ECONOMIC IMPACT OF FREER TRADE IN LATIN AMERICA AND THE CARIBBEAN: A GTAP ANALYSIS*

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The recent worldwide economic conditions resulting from the financial crisis call for greater cooperation. This paper assesses the impact of trade reforms between Latin America and the Caribbean (LAC) and India and LAC and the EU (European Union) at 2020 using a global computable general equilibrium (CGE) model. The findings show that LAC-EU tariff reduction appears to be beneficial for both regions in the short run, though not so in the long run, while the LAC-India tariff reduction impact appears to be more beneficial for both economies in the long run. This important finding emphasizes the scope and opportunities for south-south cooperation in the long run.

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1. INTRODUCTION

Latin American and Caribbean countries have grown rapidly in recent decades. However, this growth stretch has been hampered by the worldwide financial crisis of the past few years. The impacts of this crisis have been transmitted to the region mainly through the channels of external trade and export prices (Economic Commission for Latin America and the Caribbean - ECLAC, 2009). After growing continuously for six years, the gross domestic product (GDP) of Latin America and the Caribbean declined by 1.8% in 2009, resulting in increased unemployment and poverty (ECLAC, 2009).

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The financial crisis affected the region's trade, with Latin America's worldwide exports declining 31% in the first half of 2009. According to ECLAC estimates, the volume of regional trade shrank by approximately 13% in 2009, more than the 10% decline projected for global trade, while the volume of exports and imports for the Latin American and Caribbean region dropped significantly. The crisis has also affected investment and private consumption (ECLAC, 2009).

After contracting in 2009, GDP expanded by 5.9% in Latin America and the Caribbean in 2010, although performance varied significantly among countries in the region. This expansion was caused by strong domestic demand in the forms of consumption and investment, and also by buoyant external demand (ECLAC, 2010-11). On the domestic demand side, private consumption growth (up 5.9%) occurred because of an improvement in employment and wages. Public consumption rose at a modest rate of 3.9%. Investment grew by 14.5%, with strong growth in the machinery and equipment segments in particular. On the external demand side, exports of goods and services rose by over 10%. On the other hand, imports increased by more than 10%. For 2012, ECLAC projects regional growth of 4.1%, equivalent to a 3.0% rise in per capita GDP, notwithstanding the downturn in external conditions. Developed economies are likely to grow by 2.4% in 2012 (ECLAC, 2010-11). Meanwhile, the economic recovery is likely to be fragile in the United States and Japan, and Europe's economy is projected to grow by just 1.9% in 2012. Developing economies will be the major players in global growth, with a rate of 6.2% projected in 2012. The strongest performers are expected to be China (8.9%) and India (8.2%) in 2012 (ECLAC, 2010-11).

These new international conditions call for greater regional cooperation, not only to contain the adverse impact of the crisis but also to improve the region's position in the global economy. In this sense, Latin American and Caribbean countries need to adopt a more coordinated approach to tightening ties with Asia-Pacific countries (ECLAC, 2010).

Besides the Asia-Pacific region, closer links with developed countries, particularly the European Union, would likely benefit the LAC region in terms of addressing the current crisis. The LAC-EU summit in Peru in 2008 and recently in Madrid in 2010 are evidence of attempts to strengthen LAC-EU coordination and cooperation.

Towards this end, this paper makes a modest attempt to study the impact of economic cooperation between the LAC region and other countries.

Specifically, the objective of the study is to evaluate the economic impacts of freer trade between LAC and India, and LAC and the EU.

The rest of the paper is organized as follows. Section 2 briefly reviews the efforts already in place between LAC-India and LAC-EU. Section 3 develops the method of analysis. The data, aggregation scheme, scenario development and macro variable assumptions are presented in Section 4. Section 5 discusses the results. Section 6 concludes the paper.

2. A BRIEF REVIEW OF INITIATIVES

LAC countries have entered into a significant number of trade agreements with countries around the world. These include around 90 trade agreements, of which 55 are FTAs and more than 40 are partial preferential trade agreements. Of the 55 FTAs, 21 are between LAC countries and the EU or Asian economies, while the rest mainly address integration among LAC countries (for details, see Appendix B).

2.1. Efforts made by LAC-INDIA

Several Latin America and Caribbean countries and the government of India are working on ways to augment trade and commerce between India and LAC countries and are encouraged by the fact that trade relations between India and the region have grown in recent years.

Trends in Indian exports and imports are shown in tables 1 and 2. North America and Europe have continued to be important destinations for Indian products, although their combined share declined from 46.2 to 29% from 2002-03 to 2010-11. On the other hand, the share attributed to Asia, including ASEAN, steadily increased from 2002-03 to 2010-11 (4 to 56%). Exports to Latin America are on the rise. On the import side, Asia's share was around 61% in 2010-11, while the share of North America and Europe together has declined from 31 to 18%.

As shown in Table 3, India's trade with Latin American countries during the last few years has been growing steadily, increasing from US\$1.07245 billion in 1996-97 to US\$24.927 billion in 2010-11. India's exports totaled US\$10 billion and imports reached US\$14 billion in 2010-11, resulting in an unfavorable balance of trade. In Latin America, Brazil was the main destination for Indian exports, followed by Mexico, Colombia and Argentina. Chile is the top exporter to India, followed by Brazil and Argentina. In terms of products, chemicals

and pharmaceuticals were the leading exports from India, followed by engineering products. Copper accounted for around 90% of Chile's exports to India, while vegetable oils formed approximately 80% of Argentine exports to India (Focus: LAC, 2008).

Table 3. India's trade with Latin American countries

(US\$ millions)

Year	Value of exports	Value of imports	Total trade	Balance of trade
1996-1997	478.74	593.71	1,072.45	-114.97
1997-1998	699.83	580.42	1,280.25	119.41
1998-1999	611.31	730.69	1,342	-119.38
1999-2000	652.46	936.74	1,589.2	-284.28
2000-2001	978.42	707.71	1,686.13	270.71
2001-2002	1,455.71	989.73	2,445.44	465.98
2002-2003	1,636.36	1,044.92	2,681.28	591.44
2003-2004	1,777.13	1,194.13	2,971.26	583
2004-2005	2,160.71	2,054.8	4,021.51	105.91
2005-2006	2,956.01	2,409.43	5,365.44	546.58
2006-2007	4,456.81	6,278.14	10,734.95	-1,821.33
2007-2008	5,905.51	6,669.6	12,575.11	-764.09
2008-2009	6,430.26	10,224.32	16,654.58	-3794.06
2009-2010	6,479.69	10,615.77	17,095.46	-4,136.08
2010-2011	10,528.38	14,398.89	24,927.27	-3,870.51
Source: Government of India (2012)				

A series of recent initiatives have been implemented to foster the trade relationship between India and LAC; these initiatives are summarized below (Focus: LAC 2008).

Preferential trade agreement with MERCOSUR

India and MERCOSUR¹ signed a framework agreement in June 2003 in Asunción, Paraguay. As a follow-up to the framework agreement, a preferential trade agreement (PTA) was signed in New Delhi in January 2004 with a view to expanding and strengthening the relationship between MERCOSUR and India and promoting trade

1. MERCOSUR: Brazil, Argentina, Paraguay, Uruguay and Venezuela.

expansion through reciprocal fixed tariff preferences with the ultimate objective of creating a free trade area between the parties.

The India-MERCOSUR PTA contains five appendices, which were signed in March 2005. The five appendices are the MERCOSUR Offer List, India Offer List, Rules of Origin, Safeguard Measures and the Dispute Settlement Procedure. Under this PTA, India and MERCOSUR have agreed to tariff concessions ranging from 10 to 100% on 450 and 452 tariff lines respectively. The major product groups covered in the MERCOSUR offer are food preparations, organic chemicals, pharmaceuticals, essential oils, plastics and articles thereof, rubber and rubber products, tools and implements, machinery items, electrical machinery and equipment. The major products included in India's offer list are meat and meat products, inorganic chemicals, organic chemicals, dyes and pigments, rawhides and skins, leather articles, wool, cotton yarn, glass and glassware, iron and steel articles, machinery items, electrical machinery and equipment, and optical, photographic and cinematographic devices.

