	0.15
Heavy Manufacturing	(12.94)	0.00	2.40	(0.08)	0.08
Utilities and Construction	7.01	(0.01)	2.92	0.00	0.08
Transport and Communication	(2.84)	0.02	(6.25)	0.00	0.02
Other Services	(2.45)	0.04	(13.06)	0.00	0.06

( ) = negative.

Note: The GTAP variables used to calculate percentage changes are (i) *qo* for domestic output; (ii) *pxw* for export price (equal to *pm*, or output price, in this simulation); and (iii) *VXWD* for the initial level of exports and *VIWS* for the initial level of imports and *DQXS* for the volume change in exports and imports.

Source: Author's results from a GTAP simulation.

The ASEAN FTA produces mixed effects on different sectors in Cambodia (Table 2.6). Grains and crops have the largest relative output expansion (14.73%) driven by an increase in export volume. The export price for Cambodia's grains and crops increases by 0.47%, which is the largest percentage change for any sector in the country. The export volume of Cambodia's grains and crops rises more than fourfold, which is the largest relative increase for any sector. In the results, most countries' sectors have absolute percentage changes of less than 0.05% for export prices and less than 0.5% for export volume. In this simulation, the percentage change in export price turns out to be equal to the percentage change in the domestic price in each country's sector. Although the export price increases by 0.24% in Cambodia's livestock and meat products sector, there is a drop in output and export volumes. This is due to an increase in imports (1.41%), which substitute for and reduce the domestic supply of livestock and meat products in Cambodia's domestic market.

The only secondary sector that expands is textiles and clothing, mainly due to the expansion of exports under ASEAN tariff preferences.[41] All other primary and secondary sectors see their output shrink, with the largest relative fall observed in processed food (–22.31%). Output in this sector is displaced by imports because the sector sees the largest relative fall in import prices (–0.15%) and the largest absolute increase in import volumes at $82.8 million in 2004 US dollars (not shown in the table), which corresponds to a 0.25% increase across sectors. The contraction in Cambodia's real GDP is due, in order of importance, to processed food, heavy manufacturing, and light manufacturing. Import volumes increase in all sectors except for mining and extraction. The general increase in import volumes can be attributed to tariff reductions and drops in import prices in all the primary and secondary sectors.

[41] Note that this simulation focuses only on the effects of the ASEAN FTA on trade in textiles and clothing. It does not consider the possible effects of the phasing out of the Multi-Fibre Agreement.

Table 2.7 **Simulated Sectoral Effects of the ASEAN Free Trade Agreement on Viet Nam** (% change)

Viet Nam	Domestic Output	Export Price	Export Volume	Import Price	Import Volume
Grains and Crops	0.98	0.03	6.80	0.00	4.99
Livestock and Meat Products	(0.66)	0.01	(3.25)	0.00	2.91
Mining and Extraction	(0.71)	0.00	(0.63)	0.00	2.01
Processed Food	(4.02)	0.00	3.26	(0.12)	15.99
Textiles and Clothing	(0.24)	0.00	0.69	(0.01)	1.86
Light Manufacturing	(0.33)	0.00	1.41	(0.02)	5.21
Heavy Manufacturing	(0.28)	0.00	6.00	(0.02)	3.17
Utilities and Construction	3.47	0.00	(1.99)	0.00	5.93
Transport and Communication	0.40	(0.01)	2.16	0.00	(0.82)
Other Services	(1.36)	0.01	(3.46)	0.00	0.83

( ) = negative.

Notes: The GTAP variables used to calculate percentage changes are (i) *qo* for domestic output, (ii) *pxw* for export price (equal to *pm*, i.e., output price, in this simulation); and (iii) *VXWD* for the initial level of exports, *VIWS* for the initial level of imports, and DQXS for the volume change in exports and imports.

Source: Author's results from a GTAP simulation.

Table 2.7 shows how Viet Nam's sectoral output and trade change due to the simulated ASEAN FTA. Except for grains and crops, all primary and secondary sectors experience a contraction in output. Grains and crops show the largest relative increase in export price and volume. However, the general contraction in most sectors, especially in processed food and other services, explains the negative movement in Viet Nam's real GDP. This is counterbalanced to a limited degree by some growth in utilities and construction. Processed food displays the largest relative drop (–4.02%), which can be traced to an increased import volume of about 16%. The import price of processed food drops the most in percentage terms relative to other sectors. All primary and secondary sectors experience an increase in import volumes.

2.3.2.3. Simulated Welfare Effects of the ASEAN Free Trade Area

The GTAP model also computes a measure of the change in each region's welfare. The change in welfare for each region is the "equivalent variation," i.e., the change in money income that would produce the same effect on the region's utility as the policy shock. The GTAP model also conveniently decomposes the welfare change into five sources: (i) allocative efficiency, (ii) endowment effects, (iii) technical changes, (iv) terms of trade effects, and (v) investment-savings effects. As our simulation of the ASEAN FTA does not include any changes in endowment or technical and productivity parameters, no welfare effects can be attributed to these two sources. The simulation's welfare results are due only to changes in allocative efficiency (the efficiency of resource utilization), terms of trade (the change in the relative price of exports to imports both weighted by benchmark-year quantities), and investment returns on the capital account (the returns on the difference between domestic savings and investment).

The rightmost column of Table 2.8 shows the total welfare change for each country or region. There are three observations we can make about the ASEAN countries with a posi-

Table 2.8 **Simulated Welfare Effects of ASEAN Free Trade Area and Decomposition** ($ million)

Welfare	Allocative Efficiency	Terms of Trade Effects	Investment-Savings Effects	Total
Cambodia	(4.8)	71.7	22.0	**88.9**
PRC	(3.2)	(346.2)	45.5	**(303.8)**
Indonesia	85.0	119.7	(13.0)	**191.6**
Japan	(47.9)	(349.8)	60.3	**(337.4)**
Lao PDR	4.3	(2.9)	(2.3)	**(0.9)**
Malaysia	186.8	30.7	(12.3)	**205.1**
Myanmar	(0.4)	(4.8)	(1.2)	**(6.4)**
Philippines	72.0	108.5	(2.8)	**177.7**
Singapore	57.5	1,011.2	(28.8)	**1,039.9**
Thailand	(54.0)	717.2	(73.8)	**589.4**
Viet Nam	(84.8)	37.5	(15.4)	**(62.7)**
Rest of East Asia	(49.5)	(253.7)	44.3	**(259.0)**
Rest of the World	(295.6)	(1,146.7)	(22.1)	**(1,465.3)**
Total	**(135.7)**	**(7.5)**	**0.5**	**(142.8)**

( ) = negative, PRC = People's Republic of China, Lao PDR = Lao People's Democratic Republic.
Note: The Global Trade Analysis Project (GTAP) variable containing the decomposed numbers above is welfare.
Source: Author's results from a GTAP simulation.

tive total welfare change. First, Singapore receives the largest net welfare gains from the ASEAN FTA, followed by Thailand, Malaysia, Indonesia, and the Philippines. Singapore's welfare gains come mainly from large and positive terms of trade effects. Since Singapore began with no import tariffs, there was no change in its import prices but increases in all its export prices due to tariff reductions among its trade partners. Therefore, Singapore's terms of trade improve because it receives a higher price for its exports. Second, the net welfare gainer with the largest change in allocative efficiency is Malaysia. This reflects the fact that Malaysia had the highest levels of tariff protection before the simulation. The removal of tariffs shifted resources from protected but inefficient sectors to more efficient sectors. Third, all the net welfare gainers have a negative effect on their returns to savings and investment. As mentioned earlier, all ASEAN countries had trade surpluses in 2004 except for the Lao PDR, Myanmar, and Viet Nam. As the GTAP model is a static general equilibrium model, a trade surplus implies net investment in foreign capital goods. If the domestic return to capital investment increases relative to the foreign return to capital investment, then a country with an initial trade surplus suffers a welfare loss. This is the case with the older ASEAN members, particularly Thailand.

Table 2.8 shows that the ASEAN FTA does not benefit the new ASEAN members except for Cambodia. It also does not benefit non-ASEAN countries. Cambodia receives a net welfare gain from the ASEAN FTA mainly because of terms of trade and investment-savings effects. The terms of trade effect occurs because Cambodia experiences increases in export prices in most sectors and lower import prices in all sectors. The investment-savings effect occurs because Cambodia begins with a trade surplus and experiences a fall in the relative return to domestic investment. Viet Nam is the country that suffers the largest net welfare loss. The loss can be traced primarily to a drop in allocative efficiency. If the change in Viet Nam's allocative efficiency is broken down by sector, the three worst-performing sectors

are light manufacturing, textiles and clothing, and heavy manufacturing.[42] In the detailed trade results for Viet Nam (not shown), these sectors undergo trade diversion through large shifts in imports from non-ASEAN countries to ASEAN countries. As such, in these sectors, there is a loss in tariff revenue that outweighs any positive consumption and production reallocation effects.

For the ASEAN region as a whole, there is a net welfare gain of $2,222.6 million. So the ASEAN FTA creates a net benefit for the region even though some countries gain and some lose. This comes at the expense of non-ASEAN countries. The PRC, Japan, and the rest of East Asia have a total net welfare loss of $900.2 million, while the rest of the world suffers a net drop in welfare of $1,465.3 million. Therefore, the rest of the world bears more of the negative consequences of ASEAN trade preferences than the PRC, Japan, and the rest of East Asia. Table 2.8 shows that non-ASEAN countries suffer mainly due to negative terms of trade effects.

Finally, we perform a sensitivity analysis by varying the parameter values for the elasticity of substitution between imported and domestic goods around the provided GTAP values by 50%. In the GTAP model, these substitution elasticities are related to the Armington elasticities—substitution parameters between goods of different national origin—in that they have a constant ratio between them. So, a 50% variation in the values of the substitution elasticities implies a 50% variation in those of the Armington elasticities. As both types of elasticities are the crux of any FTA simulation, the results should be influenced by their values.[43] As this is for illustrative purposes, we will only discuss the real GDP and welfare of Cambodia and Viet Nam in the sensitivity results. For percentage changes in real GDP, the estimated standard deviation for Cambodia is extremely small so the real GDP contraction following the ASEAN FTA of –0.1% is likely and unaffected by changes in the elasticities. The standard deviation for Viet Nam is estimated at 0.08, so our best guess is that the percentage change in Viet Nam's real GDP lies in the range of –0.04% to –0.36%.[44] In other words, varying the elasticities does not change the sign on the percentage change in Viet Nam's real GDP. As for the welfare effects, assuming that the total welfare variable is normally distributed, the results from the sensitivity analysis can be used to calculate the probability of a negative total welfare effect. We find that the probability is 5% for Cambodia and 71% for Viet Nam. Therefore, varying the elasticities creates the possibility of a switch in the sign on the original welfare estimates for these two countries.

2.3.3. Strengths and Limitations of the GTAP Model

The strengths of the GTAP model include (i) as a general equilibrium model, it accounts for economic changes in all sectors; (ii) it is relatively accessible compared to other CGE models; (iii) it comes with a peer-reviewed and fully documented database and software suite; and (iv) it is widely used by trade policy researchers, who can easily try to replicate and verify the results of any GTAP study. On the other hand, the GTAP model faces the same limitations as other CGE models of trade policy: (i) it is constrained by the availability of data, and a lack of data may severely compromise the scope and relevance of a study and the researcher's ability to model certain trade policies; (ii) it involves many parameters, which may be difficult to estimate and validate; and (iii) it contains assumptions or characteristics that may not reflect real-world features. For example, in analyzing FTAs, the GTAP model's use of the Armington assumption creates a bias against findings of trade diversion and, therefore, a bias in favor of FTAs (Lloyd and Maclaren 2004).

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[42] *RunGTAP* includes a tool to decompose each source of welfare changes. Allocative efficiency can be decomposed by commodity and by tax type.

[43] We use the Liu quadrature in the sensitivity analysis to vary the elasticities by 50% under a uniform distribution and obtain standard deviations for the relevant variables.

[44] This assumes that the percentage change in the real GDP variable follows a normal distribution. The range shown is the 95% confidence interval.

Table 2.9 The GTAP Model, Free Trade Agreement Analysis, and Developing Countries

Item	Values and Variables	Notes on Implementation from a Developing Country Perspective
Assumptions in the GTAP Model	The standard GTAP model is based on full employment, perfect competition, constant returns to scale, differentiation by national origin (the Armington assumption), and no dynamic effects. These characteristics are modeled with specific functional forms and equations.	These characteristics may not prevail in developing countries. For examples of how to change the model to display more appropriate characteristics, see Elbehri and Hertel (2004) and Kitwiwattanachai, Nelson, and Reed (2010).
	The modeler has to decide which closure to use (i.e., which set of variables to leave as exogenous). The standard GTAP closure leaves factor endowments, technology, and tax and subsidy rates as exogenous variables.	For most FTA scenarios, the GTAP standard closure is appropriate. Exceptions are scenarios with technological changes, endogenous taxes and subsidies, or dynamic effects associated with investment and capital accumulation.
Data included in the GTAP database	Version 7 includes trade, trade protection, and input–output data for 113 countries and 57 sectors from the reference year 2004.	If a developing country has more timely or reliable data, then it can supplement or replace the GTAP trade and trade barrier data used for the analysis.
Important parameters	Important parameters are: goods substitution elasticities, factor substitution elasticities, factor transformation elasticities, investment parameters, and consumer demand elasticities.	Chapter 14 of the GTAP 7 database documentation explains how these parameter values were estimated. Modelers may replace them with other more suitable values.
Output of the GTAP model	Aggregate level outputs are real GDP, trade, terms of trade, and welfare (with sources of welfare changes). Sectoral level outputs are output, trade, and prices.	These results should be subjected to a sensitivity analysis. The RunGTAP program provides this facility.

FTA = free trade agreement, GDP = gross domestic product, GTAP = Global Trade Analysis Project.
Source: Authors.

A policy maker can assess the quality of a GTAP analysis by focusing on the following four areas. First, the model's assumptions and characteristics should be consistent with reality. For example, if the countries being studied are characterized by high rates of unemployment, a market structure in which a few firms operate in each sector with economies of scale in production, then using a model with full employment of labor, perfect competition, and constant returns to scale—as is the case in the standard GTAP model—is inappropriate. The analyst should modify the model so that it represents real-world features.[45] In the same vein, if dynamic effects are important, then using the standard GTAP model, which is static, may be misleading.

Second, the data used for simulations should be timely, suitable, and accurate. Researchers using the GTAP model almost always rely on the GTAP database, whose sources may not be complete, precise, or up-to-date. As such, the policy maker should refer to GTAP's documentation to check for the quality of the data used by the GTAP modeler. If the policy maker

[45] For an example of modifying the GTAP model to account for unemployment and changes in real wages, see Kitwiwattanachai, Nelson, and Reed (2009). For an example of modeling imperfect competition and increasing returns to scale in a GTAP model of an EU–Morocco FTA, see Elbehri and Hertel (2004).

has access to more reliable or comprehensive data (e.g., more accurate records of trade flows, tariff revenue, applied tariffs, or types of trade barrier), then the modeler should be advised to replace or supplement the data from the GTAP database.

Third, the policy maker should be aware that the GTAP model's results hinge on the parameter values used. In the latest GTAP database (version 7), values for the Armington elasticities come from recent econometric work by Hertel, Hummels, Ivanic, and Keeney (2004), while values for consumer demand elasticites come from work by and Reimer and Hertel (2004); but the values for the other parameters (factor substitution and factor transformation elasticities) date back to work on the SALTER model in 1991 (Jomini et al. 1991). Assessing the validity of econometric estimates for these parameters is beyond the scope of this chapter, but one can at least check whether the data coverage and time period of these econometric studies are relevant to the countries and goods included in the simulation. Alternatively, if the simulation comes with a sensitivity analysis, one can see whether changes in key parameter values significantly affect the values of important variables, such as output, trade, or welfare.

Lastly, a thorough CGE analysis should explain all important results from the simulation. The signs and magnitudes of the main results should be traced to the model's assumptions and structure or patterns in the exogenous variables. Any surprising numbers should also be explained. In the analysis of FTAs, the results should, at a minimum, discern any important developments in the production of regional members, preferably by sector, and the evolution of trade and welfare in both regional members and outsiders. A good CGE analysis of an FTA should present and carefully interpret these results in order to help policy makers make well-founded policy recommendations. Table 2.9 summarizes the main characteristics of the GTAP model, its required inputs, and its outputs. The table also includes implementation notes for developing countries.

