Would a free trade agreement between Bolivia and the United States prove beneficial to Bolivian households?

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Abstract

The world has witnessed an unparalleled increase in trade liberalization over the last few decades. These have been accompanied by increasing concerns over economic growth and distributional impacts emerging from trade agreements. An applied literature has emerged to address ex-ante effects at both macroeconomic and household levels. This article contributes to this literature by analyzing the case of Bolivia, which is about to initiate negotiations of a trade liberalization agreement with the US. We combine a computable general equilibrium model and a micro simulation approach to provide insights into whether the Bolivian economy and its households would win or lose from trade liberalization. The article indicates that Bolivia's efforts to reach a trade agreement with the US would pay off. However, an absolute trade liberalization scheme would not be the best option for the Bolivian poor. Sector specific measures in the form of protection to sensitive commodities would ensure that expected benefits would be more evenly distributed across most Bolivian households. Negative impacts from the elimination of US trade preferences to Bolivia and failure to sign a trade agreement with the US, suggest that a strong protectionist trade policy and limited trade relations have to be avoided if economic growth and household wellbeing are to be improved.

Key words: Trade policy, macro-micro simulation, livelihoods, Bolivia.

I. Introduction

International trade has grown substantially in the last few decades. Supporters of free trade assert that this growth has provided important opportunities for countries to benefit from new market niches, improve efficiency, promote innovation in technology and management, encourage technology transfer, and enhance productivity growth, which in turn has contributed to the economic wellbeing of countries. However, others perceive that international free trade has not contributed to economic development and, in some cases, has worsened inequality, unemployment and poverty particularly in rural areas of developing countries (Berthelot, 2002). The perception of some developing countries is that they are left out of the benefits emerging from increased and freer international trade (Thomas, 2003).

Bolivia stands on the threshold of negotiating an important trade agreement. Bolivia and the United States are expected to initiate trade talks towards a trade liberalization agreement in late 2009. This agreement might provide many potential gains, but also stirs concern among critics of free trade. A free trade agreement (FTA) with the United States, a country with significantly higher export capacity compared to Bolivia, is an issue of concern to Bolivian policy makers, the production sector, and civil society in general because of the asymmetries between these two countries. The US is Bolivia's most important trading partner and, thus, the stakes are high. The Bolivian National Institute of Statistics (BNIS, 2005) has estimated that about 60% of the Bolivian population is poor and the agreement could also have significant implications for poverty in Bolivia.

Yet, the sparse literature on trade agreements between these two countries indicates that no specific research has been carried out to estimate the economic implications that such a trade agreement would exert over the Bolivian economy and the economic wellbeing of its households. This article aims to fill this gap in knowledge. It does so by analyzing the multi-sectoral effects of trade liberalization using a computable general equilibrium model and computing corresponding price index changes at the household level.

II. Background

Historically the Bolivian economy has relied on exports of natural resources, being one of the world's top five producers and exporters of tin and with the second-largest reserves of natural gas in South America. The agro-industrial sector, especially soybean production and exports, has also had an important impact on the Bolivian economy, becoming the second most important sector after mineral and natural gas extraction. Yet Bolivia is one of South America's poorest countries, with regional disparities in wealth distribution.

Bolivia had an estimated GDP of USD 26 billion in 2004, with a growth rate of 3.6% during the last five years. Bolivian exports and imports were USD 3.1 billion and USD 2.3 billion in 2006, respectively. Bolivian tariffs are uniformly set at 10%, with capital equipment imports charged at 5%. For ten years between 1994 and 2003 the Bolivian trade balance experienced deficits, reaching its peak in 1998 with a trade deficit of USD 1.1 billion. This deficit has only been reversed in the last few years (2004 to 2006) due to the higher exports of natural gas to Brazil and Argentina.

In general, Bolivia has historically had few trading partners, geographically located in the Americas. From 1994 to 2006 five countries (United States, Brazil, Argentina, Venezuela and Colombia) represented between 33% and 71% of total Bolivian exports. The US has been a critical partner for the Bolivian economy, not only in terms of exchange in manufactures and food donations, but also in terms of preferential trade treatment. Under the 2002 Andean Trade Promotion and Drug Eradication Act (ATPDEA), the US has provided preferential duty-free treatment to Bolivia, Colombia, Ecuador and Peru on eligible articles exported to

the United States. Relevant articles for Bolivia included textiles and apparel, which entered the US duty free and free of quantity limitations. In 2005, Bolivia exported to the US about 54% of its total exports under the ATPDEA. The US long-term vision has been to operate the ATPDEA as a bridge to a FTA, which would imply US trade preferences be superseded by a more comprehensive FTA. This FTA would provide permanent duty-free status to a wider range of commodities and would mean a 'two-way avenue' trade relationship, where both trading partners would reduce and/or eliminate most import tariffs.