Preferential trade agreement with Chile

India and Chile signed the Framework Agreement to Promote Economic Cooperation in January 2005. As a follow-up to the framework agreement, a PTA was finalized after four rounds of negotiations between the two sides, with the last round taking place in New Delhi in November 2005. The PTA has two appendices related to the list of products for which the two sides have agreed to set fixed tariff preferences and three appendices relating to rules of origin, preferential safeguard measures and dispute settlement procedures. While India has offered to provide fixed tariff preferences ranging from 10 to 50% on 178 tariff lines at the eight-digit level to Chile, the latter has offered India a similar range of tariff preferences on 296 tariff lines at the eight-digit level. The products on which India has offered tariff concessions include meat and fish products (84 tariff lines), rock salt (1 tariff line), iodine (1 tariff line), copper ore and concentrates (1 tariff line), chemicals (13 tariff lines), leather products (7 tariff lines), newsprint and paper (6 tariff lines), wood and plywood articles (42 tariff lines), some industrial products (12 tariff lines), shorn wool and noils of wool (3 tariff lines) and other products (7 tariff lines).

Chile's offer covers certain agriculture products (7 tariff lines), chemicals and pharmaceuticals (53 tariff lines), dyes and resins (7 tariff lines), plastic, rubber and miscellaneous chemicals (14 tariff lines), leather

products (12 tariff lines), textiles and clothing (106 tariff lines), footwear (10 tariff lines), certain industrial products (82 tariff lines) and other products (5 tariff lines). The Agreement was signed in March 2006.

Institutional mechanisms

The following institutional arrangements are already in place: (a) the Indo-Argentine Joint Commission; (b) the Indo-Argentine Joint Trade Committee; (c) the Indo-Mexican Joint Commission; (d) the Indo-Brazilian Commercial Council; (e) the Indo-Cuban Joint Commission; (f) the Indo-Cuban Trade Revival Committee; (g) the Indo-Suriname Joint Commission; and (h) the Indo-Guyana Joint Commission.

2.2. Efforts made by LAC-EU

The countries of Latin America and the Caribbean are taking concrete steps to diversify their economies and expand their markets in Europe. The EU and LAC are natural allies given their close historical, cultural and economic ties, as well as the increasing convergence of their basic values and principles (European Union, 2008). Building on this long-standing relationship between the two regions, the EU has established and strengthened links with LAC since the 1960s. In 1999, representatives of the EU and LAC met in Rio de Janeiro to form a strategic partnership aimed at fostering political, economic and cultural links between the two regions. The summit in Rio de Janeiro was followed by several bi-annual summits held in Madrid, Spain (2002); Guadalajara, Mexico (2004); Vienna, Austria (2006); Lima, Peru (2008); and recently in Madrid (Madrid Declaration, 2010). These events have facilitated the deepening of EU-LAC relations, reaffirming the regions' commitment to promoting and strengthening their strategic partnership based on common principles, values and interests (European Union, 2008).

The EU and Brazil launched their strategic partnership at the first EU-Brazil Summit in Lisbon in July 2007. In December 2007 the European Commission initiated an Economic Partnership Agreement (EPA) with the CARIFORUM² countries (European Union MEMO/08/303). The EPA fully opens the EU market to Caribbean

2. CARIFORUM countries: Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, the Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Saint Lucia, Saint Vincent and the Grenadines, Saint Christopher and Nevis, Surinam, and Trinidad and Tobago.

exports and gradually opens the Caribbean market to new trade from the EU. Both Mexico (2000) and Chile (2003) have signed free trade agreements with the EU covering trade and investment. The Madrid Summit, which brought together heads of state and other government leaders from Latin America, the Caribbean and Europe, as well as important non-state actors, resulted in a decision to re-launch negotiations for an EU-MERCOSUR Free Trade Agreement and provide political approval for a comprehensive trade agreement between the EU and the Andean countries (Peru and Colombia) as well as the endorsement of the conclusion of negotiations between the EU and Central America³ (Madrid Declaration, 2010).

The EU is Latin America and the Caribbean's second-largest trading partner. Moreover, LAC's trade with the EU has increased substantially since 1980, particularly during the last decade, resulting in trade figures that more than doubled between 1990 and 2008 (reaching approximately €180 billion in 2008) (European Union 2010, European Union 2008a). In 2006, the EU imports from LAC totalled €75 billion, and exports to the region amounted to €71 billion. Bilateral trade between the two regions amounts to around €160 billion annually (European Union MEMO/08/286). In 2007, the EU received around 14% of Latin American exports and 19% of Caribbean exports and these numbers continue to rise (European Union 2008b). Table 4 provides figures for the EU's recent trade with LAC countries. The balance of trade is always negative from the EU's standpoint except in 2010, which shows a large surplus.

Table 4. EU members states' trade with LAC countries

(in millions of euros)

Period	Imports	Exports	Balance	Total Trade
2007	100,188	94,755	-5,433	194,939
2008	110,575	102,890	-7,685	213,463
2009	81,792	80,514	-1,278	162,309
2010	105,309	109,592	4,284	214,901
2011	124,392	122,953	-1,440	247,346
Source: EUROSTAT, DG Trade, European Commission.				

3. Central America: Costa Rica, El Salvador, Guatemala, Honduras, Panama and Nicaragua. Andean Community: Bolivia, Colombia, Ecuador and Peru.

Although its proximity makes the United States a natural export market for LAC, trade in goods with the European Union is also important for the 15 Caribbean countries that are members of the African, Caribbean and Pacific Group of States.

Almost half of the EU exports to LAC countries in 2009 consisted of machinery and vehicles, while food and beverages accounted for one-third of imports. Specifically, the EU's main exports to LAC countries were medicine, ships, aircraft, cars and car parts and gasoline, while its main imports from the region were soybeans and soybean residue, crude oil, coffee, bananas and copper and copper ore. The EU's imports from the Caribbean Community (CARICOM) have traditionally been dominated by oil, aluminum oxide, rum, sugar, and bananas. Furthermore, the EU has become an important investor in the LAC region, with over €25 billion of foreign direct investment (FDI) flows and more than €260 billion in FDI stock as of 2007 (European Union, 2010).

3. METHOD OF ANALYSIS

The computable general equilibrium (CGE) modeling framework was chosen to undertake this analysis, with a database and model known as the Global Trade Analysis Project (GTAP). This applied general equilibrium model is thoroughly documented in Hertel (1997) and in the GTAP V7 database documentation (Narayanan and Walmsley, 2008). It is a comparative, static, multi-regional CGE model.

The basic structure of the GTAP model includes industrial sectors, households, governments, and global sectors across countries. Countries and regions in the world economy are linked together through trade and prices and quantities are simultaneously determined in both factor markets and commodity markets. The main factors of production are skilled and unskilled labor, capital, natural resources and land. In the model, the total supply of labor and land is fixed for each region, but capital can cross regional borders to equalize changes in rate of return. Labor and land cannot be traded, while capital and intermediate inputs can be traded.

Producers operate under constant returns to scale, where the technology is described by the Leontief and constant elasticity of substitution (CES) functions. In the model, firms minimize the cost of inputs given their level of output and fixed technology. The production functions

used in the model are of a Leontief structure. Firms are assumed to combine a bundle of intermediate inputs in fixed proportion to a bundle of primary factors. Similarly, the relationship between the amount of intermediate inputs and outputs is also fixed. Firms purchase intermediate inputs, some of which are produced domestically and some of which are imported. It is also assumed that domestically produced goods and imports are imperfectly substituted. This is modeled using the Armington elasticity⁴, an essential component of trade policy analysis. Partial and general equilibrium models that rely on the Armington structure are universally sensitive to these elasticities.

Household behavior in the model is determined from an aggregate utility function, where aggregate utility is modeled using a Cobb-Douglas function with constant expenditure shares. This utility function includes private consumption, government consumption and savings. Private household consumption is explained by a constant difference elasticity (CDE) expenditure function.

