

# Policy alternatives and strategies for the Plurinational State of Bolivia following the end of trade preferences

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## **Abstract**

We evaluate some alternative and strategic policies for the Plurinational State of Bolivia following the ending of preferences under the Andean Trade Promotion and Drug Eradication Act (ATPDEA), especially the possibility of the country joining the talks on the partial agreement negotiated between the Andean Community countries and the European Union under a variety of formats (full liberalization or partial liberalization that excludes sensitive products). The study concludes that for the Plurinational State of Bolivia, being part of an Andean Community-European Union (AC-EU) agreement is a better alternative than maintaining the status quo whereby the country benefits from the enhanced generalized preferences granted to it by the EU (GSP+). However, there is a need for complementary measures to ensure that the benefits of trade are inclusive, as the gains are largely confined to higher-income segments of the population and so do not necessarily do anything to reduce the current unequal pattern of income distribution.



## I. Introduction

Discussions about the benefits of international free trade are not conclusive. Free trade supporters argue that exchanging goods and services is almost always to their mutual benefit (Krugman and Obstfeld, 2003). Open markets permit national resources to be employed more productively and allow sourcing non-local produced goods, giving consumers and producers a wider variety of products to choose from. Nonetheless, others perceive that free trade has not contributed to economic development, and in some cases has worsened inequality, unemployment and poverty particularly in the rural areas of developing countries (Berthelot, 2002). Jimenez et al. (2005) assert that economic gains from international trade do not guarantee in themselves gains for the poorer sectors of the economy, and that indeed more international exchange of goods might be accompanied by a rise in inequality. The 2001 Zanzibar Declaration reflects the concern of Least Developed Countries at their marginalization in the multilateral trading system as manifested in the insignificant 0.4 percent share of world trade (WTO, 2001).

Yet, countries around the world, developed and developing, have engaged in a trend of negotiating multilateral, regional and bilateral trade agreements. The WTO reports that at December 2008, there were up to 421 regional trade agreements that were notified. The Plurinational State of Bolivia has not avoided this trend, signing several trade agreements since the 1960s, though has not faced a hectic agenda in the last ten years. In fact, existing trade agreements for the Plurinational State of Bolivia are relatively old, such as the Andean Community (1969); Economic Complementation Agreement (ACE 22) with Chile (1994); Economic Complementation Agreement (ACE 31) with Mexico (1994); inclusion into the WTO (1995); MERCOSUR as associated member (1996); and the Economic Complementation Agreement (ACE 47) with Cuba (1999). The latest agreement was the Bolivarian Alternative for Latin America and the Caribbean -ALBA in Spanish- (2006) that has been spearheaded by the Bolivarian Republic of Venezuela.

In 2004 the Andean Community (CAN) tried, as a bloc, to negotiate a trade agreement with the United States. However, negotiations failed due to disagreements within the bloc and political frictions between the Plurinational State of Bolivia and Ecuador with the United States. Peru and Colombia individually signed trade agreements with the US in 2005 and 2006, respectively. The Plurinational State of Bolivia and Ecuador failed to reach any agreement, without any sign to restart negotiations for the time being. Furthermore, trade preferences that the United States grants to Andean countries called 'Andean Trade Promotion and Drug Eradication Act' (ATPDEA) was not renewed for the Plurinational State of Bolivia (expired in December 2008), though it was renewed for Ecuador until December 2010. For Colombia and Peru, these trade preferences were superseded by the more

comprehensive FTA, which provides permanent duty-free status to a wider range of commodities from those two countries into the United States.

In September 2007, the Andean Community started joint negotiations with the European Union. However, the Plurinational State of Bolivia's differing views on property rights and tariff reduction schedules led to disagreements with other Andean countries. In spite of the Plurinational State of Bolivia's request to CAN members to negotiate with the EU as a group, Colombia, Ecuador and Peru expressed their preference for individual negotiations. Thus, in February 2009 these three countries started bilateral negotiations with the EU, while the Plurinational State of Bolivia has frozen any trade negotiation for the time being.

The main purpose of this study is to investigate the economic effects for the Bolivian economy that may emerge from the Plurinational State of Bolivia-EU related trade scenarios. This study assesses how convenient is for the Plurinational State of Bolivia to be taking part or be outside negotiations with the EU, and the subsequent preferential access implications for the Bolivian economy. At the current time, there is no economic assessment on how the economic wellbeing of the domestic population and macroeconomic indicators may change as a result of a Plurinational State of Bolivia-EU trade agreement. Thus study will try to fill that void and provide with an assessment that can be used by policy makers in the Plurinational State of Bolivia to formulate trade and complementary policies.

This document is organised as follows: Section 2 describes the current trade situation of the Plurinational State of Bolivia, the objectives and research questions. Section 3 reviews the work that has been done in terms of EU-Plurinational State of Bolivia trade agreements. Section 4 provides an overview of the Bolivian external sector (exports and imports) as well as a short discussion of main exporting goods and trading partners. Section 5 presents the methodology chosen to assess a prospective trade association agreement from a macro and micro viewpoints. This section also defines trade policy scenarios, criteria for grouping GTAP regions and commodity sectors, price transmission model and the micro-simulation approach used in this research. Section 6 discusses macro-simulation results. Section 7 presents micro-simulation results and corresponding discussion. Finally, Section 8 presents conclusions and recommendations emerging from this study.

## II. Problem, objectives and research questions

After the end of trade preferences (ATPDEA) from the United States, the Plurinational State of Bolivia lost preferential access to the American market for some important products. The loss of these preferences to such large and important market would need to be filled by either new markets in other regions such as Asia or the strengthening of existing ones. One of those markets where the Plurinational State of Bolivia already has commercial ties is the European Union.

The European Union could be an alternative market to replace the ATPDEA, given that the Plurinational State of Bolivia already exports to the EU (with no trade agreement involved) and because it is an attractive market niche for any country that looks for higher prices and a large consumer market (the EU is the second largest importer in the world; the first one is the US). Taking into account the potential of the EU as importer is that the Andean Community, as a group, started negotiations with the European Union in 2007. However, Andean countries have different trade policies and strategies on the implications that might emerge from that trade agreement. Given that group negotiations between the Andean Community and the EU stalled, Peru, Colombia and Ecuador reoriented their negotiation agendas toward bilateral trade agreements. Therefore it is reasonable to consider that a trade-off between having or not an agreement with the EU needs to be assessed.

Based on these developments, the Bolivian government will need to reconsider its trade policy if these policies are going to be used as economic tool to contribute improving the domestic welfare of the Bolivian people. Interests and expectations from the Bolivian production sector, policy makers, and civil society might emerge if the Plurinational State of Bolivia decides to initiate trade negotiations with the European Union. But also some concerns might emerge regarding EU's stronger export-related capacity compared to the Plurinational State of Bolivia.

There is no specific research has been carried out to estimate the economic implications that such a trade agreement would have for both the national economy and the economic wellbeing of Bolivian households. Such lack of research is an issue in terms of policy possibilities to provide estimations as to how the various economic sectors in the Plurinational State of Bolivia would be affected by the trade agreement. This lack of research prevents the development of effective trade policies oriented to benefit both the national economy and the majority of Bolivian households. We expect to fill that gap with this study.

The overall objective of this research is to estimate the effects for the Bolivian economy and its households that could emerge from different trade reform settings between the Plurinational State of Bolivia and the European Union. More specific objectives are:

- First, to investigate economic implications emerging from termination of the ATPDEA.
- Second, to assess the impact of trade policy measures with the EU (changes in tariffs) on the progress of key macroeconomic variables (e.g. exports, imports, production and GDP).
- Third, to estimate the economic effects of the trade reforms affecting households' wellbeing (in the form of changes in income and expenditures), in particular the impact over the Bolivian poor.

### III. Literature survey

For the Plurinational State of Bolivia, a prospective trade agreement with the EU has not received attention in terms of research efforts. Thus, this study would be the first attempt on that direction. However, there are few empirical studies with marginal references to trade policy options for the Plurinational State of Bolivia, which we think are useful for this survey. These studies can be grouped into three broad categories: macroeconomic effects resulting from domestic policies and structural reforms; sectoral effects emerging from exchange rate shocks; and trade effects resulting from the Plurinational State of Bolivia-US trade simulation agreements.

In the first category of macroeconomic studies, Thiele and Wiebelt (2003a) used a Computable General Equilibrium (CGE) model to evaluate the Bolivian poverty reduction strategy over the period 1985-1999. These authors assert that the Bolivian poverty reduction strategy has not been pro-poor, as it largely bypassed sensitive economic sectors, such as agriculture. Two main drawbacks were identified in this study: a) no assessment of changes in rural income which challenges conclusions about changes in rural poverty; and b) lack of attention to external shocks which overlooks the influence of trade agreements on Bolivian GDP growth. On the other hand, Jimenez et al. (2005) look into the role of Bolivian institutions in GDP growth. Using an econometric model for the period 1970-2003, they found that domestic income growth in the Plurinational State of Bolivia has been negatively affected by large fiscal deficits, high inflation rates and high vulnerability to external shocks. In contrast, it is positively related to government investment and stability of government institutions. Relevant to this study, the authors found that economic growth did not guarantee gains for the poorer sectors of the economy, as inequality rose during that period. Klasen (2005) discussed the pro-poor growth policies in the Plurinational State of Bolivia and linkages between income and non-income dimensions of poverty. Klasen's research has helped broaden the view of poverty analysis in the Plurinational State of Bolivia by quantifying the poor's income wellbeing (money metric estimation of income) and non-income wellbeing (i.e. education, health and gender equality). However, Klasen does not analyze how trade policies have affected both rural and urban households in the Plurinational State of Bolivia.

Within the group of studies that analyze sectoral effects, Jemio and Wiebelt (2003) used a CGE model for the Plurinational State of Bolivia to test anti-shock domestic policies to palliate the negative effects emerging from external shocks (e.g. deterioration of terms of trade and direct foreign investment). They found that the Bolivian economy was highly vulnerable to external shocks, and that anti-shock policies had domestic restrictions (i.e. 'dollarization' of the Bolivian economy and high fiscal deficit) that prevented them from operating effectively against these external shocks. This result

is important as it raises questions about the efficacy of applying expansive fiscal policies to reduce the impact of deteriorating terms of trade. Barja et al. (2004) analyzed household welfare in the Plurinational State of Bolivia in the period 1999-2002 using a static model to simulate the impacts of social expenditure and external shocks (terms of trade) over household income groups. The authors found that maintaining domestic stability free from external shocks is one of the most effective mechanisms for avoiding welfare losses and maximizing poverty reduction in the Plurinational State of Bolivia. This study was comprehensive, as it considered both the financial limitations of the Bolivian government to implement aggressive social welfare programs, and the way households' expenditure was affected by government social payments.

Thiele and Wiebelt (2003b) used a CGE model for the Plurinational State of Bolivia to analyze the effects of reduced foreign investment inflows and the 'El Niño' phenomenon. They show that these external shocks have hindered the attainment of the Plurinational State of Bolivia's goals on poverty reduction and income growth over the period 1985–1999. The authors explored devaluation measures the Bolivian government applied to diminish the impact of such external shock on the livelihoods of rural and urban households. They found that devaluation measures did not reduce the poverty effect of external shocks, because household consumer prices rose much more than wage indexation (exercised under devaluation), thereby eroding the purchasing power of households.

Finally, within the studies that analyze the effects of the Plurinational State of Bolivia-US trade relations, Durán et al. (2007) used a GTAP CGE model to simulate the effect that a collective FTA between Colombia, Ecuador and Peru with the United States could have over these countries. Their results suggest that Peru and the United States would accrue for the majority of welfare gains, while Colombia and Ecuador would experience more modest gains. For the Plurinational State of Bolivia, Durán et al. found that this trade agreement would generate trade diversion and welfare losses. Valenzuela and Andriamananjara (2008) explored the effects of a FTA between the Plurinational State of Bolivia and the United States using the GTAP model and data base, Version 7.0. These authors also explored the effects of the end of US-trade preferences on the Bolivian economy. On the other hand, Telleria et al. (2007) and Giordano et al. (2007) explored several trade agreement scenarios between the Plurinational State of Bolivia and the United States, focusing on the analysis on how trade liberalisation would affect the livelihoods of Bolivian households by income level and geographical location. Both studies find that a termination of ATPDEA preference would harm the Bolivian economy.

However, these studies do not provide an analysis of trade strategies that the Plurinational State of Bolivia could implement following the termination of the ATPDEA. Also, and as discussed before there is no study that, focusing on the Plurinational State of Bolivia, analyses the trade negotiations between Andean countries and the EU and the different policy alternatives that the Plurinational State of Bolivia has. In this context, this research evaluates trade policy alternatives and strategies to fill that gap.

## IV. Bolivian economy and trade policy

The world economy in the 1980's was characterized by changes that led to the formation of economic blocs and extend the effects of the globalization to the world economy. Large groups such as the European Union were assembled and reinforced. The European Union inspired a process of world integration, as it represented one of the most important efforts governments carried out to integrate themselves in social, economic and cultural dimensions. At the end of the eighties, the Andean Community was revamped becoming an Andean free trade area. Within the framework of the Latin American Integration Association (ALADI), southern countries formed the Southern Common Market (MERCOSUR).

In the nineties, the Plurinational State of Bolivia focused on deepening integration within the Andean Community, subscribing different trade agreements, and negotiating unilateral preferential treatment like the ATPDEA to the US and the Generalized System of Preferences (SGP Plus) to Europe. Additionally, the Plurinational State of Bolivia implemented an open and free market strategy, deregulating the domestic economy and privatising state enterprises (among others) to meet IMF conditions to generate more employment, investment, economic growth, and ultimately more economic welfare. Part of the policy measures implemented in the 1990's consisted in lowering import tariffs. Such lowering is referred here as "naïve de-tariffication" since the Plurinational State of Bolivia unilaterally lowered import tariffs losing negotiating capabilities in bilateral, regional and multilateral trade negotiations. Import tariff reductions started in 1987 and ended-up in 1995 establishing a general and easy tariff structure setting 10% for general products, 5% for capital goods and 2% for books.

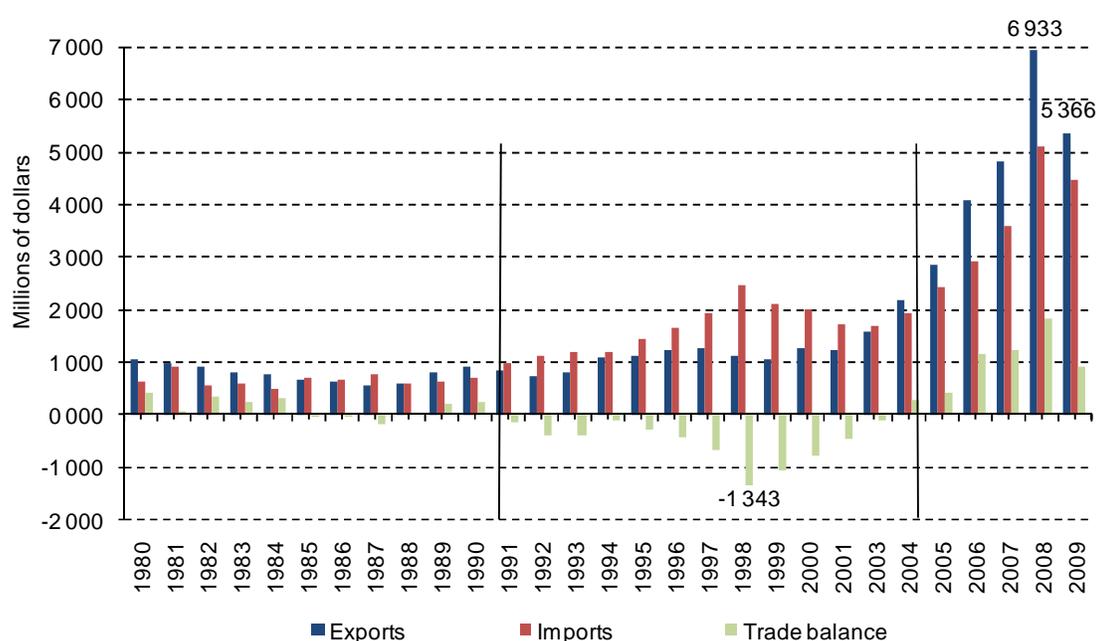
Later between 2000 and 2004, the Plurinational State of Bolivia suffered domestic political and economic crises. While Colombia, Ecuador and Peru began trade negotiations with the United States in May 2004, the Plurinational State of Bolivia did not participated of these negotiations due to such political crises that eventually contributed to the election of Evo Morales as Bolivian president in 2005. His government prioritised policies that supported the domestic market, rejecting any possibility of trade negotiations with the United States. Instead, in 2006 the Plurinational State of Bolivia joined the so-called Bolivarian Alternative for the People of Our America (Alternativa Bolivariana para los Pueblos de Nuestra América, ALBA). In September 2008 the Morales administration expelled the US ambassador in La Paz. In December of the same year, the United States did not extend the ATPDEA to the Plurinational State of Bolivia, arguing that the Plurinational State of Bolivia failed to cooperate with anti-narcotic efforts.

