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Economic Implications of an Association Agreement between the European Union and Central America

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JEL codes: F13, F15, C68

Key words: trade policy, free trade agreements, CGE models

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Abstract

Using a GTAP CGE model, we assess the potential macroeconomic effects of a future European Union-Central America Association Agreement (EU-CAAA). Currently, many agricultural products from Central America (CA) enter duty-free to the European Union (EU); with two notable exceptions: bananas and sugar. We find that liberalizing the access to both products will bring significant gains to CA, while excluding them from the negotiations will bring no static gains. If trade facilitation mechanisms are implemented and we allow for the expected increase in FDI inflows to CA, welfare gains improve for all scenarios but are conditional on the level of EU agricultural liberalization.

Keywords: trade policy, free trade agreements, CGE models

JEL classification: F13, F15, C68

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1 Introduction

Using the CGE model and database from GTAP¹ we assess the macroeconomic effects of an eventual Association Agreement between the European Union (EU)² and Central America (CA)³, also known as EU-CAAA. We analyze mainly the economic effects for the Central American region and focus on the trade liberalization components of EU-CAAA. A key aspect of the negotiations will be agricultural products. Central America exports mainly agricultural goods to the EU and agricultural protection has a significant political weight in the EU. Thus, we focus our analysis on the potential effects of EU-CAAA on the agricultural sector. To the best of our knowledge, this study is the first CGE assessment of the EU-CAAA.

After the United States, the EU is the second largest commercial partner for Central America. Therefore, the economic effects of EU-CAAA for CA are expected to be significant. On the other hand, the CA economies are too small to produce any significant economy-wide effects in the EU, although some agricultural sectors are affected.

Many agricultural products from CA already have preferential access to the EU under the GSP plus initiative. However there are two significant exceptions: bananas and sugar. Bananas is one of the main Central American exports and sugar is not currently exported, but this is a consequence of the high EU tariffs and subsidies to the sector. If both products are included under EU-CAAA we estimate that the production and export expansion of these goods can be significant.

Free trade is generally regarded as a main engine for economic growth, in particular, for small economies that cannot affect international prices, as is the case for the five Central American countries.⁴ However, many trade agreements do not imply full trade liberalization and the common rule for bilateral negotiations is to leave out “sensible” products and/or sectors. This has been the case of the latest agreements signed by the EU (e.g. with Chile, Mexico, Morocco, and South Africa). In particular, the EU has not changed its policy of agricultural protection as a result of these bilateral trade agreements.

Under these circumstances, we construct three scenarios to analyze the possible outcomes of the negotiations. Our base case scenario assumes full liberalization and thus, evaluates the full impact of EU-CAAA. Following the recent trends in EU trade negotiations, the most likely outcome of EU-CAAA will include partial agricultural liberalization. Therefore, our second scenario analyzes the case when CA is given a similar preferential treatment as the denominated ACP (Africa, the Caribbean and Pacific) countries. Finally, in the last scenario we exclude sensible agricultural products from EU-CAAA.

The standard GTAP-CGE model estimates the static effects of trade policy changes in a medium and

¹The 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.

²In the rest of this paper we refer to the EU as the EU25, i.e. before the entry of Bulgaria and Romania.

³Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua.

⁴See Winters (2004) for a literature overview.

long-run period. Besides the reduction on tariffs there are other potential benefits expected from EU-CAAA. To assess some of these additional gains we include two extensions to the main model. First, assuming that the negotiations will include trade facilitation mechanisms, we reduce the iceberg transport costs between both regions. Secondly, to assess some of the dynamic effects, we include a mechanism of endogenous capital formation to simulate the effects of the expected increased of FDI inflows to CA. Both extensions are run for all three scenarios and are also run together to estimate the potential full impact of EU-CAAA.

In our baseline scenario, with full liberalization CA experiences welfare gains of around US\$1.100 millions. When this scenario is complemented by both increased FDI inflows and trade facilitation mechanisms, the welfare gains are almost doubled to US\$ 2.175 millions and GDP increases by 2 percentage points. The main beneficiary in CA is the agricultural sector, which expands its production and exports. Consequently land rents increase by 40%, while wages rise between 2 and 3%.

On the other hand, in the intermediate scenario where CA obtains the same agricultural concessions as the ACP group of countries, welfare gains account for 0.4% in the static scenarios and 1.2% of GDP in the full impact scenarios (i.e. including trade facilitation and increased FDI inflows). However, in the last scenario where bananas and sugar are excluded from EU-CAAA the potential static benefits virtually vanish, while the full impact estimates are considerably reduced. Welfare gains in this last case account for US\$ 370 millions and GDP raises by 0.7%. Although these are still reasonable gains, they are much lower than with full liberalization. This is a backdrop for CA, since this will be the most likely outcome of the negotiations, given the recent characteristics of EU bilateral trades. To redress the agricultural protectionism of the EU, a small region as Central America could rely on a multilateral initiative (i.e. the Doha round).

However, CA can experience other gains from EU-CAAA. The agreement can consolidate and formalize the GSP plus benefits and incentive FDI inflows to CA. Finally it can enhance the cooperation agreements with the EU, including additional funding to implement a complementary agenda with structural funds that can mitigate any short-term adjustment costs from EU-CAAA and help to lift the export potential of the region.

This paper is organized as follows. Section 2 describes the initial conditions in CA and the characteristics of the bilateral trade with the EU. In Section 3 we describe the GTAP-CGE model. The next section presents the main results of our three scenarios, where we distinguish between the static effects and the simulated dynamic effects. Our conclusions are given in section 5.

2 Initial Conditions before EU-CAAA

In this section we describe the main economic characteristics of CA and its recent trade policy developments. It also presents the current tariffs and bilateral trade flows with the European Union. With this outlook we can get a general idea of how EU-CAAA can affect CA.

2.1 Main Economic Characteristics of Central America

After decades of political unrest and civil wars, during the 1990s CA experienced stability and economic recovery. Domestic policy reforms have been implemented to boost economic growth, which has enabled the region to grow at moderate rates. These reforms have been complemented with a gradual opening to foreign trade and investment. However, the region is still characterized by low income levels and widespread poverty. Costa Rica has been an exception in the region, with political stability for many decades and the GDP per capita level of a medium-income economy. These features are summarized in Table 1.

Table 1: Central America, main economic indicators by country, 2003

	GDP		GDP growth /1 1995-2003	GNI per capita /2 US\$	Population	
	US\$ millions	% CA			millions	% CA
Costa Rica	17.482	26%	4,3%	4.280	4,0	11%
El Salvador	14.396	21%	3,0%	2.200	6,5	19%
Guatemala	24.730	37%	3,5%	1.910	12,3	35%
Honduras	6.978	10%	3,1%	970	7,0	20%
Nicaragua	4.100	6%	4,2%	730	5,5	16%

Notes: /1 Average from 1995-2003 taken from the National Accounts of each country.

/2 Atlas method.

Source: World Development Indicators, World Bank.

Trade policy reforms have included the unilateral reduction of tariffs, an increase in intra-regional trade (which represents 30% of total trade) and the negotiation of free trade agreements (FTAs) with Canada, Chile, Mexico and some Caribbean countries. However, the main policy reform has been the recent negotiation of a FTA with the United States, jointly with the Dominican Republic, i.e. DR-CAFTA.⁵

Central America is also characterized by low levels of human capital. Table 2 shows that –excluding Costa Rica– the region has low literacy rates, and limited public expenditures in health and education. These aspects are reflected in the ranking of each country on the Human Development Index.

In contrast to other Latin American countries, CA has no major natural resource endowments. Thus, the region can be defined as unskilled-labor abundant. This element, in conjunction with a historically agricultural oriented economy, have made CA internationally competitive in some agricultural products (e.g. coffee, bananas, sugar). More recently, the region has also specialized in *maquila*-based exports of

⁵Francois *et al.* (2006) estimate the economic effects of DR-CAFTA using the GTAP-CGE model.