Domestic support and trade policy (tariff and non-tariff barriers) are modeled as ad valorem equivalents. These policies have a direct impact on the production and consumption sectors in the model.

There are two global sectors in the model: transportation and banking. The transportation sector takes into account the difference in the price of a commodity as a result of the transportation of the good between countries. The global banking sector brings into equilibrium the savings and investment in the model.

In equilibrium, all firms have zero real profit, all households are on their budget constraint, and global investment is equal to global savings. Changing the model's parameters allows one to estimate the impact resulting from a country or region moving from an initial equilibrium position to a new equilibrium position.

4. In the GTAP models we use Armington's (1969) assumption that goods produced in different regions are qualitatively distinct. GTAP adopts a two-tier Armington substitution in a theoretical structure that is much more complex. Armington elasticities allow differentiation between imports from different countries, specifying the extent to which substitution is possible between imports from various sources, as well as substitution between imports and domestic production. Furthermore, imported intermediates are assumed to be separable from domestically produced intermediate inputs. That is, firms first decide on the sourcing of their imports; then, based on the resulting composite import price, they determine the optimal mix of imported and domestic goods. This specification was first proposed by Paul Armington in 1969 and has since become known as the "Armington approach" to modeling import demand. In sum, it permits us to explain cross-hauling of similar products and to track bilateral trade flows. We believe that in many sectors an imperfect competition/endogenous product differentiation approach would be preferable. However, such models require additional information on industry concentration (firm numbers) as well as scale economies (or fixed costs), which is not readily available on a global basis (Hertel, 1997).

Closure plays a very important role in GTAP modeling, as it can be used to capture policy regimes and structural rigidities. The standard GTAP closure is characterized by all markets being in equilibrium, all firms earning zero profits and the regional household being on its budget constraint.

The GTAP framework's strength is that due to theoretical grounds, it is able to represent direct and indirect interactions among all sectors of the economy and provide precise detailed quantitative results (Thierfelder *et al.*, 2007).

There are a number of studies on the computable general equilibrium and Global Trade Analysis Project framework that address the impact of various trade liberalization mechanisms. However, little work has considered India-LAC and the EU on the same platform. Ram (1971) discussed India's trade with Latin America, briefly focusing on the scope, opportunities and implications of trade and economic cooperation with Peru. Recently, Lederman *et al.* (2008) examined the extent to which China and India's growth in world markets is affecting patterns of trade specialization in Latin American (LA) economies. This empirical analysis explores the correlation between the revealed comparative advantages (RCAs) of Latin America and the two Asian economies. Econometric estimates suggest that Latin America's specialization pattern diverged from that of China and India between 1990 and 2004, leading to more complementary trade specialization patterns. This is mainly due to the evolution of their RCAs in agriculture, fisheries, forestry, and mining, but not in manufacturing (with a few exceptions), where the RCA indices of China and India are moving in the same direction as the RCAs of Latin American countries (except for food manufacturing, beverages, and professional and scientific equipment). Overall, the results suggest that the growth of China and India had a negative effect on sectors that are relatively labor-intensive (skilled and unskilled), while natural-resource and scientific-knowledge intensive sectors in Latin America have benefited from China and India's growth in world markets.

Ramagosa and Reveira (2008) assessed the potential macroeconomic effects of a future European Union and Central America Association Agreement (EU-CAAA) using a global CGE model. Currently many agricultural products from Central America enter the EU duty-free (except bananas and sugar). They found that much of the potential output and welfare gains of EU-CAAA are directly related to the

inclusion of sensitive products (bananas and sugar). Around 75% of static gains in welfare are generated by the removal of tariffs on bananas and sugar. The combined static and dynamic gains account for 3% of GDP (US\$2.175 billion) when there is full trade liberalization. In contrast, when these sensitive products are excluded from EU-CAAA, welfare increases by only 0.5% of GDP (US\$375 million).

Recently, Moreira (2010) focused on trade and investment between Latin America and the Caribbean and India to better understand and promote trade and integration between the two economies, as well as to single out the main obstacles to such integration using a modified gravity model. Moreira's analysis and findings clearly indicate that the fundamentals exist for a strong trade relationship between the two regions. LAC has many of the natural resources that India needs to grow and thrive. As is the case with China, this "natural resource pull" should be strong enough to send bilateral trade soaring.

Aside from this factor, similarity in demand patterns provides another good reason for trade, particularly in manufactured goods aimed at the vast low- and middle-income populations in these two economies. But the cost of trade so far has prevented this from happening. Tariffs imposed on LAC exports to India are close to prohibitive, particularly for agricultural products. Tariffs imposed on India's exports to LAC are not as high, but they do have an impact. In addition to these two formidable obstacles, non-tariff barriers and the high cost of shipping goods between the two economies cannot be overlooked.

Despite frequent declarations of commitment to trade and integration, governments on both sides have yet to effectively address the most obvious and serious obstacles to bilateral trade. Although trade agreements have been signed between India and LAC partners such as MERCOSUR and Chile, the limited scope of these initiatives is likely to reduce their effectiveness. Unless they incorporate more LAC countries and substantially expand the number of products covered, they are not going to solve the paradox of this "missing trade." Moreover, they only partially address trade costs. An effective trade agenda must also bring transport costs down through a regulatory framework that promotes investment and competition in transport services between the two economies. However, apart from the outward FDI from both India and LAC, a very small proportion of investment

has gone to reinforcing the bilateral relationship. The bulk of outward FDI from LAC and India is destined to their major trading partners: the U.S., Europe and Asia. This is far from surprising, as trade brings economies together, clarifying the incentives for investment and reducing the significance of barriers, particularly informational barriers. Without a critical mass of trade, the prospects for bilateral investment between LAC and India appear dim.

More trade is also a key ingredient for strengthening a growing movement towards cooperation between the two economies that had been missing from their foreign policy agendas until they opened their borders to international trade. More trade is likely to strengthen the virtuous circle in which trade boosts incentives for cooperation while cooperation creates even more opportunities to trade.

One idea common to these three studies is the clear presence of opportunities for LAC trade. Ramagosa and Reveira (2008) addressed the EU-CAAA, focusing on the impact of trade liberalization on sensitive agricultural products using a global CGE, while Lederman *et al.* (2008) dealt with LAC trade patterns in the presence of India and China using revealed comparative advantage. Moreira *et al.* (2010), on the other hand, studied the trade potential between LAC and India and explored the obstacles to trade between them. The objective of these three exercises was different from this study, which is more comprehensive and estimates the impact of trade liberalization between LAC-India and LAC-EU using a global CGE model. Because the EU and India are major trading partners, we examine the impact of trade liberalization between LAC and these two economies separately, clarifying who gains and who loses in this context.

4. THE DATA, AGGREGATION SCHEME, SCENARIO DEVELOPMENT AND MACRO VARIABLE ASSUMPTIONS

The GTAP model and database used to undertake the analysis is version 7, which includes 57 commodities (sectors) and 113 countries (regions). The 57 industrial sectors in the model provide a broad disaggregation of the industrial sectors in each country and region (Appendix A). The 113 countries are aggregated into five regions and one individual country: India, Latin America, Rest of Asia, Rest of OECD, the EU and Rest of the World (ROW). In the model, the 57 industrial sectors are included for all six regions.

4.1 Scenario development

Here, three scenarios have been attempted: a) business as usual (BAU), b) moderate tariff reduction - scenario 1 and c) high tariff reduction - scenario 2.

We consider 2004 as the base year and use our macroeconomic shocks to generate a new economy for 2010, 2015, and 2020. In this analysis the tariff structure for all regions and countries remains as it is in 2004. This business-as-usual scenario remains the same throughout the analysis and is the baseline to which the other scenarios are compared.

Moderate tariff reduction describes a situation where the frequency of tariff reductions is low for the period 2010-15. This has been done for India and Latin America, while the rest of the regions are not parties to trade agreements. The reduction rate is 30% for selected agricultural commodities and 40% for selected non-agricultural commodities⁵.

