Economic Perspectives for Central America after CAFTA: A GTAP-based Analysis

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Abstract: Using a GTAP CGE application we assess the main economic results of CAFTA for Central America (CA). Currently CA enjoys preferential access to the US market through the CBI. CAFTA will consolidate and augment these concessions. Meanwhile, the agreement requires widespread opening of CA markets to US imports over time. The implementation of the ATC protocol in 2005 implies increased Chinese competition for the region. Thus, CAFTA will balance for this new source of competition in the textile and apparel sectors, while creating large opportunities for labor market improvements and FDI inflows to CA. If these opportunities are exploited, the region has much to gain from CAFTA. However, we also find a strong sectoral readjustment of resources from agricultural sectors to *maquila*-based industries, which could create important adjustment strains.

Keywords: Free trade agreements, CGE models, GTAP applications
JEL codes: F13, C68

Non-Technical Summary

The United States (US) and the five Central American countries –Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua– concluded negotiations on the US-Central American Free Trade Agreement (CAFTA) in January 2004. Under the Caribbean Basin Initiative (CBI) many Central American exports already enter without duties to the US. CAFTA will consolidate those benefits and make them permanent, so nearly 100% of all consumer and industrial products made in Central America will enter the US market duty-free immediately on ratification of the agreement.

Our analysis is based on the GTAP 6.0 pre-release 3.10 database and we use a standard GTAP static model with different shocks to evaluate the alternative scenarios. For the five Central American economies, CAFTA represents a series of opportunities that can be exploited, but also a series of critical challenges. Given the importance of US trade and investment in the region, in addition to the huge size differences between both regions, the agreement produces significant sectoral and economy-wide effects.

The most welfare-improving mechanism in CAFTA is the increase in FDI and the capital stock of the region. This emphasizes the importance of exploiting the investment opportunities associated with permanent market access to the US. Without complementary economic policies, the trade agreement can be considered mainly as a balancing force to counteract the negative impact that the implementation of the ATC protocol has for the regional economy with the increased competition of Chinese textiles and apparel goods.

From a Central American perspective, our simulations find a noteworthy welfare increase from CAFTA. However, the agreement also induces a larger export specialization in the already significant *maquila*-based sectors (i.e. textiles and apparel). This effect increases the region's trade and growth dependence on a single sector, and it draws resources from other industries and the agricultural sector. On the other hand, the US economy is barely affected. In the case of Costa Rica, as far as the country successfully implements policies to improve its business and investment climate, the probability of positive effects will increase.

1 Introduction

The United States (US) and the five Central American countries –Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua– concluded negotiations on the US-Central American Free Trade Agreement (CAFTA) in January 2004.[1]

The ratification process of the CAFTA is almost completed and few CGE applications have been used to evaluate its consequences for Central America (CA).[2] These studies mainly analyze the effects of the treaty on the USA and pay less attention of the consequences for CA. We use a standard GTAP application to evaluate the static effects of CAFTA for the region. In addition, we identify and evaluate potential effects associated with the complementary policies negotiated in the agreement. A related study by the World Bank (2005) presents an in-depth analysis of the consequences of the treaty for CA, but does not include a CGE application for the region as a whole.[3]

Under the Caribbean Basin Initiative (CBI) many Central American exports already enter without duties to the US.[4] CAFTA will consolidate those benefits and make them permanent, so nearly 100% of all consumer and industrial products made in Central America will enter the US market duty-free immediately on ratification of the agreement. The existence of an earlier trade enhancing mechanism represented by the CBI introduces two important considerations. Firstly, the CBI can be regarded as a halfway step in the trade liberalization process between both regions. As such, it would imply that CAFTA does not grant new market access for Central American products to the US, but it enhances the list of products that have had such trade preferences in the past.

Under these considerations, some sectors have already adjusted and taken advantage of export opportunities, and it is expected that CAFTA will expand the participation and trade

[1] The Dominican Republic was included into the Agreement on August 2004, named afterwards DR-CAFTA.

[2] The agreement has already been ratified by the United States, El Salvador, Guatemala, Honduras, Nicaragua and Dominican Republic. Existing CGE applications include Brown *et al.* (2004), Hilaire and Yang (2004) and USITC (2004).

[3] They include a CGE application for Nicaragua and use other analytical instruments, i.e. partial equilibrium analysis and gravity model estimations.

[4] The 1984 CBI benefits were enhanced by the Caribbean Basin Trade Partnership Act (CBTPA), enacted in May 2000 as part of the Trade and Development Act.

volume of the remaining sectors.[5] This distinction is important because previous static CGE applications have been criticized for failing to fully account for the productive and export diversification driven by such trade agreements as NAFTA (Kehoe, 2003). The combined implementation of the CBI and CAFTA with a relatively long intermediate period, assures that the productive adjustment process is gradual, and that we can be less concerned with this type of static CGE limitations.

Secondly, the agreement includes political sensitive products not present in the CBI (e.g. sugar, textiles, and apparel). Although the US economy is barely affected, the trade agreement caused intense lobbying from interest groups in the US.

From a Central American perspective, our simulations find a noteworthy welfare increase from CAFTA. However, the agreement also induces a larger export specialization in the already significant *maquila*-based sectors (i.e. textiles and apparel). This effect increases the region's trade and growth dependence on a single sector, and it draws resources from other industries and the agricultural sector. The political and social consequences of this specialization could be costly.

However, the already implemented quota reduction of Chinese textile and apparel exports to the US is currently creating intense competition pressures that will seriously affect the trade flows from CA to the US. Our baseline estimations already capture the Chinese quota reduction. Thus, the lower-bound gains from CAFTA are expected to roughly compensate for Chinese competition in this sector. Taken into consideration the significant differences between the economies of both regions, CAFTA entails both significant opportunities and threats to CA. Chinese competition highlights the importance of implementing policies aimed at diversifying exports and increasing agricultural competitiveness, which in turn can reduce the high unemployment and poverty rates of the region.

The main achievement of CAFTA is the formalization of market access concessions currently set by the US on a unilateral basis under the CBI. In addition, an institutional and legal framework has been negotiated to ease FDI flows into the region. Thus, the potential increase in FDI is expected to incentive growth and employment opportunities. Moreover, an increase in trade facilitation mechanisms creates a positive and significant welfare effect.

[5] On the other hand, given the relatively small size of the CA market for US companies, the agreement can hardly create any significant economy-wide effects for the US.

On the other hand, the welfare implications of the agreement are positive for the US. Without CAFTA the reduction of the textile and apparel (T&A) Chinese quotas negatively affects this sector in the US. With CAFTA the T&A sector in the US increases output to supply the Central American *maquilas*. In addition, the bilateral trade balance is improved, while no specific sectors are hurt. Under the negotiated conditions, the sugar industry remains highly protected from CA competition.

Our analysis is based on the GTAP 6.0 pre-release 3.10 database and we use a standard GTAP static model with different shocks to evaluate the alternative scenarios. A limitation of the database is that it groups together all Central American countries (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama and Belize), of which only the first five are included in the CAFTA.[6] A recent study by the USITC (2004) broadly adjusts the data to account only for the five countries and includes the Dominican Republic, which joined the agreement in August 2004.[7] We do not find significant differences with the USITC's broad estimations and thus leave the data unaltered. However, this highlights the need to include the countries separately in the future.

This distinction is especially necessary for evaluating the effects of CAFTA for Costa Rica, which has a different productive structure and export platform than the rest of the region. As a partial solution to not having Costa Rica as a separate region in the GTAP database, we conduct some exercises to estimate the disaggregated welfare effects of CAFTA for this particular country.

The paper is organized as follows. Section 2 presents the main economic characteristics and current conditions in the five Central American economies. Section 3 describes the main issues negotiated under CAFTA. Section 4 explains the main features of the GTAP CGE model and its associated database. Section 5 presents our baseline scenario with some complementary simulations. In Section 6 we model changes in labor and capital endowments which are expected from the increased trade volumes and FDI flows to the region. In Section 7 we present the exercise that analyzes Costa Rica as a separate sub-region. Finally, in Section 8 we summarize our results and present our main conclusions.

[6] Panama is currently negotiating an FTA with the US.

[7] We do not include this country in our exercise, because of data limitations and instead, we want to focus exclusively on CA.

2 Central America before CAFTA

2.1 General conditions

Given its geography, Central America is a natural bridge between North and South America, and between the Pacific and Atlantic Oceans. Closeness to the US market implies a geographical advantage that has been exploited in the past and is expected to increase in importance with CAFTA.

Although most of Central American countries suffered civil wars in past decades and natural disasters in recent years, the region has witnessed a period of economic recovery in the 1990s and 2000s. These results are reinforced by the stability brought by democratically elected governments, creating a positive perspective for the region's future.

Perhaps the most significant change experienced by CA in the last ten years is the consolidation of the economic opening of the region. CA has accelerated its insertion into world markets through tariff reductions, the privatizations of public enterprises and the signing of free trade agreements.[8]

Table 1 presents economic growth indicators. The average growth rate for the region was 3% for the period 2001-2005. This growth rate has only increased per capita GDP around one percentage point. So far, the economic recovery of the region has not been strong enough to improve the income of all Central Americans. Overall, GDP per capita data shows that the region has low-income country characteristics, while poverty rates are significant (ranging from 22% in Costa Rica to around 60% in Guatemala).

Under these circumstances, CAFTA is seen in the region as an important force that can eventually increase growth rates, and diversify the economy by creating new industries and attracting foreign direct investments.

It is important to highlight that Costa Rica has distinct economic characteristics from the rest of the region. It has a medium-income GDP per capita, and a more dynamic and diversified economy. This difference can be better understood by observing the human capital and

[8] Central American countries have already signed free trade agreements with Canada, Chile, Mexico and some Caribbean countries. Negotiations with the European Union are expected to start in June 2007.

productive indicators shown in the following sections. This differentiation introduces an important shortcoming from the present analysis, where data limitations do not allow us to isolate each national economy. Thus, we may be overlooking important country-specific results.[9]

Table 1: Central America, Economic Growth Indicators, 2005

Country	GDP (Current US$ Million)	Share %	GDP Growth 2001-2005 %	GDP per capita US$	GDP per capita Growth 2001-2005 %	Poverty Rate 1990-2003 %
Costa Rica	19,814	24	3.7	4,580	2.1	22
El Salvador	17,017	21	2.0	2,475	0.9	48.3
Guatemala	32,038	39	2.5	2,523	0.9	56.2
Honduras	8,384	10	3.6	1,079	0.1	48
Nicaragua	4,910	6	3.1	850	1.5	47.9
Total	82,163	100				

Source: Central Banks of each country and UNDP (2006)

2.2 Human capital and unskilled labor abundance

Despite recent economic and political stability in the region, the armed conflicts and stagnant economic conditions of the past have left the region with important shortcomings of human capital. As shown in Table 2, with the exception of Costa Rica, the region has low literacy rates, health expenditures and few initial conditions for the spreading of R&D activities.

Table 2: Human Capital Indicators for Central America

Country	Human Development Index (HDI) Rank 2004	Adult Literacy Rate (% ages 15 and older) 2004	Health Expenditure per capita (PPP US$ 2003)	Public Expenditure on Education (% GDP 2002-04)	Students in Science, Engineering, Manufacturing and Construction (% of tertiary students 1999-2004)	Researchers in R&D (per million people) 1990-2003
Costa Rica	48	94.9	616	4.9	23	368
El Salvador	101	79.2	378	2.8	23	47
Guatemala	118	69.1	235	1.7	19	n.a.
Honduras	117	80.0	184	n.a.	23	78
Nicaragua	112	76.7	208	3.1	n.a.	44

n.a.= not available

Source: UNDP (2006)

[9] As part of the present research project, we are currently including Costa Rica into the GTAP database to later conduct a separate CGE analysis for this country and overcome the limitations of analyzing the region as a single, homogenous economy.