2.4. Concluding Remarks

Countries, particularly developing ones, are increasingly turning to regional trade agreements in their efforts to benefit from world markets and overcome the failure of multilateral trade negotiations. In this context, it is crucial that policy makers have the right tools to evaluate these agreements and know how to make use of these tools. This chapter has presented various methods—trade indicators, SMART, and GTAP—to evaluate the economic effects of FTAs. Each method is explained as concisely as possible and accompanied by examples mainly from ASEAN and, in particular, the newer ASEAN members: Cambodia, the Lao PDR, and Viet Nam. It is hoped that the explanations will prove sufficiently useful for gaining a quick understanding of the logical foundations of each method, and, given the wide variety of FTA-related questions that policy makers have, the examples will illustrate which methods are relevant to which questions. Further, given that policy makers work under time, organizational, and financial constraints, the descriptions of each method's requirements should be helpful to policy makers when judging the feasibility of using any one method and the expected quality of results. Lastly, it is worth mentioning that the same methods would be applicable with some modification in the case of customs unions or other types of regional trade agreements.

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Appendix 2.1 Sources of Input–Output Tables in GTAP 7 Data Base

No.	Code	Description	Period	Source of Input–Output Table	Contributor(s)	Version
1	AUS	Australia	1997	Australian Bureau of Statistics (2001) (and associated unpublished data supplied by the Australian Bureau of Statistics) and selected shares obtained from the Monash MM144 model database	Terry Maidment Owen Gabbitas	7
2	NZL	New Zealand	1996	Statistics New Zealand (1996)	Gerard Malcolm Allan Rae	6
3	XOC	Rest of Oceania	2004	Composite		
4	CHN	People's Republic of China	2002	Department of National Economy Accounting (2006)	Jianwu He	7
5	HKG	Hong Kong, China	1988	Tormey (1993)	SALTER project	1
6	JPN	Japan	2000	Statistics Bureau, the Ministry of Public Management, Home Affairs, Posts and Telecommunications (2004)	Hirofumi Kawasaki	6
7	KOR	Republic of Korea	2003	Bank of Korea (2007)	Jong-Hwan Ko	7
8	TAP	Taipei,China	1999	Directorate-General of Budget, Accounting and Statistics (2001)	Hsing-Chun Lin Shih-Hsun Hsu	6
9	XEA	Rest of East Asia	2004	Composite		
10	KHM	Cambodia	2003	National Institute of Statistics (2006), National Institute of Statistics (2005), and National Bank of Cambodia (2006)	Sothea Oum	7
11	IDN	Indonesia	2004	Biro Pusat Statistik (1999)	Mark Horridge Armida S. Alisjahbana	7
12	LAO	Lao People's Democratic Republic	2002	Asian Development Bank (2005), Menon and Warr (2006), and Rao (1993)	Carlos Ludena	7
13	MMR	Myanmar	2005	Government Statistical Office, Ha Noi (2000) and Central Statistical Organization, Ministry of National Planning and Economic Development, Union of Myanmar, Yangon (2000)	David Roland-Holst, Saad Belghazi	7
14	MYS	Malaysia	1995	Department of Statistics, Malaysia (1994)	Kazuhiko Oyamada	5.3
15	PHL	Philippines	2000	National Statistical Office and National Statistical Coordination Board (1988)	Erwin Corong	7
16	SGP	Singapore	1996	Department of Statistics, Singapore (1995)	Ni, Houming Toh, Mun-Heng	6
17	THA	Thailand	1995	Office of National Economic and Social Development Board, Office of the Prime Minister (2000)	Kazuhiko Oyamada	5.3
18	VNM	Viet Nam	2003	Rand, John, Finn Tarp, and David Roland-Holst (2003) and Jensen and Tarp (2007)	David Roland-Holst, Finn Tarp, Jesper Jensen	7

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Appendix 2.1 *continued*

No.	Code	Description	Period	Source of Input–Output Table	Contributor(s)	Version
19	XSE	Rest of Southeast Asia	2004	Composite		
20	BGD	Bangladesh	1993–1994	Bangladesh Planning Commission and Bangladesh Institute of Development Studies (1998)	A.N.K. Noman and Jong-Hwan Ko	5
21	IND	India	1994	Government of India (2000)	Rajesh Chadha	6
22	PAK	Pakistan	2001/02	Dorosh, Niazi, and Nazli (2008)	Mark Horridge and Paul Dorosh	6.1
23	LKA	Sri Lanka	2000	Amarasinghe and Bandara (2005), and Bandara and Kelegama (2008)	Jeevika Weerahewa Jay Bandara	7
24	XSA	Rest of South Asia	2001	Composite		
25	CAN	Canada	2003	Statistics Canada	Shenjie Chen and Rick Cameron	7
26	USA	United States	2002	Dixon and Rimmer (2001); Dixon, Rimmer, and Tsigas (2004); and Lawson (1997)	Marinos Tsigas	7
27	MEX	Mexico	2002	National Institute of Statistical Geography and Informatics (2008) and the Mexican Ministry of Finance and Public Credit (2008)	Aída González	7
28	XNA	Rest of North America	2004	Composite		
29	ARG	Argentina	2000	Secretary of Agriculture, Livestock-farming, Fisheries and Food Industry	Maximilliano Méndez	6
30	BOL	Bolivia	2004	National Institute of Statistics of Bolivia (2004)	Carlos Ludena	7
31	BRA	Brazil	1996	Matriz de Insumo-Produto (1996)	Joaquim Bento S. Ferreira Filho	6
32	CHL	Chile	2003	Banco Central de Chile (2001)	Andres Schuschny and Carlos Ludena	7
33	COL	Colombia	2003	Colombian National Statistical Office (DANE)	Alvaro Perdomo	7
34	ECU	Ecuador	2004	Central Bank of Ecuador (2000)	Sara Wong Carlos Ludena	7
35	PRY	Paraguay	1994	Central Bank of Paraguay (2006)	Carlos Ludena, Ruiz Diaz, Francisco Carlos, and Gustavo Biedermann	7
36	PER	Peru	2004	Peruvian Ministry of Finance (2004)	David Roland-Holst, Saule Kazybayeva	7
37	URY	Uruguay	1997	Terra, Olivieri, Tellechea, and Zaclicever (2008)	Ines Terra	7

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Appendix 2.1 *continued*

No.	Code	Description	Period	Source of Input–Output Table	Contributor(s)	Version
38	VEN	Venezuela	1986	Planning Agency (CORDIPLAN), Venezuela	Echavarria and Arbalaez	4
39	XSM	Rest of South America	2004	Composite		
40	CRI	Costa Rica	2002	Central Bank of Costa Rica	Carlos Ludena Marco Sanchez	7
41	GTM	Guatemala	2001	Alarcón (2006)	Carlos Ludena Jose Duran	7
42	NIC	Nicaragua	2000	Central Bank of Nicaragua (2006)	Carlos Ludena Marco Sanchez Rob Vos	7
43	PAN	Panama	1996	Social accounting matrix built by Marco V. Sanchez and Rob Vos based on Supply and Use Tables from "Contraloría General of Panama"	Carlos Ludena	7
44	XCA	Rest of Central America	2004	Composite		
45	XCB	Caribbean	2004	Composite		
46	AUT	Austria	2000	European Communities (2008)	Marc Mueller Scott McDonald Csilla Lakatos	7
47	BEL	Belgium	1995	Peeters (Limburgs Universitair Centrum LUC-Deipenbeek, Belgium)	Myrna van Leeuwen (LEI) and Frank van Tongeren	5
48	CYP	Cyprus	1986	Statistical Offices in Central Europe, Malta, and Cyprus	Martin Banse and Terrie Walmsley	5.2
49	CZE	Czech Republic	2000	European Communities (2008)	Marc Mueller Scott McDonald Csilla Lakatos	7
50	DNK	Denmark	2000	European Communities (2008)	Marc Mueller Scott McDonald Csilla Lakatos	7
51	EST	Estonia	2000	European Communities (2008)	Marc Mueller Scott McDonald Csilla Lakatos	7
52	FIN	Finland	1995	Statistics Finland (Leena Kerkela)	Myrna van Leeuwen Landbouw Economisch Instituut, Wageningen University and Research Center (LEI)	5
53	FRA	France	2000	European Communities (2008)	Marc Mueller Scott McDonald Csilla Lakatos	7

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Appendix 2.1 *continued*

No.	Code	Description	Period	Source of Input–Output Table	Contributor(s)	Version
54	DEU	Germany	2000	European Communities (2008)	Marc Mueller Scott McDonald Csilla Lakatos	7
55	GRC	Greece	2000	European Communities (2008)	Marc Mueller Scott McDonald Csilla Lakatos	7
56	HUN	Hungary	1991 (96)	Központi Statisztikai Hivatal (Central Statistical Office) (1999)	Martin Banse	5
57	IRL	Ireland	2000	European Communities (2008)	Marc Mueller Scott McDonald Csilla Lakatos	7
58	ITA	Italy	1992	Istituto Nazionale di Statistica, Italy (1996)	Myrna van Leeuwen (LEI) Frank van Tongeren	5
59	LVA	Latvia	1997	Henrichsmeyer, W., J. Köckler, A. Quiring, and T. Möllmann (1999)	Martin Banse and Terrie Walmsley	5.2
60	LTU	Lithuania	1997	Henrichsmeyer, W., J. Köckler, A. Quiring, and T. Möllmann (1999)	Martin Banse and Terrie Walmsley	5.2
61	LUX	Luxembourg	1995	None, based on Belgium	Myrna van Leeuwen (LEI) and Frank van Tongeren	7
62	MLT	Malta	1986	Statistical Offices in Central Europe, Malta, and Cyprus	Martin Banse and Terrie Walmsley	5.2
63	NLD	Netherlands	2000	European Communities (2008)	Marc Mueller Scott McDonald Csilla Lakatos	7
64	POL	Poland	2000	European Communities (2008)	Marc Mueller Scott McDonald Csilla Lakatos	7
65	PRT	Portugal	1993	Instituto Nacional de Estatistica, Portugal (1996)	Myrna van Leeuwen (LEI)	5
66	SVK	Slovakia	1997	Henrichsmeyer, W., J. Köckler, A. Quiring, and T. Möllmann (1999)	Martin Banse and Terrie Walmsley	5.2
67	SVN	Slovenia	1997	Henrichsmeyer, W., J. Köckler, A. Quiring, and T. Möllmann (1999)	Martin Banse and Terrie Walmsley	5.2
68	ESP	Spain	2000	European Communities (2008)	Marc Mueller Scott McDonald Csilla Lakatos	7
69	SWE	Sweden	2000	European Communities (2008)	Marc Mueller Scott McDonald Csilla Lakatos	7

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Appendix 2.1 *continued*

No.	Code	Description	Period	Source of Input–Output Table	Contributor(s)	Version
70	GBR	United Kingdom	2000	European Communities (2008)	Marc Mueller Scott McDonald Csilla Lakatos	7
71	CHE	Switzerland	2005	Antille (2000)	Renger van Nieuwkoop Nathani Carsten	7
72	NOR	Norway	2004	European Communities (2008)	Glen Peters Nathan RiveAaheim	7
73	XEF	Rest of European Free Trade Association	2004	Composite		
74	ALB	Albania	2000	(1) Albanian Ministry of Finance publication (2001); (2) Godiva Rembeci, Institute of Statistics; (3) International Monetary Fund (2000); (4) INSTAT (2000); (5) Albanian Ministry of Finance publication (2001); and also discussions with taxation officials	Mark Horridge	5.3
75	BGR	Bulgaria	1996	National Statistical Institute of Bulgaria (NSI)	Martin Banse and Terrie Walmsley	5.2
76	BLR	Belarus	2004	Ministry of Statistics and Analysis of the Republic of Belarus	Irina Tochitskaya	7
77	HRV	Croatia	1995	Henrichsmeyer, W., J. Köckler, A. Quiring, and T. Möllmann	Martin Banse and Terrie Walmsley	5.2
78	ROU	Romania	2002	National Statistical Agency of Romania	David Laborde and Csilla Lakatos	7
79	RUS	Russian Federation	2003	Rosstat (2008) and (2006)	Natalia Tourdyeva	7
80	UKR	Ukraine	2004	Ukrainian Input–Output table, State Statistics Committee of Ukraine	Iryna Orlova	7
81	XEE	Rest of Eastern Europe	2004	Composite		
82	XER	Rest of Europe	2004	Composite		
83	KAZ	Kazakhstan	2004	Abdiev (2007)	David Roland-Holst, Saule Kazybayeva	7
84	KGZ	Kyrgyz Republic	2003		Aziz Atamanov	7
85	XSU	Rest of Former Soviet Union	2004	Composite		
86	ARM	Armenia	2002	The table is based on a table included in a social accounting matrix developed by Miles K. Light, Ekaterine Vashakmadze, and Artsvi Khatchatryan	Jesper Jensen, David Tarr, and Oleksandr Shepotylo	7

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Appendix 2.1 *continued*

No.	Code	Description	Period	Source of Input–Output Table	Contributor(s)	Version
87	AZE	Azerbaijan	2001	Statistical Committee of Azerbaijan (2005)	Jesper Jensen, David Tarr, and Oleksandr Shepotylo	7
88	GEO	Georgia	2001	Unofficial table provided by the Economic Policy Research Center in Georgia	Jesper Jensen, David Tarr, and Oleksandr Shepotylo	7
89	IRN	Iran, Islamic Republic of	2001	Statistical Center of Iran	Farzad Taheripour	7
90	TUR	Turkey	1998	State Institute of Statistics (2004)	Mustafa Acar, Burcu Afyonoglu, Savas Kus, and Bengisu Vural	7
91	XWS	Rest of Western Asia	2004	Composite		
92	EGY	Egypt	2003	National Accounts, National Planning Unit of Egypt	Noura Abdelwahab and Miles Light	6.2
93	MAR	Morocco	2004	Bussolo and Roland-Holst (1993)	David Roland-Holst, Saad Belghazi	7
94	TUN	Tunisia	1995	Institut National de la Statistique, Tunisia (1998)	Denise Konan and Ari Van Assche	6
95	XNF	Rest of North Africa	2004	Composite		
96	NGA	Nigeria	1999	Official 1990 input–output table (30 sector), and an unofficial 1999 input–output table (18 sector) supplied by Patrick Osakwe of the Trade and Regional Integration Division, United Nations Economic Commission for Africa (UNECA)	Mark Horridge and Patrick Osakwe (UNECA)	6.1
97	SEN	Senegal	1996	1996 social accounting matrix prepared by Mamadou Dansokho and Amadou Diouf in 1999 for the Senegal Government	Patrick Osakwe and Mark Horridge	6.2
98	XWF	Rest of Western Africa	2004	Composite		
99	XCF	Rest of Central Africa	2004	Composite		
100	XAC	Rest of South–Central Africa	2004	Composite		
101	ETH	Ethiopia	2002	Social Accounting Matrix 2001/02 compiled by IDS in collaboration with Ethiopian Development Research Institute	Dirk Willenbockel Sherman Robinson	7

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Appendix 2.1 *continued*

No.	Code	Description	Period	Source of Input–Output Table	Contributor(s)	Version
102	MDG	Madagascar	1999	INSTAT (2003), also documented in Dorosh, P., S. Haggblade, C. Lungren, T. Razafimanantena, and Z. Randriamiarana (2003)	Simon Njaka Randrianarivelo and Shuby Andriamanajara	6
103	MWI	Malawi	1994	MERRISA/Wobst	Mark Horridge	5
104	MUS	Mauritius	1997	Central Statistical Office of Mauritius	Sawkut Rojid	6.1
105	MOZ	Mozambique	1995	MERRISA/Arndt et al.	Mark Horridge	5
106	TZA	Tanzania	1992	MERRISA/Wobst	Mark Horridge	5
107	UGA	Uganda	1992	Ugandan National Statistics Department	Adam Blake	5
108	ZMB	Zambia	1995	MERRISA/Hausner	Mark Horridge	5
109	ZWE	Zimbabwe	1991	MERISSA/Thomas and Bautista	Mark Horridge	5
110	XEC	Rest of Eastern Africa	2004	Composite		
111	BWA	Botswana	1993–1994	McDonald	Mark Horridge	5
112	ZAF	South Africa	2005	Statistics South Africa (2006)	Cecilia Punt	7
113	XSC	Rest of South African Customs Union	2004	Composite		

Source: Authors.