In this context of unstable political situation in the Plurinational State of Bolivia, domestic exports grew substantially, especially from 2004 onwards, far exceeding the level of imports (Figure 1). However, this tendency of the last four years has not prevailed in the last thirty years. Throughout

the 1980's exports and imports ranged between US\$500 – 1000 million, with exports usually exceeding the level of imports by small margins. During the 1990's up to 2003, the trade balance experienced permanent deficits, reaching its peak in 1998 where the trade deficit was more than US\$1.3 billion, the highest deficit in the Bolivian trade balance in the last 30 years.

In the last few years, the exporting sector started to experience a favourable context due to the economic growth of neighbouring countries, Brazil and Argentina mainly. The economic growth of these two economies meant higher demand and better prices for Bolivian exports, especially natural gas. Due to these developments, for the first time in more than a decade Bolivian exports outpaced imports in 2004, and since then the trade balance has become largely positive, reaching a peak of US\$1.85 billion in 2008.

**FIGURE 1**  
**BOLIVIAN TRADE PERFORMANCE 1980 – 2008**



Source: Authors' elaboration based on INE data.

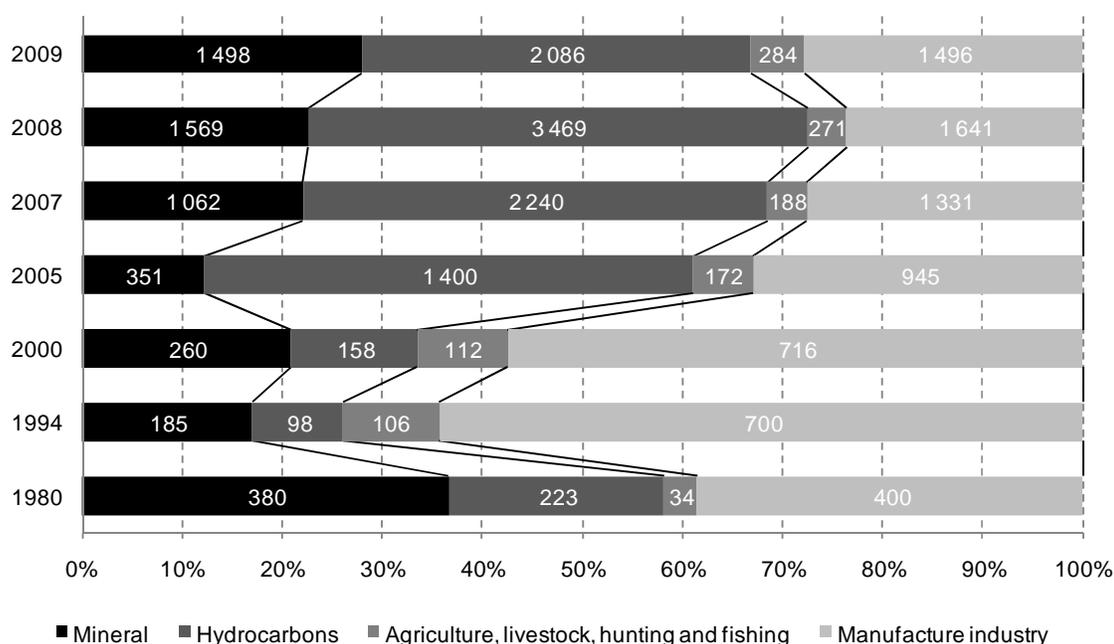
A comparison between total exports from January to June in 2008 and 2009 shows that right after ATPDEA termination (December 2008) exports decreased for almost a billion of US dollars (Figure 1). Also in the first semester 2009 imports decreased by smaller amounts (about 200 hundred million dollars). This might have been due to the fact that in January 2009 the Bolivian government moderately increased tariffs for some commodity groups (Annex 1 shows tariff increments before and after ATPDEA). Yet, the trade balance was positive in the first semester 2009 (350 million US\$), though not as large as the one achieved in 2008 (more than one billion US\$).

Figure 2 shows that the structure of Bolivian exports has changed overtime. In 1980 exports of manufactures and minerals lead the Bolivian exports (38 and 36 percent respectively). In 1994 manufactures, which are products with value-added activities, dominated Bolivian exports with more

than 60% of the total exports. The importance of the manufacturing industry somehow prevailed for the next 10 years, when exports of hydrocarbons started to grow substantially.

By 2008 Hydrocarbon and Minerals, which are products with a limited degree of transformation, dominated with 74% of total exports, while manufactures share decreased from about 40% in 1980 to 24% in 2008 (though in absolute values increased from 400 to 1641 million dollars respectively). The share of agricultural goods decreased from 10% in 1994 to 4% in 2008 though, likewise manufactures, increased in absolute terms (from 34 million in 1980 to 271 millions in 2008). The most impressive growth corresponds, without any doubt, to exports of hydrocarbons (mainly natural gas). Between 1980 and 2000 it fluctuated from 100 to 230 million dollars per year; however it grew from 1400 million in 2005 to 3470 millions in 2008 (about 50% of total Bolivian exports). In fact, from 2005 onwards about half of domestic exports corresponded to exports of hydrocarbons.

**FIGURE 2**  
**BOLIVIAN EXPORTS BY ECONOMIC SECTOR**

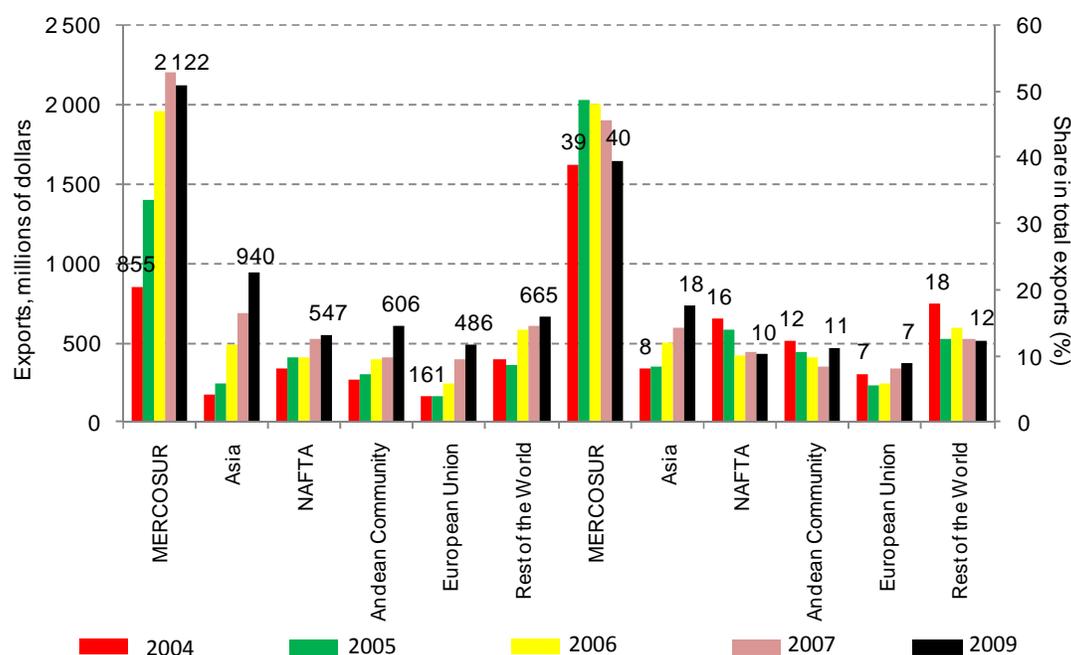


Source: Instituto Nacional de Estadística – INE. Elaboration: Instituto Boliviano de Comercio Exterior – IBCE.

This growth has a privatisation history behind. In 1993 Mr Gonzalo Sanchez de Lozada, Bolivian president who favoured policy measures prescribed by the IMF, decided to initiate an aggressive privatization programme. This programme (which was inspired in the well-known structural adjustment programmes) included privatisation of all hydrocarbon-related industry which until then was in public sector hands. Brazilian and Argentinean oil companies bought the majority of the shares of the industry, and invested large amounts in oil exploration. Thanks to these investments in the early 2000, it was found out that the Plurinational State of Bolivia has the second largest reserves of natural gas in Latin America (the Bolivarian Republic of Venezuela is in the first place). In 2006, it did not come as a surprise that, given the large economic benefits exports of natural gas was yielding to the privatised oil company, the Morales administration decided to nationalize the hydrocarbon industry.

The nationalization of the oil industry did not change much the composition of exports by partner, as they have traditionally being few and located in the Americas (Figure 3). Throughout 2004 to 2008 the Plurinational State of Bolivia exported growing values of merchandises to all economic blocs. From 2004 to 2008 MECOSUR's share increased from 39% to 52% of total Bolivian exports. This growth is explained by increased exports of natural gas to Brazil and Argentina. In fact Brazil became the most important trading partner for the Plurinational State of Bolivia accounting for about 40% of total exports in 2008 (in 2001 its share was 21%). Exports to the EU increased from 161 to 418 million dollars between 2004 and 2008, but keeping its 7% share throughout this period. Exports to Asia grew also grew substantially from about US\$ 200 in 2004 to almost US\$ 1200 in 2008 (500% growth in four years). This growth is mostly explained by mineral products (zinc, silver and lead) exported to South Korea. Finally exports to NAFTA decreased from 16% in 2004 to half of it in 2008.

**FIGURE 3**  
**BOLIVIAN EXPORTS BY DESTINATION, 2004 - 2008**

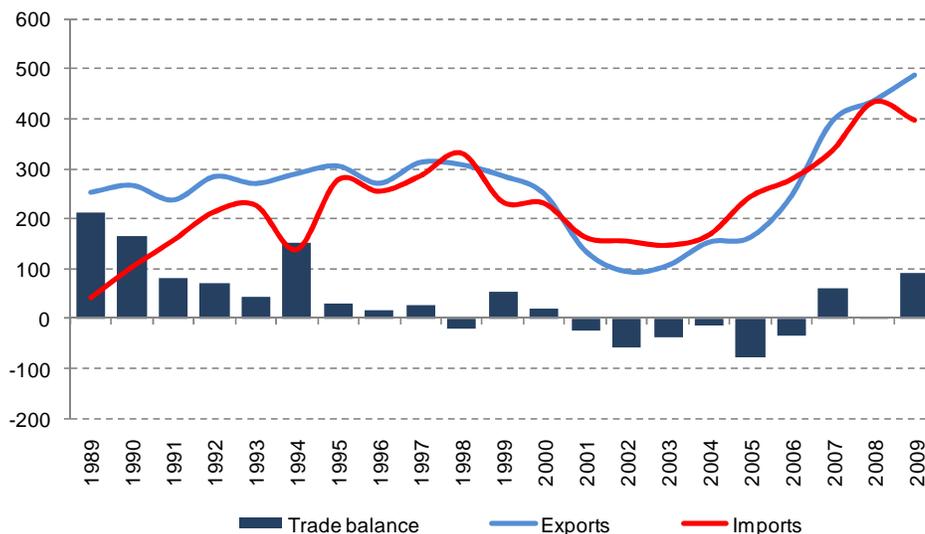


Source: Authors' elaboration based on INE data.

Figure 4 further disaggregates the trade relation with the European Union between 1989 and 2009 (May). The Plurinational State of Bolivia has experienced a positive trade balance in 1989 and throughout the 1990s (except in 1998). The trade balance from 2001 onwards has been negative, except in 2007 where exports exceeded imports by US\$ 57 million. While the EU is a relatively important trade partner for the Plurinational State of Bolivia (in 2008 Bolivian imports from the EU were US\$ 417 million or 7% in total imports),<sup>1</sup> The Plurinational State of Bolivia has been a very minor trade partner for the EU (total EU imports in 2007 was US\$ 1466 trillion, where the Plurinational State of Bolivia had an insignificant share of 0,003 per cent). Most of the products that the Plurinational State of Bolivia exports to the European Union are labour-intensive goods, including zinc and concentrates, tin and borate, silver, alcohol, vegetable oils, quinoa, processed coffee, nuts, wood furniture and leather products.

<sup>1</sup> Total value of Bolivian imports from the EU grew by 67% from 1989 to 2008.

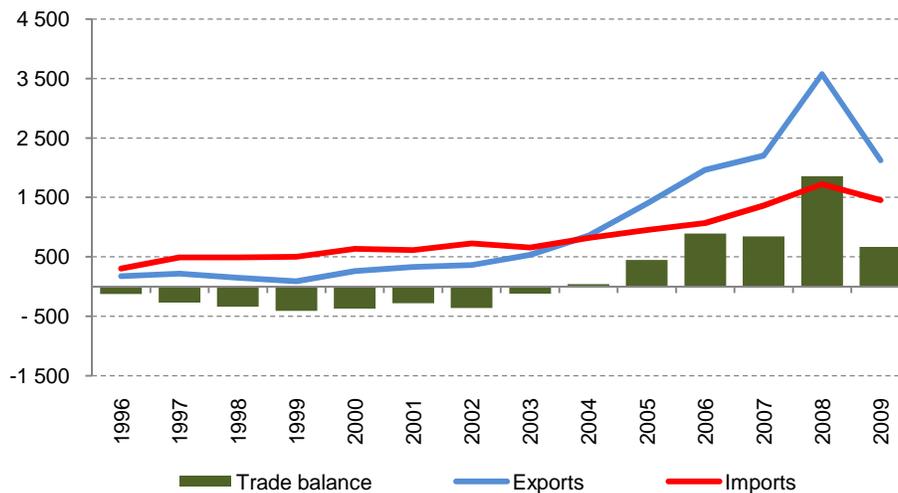
**FIGURE 4**  
**PLURINATIONAL STATE OF BOLIVIA – EUROPEAN UNION TRADE BALANCE**  
*(Million US Dollars)*



Source: Instituto de Estadística (INE). Elaboration: Instituto de Comercio Exterior (IBCE).

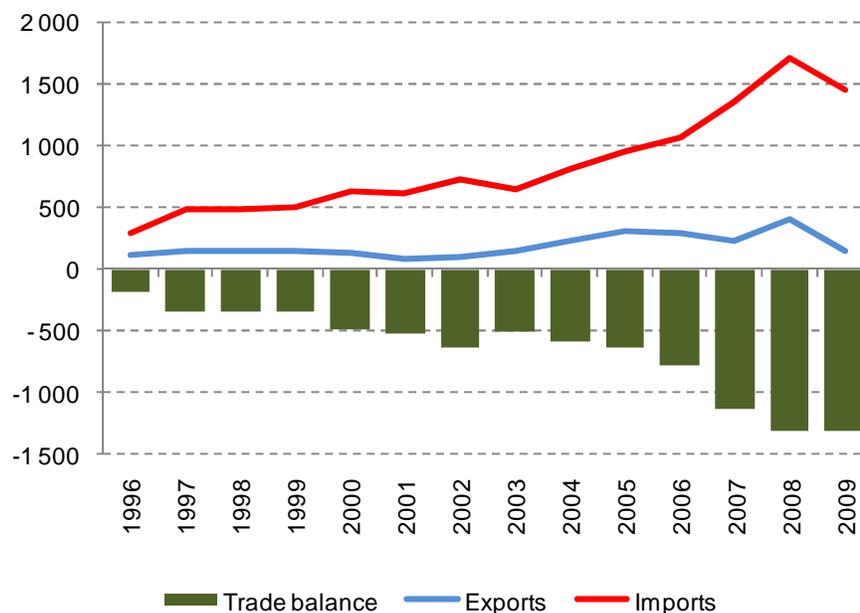
Figure 5 disaggregates export to the most important trading bloc for the Plurinational State of Bolivia. From 1996 to 2003 the trade balance between MERCOSUR and the Plurinational State of Bolivia had been negative. It only became largely positive from 2004 onwards when the Plurinational State of Bolivia started to sell natural gas to Brazil and Argentina. As seen in this figure, exports to Paraguay (US\$ 54 million) and Uruguay (US\$ 3 million) were irrelevant in 2008 in comparison with exports to Brazil (US\$ 3.023 million) and to Argentina (US\$ 493 million). This situation changes dramatically when exports of natural gas are withdrawn from total exports.