These characteristics imply that with this low human capital profile –together with the absence of major natural resource endowments– unskilled labor is a relatively abundant factor in the regional economy. Moreover, from Table 3 we observe that even when unemployment is relatively low, there are relatively high under-employment conditions tied to a significant informal sector economy. The subsequent high sub-utilization rates of labor imply that labor can be drawn to the formal sector with the improved labor opportunities expected from CAFTA.

Table 3: Central American Employment Characteristics (Averages for 1995-2003)

	Unemployment	**Under-employment**	**Total sub-utilization**
Costa Rica	5.9%	7.5%	13.4%
El Salvador	7.2%	16.2%	23.4%
Guatemala	6.2%	45.1%	51.3%
Honduras	6.1%	25.6%	31.7%
Nicaragua	12.9%	20.8%	33.7%
Average	7.7%	23.0%	30.7%

Notes: The average is taken with the available information. Some countries do not have information for the whole period or present preliminary data.
Source: Central Banks and Statitical Offices of the region

2.3 Productive structure, trade and tariffs

Table 4 shows the productive structure of the five Central American countries. It points to a very significant role for the service sector, with relatively low agricultural participation (except in Guatemala). The volume of trade with respect to GDP is high in most countries, which highlights the importance of external demand for the region. However, only Costa Rica has a significant share of its industrial exports classified as high-technology products.

Table 4: Central America, Production and Trade Indicators, 2005

Country	Agriculture, value added (% of GDP)	Industry, value added (% of GDP)	Services, value added (% of GDP)	Merchandise trade (% of GDP)	High-technology exports (% of manufactured exports)
Costa Rica	8.42	28.77	62.81	86.65	36.81
El Salvador	10.67	29.86	59.47	59.47	4.14
Guatemala	22.93	18.83	58.24	38.78	n.a.
Honduras	13.3	30.7	56	77.46	n.a.
Nicaragua	19.49	31.1	56.1	66.02	6.1

n.a. = not available

Source: World Development Indicators, The World Bank

The US is the main trading partner of CA. Almost 50 percent of the region's international trade is with the US. According to USITC data, in year 2006, the region exported more than US$14,8 billion to the US market. Although "traditional" exports like apparel products, bananas and coffee still represent a very important share of regional exports, in recent years there has been a diversification of exports, towards more technologically advanced sectors like electronics and medical instruments, non-traditional agricultural products like fruits and vegetables, beverages and prepared meats, marine products, and chemical products. Table 5 depicts the main US imports from Central American countries.

Table 5: US imports from Central America by Main Products, 2006

	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua
Total Imports (US$ Million)	4084	1909	3327	3893	1570
Articles of Apparel and Clothing	11.7%	77.0%	52.6%	66.2%	57.6%
Electrical Machinery and Equipment	20.2%	1.4%	0.0%	10.0%	8.1%
Vegetables and Fruits	25.0%	0.7%	17.0%	6.4%	2.4%
Coffee	3.5%	3.8%	8.7%	1.7%	5.9%
Fish and Crustaceans	1.7%	0.6%	0.5%	3.4%	5.8%
Meat	0.2%	n.a.	n.a.	n.a.	3.8%
Tobacco	n.a.	n.a.	0.4%	2.3%	2.2%
Sugar	1.1%	1.4%	4.1%	0.8%	2.0%
Medical Instruments	13.3%	n.a.	n.a.	n.a.	n.a.
Mineral Oils and Products	1.1%	6.5%	8.8%	n.a.	n.a.
Other Manufactures	6.5%	1.1%	n.a.	n.a.	n.a.
Others	15.8%	7.5%	7.9%	9.1%	12.2%

n.a.= not available

Source: Own elaboration with data from the US International Trade Commission

The five CA countries agreed in 1995 to reduce their common external tariff to a maximum of 15 percent.[10] The region has low average tariff rates, as a result of a unilateral process of trade liberalization and a strong commitment to global integration. However, selected agricultural commodities are protected with tariffs that significantly exceed the 15 percent common external tariff ceiling. These specially protected commodities include dairy products, rice, sugar, and poultry. In addition, the use of non-tariff barriers has decreased significantly in recent years; although there are still some of these barriers in place.[11]

2.4 Foreign Direct Investment

Foreign direct investment (FDI) inflows to CA increased significantly in the 1990s. This phenomenon has contributed in a decisive manner to export diversity in the region. Moreover, FDI inflows help finance the persistent current account deficits, especially in Costa Rica.

[10] Through the Central American Common Market (CACM) of which all countries are members. The Central American integration process has been reactivated in the last decade. At present, an average of 30 percent of total trade is intraregional.

[11] A summary of tariff rates and NTBs is presented in the Appendix.

Although apparel and textile products sectors in Central America traditionally received the most important amounts of FDI, the region has become an attractive option for investors looking to do business in other productive sectors as well. A wide range of industries, including electrical equipment, medical devices, software, chemical products, beverages and food preparations, tourism, financial services, call centers, energy and telecommunications, among others, have been growing and attracting significant foreign investment.

For example, in Costa Rica 65 percent of total FDI inflows were concentrated in the industrial sector in 1997-2003, particularly because of Intel's and several electronics and medical products companies operations, while since 2003 services like call centers and tourism, and real state sectors have attracted significant annual investments. In El Salvador, besides the important growth in telecommunications and energy, industry, commerce, finance and insurance sectors are also attracting FDI.

Together with the widening sector differentiation, there are an increasing number of companies from a diverse group of countries investing in Central America. Although US FDI participation in the region is the most significant (see Table 6), investments from the European Union, Asian nations, Canada and Mexico are growing.

Table 6: FDI Flows to Central America (Million US$)

Country	Average 1996-2000	Average 2000-2005	2005	US Share (1996-2005 Average)
Costa Rica	495.2	593.1	653.2	63%
El Salvador	309.5	373	477	35%
Guatemala	243.7	203.9	167.8	n.a.
Honduras	166.1	219.7	190	45%
Nicaragua	229.2	194.2	230	n.a.
Total	1443.7	1583.9	1718	

n.a.=not available

Source: ECLAC (2006)

2.5 Tariff revenue replacement

An important consequence of trade liberalization is the loss of fiscal revenues. The absence of feasible alternative taxes that can replace the lost revenue can thus be problematic for some countries. In particular, it can be the case that these negative fiscal effects can overcome the potential trade liberalization gains.

Due to the liberalization process initiated in CA during the 1980s, the dependence of fiscal revenues on tariffs has been significantly reduced. For 2000-2001, the World Bank (2005) reports that tariff revenue represents 1.55% of GDP. In the same report, they assess that without any consumption or production changes, the tariff revenue reduction associated with CAFTA will be less than 1% of GDP. However, when the expected growth effects of the treaty are included, the fiscal losses are compensated.

When we run our baseline experiments in GTAP, government income increases by 4.3%, despite the reduction in tariffs. Thus, the loss of fiscal revenues under CAFTA does not seem to be a problematic issue and we will not take it into consideration in the rest of our analysis.

3 Main issues negotiated under CAFTA[12]

In general, the agreement is aimed at consolidating CBI market access benefits and extending it to previously excluded sectors. Furthermore, important provisions and legal requirements are included to improve investment opportunities in CA.

3.1 Tariffs and market access

Almost no products are excluded from the agreement. Tariffs will be eliminated for all products, except sugar for the United States, fresh potatoes and fresh onions for Costa Rica, and white corn for the rest of Central America. More than 80 percent of US exports of consumer and industrial products to Central America will be duty-free immediately upon ratification of the agreement, and 85 percent will be duty free within five years. All remaining tariffs will be eliminated within ten years. Close to 98 percent of Central American exports to the US exports will be duty-free immediately. The Central American countries will accord substantial market access across their entire services regime, subject to few exceptions.

Moreover, inter-regional trade within CA is fully liberalized after the approval of the agreement.

[12] Based on information from the United States Trade Representative, www.ustr.gov, accessed on May 5, 2005. The recent World Bank (2005) report on DR-CAFTA devotes a chapter to analyze in detail the contents of the agreement.

3.1.1 Agriculture

More than half of current US farm exports to Central America will become duty-free immediately. Each Central American country will have a separate schedule of commitments providing access for US products. The US will provide the same tariff treatment to each of the five countries, but will make country-specific commitments on tariff-rate quotas. Sensitive goods (e.g. rice, beef, dairy products, corn, poultry and pork) will have tariffs phased out incrementally so that duty-free treatment is reached in 5, 10, 15, or 20 years from the time the agreement takes effect.

3.1.2 Textiles and Apparel

Textiles and apparel will be duty-free and quota-free immediately if they meet the agreement's rule of origin. The agreement's benefits for textiles and apparel will be retroactive to January 1st 2004. Some apparel made in Central America that contains certain fabrics from NAFTA partners (Mexico and Canada) will have duty-free access. A "de minimis" provision will allow limited amounts of third-country content to go into CAFTA apparel, giving producers in both the US and Central America needed flexibility.

3.2 FDI and trade facilitation mechanisms

3.2.1 Protections for Investors and property rights

One of CAFTA's main aims is to implement a secure and predictable legal framework for investors. All forms of investment are protected under the agreement, including enterprises, debt, concessions, contracts and intellectual property. Pursuant to US Trade Promotion Authority, the agreement draws from US legal principles and practices to provide US investors in CA a basic set of substantive protections that Central American investors currently enjoy under the US legal

system. For example, copyright owners maintain rights over temporary copies of their works on computers, which is important in protecting music, videos, software and text from widespread but unauthorized sharing through the Internet.

3.2.2 Access to Government Procurement Contracts

US suppliers are granted non-discriminatory rights to bid on contracts from Central American government ministries, agencies and departments. The agreement covers the purchases of most Central American central government entities, including key ministries and state-owned enterprises. It also requires fair and transparent procurement procedures, such as advance notice of purchases and timely and effective bid review procedures. Moreover, it ensures that bribery in government procurement is specified as a criminal offense under CA and US laws.

3.2.3 Protection and Promotion of Worker Rights

CAFTA fully meets the labor objectives set out by the US Congress in the Trade Promotion Act of 2002. Labor obligations are a part of the core text of the trade agreement. CA countries commit themselves to provide workers with improved access to procedures that protect their rights. The agreement requires that all parties effectively enforce their own domestic labor laws, and this obligation is upheld through the agreement's dispute settlement procedures.

3.2.4 Trade Capacity-Building

CAFTA will include a Committee on Trade Capacity Building, in recognition of the importance of such assistance in promoting economic growth, reducing poverty, and adjusting to liberalized trade. The trade capacity building committee will build on work done during the negotiations to enhance partnerships with international institutions (Inter-American Development Bank, World Bank, Organization of American States, ECLAC, and the Central American Bank for Economic Integration), non-governmental organizations, and the private sector.

4 Empirical assessments using CGE models

It is not easy to estimate the possible impacts of a free trade agreement (FTA), since many factors and conditions are involved. The expected impacts of CAFTA will depend on the static reallocation effects of productive factors and the dynamic effects resulting from expected increased competition within the integrated market, potential investments flows and technology transfers. Moreover, complementary economic policies associated with FTAs can also have important consequences (e.g. development cooperation and "agreement-pushed" domestic reforms).

Since the implementation of NAFTA in the early 1990s, CGE modeling has become the main empirical tool to assess the impact of free trade agreements. The considerable economy-wide effects expected from the policy shocks associated with trade openness require the use of general equilibrium analysis. Moreover, theoretical models and databases have been undertaking continual improvements over the years to match the extensive use of CGE models.