Appendix 2.2 Composite Regions and Correspondence with Primary Regions in GTAP 7 Data Base

Composite Region/Component Countries			Primary Region Match		GDP Share Weights
XOC	Rest of Oceania				100.00
	American Samoa	ASM	New Zealand	NZL	100.00
	Cook Islands	COK			
	Fiji	FJI			
	French Polynesia	PYF			
	Guam	GUM			
	Kiribati	KIR			
	Marshall Islands	MHL			
	Micronesia, Federated States of	FSM			
	Nauru	NRU			
	New Caledonia	NCL			
	Norfolk Island	NFK			
	Northern Mariana Islands	MNP			
	Niue	NIU			
	Palau	PLW			
	Papua New Guinea	PNG			
	Samoa	WSM			
	Solomon Islands	SLB			
	Tokelau	TKL			
	Tonga	TON			
	Tuvalu	TUV			
	Vanuatu	VUT			
	Wallis and Futuna	WLF			
XEA	Rest of East Asia				100.00
	Macau	MAC	People's Republic of China	CHN	59.80
	Mongolia	MNG	Hong Kong, China	HKG	40.20
	Korea, Democratic People's Republic of	PRK			
XSE	Rest of Southeast Asia				100.00
	Brunei Darussalam	BRN	Singapore	SGP	93.90
	Timor-Leste	TLS	Cambodia	KHM	6.10
XSA	Rest of South Asia				100.00
	Afghanistan	AFG	Bangladesh	BGD	89.70
	Bhutan	BTN	Pakistan	PAK	4.80
	Maldives	MDV	Iran, Islamic Republic of	IRN	5.40
	Nepal	NPL			

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Appendix 2.2 *continued*

Composite Region/Component Countries			Primary Region Match		GDP Share Weights
XNA	Rest of North America				100.00
	Bermuda	BMU	Canada	CAN	29.70
	Greenland	GRL	USA	USA	70.30
	Saint Pierre and Miquelon	SPM			
XSM	Rest of South America				100.00
	Falkland Islands (Malvinas)	FLK	Mexico	MEX	46.18
	French Guiana	GUF	Bolivia	BOL	22.32
	Guyana	GUY	Peru	PER	31.50
	Suriname	SUR			
XCA	Rest of Central America				100.00
	Belize	BLZ	Bolivia	BOL	30.77
	El Salvador	SLV	Ecuador	ECU	65.34
	Honduras	HND	Brazil	BRA	3.89
XCB	Rest of the Caribbean				100.00
	Antigua and Barbuda	ATG	Mexico	MEX	66.36
	Bahamas	BHS	Argentina	ARG	0.14
	Barbados	BRB	Brazil	BRA	22.64
	Dominica	DMA	Chile	CHL	0.03
	Dominican Republic	DOM	Venezuela	VEN	0.23
	Grenada	GRD	Costa Rica	CRI	0.40
	Haiti	HTI	Nicaragua	NIC	1.83
	Jamaica	JAM			
	Puerto Rico	PRI			
	Saint Kitts and Nevis	KNA			
	Saint Lucia	LCA			
	Saint Vincent and the Grenadines	VCT			
	Trinidad and Tobago	TTO			
	Virgin Islands, US	VIR			
	Anguilla	AIA			
	Aruba	ABW			
	Cayman Islands	CYM			
	Cuba	CUB			
	Guadeloupe	GLP			
	Martinique	MTQ			
	Montserrat	MSR			
	Netherlands Antilles	ANT			
	Turks and Caicos	TCA			
	Virgin Islands, British	VGB			

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Appendix 2.2 *continued*

Composite Region/Component Countries			Primary Region Match		GDP Share Weights
XEF	Rest of European Free Trade Association				100.00
	Iceland	ISL	Ireland	IRL	0.78
	Liechtenstein	LIE	Luxembourg	LUX	0.22
XEE	Rest of Eastern Europe				100.00
	Moldova, Republic of	MDA	Ukraine	UKR	100.00
XER	Rest of Europe				100.00
	Andorra	AND	Finland	FIN	3.78
	Bosnia and Herzegovina	BIH	Italy	ITA	9.44
	Faroe Islands	FRO	Netherlands	NLD	2.56
	Gibraltar	GIB	Albania	ALB	84.23
	Macedonia, the former Yugoslav Republic of	MKD			
	Monaco	MCO			
	San Marino	SMR			
	Serbia and Montenegro	SCG			
XSU	Rest of Former Soviet Union				100.00
	Tajikistan	TJK	Kazakhstan	KAZ	30.53
	Turkmenistan	TKM	Kyrgyz Republic	KGZ	69.47
	Uzbekistan	UZB			
XWS	Rest of West Asia				100.00
	Bahrain	BHR	Cyprus	CYP	85.68
	Iraq	IRQ	Armenia	ARM	4.93
	Israel	ISR	Georgia	GEO	2.37
	Jordan	JOR	Azerbaijan	AZE	3.87
	Kuwait	KWT	Turkey	TUR	3.15
	Lebanon	LBN			
	Palestinian Territory, Occupied	PSE			
	Oman	OMN			
	Qatar	QAT			
	Saudi Arabia	SAU			
	Syrian Arab Republic	SYR			
	United Arab Emirates	ARE			
	Yemen	YEM			

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Appendix 2.2 *continued*

Composite Region/Component Countries			Primary Region Match		GDP Share Weights
XNF	Rest of North Africa				100.00
	Algeria	DZA	Tunisia	TUN	100.00
	Libyan Arab Jamahiriya	LBY			
XWF	Rest of West Africa				100.00
	Benin	BEN	Nigeria	NGA	68.84
	Burkina Faso	BFA	Senegal	SEN	31.16
	Cote d'Ivoire	CIV			
	Cape Verde	CPV			
	Ghana	GHA			
	Guinea	GIN			
	Gambia	GMB			
	Guinea-Bissau	GNB			
	Liberia	LBR			
	Mali	MLI			
	Mauritania	MRT			
	Niger	NER			
	Saint Helena	SHN			
	Sierra Leone	SLE			
	Togo	TGO			
XCF	Rest of Central Africa				100.00
	Central African Republic	CAF	Zambia	ZMB	66.54
	Cameroon	CMR	Zimbabwe	ZWE	3.50
	Congo	COG	Botswana	BWA	29.96
	Gabon	GAB			
	Equatorial Guinea	GNQ			
	Sao Tome and Principe	STP			
	Chad	TCS			
XAC	Rest of South–Central Africa				100.00
	Angola	AGO	Zambia	ZMB	72.25
	Congo, the Democratic Republic of the	COD	Malawi	MWI	27.75

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Appendix 2.2 *continued*

Composite Region/Component Countries			Primary Region Match		GDP Share Weights
XEC	Rest of East Africa				100.00
	Burundi	BDI	Ethiopia	ETH	1.35
	Comoros	COM	Madagascar	MDG	5.52
	Djibouti	DJI	Uganda	UGA	4.16
	Eritrea	ERI	Zambia	ZMB	76.18
	Kenya	KEN	Botswana	BWA	12.79
	Mayotte	MYT			
	Reunion	REU			
	Rwanda	RWA			
	Sudan	SDN			
	Somalia	SOM			
XSC	Rest of South African Customs Union				100.00
	Lesotho	LSO	South Africa	ZAF	85.24
	Namibia	NAM	Zambia	ZMB	14.76
	Swaziland	SWZ			

GDP = gross domestic product, GTAP = Global Trade Analysis Project.

Source: Authors.

Chapter 3

Methods for Ex-Post Economic Evaluation of Free Trade Agreements

After a free trade agreement (FTA) is established it is important for policy makers to take stock of its effects. The actual impact of an FTA may be quite different from any prior projection. The purpose of this chapter is to present ex-post FTA evaluation methods to show policy makers what to assess and how to conduct a retrospective economic assessment. The focus of this chapter is on the economic effects of preferences on trade because they are the core of any FTA. There are other aspects of regional integration, such as the financial, political, social, and technological dimensions, but these are beyond the scope of this chapter.[46] The methods presented are mainly quantitative techniques to assess the trade and welfare outcomes of an FTA. These methods assume that there is enough data for statistical analysis from observing the FTA's effects. In general, the methods in this chapter try to answer the following questions:

(i) Has the FTA affected a member country's trade?
(ii) Have the FTA's trade effects raised a member country's welfare?
(iii) Through which channels has FTA-induced trade affected welfare?

The methods are presented in three sections. The first section discusses various ways to measure the extent to which eligible exporters can and do take advantage of preferences under an FTA by showing how to calculate the coverage, utility, and utilization rates. It also shows how to estimate the value of preferences to exporters and the cost of preferences to the countries that offer them. The second section explains how to use trade and production statistics to assess the trade effects and welfare consequences of an FTA. It describes both qualitative and quantitative approaches to evaluating an FTA. The third section contains a description of the gravity model, which is often applied to trade analysis. It discusses how to estimate the gravity model, provides sources for the required data, and explains how to interpret the estimation results. All the methods in this chapter are accompanied by examples with real data from countries, such as Cambodia, Indonesia, and Viet Nam, to illustrate how to perform the necessary computations and derive conclusions.

[46] Readers who are interested in the evaluation of noneconomic aspects of regional integration may refer to Park and Estrada (2010).

3.1. Free Trade Agreement Preference Indicators

The discriminatory nature of an FTA entails granting preferential tariffs to fellow members of the agreement. The preferential tariff is lower than the most favored nation (MFN) tariff—the tariff imposed on imports from non-member countries. The difference between the MFN tariff and the preferential tariff is known as the preference margin. For example, for the Harmonized System HS eight-digit product metal office furniture (94031000), Viet Nam's MFN tariff has been 32% since 2008, while the Common Effective Preferential Tariff offered to countries in the Association of Southeast Asian Nations (ASEAN) under the ASEAN Free Trade Area (AFTA) agreement is 5%. Therefore, the preference margin granted by Viet Nam on imports of this product from ASEAN partners is 27% (32%–5%).

3.1.1. Coverage Rate

The first step toward understanding the effects of FTA preferences is to calculate the coverage rate—the proportion of dutiable imports from FTA members that are eligible for preferential treatment. Dutiable imports are those imports on which the MFN tariffs are more than zero. Imports that have a zero MFN duty are disregarded because preferences would be irrelevant for them. To compute the coverage rate, one has to identify (i) all the tariff lines for which imports are dutiable, and (ii) all the dutiable tariff lines that are eligible for preferences. Let D be the set of all tariff lines with dutiable imports from FTA members and P be the set of all dutiable tariff lines that are eligible for preferences under the FTA. Note that P is a subset of D.[47]

The formula for the coverage rate is:

$$\text{Coverage Rate} = \frac{\sum_{i \in P} M_i}{\sum_{i \in D} M_i}$$

where

i is a tariff line
M_i is the value of imports in the tariff line i from FTA members
D is the set of all tariff lines with dutiable imports from FTA members
P is the set of all dutiable tariff lines that are eligible for preferences under the FTA

In the formula, the numerator is the sum of imports over all tariff lines that are both dutiable and eligible for preferences, while the denominator is the sum of imports over all dutiable tariff lines.[48] To calculate this fraction, one needs to know the import values

[47] Often, an FTA will state that a certain tariff line is eligible for preferences even though the tariff line has an MFN tariff of zero. This occurs when preferences are offered on broader categories of imports that include both dutiable and non-dutiable tariff lines. In any case, non-dutiable tariff lines should be excluded because preferential tariffs cannot be lower than zero.

[48] If it is known beforehand that most dutiable tariff lines have preference margins (i.e., only a few do not have preference margins), then an easier way to calculate the coverage rate would be $\text{Coverage Rate} = 1 - \frac{\sum_{i \in P^C} M_i}{\sum_{i \in D} M_i}$. That is, 1 minus the fraction of the sum of imports over all dutiable tariff lines that were not eligible for preferences over the sum of imports over all dutiable tariff lines.

from FTA partners for all dutiable tariff lines, and which dutiable tariff lines were eligible for preferences.

The coverage rate shows the official scope of the FTA. The higher the ratio of dutiable imports eligible for preferences to total dutiable imports, the wider the scope of the FTA. The coverage rate does not show the actual utilization of preferences because some imports that were eligible for preferential treatment may have entered under the MFN regime for various reasons to be discussed below. Therefore, the coverage rate is an upper bound to the share of dutiable imports that actually entered with preferences. Note that the coverage rate can be computed for any combination of importers, exporters, products, and periods in the FTA.

For example, consider the trade preferences granted by Viet Nam in 2008 to its ASEAN partners under AFTA. At the eight-digit level, out of 8,300 tariff lines, 8,099 were on the Common Effective Preferential Tariff list. The other 201 products were listed under general exceptions or were covered by another ASEAN scheme. Out of these 8,099 included products, 5,589 were dutiable and, therefore, had MFN tariffs above zero. Of those, 5,137 dutiable tariff lines (92%) were eligible for preferences. The coverage rate was 86.5%.[49] It is worth reiterating that the coverage rate is an upper bound on the share of dutiable imports that actually utilized preferences, which may be far below the coverage rate if firms choose to ignore the FTA's preferential regime.

Why would firms ignore preferences granted by an FTA? To benefit from these preferences, an exporting firm would have to deal with the administrative issues and technical requirements associated with an FTA's rules of origin. Rules of origin are the criteria for evaluating whether a good can be considered to have originated from a country.[50] In an FTA or any preferential market access scheme, rules of origin are the basis for determining the eligibility of a good for preferences. Without rules of origin, an FTA would be prone to trade deflection, whereby goods enter into the free trade area via the member country with the lowest external tariff and are reexported to another member country. Complying with rules of origin imposes various costs on firms. These costs stem from additional administrative fees and paperwork, accounting operations for extra information required by the certificate-granting authorities, and constraints on the sourcing of intermediate inputs in order to meet local content requirements.[51] These costs may be so large that they remove any incentive to utilize an FTA's preferential tariffs. For example, in the case of the North American Free Trade Agreement (NAFTA), Anson et al. (2005) found that rules of origin for Mexican exports to the United States (US) imposed an average compliance cost of around 6% in ad valorem equivalent, undoing the tariff preference (4% on average) on a large number of tariff lines. Studying the European Union's (EU) preferential market access schemes, Nilsson and Matsson (2009) showed that the coverage rate was 37.3% of the EU's dutiable imports from the world, but

[49] This estimate is upwardly biased because trade data for Viet Nam is publicly available only at the six-digit level, and so tariff data had to be aggregated from the eight-digit to the six-digit level. It was assumed, in the aggregation process, that all FTA imports in a six-digit tariff line would be considered eligible for preferences if at least one disaggregated tariff line at the eight-digit level was eligible for preferences. This assumption implies a much larger total of preferential trade and, therefore, overestimates the coverage rate.

[50] Rules of origin are usually specified as a local content requirement (e.g., minimum percentage of local value added) or a substantial transformation requirement (e.g., change in tariff classification at the level of the tariff line or at the tariff heading).

[51] The theoretical costs of rules of origin have been studied by Krueger (1999), Krishna and Krueger (1995), Falvey and Reed (1998), Falvey and Reed (2002), Krishna (2005), and Duttagupta and Panagariya (2007).

the share of dutiable imports that actually entered with preferences was 29.5%. Therefore, 7.8% of the EU's dutiable imports that were eligible for preferences did not utilize them.

3.1.2. Utility Rate

The utility rate measures the effective scope of the FTA as the share of dutiable imports that actually entered with preferences.

The formula for the utility rate, as defined by Inama (2003), is:

$$\text{Utility Rate} = \frac{\sum_{i \in P} M_i^U}{\sum_{i \in D} M_i}$$

where

i is a tariff line
M_i is the value of imports in the tariff line i from FTA members
M_i^U is the value of imports from FTA members that actually utilized the FTA's preferential rate in the tariff line i
D is the set of all tariff lines with dutiable imports from FTA members
P is the set of all dutiable tariff lines that are eligible for preferences under the FTA

In the formula, the numerator is the sum of all dutiable imports that actually utilized the FTA's preferences, while the denominator is the sum of imports over all dutiable tariff lines. The higher the utility rate, the larger the share of dutiable imports that actually entered under the preferential—rather than the MFN—tariff, indicating a wider effective scope of the FTA. Different from the coverage rate, the utility rate requires knowing the value of imports that actually entered with preferences within each dutiable tariff line that was eligible for preferential treatment.

3.1.3. Utilization Rate

Besides the scope of the FTA relative to dutiable imports, one may be interested in the attractiveness of a preferential regime relative to MFN treatment. For this, we can compute the utilization rate, which shows the degree to which preference-eligible dutiable imports enter under preferential—rather than the MFN—tariffs.