High tariff reduction indicates a situation where reductions occur at a high rate compared to moderate tariff reduction for the period 2015-20. This has also been done for India and Latin America, while the rest of the regions are, similarly, not parties to trade agreements. In this simulation, tariff barriers were reduced by 40 and 60% for selected agricultural and non-agricultural commodities, respectively.

For the European Union and Latin America, tariff reduction strategies were implemented in selected sectors of agriculture and industry. Import tariff reduction for the EU was fixed at 40 and 60% (current tariffs reduced by 40 and 60%) for agricultural and non-agricultural commodities, respectively, for the first phase of simulation from 2010 to 2015 (moderate tariff reduction, scenario 1). The high tariff reduction (scenario 2) for the period 2015-20 will consider 60 and 80% reductions for agricultural and non-agricultural commodities respectively. For LAC the reduction has been considered only for selected non-agricultural commodities which are fixed at 60% for the period 2010-15 and 80% for 2015-20. The weight of tariff reduction is selected on the basis of the lower and upper boundary of the actual tariff rate applied between two countries (Government of India, 2008).

The previous scenario description required a change in the development of the GTAP model to undertake the analysis. In this case, updating the model to 2020 requires three discrete steps (2004-10, 2010-15 and

5. See Appendix C for a list of the commodities.

2015-20). Here we have used the recursive updating process based on projections of macroeconomic variables to simulate what the various economies would look like in the future. These projections of macroeconomic variables are taken from reliable sources to predict the future direction and the strength of an economy.

4.2. Macroeconomic variable estimates and underlying assumptions

Five primary factors of production are used in the production system: land, natural resources, unskilled labor, skilled labor and physical capital. The first step in the process was to develop a BAU projection to 2010 from the benchmark 2004 GTAP7 database. This BAU scenario projection provided a picture of how the global economy and world trade might look with the current tariff barriers, providing a baseline with which to compare the scenarios with implementation of trade agreements. The projection of the global economy to 2010 was based on assumptions concerning economic and factor growth rates. Exogenous projections of each region's GDP growth were estimated in addition to estimates of factor endowments such as population, skilled and unskilled labor, and capital stock (Dimaranan, 2006; UN, 2006; World Bank, 2007; Mukhopadhyay and Thomassin, 2008, 2011). Total factor productivity was endogenously determined to accommodate the combination of these exogenous shocks. This approach allows one to predict the level and growth of GDP as well as trade flows, input use, welfare and a wide range of other variables. Instead of considering capital accumulation, we have added the extra change in investment in period t resulting from trade liberalization shocks along with the baseline capital forecast for $t+1$. The resulting forecast provided a projection of the global economy in 2010 that is in equilibrium, which serves as the starting point for the subsequent simulation exercise. Projections for the fundamental drivers of global economic change to 2015 and 2020 were also prepared in the same manner.

5. DISCUSSION OF THE RESULTS

5.1. LAC and India

This section reports changes in selected economic indicators for India and Latin American countries and four other regions resulting from a bilateral tariff reduction between India and LAC.

Table 5. Growth of output of different regions

	BAU 2010-15	BAU 2015-20
Rest of OECD	6.35	2.71
Rest of ASIA	21.53	14.71
India	42.66	52.58
LAC	17.27	15.92
EU_25	3.78	4.30
Rest of World	15.62	11.36
Total	9.30	2.60

Source: Study results.

Table 6. India and Latin America tariff reduction scenarios compared to BAU (% change)

Growth of Output	2015	2020
Rest of OECD	0.0004	-0.41
Rest of Asia	0.0001	-0.81
India	0.1154	3.56
LAC	0.0183	2.48
EU_25	0.0065	-0.89
Rest of World	0.0144	-1.49
Total	0.0013	-0.65

Source: Study results.

Impact on output

Table 5 shows our baseline projection of the global economy from 2010-15 and 2015-20 along with the simulated result of the tariff reduction between India and Latin America and the Caribbean. The growth rate varies across the region in the business-as-usual case. India shows the highest growth (42.66 and 52.58%) followed by the Rest of Asia (21.53 and 14.71%). Latin America shows moderate growth rate (17.27 and 15.92%) during this period. On the other hand, the simulated results of the tariff reduction reveal a different picture because tariff reduction on imports lowers import prices, causing domestic users to immediately substitute away from competing imports. The cheaper imports result in a substitution of imports for domestic products. The price of imports falls, thereby increasing aggregate demand for imports which in turn reduces the price of intermediate goods and

causes excess profits. This then induces output to expand, affecting demand for primary factors of production resulting in changes in their prices and transmitting shocks to other sectors in the economies undergoing trade reform.

Because in our experiment we consider the bilateral tariff reduction on agricultural and non-agricultural commodities at different rates between India and LAC, the impacts are expected to be different (Table 6).

With import tariff reduction in two phases, we do not find any significant changes in the output growth of the six regions. A marginal increase in growth for India and LAC is observed in 2015 after tariff reduction compared to BAU. However, in 2020 moderate growth is observed for both economies. Other regions in the world experience a marginal decline in the updated 2020 scenario compared to BAU growth, due to the bilateral tariff reduction between India and LAC.

This outcome is generally expected given the trade creation and trade diversion effects of trade reforms. The magnitude of impacts on the various countries and regions differs, depending first on their size and comparative advantage (resource endowments) and also on other factors such as demand structure and distribution structure. In a global CGE model it is very difficult to predict gains and losses across countries/regions, although the expectation is that tariff reduction between partner countries normally has a positive impact, while the other countries not involved in the process will achieve either marginal gains or marginal reductions. In the current study (LAC-India, Table 6), we found an output gain for all countries in the world at 2015, but a loss for all countries except India and LAC at 2020. Part of the reason is that LAC and India's positive output growth is not sufficient to compensate for negative growth experienced by other countries and this is reflected in total output growth (-0.65%).

Sectoral output

The macroeconomic results such as output growth do not fully reveal the structural adjustments that may occur in an economy. In particular, they do not disclose the impacts of proposed bilateral tariff cuts on different production sectors in different regions.

To provide additional insight, let us take a closer look at changes in the growth of sectoral output of India and LAC due to tariff reduction in

two different phases (Table 7). Changes in output growth vary across the sectors under different trade scenarios. Sectoral output growth increased for a few agricultural sectors (plant-based fibers, fishing and forestry) and almost all manufacturing sectors in India due to tariff reduction in 2015. Meanwhile, at 2020 sectoral output growth is concentrated primarily in agricultural sectors and leather. On the other hand, in Latin America a large number of sectors (agriculture and manufacturing) show positive growth due to tariff reduction compared to BAU in both scenarios. Some common sectors such as wheat, vegetables, fruit and nuts, processed rice and leather increase output in both economies at 2020.

Import tariff reduction in bilateral trade (India and LAC) is likely to favorably influence the two economies. Here, the sectoral tariff reduction in India would, it is expected, positively influence the output growth of the same sector in LAC and vice versa. However, as shown in Table 7, one-to-one correspondence does not occur for certain sectors where tariff cuts are imposed. For example, India's tariff reduction on textiles induces textile output expansion in LAC, while for food products LAC does not show gains in 2020. On the other hand, LAC's reduction of bovine meat tariffs produces positive output growth of the same sector in India, while this does not occur for electronic equipment.

In order to better understand the impacts of freer trade between LAC and India on exports, we turn to tables 5.4 through 5.6.

Export growth

The performance of total exports reflects wide variations in growth among the six regions under BAU scenarios (Table 8). India is expected to achieve the highest growth followed by Rest of Asia and LAC countries. On the other hand, the EU shows the lowest export growth under BAU (2015-20).

The direction of the percentage change in exports in India and LAC countries under tariff reduction compared to BAU provides more insight (Table 9).