Table 2: Central America, human capital indicators by country

	Health expenditure per capita US\$ PPP 2000	Literacy rate 2001	Public expenditure in Education (% GDP) 1998-2000	Human Development index Ranking /1 2001
Costa Rica	474	95.7	4.4	42
El Salvador	391	79.2	2.3	105
Guatemala	192	73.4	1.7	119
Honduras	165	75.6	4.0	115
Nicaragua	108	66.8	5.0	121

Notes: /1 The Human Development Index classifies 175 countries.

Source: UNDP (2003).

textiles and apparel.⁶

However, the CA economies are far from full employment. Table 3 shows that most of the CA countries have low unemployment rates –except Nicaragua– but have relatively high sub-employment rates. The total sub-utilization rates indirectly reflect the significant size of the informal economy in the region. Thus, there is a significant slack in the labor market to accommodate for increased labor demand.

Table 3: Central America, employment statistics, averages for 1995-2003

	Unemployment	Sub-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%
Central America /1	7.7%	23.0%	30.7%

Notes: /1 Unweighted average.

Source: Central Banks and national statistical institutes.

Being an unskilled labor abundant region, it is expected that Central American unskilled workers will benefit from trade openness. Increased international demand for the export goods that intensively use unskilled labor will increase the demand for this factor. Given the characteristics of the labor market in CA, this increased demand can be met by a combination of higher employment levels and wage raises. To estimate both impacts we use two macroeconomic closures in our simulation. First, we assume the all the labor demand adjustment is met by changes in wages, and then we assume that wages remain constant and that changes in labor demand are adjusted by the employment level.

The production structure of CA is shown in Table 4. The services sector accounts for around 60% of GDP in all countries, but agriculture is still important in Guatemala and Nicaragua. Trade volumes with

⁶Maquila industries import most of their inputs and use low-skill workers to process the products before they are exported. Besides the intensive use of labor and to a lesser extent, other intermediate inputs, maquilas have limited linkages with the domestic economy.

Table 4: Central America, productive structure, trade and FDI, 2003

	Agriculture % GDP	Manufacture % GDP	Services % GDP	Trade volumes % GDP	FDI, net flows /1 US\$ millions
Costa Rica	8,4	28,9	62,7	73,8	509,0
El Salvador	9,4	31,8	58,7	57,3	305,0
Guatemala	22,3	19,3	58,5	35,7	258,9
Honduras	13,5	30,7	55,8	64,1	185,7
Nicaragua	17,8	24,9	57,3	59,7	217,0

Notes: /1 Average for 1997-2003 taken from ECLAC.

Source: World Development Indicators, World Bank.

respect to GDP are also significant, reflecting that CA is a relatively open economy, which depends on external demand to grow.

FDI flows have increased drastically since the 1990s and now represent around 3% of total outcome. This inward capital flows have allowed a diversification of the export bundle and in turn, has helped finance the current account deficit in the region. Table 5 shows the recent evolution of FDI inflows to CA. Most of FDI has been directed towards manufactures and services, and almost 40% of FDI comes from the US. The EU has only a 10% participation in total FDI, and is centered in El Salvador and Costa Rica. However, it is expected that the signing of an association agreement can bust these figures. The rest of FDI inflows to CA are originated mainly from other Latin American countries.

Table 5: FDI inflows into Central America, US\$ millions

	1998	1999	2000	2001	2002	2003	% USA 1/	% EU 1/
Costa Rica	612	620	409	454	662	576	58%	13%
El Salvador	1,104	216	173	250	208	152	34%	22%
Guatemala	673	155	230	456	110	104	47%	2%
Honduras	99	237	282	193	176	198	27%	9%
Nicaragua	195	300	267	150	174	197	14%	0%
Total	2,682	1,527	1,361	1,503	1,329	1,227	38%	10%

Notes: 1/ Corresponds to the average from 1998-2002.

Source: UNCTAD website

Finally, we describe the trade characteristics of the region in Table 6. Under the Common Central American Market, the five countries agreed to reduce their common tariffs to 15% in 1995. In general, the regions has low average tariff levels as a consequence of the gradual reduction of trade protection that began in the 1990s. However, some specific products are still highly protected –mainly agro-industrial goods. The list includes processed rice and sugar, dairy products and poultry. Non-tariff barriers (NTBs) have also been reduced significantly, although some NTBs are still in place.

Table 6: Central America, main trade barriers, 2004

	Guatemala	El Salvador	Honduras	Nicaragua	Costa Rica
Average weighted 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	15	40	20	40	65
Yellow corn	5 – 35	0	20	0-30	1
Processed rice	32	40	35	62	35
Processed sugar	20	40	40	55	50
Pork meat	15	40	15	15	48
Poultry	15	20	50	170	150
Non-tariff barriers (NTBs)					
Anti-dumping	X	X	X	X	X
Saveguards	X	X	X	X	X
Non-automatic import permits		X		X	X
SPS prohibitions	X	X	X	X	X
Tariff-rate quotas (TRQs)	X	X	X	X	X
Price control			X		

Source: Own figures constructed with SIECA data

2.2 Bilateral Trade between CA and the EU

The EU is the second biggest trading partner for CA, only behind the US. In Table 7 we present the main exporting products from CA to the European Union. An important feature is that Costa Rica represents two thirds of all CA exports to the EU. It also has the most diversified export structure of the region. The rest of CA countries are highly dependent on the exports of coffee. Moreover, the exports are mainly agricultural, with coffee and bananas representing 43% of total exports.⁷

Table 7: Main exports from CA to the EU, 2004

	Costa Rica	El Salvador	Guatemala	Honduras 1/	Nicaragua
Total Exports (US\$ millions FOB)	1,079.4	111.5	156.4	176.9	95.0
Bananas	25.4%	0.0%	0.3%	7.6%	0.0%
Pineapple	10.8%	0.0%	0.0%	4.3%	0.4%
Melons	3.2%	0.0%	0.0%	0.8%	0.1%
Oil seeds	0.0%	0.0%	4.0%	0.0%	9.0%
Plants and foliage	7.5%	3.1%	8.6%	1.6%	1.2%
Fish and seafood	1.1%	1.7%	1.1%	1.1%	15.9%
Coffee	6.4%	52.7%	66.2%	71.0%	67.4%
Processed fish	0.9%	27.9%	0.3%	0.0%	0.0%
Machinery, parts and accessories	20.3%	0.0%	0.0%	0.4%	0.0%
Electronic equipment	7.1%	0.1%	0.0%	0.0%	0.0%
Other products	17.4%	14.4%	19.4%	13.2%	6.0%
Percentage of CA exports	66.7%	6.9%	9.7%	10.9%	5.9%

Notes: 1/ The data for Honduras corresponds to 2003.

Source: Own figures constructed with SIECA data

The implicit bilateral exports and tariffs from the GTAP database are shown in Table 8.⁸ Disregarding

⁷Note that we do not consider trade in services here. Tourism is the main foreign income source for Costa Rica and it is growing its importance for the rest of the region as well.

⁸The data corresponds to the GTAP database updated after taking into account recent trade developments –prior to the

trade in services,⁹ the majority of CA exports are agricultural goods, while the EU exports are mainly manufactures. This same pattern of trade is reflected in the trade barriers of each region. CA protects its manufactures –in particular the agro-industrial sectors– and the EU protects specific agricultural sectors.