However, recent empirical literature (e.g. Soludo et al. 2004; Berthelot, 2002) referring to new FTAs completed by developed (including the USA) and developing countries reveals concerns on the ability of FTAs to increase welfare of the poor. The debate is currently leaning to economists advocating for more integration and less trade restrictions, though critics doubt on the capacity of ordinary people to reap benefits from FTAs. The economic effects emerging from a prospective trade agreement between Bolivia and the US is a subject that has received almost no attention in terms of research efforts. Just a handful of empirical studies with slight references to trade agreements have been found, which are grouped here into two broad categories as follows: one studying macroeconomic effects from domestic policies and structural reforms (Thiele and Wiebelt, 2003; Jimenez et al. 2005; Klasen, 2005), and another focused on sectoral effects emerging from exchange rate shocks (Barja et al. 2004; Jemio and Wiebelt, 2003). The focus of these studies varies across papers, covering the effects of structural reforms and external shocks over the Bolivian economy, including poverty issues at the macro and micro-economic levels. However, no explicit study estimating the economic effects emerging from an FTA between Bolivia and the US on Bolivian households has been found. In this context, this article is the first empirical reference for Bolivia in terms of an applied macro-micro simulation technique for the estimation of changes in economic wellbeing from prospective trade reforms between Bolivia and the United States.

III. Methodology

We use a macro-micro simulation approach that consists of general equilibrium model coupled with micro-simulation approach that evaluates the effects of macro-variable changes from the GE model on households. In general terms, all macro-micro simulation approaches aim to answer the key question of how policy (trade) reforms affect the wellbeing of different household groups. Elements or variables affecting the wellbeing of households can be very diverse and go beyond economic considerations, as trade reforms also affect the social, cultural and political aspects of households. Referring strictly to economic considerations, macro-micro simulation approaches have been designed to study certain key variables that directly affect the livelihoods of households, which are grouped here into five categories:

1. *Domestic price and sources of income*: Domestic prices alter the value of the consumption bundle, affecting households' expenditures, and on the supply side the prices that producers get for their products. In this case, micro-simulation approaches have been formulated to capture the way in which price changes influence the consumption basket of households. 'Sources of income' refers to income emerging from factors of production, such as skilled and unskilled labor, capital, land, transfers, etc.;
2. *Transmission of world prices*: Micro-simulation approaches have been formulated to reflect the extent to which changes in international prices are transmitted to local prices and their corresponding effects on household expenditure and income sources;

3. *Labor markets and factor productivity*: In this case, macro-micro simulation approaches have been developed to study how trade reforms influence the movement of workers between sectors;
4. *Tariff revenues*: Macro-micro simulation approaches have been designed to estimate the amount of tariff revenue losses (if any), the mechanisms to replace such tariffs, and the impacts that such replacement might have on household welfare;
5. *Subsistence consumption (own agricultural production used for family consumption only)*: In least developed countries an important segment of the consumption bundle usually comes from auto-consumption. However, trade reforms may have no impact on such consumption. For such cases, approaches have been designed to assess the share of the consumption bundle which is not sensitive to price changes (Arndt, 2005).

As described above, the macro-micro approach generally consists of using a CGE model to simulate policy shocks whose results are used by a micro-simulation model that, in combination with a household database, allows analysis of the effects of such policies at household-group level (Cockburn, 2001). In this article, we follow the lead of Ianchovichina et al. (2002) and use the GTAP model (Hertel, 1997) as the macro-simulation model, while the micro-simulation approach uses Laspeyres price indices for income and expenditures. 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. We used the GTAP database, version 6.2 with a base year of 2001.

The macro-micro approach has been applied in three stages (Figure 1). The first stage is to set a pre-simulation (or pre-liberalization) scenario where, based on the household database, values of the consumption basket and income levels are estimated for each household category. The second stage is the simulation of trade liberalization scenarios using the GTAP model. The results of such simulations are then analyzed against key macroeconomic indicators of the Bolivian economy. The third and final stage is to 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 through the combined use of Laspeyres price indices for income and expenditures. Then, we compared both the pre- and post-liberalization scenarios and analyzed the impacts of trade reforms on households' economic wellbeing.