Table 7. Changes in output for selected sectors in India and Latin America in different trade scenarios compared to BAU (%)

2015	India	2015	LAC	2020	India	2020	LAC
7 pfb	0.50	1 pdr	1.28	2 wht	3.55	1 pdr	4.64
13 frs	0.13	2 wht	0.12	3 gro	6.81	2 wht	2.20
14 fsh	0.92	3 gro	0.05	4 v_f	1.65	12 wol	8.70
20 omt	0.81	4 v_f	0.05	5 osd	7.50	13 frs	0.99
27 tex	1.19	5 osd	0.05	6 c_b	6.07	23 pcr	4.88
28 wap	3.61	6 c_b	0.04	9 ctl	11.26	27 tex	2.41
29 lea	1.53	7 pfb	0.03	10 oap	3.38	29 lea	1.48
30 lum	0.13	8 ocr	0.09	11 rmk	3.00	30 lum	2.80
31 ppp	0.11	9 ctl	0.06	19 cmt	2.48	31 ppp	1.31
32 p_c	0.28	10 oap	0.05	22 mil	0.90	35 i_s	2.98
33 crp	0.76	11 rmk	0.06	23 pcr	3.09	36 nfm	4.57
34 nmm	0.27	18 omn	0.12	24 sgr	4.48	37 fmp	3.62
37 fmp	0.14	19 cmt	0.04	25 ofd	2.70	38 mvh	2.53
38 mvh	0.09	20 omt	0.03	26 b_t	1.81	39 otn	4.60
40 ele	0.28	22 mil	0.03	29 lea	7.44	40 ele	7.22
41 ome	1.18	23 pcr	0.11			41 ome	4.53
		25 ofd	0.03			42 omf	1.58
		35 i_s	0.12				

Source: Study results.
Note 1: Only sectors with positive growth are reported here.
Note 2: A list of the abbreviations and their meanings can be found in Appendix A.

Table 8. Export growth in BAU scenario for six regions

Export growth	2010-15	2015-20
Rest of OECD	4.42	8.98
Rest of Asia	16.11	17.58
India	39.91	51.11
LAC	30.43	11.06
EU_25	7.58	3.12
Rest of World	8.70	13.95

Source: Study results

Table 9. Direction of exports (% change) for India and LAC under different trade scenarios compared to BAU

	2015		2020	
	India	LAC	India	LAC
Rest of OECD	-2.18	-1.42	0.69	4.08
Rest of Asia	10.28	-1.17	-4.45	5.46
India		6.8		6.61
LAC	1.78		6.25	
EU_25	-3.16	-2.78	13.21	-10.79
Rest of World	-3.57	-1.33	26.29	-6.47
Total	3.15	0.20	12.05	2.65

Source: Study results.

Trade liberalization strategies are to some extent favorable for India and LAC for both scenarios compared to BAU. India's exports to LAC are expected to increase by 1.78 and 6.25% respectively under the different scenarios, whereas for the rest of the regions the percentage change shows a mixed outcome. For LAC countries, exports to India would increase by 6.8 and 6.61% respectively. However, the percentage changes in exports to other regions show a negative impact for all regions in 2015 and a mixed impact for 2020. Under tariff reduction, India's exports would benefit more (3.15 and 12.05%, respectively) than LAC (0.20 and 2.65%, respectively).

A look at trade diversion resulting from the tariff reduction between India and LAC reveals that LAC and Indian exports are diverted from other regions and increase between the two economies. A sharp difference is observed regarding trade diversion in two scenarios. In 2015 the direction of trade for India and LAC is more diversified. For example, India's exports to Rest of OECD, Rest of the World and the EU fall while LAC exports are diverted from all regions under study (except India, of course). On the other hand, in 2020 the diversion is concentrated on one region for India (Rest of Asia) and two regions for LAC (the EU and Rest of the World). The 2020 scenario (with tariff) compared to the 2020 BAU scenario shows an increase of 6.25% in trade, with LAC reflecting trade creation for India, whereas trade creation for LAC is 6.61%.

Normally in a bilateral tariff reduction scenario, both economies benefit but the impact on other regions may or may not be favorable (Mukhopadhyay and Thomassin, 2008).

Table 10. Changes in exports for selected sectors in India and Latin America in different trade scenarios compared to BAU (%)

2015	India		LAC	2020	India		LAC
5 osd	0.416	1 pdr	0.203	1 pdr	1.883	1 pdr	2.166
6 c_b	0.244	4 v_f	0.014	4 v_f	0.479	7 pfb	0.053
8 ocr	0.314	5 osd	0.019	5 osd	3.317	14 fsh	0.110
9 ctl	0.202	7 pfb	0.016	10 oap	1.509	19 cmt	1.217
10 oap	1.969	9 ctl	0.012	12 wol	5.183	20 omt	0.796
11 rmk	0.449	18 omn	0.086	20 omt	2.774	21 vol	0.329
18 omn	0.013	19 cmt	0.014	23 pcr	0.382	22 mil	0.151
20 omt	0.047	27 tex	0.131	31 ppp	0.092	23 pcr	0.277
21 vol	0.245	28 wap	0.038	35 i_s	0.179	24 sgr	0.166
23 pcr	0.409	29 lea	0.084			25 ofd	0.012
25 ofd	0.330	33 crp	0.168			27 tex	0.038
27 tex	1.263	34 nmm	0.019			28 wap	0.142
28 wap	1.946	35 i_s	0.280			29 lea	0.017
29 lea	0.670	41 ome	0.063				
33 crp	1.574	42 omf	0.145				
40 ele	0.092						
41 ome	1.295						

Source: Study results.
Note 1: Only sectors with positive growth are reported here.
Note 2: Appendix A contains a list of the abbreviations and their meanings.

An analysis of the sectoral export growth of India and Latin America due to trade reform shows that it varies in 2015 and 2020 for both economies.

In India, sectors favorably affected in terms of exports are largely agricultural in 2020 and a mixed (agriculture and manufacturing) positive effect is reflected in 2015. For LAC, the sectors that benefit are a combination of agriculture and manufacturing in 2015, while the sectors most affected are processed food and a few industrial sectors (textiles, wearing apparel and leather) at 2020. Tariff reduction has been applied to selected sectors in LAC and India (for details, see Note 1) but the impact is captured across 57 sectors. For example, the tariff reduction on plant-based fibers in India boosts the export of such products from LAC to India, while the reduction in tariffs on meat products in LAC accelerates exports of those products from India to LAC. One interesting feature observed is that the output growth of these two sectors expands (Table 7). The impact of tariff reduction on sectors that LAC and India have in common (textile and leather) varies for both economies.

Welfare impacts

It is also of interest to understand the aggregate welfare impacts of trade reforms between LAC and India on both economies as well as the Rest of the World. First we analyze the welfare effect of bilateral tariff cuts between LAC and India. In the global CGE model, each region's representative agent aims to maximize his/her welfare level. When trade policy is changed, the agent will calculate a change in his/her income level. The change in income level affects the scale of savings and consumption of each commodity so that the marginal utility of consumption is the same across commodities. In this case, price variables are used in the decision-making process to clear markets in the model. While the welfare level of representative agents in trade agreement member countries (here, India and LAC) would improve, the welfare level of agents in other regions (here, four regions) is likely to decline. Since each region's welfare function is different, the impact of trade reforms between India and LAC on the welfare level of the six regions would likely vary.

Table 11 summarizes the results of the welfare effect (measured as equivalent variation) across the six regions, indicating that gains and losses are not spread evenly. We observed that in the case of tariff reduction, the welfare of India and Latin America responded differently (US\$132.17 million and US\$3.81 million for India, US\$101.99 million and US\$7.03 million for LAC in 2015 and 2020, respectively) under different scenarios. Rest of OECD, the EU, and Rest of Asia will be the losers in the 2015 tariff reduction scenario compared to BAU, whereas at 2020 Rest of Asia, the EU and Rest of World will

Table 11. Change in welfare in LAC-India under different trade scenarios (US\$ millions)

Welfare	2015	2020
Rest of OECD	-83.31	2.04
Rest of Asia	-90.27	-0.32
India	132.17	3.81
LAC	101.99	7.03
EU_25	-51.32	-1.32
Rest of World	49.29	-4.47
Total	58.86	6.78
Source: Study results.		

be losers. Global welfare increases by US\$58.86 million in 2015 but increases only by US\$6.78 million in 2020.

5.2. LAC and the EU

If the efforts to foster trade liberalization between LAC and the EU materialize, what will be the impact on these two economies in the long run? This section discusses projections for that impact.