Table 8: Tariffs and Exports in the GTAP database after initial update

	Tariffs from:		Exports from:	
	EU to CA	CA to EU	EU to CA	CA to EU
1 Paddy_rice	14,0	52,9	0,0	0,0
2 Wheat	0,0	0,0	0,0	0,3
3 Other_cereal	5,3	0,0	1,1	0,4
4 Veg_fruits	26,6	44,9	3,1	834,9
5 Oil_seeds	0,8	0,3	0,0	16,1
6 Sugar_cane	0,0	14,3	0,0	0,0
7 Plant_fibers	4,4	0,0	0,2	0,1
8 Crops_nec	2,1	0,2	9,4	552,5
9 Cattle	6,5	0,0	0,8	0,1
10 Animprod_nec	2,2	0,3	1,3	4,3
11 Raw_milk	0,0	0,0	0,1	0,6
12 Wool	0,0	0,0	0,0	0,1
13 Forestry	2,8	0,0	0,3	2,4
14 Fishing	0,1	0,1	1,1	1,5
15 Coal	1,3	0,0	0,0	0,1
16 Oil	0,0	0,0	1,0	1,8
17 Gas	0,9	0,0	0,0	0,0
18 Minerals_nec	2,2	0,9	3,9	16,5
19 Meat	8,3	29,1	1,9	6,8
20 Meatprod_nec	18,2	2,7	4,5	3,8
21 Veg_oils	10,0	1,1	4,4	2,1
22 Dairy	15,9	23,2	35,6	3,1
23 Proc_rice	32,2	0,0	0,0	1,1
24 Sugar	28,7	177,0	0,8	19,3
25 Foodprod_nec	10,5	2,8	81,8	189,6
26 Bev_tobacco	23,8	1,2	84,0	15,0
27 Textiles	12,2	0,2	41,0	30,1
28 Apparel	12,9	0,2	26,5	31,7
29 Leather	11,6	0,2	16,3	27,0
30 Wood_prod	12,2	0,0	24,2	22,9
31 Paper_prod	2,7	0,1	105,0	11,1
32 Petrol_coal	4,9	0,0	42,3	13,1
33 Chemical_pla	3,6	0,1	679,8	58,8
34 Minprod_nec	10,0	0,1	91,2	4,1
35 Ferrous_met	4,3	0,0	72,5	0,7
36 Metals_Nec	0,8	0,2	35,5	2,1
37 Metal_prods	5,4	0,1	85,1	4,4
38 Motor_veh	7,8	0,0	177,7	7,4
39 Trans_eq_nec	5,3	2,3	539,1	193,4
40 Electronic	2,2	0,0	212,7	330,5
41 Machine_nec	1,9	0,1	689,1	33,6
42 Manufact_nec	10,2	0,1	186,0	25,4
43 Services	0,0	0,0	1346,0	2311,0
Total			4605,5	4779,8

Source: GTAP database version 6, after own simulations

The low or null tariffs faced by most of the CA agricultural exports reflects the trade preferences granted under the GSP plus initiative. Yet, this is an unilateral benefit established by the EU that has to be periodically extended.¹⁰ Thus, a direct benefit that CA can achieve from EU-CAAA will be to obtain EU-CAAA.

⁹These are mainly tourism services which do not face trade barriers, and thus, are left out of the analysis since they will not be affected by the EU-CAAA.

¹⁰Currently, the GSP plus has been extended until December 2008.

permanently and without uncertainty, the current preferences from the GSP plus.

However, there are relevant CA exports that are not included in the GSP plus. In particular, the most significant case is bananas. The larger CA exports correspond to the sector *veg_fruits*, which is mainly given by bananas but also includes other products as pineapple and melons.¹¹ This sector also faces one of the highest tariffs from the EU. Moreover, Central American bananas also face quota restrictions to enter the EU. ACP countries, on the other hand, face trade preferential conditions that also hurt Latin American producers. This situation has been responsible for several litigations in the WTO between the EU and several Latin American countries. Thus, the issue is contentious and has important repercussions for both regions.

Another pertinent case is that of sugar. Even when CA exports a small amount of sugar to the EU, this is a direct consequence of the high tariffs faced by this product: 177%. This is the most protected sector in the EU, and in addition, its production is also highly subsidized within the EU. Hence, the reduction of the trade barriers on sugar can represent an important source of increased production and new exports from CA.

The second most important Central American exporting sector from Table 8 is *crops_nec*, which includes plants and foliage and other agricultural products. While coffee is included in the sector *food_prod_nec*. These sectors does not face trade barriers from the EU and consequently, its production and exports are not expected to change with EU-CAAA.

Besides bananas and sugar, meat and dairy products also face high entry costs into the EU, but is not expected that these products can compete even when the tariffs are eliminated. Thus, the main negotiating issue for CA is to extend the GSP plus benefits to bananas and sugar. From the perspective of the EU, the elimination of the Central American tariffs on agro-industrial good can lift the exports of this sector. It is also interesting to analyze the effect of more European competition in these sectors for Central American producers.

It is important to note that the EU has also substantial agricultural export subsidies. Table 9 is constructed using the GTAP database and reports ad-valorem export subsidies. The high subsidies granted by the EU to bovine meat, dairy products and sugar, can affect negatively Central American producers. Thus, we also analyze how the removal of these subsidies changes the sectoral effects of EU-CAAA.

2.3 Recent Bilateral Agreements Signed by the EU

In this section we analyze the outcomes of the most recent bilateral agreements signed by the EU –i.e. with South Africa, Mexico, Chile, Turkey and Egypt. The EU has also started negotiations with the South

¹¹These products cannot be separated within the GTAP database. However, pineapples and melons are already included in the GSP plus and thus, will not be affected by EU-CAAA. The tariffs in the sector, thus, are then only significant for bananas.

Table 9: EU export subsidies from GTAP

Sector code	EU subsidies
2 Wheat	2.4
3 Other_cereal	33.3
4 Veg_fruits	2.2
10 Animprod_nec	0.7
11 Raw_milk	0.1
19 Meat	77.7
20 Meatprod_nec	5.4
22 Dairy	30.0
23 Proc_rice	42.0
24 Sugar	58.2
25 Foodprod_nec	3.2
26 Bev_tobacco	0.9

Source: GTAP database version 6

American countries of MERCOSUR.

The main characteristic of these agreements is that they are not strictly confined to trade issues. Some agreements include political topics (e.g. Turkey and Egypt), while most focus on matters indirectly concerned with trade. For example: competition law, customs collaboration and rules of origin, government procurement contracts, investment laws and regulation, among others. These topics have been grouped in the so-called “behind-the-border” provisions.¹² From an EU perspective, EU-CAAA will become a counter-weight against the benefits received for US firms to trade and invest in the region granted under DR-CAFTA.

The second main feature of the EU agreements is that they consistently exclude “sensible” agricultural products (Francois *et al.*, 2005; Gallezot, 2003). These products are: sugar, bovine meat, rice, some fruits and vegetables, flowers and foliage, fish and some dairy products. These exclusions are in part a result of the strict controls and agricultural protection contained in the EU’s Common Agricultural Policy (CAP).

Thus, it is expected that the behind-the-border provisions will be key in the negotiations, and moreover, it is likely that sugar and bananas will be left out of the agreement. Although some of the behind-the-border provisions may have a beneficial impact in CA, it is expected that the exclusion of sugar and bananas will have a negative repercussion.

3 The CGE Setting

The assessment of economic effects from trade agreements is a complex empirical exercise. The change in relative prices triggered by different trade policies affects the whole economy through different channels. Hence the economic effects of FTAs have a general equilibrium scope. We can divide these changes by their static and dynamic characteristics. The static effects are given by the reallocation of production

¹²For a specification of some of these provisions and their likely economic effects, see Cernat (2005).

and trade patterns, and the changes in the factor markets through adjustments in wages and sectoral employment levels. The dynamic effects include changes in the capital accumulation process (including increased levels of FDI flows), labor supply adjustments, technology transfers and productivity shifts than can occur as a consequence of larger trade and FDI flows, and increased competition from foreign firms in domestic markets. The introduction of complementary economic policies associated with FTAs can also have important consequences (e.g. development cooperation, behind-the-border provisions and “agreement-pushed” domestic reforms).

3.1 CGE modelling

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

To the best of our knowledge, this study is the first CGE assessment of the likely effects of the EU-CAAA. Since negotiations have not yet begun, we must use scenarios to assess the possible impacts of different agreement outcomes. The lack of CGE estimations is an important limitation faced by the negotiating teams from developing countries, while these models are widely available and used in developed countries.

Commonly, CGE models account for the medium and long term static effects of trade policy. An important limitation to keep in mind is that CGE models usually do not assess the short-term readjustment costs (i.e. temporal labor displacement and unemployment, and productive restructuring). The trend of recent CGE models is to incorporate some dynamic effects, mainly capital accumulation and long term labor supply projections. The inclusion of dynamic elements into CGE models is an area of current development that may further improve the estimations of the potential economic effects of FTAs and other trade policy modifications.