III.1. Modifications to the GTAP database

We modified the GTAP model in two main areas. First we updated the Input-Output table of Bolivia into GTAP. An updated Bolivian I-O matrix was transformed into a GTAP format (Ludena and Telleria, 2007), using data for the year 2004 and was incorporated into the GTAP global database interim release 6.2 (May 2006). Second, we updated tariff information contained in the GTAP database to include trade agreements signed between Latin American countries, which were relevant for Bolivia, pre and post-2001 (the base year). For pre-2001 tariffs, we used the Altertax mechanism in GTAP. For updating the database to 2006 as a new baseline year, we included information on trade agreements signed between 2001 and 2006. Such updating set 2006 as a new baseline year, upon which the intended trade agreement simulations between Bolivia and the US were conducted. The 96 regions/countries and 57 sectors, available in the GTAP database version 6.2, were aggregated into 11 regions and 29 sectors. The regional aggregation criterion consisted of choosing countries that are

important trade partners for Bolivia (Table 1). The 57 GTAP sectors were aggregated into 29 sectors, grouped into six categories that use similar production factors.

Table 1: Sectoral and Country Aggregation of the GTAP Database, Version 6.2

Country	Description	Country	Description
1. Bolivia	Bolivia	7. Peru	Peru
2. United States	US	8. Chile	Chile
3. Argentina	Argentina	9. Ecuador	Ecuador
4. Venezuela	Venezuela	10. EU25	EU (pre-2007)
5. Colombia	Colombia	11. ROW	Rest of the World
6. Brazil	Brazil		

Sector	Description	Sector	Description
Agriculture		**Manufactures Intensive in Labor**	
1. Rice	Paddy rice	18. Textiles	Textiles
2. Wheat	Wheat	19. Apparel	Wearing apparel
3. Cereals	Corn, other cereals	20. LeatherProdu	Leather products
4. VegFruitNuts	Vegetables, fruit, nuts	21. WoodProducts	Wood products
5. OilSeeds	Oil seeds	22. OthLightManu	Paper products
6. OtherAgric	Sugar crops, fibers	**Manufactures Intensive in Capital**	
7. RawMilk	Raw milk	23. PetroleuCoal	Petroleum, coal products
8. Animal	Cattle and animal prod.	24. ChemRubPlast	Chemical, rubber, plastic prod
9. Fishing	Fishing	25. MetalsNec	Ferrous metals, Metals nec
Mining		26. MetalProduct	Metal products
10. Gas	Gas	27. MotorVehicle	Motor vehicles, transport eq.
11. Energy	Coal, oil	28. MachinEquipm	Electronic and machinery eq.
12. Mining	Minerals nec		
Manufactures Intensive in Natural Resources		**Services**	
13. Meat	Meat and meat products	29. Services	Electricity, construction, trade, transport, communications, financial and business services, public admin.
14. VegOilsFats	Vegetable oils and fats		
15. DairyProduct	Dairy products		
16. FoodProducts	Processed food, beverages		
17. Sugar	Sugar		

III.2 Trade policy scenarios

Three trade scenarios were defined as follows:

Scenario 1 − FTA: in this scenario all Bolivian tradable products enter duty-free into the United States, and vice-versa. About 60% of Bolivian exports to that country already enter duty free under the ATPDEA. Therefore, this FTA considers an elimination of US tariffs for the remaining 40% of Bolivian commodities. In this case, we assumed that Bolivia removed tariffs on 100% of US commodities;

Scenario 2 − Restricted FTA: in this scenario, sensitive products[1] are excluded from the trade liberalization treaty. Thus, the United States removes tariffs on about 30% of Bolivian commodities, while Bolivia would remove tariffs on about 75% of US commodities;

Scenario 3 − No ATPDEA: this scenario assumes that the US does not renew the ATPDEA and that trade talks towards a FTA fail. Thus, the US increases tariffs to 60% of Bolivian

[1] Sensitive commodity groups for Bolivia include rice, wheat, oil seeds, dairy products, textiles and leather products, which are protected when Bolivia negotiates trade agreements. Recent US trade agreements with Latin American countries suggest that the United States has provided particular protection to beef, sugar and dairy commodity groups. We assume that protection for these commodities will be maintained as in other FTAs.

products that previously benefited from the ATPDEA to levels of preferred country. Bolivia in this case does not change import tariffs to US products.