4.1 Previous CGE results

Quantitative instruments like Computable General Equilibrium (CGE) models have been used to evaluate the likely impact of CAFTA for its member countries.[13] The United States International Trade Commission (USITC, 2004) reports positive but very small economy-wide welfare effects for the United States. US exports to Central America are likely to increase by US$2.7 billion or 15%, and US imports are likely to grow 12%, by US$2.8 billion after full implementation of the tariff liberalization provisions of CAFTA. The impact on US employment and output is expected to be minimal. The largest sectoral effects are expected in the textiles and apparel, and sugar industries, both highly-protected activities.

For Central America as a whole, Hilaire and Yang (2004) report an important welfare gain with the full implementation of CAFTA of US$3.9 billion (1.5% percent of regional GDP). A main source of the gain for Central American countries comes from expanded sales of textiles

[13] Because of differences in model specifications, databases, and country aggregations, the results of these studies show differences in magnitude, but similar "signs" and "directions" of likely effects.

and clothing and processed crops, which more than offsets trade diversion from other countries and regions. Total exports from Central America to the US market are likely to increase by 50% from their 2002 values, according to their model simulations.[14]

On the other hand, Brown *et al.* (2004) report a total improvement in US economic welfare of US$17.3 billion, which represent 0.2% of GNP. Economic welfare in CA increases by US$5.3 billion, which is 4.4% of regional GNP. For Central America, there are sizable percentage increases in the exports of food, beverages and tobacco, textiles, wearing apparel, leather products and footwear, and services. Total export value increases by US$8.3 billion and the likely impact on output in textiles, wearing apparel, and leather products and footwear in CA is also significant. As a result, the authors estimate that employment increases by 53,741 workers in textiles, 230,663 workers in wearing apparel, and 9,518 workers in leather products and footwear. The percentage increases in employment in these sectors are 28, 42, and 15 percent, respectively. These employment reallocations are apparently quite substantial and suggest that the agreement may result in significant worker displacement in the process of adjustment brought about by elimination of import barriers.

4.2 The GTAP framework

The Global Trade Analysis Project (GTAP) is an international network of institutions and researchers that facilitates and fosters trade analysis. The main aim of the project is to provide updated datasets of bilateral trade, transport, and import protection data in conjunction with individual-country, input-output data bases. Moreover, it also provides a modeling framework to conduct CGE static analysis of multi-region and economy-wide scenarios. In particular it can simulate the effects of trade policy and resource-related shocks on the medium-term patterns of global production and trade.

We use the GTAP database and CGE model to analyze the economic implications of CAFTA for Central America. Using this framework we can incorporate some issues not

[14] This result must be interpreted with caution, since the authors use data for 1997, and some recent preferential agreements are not considered; as well as the recent implementation of the quota reduction for Chinese exports of textiles and apparel products.

accounted for in previous CGE applications, including the elimination of Chinese quotas to the US, trade facilitation mechanisms and increased FDI flows to CA.

4.2.1 Database considerations

We use the GTAP database 6.0 pre-release 3.10 version, which uses 2001 as its baseline and provides the best available basis to analyze current trade policy (USITC, 2004). However, for this specific application, there are two main limitations. First, the regional aggregation available in the database groups the five Central American participants (Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua) together with Belize and Panama, which are not in CAFTA. Secondly, the baseline year is four years apart from the implementation date of the agreement. Thus, the economic environment and data changes that have taken place between 2001 and 2005 are not included in this experiment.

A recent study by the USITC (2004) broadly adjusts the data to account only for the five countries and includes the Dominican Republic, which was incorporated into CAFTA at the end of the negotiations. Moreover, the authors perform some updates to the database, in order to bring the baseline to 2005. Nevertheless, we do not find significant differences with the USITC's broad estimations and hence we leave the data unaltered.

However, this database limitation highlights the need to include the countries separately in the future. This need is especially important when evaluating the effects of CAFTA for Costa Rica, which has a different productive structure and export platform than the rest of the region.

In this paper we aggregate the data in 20 sectors and 4 regions: USA, Central America, China and the Rest of the World (ROW). With this regional grouping we can estimate the impact of CAFTA, as well as the influence of China on its bilateral trade. The sectoral aggregation was done considering the relevant exporting and importing sectors for CA.[15]

[15] A summary of the definitions and grouping of sectors can be found in the Appendix. However, the GTAP database allows for other possible combinations of sectors and regions.

4.2.2 Theoretical setting[16]

First, we use a standard GTAP static model with different shocks to evaluate the alternative scenarios.[17] In the final section we estimate some potential dynamic effects and embed them in the GTAP model as endowment shocks. The standard GTAP model uses a regional representative household with a Cobb-Douglas function to assign constant expenditure shares to private consumption, public expenditure and savings. This formulation allows for an unambiguous indicator of welfare offered by the regional utility function, which accounts for the three sources of utility. Household behavior is modeled using a Stone-Geary utility function where all subsistence shares are equal to zero. This specification allows for a well-defined intertemporal maximization between consumption and savings.

Firm behavior is modeled using a technology tree that depends largely on the assumptions of *separability* in production (see Figure 1 in the Appendix). This allows for decisions being made at each level, without considering the variables of other levels. Using this simplification, it is assumed that firms first choose between primary factors *independently* of the prices of intermediate inputs. In addition, constant returns to scale are also assumed and thus, output levels are also left out of the choice of the factor mix. The combination of production factors and intermediate inputs is assigned using a Leontief function. Thereafter, the mix of intermediate domestic and foreign inputs is selected using a CES function, the selection between foreign inputs uses an Armington specification within a CES function and finally, the mix of factors is assigned also with a CES function. All elasticities of substitution are held constant.

There is imperfect factor mobility, which is described with a CET revenue function. Full employment is also assumed, although the use of slack variables can introduce some flexibility in this assumption and initial endowments can also be changed to proxy for increases in the employment of factors previously not used.

Aggregate investment is not explained within the standard GTAP model, since it does not account for macroeconomic policies and monetary phenomena. Thus, the macroeconomic closure employed is neo-classical and investment is forced to adjust in line with regional changes

[16] This section draws heavily on Hertel and Tsigas (1997). They present the formal mathematical and schematic representation of the GTAP model, which can be consulted for those interested in understanding the specifics of the model's structure.

[17] In particular, we use the RunGTAP software version 5.

in savings. In addition, a *global closure* is assumed and the current account deficits can be non-zero but must be balanced in the *global bank* (where trade deficit must be compensated between countries).

Finally, the use of a series of accounting relationships embodies all the necessary general equilibrium conditions and nonlinear programming is used to find a feasible solution to the maximization problem. In this particular application, we use a Gragg extrapolation solution method, which allows us to deal with the significant shocks that are induced by the full trade liberalization negotiated under CAFTA.

Before we analyze the results, it is important to remember that we are first using a static GTAP application that does not take into consideration possible increases in US foreign direct investment in CA, in response to the incentives provided by the bilateral liberalization. Moreover, no allowance has been made for possible increases in capital formation and economic growth and improvements in productivity in the United States and the CAFTA countries. However, some of these dynamic effects are indirectly assessed in the last section.

Finally, it is important to stress that the simulation results include the full adjustment of the economy to the policy shock and thus can represent the long-run effect of CAFTA. Therefore, the short-run adjustment and preliminary implications of the trade agreement are not analyzed here.

5 Static GTAP baseline scenario

We first present the tariff rates and trade flows that emerge using our setting with 20 sectors and four regions. Table 7 shows that under the CBI initiative many Central American products already have a zero tariff to the US. This list excludes sugar, the milk and diary sectors and textiles and apparel (T&A). On the other hand, CA has high average tariffs for most agricultural goods and some industrial goods as well.

Table 7: Tariff rates embedded in the GTAP database (percentages)

	Tariffs to the USA			Tariffs to Central America			
Sector code	2 CA	3 China	4 ROW	1 USA	2 CA	3 China	4 ROW
1 Rice	0.0	8.6	3.7	25.9	1.2	0.0	41.0
2 Other_cereal	0.0	1.5	0.1	13.1	0.1	23.8	12.6
3 Veg_fruits	0.1	7.3	0.9	12.1	0.1	14.4	12.7
4 Sugar	37.4	37.4	24.8	33.8	35.0	45.9	34.0
5 Other_agric	1.1	6.3	7.5	0.7	1.4	5.3	3.0
6 Cattle_anim	0.0	0.6	0.2	4.8	0.4	3.4	4.0
7 Milk_diary	16.6	7.2	16.3	17.6	6.5	37.7	20.7
8 Forest_wood	0.0	0.9	0.2	4.5	1.0	10.1	5.4
9 Fishing	0.0	0.3	0.1	12.6	4.5	0.0	5.3
10 Minerals	0.0	0.1	0.0	1.7	1.3	0.3	0.4
11 Meat_bovine	3.7	5.2	3.6	8.7	1.4	14.4	12.5
12 Meat_nec	0.0	7.0	1.3	17.4	1.9	14.1	26.9
13 Bev_tobacco	0.5	3.6	2.2	20.8	2.6	18.0	23.0
14 Otherfoodpro	0.4	4.9	2.5	10.3	1.3	12.0	9.6
15 Textiles	13.3	10.2	7.6	12.6	2.9	8.1	10.2
16 Apparel	10.7	11.6	9.8	16.7	7.9	12.3	13.9
17 Leather	1.3	14.8	8.3	10.0	6.5	11.9	11.7
18 Mineral_prod	0.0	3.9	2.1	3.2	1.3	4.5	4.3
19 Other_manuf	0.0	1.7	0.9	3.3	1.6	7.4	8.4
20 Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: GTAP database 6.0 pre-release 3.11

The implicit bilateral trade from the GTAP database is reported in Table 8, which shows exports by region and sector. The concentration of Central American exports of T&A to the US is shown in this table. They represent 55% of all exports to the US. US exports, instead, are more diversified and concentrated in industrial goods. Overall, CA has a bilateral trade surplus with the US using these initial values. The US represents roughly half of all Central America's trade.

5.1 Including the ATC implementation as a pre-experiment condition

The global liberalization of textile and clothing quotas at the beginning of 2005 under the Agreement on Textiles and Clothing (ATC) has already opened the US market for Chinese exports. This fact has a significant impact for Central American T&A products and has already produced a very significant increase of Chinese exports to the US and Europe.[18] Hence, to assess the current international setting in the T&A sector, we eliminate the textile quotas for Chinese

[18] The sheer increase in textile and wearing apparel trade between China and the US may prompt temporary policies to limit this trade (The Economist, 2005a). China has already imposed an export tax, which has been considered insufficient by some US commentators and thus may be complemented by other policy measures from the US. However, even when these additional measures may be implemented, the significant impact of Chinese exports for CA has to be considered.

imports to the US as a pre-experiment condition in our baseline estimations. Subsequently, we use the updated database for our CAFTA simulations.

Table 8: Exports at market prices, by region and sector (million US$)

	USA Exports			Central American Exports			
Sector code	2 CA	3 China	4 ROW	1 USA	2 CA	3 China	4 ROW
1 Rice	84	0	675	1	5	0	5
2 Other_cereal	222	8	5,551	0	10	0	5
3 Veg_fruits	50	87	4,997	968	102	2	976
4 Sugar	4	11	339	150	1	0	433
5 Other_agric	282	1,328	13,537	525	48	1	977
6 Cattle_anim	25	677	3,143	7	50	1	42
7 Milk_diary	32	33	784	6	72	0	16
8 Forest_wood	567	1,112	27,859	181	350	1	163
9 Fishing	0	3	240	89	2	0	6
10 Minerals	12	90	6,273	84	12	0	61
11 Meat_bovine	55	55	3,891	60	47	2	32
12 Meat_nec	68	199	4,087	2	26	0	11
13 Bev_tobacco	30	16	4,331	83	79	1	41
14 Otherfoodpro	463	415	13,978	570	576	4	439
15 Textiles	1,570	451	10,698	2,363	126	1	204
16 Apparel	1,120	99	4,118	4,222	81	1	215
17 Leather	44	96	1,817	21	81	2	108
18 Mineral_prod	1,614	3,902	112,122	251	1,110	3	594
19 Other_manuf	2,985	16,474	424,580	1,410	747	57	2,271
20 Services	632	4,353	253,928	911	23	82	4,404
Total	**9,859**	**29,407**	**896,948**	**11,904**	**3,546**	**158**	**11,002**

Source: GTAP database 6.0 pre-release 3.11

Given the highly significant participation of China in this sector, we consider it imperative to include this event prior to our CAFTA baseline estimations, and this is a significant contribution of this paper with respect to previous CGE assessments.