Finally, it is important to mention that most FTAs not only consist of changes in trade barriers and protection, but also of complementary policies (i.e. behind-the-border provisions). Estimating the full impact of these kind of FTAs is thus further complicated. Yet, general equilibrium models remain the most suitable analytical framework to analyze trade policy changes.

3.2 GTAP Model and Database

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 its related CGE-model to analyze the economic implications of EU-CAAA. In addition, we add two extensions to the main model: an estimation of the trade facilitation gains and the use of an endogenous capital formation process to account for increased FDI.

3.2.1 Database Updates

We use version 6 of the GTAP database for which the baseline year is 2001.¹³ Thus, before using the database we must update it with recent trade policy changes that affected both regions between 2001 and 2006. Despite this inconvenience the GTAP database is regarded as the best available basis to analyze current trade policy (USITC, 2004).

We proceed with a sequential upgrading, including only relevant trade events and following their time path. First, we include the reduction in textile and apparel (T&A) quotas in the US and EU that followed from the application of the ATC protocol. This has increased Chinese competition for the maquila-based industry in CA that exports T&A to the US. Second, we simulate the expansion of the EU from 15 to 25 member states, and eliminate the few remaining tariffs and quotas that still existed. Finally, the most important update is to include the effects of DR-CAFTA following the simulations in Francois *et al.* (2006). The US is the main trading partner of CA and this agreements has a substantial impact on the productive and trade structure of the region.

The GTAP database has 57 productive sectors and 87 regions. In our simulations we use an aggregation of 43 sectors (all agricultural and manufacture sectors disaggregated, plus an aggregated services sector) and 5 regions: CA, EU, USA, China and Rest of the World (ROW); see Table 10 in the Appendix.

A limitation of the GTAP database is that it has Central America is an aggregated region, including Belize and Panama. This implies that some national effects for specific countries will be lost in the aggregated results. In particular, for future works it will be useful to disaggregate Costa Rica, which has a distinctive production structure and the largest share of exports to the EU.

3.2.2 Theoretical Setting

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.

First, we use a standard GTAP static model with different shocks to evaluate the alternative scenarios.¹⁴

¹³Version 7 with baseline year 2004 is expected to be released in late 2007.

¹⁴In particular, we use the RunGTAP software version 5.

In the final section we estimate some potential dynamic effects and embed them in the GTAP model as capital 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). 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 specification¹⁵ 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.

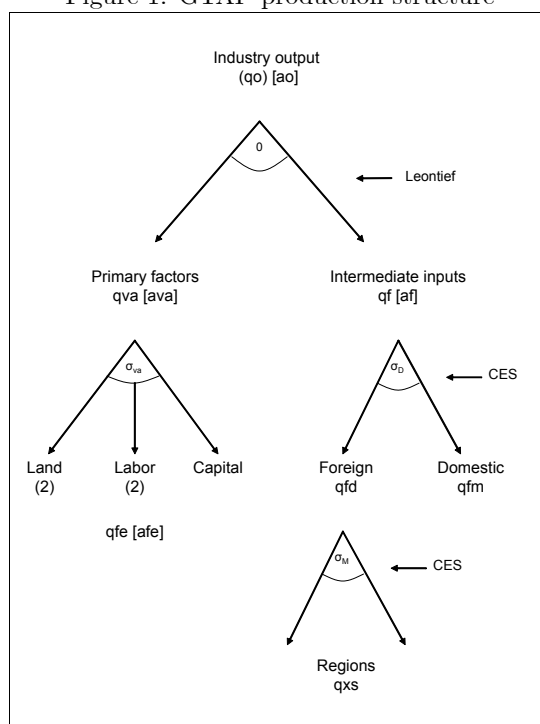
Aggregate investment is not explained within the standard GTAP model, since it does not account for macroeconomic policies and monetary phenomena. Thus, the macroeconomic closure employed is neo-classical and investment is forced to adjust in line with regional changes in savings. In addition, a *global closure* is assumed and the current account deficits can be non-zero but must be balanced in the *global bank* (where trade deficits 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.

4 EU-CAAA Simulations

We proceed to analyze the results of our CGE simulations. First, we present the database updating results and then, the assessment of our three main scenarios using the GTAP model. We end the section with the estimates of the two modelling extensions that include trade facilitation mechanisms and endogenous

¹⁵With this specification goods are differentiated by their country of origin, even when they are homogenous in other characteristics.

Figure 1: GTAP production structure



capital formation.

4.1 Initial Equilibrium with Database Updates

As explained before, the database has to be updated to include recent trade developments. We use two simulations for this. In the first we include the ATC protocol implementation and the EU expansion to 25 members. The second simulation builds on the results of the first one and includes DR-CAFTA.¹⁶ In Table 10 we show the GDP and welfare changes associated with these simulations.

Table 10: Database update simulations

Scenario:	GDP (percentage change)				Welfare (change in US\$ millions)			
	CA	EU25	USA	China	CA	EU25	USA	China
Initial equilibrium (US\$ millions)	70.035	8.292.020	10.082.155	1.159.031	-	-	-	-
EU expansion and ATC protocol	-0,2	0,0	0,0	0,7	-520	8.057	4.806	3.129
DR-CAFTA: base case	0,3	0,0	0,0	0,0	1.114	-298	284	-295

Source: GTAP database version 6 and own estimations

¹⁶In particular, we use the base case scenario from Francois *et al.* (2006), where all tariff and quotas between CA and the US are removed –except for sugar in the US and other cereas in CA.

The EU expansion and ATC protocol implementation has clear benefits for the EU. While the USA and China are also benefited by the reduction in the textile quotas. Central America, however, experiences GDP and welfare losses from the increased Chinese competition in textiles and apparel. This situation is reversed when DR-CAFTA is implemented and CA has a better access to the US market. As expected, CA and the US gain from the agreement, while the EU and China have welfare losses of a very low magnitude.

4.2 Scenario Assessment

Since the EU-CAAA negotiations have not yet begun, we use three scenarios to assess the likely outcomes of the talks. With the numerical estimates provided by the CGE simulations, we can assess the potential benefits that are at stake. In addition, we can identify the productive sectors that can be affected, positively and negatively, by the agreement.

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 European FDI into CA, in response to the incentives provided by the bilateral liberalization. Moreover, no allowance has been made for possible increases in capital formation, economic growth and improvements in productivity in CA, which could be associated with EU-CAAA. However, some of these dynamic effects are indirectly assessed in the last section.

Table 11 summarizes the main results for the three scenarios and we proceed to analyze each one in turn.

Table 11: EU-CAAA, summary of the scenario simulations

Scenario:	GDP (percentage change)		Welfare gains (change in US\$ mill.)		Welfare gains (% of GDP)		Bilateral trade (percentage change)	
	CA	EU	CA	EU	CA	EU	CA	EU
Base case: full liberalization	0,2	0,0	1.128,5	-93,2	1,6%	0,0%	45,3	45,6
ACP tariff equalization	0,0	0,0	266,7	227,6	0,4%	0,0%	20,7	43,0
Exclusion of sensible product	0,0	0,0	-92,9	212,2	-0,1%	0,0%	11,6	12,4

Source: Own estimations

4.2.1 Base Case Scenario: Full Liberalization

In this scenario we eliminate all tariffs between CA and the EU. As expected, full liberalization yields the highest welfare gains for CA, with an increase in the order of US\$ 1.100 millions or 1.6% of GDP. These gains are similar to those from the DR-CAFTA base case¹⁷ and it emphasizes the importance of the EU as a commercial partner for CA. GDP, moreover, is increased by 0.2% in this static case. On the other hand, the EU is barely affected by the agreement in overall terms, and welfare –in relation to GDP– does not change at all.

¹⁷See Francois *et al.* (2006).

The simulation results for each factor and sector are presented in Table 12. The most significant changes for CA are in the sugar industry. Sugar cane production is boosted and processed sugar output increases by almost 150%, with a threefold increase of exports to the EU. The vegetables and fruits sector also expands in CA, with a surge in exports to the EU of around 60%. However, other agricultural sectors are contracting (e.g. other crops), as well as most of the agro-industrial sectors, textiles and apparel and the rest of manufactures. These significant output changes imply a considerable productive restructuring that can have important short-term adjustment costs. The larger specialization in agricultural goods will benefit rural areas. Regarding production factors, the strong increase in agricultural production pushes land rentals up by 46%, while labor wages are also increased, but only around 3 percentage points.