III.3 Micro-simulation approach

We follow Ianchovichina et al.'s (2002) micro-simulation approach to evaluate changes in wellbeing at the household level. This simple approach calculates the upper bound of household expenditure change caused by price changes predicted by a general equilibrium model, using Laspeyeres' index, defined as,

$$P_L = \frac{\sum_i p_i^1 q_i^0}{\sum_i p_i^0 q_i^0} \text{ x } 100 \qquad (1)$$

where P_L is the change in price level, p_i and q_i stand for the price and quantity of commodity *i.* Both 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 normalized 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. The Laspeyres index overstates the increase in expenditure, as it does not account for substitution in consumption when prices change (zero elasticity of substitution). Thus, the Laspeyres index provides an upper bound measurement of the increase in expenditure, defining a worst case scenario. To measure changes in economic wellbeing, Ianchovichina et al. use GTAP's private utility equation. The term 'private utility' is specifically used in this article to denote the difference between the Laspeyres index for income and the Laspeyres index for expenditures,

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

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 an a Laspeyres price index for expenditures,

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

Equation (3) is the difference between the change in household income and the percentage change in prices weighted by the consumption shares. That is, it is a measure of economic wellbeing change, given that it computes economic change as the difference between changes in income and expenditures. In turn, household income is defined as the sum of the share in household's endowments (skilled labor, unskilled labor, capital, land and natural resources), times the percentage change in price of these endowments, *ps*(*r*),

$$yp(r) = \sum_{i \in Endowment} INCOMESHR(i,r) \text{ x } ps(r) \qquad (4)$$

The Laspeyres price index provides a fixed-weight approximation of economic private utility emerging from a change in income sources and a change in cost of living. Given the large size of the 2002 Bolivian household database (5,746 household questionnaires) used in this research, three approaches were used to group the data, allowing analyzing the micro-simulation results from several perspectives (Table 2), including: a) Earnings specialization: households were stratified according to their reliance on sector-specific factors of production (Hertel et al. 2004), b) Income levels: households were grouped into six sextiles of income categories, ranking them from the poorest to the wealthiest groups, and c) Geographical area: households were classified according to geographical regions, departments and rural/urban condition.

Table 2: Approaches to Classify the Bolivian Household Survey Data

Earnings Specialization	**Income Levels**		**Geographical Area**		
Production factor	*Income group*[1]	*Income Range (Bs/month)* [2]		*Region*	
Agriculture	I (956, 16.7%)	<= 390	Altiplano	Valley	Plain
Non-agricultural	II (950, 16.6%)	390 - 695			
Capital	III (953, 16.7%)	695 – 1,033		*Department* [3]	
Natural resources	IV (953, 16.7%)	1,033 – 1,538	La Paz	Cochabamba	Beni
Diversified	V (953, 16.7%)	1,538 – 2,547	Oruro	Chuquisaca	Pando
	VI (952, 16.7%)	2,547+	Potosí	Tarija	Santa Cruz
	Total sample → 5,746 questionnaires		*Urban*	*Urban*	*Urban*
			Rural	*Rural*	*Rural*

[1]Reading of income groups is as follows: Out of the total sample, 956 questionnaires fitted in Income group I, representing 16.7% of the total sample. [2]Income Range is expressed in Bolivianos per month (Bs/month). For the first income category 390 Bs/month (or less) and considering the average exchange rate in 2002 (1 USD = 6.9 Bolivianos), this corresponds to 56 USD/month. [3]Bolivia is geographically classified into 3 regions and 9 departments. A department is equivalent to what would be a county in England, or a state in the US.
Source: Own classification based on the 2002 Bolivian household survey.

IV. Results

IV.1 Macro Results

The results discussion focuses on the most important variables relevant to evaluate which trade reform is the most beneficial for Bolivia from both macro and micro simulation viewpoints. We begin our discussion with the macroeconomic results and later focus on the results at the household level.

Aggregate welfare outcomes

The complete liberalization scenario (FTA) would represent for Bolivia a net positive welfare effect of USD 7.2 million per year (Table 3). In the second scenario there is also a positive welfare effect indicating that the Bolivian society would be indifferent to implementing a restricted FTA and a transfer of USD 5.6 million per annum. The model results set the last scenario as the worst case for Bolivia, indicating that the end of unilateral trade preferences (no ATPDEA) would result in a net loss of USD 4.1 million per year. For the United States, the trade liberalization scenarios represent a net positive welfare effect of USD 19.8 and 19.5 million per year respectively, with the third scenario representing a negligible net welfare gain of USD 0.8 million per annum. The Bolivian GDP would increase annually by 0.57% and 0.43% under Scenarios 1 and 2 respectively, and decrease by 0.32%

per year under Scenario 3. US GDP would increase by negligible amounts (0.001% per annum in the first two scenarios, and no increase in the third scenario). This result was expected given that Bolivia is a minor trade partner for the US, and thus a change in the trade flows with Bolivia is of minor impact on the US economy.[2] These results provide the first indication as to which of the three scenarios would be the most advantageous for Bolivia in terms of economy-wide enrichment.