**FIGURE 5**  
**TRADE BALANCE BETWEEN THE PLURINATIONAL STATE OF BOLIVIA AND MERCOSUR**  
*(In millions of US dollars and percentages)*



Source: Instituto de Estadística (INE). Elaboration: Instituto de Comercio Exterior (IBCE).

**FIGURE 6**  
**PLURINATIONAL STATE OF BOLIVIA - MERCOSUR TRADE BALANCE,**  
**WITHOUT NATURAL GAS**  
*(million US dollars)*



Source: Instituto de Estadística (INE). Elaboration: Instituto de Comercio Exterior (IBCE).

Figure 6 shows a comparison between exports to MERCOSUR with and without natural gas. With no exports of natural gas, the Plurinational State of Bolivia would have had a permanent trade deficit with MERCOSUR, which from 1996 to 2008 would have accrued to US\$ 8.433 million (IBCE - Menacho, 2009). Bolivian exports to Brazil (accounting natural gas) were US\$ 3.023 million in 2008, but with no gas exports they would just be US\$ 52 million. Likewise exports to Argentina with natural gas were in 2008 were US\$ 493 million, but without gas they would just be US\$ 42 million.

These figures show how important natural gas has become to the Plurinational State of Bolivia, which have been financing the level of imports. This overview of the Bolivian external sector shows that relying in a few trading partners might leave the country vulnerable to foreign shocks such as price and demand contractions, which may cause volatile foreign currency inflows. The fact that about 50% of exports comes from hydrocarbons leaves the Plurinational State of Bolivia in a situation of highly dependency not only to gas prices, but also on fiscal revenues as natural gas is the main source of fiscal income for the Bolivian government.

## **V. Methodology - A macro-micro simulation approach**

This section presents the research approach that has been followed to estimate the changes in the Bolivian economy and household groups resulting from liberalization scenarios between the Plurinational State of Bolivia and the EU. This approach consists of a combination of a macro simulation model (in the form of a Computable General Equilibrium - CGE) and a micro-simulation approach (in form of Laspeyres price indices for income and expenditure), which in short can be referred to as a 'macro-micro approach'.

### **A. Introduction to macro-micro simulations**

The impacts of trade reforms over rural and urban households in the developing world have become a major concern of the WTO negotiations (Hertel et al., 2005). This concern is also reflected in the 'Millennium Development Goals' which commits governments to halve poverty by 2015. According to Vandemoortele (2009), the establishment of a fair and improved international trading system is an important component in achieving this goal. To analyse such impacts, researchers have used a variety of tools, including the combined use of a CGE model with micro-simulation models, also called macro-micro simulation approach.

The macro-micro approach consists of using a CGE model to simulate policy shocks. The results, including changes in commodity prices, returns to factors of production, GDP, imports and exports and terms of trade are used by a micro-simulation approach that allows analysis of the effects of such policies at household-group level. For social and economic policy analysis this technique has the advantage of producing results that can be evaluated at the household level.

In general terms, the macro-micro simulation approach aims to answer the key question of how trade reforms affect the wellbeing of different household groups (Telleria et al., 2007). Given that the household data available for this research contains earnings and consumption data, we measure economic wellbeing by bi-featured indicators: income and expenditure. Both provide a measure of the economic wellbeing of an individual. However, we acknowledge that economic wellbeing viewed in this way is a narrower picture of a more comprehensive wellbeing concept, which would include other components such as health, education, housing, etc. Section 4.4 describes in more detail the micro-simulation approach.

The GTAP model (Hertel, 1997) has been chosen as the macro-simulation model, while the micro-simulation approach uses price indexes as defined by Ianchovichina et al. (2002). The GTAP model is a standard, static, multi-region, multi-sector general equilibrium model which includes explicitly treatment of international trade and transport margins, global savings and investment, and price and income responsiveness across countries. It assumes perfect competition, constant returns to scale, and an Armington specification for bilateral trade flows that differentiates trade by origin. It also assumes a fixed factor endowment and full factor use. In this research we use the GTAP Data Base, version 7.0, which represents a snapshot of the world economy in the year 2004. The results of this model for all variables are expressed as relative changes from the original GTAP Data Base. That is, results are percentage changes from the base case scenario. The macro-micro approach has been applied in three stages:

- (i) First, we set a pre-simulation (or pre-liberalisation) scenario where, based on the household database, values of the consumption basket and income levels are estimated for each household category.
- (ii) The second stage is the simulation of trade liberalisation scenarios using the GTAP model. The results of such simulations are then analyzed against key macroeconomic indicators of the Bolivian economy.
- (iii) Finally, we use the results from the general equilibrium model (percentage changes in prices of commodities and sources of income), to estimate money metric estimations of changes in households' spending and revenues using the micro-simulation approach. We use a cointegration model to analyse the degree of integration between primary and secondary markets, so estimating price transmission coefficients. Then, we compared both the pre- and post-liberalisation scenarios and analyzed the impacts of trade reforms on households' economic wellbeing.

Given the large size of the GTAP database, the amount of computational resources needed to compute the data is usually very large and, therefore, for the simulations to be solvable data aggregation is needed (Hertel et al, 2004). The 113 regions (or countries) and 57 sectors (commodity groups) available in the GTAP database version 7.0 were aggregated into 14 regions and 35 sectors (Annex 2).

The regional aggregation criterion used consisted of choosing countries that are important trade partners for the Plurinational State of Bolivia. South American countries, the United States and the European Union represent between 77 and 97% of total Bolivian exports to the world between 1994 and 2006. The 57 GTAP sectors were aggregated into 35 sectors that are important commodities for trade flows (importing and exporting sectors), employment generation and food security. For purposes of presentation of results, these 35 sectors were further aggregated into five commodity sectors namely 'Agriculture', 'Mining and natural resources', 'Light manufactures', 'Heavy manufactures, and 'Services' (Annex 3).

**TABLE 1**  
**GROUPS OF COUNTRIES AND REGIONS USED IN MACRO SIMULATIONS**

No.	Region	Description
1	Bolivia (Plur. State of)	Bolivia (Plur. State of)
2	United States	United States
3	EU27	European Union 27: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Ireland, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom, Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia
4	Mexico	Mexico

(continued)

Table 1 (concluded)

No.	Region	Description
5	Argentina	Argentina
6	Brazil	Brazil
7	Chile	Chile
8	Colombia	Colombia
9	Ecuador	Ecuador
10	Paraguay	Paraguay
11	Peru	Peru
12	Venezuela (Bol. Rep. of)	Venezuela (Bol. Rep. of)
13	Rest of Latin America	Uruguay, Guyana, Suriname, Central America and the Caribbean
14	Rest of the world	Asia, Africa, Oceania

Source: Authors' classification based on results from GTAP 7.0 simulations.

**TABLE 2**  
**SECTORAL AND REGIONAL AGGREGATION OF THE GTAP DATABASE, VERSION 7.0**

No.	Sector		Description	
1		Rice	Paddy rice	
2		Wheat	Wheat	
3		Cereals	Cereals	
4	Agriculture	VegFruitNuts	Fruits and Vegetables	
5		OilSeeds	Oil seeds	
6		SugarCane	Sugar cane	
7		PlantBasFib	Plant based fibers	
8		Crops	Other crops (coca)	
9		BovSheepGo	Cattle	
10		Fores&Fish	Forestry and Fishing	
11	Mining and natural resources	Oil&Coal	Oil and coal	
12		Gas	Gas	
13		MinExtrac	Mineral Extraction	
14		BovMeatPro	Meats	
15		VegOilsFats	Vegetable oils and fats	
16		DairyProdu	Dairy products	
17		ProcesRice	Processed rice	
18		Sugar	Sugar	
19		OtherFood	Other food	
20		BevTobac	Beverages and Tobacco	
21	Light manufactures	Textiles	Textiles	
22		Apparel	Wearing Apparel	
23		LeatherProdu	Leather products	
24		WoodProdu	Wood products	
25		PaperProdu	Paper products	
26		PetroleuCoal	Petroleum and coal products	
27		ChemRubPlast	Chemical products	
28		MinerProdu	Mineral products	
29		Heavy manufactures	Ferr&NonFe	Ferrous and Non-ferrous metals
30			MetalProduct	Metal Products

(continued)

Table 2 (concluded)

No.	Sector		Description
31		MotorVehicle	Motor Vehicles and Transport
32		ElectEquipm	Electronic equipment
33		MachinEquipm	Machinery and Equipment
34		Manufact	Other Manufactures nec
35	Services	Services	Utilities, construction, trade, transport, communications, financial and business services, public admin.

Source: Authors' classification based on results from GTAP 7.0 simulations.

## B. Trade scenarios and sensitive commodities

The latest development in the Plurinational State of Bolivia-US trade relationship resulted in the end of the ATPDEA for the Plurinational State of Bolivia in December 2008. In light of this new status quo, we formulate a series of trade scenarios that tries to reflect this new development, as well as to analyze the ex-ante economic effects of the the Plurinational State of Bolivia-EU trade agreement. Thus, the definition of the trade scenarios was based on identification of sensitive commodities, updating of trade developments, and enquires to the Bolivian government as to what were the most likely trade settings in a prospective trade agreement.

We also account for sensitive commodities from both the EU and the Plurinational State of Bolivia for the simulation scenarios. From the EU trade negotiations with Peru, Colombia and Ecuador, it is evident that the EU has provided a particular protection to some commodity groups considered as sensitive. These commodities include fruits and vegetables, meat, dairy products, sugar, beverages and tobacco, and other food products. In the case of the Plurinational State of Bolivia, products to which the Plurinational State of Bolivia provides a special protection when negotiating trade agreements include rice, wheat, oilseeds, meats, dairy products, sugar, textiles and leather products. We also consider sensitive products for Colombia, Ecuador and Peru. These include rice, wheat, cereals, fruits and vegetables, plant based fibers, meat, milk, paper products, textiles, motor vehicles and chemical products. Based on this, the trade scenarios tested were:

- Scenario 1: No ATPDEA (termination of the ATPDEA). This scenario simulates the economic impacts of the end of the ATPDEA. In this scenario US tariffs for Bolivian products increase on all goods that previously benefited from ATPDEA trade preference (Annex 4 shows tariff changes before and after ATPDEA). The Plurinational State of Bolivia also increases tariffs to some products imported from the US.

The results of this first scenario serve as the new baseline for the next four scenarios. That is, the GTAP database is updated to incorporate the end of the ATPDEA for the Plurinational State of Bolivia. This new baseline is used to analyze ex-ante the impacts of a trade agreement between the European Union and Andean countries. The four scenarios considered are:

- Scenario 2: CAN – EU Total Liberalisation. In this scenario all products from Andean countries (the Plurinational State of Bolivia, Colombia, Ecuador, and Peru) enter duty-free into the European Union, and vice-versa.
- Scenario 3: CAN – EU with ‘sensitive products’. Sensitive products from both Andean countries and the EU are excluded from the trade liberalisation treaty. Tariffs for all other products are eliminated.
- Scenario 4: CAN – EU Total Liberalisation without the Plurinational State of Bolivia. All Andean countries except the Plurinational State of Bolivia sign a trade agreement with the EU. All tradable products enter duty-free into both regional blocs.

- Scenario 5: CAN – EU Total Liberalisation without the Plurinational State of Bolivia and with ‘sensitive products’. In this scenario all Andean countries except the Plurinational State of Bolivia sign a trade agreement with the EU. All tradable products, except those considered sensitive ones’, enter duty-free into both regional blocs.

The first two scenarios assume that the Plurinational State of Bolivia signs a trade agreement with the European Union along with the other Andean countries. The last two scenarios assume that the Plurinational State of Bolivia does not sign a trade agreement with the EU, but the other Andean countries do. Within each pair of scenarios, we consider total liberalization and partial liberalization, this last which accounts for sensible products.

## 1. Modifications to the GTAP Data base

As the base year of the GTAP data base version 7.0 is 2004, the database does not reflect the current tariff structure. That is, it does not incorporate tariff information from trade agreements stipulated after 2004. For example, in December 2008 US tariffs to Bolivian products increased because of the end of trade preferences from the ATPDEA. Thus, we update the tariff information in the GTAP database to incorporate trade reforms up to a new base year, in this case 2008. Using this new baseline we simulate first the end of the ATPDEA, and upon this new baseline, we simulate the trade liberalization scenarios between the EU and the Andean countries (Annex 4 shows tariff modification before and after modifications in tariff information).

## C. Market integration

As explained before, commodity prices change as result of trade reforms. However, those changes in international commodity prices might not affect domestic prices uniformly. Nicita (2005) and Hertel and Winters (2005) suggest that households living in urban areas are more sensible to changes in prices at the border than rural areas. For rural regions only a fraction of international prices are felt, especially in the case of agricultural products. Nicita (2005) finds that for Mexico international prices are transmitted differentially within regions, depending on the type of product and distance to the border. The price transmission or “pass-through” of international prices to domestic prices at the border was 66 percent for manufactured products, but only 25 percent for agricultural products. At the same time, that price transmission decreases as distance to the border increases.

In this study we incorporate these features of imperfect price transmission between urban and rural areas and different type of products. This would allow distributing price changes from trade liberalization to households, according to their regional location in the Plurinational State of Bolivia. For this, we analyze whether or not there is some degree of integration between domestic primary and secondary markets in the short and long term. We econometrically estimate price transmission relations and then map those relationships directly into the economic wellbeing function of households. This approach allows transmitting price changes from the GTAP global CGE model into Bolivian households living in different geographical areas. The next section outlines this methodology more in detail.

### 1. Market integration approach

From the perspective of market integration, two or more markets are integrated when changes in prices in one market, are transmitted to one or more markets in equal or different degrees and at different speeds. To measure integration between two or more markets, we need to determine a causality relationship between prices in main markets (from large and well-connected cities) and prices in secondary markets (from smaller and weakly-connected cities). If there is causality, the sign and direction determines the degree of cointegration in prices in the long term. This allows estimating price elasticity of transmission between both markets, and the speed of adjustment in the short term.

To test whether markets in the Plurinational State of Bolivia are integrated or not, we use a cointegration test called the Vector Error Correction Model (VECM). The VECM is a time series regression model that is based on the behavioural assumption that two or more time series exhibit an equilibrium relationship that determines both short and long time behaviour. VECM models are common time series models for estimating and testing leading indicators of cointegration, and offer several advantages.<sup>2</sup> These are simple multivariate models in which a variable is explained by its own past values and past values of all other variables (leading indicators) in the system.

The VECM allows identifying one or more cointegration vectors that capture the dynamics of price convergence between markets in the long term. Coefficients of each equation show an equilibrium relationship between price variables. Speed coefficients of adjustment show how fast the equilibrium is achieved in the long term. In addition, the coefficients indicate those variables (i.e. prices) that adjust in the system after the shock has occurred. However, the speed coefficients of adjustment cannot tell the time needed for prices to adjust. Engler and Nahuelhual (2003) indicate that if speed coefficients are 1, then variables would respond immediately (i.e. one month). For lower coefficient values such as 0.75 then the reaction is slower. In general, the smaller the coefficient the slower the variable reaction.