The formula for the utilization rate is:

$$\text{Utilization Rate} = \frac{\sum_{i \in P} M_i^U}{\sum_{i \in P} M_i}$$

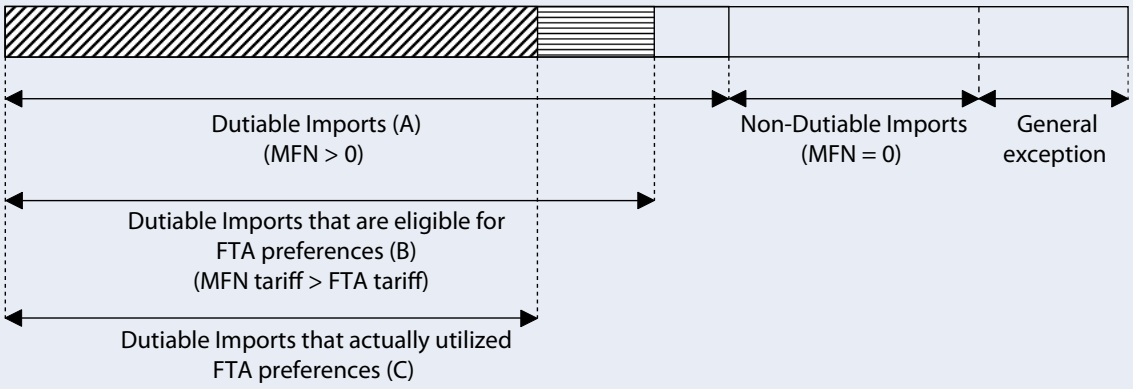
where

i is a tariff line
M_i is the value of imports in the tariff line i from FTA members
M_i^U is the value of imports from FTA members that actually utilized the FTA's preferential rate in the tariff line i
P is the set of all dutiable tariff lines that are eligible for preferences under the FTA

In the formula, the numerator is the sum of all dutiable imports that actually utilized the FTA's preferences, while the denominator is the sum of all dutiable imports that were eligible for the FTA's preferences. The utilization rate differs from the utility rate in that the denominator of the utilization rate considers only dutiable imports that are eligible for preferences while that of the utility rate considers all dutiable imports. The higher the utilization rate, the more preference-eligible imports actually enter under preferential rather than MFN tariffs. A higher utilization rate also implies that the compliance costs of rules of origin are less of a constraint. To provide a visual summary, Figure 3.1 shows the structure of imports and the different components used in the calculation of the coverage, utility, and utilization rates.

As an example, we consider the EU's generalized system of preferences (GSP) scheme, under which certain ASEAN countries benefit from preferential treatment. Preferential imports into the EU from ASEAN comprise mainly mechanical appliances, plastics and rubber, textiles, footwear, and prepared foodstuffs. Nilsson and Matsson (2009) compute a utilization rate of 65.3% for EU preferential imports from ASEAN in 2007, implying that 34.7% of EU preferential imports from ASEAN that could have entered under the GSP actually did not. The authors also calculate the utilization rate on EU preferential imports from the whole world, which is 79%. This is higher than the utilization rate on EU preferential imports from ASEAN. The authors explain ASEAN's lower utilization rate by showing that ASEAN countries face small ad valorem preference margins ranging from 0.8% (textiles) to 3.3% (prepared foodstuffs). Therefore, it can be inferred that the compliance costs of the EU's rules of origin for ASEAN countries to benefit from the GSP are at least 0.8%–3.3% of import value for each of the corresponding sectors.

Figure 3.1 **Structure of Imports and Formulas for Free Trade Agreement Preference Indicators**



Coverage Rate = B/A*100
Utility Rate = C/A*100
Utilization Rate = C/B*100

FTA = free trade agreement, MFN = most favored nation.
Source: Authors.

3.1.4. Value of Free Trade Agreement Preferences

To exporters, the value of trade preferences comes from the rents generated by being subject to lower tariffs than the MFN tariff. For the importing country, these rents are an implicit transfer of tariff revenue from the government to foreign exporters, and possibly, domestic importers, due to the preference scheme. The sizes of these rents are proportional to the preference margin, but are inversely related to the costs of complying with rules of origin and the market power of domestic importers in the industry. If the domestic importers of the product are able to affect the price by changing their buying patterns, then they may be able to appropriate some of the rents. This reduces the value of trade preferences to foreign exporters or, equivalently, the transfer from the importing country. For example, Özden and Olarreaga (2005) found that under the African Growth and Opportunity Act, a preferential scheme for African exports of clothing to the US, only one-third of the available rents actually accrued to African exporters.

As a first step toward measuring the value of trade preferences, we can multiply the preference margin in a certain dutiable tariff line with the tariff line's value of imports from trade partners that are eligible for and actually use preferences. This yields a maximum value of preferences to foreign exporters because compliance costs and the effects of market power among domestic importers could reduce the actual value. Continuing with the example from the previous section, the maximum value of EU preferences to ASEAN exporters in 2007 for textiles was €14.2 million (0.8% of €1,780.5 million). For prepared foodstuffs, it was €29.9 million (3.3% of €905.9 million). For an aggregate measure of the maximum value of trade preferences, we can simply sum up the computed values over all dutiable tariff lines that were eligible for preferences. The aggregate maximum value of EU preferences to ASEAN exporters in 2007 was €546.8 million.[52] This number is the cost to the EU government of lost tariff revenue from offering preferences under the GSP to ASEAN exporters, but it is only an upper bound on and a rough approximation of the value of GSP preferences to ASEAN exporters. To obtain a more accurate figure of the value of trade preferences to foreign exporters, one has to estimate compliance costs and the effects of importer market power. Methods to do so are technically difficult, and the reader may refer to work by Herin (1986) and Anson et al. (2005) for estimates of compliance costs, and Özden and Olarreaga (2005) for the effects of importer market power.

3.1.5. Data Sources: Customs Data and Firm Surveys

The main sources of data to calculate the FTA preference indicators described above are customs declarations and certificates of origin. For any good in a shipment, these documents should provide information on the value of the good, its weight, HS code, and the origin criterion used, when preferences are requested. The AFTA certificate of origin is known as Form D (Appendix 3). For the EU, information on the origin of goods is provided in the Single Administrative Document. If the relevant information for a specific FTA can be extracted from these forms and compiled, then the indicators presented in the previous sections should be calculated to measure the utilization and value of preferences.[53]

Alternatively, the necessary information for a specific FTA may be collected via firm surveys to estimate the indicators. The survey should be directed to a random sample of export firms from FTA member countries that sell to other member countries, and it should include the following questions:

---

[52] The raw numbers for the calculation of the aggregate value of EU preferences to ASEAN countries can be found in Tables 1 and 2 of Nilsson and Matsson (2009).

[53] Statistics, such as the number of certificates of origin issued or the number of companies that conduct international trade under an FTA, may also be indicators of FTA preference utilization, but they are less accurate.

(a) How much do you export to FTA member countries?
(b) What percentage of your exports to FTA member countries is dutiable?
(c) Out of your dutiable exports to FTA member countries, what percentage is eligible for preferences?
(d) Out of your dutiable exports to FTA member countries, what percentage actually enters under preferential tariffs?
(e) For this FTA, what is the export-weighted average preferential tariff that you pay?
(f) Without this FTA, what would be the export-weighted average MFN tariff that you would pay?
(g) As a percentage of the value of your exports to FTA member countries that actually enter under a preferential tariff, what is the administrative and compliance cost?

If an export firm provides proper responses to the questions above, then we can compute the following statistics for the export firm:

Utility rate = (d)

Utilization rate = (d)/(c)

Export-weighted average preference margin = (f) – (e)

Value of exports that actually enter under preferential tariffs = (a)*(b)*(d)

Maximum value of preferences for the export firm = (a)*(b)*(d)*[(f) – (e)]

Maximum value of preferences net of administrative and compliance costs = (a)*(b)*(d)*[(f) – (e) – (g)]

For either the utility or utilization rates, an export-weighted average of the export firms' rates can be used as an estimate of the aggregate rate. For an estimate of a country's aggregate maximum value of preferences, we sum up the maximum value of preferences over all export firms in the sample and multiply this sum by the ratio of total intra-FTA exports over the sum of intra-FTA exports by firms in the sample.

A firm-level survey may also be useful in collecting other information about export firms within an FTA.[54] More importantly, firm-level surveys can be used to investigate why the utilization rate of preferences in an FTA is high or low. The firms can be asked to rank the importance of certain factors in encouraging or discouraging preference utilization, such as availability of FTA-related information, size of preference margins, procedural efficiency associated with rules of origin, sourcing constraints under rules of origin, overlapping FTAs, reduction of tariffs under investment schemes, and non-tariff measures.

3.1.6. Strengths and Limitations of Free Trade Agreement Preference Indicators

The indicators described in the previous sections are useful summary measures of the extent and effectiveness of preferences in an FTA. They are easily calculated provided that the relevant data is made available. However, these indicators do not identify the reasons for a given level of preference utilization. Firm-level surveys can be used to fill this gap. Furthermore, these indicators focus on measuring the scope, utilization, and value of preferences rather than the size of an FTA's effects on trade or economic welfare.

[54] For example, the Japanese External Trade Organization conducts an annual survey directed at Japanese manufacturing firms' affiliates operating abroad that includes FTA-related questions on the percentage of exports sales out of total sales; the breakdown of export destinations; and whether or not the firm took advantage of FTAs and, if so, which ones.

3.2. Free Trade Agreement Trade and Welfare Indicators

This section explains how to use trade statistics to retrospectively analyze the trade effects of an FTA and make inferences about economic welfare. The trade impact of an FTA is of primary interest because the FTA is a commercial arrangement, and is therefore intended to affect trade, and the effects on trade are an important indicator of the welfare effects of the FTA. The first part of this section employs a qualitative Vinerian approach to analyzing the trade effects of an FTA in a particular sector. The second part presents two quantitative approaches that focus on trade indicators identified by Lloyd and Maclaren (2004). The methods in this section are easy to implement but yield results that are only indicative of the trade effects of an FTA. As such, they are useful in gaining a first impression before more elaborate methods are deployed. A more formal method—the gravity model—is described in the final section.

3.2.1. Qualitative Analysis of Trade Creation and Trade Diversion

Viner's analysis of FTAs provides a conceptual framework for studying the trade effects of an FTA (Viner 1950). According to Viner's model, a regional trading agreement is beneficial (harmful) if the magnitude of **trade creation**—when preferential tariffs replace inefficient home production with efficient imports from an FTA partner—is larger (smaller) than **trade diversion**—when preferential tariffs replace efficient imports from the rest of the world with inefficient imports from an FTA partner. Therefore, it is important to focus on changes in domestic production and intra- and extraregional trade.

For a qualitative evaluation of an FTA's trade effects, one can make a comparison of trade and production levels before and after an FTA's implementation using the following criteria:

(i) An increase in imports from FTA partners accompanied by a drop in domestic production indicates trade creation.
(ii) An increase in imports from FTA partners accompanied by a drop in imports from non-FTA partners indicates trade diversion.
(iii) A rise in total imports where imports from non-FTA partners are constant or increasing implies that there is no trade diversion, thus indicating a positive welfare effect.
(iv) A rise in total imports where imports from non-FTA partners and domestic production decrease and
    (a) the fall in imports from non-FTA partners is larger than the fall in domestic production, implying that trade diversion exceeds trade creation, thus indicating a negative welfare effect; or
    (b) the fall in imports from non-FTA partners is smaller than the fall in domestic production, implying that trade creation exceeds trade diversion, thus indicating a positive welfare effect.
(v) A drop in total imports indicates a negative welfare effect.[55]

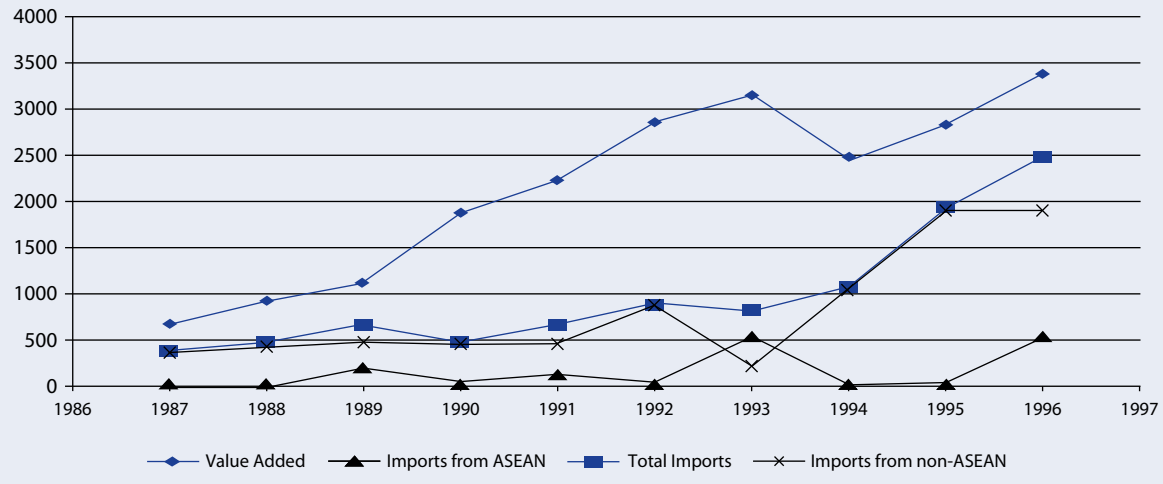
To illustrate, consider Indonesia's food manufacturing sector (International Standard Industrial Classification of all Economic Activities [ISIC] 311, Revision 2). Figure 3.2 shows

[55] A drop in total imports may be the result of (i) a fall in imports from both FTA and non-FTA partners, (ii) a larger fall in imports from non-FTA partners relative to an increase in imports from FTA partners, and (iii) a larger fall in imports from FTA partners relative to an increase in imports from non-FTA partners. In cases (i) and (ii), there is no trade creation and, therefore, the welfare effect is negative. Case (iii) is unlikely because the FTA is supposed to discriminate in favor of FTA partners and against non-FTA partners.

the sector's trends from 1987 to 1996 in domestic value-added, total imports, imports from ASEAN, and imports from non-ASEAN countries. Since the original six ASEAN countries signed AFTA in January 1992, the reference year chosen was 1991. After 1991, ASEAN imports were relatively stable, except for upward spikes in 1993 and 1996. Non-ASEAN imports after 1991 followed an increasing trend except for a sharp fall in 1993. Therefore, 1993 and 1996 stand out as years when the preferential arrangements in AFTA may have affected Indonesian imports in this sector. In 1993—a year of possible trade diversion—the increase in ASEAN imports was accompanied by a large fall in non-ASEAN imports. The increase in intraregional imports in 1993 was smaller than the drop in extraregional imports as shown by the dip in total imports. As such, it is likely that this sector experienced a negative welfare effect in 1993. Further, it is unlikely that intraregional imports were replacing domestic production (i.e., trade creation) because domestic production reached a peak in 1993. In contrast, 1996 was a year when ASEAN imports increased and non-ASEAN imports had reached a level that was four times that of 1991. The rise in non-ASEAN imports in 1996 suggests that there was no trade diversion and, therefore, Indonesia's food manufacturing sector was experiencing a positive welfare effect.

Although this type of pre–post analysis is relatively easy, there are several limitations to this method. First, the analysis is descriptive and does not quantify the FTA's trade or welfare effects. Having these effects quantified is a prerequisite for combining results with those from other sectors and conducting a cost–benefit analysis of an FTA. Second, the analysis assumes that any changes in trade and production are caused by the FTA when these could be affected by other factors, such as changes in import demand, supply of the import substitute, or technological advances. Not accounting for these non-FTA factors provides a misleading impression of how the FTA affects trade and welfare. In other words, assuming that trade and production would remain at their pre-FTA levels in the absence of the FTA—and, therefore, that all changes in trade and production are caused by the FTA—is unrealistic.

Figure 3.2 **Indonesian Food Manufacturing Value-Added and Imports from ASEAN and Non-ASEAN Countries, 1987–1996** ($ million)



ASEAN = Association of Southeast Asian Nations.

Note: Values are based on the International Standard Industrial Classification of all Economic Activities 311, Revision 2.

Source: World Bank's Trade, Production, and Protection Database (Nicita, A. and M. Olarreaga. 2006. Trade, Production and Protection (1976–2004). *World Bank Economic Review*. 21. [1])

3.2.2. Quantitative Indicators of Trade and Welfare Effects

One problem with the previous method is that neither the FTA's trade effects nor its welfare effects are quantified, leaving the magnitudes of these effects unknown. To compute these effects, we refer to the general equilibrium model of a regional trading arrangement devised by Lloyd and Maclaren (2004). They show that the economic welfare of a member country depends on changes in three key indicators: trade volume, intra-union terms of trade, and extra-union terms of trade. These are all positively related to the member country's welfare, meaning that if, for example, a member country's trade volumes increase or its terms of trade improve as a result of the FTA, then its economic welfare will have risen.