From Table 9 we observe that with the implementation of the ATC, the T&A sector shrinks in CA and the US, while it increases in China by roughly the same amount of the Central American and US decline. Wages and capital returns to CA are diminished and this creates a welfare loss to the region of around 0.8% of GDP.[19]

[19] The main results for each scenario are presented in Table 19 in the last section of this paper.

Table 9: Elimination of Chinese T&A quotas to the US (percentage changes)

	Output			Market price		X fob			M cif		
Sector code	USA	CA	China	USA	CA	USA	CA	China	USA	CA	China
Land	-	-	-	0.0	3.3	-	-	-	-	-	-
UnSkLab	-	-	-	-0.1	-2.4	-	-	-	-	-	-
SkLab	-	-	-	0.0	-2.3	-	-	-	-	-	-
Capital	-	-	-	-0.1	-2.6	-	-	-	-	-	-
NatlRes	-	-	-	0.1	3.9	-	-	-	-	-	-
Rice	0.2	0.4	-0.2	-0.1	-1.2	0.3	4.8	-5.4	-0.4	-2.1	4.4
Other_cereal	0.1	0.5	-0.4	-0.1	-1.0	0.2	1.1	-1.7	0.0	-0.5	0.8
Veg_fruits	0.1	1.1	-0.1	-0.1	-0.8	0.2	1.7	-3.0	0.0	-1.3	4.1
Sugar	0.0	2.9	-0.5	-0.1	-1.4	0.0	5.1	-5.3	0.2	-3.0	1.5
Other_agric	-0.1	1.9	1.9	-0.1	-0.7	0.7	3.4	-7.6	-0.2	-1.2	5.0
Cattle_anim	0.1	0.1	-0.1	-0.1	-1.1	1.3	1.4	-4.0	-0.1	-1.3	6.0
Milk_diary	0.0	0.3	-1.3	-0.1	-1.4	0.0	3.6	-7.0	-0.1	-3.5	1.4
Forest_wood	0.1	2.6	-2.2	-0.1	-1.8	0.3	6.0	-5.0	-0.3	-2.9	1.9
Fishing	0.0	0.4	-0.2	0.0	-1.1	0.1	1.0	-0.9	0.0	-2.1	1.1
Minerals	0.0	2.6	-1.4	0.0	0.1	0.0	-0.5	1.8	0.0	3.0	-2.9
Meat_bovine	0.1	0.4	-2.4	-0.1	-1.5	0.1	6.8	-7.0	0.0	-3.6	-1.1
Meat_nec	0.1	0.0	-2.5	-0.1	-1.4	0.6	5.7	-9.5	-0.2	-5.1	4.4
Bev_tobacco	0.0	-0.1	-0.1	-0.1	-1.8	0.0	1.0	-1.5	0.0	-2.2	1.3
Otherfoodpro	0.0	1.2	-0.6	-0.1	-1.4	0.1	2.9	-3.7	-0.1	-1.9	2.3
Textiles	-4.8	-9.1	12.2	-0.4	-1.3	0.8	-11.2	19.3	4.0	-12.8	14.6
Apparel	-8.1	-19.5	29.1	-1.1	-1.4	6.6	-28.1	47.6	9.8	-3.7	4.6
Leather	1.5	4.9	-4.5	0.0	-1.5	2.2	11.0	-4.7	-0.4	-2.4	1.9
Mineral_prod	0.0	2.9	-1.4	-0.1	-1.3	0.3	4.8	-4.1	-0.3	-1.4	1.7
Other_manuf	0.3	6.9	-3.3	-0.1	-1.3	0.6	8.9	-5.6	-0.2	-1.2	1.1
Services	0.0	0.2	-0.2	-0.1	-2.0	0.1	5.5	-2.9	-0.1	-3.8	1.9

5.2 CAFTA baseline scenario

Once we updated our database to include the quota reduction to Chinese exports of T&A, we proceeded to estimate the impact of CAFTA. This calculation is done by assuming a full liberalization of trade between the US and Central America, as well as free trade within CA. Thus, we reduce all tariffs between both regions to zero and eliminate all tariffs within CA; but keep the original tariffs with China and the ROW. In accordance with the agricultural exclusions made in the agreement we do not remove the tariffs for sugar from CA to the US, or for "other_cereal" from the US to CA.[20] In addition, some minor quotas across both regions and within CA were also eliminated.

The results for this baseline scenario show that welfare gains are positive for CA. Welfare increases US$1028 million or 1.5% of previous GDP, which in turn has a 0.26% growth rate.

[20] Because of limitations with the aggregation of sectors provided by the GTAP database, the exclusion of white corn is proxied by leaving the tariff of "other_cereal" unaltered, even when other products are being included. For similar reasons, onion and potato tariffs to Costa Rica were not considered, even when they were excluded from the negotiated tariff reductions.

Household incomes rise 4.05%, driven by a significant increase in wages and capital returns. Moreover, CA has positive terms-of-trade effects that also contribute to these welfare gains.[21] As expected, the equivalent values for the US are close to zero.

From Table 10, we also find that textiles and clothing production in CA increase significantly, drawing an even higher specialization into these sectors, at the expense of the rest of the economy. This situation is also reflected in the export composition, where T&A accounts now for 65% of total exports. Agricultural production is significantly decreased, with rice being the most affected crop.

Table 10: CAFTA, baseline scenario (percentage changes)

	Output		Market price		X fob		M cif	
Sector code	USA	CA	USA	CA	USA	CA	USA	CA
Land	-	-	0.3	-7.7	-	-	-	-
UnSkLab	-	-	0.0	5.6	-	-	-	-
SkLab	-	-	0.0	5.6	-	-	-	-
Capital	-	-	0.0	6.3	-	-	-	-
NatlRes	-	-	-0.1	-10.7	-	-	-	-
Rice	2.1	-12.0	0.2	0.7	8.1	-26.1	0.6	65.5
Other_cereal	0.0	-0.9	0.1	2.0	0.0	-2.0	0.1	0.9
Veg_fruits	0.1	-2.6	0.1	1.7	0.4	-3.4	0.0	7.1
Sugar	0.3	-6.4	0.1	3.0	3.0	-9.8	-0.3	63.0
Other_agric	0.0	-2.8	0.1	1.6	-0.2	-5.0	0.2	3.7
Cattle_anim	0.1	-1.7	0.0	1.8	-0.1	-4.0	0.2	3.2
Milk_diary	0.1	-1.6	0.0	2.5	6.0	29.1	0.7	22.6
Forest_wood	0.0	-7.8	0.0	3.8	0.4	-13.8	0.1	10.4
Fishing	0.0	-1.3	0.0	1.2	-0.1	-0.8	0.1	6.6
Minerals	0.0	-5.7	0.0	0.1	-0.1	1.1	0.0	-6.6
Meat_bovine	0.0	-1.6	0.0	2.8	0.6	-3.9	0.3	26.8
Meat_nec	0.1	-6.8	0.0	2.8	2.0	-30.0	0.2	73.1
Bev_tobacco	0.0	-0.3	0.0	4.0	0.3	-1.2	0.0	8.8
Otherfoodpro	0.1	-4.2	0.0	2.3	1.2	-6.2	0.0	9.4
Textiles	0.7	46.6	-0.1	1.1	11.9	93.5	3.4	48.7
Apparel	0.4	41.4	-0.1	0.7	15.6	75.3	1.7	23.7
Leather	0.2	-5.5	0.0	2.5	1.9	-1.8	0.1	12.5
Mineral_prod	0.0	-6.7	0.0	2.6	0.2	-10.7	0.1	5.5
Other_manuf	0.0	-13.4	0.0	2.7	0.0	-15.7	0.1	3.8
Services	0.0	-0.6	0.0	4.5	-0.1	-11.4	0.0	8.6

When analyzing factor prices, CA experiments significant increases in wages for unskilled and skilled labor, as well as capital returns. These gains assure the welfare and income increases and, moreover, promises a relief to poor unskilled workers. In addition, consumer prices increase less than income and the representative agent experiments a utility rise. The overall situation of poverty in each country is likely to improve under these conditions, given that unemployment can be curved (something we analyze further in a separate simulation). However, land returns are

[21] These positive terms-of-trade effects are present throughout the rest of scenarios. However, they diminish when factor endowments are endogenously determined in the model.

adversely affected because of the negative impact of CAFTA on the agricultural sector. This change implies a redistribution of income from rural land-owners to workers.

On the other hand, the effects of CAFTA for the US are very small, where only the T&A and rice sectors obtain a significant output and export increase. Moreover, the bilateral trade between both regions increases by around 27%.

5.3 US sugar liberalization under CAFTA

While Central American countries will phase out their sugar tariffs over 15 years, the approximately 100% out-of-quota duty in the United States will not be cut. The United States will establish tariff-rate quotas (TRQs) for Central American countries, starting at 97,000 MT and growing to about 140,000 MT in year 15, thereafter growing by 2% a year. Provisions will ensure that only net surplus exporting countries in the region have access to the new system, and provisions have been agreed to allow alternative forms of compensation to be established to facilitate sugar stock management by the United States.[22]

Therefore, even though CAFTA has been highly opposed by the US sugar industry, in fact, the trade agreement will produce no substantial changes in current bilateral trade conditions in this sector. Under the current conditions, 33.6% of CA exports are in-quota, while CAFTA will increase this percentage up to 47.5%. This will maintain CA sugar exports below 1.7% of total US consumption (World Bank, 2005). In turn, the TRQs change will not increase sugar production in CA, but the revenue received by CA sugar producers will increase due to higher US prices relative to world prices.[23]

However, sugar is especially significant for CA, since the elimination of the US import tariff would have produced a very important increase of output and exports. This was assessed in a separate simulation were import tariffs for Central American sugar to the US were included as an additional shock to the baseline scenario.

[22] USTR (2004).
[23] Angel (2005) estimates a 3% average price increase for the sugar producer in El Salvador.