Changes in selected economic indicators of LAC, the EU and the four other regions resulting from the bilateral tariff cuts between LAC and the EU are discussed below.

Growth of output

As we have seen in the previous section, output growth of the EU and LAC is expected to be 3.78 and 17.27% respectively from 2010 to 2015, while for 2015 to 2020 such growth would be 4.30 and 15.92% respectively.

According to the EU-LAC scenario, industrial tariff reduction is imposed on LAC and both industrial and agricultural tariff reductions are imposed on the EU for the period 2010-20, considering two different tariff weights (for details, see Note 2).

Both LAC and the EU show positive output growth due to the tariff reduction, but the other regions perform differently (Table 12).

Table 12. EU and Latin America tariff reduction scenarios compared to BAU

Growth of output	2015	2020
Rest of OECD	-0.04	-1.17
Rest of Asia	0.01	-0.71
India	-0.15	1.81
LAC	0.18	1.65
EU_25	0.16	0.94
Rest of World	0.01	-1.10
Total	0.04	-0.03
Source: Study results.		

Sectoral performance

The percentage change in output growth of selected sectors due to tariff reduction compared to BAU is presented in Table 13, where positive output growth is shown for tariff-imposed sectors as well as

Table 13. Changes in output for selected sectors in the EU and Latin America in different trade scenarios compared to BAU (%)

2015	LAC	2015	EU	2020	LAC	2020	EU
2 wht	5.19	2 wht	7.66	2 wht	7.44	2 wht	11.12
3 gro	10.25	3 gro	5.29	3 gro	11.28	3 gro	7.47
4 v_f	12.67	4 v_f	8.29	4 v_f	13.71	4 v_f	10.85
5 osd	7.42	5 osd	7.33	5 osd	8.94	5 osd	8.99
6 c_b	9.43	6 c_b	4.03	6 c_b	10.39	6 c_b	7.11
8 ocr	9.71	8 ocr	7.64	8 ocr	12.00	8 ocr	10.82
10 oap	8.20	10 oap	4.04	10 oap	8.71	10 oap	6.10
18 omn	1.45	18 omn	0.85	19 cmt	6.40	19 cmt	1.23
19 cmt	5.56	19 cmt	2.00	20 omt	5.31	20 omt	2.87
20 omt	4.18	20 omt	2.14	21 vol	2.29	21 vol	4.37
21 vol	1.99	21 vol	3.29	23 pcr	8.54	23 pcr	9.40
23 pcr	11.06	23 pcr	7.10	24 sgr	3.97	24 sgr	2.92
24 sgr	3.99	24 sgr	2.44	25 ofd	3.22	25 ofd	0.89
25 ofd	3.81	25 ofd	1.24	27 tex	2.53	27 tex	0.46
27 tex	2.87	27 tex	1.10	28 wap	1.10	29 lea	2.34
28 wap	2.35	28 wap	0.38	29 lea	1.65		
29 lea	2.79	29 lea	1.91	36 nfm	2.02		
30 lum	0.39	31 ppp	0.06	39 otn	0.96		
31 ppp	0.41	32 p_c	1.90	40 ele	1.07		
32 p_c	2.91	33 crp	0.29	41 ome	0.14		
33 crp	0.49	34 nmm	0.59	40 ele	1.07		
34nmm	0.18	37 fmp	0.01	41 ome	0.14		
35 i_s	0.75	38 mvh	0.04	41 ome	0.14		
36 nfm	1.63						
38 mvh	0.56						
39 otn	1.34						
40 ele	1.05						
41 ome	0.91						

Source: Study results.

Note 1: Only sectors with positive growth are reported here.

Note 2: Appendix A includes a list of the abbreviations and their meanings.

for other sectors. Highest output growth is observed for vegetables, fruit and nuts, grains nec., crops nec. and sugarcane and sugar beet for both regions during 2010-20. For some sectors, despite the application of tariff reduction, there is no increase in output growth (for example, forestry) and therefore tariff reductions in these sectors should be considered carefully by policymakers. On the other hand, some sectors, largely in the agri-food industry, are found to be influenced favorably even without being subject to tariff reduction under the two scenarios.

Impact on exports

The performance of export growth under BAU is recorded in Table 8, indicating wide variations in the export growth of the six regions. It should be noted that exports from LAC and the EU are expected to grow differently under BAU during 2010-20. Exports from LAC would decline sharply from 30.43% in 2010-15 to 11.06% in 2015-20. In the case of the EU, however, the growth rate is expected to decline sharply (from 7.58% in 2010-15 to 3.12% in 2015-20).

A look at the direction of the percentage change in exports from LAC and the EU under different trade scenarios compared to BAU (Table 14) reveals the following:

Trade creation is observed in 2015 and 2020 for the EU (0.23 and 0.12% respectively), and LAC (0.79 and 0.66% respectively). The rate of trade creation is expected to decline during this period for

Table 14. Direction of % change in exports in LAC and EU scenarios

	2015		2020	
	EU	LAC	EU	LAC
Rest of OECD	-0.51	-0.19	-0.41	-1.58
Rest of Asia	-0.51	-0.55	-0.37	0.14
India	-0.16	1.61	-0.27	4.97
LAC	22.26		13.12	
EU_25		9.10		4.12
Rest of World	-0.29	-0.65	-0.19	1.92
Total	0.23	0.79	0.12	0.66

Source: Study results.

the two economies. Exports from the EU to LAC are expected to fall significantly from 22.26 to 13.12% from 2015 to 2020. A similar pattern is likely to be observed for exports from LAC to the EU (from 9.12 to 4.12%).

It is interesting to note that the percentage change in exports from the EU to LAC (22.26% in 2015) occurs due to exports being withdrawn from other regions of the world and this is expected to continue in 2020, such that trade diversion occurs in both periods.

Trade diversion is expected to be different for LAC, which would likely divert exports from Rest of OECD, Rest of Asia, and Rest of the World in 2015 and only from Rest of OECD in 2020.

An analysis of changes in sectoral exports due to tariff reductions reflects, as shown in Table 15, that the EU gains in the agriculture, processed food and mining sectors at 2020 and manufacturing sectors at 2015. There is a favorable impact for metals nec. and electronic equipment for the EU in 2015, but these sectors do not figure as prominently in 2020. Here, it is important to note that tariff imposition on selected sectors will not always favor those particular sectors'

Table 15. Changes in exports for selected sectors in the EU and Latin America under different trade scenarios compared to BAU (%)

2020	LAC		EU	2015	LAC		EU
3 gro	0.81	3 gro	3.86	2 wht	0.91	3 gro	1.45
5 osd	2.79	4 v_f	4.26	5 osd	0.59	4 v_f	3.87
6 c_b	1.23	5 osd	2.19	6 c_b	0.37	23 pcr	0.27
8 ocr	4.0	7 pfb	0.15	8 ocr	2.16	27 tex	0.38
10 oap	1.57	10 oap	2.32	10 oap	1.62	28 wap	0.49
12 wol	1.17	18 omn	8.04	12 wol	1.46	29 lea	0.75
13 frs	1.81	20 omt	3.4	19 cmt	1.45	30 lum	0.42
18 omn	2.3	22 mil	2.59	20 omt	3.58	31 ppp	0.14
19 cmt	10.6	24 sgr	2.06	21 vol	1.25	34 nmm	0.18
31 ppp	0.16	25 ofd	0.07	23 pcr	0.66	35 i_s	0.14
32 p_c	1.87	26 b_t	1.43	24 sgr	1.47	36 nfm	0.25
36 nfm	0.04	31 ppp	0.01	27 tex	0.36	37 fmp	0.28
		32 p_c	1.64	28 wap	0.32	40 ele	0.12
		34 nmm	0.19	33 crp	2.21	42 omf	0.61

Source: Study results.

Note 1: Only sectors with positive growth are reported here.