3.2.2.1. Trade Volumes and Terms of Trade: Observed Values

This section shows how to use observed trade values to compute changes in trade volume, terms of trade, and welfare according to the model developed by Lloyd and Maclaren (2004). The example used here is trade in Indonesia's food manufacturing sector (ISIC 311, Revision 2) in the years 1991 and 1995 with four trading partners—Australia, Canada, Singapore, and Thailand—that comprise two ASEAN and two non-ASEAN countries (Table 3.1). Although Indonesia traded manufactured food with other countries, we will assume for illustrative purposes that these four countries were Indonesia's only trade partners in manufactured food.

Table 3.1 shows trade data for computing changes in Indonesia's manufactured food trade volumes and terms of trade between 1991 and 1995, which is 3 years after the agreement establishing AFTA was signed by the original six members in 1992. According to Lloyd and Maclaren's model, the sum of bilateral changes in trade volumes should be weighted by any border taxes or subsidies in a base period.[56] We use 1991 as the base period and 1995 as the new period in our example. We assume that there are no border measures on exports, so the trade volume computation only involves imports. We obtain data on applied import tariffs from the United Nations Conference on Trade and Development's TRAINS (trade analysis and information system) database via WITS (world integrated trade solution)

Table 3.1 **Indonesian Trade Values, Quantities, and Unit Values with Selected ASEAN and Non-ASEAN Countries, 1991 and 1995**

Reporter	Partner	Year	Import Quantity ($'000)	Import Quantity ('000 kilos)	Import Unit Value ($ per kilo)	Export Value ($'000)	Export Quantity ('000 kilos)	Export Unit Value ($ per kilo)
Indonesia	Thailand	1991	103,377	292,900	0.35	3,361	10,094	0.33
Indonesia	Thailand	1995	388,923	1,118,000	0.35	10,411	13,149	0.79
Indonesia	Singapore	1991	41,991	132,600	0.32	45,701	108,100	0.42
Indonesia	Singapore	1995	48,269	66,139	0.73	38,576	36,742	1.05
Indonesia	Australia	1991	44,781	52,198	0.86	20,587	47,371	0.43
Indonesia	Australia	1995	107,103	138,200	0.77	23,602	29,646	0.80
Indonesia	Canada	1991	9,853	53,552	0.18	13,167	32,063	0.41
Indonesia	Canada	1995	18,459	54,609	0.34	23,491	33,254	0.71

Note: The unit value is the trade value divided by the trade quantity. Values are based on the International Standard Industrial Classification of all Economic Activities 311, Revision 2.

Source: Author's computations with data sourced from the World Bank's Trade, Production, and Protection Database (Nicita, A. and M. Olarreaga. 2006).

[56] A tax or subsidy on a traded good in their model simply shows up as the difference between the international and domestic prices of a good. For example, an import tariff on a good causes the domestic price to be higher than the international price by the amount of the tariff. As another example, an export subsidy on a good also causes the domestic price to be higher than the international price by the amount of the subsidy.

software. Indonesia's import-weighted applied tariffs in 1990, classified under ISIC 311, Revision 2, were 12.55% (Singapore), 14.95% (Thailand), 17.85% (Australia), and 2.96% (Canada).[57] We weight the import volume changes with the product of these ad valorem import-weighted tariffs and the corresponding unit values in the base period.

The formula for the change in trade volume is:

$$\text{Change in Trade Volume} = \sum_{p} t_{mp} u^{0}_{mp} (m^{1}_{p} - m^{0}_{p})$$

where

p indicates a partner country

t_{mp} is the import-weighted ad valorem tariff on imports from partner country p in the base period

u^{0}_{mp} is the unit value of imports from partner country p in the base period

m^{1}_{p} is the quantity of imports from partner country p in the new period

m^{0}_{p} is the quantity of imports from partner country p in the base period

In the example of Indonesian manufactured food imports between 1991 and 1995, the change in trade volume was $53.42 million. This is positive, indicating that economic welfare in this sector rose in part because of expanded trade volumes.

To complete the analysis, we compute changes in Indonesia's terms of trade with respect to ASEAN and non-ASEAN partners in the sector for manufactured food. According to Lloyd and Maclaren's model, the change in terms of trade should be weighted by base period trade quantities.

The formula for the change in terms of trade is:

$$\text{Change in Terms of Trade} = \sum_{p} x^{0}_{p} (u^{1}_{xp} - u^{0}_{xp}) - \sum_{p} m^{0}_{p} (u^{1}_{mp} - u^{0}_{mp})$$

where

p indicates a partner country

x^{0}_{p} is the quantity of exports to partner country p in the base period

u^{1}_{xp} is the unit value of exports to partner country p in the new period

u^{0}_{xp} is the unit value of exports to partner country p in the base period

m^{0}_{p} is the quantity of imports from partner country p in the base period

u^{1}_{mp} is the unit value of imports from partner country p in the new period

u^{0}_{mp} is the unit value of imports from partner country p in the base period

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[57] There are many HS six-digit categories that fall under ISIC 311, Revision 2. WITS provides import and tariff data by HS six-digit categories. Let *HS* be the set of HS six-digit categories that correspond to ISIC 311, Revision 2 imports from a partner country and m be a particular HS six-digit category within that set. The import-weighted applied tariff for a trade partner is $t_{mp} = \sum_{m \in HS} \left(\frac{M_m t_m}{\sum_{m \in HS} M_m} \right)$, where M_m is the value of base period imports from the partner country in category m and t_m is the base period *ad valorem* applied tariff on imports from the partner country in category m. As information on Indonesia's import measures for 1991 was unavailable, we assume that the import-weighted tariffs in 1991 were the same as in 1990.

The formula is applied to two groups: intra-bloc and extra-bloc partners. In the example, the change in Indonesia's terms of trade for manufactured food with respect to ASEAN countries is $18.38 million, and for non-ASEAN countries it is $23.28 million. We conclude that 3 years after AFTA, Indonesia's food manufacturing sector experienced a gain in economic welfare through increased trade volumes and improved terms of trade with respect to both ASEAN and non-ASEAN partners. The overall gain in welfare was approximately $95.08 million ($53.42 million + $18.38 million + $23.28 million).

The analysis above was able to quantify the trade and welfare effects of an FTA in a particular sector. The same analysis could be repeated over multiple sectors and the results aggregated to obtain more wide-ranging results. However, like the previous method, the approach above did not address the problem of whether or not these effects were actually caused by the FTA. Both methods implicitly assumed that the changes in trade and production after the FTA were driven solely by the FTA. If other factors besides the FTA were significant in affecting trade and production patterns, then these two methods would be inappropriate.

3.2.2.2. Trade Volumes and Terms of Trade: Extrapolated Values with Pre-Free Trade Agreement Growth Rates

In order to isolate the effects of the FTA from the effects of other factors such as changes in income, prices, and transport and communication costs, it is necessary to construct a counterfactual, which is a hypothetical estimate of what trade would have been without the FTA. The FTA's trade effects can then be quantitatively assessed by comparing actual values with the counterfactual. This section constructs a simple but imperfect counterfactual that allows trade in the post-FTA period to evolve according to pre-FTA trends. The underlying assumption is that the impact of other factors besides the FTA on the trend in trade flows would be the same with or without the FTA. More specifically, we compute the geometric mean of annual growth in the pre-FTA period and use this growth rate to obtain numeric estimates of the counterfactual after integration.

We continue using the case of Indonesian trade in food manufacturing (ISIC 311, Revision 2) with Australia, Canada, Singapore, and Thailand from 1987 to 1995. As noted previously, AFTA was signed in 1992, and therefore import growth rates for Indonesia prior to 1992 are needed in order to estimate a counterfactual for the years 1992 onwards. The pre-AFTA (1987–1991) geometric mean annual growth rates of Indonesia's import quantities and trade unit values with the four selected partners are shown in Table 3.2.

To illustrate the extrapolation, consider Indonesia's trade with Singapore in 1991: Indonesia imported 132.6 million kilograms of manufactured food from Singapore at a unit value of $0.32 per kilogram. To extrapolate Indonesia's import quantities, for example, from 1991 to 1995, the 1991 import quantity is simply multiplied by the corresponding geometric mean growth rate over 4 years: 132.6 million* $(1 + 32.36\%)^4 = 407$ million kilograms. The difference

Table 3.2 **Indonesian Geometric Mean Annual Growth Rates of Trade Quantities and Unit Values with Selected ASEAN and Non-ASEAN Countries, 1987–1991** (%)

Country	Import Quantities	Unit Value of Imports	Export Quantities	Unit Value of Exports
Singapore	32.36	(5.50)	2.88	17.66
Thailand	65.83	(4.70)	118.40	(25.07)
Australia	22.19	2.03	144.11	(10.12)
Canada	(8.10)	(12.80)	101.51	(8.34)

( ) = negative, ASEAN = Association of Southeast Asian Nations.
Note: Values are based on the International Standard Industrial Classification of all Economic Activities 311, Revision 2.
Source: Authors.

between the actual and extrapolated values of each variable is an estimate of the AFTA effect. Table 3.3 shows the calculations of the imputed AFTA effect on Indonesian manufactured food imports. We can see that this effect was negative in 1995 for Indonesia's two ASEAN partners and positive for the two non-ASEAN partners. This is surprising as the preferential agreement should have increased Indonesia's intraregional imports and reduced extraregional imports.

However, to quantify the trade volume effect on welfare, we use a slightly adapted version of the Lloyd and Maclaren (2004) measure as described in the previous section.

The formula for the change in trade volume is:

$$\text{Change in Trade Volume} = \sum_{p} t_{mp} u^{E}_{mp} (m^{1}_{p} - m^{E}_{p})$$

where

p indicates a partner country

t_{mp} is the import-weighted ad valorem tariff on imports from partner country p in the base period

u^{E}_{mp} is the extrapolated unit value of imports from partner country p in the new period

m^{1}_{p} is the actual quantity of imports from partner country p in the new period

m^{E}_{p} is the extrapolated quantity of imports from partner country p in the new period[58]

In this example, the change in trade volume is –$57.75 million. This negative amount partially indicates that AFTA had a negative welfare impact on the food manufacturing sector in Indonesia because of lower trade volumes.

Table 3.3 also shows that, as a result of AFTA, Indonesia's manufactured food import prices from Canada, Singapore, and Thailand increased, while imported food from Australia became cheaper. Indonesia's manufactured food export prices to all four countries rose. To quantify the terms of trade effect, we can compute another adapted Lloyd and Maclaren welfare measure.

The formula for the change in terms of trade is:

$$\text{Change in Terms of Trade} = \sum_{p} x^{E}_{p} (u^{1}_{xp} - u^{E}_{xp}) - \sum_{p} m^{E}_{p} (u^{1}_{mp} - u^{E}_{mp})$$

where

p indicates a partner country

x^{E}_{p} is the extrapolated quantity of exports to partner country p in the new period

u^{1}_{xp} is the unit value of exports to partner country p in the new period

u^{E}_{xp} is the extrapolated unit value of exports to partner country p in the new period

m^{E}_{p} is the extrapolated quantity of imports from partner country p in the new period

u^{1}_{mp} is the unit value of imports from partner country p in the new period

u^{E}_{mp} is the extrapolated unit value of imports from partner country p in the new period

[58] Import-weighted tariffs were used in the base period because these correspond to the tariff regime without the FTA. In this example, the same import-weighted applied tariffs were used as on p. 72.

Table 3.3 **Indonesian Actual and Extrapolated Trade Statistics with Selected ASEAN and Non-ASEAN Countries, 1991–1995**

Partner Country		Singapore		Thailand		Australia		Canada	
Year		1991	1995	1991	1995	1991	1995	1991	1995
Import Quantity	Actual ('000 kg)	132,600	66,139	292,900	1,118,000	52,198	138,200	53,552	546,109
	Ext. ('000 kg)	…	407,013	…	2,215,011	…	116,348	…	38,250
	Imputed AFTA effect ('000 kg)	…	(340,874)	…	(1,097,011)	…	21,852	…	16,359
Import Unit Value	Actual ($ per kg)	0.32	0.73	0.35	0.35	0.86	0.77	0.18	0.34
	Ext. ($ per kg)	…	0.33	…	0.29	…	0.93	…	0.10
	Imputed AFTA effect ($ per kg)	…	0.40	…	0.06	…	(0.15)	…	0.24
Export Unit Quantity	Actual ('000 kg)	108,100	36,742	10,094	13,149	47,371	29,646	32,063	33,254
	Ext.('000 kg)	…	1,682,114	…	528,691	…	121,113	…	229,663
	Imputed AFTA effect ('000 kg)	…	(1,645,372)	…	(515,542)	…	(91,467)	…	(196,409)
Export Unit Value	Actual ($ per kg)	0.42	1.05	0.33	0.79	0.43	0.80	0.41	0.71
	Ext. ($ per kg)	…	0.78	…	0.16	…	0.28	…	0.29
	Imputed AFTA effect ($ per kg)	…	0.27	…	0.63	…	0.51	…	0.42

( ) = negative, … = not applicable, AFTA = Association of Southeast Asian Nations Free Trade Area, Ext.= extrapolated.

Source: Author's computations with data sourced from the World Bank's Trade, Production, and Protection Database (Nicita, A. and M. Olarreaga. 2006).

For the Indonesian food manufacturing sector, the change in terms of trade in relation to its two ASEAN partners was –$113.15 million, which indicates a loss. On the other hand, Indonesia experienced a positive change in its terms of trade compared with its two non-ASEAN partners in the amount of $1,094.17 million. The combined welfare effects of changes in trade volume and terms of trade are overwhelmingly positive at $923.27 million ($1,094.17 million – $113.15 million – $57.75 million), with most of the gains coming from improved extraregional terms of trade.

To complete the analysis, an explanation is required for the surprising result that AFTA reduced Indonesia's intraregional imports. This may be due to several factors that created an upward bias in the estimated counterfactual trend. First, there was already some growth in Indonesian manufactured food imports from ASEAN before 1992 as economic restructuring took place in anticipation of AFTA. Second, Indonesia introduced rapid, large-scale economic reforms in the latter half of the 1980s, especially in the trade and finance sectors, and these reforms would have had the most impact on trade and production before 1992. Third, the effects of preferences were not seen in the first half of the 1990s because Indonesia took a longer time to implement its AFTA commitments. These three factors may have contributed to an overestimation of the counterfactual trend, and therefore generated extrapolated values that were larger than actual values.

3.2.3. Strengths and Limitations of Free Trade Agreement Trade and Welfare Indicators

The main strengths of the set of indicators described above is that they can offer a quick first impression of an FTA's effects on trade and welfare at any level—tariff line, sectoral,

national, or regional—provided that the requisite data is available. The qualitative Vinerian method is limited, however, by its descriptive nature. To measure the size of an FTA's trade and welfare effects, one can use the quantitative methods described under the sections on coverage and utility rates. These methods are relatively simple to compute with data on trade and tariffs, and are based on a sound general equilibrium model. However, they are limited in the way that they account for other factors, besides the FTA, that affect trade. The coverage rate method does not use a counterfactual and assumes that observed changes in trade after the FTA are entirely due to the FTA. The utility rate method uses a counterfactual based simply on pre-FTA growth rates in trade. This counterfactual captures the general trends in trade and welfare and, to some extent, how other factors besides the FTA affect these general trends. However, this counterfactual obviously does not account for the variation in trade and welfare levels caused by individual non-FTA factors. These methods, therefore, may not provide reliable estimates of an FTA's trade and welfare impact. For more credible estimates, more elaborate methods, like the gravity model, need to be deployed.