Table 11: CAFTA including US sugar liberalization (percentage changes)

	Output		Market price		X fob		M cif	
Sector code	USA	CA	USA	CA	USA	CA	USA	CA
Land	-	-	0.3	-6.1	-	-	-	-
UnSkLab	-	-	0.0	6.1	-	-	-	-
SkLab	-	-	0.0	6.0	-	-	-	-
Capital	-	-	0.0	6.8	-	-	-	-
NatlRes	-	-	-0.1	-11.1	-	-	-	-
Rice	2.2	-10.8	0.2	1.2	8.4	-27.7	0.6	68.2
Other_cereal	0.1	0.6	0.1	2.9	0.1	-1.0	0.1	4.3
Veg_fruits	0.1	-3.2	0.1	2.2	0.4	-4.3	0.0	8.7
Sugar	-2.9	20.5	-0.5	4.0	5.2	54.7	29.3	67.9
Other_agric	0.0	-3.4	0.1	2.2	-0.1	-7.2	0.2	6.6
Cattle_anim	0.1	-1.4	0.0	2.5	-0.1	-4.7	0.2	4.2
Milk_diary	0.1	-1.7	0.0	3.0	6.2	27.5	0.6	23.9
Forest_wood	0.0	-8.3	0.0	4.2	0.5	-14.7	0.1	11.0
Fishing	0.0	-1.4	0.1	1.5	-0.1	-1.0	0.1	7.2
Minerals	0.0	-6.2	0.0	0.1	-0.1	0.7	0.1	-7.1
Meat_bovine	0.1	-1.9	0.0	3.3	0.7	-6.2	0.3	28.4
Meat_nec	0.1	-7.0	0.0	3.3	2.2	-31.7	0.2	76.5
Bev_tobacco	0.0	-0.3	0.0	4.4	0.3	-1.3	0.0	9.3
Otherfoodpro	0.1	-4.5	0.0	2.7	1.3	-6.9	0.0	10.0
Textiles	0.7	44.1	-0.1	1.4	11.7	90.6	3.3	47.5
Apparel	0.4	39.4	-0.1	1.0	15.8	72.8	1.7	24.3
Leather	0.2	-6.4	0.0	2.8	2.0	-3.4	0.1	12.9
Mineral_prod	0.0	-7.2	0.0	2.8	0.2	-11.6	0.1	5.6
Other_manuf	0.0	-14.3	0.0	3.0	0.0	-17.0	0.1	4.2
Services	0.0	-0.6	0.0	4.9	-0.1	-12.3	0.0	9.4

As shown in Table 11, the increase in sugar exports would have created less dependence on T&A exports for CA, and also a much needed balance between the sectoral division of production between agriculture and industry.[24] Moreover, welfare gains for CA increase in an additional 120 million US$, driven by a higher factor price increase in CA and utility gains for the representative household of the region. Thus, US sugar protectionism seems very harmful for CA and it is a very relevant issue partially excluded from CAFTA.

5.4 Agricultural protection in CA

Accounting for the negative effects of CAFTA on the agricultural sectors in CA reported in our baseline scenario, it is useful to simulate an alternative case where food protection in this region is not lifted with the agreement. Given the phase-out schedule for most of the agricultural

[24] E.g. the increase in *maquila*-based production drawn from agricultural sectors, supposes a high rate of immigration from rural to urban communities. This can be costly and ultimately, an unrealistic situation as also expressed by Brown *et al.* (2004). However, an increase in sugar production would have created a more balanced situation between rural and urban production.

sensible products of CA, this simulation can proxy a "medium-way scenario" where agriculture is still not fully opened.[25]

With regard to welfare gains, this scenario is fairly comparable to the baseline case, providing a slight increase of US$37 million. Table 12 shows that the dependence of CA on the T&A sector continues, but now the "Rice" and "Milk_diary" are less affected by the agreement. The rest of the agricultural sectors in CA continue to face output reductions, driven mainly by the reallocation of resources to the T&A *maquila*-based sectors. Factor prices and bilateral trade are also mainly unchanged.

Therefore, this medium-term scenario roughly replicates our baseline scenario results. However, it would imply an important interval for some Central American agricultural sectors to adjust for competition from the US.

Finally, it is important to remember that without CAFTA, CA experiments a welfare loss driven from higher competition from Chinese products in the US T&A market. Provided that the current CBI assures market access to many Central American products, in our baseline scenario, CAFTA is more than compensating for the negative effects of the Chinese quota reduction in T&A.[26]

6 Assessment of gains derived from complementary policies and dynamic effects

Besides liberalizing bilateral trade between the United States and the region, CAFTA will also strengthen integration efforts among the countries of Central America, and remove barriers to trade and investment in the region to US companies.[27] The agreement will also require CA to undertake reforms to improve their performance in areas critical for competitiveness, including: customs integration and administration, the protection of intellectual property rights, access and

[25] For instance, in the case of rice, all Central American tariffs will be eliminated in 18 years (20 years for Costa Rica). All tariff cuts will be back loaded, with out-of-quota imports subject to a safeguard. TRQs will be established for rough and milled rice. For pork, all tariffs will be eliminated by 15 years. Tariffs on bacon and some offal products will be eliminated immediately. TRQs amounting to 9,450 MT will be established and grow from 5 to 15 percent a year (USTR, 2004).

[26] In Table 15 we present the net gains for USA and CA when the implications of the ATC protocol are included.

[27] Pratt and Rivera (2003).

protection of investments in utilities (energy, telecommunications, and water), construction, insurance and financial services markets, sanitary standards, and other certification norms. In the case of Costa Rica, market liberalization in state monopolies (i.e. telecommunications and insurance) will be gradually implemented.

Table 12: CAFTA with food protection in CA

	Output		Market price		X fob		M cif	
Sector code	USA	CA	USA	CA	USA	CA	USA	CA
Land	-	-	0.2	-6.2	-	-	-	-
UnSkLab	-	-	0.0	5.8	-	-	-	-
SkLab	-	-	0.0	5.7	-	-	-	-
Capital	-	-	0.0	6.4	-	-	-	-
NatlRes	-	-	-0.1	-10.2	-	-	-	-
Rice	0.1	-0.4	0.0	2.6	0.3	-6.6	0.2	4.3
Other_cereal	0.0	-0.7	0.0	2.5	0.0	-2.1	0.1	1.7
Veg_fruits	0.1	-3.1	0.1	2.0	0.4	-4.0	0.0	7.8
Sugar	0.2	-6.2	0.1	3.3	0.2	-10.6	-0.5	18.0
Other_agric	0.0	-3.7	0.1	2.0	-0.1	-6.5	0.2	5.0
Cattle_anim	0.0	0.0	0.0	2.5	-0.1	-4.1	0.1	5.6
Milk_diary	0.0	0.6	0.0	3.1	-0.3	38.8	0.6	15.4
Forest_wood	0.0	-8.0	0.0	4.0	0.4	-14.1	0.1	10.6
Fishing	0.0	-1.2	0.1	1.6	-0.1	-1.1	0.1	7.1
Minerals	0.0	-5.9	0.0	0.1	-0.1	1.1	0.1	-6.9
Meat_bovine	0.0	-1.9	0.0	3.3	0.7	-6.0	0.3	28.3
Meat_nec	0.0	-0.2	0.0	3.3	-0.1	-2.2	0.2	14.2
Bev_tobacco	0.0	-0.4	0.0	4.2	0.3	-1.3	0.0	9.0
Otherfoodpro	0.1	-4.6	0.0	2.9	1.3	-7.1	0.0	10.5
Textiles	0.7	45.5	-0.1	1.2	11.8	92.2	3.3	48.2
Apparel	0.4	40.7	-0.1	0.8	15.7	74.5	1.7	23.9
Leather	0.2	-6.1	0.0	2.7	2.0	-2.9	0.1	12.7
Mineral_prod	0.0	-6.9	0.0	2.7	0.2	-11.1	0.1	5.5
Other_manuf	0.0	-13.7	0.0	2.8	0.0	-16.1	0.1	3.9
Services	0.0	-0.6	0.0	4.6	-0.1	-11.8	0.0	8.9

There are also important efforts in each country to improve ports and airports, and to coordinate regional customs modernization and harmonization. All these complementary policies, together with the expanding logistics, transport and distribution services, present a promising outlook for Central America as a future investment and trade platform for the Americas and the rest of the world. Leading global companies (e.g. Intel, Siemens, Hydro Quebec, AT&T, Maersk-SeaLand, and Procter & Gamble) are investing and even placing their Latin American headquarters in the region, an optimistic signal for the future of business and economic growth. CAFTA can contribute to this process, attracting the necessary investments to increase productivity in Central American countries, and consolidate the development of a regional market of significant scale.

To assess for the potential impact of these complementary policies, we conduct four experiments. First, we estimate the effects of trade facilitation and then assess the potential impact of CAFTA on the employment conditions in CA. In a third experiment we model an increase in FDI flows to CA, by allowing capital accumulation to be endogenously determined in the model to reflect differences in expected returns from both regions. Finally, we explore an "optimistic scenario" experiment where the three previous results are simultaneously assessed.

6.1 Trade facilitation

In the GTAP setting trade costs are modeled using the "iceberg cost" approach. This implies that no specific international transportation sector is modeled, but instead that there is a markup between the effective price of goods and services between importers and exporters. This markup is lost ("melted") and cannot be explained by tariffs or NTBs, or can be assigned to any region or institution.

Using this approach, we can model trade facilitation mechanisms as a decrease in these iceberg trade costs. These efficiency-enhancing trade facilitation mechanisms include customs automatization, improvements in ports and roads that reduce transportation costs, and the simplification of custom procedures that serve to reduce effective import prices.[28]

When we include a uniform 2% decrease in transportation costs between both regions and within CA, to simulate an improvement in trade facilitation mechanisms, the gains from CAFTA are highly increased. First, 10% further increase in trade volumes between both regions is reached. In addition, welfare gains for CA rise by US$729 million with respect to our baseline case, which are motivated by a 3.6% increase in terms of trade and additional increases in wages and capital returns in the region. These increased trade volumes amplify our previous results. In Table 13 we project further increases in the volumes of T&A form CA to the US, while the agricultural output reduction in the former region are also enlarged.

[28] Hertel *et al*. (2001).

Table 13: CAFTA baseline with a 2% trade facilitation increase (percentage changes)

	Output		Market price		X fob		M cif	
Sector code	USA	CA	USA	CA	USA	CA	USA	CA
Land	-	-	0.3	-9.0	-	-	-	-
UnSkLab	-	-	0.0	8.1	-	-	-	-
SkLab	-	-	0.0	8.2	-	-	-	-
Capital	-	-	0.0	8.9	-	-	-	-
NatlRes	-	-	-0.1	-9.8	-	-	-	-
Rice	2.3	-13.3	0.2	1.5	8.9	-27.3	0.7	72.3
Other_cereal	0.0	-2.1	0.1	3.0	0.0	-3.0	0.2	1.2
Veg_fruits	0.1	-3.0	0.1	2.8	0.5	-3.2	0.1	10.1
Sugar	0.3	-7.7	0.1	4.3	3.5	-12.0	-0.1	72.5
Other_agric	0.0	-4.2	0.1	2.7	-0.1	-5.8	0.4	8.4
Cattle_anim	0.1	-2.1	0.1	2.9	-0.2	-4.0	0.2	6.0
Milk_diary	0.1	-1.9	0.0	3.7	7.3	35.4	0.7	29.8
Forest_wood	0.0	-9.9	0.0	5.3	0.6	-13.3	0.1	14.8
Fishing	0.0	-1.3	0.0	3.0	-0.1	0.1	0.1	10.1
Minerals	0.0	-6.8	0.0	1.0	-0.1	5.8	0.1	-7.5
Meat_bovine	0.1	-1.6	0.0	4.2	0.8	-2.3	0.4	37.6
Meat_nec	0.2	-7.9	0.0	4.2	2.5	-31.0	0.3	92.8
Bev_tobacco	0.0	0.1	0.0	5.6	0.3	-0.2	0.0	11.4
Otherfoodpro	0.1	-4.7	0.0	3.4	1.4	-5.0	0.1	12.5
Textiles	0.8	51.3	-0.1	1.8	13.8	107.5	3.8	56.0
Apparel	0.4	47.5	-0.2	1.5	17.6	87.7	1.9	27.6
Leather	0.3	-7.3	0.0	3.6	2.4	-1.8	0.1	16.6
Mineral_prod	0.0	-8.3	0.0	3.5	0.2	-9.6	0.1	7.0
Other_manuf	-0.1	-15.7	0.0	3.8	0.0	-15.8	0.1	5.8
Services	0.0	-0.5	0.0	6.4	-0.1	-14.8	0.1	13.1

6.2 Employment gains in CA

One of the most anticipated gains from CAFTA for CA is expected on increased employment opportunities for the region, which can curb low wages and high under-employment and sub-utilization rates. In turn, these improved labor conditions can ease the high poverty rates in the region.