Not only is EU-CAAA generating large welfare gains for CA, but it also reduces some of the production specialization imbalances created by DR-CAFTA. Under this agreement, it is expected that the textiles and apparel sector will have a major expansion, which will in turn reduce the output of most other sectors. Thus, EU-CAAA will reduce the maquila-based textiles and apparel production, which is concentrated in urban areas and bring output and export opportunities to rural areas.

To complement the previous results, we run another simulation where –in addition to the tariff’s removal– European export subsidies are also eliminated. However, the results are not altered. Welfare gains remain at the same level and the production changes outlined before are also maintained. This indicates that the main barrier faced by CA exporters is the high tariff protection in the EU.

This full liberalization scenario, however, is highly implausible given the recent EU bilateral trade agreements where “sensible” agricultural products were excluded from the negotiations. The following two scenarios will deal with the more likely negotiation outcomes.

4.2.2 Tariff Equalization with ACP countries

This second scenario corresponds to an intermediate liberalization of the “sensible” agricultural products: sugar and bananas. We keep the tariff removal for all other sectors as in the former scenario, but the tariffs on sugar and bananas are reduced to a level comparable with the trade preferences currently enjoyed by the ACP countries. This group of countries is granted this preferential status because of being an ex-colony of a EU member state and/or because it is a Least Developed Country (LDC).

Table 13 shows the tariffs faced in the EU by the ACP countries. These are the implicit values from the GTAP database and thus, we use the regions identified there. The first two regions are Caribbean and the rest are from Sub-Saharan Africa. There is wide differences in the tariffs by region, so we construct an average weighted by the exports to the EU. For the veg_fruits and sugar sectors the ACP countries face lower tariffs than CA.¹⁸ We use the ACP weighted tariff values as an estimation of a mid-way tariff level

¹⁸In the case of sugar tariffs for the Caribbean regions, these values are distorted by the inclusion of Cuba and Puerto Rico –which are not ACP countries– in the aggregations.

Table 12: Full liberalization scenario, percentage changes

Sector code	Output		Prices		Exports		Imports	
	CA	EU	CA	EU	CA	EU	CA	EU
Land	-	-	46,4	-0,8	-	-	-	-
Unskilled labor	-	-	3,3	0,0	-	-	-	-
Skilled labor	-	-	2,8	0,0	-	-	-	-
Capital	-	-	2,5	0,0	-	-	-	-
Natural_Res	-	-	-2,5	0,0	-	-	-	-
Paddy_rice	5,9	0,2	10,5	0,0	136,1	0,6	26,1	0,2
Wheat	-6,7	0,2	7,5	-0,1	-29,3	0,4	26,3	0,0
Other_cereal	3,1	0,1	9,9	-0,1	0,1	0,1	19,8	0,0
Veg_fruits	21,1	-1,9	13,4	-0,3	62,6	-3,6	21,7	1,5
Oil_seeds	-3,9	0,2	8,3	-0,1	-22,0	0,4	26,5	0,0
Sugar_cane	63,4	-6,4	20,2	-0,5	-11,7	-2,3	94,4	-5,4
Plant_fibers	0,5	0,2	9,5	-0,1	-24,9	0,2	26,1	-0,1
Crops_nec	-15,3	0,4	6,3	0,0	-24,7	1,0	15,8	-0,2
Cattle	0,6	0,0	9,6	-0,1	4,9	0,1	10,6	-0,1
Animprod_nec	-1,7	0,1	8,9	-0,1	-6,7	0,1	8,3	-0,1
Raw_milk	-1,4	0,1	9,2	-0,1	-42,4	0,7	33,8	-0,4
Wool	3,9	0,5	8,8	-0,1	-52,1	0,7	52,2	-0,1
Forestry	0,2	0,0	2,7	0,0	-8,7	0,0	5,1	0,0
Fishing	-0,5	0,0	1,3	0,0	-1,1	-0,1	3,1	-0,1
Coal	-1,0	0,0	0,1	0,0	-0,8	0,0	-2,1	0,0
Oil	-1,1	0,0	0,2	0,0	-2,1	0,0	0,3	0,0
Gas	-0,6	0,0	1,3	0,0	-33,9	0,0	16,1	0,0
Minerals_nec	-3,0	0,0	1,0	0,0	-0,7	0,0	-3,7	0,0
Meat	-2,2	0,0	6,1	-0,1	-6,4	0,0	16,2	0,1
Meatprod_nec	-5,1	0,1	6,6	-0,1	-25,5	0,2	28,3	-0,1
Veg_oils	-4,9	0,1	4,1	-0,1	-12,2	0,3	8,9	-0,1
Dairy	-4,5	0,1	3,8	-0,1	-10,5	0,3	12,8	0,0
Proc_rice	-0,4	0,1	3,5	-0,1	-9,6	0,1	8,5	0,0
Sugar	143,4	-8,4	5,5	-0,7	338,0	-31,2	18,1	43,9
Foodprod_nec	-3,3	0,1	3,7	-0,2	-6,1	0,2	5,8	-0,1
Bev_tobacco	-0,7	0,1	2,8	-0,1	-5,2	0,1	12,0	-0,1
Textiles	-11,7	0,2	1,9	0,0	-10,3	0,3	-4,9	0,0
Apparel	-8,5	0,1	1,6	0,0	-8,4	0,2	3,7	0,0
Leather	-7,9	0,1	2,1	0,0	-12,1	0,2	3,9	0,0
Wood_prod	-5,0	0,1	2,4	0,0	-10,9	0,1	7,0	0,0
Paper_prod	-3,3	0,0	1,7	0,0	-5,7	0,0	2,0	0,0
Petrol_coal	0,1	0,0	0,3	0,0	-0,8	0,0	0,7	0,0
Chemical_pla	-5,7	0,1	1,5	0,0	-8,5	0,1	0,6	0,0
Minprod_nec	-5,7	0,0	1,8	0,0	-9,4	0,1	3,7	0,0
Ferrous_met	-8,2	0,1	1,6	0,0	-8,8	0,1	-1,9	0,0
Metals_Nec	-9,1	0,1	1,7	0,0	-11,3	0,1	-0,5	0,0
Metal_prods	-5,5	0,0	1,5	0,0	-9,9	0,1	3,0	0,0
Motor_veh	-0,5	0,0	0,3	0,0	-2,3	0,0	5,3	0,0
Trans_eq_nec	0,3	0,3	0,4	0,0	2,7	0,4	2,3	0,0
Electronic	-9,2	0,1	1,4	0,0	-10,1	0,1	1,4	0,0
Machine_nec	-7,8	0,0	1,7	0,0	-10,7	0,1	3,1	0,0
Manufact_nec	-10,1	0,1	1,8	0,0	-12,5	0,3	9,6	0,0
Services	0,3	0,0	2,3	0,0	-6,1	0,0	5,2	0,0

Source: Own estimations

from the current situation to a full liberalization case.