3.3. The Gravity Model

The gravity model is an econometric method of estimating trade flows.[59] This model has been used to analyze the impact of not only FTAs, but also the effects of General Agreement on Tariffs and Trade–World Trade Organization (WTO) membership, currency unions, migration flows, foreign direct investment, and even disasters. The main benefit of the gravity model in evaluating an FTA is that it can control for the effects of as many other trade determinants besides the FTA as necessary, and can therefore isolate the effects of the FTA on trade. The basic gravity model of trade, which is analogous to Newton's law of universal gravitation in physics, relates the imports of country i from country j (M_{ij}) positively to the gross domestic product (GDP) of the importing country (Y_i) and the GDP of the exporting country (Y_j), but negatively to the geographical distance between the importing and exporting countries (D_{ij}):

$$M_{ij} = G\frac{Y_i Y_j}{D_{ij}} \tag{1}$$

where
G is a constant

Expressed in logarithmic form and attaching a random error term (uij), the basic gravity equation becomes

$$\ln M_{ij} = G + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 \ln D_{ij} + u_{ij} \tag{2}$$

where the β's are coefficients. Given the hypothesized relationships contained in the gravity model, β_1 and β_2 are expected to be positive, while β_3 is expected to be negative. In the gravity equation, geographical distance between the importing and exporting countries is actually a proxy for trade costs, which impede bilateral trade. Other variables that capture trade costs (e.g., adjacency, common language, colonial links, common currency, or whether the importing or exporting countries are islands or landlocked) may be added to

[59] The gravity model is attributed to Jan Tinbergen (1962), who compared the size of bilateral trade flows between any two countries to the gravitational force in physics between two objects. Since Tinbergen, many authors have produced theoretical models that yield the gravity equation for trade (e.g., Anderson 1979 and Bergstrand 1985).

this basic equation along with other explanatory variables. Furthermore, recent theoretical work on the gravity equation has emphasized that bilateral trade is not only a function of distance between the two countries, but also the distance of the pair from other countries. Anderson and van Wincoop (2003) have coined the term "multilateral trade resistance" to denote the distance between the pair vis-à-vis the rest of the world: the higher the multilateral resistance, the more the pair of countries should trade with each other and vice versa. Multilateral resistance can be easily included in the basic gravity equation as a set of fixed importer ($\mathbf{MTR}_i$) and exporter effects ($\mathbf{MTR}_j$).[60] The gravity equation is thus

$$\ln M_{ij} = G + \beta_1 \ln Y_i + \beta_2 \ln Y_j + \beta_3 \ln D_{ij} + \mathrm{MTR_i} + \mathrm{MTR_i} + u_{ij} \quad (3)$$

At a minimum, the model is estimated with data on bilateral trade, GDP, and distance, using linear regression (ordinary least squares), which is a procedure performed by any statistical software package.[61] The sample should not be restricted only to countries in which the researcher is interested, but it should include as many countries as possible so that the regression is based on the maximum information available. The gravity equation can be estimated with data across pairs of countries from just one year (cross section) or for pairs of countries observed over multiple years (panel data). Panel data is preferable because, then, the effects of particular years on global trade can be controlled for. With panel data, the gravity equation is

$$\ln M_{ij}^t = G + \beta_1 \ln Y_i^t + \beta_2 \ln Y_j^t + \beta_3 \ln D_{ij} + \mathrm{MTR_i} + \mathrm{MTR_j} + \mathrm{YEARS} + u_{ij}^t \quad (4)$$

where the *t* superscript denotes the year of the observation and YEARS is a set of indicator variables for all the years in the sample except the first.[62]

For the analysis of an FTA, we add two variables to the gravity equation. The first is an indicator variable (*TradeCreate*) for observations where both the importing and exporting countries are members of the FTA in year *t*, while the second is an indicator variable (*TradeDivert*) for observations where the importing country is a member of the FTA in year *t*, but the exporting country is not. As the variable names suggest, the first variable measures trade creation, which is expected to be positive under the FTA, and the second, trade diversion, which is expected to be negative under the FTA. The gravity model for evaluating an FTA is therefore

$$\ln M_{ij}^t = G + \beta_1 \ln Y_i^t + \beta_2 \ln Y_j^t + \beta_3 \ln D_{ij} + \mathit{TradeCreate} + \mathit{TradeDivert} + \mathrm{MTR_i} + \mathrm{MTR_i} + \mathrm{YEARS} + u_{ij}^t \quad (5)$$

---

60 Here, a fixed effect is a binary variable that indicates whether or not an observation is of an individual country. For example, to construct a fixed importer effect for Cambodia, we set a variable equal to 1 whenever the importing country is Cambodia and zero otherwise. When these fixed effects are included, it is not possible to estimate the effects of time-invariant country-specific characteristics, such as being an island or being landlocked. Instead of using fixed effects to control for multilateral trade resistance, one could use a formula that measures the average distance to other trading partners or use iterative methods to construct estimates of the price-raising effects of barriers to multilateral trade (Anderson and van Wincoop 2003).

61 Some examples of statistical software are Stata, SAS, and E-Views. Linear regression is also available in the data analysis tool of Excel.

62 Suppose the sample contains observations from 2000 to 2003, then the YEARS set includes indicator variables for 2001, 2002, and 2003. The 2001 indicator variable, for example, is equal to 1 when the observation is from that year, and zero otherwise.

3.3.1. Gravity Model Data

Estimation of a gravity equation requires data on bilateral trade, GDP, distances, and possibly other determinants of bilateral trade including contiguity (common border), common language, colonial ties, and exchange rates. Bilateral trade flows can be found in the International Monetary Fund Direction of Trade Statistics; the United Nations Commodity Trade (Comtrade) Statistics Database; or the World Bank Trade, Production, and Protection database by Nicita and Olarreaga (2006). Data on GDP in current US dollars, converted at current exchange rates, can be found in the International Monetary Fund's International Financial Statistics, or the World Bank's World Development Indicators. Data on distances—typically the geodesic distances between capitals or the largest cities of each country by population—are available from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII), along with other geographic and trade-related variables.[63]

3.3.2. Interpretation of Gravity Model Results

To illustrate, a gravity model was estimated with data from 177 importing countries and 193 exporting countries over the period 1988–2007. The trade data is sourced from Comtrade, GDP from the World Development Indicators, and the distance variable from CEPII. The gravity model is estimated first without any FTA-related variables as in equation (4), and then with FTA-related variables as in equation (5). The trade effects of AFTA are evaluated next. AFTA, as mentioned in previous sections, was signed by the original six members in 1992 and joined subsequently by Viet Nam in 1995, the Lao People's Democratic Republic (Lao PDR) and Myanmar in 1997, and Cambodia in 1999.

Box 3 Various Study Results by Gravity Model

Many empirical papers have used the gravity model to study the economic implications of free trade agreement formation for international trade. Bayoumi and Eichengreen (1995) analyzed a sample of 21 industrial countries in the period 1953–1992 and found that the European Free Trade Association resulted in trade creation while the European Economic Community had both trade creation and diversion effects. They note that the accession of Spain and Portugal resulted in almost no trade diversion. In another study, Chang and Winters (1999) find that outsiders who export to a regional bloc are, on average, adversely affected by their exclusion from the regional agreement. The authors show that even if the regional agreement does not increase external barriers to trade, the excluded countries may still be negatively affected. This could arise from excluded exporters decreasing their prices to meet the competition from suppliers within the regional trading agreement. There are many gravity studies on the Association of Southeast Asian Nations (ASEAN) Free Trade Area (AFTA), and one by Manchin and Pelkmans-Balaoing (2008) uses a gravity model to estimate directly the impact of AFTA to date. They find that, in fact, AFTA preferential tariffs do matter for a range of products, particularly where the most-favored nation tariff and the AFTA preference tariff differ by a "critical" amount.

Source: Authors.

[63] The CEPII database can be accessed at www.cepii.fr/anglaisgraph/bdd/distances.htm

Table 3.4 Regression Results from Gravity Model Estimation

Linear regression					Number of obs. = 260,119 F(382,259736) = 2,271.82 Prob > F = 0.0000 R squared = 0.7312 Root MSE = 2.0943	
ln***Mij***	Coef.	Robust Std. Err.	t	P>| t |	(95% Confidence Interval)	
ln*Yi*	.8561031	.0259124	33.04	0.00	.8053155	.9068908
ln*Yj*	.3612175	.0233257	15.49	0.00	.3154998	.4069352
ln*Dij*	(1.691341)	.0058937	(286.98)	0.00	(1.702892)	(1.67979)

( ) = negative, obs. = observations, coef. = coefficient, MSE = root mean square error, std. Err. = standard error.
Source: Authors.

Table 3.4 shows output from having used the Stata software package to estimate the gravity model as formulated in equation (4). Only the results for GDP and distance are shown as these are the key explanatory variables in the gravity model. The coefficient estimates, since the variables are in logarithmic form, can be interpreted as elasticities. For example, the coefficient estimate on the importing country's GDP is equal to 0.865, which implies that a 1.0% increase in the GDP of the importing country raises its imports by 0.865%.

The coefficient estimates and their standard errors can be used to test certain hypothesized relationships. For example, suppose we state a null hypothesis that bilateral trade is unrelated to the GDP of the importing country (β_1 equals zero). The regression results show that the coefficient estimate on the importing country's GDP ($\hat{\beta}_1$) is 0.865 with a standard error of 0.026. To test the stated null hypothesis, we first choose a level of statistical significance—the maximum probability that the null hypothesis can be mistakenly rejected. This level is often set at 5% (or 1% for a more stringent test). Using 5%, a t-statistic is computed according to the following formula:

$$t\text{-}statistic = \left| \frac{\hat{\beta}}{\hat{\sigma}_{\beta_1}} \right| = \left| \frac{0.865}{0.026} \right| = 33.4$$

This t-statistic is computed automatically by most regression software packages, including Stata as shown in Table 3.4. Once the value for the t-statistic is determined, it can be compared to the critical value, which is a cutoff value for the t-statistic corresponding to the chosen significance level. The critical value can be found using a table of values from Student's t-distribution. To consult this table, we need to compute the degrees of freedom, which is the number of observations (n) minus the number of explanatory variables (k) minus 1 ($n - k - 1$), or in this example: 260,119 – 382 – 1 = 259,736. This example contains a large number of explanatory variables because of the importer and exporter fixed effects as well as the year indicator variables. The critical value for this test with a significance level of 5% is 1.96.[64] As the computed t-statistic is more than the critical value, the null hypothesis is rejected. Therefore, a statistically significant relationship exists between bilateral trade and the importing country's GDP.

[64] With a very large number of degrees of freedom, one may also consult the normal distribution table. In any case, it is necessary to refer to a table on two-tailed tests.

Most statistical software packages also produce a p-value, which is the probability of finding, due to random sampling, as large a difference between the estimated and hypothesized values as the difference actually found given that the hypothesized value is true. A smaller p-value implies a smaller probability that random sampling caused as large a difference between the estimated and hypothesized values to be found, therefore a higher likelihood that the values are indeed different, and a firmer basis to reject the null hypothesis. An alternative method of hypothesis testing that yields the same result as using the t-statistic is to check if the p-value is below the chosen significance level. If this is so, then the null hypothesis is rejected. In the regression results above, the p-value for each explanatory variable is an extremely small number, so we can safely reject the null hypothesis that these variables are unrelated to bilateral trade. Moreover, the coefficient estimates have the expected sign.

Table 3.5 shows Stata output from having estimated the gravity model as formulated in equation (5). This estimation differs from the previous one in that variables for AFTA trade creation and diversion are included. The results for GDP and distance are almost the same as from the previous estimation. However, the estimated coefficient on *TradeCreate* is negative and that for *TradeDivert* is positive, which is the opposite of what was expected. Their signs and statistical significance suggest that AFTA actually reduced intraregional trade and increased extraregional trade. The percentage reduction in intraregional trade can be computed as $e^{-0.319} - 1 = -27\%$, while the percentage increase in extraregional trade is $e^{0.2275} - 1 = 26\%$.[65] Although the proportions of changes in intra- and extraregional trade are estimated to be about the same, extraregional trade of ASEAN countries was about four times that of intraregional trade during the period, suggesting that the net effect of AFTA was an absolute rise in trade. Nevertheless, the strange results for trade creation and diversion suggest either that preferential AFTA tariffs were ineffective or there were specification problems in the model, such as omitted variables.[66]

Table 3.5 Regression Results from Gravity Model Estimation with Trade Creation and Trade Diversion

Linear regression					Number of obs.	= 260,119
					F(382,259734)	= 2,261.09
					Prob > F	= 0.0000
					R squared	= 0.7312
					Root MSE	= 2.0941
ln***Mij***	Coef.	Robust Std. Err.	t	P>| t |	(95% Conf.	Interval)
ln*Yi*	.8463466	.0260789	32.45	0.00	.7952326	.8974605
ln*Yj*	.3625608	.0233251	15.54	0.00	.3168443	.4082774
ln*Dij*	(1.69801)	.006006	(82.72)	0.00	(1.709781)	(1.686238)
TradeCreate	(.3190286)	.08031	(3.97)	0.00	(.476434)	(.1616232)
TradeDivert	.2274481	.0531532	0.28	0.00	.1232693	.3316269

( ) = negative, obs. = observations, coef. = coefficient, MSE = root mean square error, std. Err. = standard error.
Source: Authors.

[65] This formula is used to interpret the coefficient on an explanatory variable when the variable is an indicator (or dummy) variable and the dependent variable is in logarithmic form.

[66] Possible specification problems include the omission of variables to capture the trade effects of the 1997–1998 Asian financial crisis or cross-country foreign direct investment and platform production in East Asia.

Table 3.6 **Regression Results from Gravity Model Estimation with Trade Creation and Trade Diversion—Original Six ASEAN Members and Cambodia, the Lao People's Democratic Republic, and Viet Nam**

Linear regression					Number of obs.	= 260,119
					F(382,259734)	= 2,252.18
					Prob > F	= 0.0000
					R squared	= 0.7313
					Root MSE	= 2.0939
ln***Mij***	Coef.	Robust Std. Err.	t	P>| t |	(95% Conf.	Interval)
ln*Yi*	.845397	.0260671	32.43	0.000	.7943063	.8964878
ln*Yj*	.3632986	.0233275	15.57	0.000	.3175774	.4090198
ln*Dij*	(1.698416)	.0060065	(282.76)	0.000	(1.710188)	(1.686643)
Orig6TradeC	(.7267084)	.0986292	(7.37)	0.000	(.920019)	(.5333978)
Orig6TradeD	.0406138	.0672881	0.60	0.546	(.0912691)	.1724967
CLVTradeC	.6353428	.118895	5.34	0.000	.4023118	.8683738
CLVTradeD	.585979	.0803296	7.29	0.000	.4285351	.7434229

( ) = negative, obs. = observations, coef. = coefficient, MSE = root mean square error, std. Err. = standard error.

To investigate if AFTA had a different effect on newer ASEAN members, we run a regression with separate trade creation and diversion indicator variables for two groups: (i) the original six members (*Orig6TradeC* and *OrigTradeDivert*) and (ii) newer members (*CLVTradeC* and *CLVTradeD*) (Table 3.6).[67]

Again, the results for GDP and distance are almost the same as in previous estimations. However, by breaking down the trade creation and diversion variables by groups of ASEAN countries, we can see that AFTA affected these groups differently. The original six members experienced a reduction of 52% ($e^{-0.7267} - 1$) in intraregional trade, while extraregional trade did not change significantly.[68] Interestingly, the intraregional trade of newer ASEAN members rose by 89% ($e^{0.6353} - 1$) and their extraregional trade rose by 80% ($e^{0.586} - 1$) as a result of AFTA. To gain some perspective on these numbers, consider the case of Cambodian imports. In the third year after becoming an ASEAN member and participating in AFTA (2002), the country's intraregional imports were $598 million and extraregional imports were $1,067 million. The estimates above suggest that without AFTA, Cambodia would have imported only $316 million ($598 million/1.89) from other ASEAN countries and $593 million ($1,067 million/1.80) from countries outside the region. In other words, Cambodia experienced an increase in trade in that third year of close to $1 billion due to AFTA.

3.3.3. Strengths and Limitations of the Gravity Model

The gravity model is used as a workhorse for analyzing trade because data for it is widely available, the model has high explanatory power, and there are established standard practices that facilitate the work of researchers. Its main strengths in evaluating an FTA are that it allows the analyst to control for other trade-related variables and quantify any changes in

[67] The group of newer members includes Cambodia, the Lao PDR, and Viet Nam. As trade data for Myanmar is unavailable, it is excluded from the regressions.

[68] Although the sign on *Orig6TradeD* is positive, which would indicate that the original ASEAN six experienced a rise in extraregional imports, the result is not statistically significant because of the small t-statistic (or high p-value).

a country's trade due to the FTA. These quantitative estimates may then be used in welfare calculations. However, the model may yield misleading results if the data is inaccurate or important variables are omitted from the estimation. Further, although the method of estimating the gravity model presented above addresses most of the basic data and specification issues that arise in implementation, other more complicated problems exist. The analyst should refer to the recent literature for potential solutions to these problems.[69]

3.4. Concluding Remarks

This chapter has presented ex-post economic evaluation methods for policy makers to get a better understanding of how an already-established FTA actually affects trade and welfare. In particular, these methods show how to (i) compute the official versus effective utilization rate of preferences and the value of preferences, (ii) qualitatively assess trade creation and diversion, (iii) quantitatively analyze the FTA's trade effects with trade indicators and the gravity model, and (iv) make inferences about economic welfare. Evaluating the true versus expected economic impact of an FTA is an important part of the monitoring and surveying process that should follow the establishment of an FTA. By noting any discrepancies between the FTA's actual and predicted effects, policy makers can improve their ex-ante assessment methods, as well as adjust domestic policies and international positions in ongoing FTA negotiations accordingly.