The first steps to test for cointegration is to conduct Augmented Dickey Fuller (ADF) tests on each of the price time series to determine if they are non-stationary (we hypothesize that they will not be stationary). Using the ADF, we tested if each time series (expressed in logarithms) hold or not a unitary root. Then, following Johansen (1988, 1991) we proceeded to test for cointegration. Using the VECM we estimated:<sup>3</sup> (a) if some spatial integration and causality in the long term exists; and (b) the time needed (measured in months) for prices to adjust to equilibrium. Annex 5 presents in more detail the tests used to assess market cointegration.

The data used to evaluate these dynamics of transmission between markets was price information for different regions and products in the Plurinational State of Bolivia. These prices were collected by the Fundación Valles through the Sistema Integrado de Mercados Agropecuarios (Integrated System of Agricultural Markets). Since 2002 to current date, the Fundación Valles has collected daily price information in six out of the nine departments in the Plurinational State of Bolivia. These data includes 33 commodities from the consumption bundle of any standard Bolivian family. We use monthly average prices for each of those commodities, for the period from May 2002 to August 2009. To estimate price elasticities, we transform commodity prices into logarithms.

Annex 6 shows all departments where price information for these commodities was collected. These prices correspond to markets of La Paz, Santa Cruz, Cochabamba, Sucre, Tarija and Oruro. Given that La Paz, Santa Cruz and Cochabamba are the most populated and better connected to international markets in the Plurinational State of Bolivia (where a significant share of total Bolivian exports come from), we consider these three cities as main domestic markets. Sucre, Tarija and Oruro, with low population, few companies exporting abroad and poorly connected to international markets are considered secondary markets.

## D. Micro-simulation approach

The micro-simulation approach used in this analysis is the Laspeyres price indices for income and expenditure. The methodology consists of using the CGE model as ‘price generator’, and the micro-simulation approach as a bridge to transmit those changes in prices to the household level. The household

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<sup>2</sup> First, it allows to study the relation that prevails between time series characterised by non-stationary pattern (non-stationarity is a very common case when analysing regressions that involve time series); Second, it is standard as allows stating a pre-determined structural model for the variables, which facilitates the estimation of causalities such as Granger; and Third, allows to explain the process that a group of variables follow to restores equilibrium within the system.

<sup>3</sup> By pair cities, one secondary market with each primary market.

survey provides the structure of households' consumption and income before the trade scenarios are simulated. This structure is set to a base-year using the Laspeyres cost of living and income indices.

Price changes of commodities and price changes of sources of income (i.e. returns to factors of production) were obtained from the GTAP model. We adjust price transmission between the macro and micro models using the results from the cointegration tests. This adjustment reflects the impact of international price changes in domestic prices by geographical location. Using the Laspeyres indices for expenditure and income, the modified prices are then used to obtain a post-liberalisation structure of households' consumption and income.

The change in cost of living by segments of population provides an upper bound measurement of the increase/decrease in expenditure that would be required (for each population segment) to purchase the same quantities of goods as in the base-year (Ianchovichina et al., 2002). Also changes in households' livelihoods are estimated according to changes in returns to production factors. This approach uses economic wellbeing and price index notions, which are described next.

### Price index

Following Ianchovichina et al. (2002), we use the Laspeyres price index to calculate the impact on the expenditure side of households emerging from the different policy simulation scenarios. Formally, this index is defined as:

Following Ianchovichina et al. (2002), we use the Laspeyres price index to calculate the impact on the expenditure side of households emerging from the different policy simulation scenarios. Formally, this index is defined as:

$$P_L = \frac{\sum_i p_i^1 q_i^0}{\sum_i p_i^0 q_i^0} \times 100 \quad (1)$$

Where PL is the change in price level,  $p_i$  and  $q_i$  are the price and quantity of commodity  $i$ , respectively. Prices and quantities are indexed by time, where 0 denotes the base period, and 1 refers to the post simulation period. This price index is normalised to a value of 100 in the base year to indicate the percentage level of the price index in period 1 relative to the base year. For example, a price-index value of 110 in period 1 indicates that the price index is 10% higher in the first year compared to the base year.

As mentioned by Ianchovichina et al. (2002), the Laspeyres index overstates the increase in expenditure because it does not account for substitution in consumption when prices change (zero elasticity of substitution). That is, households might respond to price changes by altering the quantities they purchase. Consequently, the Laspeyres index provides an upper bound measurement of the increase in expenditure.

### Changes in private utility

Following Ianchovichina et al. (2002), we use of GTAP's private utility equation to measure changes in economic wellbeing. The term 'private utility' is used to refer to an individual's difference between the Laspeyres index for income and the Laspeyres index for expenditure:

$$up(r) = \frac{yp(r) - \sum_{i \in TRAD} [CONSHR(i, r) \times pp(i, r)]}{\sum_{i \in TRAD} [CONSHR(i, r) \times INCPAR(i, r)]} \quad (2)$$

Where  $up(r)$  represents the percentage change in private utility in region  $r$ ;  $yp(r)$  is the percentage change in private household income in region  $r$ ;  $CONSHR(i,r)$  is the share of  $i$  in total consumption in region  $r$ ;  $pp(i,r)$  is the percentage change in the demand price of commodity  $i$  in region  $r$ ;  $INCPAR(i,r)$  is the income expansion parameter (elasticity) of commodity  $i$  in region  $r$ . If preferences are homothetic (i.e. a change in budget will allow for proportional changes in the demand of commodities) the  $INCPAR(i,r)$  equals 1 for all commodities, and therefore equation (2) collapses into the difference between a Laspeyres price index for income and a Laspeyres price index for expenditure:

$$up(r) = yp(r) - \sum_{i \in TRAD} [CONSHR(i, r) \times pp(i, r)] \quad (3)$$

Equation (3) is the difference between the change in household income (returns from skilled labour, unskilled labour, capital, land and natural resources)<sup>4</sup> and the consumption share times the percentage change in prices summed over all commodities. In other words, this equation measures economic wellbeing change by computing the difference between changes in income and expenditure. A Laspeyres price index provides a fixed-weight approximation in the economic private utility emerging from a change in income sources and a change in expenditure.

## Household Data

The data used in this study comes from the Bolivian National Institute of Statistics (BNIS, 2002) who surveyed 5,746 households from the nine departments in which the country is geographically classified.<sup>5</sup> Out of this total number of households, 3,339 were located in urban areas, and 2,407 in rural ones. The survey contains information on household income (salaries, wages) and expenditure on food items. Given the large size of the sample and for presentation purposes, we grouped household data as follows:

Households contained in the database were classified according to departments. A geographical dimension was critical given the disparities in income and poverty incidence across the country. For example, for Beni department, the analysis was based on 412 household questionnaires. For Chuquisaca we had 477 questionnaires, and so on.

**TABLE 3**  
**GEOGRAPHICAL GROUPING, 2002**

Department	Rural	Urban	Total	%
1. La Paz	430	789	1 219	21.2
2. Oruro	239	297	536	9.3
3. Potosí	350	282	632	11.0
4. Cochabamba	373	538	911	15.9
5. Chuquisaca	262	215	477	8.3
6. Tarija	199	277	476	8.3
7. Beni	147	265	412	7.2
8. Pando	95	48	143	2.5
9. Santa Cruz	320	620	940	16.4
Total	2 415	3 331	5 746	100

Source: own classification based on data from the Bolivian National Institute of Statistics (2002).

<sup>4</sup> In turn, household income is defined as the sum of the share in the household's endowments times the percentage change in price of these endowments  $yp(r) = \sum_{i \in Endowment} INCOMESHR(i, r) \times ps(r)$

<sup>5</sup> Due to missing data on household sources of income, 106 questionnaires were excluded from the database. Therefore the analysis was based on 5640 questionnaires.

Households were grouped into six sextiles of income. The first corresponds to household that earned less than or equal to 389.7 Bolivianos per month (Bs/month). Considering the average exchange rate in 2002 (1 USD = 6.9 Bolivianos), this amount corresponded to 57 USD/month. In total 956 questionnaires were included in this income category. The second income group corresponds to household who have earned between 389.7 and 694.9 Bs/month (between 57 and 101 USD/month) and so on. Currently (September 2009) the average exchange rate is 1 USD = 7 Bolivianos.<sup>6</sup>

**TABLE 4**  
**INCOME CATEGORY IN THE PLURINATIONAL STATE OF BOLIVIA, 2002**

Income group (Bs/month)	No. of questionnaires	%
Sextile I: <= 390	956	16.7
Sextile II: 390 - 695	950	16.6
Sextile III: 695 – 1 033	953	16.7
Sextile IV: 1 033 – 1 538	953	16.7
Sextile V: 1 538 – 2 547	953	16.7
Sextile VI: 2 547	952	16.7
Total	5 717	100

Source: own classification based on data from the Bolivian National Institute of Statistics (2002).

**TABLE 5**  
**EDUCATION STATUS IN THE PLURINATIONAL STATE OF BOLIVIA, 2002**

Education	No. of households	Participation(%)
Literate	4 977	86.6
Illiterate	769	13.4
Total	5746	100

Source: own classification based on data from the Bolivian National Institute of Statistics (2002).

Households might have many activities (e.g. get income from farming and from manufacturing) build up his/her monthly income. In this classification households were grouped according to the economic activity that contributed the most to the households' income (see table 6)

**TABLE 6**  
**ECONOMIC ACTIVITY**

Activity	Total	Percentage
Agriculture	2 086	36.3
Capital	1 303	22.7
Diversified	623	10.8
Natural resources	764	13.3
No information	356	6.2
Non-agriculture	614	10.7
Total	5 746	100.0

Source: own classification based on data from the Bolivian National Institute of Statistics (2002).

<sup>6</sup> In October 2009, the average exchange rate was 1 dollar = 7 Bolivianos, which shows a stable exchange rate.



## VI. Macro-simulation reports

This section is divided into two main parts. First, we discuss the impacts that the end of trade preferences (ATPDEA) would produce on the Bolivian economy. Second, as a policy alternative and strategy following the end of the ATPDEA, we then discuss the results from the different scenarios that consider a trade agreement between the European Union and the Andean Community, with and without the Plurinational State of Bolivia. The simulation scenarios were run employing the data base that sets 2008 as the new baseline year (includes all FTAs and modifications of tariffs/preferential access that happened in Latin America up this year).

### A. Economic impacts on the Plurinational State of Bolivia from the end of trade preferences (ATPDEA)

The main results of the lost of trade preferences are presented in Table 1. As bilateral tariffs rise for both the United States and the Plurinational State of Bolivia, the Plurinational State of Bolivia main economic indicators tend to deteriorate. GDP falls by 0.04 per cent, as well as there are welfare losses of 10 million dollars per year. As a result, household income decreases by 0.31 per cent. As trade preferences are eliminated, both exports and imports decline. Exports decrease by 0.30 per cent and imports by 0.54 per cent. The steeper decline in imports gives a very slight jump to domestic production (0.03). Terms of trade get reduced for the Plurinational State of Bolivia by 0.24 per cent.

**TABLE 7**  
**IMPACTS ON THE PLURINATIONAL STATE OF BOLIVIA ON THE END OF ATPDEA**  
*(Percentage changes)*

Economic variable	Percentage Change
GDP	-0.04
Welfare (millions of US dollars)	-10.00
Income	-0.31
Production	0.03
Exports	-0.30
Imports	-0.54
Terms of trade	-0.24

Source: Authors based on results from GTAP 7.0 simulations. Variables used from GTAP are GDP (qgdp), welfare (EV), income (y), production (qo), exports (qxwreg), imports (qiwreg) and terms of trade (tot).

These results are consistent with Telleria et al. (2009), which also discuss the poverty effects of the end of the ATPDEA in the Plurinational State of Bolivia. Sectoral effects follow a similar pattern as in Telleria et al., and are available from the authors upon request.

## **B. A FTA between CAN and the EU: Impacts on the Plurinational State of Bolivia**

As we examine the impacts from a full liberalisation between the Andean Community (the Plurinational State of Bolivia, Colombia, Ecuador and Peru) with the European Union on the Plurinational State of Bolivia, we observe that there is a slight decrease in GDP for the Plurinational State of Bolivia (first column in Table 2). However, the welfare gains associated with this trade agreement on Bolivian society amount to US\$ 33 million per year. Household income increases by almost 2 per cent, and domestic production is not affected. Exports (2.2%), imports (3.6%) and terms of trade (1.4%) all improve for the Plurinational State of Bolivia. Overall, there are positive impacts on the Plurinational State of Bolivia from full liberalisation.

As we exclude sensitive products from trade liberalisation for both the Andean Community and the European Union (second column in Table 2), the benefits for the Plurinational State of Bolivia, although still positive, decrease slightly. Welfare increases by US\$ 25 million per year, and household income increase by 1.4 percent. GDP remain unchanged, and exports and imports increase, as well as terms of trade. These results show that there is a positive effect on the Plurinational State of Bolivia from a trade agreement with the European Union.

**TABLE 8**  
**IMPACTS ON THE PLURINATIONAL STATE OF BOLIVIA OF A FTA BETWEEN CAN AND THE EU**  
*(Percentage changes)*

Economic Variable	With Bolivia (Plur. State of)		Without Bolivia (Plur. State of)	
	FTA CAN-EU	FTA CAN-EU with sensitives	FTA CAN-EU	FTA CAN-EU with sensitives
GDP	-0.01	-0.01	0	0
Welfare (millions of \$US)	33	25	3	-3
Income	1.92	1.4	0.17	-0.17
Production	0.0	0.0	0.0	0.0
Exports	2.2	2.0	0.0	-0.0
Imports	3.6	3.1	0.2	-0.2
Terms of trade	1.4	1.0	0.1	-0.1

Source: Authors based on results from GTAP 7.0 simulations. Variables used from GTAP are GDP (qgdp), welfare (EV), income (y), production (qo), exports (qxwreg), imports (qiwreg) and terms of trade (tot).

In the case where the other member of CAN negotiate a trade agreement with the European Union, the benefits are very small (total liberalisation) or even negative (sensitive commodities excluded). With full liberalisation the change in GDP is zero and welfare and income increase slightly. However, when sensible products are considered, the impacts on the Plurinational State of Bolivia are slightly negative, probably due to trade diversion from other CAN members and the EU. These results suggest that the Plurinational State of Bolivia would benefit slightly more from a trade agreement with the EU, if it negotiates along with the other member of CAN. When the Plurinational State of Bolivia is out of the CAN-EU agreement the welfare change is slightly positive or negative.

### **1. Changes in exports and imports**

With full liberalisation (with the Plurinational State of Bolivia in the CAN-EU agreement), exports increase for most sectors within agriculture and light manufactures, and decrease in mining & natural

resources and heavy manufactures (Table 3). Within agriculture and light manufactures, the overall Bolivian exportable production of sugar cane, rice and wheat (in this order) and textiles, wood products and leather products all increase substantially. These increments are due to a substitution effect that impacted over prices of Bolivian products in the EU market. That is, because the EU eliminated import tariffs to Bolivian products, along with prices of the other CAN countries, consumer prices were reduced in the EU market.

Within mining and natural resources and heavy manufactures, most of them decrease somewhat in scenarios that include the Plurinational State of Bolivia in the trade agreement between CAN and the EU. This is because the price of Bolivian commodities did not become much cheaper in comparison with the prices of the same commodities exported into the EU from other CAN countries. That is, as the EU already charges low import tariffs to Bolivian mining and natural resources and heavy manufactures products, when tariff reductions were simulated actually Bolivian prices were not reduced significantly. In addition, the Plurinational State of Bolivia benefits from the SGP-Plus, which already grants duty-free status to some Bolivian commodities exported to the EU. The difference in prices between Bolivian and other EU countries provoked an incentive for EU importers to switch (i.e. substitute) towards importing more products from other than the Plurinational State of Bolivia CAN countries.

When we account for sensitive products, exports decrease for some sectors. However, for those sectors which had an increase in exports under full liberalisation, the increase in exports was even larger with sensitive products (such as rice, wheat and cereals). This may be due to factor reallocation to those sectors which have a comparative advantage in the Plurinational State of Bolivia such as agriculture and light manufactures.