The changes in factors and goods of this ACP tariff equalization scenario are presented in Table 14. The main variation from the new tariff levels in sugar and veg_fruits is that the output and exports of both sectors are significantly reduced. For the first sector output is reduced by almost 40%. But the most stricken change is in the sugar industry. Sugar cane and processed sugar production remain constant, since the tariff levels are still high. This situation ensures that no output nor export gains are experienced by CA in this sector. These negative results are reflected in not so vigorous expansion of agricultural production, which in turn is reflected in the lower increase in land rentals. Additionally, bilateral trade flows are 50%

Table 13: ACP tariffs to the EU

Sector:	1	3	4	6	8	10	19	20	21	22	23	24	25
	Paddy	Other	Veg.	Sugar	Crops	Anim.	Bovine	Meat	Veg. oils	Dairy	Proc.	Sugar	Food
GTAP region:	rice	cereal	fruits	cane	nec	prod. nec	meat	prod. nec		products	rice		prod.
1 RestCaribbean	-	-	4,3	-	5,6	2,1	-	9,6	0,8	2,7	2,8	166,5	9,7
2 RestFTAA	18,8	3,1	30,5	17,0	-	1,1	26,3	15,4	1,3	28,3	14,4	163,6	0,8
3 Bostwana	-	-	1,4	-	-	-	75,7	3,8	12,4	-	-	-	3,0
4 SouthAfrica	-	7,4	10,7	9,8	1,2	0,1	74,4	1,7	1,7	39,4	46,3	39,5	12,1
5 SACU	-	-	8,1	-	-	-	81,6	-	11,1	41,5	-	186,7	-
6 Malawi	-	-	-	-	-	-	-	-	-	-	-	96,2	-
7 Mozambique	-	-	-	-	-	-	-	-	-	-	-	21,4	-
8 Tanzania	-	-	-	-	-	-	-	-	-	-	7,4	96,0	-
9 Zambia	-	-	-	-	-	-	-	-	-	-	-	97,8	-
10 Zimbabwe	-	12,8	4,0	-	-	0,2	111,0	1,8	-	-	-	116,0	0,5
11 RestSADC	-	0,1	4,9	-	-	-	28,3	2,0	-	4,2	18,9	99,6	0,1
12 Madagascar	-	-	0,3	-	-	-	-	-	-	-	28,3	94,0	-
13 Uganda	-	-	2,6	-	-	-	-	-	-	-	-	-	-
14 RestSSA	-	2,1	13,2	4,7	-	-	0,4	9,0	-	8,9	11,6	51,4	-
ACP weighted	3,0	1,3	12,9	0,8	0,1	0,2	73,1	5,2	0,2	12,3	6,5	125,8	1,7
CA	52,9	-	44,9	14,3	0,2	0,3	29,1	2,7	1,1	23,2	0,0	177,0	2,8

Source: GTAP database version 6 and own estimations

lower, overall output in CA is unchanged and the previous welfare gains are reduced by US\$ 860 million in this intermediate scenario, when compared to the base case.

We ran extra simulations using different sugar tariffs to assess the sensitivity of the Central American export possibilities to the EU. Only when the tariff is set at 60% (i.e. half the weighted average for ACP countries) does sugar production in CA increase by 20%. With a tariff of 30% production raises by 60%. Therefore, even when CA has the potential to export large amounts of sugar to the EU, only a drastic tariff cut can allow Central American producers to compete in the European markets.

4.2.3 Exclusion of Sensible Agricultural Products

The third and last scenario consists of leaving out both agricultural sectors that include “sensible” products for the EU: veg_fruits and sugar. In accordance, it is expected that CA will ask for compensation by protecting its own sensible products. Thus, we assume that CA will exclude from EU-CAAA four sensible sectors: other cereals, bovine meat, dairy products and processed sugar. In addition, we also exclude the bovine meat sector EU tariffs from the agreement.

This is the most probable outcome of the EU-CAAA negotiations but it yields the less optimistic scenario. CA suffers a small welfare loss that equals 0.1% of its GDP, while the EU has a welfare gain that is still not substantial in relation to its GDP. Given the higher protection implicit in this scenario, it is also the one that increases bilateral trade the less. These results remark that the static gains for CA are closely related to the reduction of the EU agricultural protection.

In Table 15 we observe that there are no significant sectoral changes associated with this scenario. There are small production changes and the exports of the main products remain almost constant. Factor

Table 14: ACP tariff equalization scenario, percentage changes

Sector code	Output		Prices		Exports		Imports	
	CA	EU	CA	EU	CA	EU	CA	EU
Land	-	-	20,2	-0,6	-	-	-	-
Unskilled labor	-	-	0,8	0,0	-	-	-	-
Skilled labor	-	-	0,5	0,0	-	-	-	-
Capital	-	-	0,3	0,0	-	-	-	-
Natural_Res	-	-	-1,7	0,0	-	-	-	-
Paddy_rice	-3,4	0,0	3,0	0,0	297,0	-0,2	6,2	0,2
Wheat	-4,9	0,1	2,6	0,0	-13,4	0,1	5,7	0,0
Other_cereal	-2,3	0,0	3,1	0,0	-3,1	0,0	1,7	0,0
Veg_fruits	15,3	-1,3	6,2	-0,2	40,4	-2,6	8,3	0,6
Oil_seeds	-4,8	0,1	2,7	0,0	-8,1	0,1	3,5	0,0
Sugar_cane	-0,5	-0,2	3,3	-0,1	65,6	-0,1	8,9	-0,1
Plant_fibers	-3,5	0,1	3,0	0,0	-9,9	0,1	3,2	0,0
Crops_nec	-7,5	0,2	2,4	0,0	-10,1	0,4	4,8	-0,1
Cattle	-1,5	0,0	3,4	0,0	1,0	0,0	3,3	0,0
Animprod_nec	-1,6	0,0	3,3	0,0	-2,7	0,0	2,7	0,0
Raw_milk	-1,1	0,0	3,5	0,0	-19,3	0,3	11,8	-0,2
Wool	-1,5	0,2	2,9	0,0	-22,9	0,2	14,0	0,0
Forestry	-0,6	0,0	0,3	0,0	-1,1	0,0	0,5	0,0
Fishing	-0,3	0,0	-0,2	0,0	0,2	0,0	0,2	0,0
Coal	-0,2	0,0	0,0	0,0	-0,1	0,0	-1,0	0,0
Oil	-0,2	0,0	0,0	0,0	-0,1	0,0	-0,2	0,0
Gas	-0,2	0,0	-0,1	0,0	1,4	0,0	-0,6	0,0
Minerals_nec	-0,5	0,0	0,1	0,0	0,4	0,0	-1,2	0,0
Meat	-1,6	0,0	2,0	0,0	-9,5	0,0	4,7	0,0
Meatprod_nec	-2,3	0,0	2,2	0,0	-9,2	0,1	10,6	0,0
Veg_oils	-1,8	0,0	1,1	0,0	-4,0	0,1	2,8	0,0
Dairy	-0,1	0,0	1,2	0,0	5,6	0,0	2,3	0,0
Proc_rice	-0,2	0,0	1,0	0,0	-2,9	0,0	2,3	0,0
Sugar	0,3	-0,2	1,2	0,0	2,4	-1,1	2,4	0,1
Foodprod_nec	-1,1	0,0	1,0	0,0	-1,1	0,1	2,1	0,0
Bev_tobacco	-1,0	0,0	0,5	0,0	-4,1	0,1	8,7	0,0
Textiles	-2,2	0,1	0,3	0,0	-1,9	0,1	-0,7	0,0
Apparel	-1,3	0,0	0,2	0,0	-1,2	0,1	0,9	0,0
Leather	-2,6	0,0	0,3	0,0	-3,5	0,1	1,5	0,0
Wood_prod	-1,7	0,0	0,3	0,0	-2,8	0,1	2,8	0,0
Paper_prod	-1,0	0,0	0,2	0,0	-1,6	0,0	0,3	0,0
Petrol_coal	-0,2	0,0	0,0	0,0	-0,3	0,0	0,2	0,0
Chemical_pla	-1,6	0,0	0,1	0,0	-2,1	0,0	0,7	0,0
Minprod_nec	-3,1	0,0	0,1	0,0	-5,0	0,1	2,1	0,0
Ferrous_met	-2,4	0,0	0,2	0,0	-2,9	0,0	-0,4	0,0
Metals_Nec	-1,7	0,0	0,2	0,0	-1,5	0,0	-0,4	0,0
Metal_prods	-1,9	0,0	0,1	0,0	-3,7	0,0	1,5	0,0
Motor_veh	-1,2	0,0	-0,3	0,0	-0,8	0,0	1,9	0,0
Trans_eq_nec	4,5	0,2	-0,2	0,0	7,7	0,3	0,9	0,0
Electronic	-0,9	0,0	0,1	0,0	-0,8	0,0	0,4	0,0
Machine_nec	-1,6	0,0	0,2	0,0	-1,6	0,0	0,8	0,0
Manufact_nec	-5,6	0,1	0,2	0,0	-4,1	0,2	6,0	0,0
Services	0,1	0,0	0,4	0,0	-1,0	0,0	0,9	0,0

Source: Own estimations

wages barely change, with labor suffering even a small reduction in CA.