[69] The other problems are, for example, the presence of zero bilateral trade values (Martin and Pham 2008), the bias of ordinary least squares when there is heteroskedasticity in a log-linearized model (Silva and Tenreyro 2006), and the endogeneity of FTAs (Baier and Bergstrand 2007).

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Appendix 3: Association of Southeast Asian Nations Free Trade Area's Form D—Certificate of Origin

ATTACHMENT 3

Original (Duplicate/Triplicate)

1. Goods consigned from (Exporter's business name, address, country)	Reference No. ASEAN COMMON EFFECTIVE PREFERENTIAL TARIFF / ASEAN INDUSTRIAL COOPERATION SCHEME CERTIFICATE OF ORIGIN (Combined Declaration and Certificate) FORM D Issued in _____ (Country) See Overleaf Notes
2. Goods consigned to (Consignee's name, address, country)	
3. Means of transport and route (as far as known) Departure date Vessel's name/Aircraft etc. Port of Discharge	4. For Official Use ☐ Preferential Treatment Given Under ASEAN Common Effective Preferential Tariff Scheme ☐ Preferential Treatment Given Under ASEAN Industrial Cooperation Scheme ☐ Preferential Treatment Not Given (Please state reason/s) ..... Signature of Authorised Signatory of the Importing Country

5. Item number	6. Marks and numbers on packages	7. Number and type of packages, description of goods (including quantity where appropriate and HS number of the importing country)	8. Origin criterion (see Notes overleaf)	9. Gross weight or other quantity and value (FOB)	10. Number and date of invoices

11. Declaration by the exporter The undersigned hereby declares that the above details and statement are correct; that all the goods were produced in ..... (Country) and that they comply with the origin requirements specified for these goods in the ASEAN Common Effective Preferential Tariff Scheme for the goods exported to ..... (Importing Country) ..... Place and date, signature of authorised signatory	12. Certification It is hereby certified, on the basis of control carried out, that the declaration by the exporter is correct. ..... Place and date, signature and stamp of certifying authority
13 ☐ Third-Country Invoicing ☐ Exhibition ☐ Accumulation ☐ De Minimis ☐ Back-to-Back CO ☐ Issued Retroactively ☐ Partial Cumulation	

Chapter 4

Special Considerations for Developing Countries

Much of the theoretical and empirical modeling for assessing the impacts of free trade agreements (FTAs) was produced in the context of developed countries. While the preceding chapters of this book put special emphasis on the FTA assessment from the angle of developing countries, it is undeniable that the evolution of economic integration, in particular, in the context of the European Economic Community (EEC) and later, the European Union (EU), greatly influenced the theoretical framework and methodologies for assessing the impacts of FTAs. There are various economic impacts that cannot be fully captured by economic statistics and models as well as noneconomic benefits, which are critical for all countries, especially developing countries. Countries, especially developing ones, are able to gain from FTAs *additional* benefits to the traditional trade benefits if the FTAs are properly designed. This chapter looks into those unquantifiable benefits of FTAs.[70]

Developing countries require special consideration in the context of formal regional cooperation agreements. One cannot expect developing countries, especially least developed countries, to respond to changes in, say, tariffs and non-tariff barriers in the same way that developed countries do, given the policy and institutional frameworks and structural issues that characterize them. First of all, developing countries cannot get fully involved in FTA negotiations or cannot engage in FTA negotiations in a strategic manner, because they tend to lack negotiating capabilities. Training courses provided by international organizations that support multilateral and/or regional trade liberalization, such as the World Trade Organization (WTO) and the Asian Development Bank (ADB), are helpful in building up their human resources and negotiation skills.

Second, it is not easy for developing countries to exploit the possible benefits of FTAs and/or to adjust to the new economic environments brought about by FTAs. Developing countries usually lack the human and institutional capacity to formulate effective FTA policies and adjustment policies. Given these capacity constraints, developing country FTAs are sometimes initiated through top-down decisions dictated by high-level government–to–government initiatives, not by bureaucratic bottom-up approaches that usually begin at pre-negotiation consultations. The lack of private sector capacity is also a serious problem. Technologies in the private sectors of developing countries are usually less advanced than those in the private sectors of developed countries. Thus, private sectors are unable to exploit business opportunities brought on by FTAs and, therefore, they are sometimes unsupportive of their governments' FTA initiatives. Last but not least, developing countries' industries usually experience structural problems, thus structural reform is necessary. Without structural reform, the potential bene-

[70] Parts of this section borrow from Plummer (2007).

fits of an FTA cannot be enjoyed by relevant stakeholders. It should be noted that FTAs can be used for the purpose of capacity development and structural reforms in developing countries.

Third, while on one hand aspects of the broader environment that are critical for economic development—including macroeconomic stability and stable political relations with neighboring countries—constrain developing countries' economic development and their ability to maximize the economic benefits of an FTA; on the other hand, properly designed FTAs contribute to greater stability in both macroeconomic conditions and political relations with neighbors. Those wider benefits are as important as, or sometimes more important than, the narrowly defined trade interests and economic welfare brought about by FTAs.

In short, bottlenecks associated with capacity constraints in both public and private sectors can be alleviated if an FTA addresses those issues. FTAs can also bring additional benefits, such as macroeconomic stability to the country and political stability in the region. Those benefits of FTAs critical for the economic development of developing economies are not fully captured by economic theories and methodologies introduced in the previous chapters since these are mainly based on the experience of developed countries. In this last section, we consider some of the more salient policy-relevant implications of bilateral and regional economic cooperation for developing economies. Developing countries can utilize FTAs for structural reform. FTAs also enhance the potential for technology transfers among firms, and human and institutional capacity building, especially in least developed countries. Finally, FTAs also contribute to a country's macroeconomic, political, and security stability in a region.

4.1. "Lock-In" of Structural Reform and Policy Adjustment

Various structural reforms in developing countries are not directly pertinent to trade or even investment and financial flows per se but are essential to the modernization and competitiveness of an economic system. While often pushed by economists and technocrats, these reforms frequently do not find special interest groups within the body politic that are able to push them. And since they tend to be controversial (with clear losers), they are difficult to promote, even if the economic gains in terms of increasing competitiveness are clear. Examples include the need for better laws related to corporate (and public) governance; competitions policy, including reform of state-owned enterprises, and financial and other services; intellectual property protection; and other "sensitive sectors" with important links to the rest of the economy.

Regional integration can help to push reforms in these areas by providing the rigor of a formal accord. An FTA locks member countries into a particular set of economic policies and insulates their economic reform from future domestic political interference—the so-called "lock-in" effect. Since developing countries require such reforms more than most developed countries, regional integration can, therefore, generate greater gains. For example, the creation of the EEC and the Canada–United States Free Trade Agreement arguably made relatively little progress in promoting structural reforms, as these agreements were between developed countries. However, when the EEC took on Greece, Portugal, and Spain in the 1980s, these countries, which could be termed "newly industrialized" rather than "developed," made significant gains in terms of structural reforms, leading to greater competitiveness and productivity (outside agriculture). The same can be said of Mexico in the North American Free Trade Agreement (NAFTA); while it has a long way to go before becoming a truly developed economy, Mexico has made great progress toward providing a more stable economic framework, modernizing and liberalizing previously undeveloped sectors (such as

financial services, which now has significant foreign penetration), and increasing productivity. This eventual necessity of "teeth" in formal regional accords has been recognized by the Association of Southeast Asian Nations (ASEAN), as indicated by the many "behind-the-border" measures covered in the ASEAN Economic Community Blueprint.

One theoretically interesting issue relating to lock-in effects, which also has important policy implications, is as follows: If a country decides to commit to structural reform, why not commit at the global, rather than regional level? It can be argued that commitment at the FTA level may not be credible enough and that only reforms at the WTO level will produce favorable effects. This could well be the case for developed countries. However, for most developing countries, commitments at the regional level may even be better than those within the context of the WTO under some circumstances.[71] This is because commitments at the WTO level tend to be more general, whereas regional commitments are more focused. Moreover, as they are undertaken within the context of a (most likely, geographically-based) bilateral or small group of countries with implicit high costs of backtracking, an FTA could potentially be more credible. In addition, the WTO includes several flexibilities in the form of the enabling clause that would make it easier to backtrack, and hence the lock-in effects could be less convincing. Further, the costs of lock-in may be higher in the context of the WTO, where compensation for breached commitments may apply to a much larger group of countries. To avoid this circumstance, making commitments at the FTA level may be a more realistic option for many developing countries. Perhaps the best scenario for developing countries is to first make commitments at the FTA level to test the waters, and then to make commitments at the WTO level once the country becomes comfortable in doing so.

Nevertheless, countries should not make commitments at the FTA level instead of the WTO level just because regional commitments can be breached more easily or because it implies a smaller penalty. The point here is that for small economies, committing at the WTO level at an early stage of structural reform may be too risky. But at the same time, it should be noted that regional agreements should be credible enough to exploit lock-in effects. This will not be possible unless the markets trust regional commitments within an FTA to be reliable and credible.

Because an FTA could also be used for protectionists' purposes, it is important for FTA policy makers to take note of Viner's basic principles related to FTAs introduced in Chapter 1, which state that an FTA should maximize trade creation effects and minimize trade diversion effects so that the overall efficiency gain will be positive. Trade creation happens when less efficient domestic production is displaced by more efficient partner-country production. Usually, protectionist voices tend to be louder than those of the industries that would most benefit from an FTA, such as exporters and firms using imported inputs, and consumers, who can enjoy cheaper imported products with the implementation of the FTA. Weak industries will endeavor to minimize trade creation, as they will be the most affected, and maximize trade diversion, as they may be able to exploit protection in a regional context. For efficiency purposes and for the good of the economy in the long run, FTAs should be used to reform weak industries, not to protect them. Government action should be mobilized to facilitate the associated structural reform, rather than impede it.

It is should be noted that structural reform becomes easier when it is supported by relevant adjustment polices. Such policies are necessary for all countries, but are especially critical for developing countries (Box 4.1). Adjustment policies at both the firm level and worker level are required to mitigate adverse effects of structural changes in developing countries caused by

[71] Of course, it may even be that the country is not a WTO member, in which case lock-in effects at the FTA level are possible.

Box 4.1 Trade Adjustment Assistance Programs of the United States and the Republic of Korea

Trade Adjustment Assistance in the United States

The United States (US) Trade Adjustment Assistance (TAA) Program was created under the Trade Act of 1974 as a federal program under each state to mitigate the adverse effects of international trade both on workers, through the TAA program of the US Department of Labor, and on firms, through the TAA program of the US Department of Commerce. Changes were then made to the Trade Act via the Recovery Act, effective 18 May 2009, which expanded the benefits and services available to workers and firms affected by foreign trade, including extending program coverage to include more workers and opening the application process for TAA certification to firms in the services sector.

Eligibility for TAA at both the worker level and firm level requires the occurrence of at least one of four conditions that lead to either actual decline in sales or production at the workers' firm, or layoff or separation of or threat thereof to a minimum number of workers within 12 months preceding the date of petitioning for TAA certification. These conditions are (i) increased imports of like or directly competitive goods and services (including component parts or services), (ii) shifts in the production of goods or supply of services to a country outside the US, (iii) workers' firm's loss of business as a supplier or downstream producer to a TAA-certified firm, or (iv) acquisition of services by a public agency from a foreign country. The certification process is bypassed if workers are employed by a company identified by the International Trade Commission as a company in an affirmative finding of injury (Government of the United States, Department of Labor 2010).

Eligible workers are entitled to TAA program benefits and services, which include training and income support payments, job search and relocation allowances, as well as other reemployment services. The trade readjustment allowance is provided as income support to augment unemployment compensation, and is based on the amount of unemployment insurance received by an individual. Under the trade readjustment allowance, workers may also avail of a health coverage tax credit for 80% of monthly health premium payments. Training, as well as apprenticeships, post-secondary education, and prerequisite and remedial education, is available to laid-off workers and even to those threatened with separation, and is paid for with TAA program funds. Workers 50 years or older with less than $55,000 annual income under their prospective employment are eligible for the reemployment trade adjustment assistance, which is a wage supplement when accepting new employment at a lower wage, including employment and case management services to help evaluate relevant training and career options. The Trade readjustment allowance and reemployment trade adjustment assistance payments may not be received concurrently. Job search and relocation allowances are reimbursements for expenses incurred for travel and subsistence while seeking employment, and for moving to a new area for reemployment.

For US manufacturers or producers, which have suffered a decline in employment and sales or production due to increased import competition, technical assistance in preparing an adjustment proposal (business recovery plan) is provided to firms through the TAA program to improve competitiveness. Typical technical assistance activities include market research, identification of technological needs, and completion of a quality assurance program. The share of TAA in technical assistance allotted for each firm is certified has a limit of $75,000. Eligible firms are entitled to 50:50 cost sharing in terms of consultants, engineers, and other experts for improvements in manufacturing, engineering, marketing (identifying new markets and export opportunities), information technology, and quality assurance. As a result of the funds matched through TAA, firms are able to expedite improvements by freeing company resources for other expenses not covered by the TAA program.[a] Assistance is also provided by TAAs in terms of identifying production inefficiencies and developing debt restructuring strategies, as well as in finding new sources of business financing through government agencies or private financial institutions. The granting of approval for the adjustment proposal by the Department of Commerce Economic Development Administration depends upon the finding that the proposal (i) is reasonably calculated to materially contribute to the economic adjustment of the firm, (ii) gives adequate consideration to the interests of the firm's workers, and (iii) demonstrates that the firm will use its own resources for adjustment (Hornbeck 2007).

continued on next page

Box 4.1 *continued*

For US communities directly affected by NAFTA, the US Community Adjustment and Investment Program (CAIP) was created to provide credit to private-sector firms in affected communities suffering significant job losses due to changes in trade patterns with Canada and Mexico. The North American Development Bank (NADB), created under the 1993 NAFTA Implementation Act, is the main source of funds for the Mexican and US CAIPs. In the US, the main function of the adjustment and investment program under the NADB is to assist eligible US communities or counties in the creation and/or preservation of private sector jobs to adjust to significant losses due to NAFTA. Eligibility of a county requires that the unemployment rate averages at least 1% or more above the national unemployment rate for 12 months prior to the application for certification. Eligibility also requires at least 300 or more NAFTA-related job losses in rural areas and 500 or more losses in urban areas. Small private sector firms as well as nonprofit and public entities with demonstrated need for financing job creation and/or preservation in an eligible county are entitled to access to financing through the three US CAIP programs: (i) the CAIP federal agency program (federal loans and loan guarantees), (ii) CAIP credit programs (direct loans and guarantees provided by the NADB), and (iii) the CAIP grant program (grants that support specific projects and provide technical assistance to affected communities).

Trade Adjustment Assistance in the Republic of Korea

Shortly after the conclusion of the FTA between the Republic of Korea and the European Union (EU) in 2006, the Government of the Republic of Korea laid out the legal framework for the Korean Trade Adjustment Assistance (TAA) Program under the Act on Trade Adjustment Assistance for Manufacturing and Other Industries, perhaps due to structural adjustments brought about by the FTA. Under the program, loans, investments, and job placement support are given out to small and medium-sized firms and manufacturers. Ahn (2010) reports that while this resembles the US TAA program for firms, the government reports that over 90% of TAA funds are allocated to manufacturers and firms, unlike the US TAA program which instead allots over 90% of its funds to US workers. Furthermore, eligibility under the Korean TAA requires that the Korean Trade Commission gives a positive finding of serious injury—sales or production falling by over 25% due to import competition—and imports of the same kind or directly competitive goods and services being the primary cause of serious injury in the company applying for assistance. Nevertheless, the Korean TAA program is still in its infancy. As of October 2010, only three TAA measures have been implemented based on Korean Trade Commission findings, amounting to 400 million won in loans, and 32 million won in consulting support.

[a] The TAA program for firms is administered by the Economic Development Administration of the US Department of Commerce, through a national network of 11 Trade Adjustment Assistance Centers, as funded by the Department of Commerce. For application procedures, program benefits, and select case studies on the TAA program for firms, see www.taacenters.org/

Source: Ahn, Dukgeun. 2010. Legal and Institutional Issues of Korea-EU FTA: New Model for Post-NAFTA FTAs? *Groupe D'Économie Mondiale Policy Brief October 2010*. Paris; Hornbeck, J.F. 2007. Trade Adjustment Assistance for Firms: Economic, Program, and Policy Issues. *CRS Report for Congress RS 20210*. www.nationalaglawcenter.org/assets/crs/RS20210.pdf; and North American Development Bank (NADBa). 2009. *Guidelines for the Community Adjustment and Investment Program*. www.nadbank-caip.org/guidelines%20rev%201%2027%2009final1.doc

FTAs.[72] What should be noted is that structural reform should be conducted sooner or later irrespective of having FTAs. Thus, it is beneficial for developing countries to conduct structural reform, taking advantage of technical assistance on structural adjustments rendered by the developed FTA partner. Development agencies of potential developed partners of FTAs and international development institutions are helpful in identifying adjustment policy needs of each developing country in pursuing FTAs and in financing the implementation of such policies.[73]

[72] Developing countries' views on adjustment costs associated with FTA (in particular, ASEAN's developing countries' perspectives) can be found in Andreosso-O'Callaghan (2009).