Note 2: Appendix A contains a list of the abbreviations and their meanings.

access to the partner's market. However, indirect impacts may be felt that could stimulate export growth in other sectors, which may be due to direct and indirect interactions among all sectors within a country and across regions. Apart from that, it should be mentioned that there are only 57 sectors classified in GTAP version 7, which is fairly aggregated. In many cases a product part is traded, the impact of which is not reflected in the current classification scheme. This may create difficulties in explaining the impact of commodities for manufacturing industries. Further disaggregation of sectors in GTAP would be helpful in capturing the effect.

The number of sectors affected in the agriculture group is greater for LAC compared to the EU for both periods. This is expected because the EU would reduce import tariffs on both agriculture and manufacturing sectors (for details, see Appendix C). LAC is expected to benefit particularly from oilseeds, crops nec., bovine cattle, horse and goat meat products for both periods.

Welfare effect

Table 16 presents the welfare gains resulting from the tariff cut between the EU and LAC in 2015 and 2020. Global welfare is expected to reach US\$6.086 billion in 2015 and US\$2.436 billion in 2020.

Welfare gains are observed for the EU, LAC and India under different trade scenarios, while other regions of the world show a reduction in welfare under LAC-EU tariff reduction scenarios.

Table 16. Change in welfare in LAC-EU under different scenarios (US\$ millions)

Welfare	2015	2020
Rest of OECD	-1233.30	-1159.56
Rest of Asia	-4359.51	-150.43
India	1675.12	85.75
LAC	8912.06	628.15
EU_25	2028.62	3327.09
Rest of World	-937.01	-294.94
Total	6085.85	2436.07
Source: Study results.		

6. CONCLUSION

This paper makes a modest attempt to forecast the impact of trade reforms between LAC-India on the one hand and LAC-EU on the other in 2020 using a global computable general equilibrium model. A number of simulation exercises relating to alternative trade policies (implementation of import tariff reductions) were carried out between LAC-India and LAC-EU in 2010, 2015 and 2020 specifically to study the implications of tariff reduction policies.

The findings show that the output of six economies varies under BAU in 2020. The bilateral tariff reduction scenarios for LAC and India and LAC and the EU reflect that the countries who are parties to the agreement benefit but the impact on other countries is not so favorable. As a result of the tariff reduction between LAC and India, India's exports to LAC increase through diversion of exports from other countries and vice versa. Overall, both LAC and India gain more than they lose in exports after tariff reduction. Tariff reduction between LAC and the EU broadly indicates trade creation and trade diversion under both scenarios.

What emerges from these two experiments (tariff cuts between LAC-India and LAC-EU) is worth noting for policymakers. LAC will benefit more from trading with India compared to the EU in the long run (2020) while the opposite would likely be true in the short run (2015). In the case of LAC-India trade reform, LAC will divert its trade from the EU to enter the Indian market (Table 5.5) at 2020, while in the case of LAC-EU reform, LAC does not divert its trade from India to capture more of the EU market at 2020 (Table 14). As a result, a welfare loss for the EU is reflected at 2020 (US\$-1.32 million) under LAC-India trade reform, while India shows a welfare gain under LAC-EU trade reform. Thus the policy of trade liberalization is likely to be beneficial for LAC and India but not for the EU in the long run. Variation among sectors is observed for outputs and exports for LAC, the EU and India under different scenarios, such that one-to-one correspondence between the sectors with tariff reduction and the expected favorable impacts on those sectors' output and exports is not always apparent from the results. Instead, in some cases there are negative impacts for both the LAC and Indian economies and the same is true for the EU and LAC. It has also been found that sectors not subject to tariff cuts record positive growth in output and exports. This result, although thought-provoking, may be due to the interdependence of

sectors within the country and across the different economies of the world, the functioning of which has been theoretically and empirically simulated by the global computable general equilibrium model used in this study. The welfare impact of bilateral trade reforms is found to be positive for India, LAC and the EU.

Our findings show that LAC-EU tariff reduction appears to be beneficial for both regions in the short run, though not so in the long run. On the other hand, the LAC-India tariff reduction impact appears to be more beneficial for both economies in the long run than in the short run. This important finding emphasizes the scope and opportunities for south-south cooperation in the long run. In terms of policy, it appears that trade liberalization merits consideration in Latin America and the Caribbean given the long-run benefits, but further investigation is required.

One of the limitations of this study is that it considers LAC as a whole, making it difficult to identify which LAC countries will gain or lose from expanded trade integration. In addition, the study considers only the uniform application of tariff reduction across the LAC region, which can lead to overestimates or underestimates in terms of the results in some cases. Most importantly, this study is based on the GTAP framework, which represents direct and indirect interactions among all sectors of the economy and also among different economies, with precise detailed quantitative results. These are the advantages of most multisector CGE models and not only of GTAP. The main weakness of GTAP is its static nature, which may undermine long-horizon forecasts as is partly reflected in the result.

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APPENDIX A

Table A1. Sectoral classification in GTAP Version 7

pdr	Paddy rice	wht	Wheat
gro	Cereal grains nec.	v_f	Vegetables, fruit, nuts
osd	Oil seeds	c_b	Sugar cane, sugar beet
pfb	Plant-based fibers	ocr	Crops nec.
ctl	Cattle, sheep, goats, horses	oap	Animal products nec.
rmk	Raw milk	wol	Wool, silk-worm cocoons
frs	Forestry	fsh	Fishing
coa	Coal	oil	Oil
gas	Gas	omn	Minerals nec.
cmt	Meat: cattle, sheep, goat, horse	omt	Meat products nec.
vol	Vegetable oils and fats	mil	Dairy products
pcr	Processed rice	sgr	Sugar
ofd	Food products nec.	b_t	Beverages and tobacco products
tex	Textiles	wap	Wearing apparel
lea	Leather products	lum	Wood products
ppp	Paper products, publishing	p_c	Petroleum, coal products
crp	Chemical, rubber, plastic products	mmm	Mineral products nec.
i_s	Ferrous metals	nfm	Metals nec.
fmp	Metal products	mvh	Motor vehicles and parts
otn	Transport equipment nec.	ele	Electronic equipment
ome	Machinery and equipment nec.	omf	Manufactures nec.
ely	Electricity	gdt	Gas manufacture, distribution
wtr	Water	cns	Construction
trd	Trade	otp	Transport nec.
wtp	Sea transport	atp	Air transport
cmn	Communication	ofi	Financial services nec.
isr	Insurance	obs	Business services nec.
ros	Recreation and other services	osg	PubAdmin/Defence/Health/Education
dwe	Dwellings		

Source: Narayanan and Walmsley (2008).

APPENDIX B

Table B1. Trade agreements in force

Customs unions

Andean Community
Caribbean Community (CARICOM)
Central American Common Market (CACM)
MERCOSUR

Free trade agreements

Partner countries	Date of signature	Date of entry into force
Bolivia - MERCOSUR	17 Dec 1996	28 Feb 1997
Bolivia - Mexico	17 May 2010	07 Jun 2010
Canada - Chile	05 Dec 1996	05 Jul 1997
Canada - Colombia	21 Nov 2008	15 Aug 2011
Canada - Costa Rica	23 Apr 2001	01 Nov 2002
Canada - EFTA	26 Jan 2008	01 Jul 2009
Canada - Israel	31 Jul 1996	01 Jan 1997
Canada - Peru	29 May 2008	01 Aug 2009
CARICOM - Costa Rica	09 Mar 2004	→
CARICOM - Dominican Republic	22 Aug 1998	→
CARIFORUM - European Union	15 Oct 2008	29 Dec 2008
Central America - Chile	18 Oct 1999	→
Central America - Dominican Republic	16 Apr 1998	→
Central America - Panama	06 Mar 2002	→
Chile - Australia	30 Jul 2008	06 Mar 2009
Chile - China	18 Nov 2005	01 Oct 2006
Chile - Colombia	27 Nov 2006	08 May 2009
Chile - EFTA	26 Jun 2003	01 Dec 2004
Chile - EU	18 Nov 2002	01 Feb 2003
Chile - Japan	27 Mar 2007	03 Sep 2007
Chile - Korea	15 Feb 2003	01 Apr 2004
Chile - MERCOSUR	25 Jun 1996	01 Oct 1996
Chile - Mexico	17 Apr 1998	01 Aug 1999
Chile - New Zealand, Singapore and Brunei Darussalam (P4)	18 Jul 2005	→
Chile - Panama	27 Jun 2006	07 Mar 2008
Chile - Peru	22 Aug 2006	01 Mar 2009
Chile - Turkey	14 Jul 2009	01 Mar 2011
Chile - United States	06 Jun 2003	01 Jan 2004