4.3 Dynamic Simulation Extensions

We present now the two extensions to the main GTAP model that complement the previous static results. Usually, the static gains are relatively small when compared to the results of econometric studies. These studies find a strong and significant relation between trade openness, trade and FDI flows, and growth.¹⁹

¹⁹For surveys on the topic see Edwards (1993), Barro and Sala-i-Martin (1995), and Easterly (2001). A critical view of this literature is given by Rodríguez and Rodrik (2001).

Table 15: Scenario with exclusion of sensible agricultural products, percentage changes

Sector code	Output		Prices		Exports		Imports	
	CA	EU	CA	EU	CA	EU	CA	EU
Land	-	-	0,4	0,0	-	-	-	-
Unskilled labor	-	-	0,0	0,0	-	-	-	-
Skilled labor	-	-	-0,1	0,0	-	-	-	-
Capital	-	-	-0,1	0,0	-	-	-	-
Natural_Res	-	-	-0,4	0,0	-	-	-	-
Paddy_rice	1,2	-0,2	0,2	0,0	388,9	-0,5	0,4	0,2
Wheat	0,1	0,0	0,0	0,0	0,2	0,0	-0,1	0,0
Other_cereal	0,1	0,0	-0,1	0,0	0,1	0,0	0,0	0,0
Veg_fruits	0,0	0,0	-0,1	0,0	0,1	0,0	0,6	0,0
Oil_seeds	0,1	0,0	0,0	0,0	0,4	0,0	-0,1	0,0
Sugar_cane	0,1	0,0	-0,1	0,0	87,9	-0,1	-0,1	0,1
Plant_fibers	0,3	0,0	0,0	0,0	0,0	0,0	0,1	0,0
Crops_nec	0,2	0,0	0,0	0,0	0,4	0,0	0,5	0,0
Cattle	0,0	0,0	-0,1	0,0	-0,3	0,0	0,1	0,0
Animprod_nec	-0,1	0,0	-0,1	0,0	0,1	0,0	-0,1	0,0
Raw_milk	0,1	0,0	-0,1	0,0	0,3	-0,1	-0,2	0,0
Wool	0,1	-0,1	-0,1	0,0	1,0	-0,1	-0,5	0,0
Forestry	-0,2	0,0	-0,2	0,0	0,5	0,0	-0,7	0,0
Fishing	0,0	0,0	-0,2	0,0	0,1	0,0	-0,3	0,0
Coal	0,1	0,0	0,0	0,0	0,1	0,0	-0,5	0,0
Oil	0,0	0,0	-0,1	0,0	0,5	0,0	-0,4	0,0
Gas	-0,2	0,0	-0,5	0,0	15,0	0,0	-5,1	0,0
Minerals_nec	-0,4	0,0	-0,3	0,0	0,7	0,0	-0,8	0,0
Meat	-0,1	0,0	-0,1	0,0	0,4	0,0	-0,4	0,0
Meatprod_nec	-0,6	0,0	-0,1	0,0	1,4	0,1	2,2	0,0
Veg_oils	-0,3	0,0	-0,1	0,0	-0,3	0,1	0,5	0,0
Dairy	1,0	0,0	-0,1	0,0	10,4	0,0	-0,1	0,0
Proc_rice	-0,1	0,0	-0,1	0,0	0,3	0,0	-0,3	0,0
Sugar	0,2	0,0	-0,1	0,0	0,4	0,0	-0,4	0,0
Foodprod_nec	0,1	0,0	-0,2	0,0	1,3	0,0	0,6	0,0
Bev_tobacco	-1,2	0,0	-0,3	0,0	-3,7	0,1	7,5	0,0
Textiles	0,9	0,0	-0,2	0,0	1,0	0,1	0,6	0,0
Apparel	0,7	0,0	-0,2	0,0	0,8	0,1	-0,1	0,0
Leather	-0,8	0,0	-0,3	0,0	-0,5	0,0	0,7	0,0
Wood_prod	-1,0	0,0	-0,1	0,0	-0,7	0,0	1,7	0,0
Paper_prod	-0,2	0,0	-0,2	0,0	-0,4	0,0	0,0	0,0
Petrol_coal	-0,4	0,0	0,0	0,0	-0,1	0,0	0,0	0,0
Chemical_pla	-0,5	0,0	-0,3	0,0	-0,5	0,0	0,3	0,0
Minprod_nec	-2,4	0,0	-0,3	0,0	-3,9	0,1	1,8	0,0
Ferrous_met	-0,7	0,0	-0,2	0,0	-1,2	0,0	0,1	0,0
Metals_Nec	0,5	0,0	-0,2	0,0	1,3	0,0	-0,3	0,0
Metal_prods	-0,9	0,0	-0,3	0,0	-1,8	0,0	1,2	0,0
Motor_veh	-1,3	0,0	-0,4	0,0	-0,3	0,0	1,5	0,0
Trans_eq_nec	5,7	0,2	-0,4	0,0	9,1	0,3	0,8	0,1
Electronic	1,3	0,0	-0,2	0,0	1,6	0,0	0,4	0,0
Machine_nec	0,3	0,0	-0,2	0,0	0,8	0,0	0,4	0,0
Manufact_nec	-4,4	0,0	-0,2	0,0	-1,7	0,2	5,0	0,0
Services	0,0	0,0	-0,1	0,0	0,4	0,0	-0,3	0,0

Source: Own estimations

The low GDP gains from most CGE models is generally attributed to the lack of dynamic effects. These include: international capital flows and FDI, the availability of cheaper and higher quality intermediate inputs, the implementation of trade facilitation mechanisms, increased competition in the domestic markets, and possible technological transfers associated with a closer integration with international markets. These dynamic effects have the potential to generate much larger welfare and outcome benefits than the static gains (Francois *et al.*, 1996).

On the other hand, the measurement and empirical assessment of these dynamic effects is extremely complex. In addition, the implicit interrelations between different dynamic variables is more difficult to

disentangle. For example, what is the impact of larger FDI inflows in sector-specific productivity? Or what is the effect on the domestic market structure of higher international competition?

Despite these setbacks, some dynamic mechanisms have been incorporated into the CGE framework. The modelling of trade facilitation mechanisms is straightforward, even when it is one of the dynamic effects with less potential to increase growth. Finally, one of the dynamic mechanisms that has greater potential, higher capital inflows, has also been incorporated into CGE models. In the following sections, we explain how we include both mechanisms as extensions to the main GTAP-CGE model.

4.3.1 Trade Facilitation Mechanisms

These mechanisms include the simplification of customs procedures, the harmonization of standards and regulations between regions, and in a more general view: customs automatization, better ports and transport infrastructure, and other means that reduce the effective price of imports (Hertel *et al.*, 2001).

Trade costs in GTAP are modelled using the *iceberg costs* method. This implies that there is no explicit international transport sector and instead, there is a markup between the effective import and export prices. The costs associated with this markup are *melted* during the process, and they are not assigned to any region or institution. Nor are they associated with any specific non-tariff barriers.

Trade facilitation mechanisms, therefore, can be modelled as a reduction in these iceberg costs. In particular, in these simulations we use a reduction of 2% in the iceberg costs between CA and the EU. This 2% value is the most common in the literature, even when the associated gains from trade facilitation can be higher.²⁰

The simulation results using this mechanism show an increase in the welfare gains (see Table 16).²¹ For the full liberalization scenario welfare increases in addition by US\$ 200 million and for the scenario with the exclusion of sensible agricultural products welfare is now rising, but only by US\$ 95 million. Bilateral trade gets a boost of 10 percentage points, with respect to the static simulations. When we analyze the changes in sectoral production and factor prices, the new simulations follow the same pattern of the static scenarios but the effects are bigger.