[73] For the discussion on the US's trade capacity-building policy toward (potential) FTA partners, see Langton (2007). The detailed argument on actual adjustment policies required by a potential FTA partner of the US can be found in *Assessment of Morocco's Technical Assessment Needs in Negotiating and Implementing a Free Trade Agreement with the United States*. www.moroccousafta.com/downloads/ftatechen.pdf

4.2. Technology Transfer and Foreign Direct Investment

In Chapter 1, we found that an FTA increases not only trade but also foreign direct investment (FDI) (both FDI between member and non-member countries). Trade and FDI, especially the latter, are important vehicles for transferring technology and know-how from developed to developing countries. This is one of the primary reasons why many developing countries seek to attract FDI inflows through unilateral and concerted trade liberalization, and through other means. Regional integration is one means to attract such long-term investment flows, since it creates a more integrated marketplace within which multinationals can enjoy a regional division of labor with low transaction costs and exploit product-level economies of scale. It is often said that the ASEAN Free Trade Area (AFTA) itself is more of an investment agreement than a trade agreement, in that it is designed to enhance inward FDI more than intraregional trade flows.

The link between FDI and technology transfer has been firmly established. It is one of the primary reasons why ASEAN countries have consistently sought means to lure FDI inflows, including through unilateral and concerted trade liberalization. Moreover, attracting more production networks to ASEAN members, who have been increasingly driving the integration of the ASEAN economies, is a high priority, particularly for Cambodia, the Lao People's Democratic Republic, and Viet Nam. The ASEAN Economic Community Blueprint emphasizes the importance of closing the development gap in ASEAN via the Initiative for ASEAN Integration and other means. Production networks allow the least developed members of ASEAN to participate profitably in the globalization process, including through small and medium-sized enterprises.

The relationship between trade and technology transfer is less well known than that of FDI and technology transfer, or at least it is less appreciated. Through trade liberalization, countries are also able to stimulate technological development. For example, trade leads to adaptations of new technologies from abroad by increasing the potential for success in using these technologies to crack foreign markets; in addition, increased competition forces domestic firms to place a higher priority on creating their own or importing new technologies (Pissarides 1997). This implies a strong incentive for developing countries emphasizing technology transfer (such as ASEAN members) to liberalize even unilaterally.

Moreover, to best take advantage of these new technologies, countries find that they must establish strong intellectual property protection laws and enforcement mechanisms. Without an attractive, protective environment in which multinationals can operate and in which domestic firms can invest in new innovations, the process of technology transfer is greatly inhibited. Formal free trade areas can help in creating a strong underlying framework for the protection of intellectual property and generate peer pressure to implement associated laws.

In this context, an FTA between developed and developing countries seems to be more beneficial to the developing countries. Since corporations in developed countries usually have more advanced technologies than small and medium-sized enterprises in developing countries, there are opportunities for technology transfer which can be directly facilitated by FTAs. When developing countries team up with developed countries in an FTA, they are able to encourage technology transfer specifically, either through internal promotional means (e.g., in terms of training facilities, regional research and academic institutes, and research consortia) or in jointly by devising means to bring in appropriate technologies from abroad.

It may be beneficial for developing countries to include specific and concrete provisions for this type of economic cooperation in FTAs. For example, the Japan–Malaysia Economic Partnership Agreement (EPA) has specific provision on cooperation in the automobile sector

Box 4.2 Technology Transfer in Free Trade Agreements

Japan–Malaysia EPA, Chapter 2 Trade in Goods, Article 26 Co-operation in the Field of Automotive Industry

The Countries shall co-operate, with the participation of their respective automotive industries, to further enhance competitiveness of the automotive industry in Malaysia.

Japan–Indonesia EPA, Chapter 8 Energy and Mineral Resources, Article 104 Cooperation

1. Both Parties shall cooperate in the energy and mineral resource sector of Indonesia.
2. (a) The Parties shall endeavor to make available the necessary funds and other resources for the implementation of cooperation under this Article in accordance with their respective laws and regulations.
   (b) Costs of cooperation under this Article shall be borne in an equitable manner to be mutually agreed upon by the Parties.
3. (a) Areas of cooperation under this Article shall include policy development, capacity building, and technology transfer.
   (b) Forms of cooperation under this Article shall be set forth in the Implementing Agreement.

EPA = Economic Partnership Agreement.

Source: http://aric.adb.org/FTAbyCountryAll.php

of the chapter on trade in goods (Chapter 2), in addition to the chapter on cooperation, which covers general cooperation issues (Chapter 12). This is because the Government of Malaysia recognized the urgent need to strengthen its automobile industry so that it can thrive even after the implementation of Japan–Malaysia EPA. Likewise, the Government of Indonesia requested assistance in increasing competitiveness in the energy and mineral resources sectors, in which Indonesia has comparative advantage given that the country is one of the most natural resource-rich countries in the world. Technology transfer is included in the chapter on energy and mineral resources (Box 4.2).

4.3. Human and Institutional Capacity Building

FTAs are potentially beneficial for developing countries also in terms of human resource and institutional capacity building. In particular, FTAs between developed and developing countries (so-called North–South FTAs) may allow the latter to have access to various technical assistance programs rendered by the former under the FTA. In some cases, technical assistance programs are also made available to potential FTA partners during the preparatory phase for the FTA.[74] The core of technical assistance is capacity building, for example, training and transfer of know-how in the form of seminars and workshops, study visits, and scholarships tailored to the needs of individual partner country; and assistance in trade-related institution building, including in the area of legal infrastructure.

Technical assistance is necessary to assist developing countries in implementing FTA obligations, especially in the area of customs procedures, measures involving sanitary and phytosaniatry and technical barriers to trade, competition policies, and intellectual property rights, if covered by the FTA. While the necessity of technical assistance in those areas is already

[74] For example, European Free Trade Association, comprising four member countries (Iceland, Liechtenstein, Norway, and Switzerland), provides technical assistance to potential FTA partners. See: www.efta.int/free-trade/technical-assistance.aspx. This was also the case during the negotiations to create a "free trade area of the Americas." The free trade area, ultimately, was not approved, but the technical assistance accorded to the developing countries in Latin America had important spillover effects in terms of human capacity building.

established in the multilateral agreements at the WTO, engaging in FTAs can be an effective supplementary tool for developing countries to obtain concrete and specific assistance in those areas necessary to implement obligations under FTAs and even under the WTO. It would be beneficial if each topical chapter of an FTA includes specific technical assistance provisions for the implementation of the obligations it stipulates. This way of incorporating technical assistance provisions in FTAs is clearer and more beneficial to developing countries than when FTAs include only a separate chapter that covers general technical cooperation and technical assistance issues.

In the analysis of customs procedure chapters of 30 FTAs in the Asia-Pacific region, Asia-Pacific Economic Cooperation (2008) found a strong desire for cooperation between all parties that, in most cases, includes the provision of technical assistance in particular areas, such as risk assessment techniques, simplifying customs procedures, and upgrading personnel skills. On origin administration, the necessity of helping developing countries through technical assistance to develop greater capacity in certifying (preferential) origin has been widely recognized.[75] Given the significant impact of efficient customs administration on trade facilitation, capacity development of customs is the key to exploit the benefits of an FTA (on the customs efficiency issues, see ADB and ESCAP 2009, pp. 40–59). Likewise, many FTAs in the region contain a sanitary and phytosanitary chapter that includes technical assistance provisions; but the level of commitments in this field is usually not high and the commitments are rather nonbinding (Asia-Pacific Economic Cooperation 2008).

Competition policy is one of the areas where developing countries need substantial technical assistance from developed countries, particularly since most of them do not have formal national competition policies. Developed countries are willing to assist developing countries to establish a relevant statutory framework for competition policy. In FTAs in Asia and the Pacific, there is a strong emphasis on technical cooperation between the parties on competition policy matters, particularly in the EPAs between Japan and Southeast Asian countries. Designed effectively by developing countries with a relevant technical support from developed countries, competition policy ensures that consumers and producers get a "fair" price. Competition policy is also useful to overcome anticompetitive practices of national and foreign firms and to facilitate the transition from former state-owned monopolies, as well as ensuring a level playing field for state-owned firms that remain. In terms of capacity building methods, staff expertise tends to be the first priority for developing countries in helping to develop a strong competition-policy framework. It is also recognized that cooperation in the field of competition policy among FTA members is already one type of technical assistance because communication with more developed partners increases the competence of competition authorities in developing countries (Brusick et al. 2005, p. 140).

Intellectual property rights constitute another area where substantial collaboration between developed and developing countries can be expected under FTAs. Developed countries, such as Japan, the United States (US), and those of the EU, provide various forms of technical assistance in this area. While the US's assistance tends to be a one-shot event, the technical assistance programs of Japan and the EU countries tend to extend over the longer time frame of 3–5 years (Roffe et al. 2007). Protection of intellectual property rights is important for a sustainable growth of not only trade, but also investment. Technical assistance in this field usually focuses on

(i) policy advice, i.e., activities that provide advice to assist governments in the preparation of laws and regulations on the protection of intellectual property and their enforcement, including legal obligations stemming from multilateral and bilateral agreements;

[75] In the EU, proposals envisaged increased technical assistance in this area (Woolcock 2007).

(ii) institutional and human capacity building, e.g., support for the establishment, modernization, and administration of domestic intellectual property offices; and development of human resources by training, etc.; and
(iii) public awareness on intellectual property rights, i.e., activities targeted at the domestic private sector and the overall public to educate people on intellectual property and economic growth, counterfeits, and piracy.

4.4. Macroeconomic Stability Considerations

There is a general consensus in economics that macroeconomic stability is critical to the continued success of any development strategy. Even short-term bouts of instability can haunt an economy for many years; Latin America's long struggle with inflation was only recently won, and this has been accomplished with considerable economic cost (through unemployment and foregone output) and social tension. Promoting macroeconomic stability tends to be difficult in developing countries, and external means to support this process are often a necessary part of the stabilization process.

In particular, exchange-rate stability is a vital area for the smooth functioning of the economy, particularly for trade. Developing countries tend to rely on variations of fixed exchange-rate regimes for a number of reasons, including vulnerability to inflation. It became clear during the recent economic crisis that the internationalization of these economies, though yielding many benefits, also exposes them more to "external shocks" (i.e., those originating abroad) particularly for countries with fixed exchange rates; and intraregional interdependence, as well as the perception that Asia is increasingly performing as a group,[76] suggest that there are strong policy externalities in the region. Macroeconomic instability created, say, by an asset bubble in one market could, therefore, have an important effect on the other markets. Hence, closer integration at the real and policy levels implies the need for greater cooperation at the macroeconomic level as well.

Preferential trading arrangements can help to encourage macroeconomic stability in a number of ways. In particular, real-financial links endemic to preferential trading agreements require stable macroeconomic policies if the agreement is to function smoothly. In order to ensure a stable partnership, countries must share information, cooperate in advocating stable fiscal and monetary policies, and apply strong peer pressure against unstable policies.

A proper linkage between regional trade integration and regional macroeconomic policy coordination should be considered in designing regional economic integration. Some regional integration schemes establish an institutional framework for regional economic surveillance in parallel with the FTA. North America is a typical example. NAFTA was signed by the three governments in 1994. In the same year, central banks and treasuries of the three countries signed the North American Financial Agreement that included a network of swap agreements, as well as a regional economic surveillance mechanism among the financial authorities of the three countries (Henning 2002). It seems that ASEAN also pays attention to the linkage between trade integration and macroeconomic stability. While AFTA started only in 1992, regional economic surveillance of ASEAN has been strengthening over the years.

[76] What we mean here is that as ASEAN cooperation deepens, markets begin to view the nations as one entity. Besides, business cycles in the ASEAN countries have become more correlated (see, for example, Kim, Kose, and Plummer 2003).

Moreover, in advanced (or "modern") regional agreements, countries find that they must focus on non-traditional areas affecting trade and investment if they are to advance economic integration, including competition policy and government procurement.[77] These "non-border" measures force a stronger market orientation, inject greater microeconomic competition by reducing the power of domestic monopolies and rent seeking, and put constraints on government action through, say, the abolition of export subsidies and restrictions on industrial policies. Thus, such forced macroeconomic stability could be highly beneficial to the economic development strategies of participating countries.

4.5. Strategic Considerations

Most existing preferential trading arrangements were either created as economic arrangements in support of political goals, or were at least consistent with the diplomatic strategy of the founding countries. Economic cooperation in these arrangements is seen as an important vehicle through which political goals can be pursued (which, in themselves, have important economic ramifications). The EU has been effective in using preferential trading arrangements as a diplomatic tool over the past 40 years, in part out of necessity, given that commercial policy was the only unified policy at the regional level.

To the extent that these regional accords add to the political stability of the region, they serve economic development in general and the goal of policy reform in particular, even if the arrangements are weak in terms of substance. This, of course, is an important part of the early success story of ASEAN. Although most ASEAN countries had only recently achieved independence and were struggling to create nation states (which entailed many territorial disputes), the arrangement established an important dialogue process that prevented overt hostilities between these countries. To say that ASEAN's intentionally weak economic cooperation initiatives of the past had nothing to do with the subsequent dynamic growth in the region is to seriously understate its role.

Today, ASEAN is deepening its own identity in terms of strategic economic policy and diplomatic relations. It is unwise to compare the emerging reality of economic cooperation in ASEAN to the process in Europe since ASEAN today is in a very different subjective historical context. However, Europe has always provided an "economic cooperation guide" to ASEAN. Wisely, ASEAN has not copied the European experience, but rather has adapted it to its own special context and at its own pace. But the pace is quickening; regional accords in Asia have been booming in number and membership ("horizontal integration"), as well as in terms of product, sectoral, and policy coverage. The decision by ASEAN leaders to create an ASEAN economic community was a conscious attempt to signal the fact that ASEAN intended to pursue a single market along the lines of the EU, albeit with ASEAN characteristics.

The findings of recent theoretical and empirical studies are consistent with the above observations. A recent study shows that trade interdependence leads to peace. Lee and Pyun (2009) find that the increase in bilateral trade interdependence and global trade openness brings not only economic gains but also political benefits. Thus, promotion of trade through FTAs is an effective method of establishing political stability in the region. The literature also underscores the observation that shared experience leads to a shared sense of "we-ness." In this regard, cooperation in a narrow field, such as trade, may lead to a wider area of cooperation by establishing a shared regional identity.

[77] On the modern FTAs in Asia, see Plummer (2007).

Note, however, that there exists the possibility that an FTA may be used as a diplomatic tool to pursue one country's strategic goals which are not necessarily shared by other FTA members. An often-cited traditional case of misuse of FTA is the Zollverein in the pre-war period when Prussia established an FTA with weaker German states (Viner 1950). By excluding Austria from the FTA, Prussia attempted to increase its influence in the region and minimize that of Austria. It should be noted that asymmetric economic and trade interdependence is always a source of influence and power because smaller states are usually more vulnerable than larger ones. Thus, making an FTA as inclusive as possible in terms of membership tends to be advisable. The advocacy of "open regionalism" in Asia and the Pacific is very relevant in this context.

4.6. Concluding Remarks

In sum, while regionalism is a second-best policy, there is reason to believe that bilateral and plurilateral accords could potentially generate far greater gains than standard models would suggest, given the critical importance of dynamic and non-border or policy changes that are inherent in such accords. Moreover, developing countries in Asia stand to gain relatively more from these "deep" policies than developed countries, provided that the region's FTAs are open, trade creating rather than trade diverting (i.e., the regional division of labor that emerges from the accord is consistent with comparative advantage), and other regulatory and non-border conditions are met. Maximizing benefits that cannot easily be quantified by economic models is critical for developing countries to have a fruitful conclusion of FTAs. But this requires careful construction of the agreement.

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Methodology for Impact Assessment of Free Trade Agreements

This publication displays the menu for choice of available methods to evaluate the impact of Free Trade Agreements (FTAs). It caters mainly to policy makers from developing countries and aims to equip them with some economic knowledge and techniques that will enable them to conduct their own economic evaluation studies on existing or future FTAs, or to critically re-examine the results of impact assessment studies conducted by others, at the very least.

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