Table B1. (continued)

Partner countries	Date of signature	Date of entry into force
Colombia - European Free Trade Association (EFTA)	25 Nov 2011	01 Jul 2011
Colombia - Mexico	13 Jun 1994	➔
Colombia - Northern Triangle	09 Aug 2007	➔
Costa Rica - China	08 Apr 2010	01 Aug 2011
Costa Rica - Mexico	05 Apr 1994	01 Jan 1995
DR-CAFTA (Central America - Dominican Republic - United States)	05 Aug 2004	➔
El Salvador - Taiwan	07 May 2007	➔
Guatemala - Taiwan	22 Sep 2005	01 Jul 2005
Honduras - Taiwan	07 May 2007	➔
MERCOSUR - Israel	18 Dec 2007	➔
MERCOSUR - Peru	30 Nov 2005	➔
Mexico - EFTA	27 Nov 2000	01 Jul 2001
Mexico - EU	08 Dec 1997	01 Jul 2000
Mexico - Israel	10 Apr 2000	01 Jul 2000
Mexico - Japan	17 Sep 2004	01 Apr 2005
Mexico - Nicaragua	18 Dec 1997	01 Jul 1998
Mexico - Northern Triangle	29 Jun 2000	➔
Mexico - Peru	06 Apr 2011	01 Feb 2012
Mexico - Uruguay	15 Nov 2003	15 Jul 2004
NAFTA (Canada - Mexico - United States)	17 Dec 1992	01 Jan 1994
Nicaragua - Taiwan	16 Jun 2006	01 Jan 2008
Panama - Singapore	01 Mar 2006	24 Jul 2006
Panama - Taiwan	21 Aug 2003	01 Jan 2004
Peru - China	28 Apr 2009	01 Mar 2010
Peru - European Free Trade Association (EFTA)	14 Jul 2011	01 Jul 2011
Peru - Japan	31 May 2011	01 Mar 2012
Peru - Singapore	29 May 2008	01 Aug 2009
Peru - South Korea	14 Nov 2010	01 Aug 2011
Peru - Thailand	31 Dec 2011	➔
Peru - United States	12 Apr 2006	01 Feb 2009
United States - Australia	18 May 2004	01 Jan 2005
United States - Bahrain	14 Sep 2004	01 Jan 2006
United States - Israel	22 Apr 1985	01 Sep 1985
United States - Jordan	24 Oct 2000	17 Dec 2001
United States - Morocco	15 Jun 2004	01 Jan 2006
United States - Oman	19 Jan 2006	01 Jan 2009
United States - Singapore	06 May 2003	01 Jan 2004
United States - South Korea	30 Jun 2007	15 Mar 2012

Table B1. (continued)

Framework agreements

Partner countries	Date of signature	Date of entry into force
MERCOSUR - India	25 Jan 2004	01 Jun 2009
MERCOSUR - Mexico (ACE54) - framework agreement	05 Jul 2002	05 Jan 2006
MERCOSUR - Mexico (ACE55) - auto sector agreement	27 Sep 2002	➔

Partial preferential agreements

Partner countries	Date of signature	Date of entry into force
Andean countries (Colombia, Ecuador, Venezuela) - MERCOSUR	18 Oct 2004	➔
Argentina - Brazil (ACE No 14)	20 Dec 1990	20 Dec 1990
Argentina - Chile (AAP.CE No 16)	02 Aug 1991	02 Aug 1991
Argentina - Mexico (ACE No 6)	28 Nov 1993	01 Jan 1987
Argentina - Paraguay (ACE No13)	06 Nov 1992	06 Nov 1992
Argentina - Uruguay (AAP.CE No 57)	31 Mar 2003	01 May 2003
Bolivia - Chile (AAP.CE No 22)	06 Apr 1993	06 Apr 1993
Brazil - Guyana (AAP.CE No 38)	27 Jun 2001	31 May 2004
Brazil - Mexico (AAP.CE No 53)	03 July 2002	02 May 2003
Brazil - Uruguay	30 Sep 1986	01 Oct 1986
CARICOM - Colombia	24 July 1994	01 Jan 1995
CARICOM - Venezuela	13 Oct 1992	01 Jan 1993
Chile - Ecuador (AAP.CE No 32)	20 Dec 1994	20 Dec 1994
Chile - Venezuela (AAP.CE No 23)	02 Apr 1993	02 Apr 1993
Colombia - Costa Rica (AAP.A25TM No 7)	02 Mar 1984	➔
Colombia - Honduras	30 May 198	➔
Colombia - Nicaragua (AAP.AT25TM N° 6)	02 Mar 1984	➔
Colombia - Panama (AAP.AT25TM N° 29)	09 July 1993	18 Jan 1995
Colombia - Venezuela	28 Nov 2011	16 Apr 2012
Costa Rica - Venezuela (AAP.A25TM No 26)	21 Mar 1986	➔
Dominican Republic - Panama	17 July 1985	8 June 1987
Ecuador - Paraguay (AAP.CE No 30)	15 Sep 1994	➔
Ecuador - Uruguay (AAP.CE No 28)	01 May 1994	01 Apr 2005
El Salvador - Venezuela (AAP.A25TM No 27)	10 Mar 1986	➔
Guatemala - Venezuela (ACE No 23)	10 Oct 1985	➔
Guyana - Venezuela (AAP.A25TM No 22)	27 Oct 1990	28 June 1991
Honduras - Panama	08 Nov 1973	➔
Honduras - Venezuela (AAP.A25TM No 16)	20 Feb 1986	➔
Mexico - Panama (AAP.A25TM No 14)	22 May 1985	24 Apr 1986
Mexico - Peru (ACE No 8)	29 Jan 1995	25 Mar 1987
Nicaragua - Panama	26 July 1973	18 Jan 1974
Nicaragua -Venezuela (AAP.A25 TM No 25)	15 Aug 1986	➔
Trinidad and Tobago - Venezuela (AAP.A25TM No 20)	04 Aug 1989	➔

Source: http://www.sice.oas.org/agreements_e.asp

APPENDIX C

Specific commodities have been identified for tariff reduction on the basis of a recent proposed agreement between India and Latin American countries.

Table C1. Tariff reduction on commodities in LAC and India

LAC	India
Cattle, sheep, goats, horses	Plant based fiber
Forestry	Food products
Minerals nec.	Textiles
Meat: cattle, sheep, goats, horse	Wearing apparel
Meat products nec.	Leather products
Textile	Chemical, rubber, plastic products
Wearing apparel	Electronic equipment
Leather products	Machinery and equipment nec.
Wood products	
Paper products, publishing	
Chemical, rubber, plastic products	
Mineral products nec.	
Ferrous metals	
Electronic equipment	
Machinery and equipment nec.	
Manufactures nec.	
Source: Focus: LAC (2008).	

Table C2. Tariff reduction on commodities in the EU and LAC

EU	LAC
Wheat	Food products nec.
Cereal grains nec.	Chemical, rubber, plastic products
Vegetables, fruit, nuts	Metals nec.
Oil seeds	Motor vehicles and parts
Sugar cane, sugar beet	Transport equipment nec.
Crops nec.	Electronic equipment
Forestry	Machinery and equipment nec.
Minerals nec.	
Vegetable oils and fats	
Food products nec.	
Beverages and tobacco products	
Leather products	
Wood products	
Paper products, publishing	
Petroleum, coal products	
Chemical, rubber, plastic products	
Mineral products nec.	
Ferrous metals	
Metals nec.	
Motor vehicles and parts	
Transport equipment nec.	
Electronic equipment	
Machinery and equipment nec.	
Manufactures nec.	
Source: Focus: LAC (2008).	