**TABLE 9**  
**CHANGE IN BOLIVIAN EXPORTS**

Sector		With Bolivia (Plur. State of)		Without Bolivia (Plur. State of)	
		FTA CAN-EU	FTA CAN-EU with sensitives	FTA CAN-EU	FTA CAN-EU with sensitives
Agriculture	1. Rice	39.9	53.2	-0.6	2.4
	2. Wheat	38.5	47.0	-2.7	1.7
	3. Cereals	16.3	19.4	-0.9	0.6
	4. Vegetables and Fruits	9.1	-3.0	-3.0	0.9
	5. Oilseeds	0.9	0.0	2.6	0.8
	6. Sugar Cane	58.6	69.2	-2.6	1.3
	7. Plant Based Fibers	-6.4	-5.2	0.1	0.4
	8. Other Crops	22.4	29.4	-0.9	1.5
	9. Cattle	21.5	24.3	0.9	0.9
	10. Forestry & Fishing	-19.3	-19.3	-0.3	0.0
Mining and natural resources	11. Oil & Coal	-2.2	-1.8	-0.1	0.2
	12. Gas	-0.8	-0.7	-0.1	0.0
	13. Mineral Extraction	-1.4	-1.1	-0.2	0.0
Light manufactures	14. Meat	8.4	-9.9	-3.3	1.1
	15. Vegetable Oils & Fats	-2.4	-4.4	1.8	-1.2
	16. Dairy Products	-27.8	-9.4	-21.3	0.1
	17. Processed Rice	1.9	4.2	-0.6	0.3
	18. Sugar	1.6	-6.1	7.8	-0.6

(continued)

Table 9 (concluded)

Sector	With Bolivia (Plur. State of)		Without Bolivia (Plur. State of)	
	FTA CAN-EU	FTA CAN-EU with sensitives	FTA CAN-EU	FTA CAN-EU with sensitives
19. Other Food	9.5	-5.0	-1.3	-1.0
20. Beverages & Tobacco	12.7	-3.2	-1.0	-0.3
21. Textiles	99.1	106.4	-4.0	0.5
22. Apparel	11.0	13.5	-1.3	0.4
23. Leather Products	32.6	35.9	-1.4	0.3
24. Wood Products	65.2	67.9	-0.7	0.6
25. Paper Products	11.0	15.3	-3.4	0.3
Heavy manufactures				
26. Petroleum Products	-1.0	-0.6	-0.1	0.1
27. Chemical Products	7.5	10.0	-1.3	0.6
28. Mineral Products	-7.4	-6.9	-3.3	-3.3
29. Ferrous & Non Ferrous Metals	11.1	12.8	-0.7	0.4
30. Metal Products	-2.9	-0.9	-1.4	0.0
31. Motor Vehicles	-7.2	-4.9	-1.1	0.7
32. Electric Equip.	-1.6	1.3	-1.3	0.7
33. Machinery & Equip.	-7.6	-5.3	-1.7	-0.1
34. Other Manufactures	-8.1	-6.1	-0.8	0.8

Source: Authors based on results from GTAP 7.0 simulations.

As the Plurinational State of Bolivia does not participate in a trade agreement (in both full liberalisation and liberalisation without sensitive commodities), the change in exports is small for most sectors, with most of them decreasing or increasing marginally. These reductions are probably due to a diversion effect created by the reduction import tariffs that benefited similar commodities exported from the other CAN countries.

In terms of imports, the first point of impact of the reduction in Bolivian import tariffs is increased demand for imports from EU into the Plurinational State of Bolivia at the expense of imports from the other markets (Table 4).

**TABLE 10**  
**CHANGE IN BOLIVIAN IMPORTS**  
(Percentage change)

Sector	With Bolivia (Plur. State of)		Without Bolivia (Plur. State of)	
	FTA CAN-EU	FTA CAN-EU with sensitives	FTA CAN-EU	FTA CAN-EU with sensitives
1. Rice	7.8	3.2	1.7	-1.0
2. Wheat	2.3	0.9	0.2	-0.2
Agriculture				
3. Cereals	2.6	1.3	0.5	-0.3
4. Vegetables and Fruits	4.0	1.5	0.6	-0.4
5. Oilseeds	1.3	-2.9	2.8	-1.6

(continued)

Table 10 (concluded)

Sector		With Bolivia (Plur. State of)		Without Bolivia (Plur. State of)	
		FTA CAN-EU	FTA CAN-EU with sensitive	FTA CAN-EU	FTA CAN-EU with sensitive
	6. Sugar Cane	4.5	0.5	2.1	-1.0
	7. Plant Based Fibers	11.7	11.6	0.2	-0.3
	8. Other Crops	11.9	8.2	1.2	-0.9
	9. Cattle	4.3	2.6	0.2	-0.5
	10. Forestry & Fishing	22.5	22.8	0.1	-0.1
Mining and natural resources	11. Oil & Coal	0.6	0.3	0.2	-0.2
	12. Gas	5.4	4.0	0.1	-1.0
	13. Mineral Extraction	4.6	5.3	-0.3	0.1
Light manufactures	14. Meat	10.7	5.2	1.1	-0.8
	15. Vegetable Oils & Fats	4.5	2.6	0.9	-0.6
	16. Dairy Products	8.2	4.6	0.5	-0.3
	17. Processed Rice	5.1	3.2	0.6	-0.5
	18. Sugar	0.1	3.5	-3.7	0.0
	19. Other Food	1.2	0.9	0.1	-0.1
	20. Beverages & Tobacco	3.8	3.3	0.2	-0.1
	21. Textiles	4.2	3.9	0.0	-0.1
	22. Apparel	13.1	12.8	-0.2	-0.2
	23. Leather Products	9.0	7.0	0.3	-0.3
	24. Wood Products	23.7	23.7	-0.1	-0.2
	25. Paper Products	3.4	3.1	0.1	-0.1
Heavy manufactures	26. Petroleum Products	1.3	1.1	0.1	-0.1
	27. Chemical Products	3.3	3.1	0.1	-0.1
	28. Mineral Products	6.9	6.3	0.1	-0.2
	29. Ferrous & Non Ferrous Metals	0.2	0.6	-0.2	0.1
	30. Metal Products	2.4	2.2	0.1	-0.1
	31. Motor Vehicles	4.2	3.8	0.1	-0.1
	32. Electric Equip.	6.3	5.8	0.2	-0.2
	33. Machinery & Equip.	3.7	3.4	0.1	-0.1
	34. Other Manufactures	8.1	7.4	0.2	-0.2

Source: Authors based on results from GTAP 7.0 simulations.

With full liberalisation (with the Plurinational State of Bolivia in the CAN-EU agreement), the model projected that the volume of Bolivian imports from the EU would grow in all sectors of the economy (agriculture, light manufactures, mining & natural resources, and heavy manufactures). However, the change imports are not very large except in the case of plant fibers, meat products and forestry & fishing (as land-locked country, the Plurinational State of Bolivia would import mostly fish), apparel and wood products (such as finished furniture). Two reasons explain the limited growth in Bolivian imports: a) some of these commodity groups were already tax-free in the pre-reform scenario, and thus prices of EU commodities in the Bolivian market changed moderately; and b) the Bolivian price

of aggregated imported commodities did not change significantly because the share of EU commodities into the Bolivian market is small (around 8% as shown in Figure 5 below). Both reasons implied a relatively small change in the difference of prices by source and aggregated imported prices.

Under scenarios that simulate no agreement between the Plurinational State of Bolivia and the EU (last two columns in Table 4), the model projected negligible growth or marginal declines in the volumes of Bolivian imports from the EU. Volume changes on imports as shown in this table can also be explained by the different settings of these scenarios. That is, when comparing the scenarios that simulate an agreement with the others that simulate an agreement but without the Plurinational State of Bolivia, the second one imposes quantitative restrictions (i.e. higher tariffs) that are not present in the first one (i.e. no tariffs). Such restrictions lower the possibilities of increasing the exchange of commodities between the EU and the Plurinational State of Bolivia.

## 2. Production and factor use

This section addresses changes in aggregated production and factor use in the Plurinational State of Bolivia. Analysing the domestic production of commodity sectors is important in terms of understanding the general equilibrium demand response simulated in GTAP. Changes in aggregated production refer to total production increased or decreased in the Plurinational State of Bolivia as a result of CAN-EU trade reforms (with or without the Plurinational State of Bolivia). Table 5 shows that as some exports increase under full liberalisation, so does production. With full liberalisation the model projected the production of Bolivian commodities (which includes domestically consumed and exported commodities) decreased in most mining & extraction of natural resource and heavy manufactures, and increased in most agriculture commodities and light manufactures.

The most noticeable result is observed in the domestic production of textiles and wood products that increased 51.4 and 22.6% annually respectively. This effect is even larger under the scenario with sensitive products, where there is a larger increase in production for those sectors. The driving forces behind these growths were increments in the production of goods for the domestic and goods oriented to international markets. However, the production of some commodity groups also decreased. For example electric equipment and oil seeds decreased (10% and 2.3% per year respectively), which is explained by reductions in domestic production oriented to international markets and a drop in local production oriented to the domestic market.

In general total production of commodity sectors decreased slightly in scenario where the Plurinational State of Bolivia is out of the CAN-EU trade agreement (next to the last column in Table 5). Yet, few sectors such as oils seeds and sugar cane increased marginally due to a small expansion in exportable production, and a modest contraction in production of domestically traded commodities. In the last scenario (FTA CAN-EU with sensible - last column in Table 5), the model projected null or minor increments in all domestic production of tradables and non-tradables ('Agriculture', 'Mining and natural resources', 'Light manufactures' and 'Heavy manufactures'), due to small expansions in both domestic production for the local and international markets. In general, for those scenarios where the Plurinational State of Bolivia does not participate in a FTA, production changes are small or negligible.

**TABLE 11**  
**CHANGE IN PRODUCTION IN BOLIVIAN SECTORS**  
(Percentage change)

Sector		With Bolivia (Plur. State of)		Without Bolivia (Plur. State of)	
		FTA CAN-EU	FTA CAN-EU with sensitive	FTA CAN-EU	FTA CAN-EU with sensitive
Agriculture	1. Rice	-0.1	-0.1	0.0	0.0
	2. Wheat	-2.2	-0.9	-0.3	0.2
	3. Cereals	0.4	0.6	-0.1	0.0

(continued)

Table 11 (concluded)

Sector		With Bolivia (Plur. State of)		Without Bolivia (Plur. State of)	
		FTA CAN-EU	FTA CAN-EU with sensitive	FTA CAN-EU	FTA CAN-EU with sensitive
	4. Vegetables and Fruits	0.9	-0.5	-0.4	0.1
	5. Oilseeds	-2.3	-3.6	1.5	-0.7
	6. Sugar Cane	0.6	-0.6	1.1	-0.1
	7. Plant Based Fibers	1.9	3.3	-0.3	0.3
	8. Other Crops	1.7	2.5	-0.1	0.2
	9. Cattle	0.1	0.2	-0.1	0.0
	10. Forestry & Fishing	8.0	8.4	-0.1	0.1
Mining and natural resources	11. Oil & Coal	-0.8	-0.7	0.0	0.1
	12. Gas	-0.8	-0.7	-0.1	0.0
	13. Mineral Extraction	0.3	0.8	-0.2	0.1
	14. Meat	0.0	0.0	0.0	0.0
	15. Vegetable Oils & Fats	-2.3	-4.0	1.6	-1.1
	16. Dairy Products	-2.5	-1.2	-1.2	0.0
	17. Processed Rice	-0.2	-0.1	0.0	0.0
	18. Sugar	0.1	-1.8	1.9	-0.1
	19. Other Food	-0.8	-2.2	-0.3	0.0
	20. Beverages & Tobacco	0.1	-0.7	-0.1	0.0
	21. Textiles	51.4	56.1	-2.3	0.3
	22. Apparel	3.1	3.9	-0.3	0.1
	23. Leather Products	6.2	7.6	-0.4	0.2
Light manufactures	24. Wood Products	21.6	22.6	-0.2	0.2
	25. Paper Products	-3.6	-3.1	-0.2	0.1
	26. Petroleum Products	-0.4	-0.4	0.0	0.0
	27. Chemical Products	-5.0	-4.3	-0.2	0.1
	28. Mineral Products	-2.4	-2.2	-0.1	-0.1
	29. Ferrous & Non Ferrous Metals	5.9	7.2	-0.6	0.3
	30. Metal Products	-5.2	-4.3	-0.5	0.0
	31. Motor Vehicles	-6.4	-5.3	-0.5	0.4
	32. Electric Equip.	-10.0	-8.8	-0.5	0.4
	33. Machinery & Equip.	-7.6	-6.0	-1.1	0.1
	34. Other Manufactures	-6.2	-4.9	-0.5	0.5

Source: Authors based on results from GTAP 7.0 simulations.

Finally, changes in factor use (land, labour and capital) are small. With full liberalisation, within agriculture there is factor reallocation between oilseeds and other sectors, as oilseeds use less land (-0.5%), while other sectors use more land, labour and capital. This is mainly due to the decline in production of oilseeds. With liberalisation with sensible products, there is a similar pattern, but with less factor use in oilseeds and sugar cane. Outside agriculture, there is a slight increase in factor use for almost all sectors.

## C. Tariff revenues

As pointed out by an IMF (2005) report, a subject that has been frequently ignored in trade liberalisation studies is the issue of the loss in government revenues when import tariffs are eliminated. CGE models like GTAP are, for the time being, unable to account for how tariff revenues are replaced with other sources of revenue for the government. However, the tariff structure for the Plurinational State of Bolivia in the GTAP database shows that the Plurinational State of Bolivia is a fairly open economy. This reflects the process of unilateral tariff reduction that the Plurinational State of Bolivia underwent during the structural adjustment program implemented in the late eighties and early nineties. Thus when tariff reductions were simulated under different scenarios in GTAP, the grade of modifications in the tariff structure of the Plurinational State of Bolivia was not substantial.

Additionally, Bolivian custom office collected (in 2008) about 1000 million dollars from import tariffs worldwide. Out of this amount, about US\$ 300 million was collected from firms that imported goods from the European Union.<sup>7</sup> In 2008, these US\$ 300 million represented 2.3% of the Bolivian government total expenditure. In the case of a the Plurinational State of Bolivia-EU trade agreement, the potential 2.3% loss in fiscal income for the government of the Plurinational State of Bolivia will have to be covered from domestic taxes or other sources.

Considering that the share of Bolivian imports from the EU has not been large (7% in average between 2004 and 2008 as shown in Figure 3), we believe that the importance of the EU is in terms of tariff revenues would not be growing. In addition, the Plurinational State of Bolivia imports from the EU capital goods such as machinery (both new and second hand trucks, agricultural equipment), oils, lubricants, textiles (e.g. jerseys, cardigans), medicines, etc which in turn are used as inputs for the production of other final goods. Therefore, the production sector might actually benefit from tariff elimination. However, this is a subject that needs to be addressed more carefully, and which is out of the scope of this research.

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<sup>7</sup> Eduardo Rojas, personal communication. Mr. Rojas is the General Manager of the Regional Customs Administration in Cochabamba, The Plurinational State of Bolivia.

## VII. Micro-simulation results

This section presents results from the application to the macro-micro simulation approach as described in previous section. Results provide insights into the impact of the different trade scenarios across the various household classifications. This analysis has taken into account the fact that once domestic prices change due to an external factor (such as elimination of import tariffs), prices of commodities might not immediately be transmitted to the different rural and urban areas of a given region/country. In the case of the Plurinational State of Bolivia, we have estimated these coefficients (Annex 7) to allow for price adjustment in less connected markets and low populated areas. The main markets (well connected and relatively more populated) were La Paz, Santa Cruz and Cochabamba, where it was assumed a unitary price transmission; while the less connected markets were Beni, Chuquisaca, Oruro, Pando, Potosí and Tarija which had different transmission coefficients as shown in Annex 7.