While our baseline scenario shows a wage increase of around 5.6% for both skilled and unskilled labor, these figures are implicitly assuming full employment. As shown in Section 2, despite relatively low unemployment figures, labor sub-utilization is a serious problem in CA. Therefore, a more realistic simulation must take into account these labor market characteristics.

To simulate an eventual positive impact of the agreement on employment, we change the closure rule of the basic GTAP model. Thus, we fix unskilled workers wages in CA, to allow for trade shocks to adjust the number of unskilled employed workers.[29]

Using this closure rule under our baseline scenario, CAFTA increases employment of unskilled workers by 5.6%. In addition, GDP presents a significant increase of 2.2%, determined

[29] This is done by letting the variable "endwslack" capture the increase in employment in CA.

by the use of previously idle workers. Thus, even when sub-utilization figures will remain high, CAFTA can be a very positive influence to tackle this problem in the region, while providing a significant increase in production. However, we also find that Central American output and exports are still biased toward the T&A sector, with the related decrease in the agricultural employment and production.

6.3 Assessment of Dynamic Effects

Many of the economy-wide effects of increased trade openness are dynamic in nature. While an improvement in the allocation of resources is the main static effect of liberalization, most of the expected gains from increased trade are dynamic. These include more and cheaper inputs and final products, procompetitive effects associated with increasing returns to scale and the erosion of market power (Francois *et al.*, 1996). However, the increase in investment flows is generally regarded as the main dynamic effect associated with trade liberalization.

Overall, static gains from trade are relatively small with respect to base GDP and this is not consistent with cross-country estimates of trade and growth. These studies imply that there is a strong link between increased trade, more investment and growth.[30] Thus, in order to assess the wider impact of trade liberalization it is important to include some estimates of the dynamic gains associated with increased investment and capital accumulation.

6.3.1 Implications of expected FDI increased flows

As explained in Section 2, US FDI to the region is highly significant and CAFTA is expected to increase these investment flows. In addition, the stock of US foreign direct investments in the region is relatively high at US$3 billion.[31] To take full advantage of CAFTA, the greatest challenge for the region is to improve its productivity and competitiveness. One of the most important expected effects of CAFTA on Central America will be the “agreement-pushed”

[30] Some literature surveys on the topic include Edwards (1993), Barro and Sala-i-Martin (1995), and Easterly (2001).

[31] According to USTR data.

reforms and policy changes that would create a better investment climate for US companies, and at the same time generate positive externalities for other foreign firms interested in investing in the region.

Besides the expansion of trade flows, CAFTA builds the foundations for a development path in Central America based on increasing foreign direct investments, the creation of productive linkages with local firms and cluster consolidation, the transfer of technology and human capital formation, and the reinforcement of integration strategies in the region. Already some advances have been made in Central America with the creation of regulatory frameworks and incentives schemes to attract more foreign companies.

Preference-sensitive products like textiles and apparel, bananas, and sugar, will have a better positioning with CAFTA, although important forces outside the region's control influence the international markets for these products. Other goods like fruits and vegetables, forestry products, and processed food have growth potential, particularly if higher value is added with further processing, product differentiation, and quality improvements. Growing sectors like electrical equipments and medical devices, and apparel and textiles are foreign investment-led activities, so further improvements in the competitiveness climate of the region should help consolidate and expand investments and trade in these sectors. New business opportunities in the expanding eco-tourism sector, and nature-based activities like bio-prospecting and environmental services, should gain more prominence in the region's competitive positioning.

Under our baseline scenario there is already a significant flow of capital to CA. The current net rate of return on the capital stock (RORC) of the region is increased by 5.7% in our CAFTA baseline scenario. Since this rate of return in the rest of the regions does not change, the agreement creates large incentives for FDI flows towards the region. This condition is partially responsible for the increase of 6.5% in the output of capital goods in CA and a rise of 0.6% in the end-of-period capital stock.

However, given the provisions contained in CAFTA to ease US investments in CA, it is expected that greater FDI flows can be obtained under the agreement. We would account for this increased FDI flows by allowing capital accumulation to endogenously adjust and take advantage of the differences in rates of return between both regions.

6.3.2 FDI and Capital Accumulation in GTAP

In this subsection we focus our analysis in the relationship between trade openness and increased capital formation. In our previous static model, the savings rate and initial capital are held constant, while end-of-period capital is increased to reflect changes in the net rate of return and the ease with which excess savings are allocated between regions. However, the final level of capital does not affect the main economic results associated with tariff reductions (e.g. GDP, welfare, trade volumes).

Following Francois *et al.* (1996), we can assess the impact of increased capital accumulation by changing the closure rule of the standard GTAP model. To do this, we assume that the savings rate and the initial level of capital are endogenously determined and thus, the increase in capital associated with trade liberalization is directly integrated into the results of the simulation.

In practical terms, GTAP uses the end-of-period capital level, which is associated with the new savings rate and the flow of FDI from regions with lower capital returns, as the initial capital level. Hence, the trade shocks are implicitly considering the capital accumulation associated with the shock itself. In this way, although we are not explicitly using a dynamic model, we proxy the dynamic effects of capital accumulation.

6.3.3 Capital accumulation under CAFTA

As explained before, one of the main issues negotiated in CAFTA was the inclusion of legal and administrative provisions to ease the flow of FDI into the region. Moreover, given that the CBI already grants market access to the US for many Central American products, it is expected that investment will provide the biggest economic impact of the agreement for the region (The Economist, 2005b).

Therefore, we can link FDI flows into the region with an increase in the amount of capital. In our GTAP model, we assess this effect by including an additional scenarios were we shock our baseline case by changing the closure rule to include endogenous capital accumulation and saving rates. The results show an increase in the initial stock of capital of 8.7%; and this in turn is associated with a very significant 4% raise in both GDP and social welfare. As before, output changes are concentrated in the T&A sectors, but given an increase in the productive capacity of

the economy, there is not a reduction in all other sectors and some are even expanding (i.e. services, beverages and tobacco, milk and diary products).

6.4 Optimistic scenario

Until now, we have assessed the impact of individual shocks compared with our baseline scenario where CAFTA only alters the tariffs between both regions. However, it is relevant to assess the full impact of the trade agreement when all these individual shocks take place. While the baseline scenario can be considered to be a lower bound assessment where only tariff removal is considered, this last cumulative scenario can be described as the optimistic outlook of CAFTA. In this last case, the agreement generates increased FDI, trade facilitation mechanisms that reduce the markup between world and domestic prices and, additionally, reduces the high under-employment rates of the region.

The joint impact of these positive assumed outcomes is achieved by changing the closure rules and adding shocks to our baseline scenario. The new macroeconomic closure rule reflects two changes. First, it allows capital to increase, due to the expected flows of FDI into the region. Secondly, it changes the unskilled labor market closure, where wages are now fixed and the market is cleared by the quantity of unskilled labor supplied. Finally, for the additional shocks we assume a 2% decrease in the transport costs to reflect the impact of trade facilitation mechanisms.

As expected, this upper-bound scenario produces significant welfare gains for CA with an increase of roughly US$4,500 million. This improvement is primarily supported by the increase in factor endowments, where unskilled labor raises by 11.5% and the capital stock by 16.3%. In addition, GDP is increased by a very significant 12.3%, while skilled labor wages increase by almost 9%.

Table 14: CAFTA, optimistic scenario (percentage changes)

	Output		Market price		X fob		M cif	
Sector code	USA	CA	USA	CA	USA	CA	USA	CA
Land	-	-	0.3	12.0	-	-	-	-
UnSkLab	-	11.5	0.1	0.0	-	-	-	-
SkLab	-	-	0.0	8.9	-	-	-	-
Capital	-	16.3	0.1	-0.3	-	-	-	-
NatlRes	-	-	0.0	20.7	-	-	-	-
Rice	2.4	-5.8	0.2	-0.5	9.2	-19.2	0.8	76.1
Other_cereal	0.1	6.1	0.1	3.0	0.3	2.7	0.2	10.0
Veg_fruits	0.0	0.5	0.1	1.9	0.4	-1.3	0.2	14.1
Sugar	0.0	3.3	0.0	0.6	2.9	0.2	0.5	69.1
Other_agric	0.0	1.8	0.1	2.3	0.0	-4.0	0.5	16.5
Cattle_anim	0.0	5.5	0.1	2.7	-0.2	-0.3	0.2	12.9
Milk_diary	0.1	5.3	0.1	0.7	6.5	52.6	0.9	28.1
Forest_wood	0.0	7.2	0.0	-0.4	0.4	9.5	0.2	16.6
Fishing	0.0	2.3	0.1	5.9	-0.1	-2.2	0.2	16.2
Minerals	0.0	2.7	0.0	2.3	0.1	-4.9	0.1	12.9
Meat_bovine	0.0	4.9	0.1	1.2	0.6	14.7	0.7	35.3
Meat_nec	0.1	-2.2	0.1	1.6	2.2	-19.9	0.3	84.3
Bev_tobacco	0.0	6.1	0.0	-0.1	0.3	5.2	0.1	10.5
Otherfoodpro	0.1	3.0	0.0	0.1	1.2	3.9	0.2	13.5
Textiles	0.7	99.7	-0.1	-2.1	18.3	159.3	5.0	85.2
Apparel	-0.1	91.3	-0.2	-2.8	17.3	138.9	2.7	26.4
Leather	0.2	13.6	0.0	-1.0	2.0	27.9	0.1	18.6
Mineral_prod	0.0	10.6	0.0	-0.5	0.3	12.4	0.2	17.0
Other_manuf	-0.1	9.6	0.0	-0.4	0.0	10.6	0.2	12.8
Services	0.0	8.6	0.0	1.0	-0.1	-1.6	0.1	11.6

From Table 14 we observe again a high specialization in the *maquila*-based T&A sector, which is a constant throughout all our simulations. Nevertheless, now most of the CA economy is also expanding and only two sectors are shrinking (rice and meat_nec). Thus, in this optimistic scenario most of the expected gains from trade are realized and the general economic results are positive.

7 Estimations to disaggregate the welfare effects of CAFTA between Costa Rica and the rest of Central America

As noted before, the economic characteristics and productive structure of Costa Rica are different from the rest of Central America. Thus, it is interesting to assess how CAFTA can affect the Costa Rican economy.

To estimate the effects of CAFTA on the Costa Rican economy, first we divide the CA region in two sub-regions: Costa Rica (CR) and the rest of Central America (XCA). Then we proceed to disaggregate the total regional welfare equivalent variation between both sub-regions.

Welfare effects are estimated in GTAP using the following formula:

$$EV(r) = u(r) * \frac{INC(r)}{100}$$

where *EV(r)* measures the welfare equivalent variation in 2001 million US$, *u(r)* represents per capita welfare and *INC(r)* is a coefficient that reports initial equilibrium values for regional expenditure (Hertel and Tsigas, 1997).

From this formula, we know that changes in social welfare are measured by changes in real income. This in turn, can be divided between pure income gains, and the drop in consumer's cost of living. The first effect is driven by the increase and new allocation of output across productive sectors, while the second effect measures the impact of price changes in welfare.

7.1.1 Income effects

To disaggregate the income effect between sub-regions, we use an output decomposition approach. This assigns the total change in value added to each productive sector, using the sectoral shares of each sub-region. In this way, we can measure the participation of each sub-region's sector in total output. With this information we know how production is affected in each sub-region.