However, there is still a hedge between the results that include the reduction of EU agricultural protection and the full liberalization case. In the later scenario, the inclusion of dynamic effects enhances the welfare and GDP gains, while the exclusion scenario has gains of a lesser magnitude. This result also holds in the other dynamic simulations and are directly related to the levels of bilateral trade implicit in the scenarios. With full liberalization trade flows increase the most and thus, the positive impact of the trade facilitation mechanisms are fully exploited.

²⁰Engman (2005) overviews some recent applications of these mechanisms.

²¹We do not present here the results for the scenarios with the ACP equiparation. These results are always an intermediate case between the extreme scenarios.

Table 16: EU-CAAA, summary of the dynamic scenario simulations

Scenario:	GDP (percentage change)		Welfare gains (change in US\$ mill.)		Welfare gains (% of GDP)		Bilateral trade (percentage change)	
	CA	EU	CA	EU	CA	EU	CA	EU
Trade facilitation mechanisms:								
Base case: full liberalization	0,4	0,0	1.360,5	82,9	1,9%	0,0%	55,8	51,5
Exclusion of sensible products	0,2	0,0	94,8	393,0	0,1%	0,0%	21,0	48,3
Endogenous capital accumulation:								
Base case: full liberalization	1,5	0,0	1.758,3	-84,8	2,5%	0,0%	46,0	46,1
Exclusion of sensible products	0,2	0,0	23,1	212,9	0,0%	0,0%	11,7	42,8
Combined impact:								
Base case: full liberalization	2,0	0,0	2.174,9	95,3	3,0%	0,0%	56,9	52,1
Exclusion of sensible products	0,7	0,0	378,2	395,1	0,5%	0,0%	21,4	48,5

Source: Own estimations

4.3.2 Endogenous Capital Accumulation

One of the main issues included in most bilateral FTAs is to establish and/or reinforce the legal and institutional framework to ease the flow of international investments. Hence, the second dynamic extension is the inclusion of an endogenous capital accumulation procedure that can indirectly account for the expected increase in FDI inflows. The standard GTAP model is static and hence, the saving rate and the initial capital stock are held constant. The end-of-period capital stock is increased to reflect the inflow of international capital linked to the differential between capital return rates. However, the capital changes are a result of the simulation, and are not incorporated into the calculation of the new equilibrium –i.e. it does not affect production, wages, nor welfare.

To estimate the welfare gains of the expected increase in FDI inflows to CA, we follow Francois *et al.* (1996) and change the closure rules in the standard GTAP model to incorporate the capital change directly into the estimation process. Using this approach, capital accumulation is endogenously determined and it simulates a dynamic setting. In particular, this alternative closure rule implies a two-stage estimation process. First, the end-of-period capital stock is estimated using the differential in return rates. In the second stage, this new capital stock is used as the initial value to assess the general equilibrium effects of increased capital. Therefore, although we do not use a dynamic model, we can estimate the welfare implications of an increase in the capital stock associated with higher FDI inflows to CA.

The results for these simulations are shown in Table 16. Gross output is increasing by 1.5 percentage points, while welfare increases in US\$ 1.750 millions or 2.5% of GDP. This represents 1.3 p.p. of additional output and US\$ 600 million more than in the static full liberalization scenario. These significant gains are a consequence of the capital stock increasing by 2.9%. However, for the scenario with exclusion of sensible products, the gains are quiet smaller but positive. Output increases only 0.2% and the additional welfare gains are US\$ 100 million.

4.3.3 Combined Dynamic Estimations

In the last row of Table 16 we present the estimations when both the trade facilitation mechanism and the endogenous capital accumulation are combined. As expected, this is the scenario that has the highest output and welfare gains. This final scenario is an approximation of the full impact of EU-CAAA when both the expected static and dynamic effects are included. Moreover, it can be regarded as a lower-bound estimation, since not all the dynamic effects are estimated, such as increased competition and productivity associated with higher trade volumes.

However, the main feature of Table 16 is that it has the same pattern of high gains for full liberalization and low gains for the exclusion scenario.

5 Summary

The main result of our simulations is that much of the potential output and welfare gains of EU-CAAA are directly related to the inclusion of sensible agricultural products in the final agreement. Around 75% of the welfare static gains are generated by the removal of the tariffs in bananas and sugar. The combined static and dynamics welfare gains can account for US\$ 2.175 millions or 3% of GDP when there is full trade liberalization. In contrast, when these sensible products are excluded from EU-CAAA welfare increases by only US\$ 375 millions or 0.5% of GDP.

The reason why both sensible products are so important, is that the other main Central American export goods already enjoy preferential access to the EU under the GSP plus framework. An important outcome the EU-CAAA will be to formalize these concessions, which are currently unilaterally set by the EU and periodically revised. Thus, the current uncertainty for producers and investors can be eliminated.

Given the recent track record of bilateral agreements by the European Union, it is expected that both sugar and bananas will be excluded from the negotiations. This possible outcome reflects the underlying weakness of bilateral trade agreements in contrast to multilateral negotiations, where broader compromises from developed countries could be expected. Under these circumstances, CA can still benefit from EU-CAAA if it implements complementary policies that can facilitate trade between both regions and create the necessary conditions for an increase in the investment flows from the EU. Additional funding from the EU to achieve these complementary policies can also be a positive outcome from the agreement.

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 EU-CAAA. Therefore, the short-run adjustment and preliminary implications of the trade agreement are not analyzed here.

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7 Appendix

Table 10: GTAP sectoral aggregation used for EU-CAAA

	GTAP sector	Agg. Sector	Description
1	PDR	Paddy_rice	Paddy rice
2	WHT	Wheat	Wheat
3	GRO	Other_cereal	Cereal grains nec
4	V_F	Veg_fruits	Vegetables, fruit, nuts
5	OSD	Oil_seeds	Oil seeds
6	C_B	Sugar_cane	Sugar cane, sugar beet
7	PFB	Plant_fibers	Plant-based fibers
8	OCR	Crops_nec	Crops nec
9	CTL	Cattle	Bovine cattle, sheep and goats, horses
10	OAP	Animprod_nec	Animal products nec
11	RMK	Raw_milk	Raw milk
12	WOL	Wool	Wool, silk-worm cocoons
13	FRS	Forestry	Forestry
14	FSH	Fishing	Fishing
15	COA	Coal	Coal
16	OIL	Oil	Oil
17	GAS	Gas	Gas
18	OMN	Minerals_nec	Minerals nec
19	CMT	Meat	Bovine meat products
20	OMT	Meatprod_nec	Meat products nec
21	VOL	Veg_oils	Vegetable oils and fats
22	MIL	Dairy	Dairy products
23	PCR	Proc_rice	Processed rice
24	SGR	Sugar	Sugar
25	OFD	Foodprod_nec	Food products nec
26	B_T	Bev_tobacco	Beverages and tobacco products
27	TEX	Textiles	Textiles
28	WAP	Apparel	Wearing apparel
29	LEA	Leather	Leather products
30	LUM	Wood_prod	Wood products
31	PPP	Paper_prod	Paper products, publishing
32	P_C	Petrol_coal	Petroleum, coal products
33	CRP	Chemical_pla	Chemical, rubber, plastic products
34	NMM	Minprod_nec	Mineral products nec
35	I_S	Ferrous_met	Ferrous metals
36	NFM	Metals_Nec	Metals nec
37	FMP	Metal_prods	Metal products
38	MVH	Motor_veh	Motor vehicles and parts
39	OTN	Trans_eq_nec	Transport equipment nec
40	ELE	Electronic	Electronic equipment
41	OME	Machine_nec	Machinery and equipment nec
42	OMF	Manufact_nec	Manufactures nec
43	ELY	Services	Electricity
43	GDT	Services	Gas manufacture, distribution
43	WTR	Services	Water
43	CNS	Services	Construction
43	TRD	Services	Trade
43	OTP	Services	Transport nec
43	WTP	Services	Water transport
43	ATP	Services	Air transport
43	CMN	Services	Communication
43	OFI	Services	Financial services nec
43	ISR	Services	Insurance
43	OBS	Services	Business services nec
43	ROS	Services	Recreational and other services
43	OSG	Services	Public Adm., Defense, Education, Health
43	DWE	Services	Dwellings