The analysis of the impacts of alternative trade reforms on household economic wellbeing involves computing the private utility equation as defined in Section 5.4. This equation uses the resulting price and return to factor changes (generated by GTAP), weighted by price transmission coefficients, for the computation of the difference between Laspeyres index for income and Laspeyres index for expenditure, so producing an estimation of the post-reform private utility at pre-reform quantities. The Laspeyres indices were subsequently normalised to a value of 100 in the base year, to indicate the percentage change in income and expenditure across household classifications. In this investigation we have referred to this process as ‘macro-micro simulation approach’.

### A. Changes in prices

Table 12 shows that, as expected, import prices from the EU into the Plurinational State of Bolivia would decrease as a result of a FTA CAN EU. However, domestic prices in the Plurinational State of Bolivia would actually increase in this scenario, and in scenario “FTA CAN – EU, no sensitives” and “FTA CAN – EU, no the Plurinational State of Bolivia” (though price increments in this last one are marginal. On the contrary, domestic prices would decrease under the last scenario (“FTA CAN – EU, no the Plurinational State of Bolivia, no sensitives”).

Why is that domestic prices in the Plurinational State of Bolivia increase in the first scenario? With trade liberalization and reduced tariffs, prices are expected to decrease. However, there are general equilibrium impacts that are captured by the model.

**TABLE 12**  
**SIMULATION EFFECTS ON COMMODITY PRICES AND PRODUCTION FACTORS**  
*(Percentage changes)*

Commodity	With Bolivia (Plur. State of)		Without Bolivia (Plur. State of)	
	FTA CAN-EU	FTA CAN-EU with sensitives	FTA CAN-EU	FTA CAN-EU with sensitives
1. Rice	2.1	0.9	0.4	-0.3
2. Wheat	1.6	1.1	0.2	-0.2
3. Cereals	2.2	1.1	0.4	-0.3
4. Vegetables and Fruits	2.3	0.9	0.3	-0.3
5. Oilseeds	1.6	0.3	0.6	-0.4
6. Sugar Cane	1.8	0.8	0.4	-0.2
7. Plant Based Fibers	1.8	1.2	0.2	-0.2
8. Other Crops	2.5	1.3	0.4	-0.3
9. Cattle	1.9	0.9	0.4	-0.3
10. Forestry & Fishing	8.0	8.0	0.1	-0.1
11. Oil & Coal	0.3	0.2	0.1	0.0
12. Gas	0.3	0.3	0.0	-0.1
13. Mineral Extraction	2.1	1.9	0.0	-0.1
14. Meat	2.0	1.2	0.2	-0.2
15. Vegetable Oils & Fats	1.4	0.5	0.5	-0.3
16. Dairy Products	1.9	1.4	0.2	-0.2
17. Processed Rice	1.9	1.2	0.2	-0.2
18. Sugar	1.8	1.3	0.2	-0.2
19. Other Food	1.6	0.9	0.3	-0.2
20. Beverages & Tobacco	1.7	1.3	0.1	-0.1
21. Textiles	1.6	1.3	0.1	-0.1
22. Apparel	1.7	1.3	0.1	-0.1
23. Leather Products	1.7	1.3	0.1	-0.1
24. Wood Products	3.2	2.9	0.1	-0.1
25. Paper Products	1.4	1.0	0.1	-0.1
26. Petroleum Products	0.6	0.5	0.1	-0.1
27. Chemical Products	1.6	1.3	0.1	-0.1
28. Mineral Products	1.9	1.6	0.1	-0.1
29. Ferrous & Non Ferrous Metals	1.9	1.7	0.0	-0.1
30. Metal Products	1.4	1.1	0.1	-0.1
31. Motor Vehicles	1.6	1.3	0.1	-0.1
32. Electric Equipment	1.7	1.3	0.1	-0.1
33. Machinery & Equipment	1.5	1.2	0.1	-0.1
34. Other Manufactures	1.3	1.0	0.1	-0.1
35. Services	1.8	1.5	0.1	-0.1
Land	1.7	-2.9	1.7	-1.0
Unskilled labour	2.5	2.0	0.2	-0.2
Skilled labour	2.1	1.8	0.1	-0.1
Capital	2.4	2.0	0.1	-0.1
Natural Resources	-0.7	0.3	-0.3	0.2

Source: Authors' estimations based on results from GTAP 7.0 simulations.

The EU represents for most products in the Plurinational State of Bolivia for less than 10% of total imports. Brazil, Argentina and ROW represent most of the share of imports. Exports to the EU,

Ecuador and most products of Colombia increase, while for all other partners decreases. In relative terms, the prices that the Plurinational State of Bolivia pays for these imports from the EU fell relative to imports of other countries. However, relative prices of products from Andean partners, especially Colombia and Ecuador increase for the Plurinational State of Bolivia, relative to the price of other imports. Therefore, the overall impact in the Plurinational State of Bolivia in the first scenario is increased domestic prices.

Under the third and fourth scenarios (“FTA CAN – EU, no Plurinational State of Bolivia” and “FTA CAN – EU, no Plurinational State of Bolivia, no sensitives” respectively), percentage changes in most commodity prices were projected to be either positive or negative, but negligible. This is because in these scenarios it is simulated that the Plurinational State of Bolivia is out of the trade agreement, while changes in prices are due to changes in import tariffs from both the EU and other than the Plurinational State of Bolivia CAN countries.

The effect of the simulations on the income side resulted in mixed results for Bolivian production factors (bottom part of Table 6). While increments were projected in returns to unskilled labour, skilled labour and capital under the first two scenarios, reductions were projected in natural resources for the first scenario, and in land for the second scenario. In the case of the last two scenarios (where the Plurinational State of Bolivia is out of the agreement) the model projected marginal increments or reductions in all production factors, except in the case of land that increased under the third scenario.

The negative results in natural resources and land are basically explained by their sluggish feature which means that both resources are virtually fixed in the economy. Therefore, when demand for these resources decrease, their prices do so (given that their supply is almost perfectly inelastic). In the first and third scenario the model projected an increase in the demand for land, which lead to an increase in its relative price. GTAP model assumes that unskilled and skilled labour and capital are mobile factors in the economy. With growing demand for the three of them in the first three scenarios, the model projected increased prices.

## **B. Changes in private utility**

Table 13 presents the impacts of the trade reforms on households’ private utility by department. In general the results indicate that private utility would increase for households under the first two scenarios (FTA CAN-EU with the Plurinational State of Bolivia), and would decrease or remain changeless under the last two scenarios (FTA CAN-EU, but without the Plurinational State of Bolivia). The moderate changes in household private utility reflect the rather small changes in commodity prices and returns to production factors estimated by the CGE model (Table 12). This outcome is not surprising given the relatively small rates of protection the Plurinational State of Bolivia has been applying to EU products and to the relatively small share EU products into Bolivian markets. Considering the effect on private utility by region, Chart 7 shows that the urban households benefit more than those the rural department and rural/urban condition shows that urban households tend to benefit more than rural ones under Scenario 1 (FTA CAN-EU). In La Paz and Cochabamba departments private utility is estimated to be negative, though small. The Annex 6 presents the values of private utility for the other three scenarios. In general terms, private utility tends to be positive for urban areas and negative in rural areas.

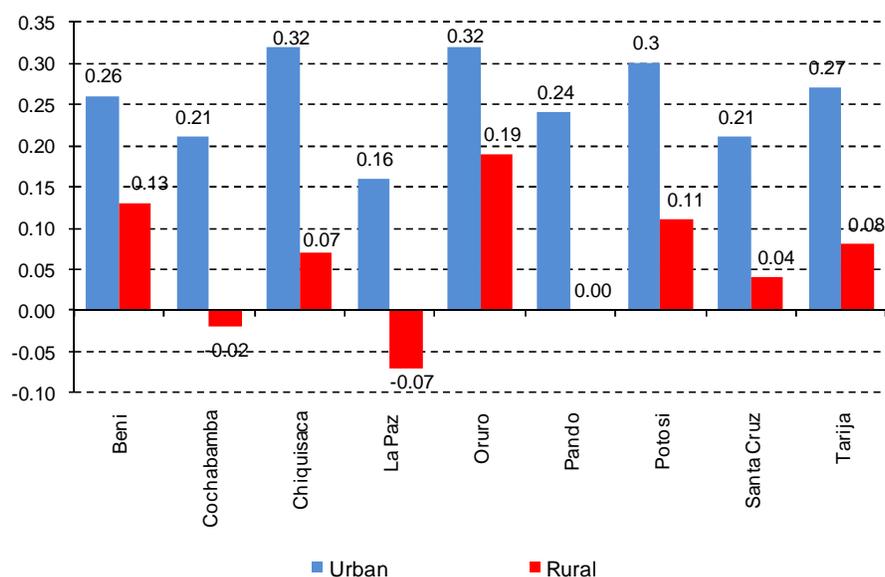
**TABLE 13**  
**HOUSEHOLD PRIVATE UTILITY BY LIBERALISATION SCENARIO AND DEPARTMENT**  
*(Changes)*

Departament	With Bolivia (Plur. State of)		No Bolivia (Plur. State of)	
	FTA CAN-EU	FTA CAN-EU, no sensitives	FTA CAN-EU	FTA CAN-EU, no sensitives
Beni	0.24	0.60	-0.12	0.05
Chuquisaca	0.24	0.43	-0.57	0.02
Cochabamba	0.16	0.59	-0.14	0.07
La Paz	0.12	0.54	-0.15	0.07
Oruro	0.28	0.69	-0.13	0.06
Pando	0.11	-0.14	0.04	-0.03
Potosí	0.25	0.57	-0.11	0.05
Santa Cruz	0.19	0.64	-0.15	0.07
Tarija	0.24	0.67	-0.14	0.06
Total	0.20	0.59	-0.14	0.06

Source: Authors' estimations based on results from micro-simulations.

Note: To reduce the impact of extreme values of private utility, the median was used instead of the mean.

**FIGURE 7**  
**PRIVATE UTILITY BY DEPARTMENT AND BY RURAL AND URBAN CONDITION**



Source: Authors' estimations based on results from micro-simulations.

These results indicate that the micro-simulation model has computed increased returns to production factors that overcame higher prices of commodities. I.e., values of the Laspeyres index for income were greater than values of the Laspeyres index for expenditure. With increased prices of commodities, households' expenditure on their consumption bundle became more costly. In the case of urban households, such higher costs were covered by even higher returns to production factors, resulting in a net positive benefit for them (reflected on positive private utility values). In the case of

rural households higher costs of the consumption bundle were marginally covered by higher income, or were not in the case of rural households from La Paz and Cochabamba rural areas.

The micro-simulation model shows a harmful situation for rural households who would not benefit in general from the different CAN-EU trade agreements. At first sight this is not as dramatic as it looks like given that changes in welfare are not large. Yet, considering households in rural areas of the Plurinational State of Bolivia are the poorest in the country, minor changes in welfare might mean difficulties for the most vulnerable ones.

Another perspective is given by Table 14, which summarises results of household private utility by income group. As a consequence of the CAN – EU liberalisation reforms with and without sensitive commodities (first two scenarios), the private utilities of households included in the income category ‘389.71 – 694.95’ Bs/month and above are projected to increase, while the private utility of the poorest household income group (‘<= 389.7’) is projected to either decrease (Scenario 2) or insignificantly increase (Scenario 1).

Under the third scenario (trade agreement without the Plurinational State of Bolivia), the private utility of all household groups (except the poorest income group) is projected to increase. Under the fourth scenario (no Plurinational State of Bolivia, no sensitive commodities), the opposite is projected. That is, only the private utility of household heads belonging to the poorest income category (Sextile I) is projected to be negative, while the private utilities of the rest of the income groups are projected to negligible increase.

**TABLE 14**  
**PRIVATE UTILITY BY PER LIBERALISATION SCENARIO AND INCOME CATEGORY**  
*(Percentage change)*

Income category (Bs/month)	With Bolivia (Plur. State of)		Without Bolivia (Plur. State of)	
	FTA CAN-EU	FTA CAN-EU, no sensitives	FTA CAN-EU	FTA CAN-EU, no sensitives
Sextile I: <= 390	0.08	-0.69	0.25	-0.14
Sextile II: 390 - 695	0.21	0.56	-0.13	0.05
Sextile III: 695 – 1,033	0.22	0.59	-0.14	0.06
Sextile IV: 1,033 – 1,538	0.22	0.63	-0.15	0.07
Sextile V: 1,538 – 2,547	0.20	0.64	-0.15	0.07
Sextile VI: > 2,547	0.21	0.64	-0.15	0.07
Total	0.20	0.59	-0.14	0.06

Source: Authors’ estimations based on results from micro-simulations.

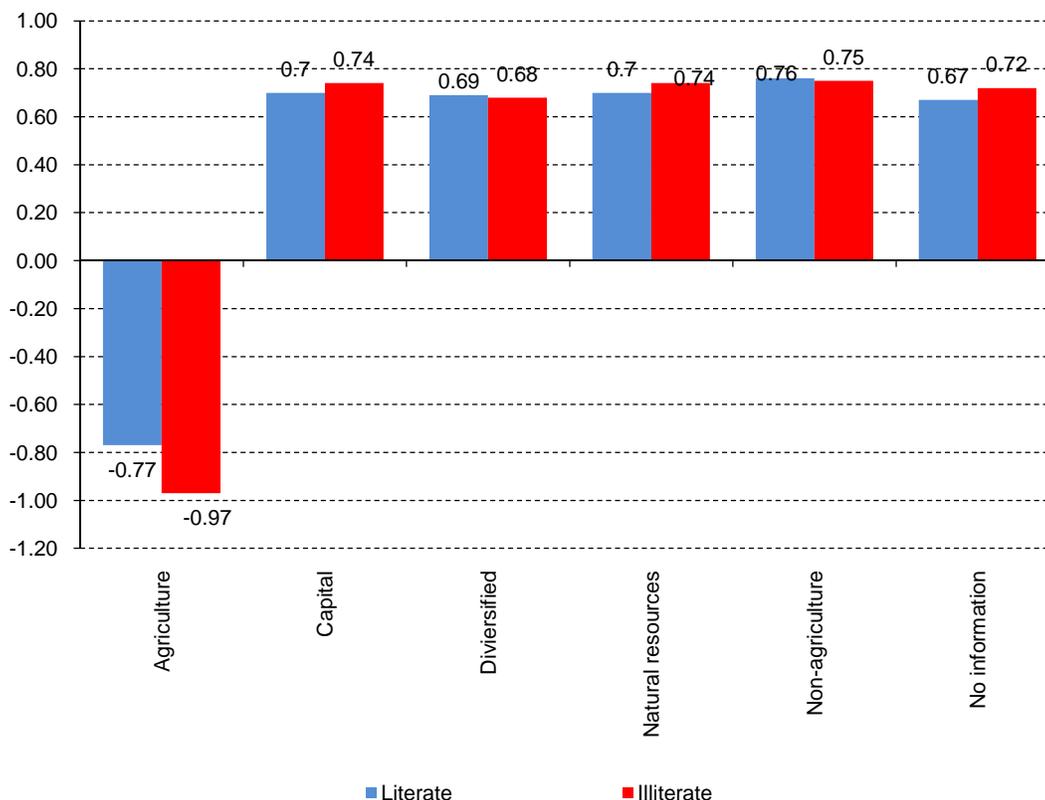
Note: Due to missing data on household sources of income, 106 questionnaires were excluded from the database. Therefore analysis was done based on 5640 questionnaires.

To reduce the impact of extreme values of private utility, the median was used instead of the mean.

Figure 8, which shows the results that combine information on households’ education group, production factors and private utility level for Scenario 2 (FTA CAN – EU, no sensitives) confirms that the most vulnerable households (i.e. depending mainly on agriculture for their livelihoods) would be worst-off as a result of a trade agreement with the EU. Households depending on the rest of production factor categories (capital, natural resources, non-agriculture and diversified resources) would be better-off. Annex 8 shows the changes in private utility for the four scenarios. Generally, scenarios that simulate a trade agreement with the Plurinational State of Bolivia included are the most advantageous for Bolivian households (except in the cases of households that obtain a significant share of their income from agricultural activities). The results are irrespective of the literacy in the households as both tend to gain with the agreement, except again in the case of those households that get most of their income from agriculture.