In the case of Costa Rica we use data from the Central Bank's national accounts.[32] Then we map this particular sector aggregation (121 sectors) to the full 57 GTAP sectors and finally, to the 20 sector aggregation we used in our model. To obtain the GDP weight of Costa Rica in total Central American GDP we use World Bank's World Development Indicators (WDI) GDP data at current 2001 US$. There is a slight difference between WDI and GTAP data, so we adjust the WDI data to match the GTAP data, and then we estimate the share of each Costa Rican sector. These shares are presented in the following table.

[32] "Cuadros de oferta y utilización," Central Bank of Costa Rica (2004).

Table 15: Central America and Costa Rica, GDP per sector, 2001

	CA	CR	CR shares
1 Rice	354.2	69.6	19.7%
2 Other_cereal	259.2	1.3	0.5%
3 Veg_fruits	2,368.9	661.5	27.9%
4 Sugar	911.9	105.2	11.5%
5 Other_agric	2,124.4	212.6	10.0%
6 Cattle_anim	1,293.4	213.3	16.5%
7 Milk_diary	1,157.7	227.6	19.7%
8 Forest_wood	2,201.4	291.3	13.2%
9 Fishing	495.1	96.4	19.5%
10 Minerals	390.8	24.6	6.3%
11 Meat_bovine	910.9	67.2	7.4%
12 Meat_nec	733.2	81.8	11.2%
13 Bev_tobacco	1,255.5	191.9	15.3%
14 Otherfoodpro	3,562.9	336.6	9.4%
15 Textiles	2,797.1	39.6	1.4%
16 Apparel	2,743.5	166.9	6.1%
17 Leather	436.2	11.1	2.5%
18 Mineral_prod	4,497.2	562.0	12.5%
19 Other_manuf	6,349.3	1,205.9	19.0%
20 Services	35,306.3	10,915.7	30.9%
Total	**70,149.1**	**15,482.1**	**22.1%**

Costa Rica represents 22% of regional output and has significant participations in rice, vegetables and fruits, milk and diary products, other manufactures and services. It is important to note that the T&A sector is not significant in CR, in contrast to its weight for the rest of Central America.

Once we have the CR output shares we can divide total income gains by applying these shares to the changes in value added per sector reported in each GTAP scenario we run. Finally, we sum up the sectoral changes to obtain the total income gains for CR. The results for the three main scenarios are shown in Table 16.

In the first scenario, with the increase in Chinese textile competition we observe that XCA total income is decreasing. This is driven by the contraction of the T&A sectors. Given the small participation of these sectors in CR and that the rest of the economy is expanding, total income is increasing.

However, in our CAFTA baseline scenario we observe the opposite effect. Income is increasing in XCA because of a sharp specialization in the T&A sectors, while Costa Rican income decreases.

Table 16: Costa Rica and the rest of Central America, value added changes by sector, US$ million

	ATC protocol		CAFTA: baseline		CAFTA: optimistic	
Sector code	**XCA**	**CR**	**XCA**	**CR**	**XCA**	**CR**
Rice	1.2	0.3	-33.0	-8.1	-16.1	-3.9
Other_cereal	1.3	0.0	-2.2	0.0	15.3	0.1
Veg_fruits	18.9	7.3	-42.7	-16.5	7.8	3.0
Sugar	22.3	2.9	-48.8	-6.4	25.3	3.3
Other_agric	34.4	3.8	-51.4	-5.7	32.1	3.6
Cattle_anim	0.9	0.2	-18.3	-3.6	57.4	11.3
Milk_diary	3.1	0.8	-14.5	-3.5	47.4	11.6
Forest_wood	49.0	7.5	-142.7	-21.8	130.5	19.9
Fishing	1.4	0.3	-5.1	-1.2	9.0	2.2
Minerals	9.2	0.6	-19.7	-1.3	9.4	0.6
Meat_bovine	3.7	0.3	-12.9	-1.0	39.8	3.2
Meat_nec	0.1	0.0	-42.9	-5.4	-13.8	-1.7
Bev_tobacco	-0.5	-0.1	-3.6	-0.7	63.4	11.4
Otherfoodpro	39.4	4.1	-131.7	-13.7	93.4	9.7
Textiles	-273.5	-3.9	1,375.0	19.8	2,941.9	42.3
Apparel	-622.7	-40.3	1,292.5	83.7	2,848.5	184.5
Leather	19.7	0.5	-21.8	-0.6	53.9	1.4
Mineral_prod	108.9	15.6	-248.4	-35.5	395.5	56.5
Other_manuf	328.1	76.9	-626.0	-146.8	450.3	105.6
Services	46.3	20.7	-150.6	-67.4	2,039.4	912.7
Total	**-209.0**	**97.5**	**1,051.1**	**-235.7**	**9,230.5**	**1,377.3**

In our last scenario, the significant increase in Central American income driven mainly by the accumulation of capital allows income to increase in both regions. However, the increase in XCA is proportionally higher than that in CR.

These allocation patterns are a direct result of treating the whole region as homogenous and will be further analyzed bellow.

7.1.2 Cost of living effects

This effect is estimated by subtracting the income effect from the total increase in welfare *EV(r)*. Since prices are equalized along regions in GTAP, we can assess the cost of living effect by assigned this remaining welfare gains to each sub-region by applying GPD weights. Therefore, the differences in equivalent welfare variation between regions are only driven by our output decomposition.

In Table 17 we show the net welfare results for both sub-regions when the initial ATC protocol implementation is added to the CAFTA results.

Table 17: Costa Rica and the rest of Central America, net welfare decomposition

	Welfare net gains (mill. US$)		EV / base GDP		GDP (% change)		Cost of living (mill. US$)	
SCENARIO:	**XCA**	**CR**	**XCA**	**CR**	**XCA**	**CR**	**XCA**	**CR**
ATC protocol	-543	2.8	-1.0%	0.02%	-0.4%	0.6%	-0.6%	-0.6%
CAFTA: Baseline	673	-186	1.2%	-1.2%	1.5%	-0.9%	-0.3%	-0.3%
Full sugar liberaliz.	758	-150	1.4%	-1.0%	1.5%	-0.9%	-0.1%	-0.1%
CA food protection	694	-170	1.3%	-1.1%	1.5%	-0.8%	-0.3%	-0.3%
Trade facilitation	1,273	-57	2.3%	-0.4%	1.7%	-1.0%	0.6%	0.6%
Fixed unsklab wages	524	-394	1.0%	-2.5%	4.3%	0.8%	-3.3%	-3.3%
Endog. capital acc.	2,201	103	4.0%	0.7%	6.1%	2.8%	-2.1%	-2.1%
CAFTA: Optimistic	3,905	26	7.1%	0.2%	16.5%	9.5%	-9.4%	-9.4%

The main result is that the equivalent welfare variation for CR is negative for most of our scenarios. Only when unskilled labor and capital endowments are increased do the welfare changes become positive.

This is a direct consequence that under our GTAP specification, the model is treating the whole Central American region as a single homogenous economy. Thus, production can shift from one sub-region to the other without problems. Moreover, production and consumption patterns are driven by the parameters of the whole region and therefore, the simulation results for CR are being determined by the changes that will probably occur for the rest of the region, but not necessarily for CR.

This is not a realistic situation and to fully account for the separate effects that CAFTA can cause on the Costa Rican economy we must include the country in the GTAP database and run the simulations with CR as a region apart. This can greatly improve our numerical estimations and the robustness of our results. It is not only important to empirically assess the potential production and consumption changes in Costa Rica, but also because the current results for the rest of the region are also blurred by the inclusion of a more diversified economy as the Costa Rican.

Still, some important conclusions can be derived from the former exercise. First, the US tariff reductions negotiated under CAFTA will barely affect the production patterns of CR. Instead, it is the elimination of local tariffs what will cause most of the changes. Thus, since Costa Rica's main exports already enter the US market without tariffs under the CBI, it gains little from US tariff reductions. Potential gains from the agreement can be obtained from a better

allocation of local production away from products were US imports are cheaper and by the expected decrease in the cost of living associated with the possibilities to buy cheaper imported products.

Secondly, the main CAFTA outcomes for CR will be associated with the potential dynamic effects related with increased FDI flows, and the step up of trade facilitation mechanisms. In the disaggregation exercise presented above, there are positive welfare gains from CAFTA when the capital stock is allowed to increase and reflect the potential new FDI flows into the region. This is important because in the former exercise CR is changing its production allocation in an inefficient way by following the rest of Central America's comparative advantages. If CR is allowed to follow its own comparative advantages, we can certainly expect the change in total income to be positive, or at least, less negative. With the increased productive capacity associated with more factor endowments, CAFTA would represent a significant welfare improvement for the country.

To numerically estimate these effects we can use the welfare decomposition available in GTAP. Here we obtain a decomposition of the welfare variations associated with the different sources of welfare gains. This decomposition is divided into allocation gains, endowments, technological change, terms of trade and IS effects.[33] The first effect represents the income gains related to a more efficient allocation of resources once tariff distortions are eliminated. The second effect measures the welfare improvements provided by an increase in the endowment of productive factors. Technological change is associated with more efficient use of existing factors, while terms of trade gains are a direct result of national income increasing by a favorable international price set. Finally, the IS effects refer to the equivalent welfare variations associated with changes in saving rates and the consequent increase in expected future utility.

Table 18 summarizes the results for our main scenarios.[34] In our first CAFTA experiments the welfare changes are dominated by terms-of trade improvements, while a better allocation of resources and the IS effects are also positive and significant. However, it is clear that the main

[33] There is also welfare variations associated with population and consumer preferences changes, which do not apply for the type of experiment we perform.

[34] Instead of using the scenario where unskilled wages are fixed, we directly shock our baseline case with the equivalent increase in unskilled labor of 5.6%. In this way, we can directly measure the impact of more employment in the welfare variation, which is not accounted for when we just leave the wages fixed.

potential gains of CAFTA for CA as a whole are provided by the increase in unskilled labor employment and the stock of capital provided by higher FDI flows into the region. These welfare changes easily dominate the other three effects.

Table 18: Welfare decomposition for Central America, US$ million

SCENARIO:	Total	Allocation	Endowm.	Techn.	TOT	IS
ATC protocol	**-540.5**	-109.1	0.0	0.0	-325.2	-106.2
CAFTA: Baseline	**1,027.8**	176.0	0.0	0.0	646.5	205.3
Full sugar liberaliz.	**1,148.9**	192.9	0.0	0.0	728.9	227.1
CA food protection	**1,064.9**	168.0	0.0	0.0	683.5	213.4
Trade facilitation	**1,756.3**	234.5	0.0	332.6	909.3	279.9
Unsklab increase	**2,319.8**	318.9	1,223.9	0.0	593.8	183.2
Endog. capital acc.	**2,845.2**	400.5	1,840.1	0.0	460.8	143.8
CAFTA: Optimistic	**4,471.5**	698.2	3,449.4	352.5	3.1	-31.7

Also the implementation of trade facilitation mechanism results in a technological improvement. This is provided by fewer waists associated with a more efficient transport technology and with a direct improvement of terms-of-trade because the markup between international and local market prices is reduced.

Applying these results to CR, it can be reaffirmed that the dynamic effects of CAFTA represent the most important potential gains for this economy.

7.1.3 CAFTA not ratified by Costa Rica

Currently CAFTA has already been ratified by the Dominican Republic, El Salvador, Honduras and Guatemala and it is expected to be ratified soon in Nicaragua. In Costa Rica, however, the agreement has not yet been sent to Congress for its discussion and approval. It is interesting to evaluate the outcome of a possible scenario without CAFTA, in order to estimate the potential impacts for Costa Rica.