Overall results support the conclusion that households in the Plurinational State of Bolivia would suffer from not signing into an FTA with the European Union. Nonetheless, FTAs also have unintended consequences especially for the poorest and rural households. Therefore the government should consider implementing compensatory policies if decides to engage into a trade agreement with the EU. Complementarily, Page (2008) suggests that countries should not assume that trade agreements alone will automatically generate development benefits, and that the evidence from Latin America advocates for introducing complementary policies both directly and indirectly.

**FIGURE 8**  
**PRIVATE UTILITY BY PRODUCTION FACTOR AND EDUCATION GROUP**  
*(Percentage change)*



Source: Authors' estimations based on results from micro-simulations.

The combined macro-micro results suggest that economic growth could contribute to poverty reduction. In general, there seems to be some agreement on the positive effects of economic growth on poverty reduction. For example, Giordano (2009) reports that according to the World Development Report 2001 a value of two is observed in developing countries in the elasticity of income to poverty reduction. That is, a one percent increase in real income reduces headcount poverty by two percent. Cragg and Epelbaum (1996) suggest that, in the long-run, returns to skill labour have risen in Mexico as a result of trade liberalisation in the late 80s and early 90s. In Colombia, which reduced also drastically tariffs in early 90s, returns to skilled labour also increased due to an increase in the demand for skilled workers (Attanasio et al., 2003). Winters (2003) reports that trade liberalisation was associated with a marked acceleration in formal employment creation.

## VIII. Conclusions and recommendations

The core conclusion of this research is that a CAN – EU trade agreement that includes the Plurinational State of Bolivia is a superior alternative to maintaining the status quo. This conclusion draws from the most important findings of sections 6 and 7. While Section 6 placed the first two scenarios (both of them include the Plurinational State of Bolivia in the agreement, with one of them excluding sensitive commodities) as the most profitable trade setting for the Bolivian economy as a whole, Section 7 found that such scenarios that were the most advantageous trade setting where benefits would be distributed across most household groups of Bolivian society. The scenarios that exclude the Plurinational State of Bolivia from the CAN – EU trade agreement were repetitively projected to be the worst trading picture for both the Bolivian macroeconomic performance and the economic wellbeing of its households.

At a household level, the micro-simulation model projected that the economy-wide trade liberalisation settings resulted in higher benefits for most household groups, while the scenarios that simulate a trade agreement but without the Plurinational State of Bolivia, private utility tends to be negative or marginally positive. Yet, compensatory or complementary policies are recommended for the poorest income groups if the Plurinational State of Bolivia decides to engage into a trade agreement with the EU.

We recognise that trade reforms by themselves do not achieve substantive changes in poverty reduction. We would recommend carrying them out in association with macroeconomic stabilization policies, deregulation, technological improvement policies, and other policies that fit better for the domestic development.

We consider that the Plurinational State of Bolivia should not remain apart from the liberalisation processes that characterise the current globalised economy. The other CAN countries (Colombia, Ecuador and Peru) already started negotiations with the EU towards a trade agreement. If the Plurinational State of Bolivia is unable to make the EU to lower its domestic tariffs for Bolivian products, it will lose competitiveness in comparison with Colombian, Ecuadorian and Peruvian goods and services as EU import tariffs for them will be reduced or eliminated. To keep its market share the Plurinational State of Bolivia has to react implementing a trade policy that will keep open market niches for Bolivian products.

The Plurinational State of Bolivia already applies low tariffs to EU goods. As it was mentioned, such low tariffs are associated to the fact that right after the structural adjustment program

that involved a process of unilateral tariff reduction, the Plurinational State of Bolivia became a fairly open economy. Therefore, the sacrifice the government would have to do would not be huge, and there is more to gain in terms of access to the EU market than to lose in terms of tariff elimination. The Plurinational State of Bolivia already left itself out of the agreement with the US (the largest importer in the world), and now has to consider carefully if it is really convenient to be once more out of a trade agreement with an important market like the EU (the second largest importer in the world).

## Bibliography

- Aduana de Bolivia, 2009. Arancel aduanero de Bolivia 2009. Accessed on 5 July 2009. <http://www.cnda.net.bo>.
- Attanasio, O., P. Goldberg, and N. Pavcnik, 2003. Trade reforms and wage inequality in Colombia. National Bureau of Economic Research, Cambridge, MA. Accessed on 7 June, 2009. [www.nber.org/papers/w9830.pdf?new\\_window=1](http://www.nber.org/papers/w9830.pdf?new_window=1).
- Berthelot, J., 2002. How the CAP Undermines Food Security in Developing Countries?. Nordic seminar, Stockholm, Sweden, 8 February 2002. Organised by Ekologiska Lantbrukarna and FGL (SE), in cooperation with Landsforeningen Ökologisk Jordbrug (Denmark), Luomuliitto (Finland) and Oikos (Norway). Online, accessed on 16 July 2009, and available from: <http://www.solidarite.asso.fr/actualites/how.htm>.
- Barja, G., J. Monterrey and S. Villarroel, 2004. Bolivia: Impact of shocks and poverty policy on household welfare. Global Development Network, Universidad Católica Boliviana, La Paz, Bolivia; Bolivian National Institute of Statistics (BNIS), 2002. Database: Encuesta de Mejoramiento de Condiciones de Vida 2002. Programa MECOVI. La Paz – Bolivia. accessed on 8 June 2009, <http://www.ine.gov.bo/enchogares/enchogares.aspx>.
- Cámara Boliviana de Hidrocarburos – CBH, 2009. Situación y perspectivas de la industria petrolera boliviana. Accessed on 17 May 2009. <http://www.cbh.org.bo/es/documento/informe2008.pdf>.
- Durán Lima, J., A. Schuschny and C. de Miguel, 2007. El modelo GTAP y las preferencias arancelarias en América Latina y el Caribe: reconciliando su año base con la evolución reciente de la agenda de liberalización regional. Economic Commission for Latin America and the Caribbean (ECLAC), Santiago, Chile.
- Fundación Valles, 2009. Base de datos de precios en distintos mercados de Bolivia. Sistema Integrado de Mercados Agropecuarios. Cochabamba – Bolivia.
- Jemio, L. and M. Wiebelt, 2003. ¿Existe Espacio para Políticas Anti-Shocks en Bolivia? Lecciones de un Análisis basado en un Modelo de Equilibrio General Computable. Kiel Institute of World Economics, Instituto de Investigaciones Socio-Económicas. La Paz, Bolivia.
- Jimenez, E., G. Candia and M. Mercado 2005. Economic growth, poverty and institutions: a case study of Bolivia. Unidad Económica de Políticas Sociales y Económicas (UDAPE), La Paz, Bolivia.
- Giordano, P. (editor), 2009. Trade and Poverty in Latin America. Inter-American Development Bank.
- Giordano, P., M. Mendez-Parra and M. Watanuki. 2007. Andean Countries at a Crossroads: Evaluating Pro-Poor Trade Integration Options. Paper presented at the 10th Annual Conference on Global Economic Analysis, June 7-9, 2007, Purdue University, USA.

- Gujarati, D.N., 1995. *Basic Econometrics*. 3rd Edition. New York: McGraw-Hill, 1995.
- Hertel, T.W. (ed.), 1997. *Global Trade Analysis, Modeling and Applications*. Edited by Thomas Hertel, Cambridge University Press 1997.
- Hertel, T.W., M. Ivanic, P. Preckel, and J. Cranfield, 2004. The earning effects of multilateral trade liberalization: implications for poverty. *The World Bank Economic Review*. Vol 18, No 2.
- Hertel, T.W. and A. Winters (eds). 2005. *Poverty and the WTO: Impacts of the Doha Development Agenda* (World Bank Trade and Development Series). World Bank Publications.
- Hertel, T.W. and A. Winters, 2005. *Estimating the Poverty Impacts of a Prospective Doha Development Agenda*. Blackwell Publishing Ltd 2005.
- Ianchovichina, E., A. Nicita and I. Soloaga, 2002. Trade reform and poverty: the case of Mexico. *The World Economy*. Volume 25 Issue 7 Page 945-972, July 2002.
- Instituto Boliviano de Comercio Exterior (IBCE), 2009. PP presentation ¿Cómo aprovecha Bolivia los Acuerdos Comerciales y Mercados Preferenciales? by Limberg A. Menacho Ardaya. Santa Cruz, Bolivia.
- IMF, 2005. *Dealing with the Revenue Consequences of Trade Reform*. Background Paper, Washington. Online, accessed on 20 August 2009, and available from: <http://www.imf.org/external/np/pp/eng/2005/021505.pdf>.
- Instituto Nacional de Estadística (INE), 2006. *Actualidad Estadística*. Online, accessed on 15 May 2009, and available from: [http://www.ine.gov.bo/pdf/actest/AE\\_2007\\_735.pdf](http://www.ine.gov.bo/pdf/actest/AE_2007_735.pdf).
- Johansen, S. 1988. Statistical Analysis of Cointegration Vectors. *Journal of Economic Dynamics and Control*, 12: 231–254.
- Johansen, S. 1991. Estimation and Hypothesis testing of Cointegrating Vectors in Gaussian Vector Autoregressive Models. *Econometrica*, 59(6): 1551-1580.
- Klasen, S., 2005. *Economic growth and poverty reduction: measurement and policy issues*. OECD Development Centre, Working Paper No. 246. Research programme on: Social Institutions and Dialogue.
- Krugman, P. and M. Obstfeld, 2003. *International Economics, Theory and Policy*. Sixth edition, Addison Wesley, Boston.
- Nicita, A., 2005. *Multilateral Trade Liberalization and Mexican Households: The Effect of the Doha Development Agenda*. World Bank Policy Research Working Paper 3707, September 2005. Development Research Group. Accessed on 29 March, 2009 [http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2005/09/01/000016406\\_20050901171126/Rendered/PDF/wps3707.pdf](http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2005/09/01/000016406_20050901171126/Rendered/PDF/wps3707.pdf).
- Page, S., 2008. *What happens after trade agreements?*. Overseas Development Institute – UK. Accessed on 10 July 2009. <http://www.odi.org.uk/resources/download/1014.pdf>.
- Pesaran, M., and B. Pesaran., 1997. *Working with MICROFIT 4.0 Interactive Econometric Analysis*. 505 p. Oxford University Press, Burgess Hill, West Sussex, GB.
- Telleria, R., C.E. Ludena, B. Shankar and R. Bennett, 2007. “Would a free trade agreement between Bolivia and the United States prove beneficial to Bolivian households?”. Forthcoming *Journal of International Agricultural Trade and Development*.
- Thiele, R., and M. Wiebelt, 2003a. *Attacking Poverty in Bolivia – Past Evidence and Future Prospects: Lessons from a CGE Analysis*. Kiel Institute for World Economics, Duesternbrooker Weg 120, D-24105 Kiel, Germany.
- Thiele, R., and M. Wiebelt, 2003b. *Macroeconomic and Distributional Effects of Devaluation in a Dollarized Economy: A CGE Analysis for Bolivia*. Kiel Institute for World Economics, Duesternbrooker Weg 120, D-24105 Kiel, Germany.
- Tweeten, L., 1992. *Agricultural Trade, Principles and Policies*. The Ohio State University, Westview Press, USA.
- Valenzuela, E. and S. Andriamananjara. 2008. *Economic Impacts of Different Trade Policy Scenarios on the Bolivian Economy*. World Bank mimeo.
- Vandemoortele, J., 2009. The MDG Conundrum: Meeting the Targets Without Missing the Point. *Development Policy Review*, 2009, 27 (4): 355-371.

- Wiggins, S., A. Schejtman, G. Gray, and C. Toranzo, 2006. Institutions & economic growth in Bolivia. IPPG Working Paper No. 1, April 2006: Bolivia Case Study: an interpretative summary. August 2006.
- Winters, A., 2003. Trade Liberalisation and Poverty. University of Sussex – UK. <http://siteresources.worldbank.org/INTPOVERTY/Resources/WDR/winters2.pdf> Accessed on 2 May 2009.
- WTO, 2001. LDC Trade Ministers' Meeting. Zanzibar, Tanzania, 22-24 July 2001. Online, accessed on 16 May 2009, and available from: <http://www.un.org/esa/ffd/themes/ldc-4.htm>.



## **Annexes**

## Annex 1

**TABLE A.1**  
**CHANGE IN TARIFFS AFTER THE END OF ATPDEA**

Sector	Bolivia's applied tariffs on imports from the United States		United States' applied tariffs on imports from Bolivia (Plur. State of)	
	Before ATPDEA	After ATPDEA	Before ATPDEA	After ATPDEA
1. Rice	0	10	0	0
2. Wheat	10	10	0	0
3. Cereals	10	15	0	0
4. Vegetables and Fruits	10	10	0	20
5. Oilseeds	10	10	0	0
6. Sugar Cane	0	20	0	0
7. Plant Based Fibers	10	10	0	0
8. Other Crops	10	10	0	0
9. Cattle	10	10	0	0
10. Forestry & Fishing	10	10	0	0
11. Oil & Coal	0	10	0,4	0
12. Gas	10	10	0	0
13. Mineral Extraction	10	10	0	0
14. Meat	10	10	0	4,5
15. Vegetable Oils & Fats	10	10	0	0
16. Dairy Products	10	10	0	14,5
17. Processed Rice	10	10	0	0
18. Sugar	10	10	0	0
19. Other Food	10	20	0	4,5
20. Beverages & Tobacco	10	10	0	0
21. Textiles	10	35	0	4,2
22. Apparel	10	20	0	0
23. Leather Products	10	10	4,6	4,6
24. Wood Products	10	35	0	0
25. Paper Products	7,9	10	0	0
26. Petroleum Products	10	10	0,6	0,6
27. Chemical Products	10	15	0	0
28. Mineral Products	10	10	0	0
29. Ferrous & Non Ferrous Metals	9,6	10	0	5,5
30. Metal Products	9,6	10	0	5,5
31. Motor Vehicles	8,4	10	0	0
32. Electric Equipment	10	10	0	0
33. Machinery & Equipment	5,3	10	0	0
34. Other Manufactures	10	10	0	0
35. Services	0	0	0	0

Source: Aduana de Bolivia, 2009 (<http://www.cnda.net.bo>); GTAP 7.0 Data Base; and USITC - United States International Trade Commission (<http://hts.usitc.gov> - Harmonized Tariff Schedule of the United States, 2009).

## Annex 2

**TABLE A.2**  
**CHANGE IN TARIFFS AFTER TOTAL LIBERALISATION OF TRADE WITH THE**  
**EUROPEAN UNION (SCENARIO 2)**

Sector	Bolivia's applied tariffs on imports from the European Union		European Union's applied tariffs on imports from Bolivia (Plur.State of)	
	Before	After	Before	After
1. Rice	0	0	10	0
2. Wheat	9,94	9,94	10	0
3. Cereals	0	0	15	0
4. Vegetables and Fruits	4,72	0	10	10
5. Oilseeds	6,73	6,73	10	0
6. Sugar Cane	0	0	20	0
7. Plant Based Fibers	0	0	10	0
8. Other Crops	9,64	0	10	0
9. Cattle	5,64	0	10	0
10. Forestry & Fishing	6,35	0	10	0
11. Oil & Coal	0	0	10	0
12. Gas	0	0	10	0
13. Mineral Extraction	9,73	0	10	0
14. Meat	5,09	5,09	10	10
15. Vegetable Oils & Fats	9,79	0	10	0
16. Dairy Products	8,56	8,56	10	10
17. Processed Rice	6,7	0	10	0
18. Sugar	1,32	1,32	10	10
19. Other Food	9,72	0	20	20
20. Beverages & Tobacco	9,86	0	10	10
21. Textiles	9,45	9,45	35	0
22. Apparel	7,74	0	20	0
23. Leather Products	7,98	7,98	10	0
24. Wood Products	9,43	0	35	0
25. Paper Products	7,61	0	10	0
26. Petroleum Products	9,54	0	10	0
27. Chemical Products	10	0	15	0
28. Mineral Products	9,92	0	10	0
29. Ferrous & Non Ferrous Metals	9,52	0	10	0
30. Metal Products	9,71	0	10	0
31. Motor Vehicles	6,91	0	10	0
32. Electric Equipment	9,84	0	10	0
33. Machinery & Equipment	5,53	0	10	0
34. Other Manufactures	9,68	0	10	0
35. Services	0	0	0	0

Source: Authors' classification based on results from GTAP 7.0 simulations.