In our exercise we cannot directly estimate the economic consequences if CAFTA is implemented by the rest of CA and not in CR. To do this, we need to have CR as a separated region in our estimations. This will allow us to change the tariff rates and economic conditions in

the rest of the region, while they are left unchanged in Costa Rica. Nevertheless, from the results of our former sections, we can make some general remarks.

First, one of the main advantages for CR of implementing CAFTA will be that it will no longer rely on the unilaterally set CBI policy by the US. As explained above, a big proportion of Costa Rican exports actually enter the US market under this initiative. While the CBI is expected to be operating in the following years, there is no insurance that it will be extended. In the short run, this creates additional uncertainty for business that may be evaluating to increase production and make future investments. In the medium-run, the discontinuation of the CBI will have appalling consequences for many productive sectors that export mainly to the US. Moreover, given the importance of US demand to Costa Rican production, this will necessary have a significant negative impact on the main macroeconomic indicators of the country.

Most importantly, the significant flows of FDI from the US to CR can be cut short. A reduction in FDI flows will not only provoke a serious balance of payment readjustment (a very significant part of the current account deficit of CR is continually financed by FDI flows which mainly come from the US), but FDI flows have also a positive and significant impact of actual and future production and employment. Therefore, the reduction in FDI flows is perhaps the most threatening perspective in the hypothetical case that CR did not endorse CAFTA.

We have shown that the CAFTA dynamic effects are the most relevant for Costa Rica. However, in that particular case we have assumed that the agreement was ratified in the entire region and thus, the potential gains could be realized. In our current scenario, Costa Rica will not only lose these considerable potential welfare gains, but it is a distinctive possibility that it can be left worse off.

The reduction of FDI to CR can be the expected outcome of various scenarios. Firstly, it can reflect the uncertainty associated with the market access of certain products to the US (either under CAFTA or the CBI). Secondly, foreign businesses which were intended to invest in CR could find it more attractive to invest in other Central American countries if CAFTA is not ratified in CR. Finally, from a long-run point of view, if CAFTA is not implemented, it can signal a negative perspective for future economic growth and thus, it can avert future FDI. Several studies from academics and international organizations have shown that for small economies, it is highly improbable to sustain high growth rates for a significant period without a strong commitment to free trade policies.

A third source of potential welfare changes can be the squatter of consumer surplus related to cheaper US imports. From the current tariff protection structure we previously analyzed, it is clear that CAFTA will reduce the real price of many food products like rice and diary products. These products are widely consumed in CR and it is likely that the producers lose associated with the elimination of tariff rents and the reallocation costs, are less than the consumer surplus.

In addition, the impact of lower food prices is more relevant for poor household than for richer ones. This is a direct consequence of the fact that poor households consume a higher proportion of their income, and that the expenditure share of food products is significant. On the other hand, the initial adjustment and transitional costs for producers can also be significant and have not been directly estimated in our experiments. Poorer households are less capable and prepared to cope with adjustment strains. Thus, the importance of complementary policies to deal with the losers of the agreement can prove to be very high.

Finally, the political uncertainty surrounding the ratification of CAFTA in Costa Rica can also have a significant economic impact. Since the mid 80s, CR has relied on a development strategy based on export and FDI promotion. This has lead to a progressive increase in trade openness, the volume of imports and exports and a significant increase of FDI flows into the country. Several FTA have been negotiated and although there are not as significant as CAFTA, they have clearly signaled a strategy of progressive trade liberalization. Halting this process can create considerable uncertainty regarding the international economic policies of the country, and this can seriously interfere with investment and production decisions.

8 Summary and conclusions

In this last section we present a summary in Table 19 of the main results for all the scenarios. From the point of view of the US, CAFTA represents insignificant overall changes in its main macroeconomic indicators. From the different scenarios, some sectors are benefited from the agreement, mainly rice and the T&A sector, which is expected to provide intermediate inputs to

the T&A *maquilas* of CA.[35] Moreover, bilateral trade volumes are significantly boosted, form values between 25% and 60% for the different scenarios.

Table 19: CAFTA, summary results for all scenarios

	Welfare gains (mill. US$)		Welfare net gains /1 (mill. US$)		GDP (% change)		Household Income (% change)		Terms of trade (% change)		Bilateral trade volume (% change)	
SCENARIO:	**USA**	**CA**	**USA**	**CA**	**USA**	**CA**	**USA**	**CA**	**USA**	**CA**	**USA**	**CA**
Initial values (mill. US$)	-	-	-	-	10,082,153	70,149	-	-	-	-	23,169	23,044
ATC protocol	6,293	-541	6,293	-541	0.0	-0.2	-0.1	-2.3	0.3	-1.3	-8.0	-7.4
CAFTA: Baseline	116	1,028	6,408	487	0.0	0.3	0.0	4.1	0.0	2.6	26.7	27.4
Full sugar liberaliz.	55	1,149	6,348	608	0.0	0.3	0.0	4.6	0.0	2.9	27.8	28.6
CA food protection	81	1,065	6,373	524	0.0	0.2	0.0	4.4	0.0	2.7	25.4	26.3
Trade facilitation	395	1,756	6,688	1,216	0.0	0.8	0.0	6.4	0.0	3.6	36.3	37.2
Fixed unsklab wages	270	671	6,563	130	0.0	2.2	0.0	2.1	0.0	1.4	30.5	31.1
Endog. capital acc.	247	2,845	6,540	2,305	0.0	4.1	0.0	6.3	0.0	1.8	31.8	32.5
CAFTA: Optimistic	1,006	4,471	7,299	3,931	0.0	12.3	0.0	6.8	0.1	0.0	55.5	56.0

Notes: /1 After excluding the effects of the ATC protocol scenario
Source: GTAP database 6.0 pre-release 3.11 and own estimations

For the five Central American economies, CAFTA represents a series of opportunities that can be exploited, but also a series of critical challenges. Given the importance of US trade and investment in the region, in addition to the huge size differences between both regions, the agreement produces significant sectoral and economy-wide effects.

It is clear from Table 19, that the most welfare-improving mechanism in CAFTA is the increase in FDI and the capital stock of the region. This observation points to the importance of exploiting the investment opportunities associated with a bilaterally determined and permanent privileged market access to the US. If CAFTA can improve the investment climate in the region and this is complemented with economic policies that improve infrastructure and increase competitiveness, then the region can achieve a path of sustainable growth.

The key factor for CA will be the scope and depth of the complementary policies associated with CAFTA. After analyzing the Mexican experience with NAFTA, Lederman *et al.* (2004) conclude that FTAs with the USA offer great opportunities for Latin American countries, but without these complementary policies, there is no guarantee that the agreement can increase

[35] Although we do not explicitly create any restrictions to account for rules of origin, in all our simulations CAFTA produces an increase of T&A imports from the US to CA, with a decrease of imports from the other two regions.

growth. In relation to CAFTA, the same conclusions are reached by the World Bank (2005). In addition, they analyze and report the specific complementary policies most needed in each Central American country.

Therefore, without complementary economic policies, CAFTA can be considered mainly as a balancing force to counteract the negative impact of the implementation of the ATC protocol. Given the great of importance of T&A commerce with the US, the CA economy without CAFTA will be hurt by the increased competition of Chinese textiles and apparel goods. Even when our baseline scenario produces modest but positive welfare gains and the improvement of labor market outcomes, CAFTA also incentives a higher concentration in the already significant *maquila*-based T&A sector of the region. This specialization is so important that roughly two thirds of exports will be supplied from these two sectors alone.

In turn, to generate this sectoral concentration, resources must be taken from the rest of the economy. The agricultural sector is significantly affected by this process, which is complemented by the reduction of import protection negotiated in the trade agreement. When we assess a medium-term simulation of the agreement by not liberalizing the agricultural sector in CA, this situation is partially reverted. This highlights the importance of complementary policies in the agricultural sector which can mitigate or reverse these negative effects, while the phase-out of import protection is not fully implemented.

One significant drawback from CAFTA is that US sugar protection is mainly unaffected, in clear contrast to the recent rhetoric of this influential industry in the US. With the liberalization of the sugar sector, the problematic imbalances created between the rural and urban sectors in CA could have been adverted, with additional welfare improvements for the region.

If the region can effectively implement the complementary economic policies that are expected, then we could reach the significantly positive outcomes estimated in our upper-bound scenario. In any case, the favorable impact in the labor market outcomes, if it is assessed as an increase in wages or a reduction in unemployment, generate key welfare gains which can be shared by the workers of the region and create a positive income increase for poor families. If in addition, labor market legal conditions are also improved with the implementation of CAFTA, these positive outcomes could be even higher.

Finally, in the case of Costa Rica, CAFTA does not seem as favorable as it is for the rest of Central America. The first reason is that it has little to gain from T&A exports to the US.

Moreover, Costa Rica will open some sensitive markets to US imports (i.e. milk and diary products, poultry, pork, rice, telecommunications and insurance services). This implies that the implementation of competitiveness policies associated with the agreement will be fundamental for this country to take advantage of the increased trade and investment opportunities embedded in CAFTA. Potential gains will depend on FDI inflows. As far as Costa Rica successfully implements policies to improve the country's business and investment climate, the probability of positive effects will increase.

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10 Appendix

Table 20: Main Trade Barriers in Central America

Average Tariffs (%)	Guatemala	El Salvador	Honduras	Nicaragua	Costa Rica
Average nominal external tariff	7.1	6.9	7.1	5.1	7.1
Capital goods	0	0	1	0	0
Inputs	0	0	1	0	0
Intermediate Goods	5 – 10	5 – 10	5 – 10	5	5 – 10
Final Goods	15	15	15	15	15
Most Protected Industries (%)					
Diary products (Milk)	15	40	20	40	65
Corn (yellow)	5 – 35	0	20	0-30	1
Rice	32	40	35	62	35
Sugar	20	40	40	55	50
Pork meat	15	40	15	15	48
Chicken meat	15	20	50	170	150
Non-Tariff Barriers					
Countervailing & anti-dumping	X	X	X	X	X
Safeguards	X	X	X	X	X
Non-automatic licensing		X		X	X
SPS Prohibitions	X	X	X	X	X
Tariff Rate Quotas	X	X	X	X	X
Price Band Controls			X		

Source: Own elaboration with information from SIECA

Table 21: CAFTA sectoral aggregation

	Sector code	Sectors included
1	Rice	Paddy rice; and Processed rice
2	Other_cereal	Cereal grains nec
3	Veg_fruits	Vegetables, fruit, nuts
4	Sugar	Sugar cane, sugar beet; and Processed sugar
5	Other_agric	Wheat; Oil seeds; Plant-based fibers; and Crops nec
6	Cattle_anim	Bovine cattle, sheep and goats, horses; Animal products nec; and Wool, silk-worm cocoons
7	Milk_dairy	Raw milk; and Dairy products
8	Forest_wood	Forestry; Wood products; and Paper products, publishing
9	Fishing	Fishing
10	Minerals	Coal; Oil; Gas; and Minerals nec
11	Meat_bovine	Bovine meat products
12	Meat_nec	Meat products nec
13	Bev_tobacco	Beverages and tobacco products
14	Otherfoodpro	Vegetable oils and fats; Food products nec
15	Textiles	Textiles
16	Apparel	Wearing apparel
17	Leather	Leather products
18	Mineral_prod	Petroleum, coal products; Chemical, rubber, plastic products; and Mineral products nec
19	Other_manuf	Ferrous metals; Metals nec; Metal products; Motor vehicles and parts; Transport equipment nec; Electronic equipment; Machinery and equipment nec; and Manufactures nec
20	Services	Construction; Trade; Transport nec; Water transport; Air transport; Communication; Financial services nec; Insurance; Business services nec; Public Administration, Recreation and other services; Defense, Education, Health; and Dwellings

Figure 1: GTAP Production Structure