## Annex 3

### Cointegration analysis to measure market integration

#### Augmented Dickey-Fuller (ADF) test

A basic requirement to undertake a cointegration analysis consists of ensuring that time series data are not stationary and that exhibit an alike-integration order. A time series is defined as non-stationary when it does not display a trend to regress to its own mean (in addition its variance tends to grow on time). Alternatively, a time series is stationary if the mean, variance and autocovariance (at various lags) remain the same throughout the length of the series. Formally:

$$E(Y_t) = \mu = \text{constant}$$

$$\text{Var}(Y_t) = E(Y_t - \mu)^2 = \sigma^2(Y_t) = \text{constant}$$

$$\text{Cov}(Y_t, Y_{t+k}) = \gamma_k = E[(Y_t - \mu)(Y_{t-k} - \mu)] = \sigma_k$$

We use ADF test to determine if time series are not stationary.

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^m \Delta Y_{t-i} + v_t$$

Where  $\Delta Y_{t-1}$  is the first differential of the variable (lagged one period);  $t$  is the time or trend variable;  $i$  is the number of lags;  $v$  the error term;  $\beta_1$  is the intercept (constant); and  $\delta$  and  $\alpha$  are the parameters to be estimated. The null hypothesis is  $\delta=0$  which means that there is a unit root (the alternative hypothesis is that  $\delta < 0$ ). If the absolute value statistic  $\tau$  exceeds the critical absolute values of the ADF test, then we reject the null hypothesis ( $\delta=0$ ). Thus, the time series is stationary as it does not exhibit a unitary root.

If a time series has been differentiated once and is stationary, then we can say that the original series is integrated of order one, denoted as  $I(1)$ . If the original time series is differentiated twice to make it stationary, then it is said that the original time series is integrated of order two, or  $I(2)$ . Obviously, if  $d=0$  then  $I(0)$ , and we have a stationary time series. Pesaran et al. (1997) recommends estimating the ADF test with a specific number of lags. The number of lags is important in finite time series.

#### Akaike and Schwartz criterion

The structure of the minimum classification error (MCE) is closely related with the Vector Autoregression (VAR). Thus, the number of lags used to estimate VAR is kept in the estimation of the MCE model. The selection of the lags is done using jointly the Akaike information Criterion (AIC) and the Schwarz Bayesian Criterion (SC). The optimal number of lags is chosen by maximising the statistical model:

$$AIC(n) = Ln \det \left( \sum_n \right) + \frac{2M^2 n}{T}$$

$$SC(n) = Ln \det \left( \sum_n \right) + \frac{2M^2 n Ln T}{T}$$

Where  $n$  is the number of parameters in the statistical model,  $T$  is the number of observations (fixed);  $M$  is the number of variables in the system; and  $\sum_n$  is the matrix of residuals.

### Johansen cointegration test

Two time series are cointegrated, thus displaying a long term relationship, if these time series are integrated of order I(1). That is, they become stationary when differentiated once, and exists an stationary time series that is a linear combination of order I(0). In practice, this relationship is estimated through a regression between the dependent variable and several explanatory variables (that do not include lags). This regression is known as Johansen cointegration test:

$$\mu_t = Y_t - \delta_0 - \sum_{i=1}^n \delta_i X_{it}$$

Where  $Y_t$  is the dependent variable;  $\delta_0$  and  $\delta_t$  are long-term parameters;  $X_{it}$  are explanatory variables; and  $\mu$  is the long-term error

### Vector Error Correction Model (VECM)

The VECM is a mechanism that corrects for disequilibrium in time series (Gujarati, 1995).

$$\Delta Y_t = \alpha_1 + \sum_{j=1}^m \beta_j \Delta Y_{t-j} + \sum_{k=1}^m \gamma_k \Delta X_{t-k} + \varphi_t(\varepsilon_t) + \mu_t$$

Where  $\Delta Y_t$  denotes the first difference in the dependent variable;  $\alpha$ ,  $\beta$  and  $\gamma$  are parameters to be estimated;  $\mu$  is the error term;  $m$  represents the number of lags;  $\varepsilon$  represents cointegration vectors;  $\Phi_t$  coefficients of speed adjustment, that capture how fast the variables adjust towards equilibrium once the shock has occurred (the larger the coefficient, the faster the response).

If in one or more equations, the adjustment coefficients are statistically equal to zero, the dependent variable of that equation does not respond to disequilibrium. If the coefficient displays a negative sign, then exists an indirect relationship between the variables that restore the long-term linear relationship.

## Annex 4

TABLE A.3

### AVAILABILITY OF PRICE DATA FOR SELECTED PRODUCTS AND CITIES IN THE PLURINATIONAL STATE OF BOLIVIA

Goods	Cochabamba		La Paz				Santa Cruz			Sucre	Tarija	Oruro	Bolívar		
	La Pampa	Campe-sino	Santa Bárbara	Mercado Rodríguez	Uruguay	La Ceja	Cemen-terio	Calle Max Paredes	Abasto	La Ramada	Campe-sino	Campe-sino		Max Fernández	Tagarete
Oil	x							x	x		x	x		x	
Rice	x				x					x	x	x			x
Paddy rice	x				x					x	x	x			x
Pea	x					x			x		x	x	x		x
Pepper	x				x				x		x	x		x	
Sugar	x			x					x		x	x		x	
Bean	x		x	x		x			x		x	x	x		
Maize	x		x		x				x		x	x	x		
Wheat			x		x				x		x	x	x		
Flour	x				x				x		x	x	x		
Apple		x						x	x		x	x			x
Peanut	x				x				x		x	x	x		
Lemon	x							x	x		x	x	x	x	
Tomato	x			x		x			x		x	x	x		
Onion	x		x	x		x			x		x	x	x		
Corn	x			x		x			x		x	x	x		
Potato flour	x				x				x		x	x	x		
Banana		x						x	x		x	x	x		
Orange		x						x	x		x	x	x		
Lettuce	x			x		x			x		x	x	x		
Carrot	x		x			x			x		x	x	x		
Butter	x							x	x		x	x	x		
Pork	x			x					x		x	x			x
Lamb	x			x					x		x	x			x
Red meat	x			x					x		x	x			x
Poultry	x							x	x		x	x			x
Fish	x						x		x		x	x	x		
Cheese	x							x	x		x	x	x		
Tuber		x				x			x		x	x	x		
Potato		x				x			x		x	x	x		
Yuca	x								x		x	x	x		
Quinoa	x								x		x	x	x		
Coca	x							x	x		x	x	x		

Source: Valles Foundation, 2009. Integrated Agropecuary Market System. Cochabamba, Bolivia (Price database in various markets in the Plurinational State of Bolivia).

## Annex 5

**TABLE A.4**  
**GTAP CHANGES IN PRICES OF GOODS AND IN THE PRICE TRANSMISSION**  
**COEFFICIENTS**

Sector	Change in prices of primary products				Price transmission coefficients for the more remote regions	
	FTA CAN-EU	FTA CAN-EU, no sensitives	FTA CAN-EU, excl. Bolivia (Plur. State of)	FTA CAN-EU, excl. Bolivia (Plur. State of), no sensitives	Tarija, Beni, Pando	Chuquisaca, Oruro, Potosí
Oil	1.59	0.29	0.62	-0.39	0.68	0.96
Pepper	1.59	0.29	0.62	-0.39	0.98	1.11
Pea	1.59	0.29	0.62	-0.39	1.11	0.89
Rice	2.10	0.92	0.40	-0.29	0.97	0.97
Tuna, sardine	7.98	7.95	0.06	-0.09	0.61	0.68
Sugar	1.78	1.30	0.17	-0.15	0.93	0.96
Alcoholic bev.	1.68	1.27	0.13	-0.14	1.00	1.00
Onion	2.32	0.87	0.34	-0.27	0.92	0.82
Pork	1.93	0.85	0.36	-0.27	1.00	0.86
Cereals	2.19	1.12	0.36	-0.27	0.97	0.95
Corn	1.43	0.45	0.46	-0.30	0.75	0.80
Chuño	1.79	1.16	0.23	-0.17	0.99	1.00
Coca	2.45	1.34	0.40	-0.27	1.12	0.89
Cocoa	2.45	1.34	0.40	-0.27	1.12	0.89
Spices	2.45	1.34	0.40	-0.27	1.00	1.00
Lamb	1.93	0.85	0.36	-0.27	0.90	0.95
Cold cuts	1.97	1.24	0.24	-0.20	1.00	0.84
Noodles	1.59	0.93	0.26	-0.20	1.00	1.00
Soft drinks	1.68	1.27	0.13	-0.14	1.00	1.00
Bean	2.45	1.34	0.40	-0.27	0.95	0.71
Flour	1.59	0.93	0.26	-0.20	1.10	1.20
Liver	1.97	1.24	0.24	-0.20	1.00	0.84
Eggs	1.88	1.35	0.17	-0.16	0.94	1.02
Juices	1.68	1.27	0.13	-0.14	1.00	1.00
Milk	1.88	1.35	0.17	-0.16	1.00	1.00
Powder milk	1.88	1.35	0.17	-0.16	1.00	1.00
Lettuce	2.32	0.87	0.34	-0.27	0.73	0.93
Lemon	2.32	0.87	0.34	-0.27	1.00	1.00
Maize	2.19	1.12	0.36	-0.27	0.97	0.95
Peanut	1.43	0.45	0.46	-0.30	1.05	1.06
Butter	1.88	1.35	0.17	-0.16	0.99	0.15
Apple	2.32	0.87	0.34	-0.27	1.06	1.03
Jam	1.59	0.93	0.26	-0.20	1.00	1.00
Honey	1.59	0.93	0.26	-0.20	1.00	1.00
Orange	2.32	0.87	0.34	-0.27	1.00	1.00
Oca	1.79	1.16	0.23	-0.17	0.95	1.02
Other meats	1.93	0.85	0.36	-0.27	1.00	0.84

(continued)

Table A.4 (concluded)

Sector	Change in prices of primary products				Price transmission coefficients for the more remote regions	
	FTA CAN-EU	Tarija, Beni, Pando	Tarija, Beni, Pando	FTA CAN-EU, excl. Bolivia (Plur. State of), no sensitives	Tarija, Beni, Pando	Chuquisaca, Oruro, Potosí
Other fruits	2.32	0.87	0.34	-0.27	0.94	0.93
Other dairy products	1.88	1.35	0.17	-0.16	1.00	1.00
Other fish	7.98	7.95	0.06	-0.09	0.61	0.68
Other refresh.	1.68	1.27	0.13	-0.14	1.00	1.00
Other tubercule	1.79	1.16	0.23	-0.17	1.00	1.00
Other vegetables	2.32	0.87	0.34	-0.27	0.94	0.93
Bread	1.59	0.93	0.26	-0.20	1.00	1.00
Potato	1.79	1.16	0.23	-0.17	1.00	1.00
Papaya	2.32	0.87	0.34	-0.27	1.00	1.00
Fish	7.98	7.95	0.06	-0.09	0.61	0.68
Banana	2.32	0.87	0.34	-0.27	1.00	1.00
Plantains	2.32	0.87	0.34	-0.27	1.00	1.00
Chicken	1.93	0.85	0.36	-0.27	0.96	1.00
Cheese	1.88	1.35	0.17	-0.16	1.00	1.00
Quinoa	2.19	1.12	0.36	-0.27	0.95	0.97
Soft drinks	1.68	1.27	0.13	-0.14	1.00	0.98
Salt	1.59	0.93	0.26	-0.20	1.00	1.00
Tea, coffee	2.45	1.34	0.40	-0.27	1.00	1.00
Tomato	2.32	0.87	0.34	-0.27	0.94	0.93
Wheat	1.60	1.06	0.22	-0.18	1.00	0.93
Bovie meat	1.97	1.24	0.24	-0.20	1.00	0.84
Cassava	1.79	1.16	0.23	-0.17	1.01	0.96
Carrot	2.32	0.87	0.34	-0.27	0.76	0.99

Source: Authors based on Eviews econometric estimations.

This table shows the 60 products that represent the typical household's consumption basket in the database described in section 5.4. The first four columns show the percent change in prices as a result of the GTAP model, mapped to the products in the basket. As mentioned in section 7, we have assumed that the domestic markets that are better connected to international markets are La Paz, Santa Cruz and Cochabamba. The least connected domestic markets are Beni, Chuquisaca, Oruro, Pando, Potosí and Tarija. For these we estimated price transmission coefficients, shown in the last two columns of the table. Based on these coefficients, we modified the GTAP price estimates to show that the connected areas least connected to international markets are also less exposed to changes in international prices. This adjustment was made for each of the 5,746 families in the household survey.

## Annex 6

**TABLE A.5**  
**PRIVATE UTILITY BY DEPARTMENT AND BY RURAL AND URBAN CONDITION**

Departament	Zone	Number of observations	FTA CAN-EU	FTA CAN–EU, no sensitives	FTA CAN – EU, no Bolivia (Plur. State of)	FTA CAN – EU, no Bolivia (Plur. State of), no sensitives
Beni	Rural	138	0.13	-0.95	0.40	-0.22
	Urban	254	0.26	0.70	-0.14	0.07
Chuquisaca	Rural	262	0.07	-1.42	0.51	-0.28
	Urban	211	0.32	0.79	-0.16	0.07
Cochabamba	Rural	371	-0.02	-0.3	0.33	-0.19
	Urban	528	0.21	0.71	-0.16	0.08
La Paz	Rural	424	-0.07	-0.94	0.30	-0.17
	Urban	768	0.17	0.67	-0.17	0.08
Oruro	Rural	238	0.19	-0.36	0.19	-0.11
	Urban	294	0.32	0.78	-0.16	0.07
Pando	Rural	92	0.00	-0.56	0.21	-0.12
	Urban	44	0.24	0.68	-0.14	0.07
Potosí	Rural	343	0.11	-0.54	0.22	-0.13
	Urban	277	0.31	0.80	-0.17	0.08
Santa Cruz	Rural	316	0.04	-0.63	0.22	-0.12
	Urban	604	0.21	0.72	-0.16	0.08
Tarija	Rural	199	0.08	-0.89	0.32	-0.17
	Urban	277	0.27	0.75	-0.16	0.08
Total	Rural	2 383	0.06	-0.78	0.30	-0.16
	Urban	3 257	0.24	0.73	-0.16	0.08
	Total	5 640	0.20	0.59	-0.14	0.06

Source: Author estimations based on micro simulations.

## Annex 7

**TABLE A.6**  
**CHANGE IN THE PRIVATE UTILITY BY FACTOR OF PRODUCTION AND EDUCATION LEVEL**  
*(Percentage change)*

Factor of production	Education	Number of observations	FTA CAN - EU	FTA CAN-EU, no sensitives	FTA CAN – EU, no Bolivia (Plur. State of)	FTA CAN - EU , no Bolivia (Plur. State of), no sensitives
Agriculture	Illiterate	503	0.08	-0.97	0.34	-0.19
	Literate	1556	0.15	-0.77	0.32	-0.18
Capital	Illiterate	87	0.22	0.74	-0.17	0.08
	Literate	1189	0.20	0.70	-0.16	0.08
Diversified	Illiterate	32	0.24	0.69	-0.16	0.08
	Literate	580	0.21	0.69	-0.16	0.08
Natural resources	Illiterate	32	0.23	0.73	-0.17	0.08
	Literate	723	0.22	0.70	-0.16	0.08
No information	Illiterate	71	0.24	0.75	-0.17	0.08
	Literate	257	0.28	0.76	-0.16	0.07
Non agriculture	Illiterate	31	0.23	0.72	-0.16	0.07
	Literate	579	0.20	0.67	-0.16	0.08
Total	Illiterate	756	0.16	-0.12	0.08	-0.05
	Literate	4884	0.20	0.62	-0.14	0.07

Source: Author estimations based on micro simulations.