Table 3: Aggregated Welfare Changes for Bolivia and US

Welfare indicator	Bolivia			US		
	Scenario 1 FTA	Scenario 2 Restricted FTA	Scenario 3 No ATPDEA	Scenario 1 FTA	Scenario 2 Restricted FTA	Scenario 3 No ATPDEA
Change in EV (million USD)	7.2	5.6	-4.1	19.8	19.5	0.8
Change in GDP (%)	0.572	0.434	-0.317	0.001	0.001	0.000

EV = Equivalent variation is a welfare measure (in monetary terms) of the simulated policy scenario.

The size of changes in welfare and GDP under the first two scenarios, though positive, is not considerable. In fact, such changes suggest quite moderate gains resulting from the trade reforms. This is because the trade policy measures simulated consisted on lowering import tariffs to just 40% of all Bolivian commodities exported into the US (the remaining 60% already enters duty-free under the ATPDEA). Also, Bolivia has maintained relatively low protection measures to US products, with tariffs uniformly set at 10%, with exemptions on capital equipment (5% tariff), and books and publications (2% tariff). Moreover, the use of the Armington structure in the GTAP model tends to display, when one country reduces its tariff rates, reduced terms of trade effects and small resource reallocation across industries. For those reasons, the removal of such low and limited tariffs would not generate large changes in GDP or aggregated welfare.

Changes on exports

The overall Bolivian exportable production of labor-intensive manufactures would increase in the first and second scenarios, and decrease in the third one. That is, as US import tariffs of these manufactures are reduced, the US substitutes towards labor-intensive manufactures from Bolivia relative to other countries.

Table 4: Percentage Change in Bolivian Export Sales

Commodity group	**Scenario 1 FTA**	**Scenario 2 Restricted FTA**	**Scenario 3 No ATPDEA**
Agriculture	-3.4	-2.6	1.3
Mining	-2.4	-1.9	1.1
Manufactures intensive in natural resources	21.4	-2.8	1.6
Manufactures intensive in labor	20.5	21.2	-22.4
Manufactures intensive in capital	-3.2	-2.5	1.6
Services	-2.9	-2.4	1.2

Bolivian exports of other sectors such as agriculture, mining, capital intensive manufactures and services under Scenarios 1 and 2 would decline, as implied by negative values in Table 4. This decline in exports is because most of these commodity groups were already tax-free in the pre-reform scenario and, thus, the change in prices of these Bolivian commodities in the US markets only slightly changed. Additionally, the aggregate commodities import price into the US would not change because the share of Bolivian

[2] US imports from Bolivia worthed USD 308 millions in 2005 representing just 0.02% of total US imports.

exports into US markets is relatively insignificant. In the third scenario, the Bolivian exports of labor intensive manufactures substantially decreased (-22.4% per year). The reason behind this is found in the tariff reform under Scenario 3, which assumed that trade preferences the US gives to Bolivia are eliminated. This would cause tariffs of Bolivian labor-intensive manufactures to increase, making these products more expensive in US markets. This is reflected by the substitution effect, which implies a substitution of Bolivian manufactures by cheaper and more competitive suppliers of these products. Considering the expansion in Bolivian exports to the US in some commodity groups and the contraction in other groups, in overall terms, Bolivian exports to the US would grow annually by 14.2% and 11.1% in the first and second scenarios respectively, and would decrease by 5.8% per year if the ATPDEA is eliminated (Table 5).

Table 5: Change in Bolivian Exports by Trade Partner

Country	Scenario 1 FTA		Scenario 2 Restricted FTA		Scenario 3 No ATPDEA	
	Value (million USD)	% change	Value (million USD)	% change	Value (million USD)	% change
United States	35.5	14.2	27.8	11.1	-14.4	-5.8
Argentina	-2.0	-3.0	-1.5	-2.3	1.0	1.5
Venezuela	-2.2	-1.2	-1.7	-1.0	1.0	0.6
Colombia	-1.9	-1.5	-1.5	-1.2	0.9	0.7
Brazil	-1.6	-0.6	-1.2	-0.5	0.7	0.3
Peru	-1.2	-2.0	-0.9	-1.6	0.5	0.9
Chile	-0.7	-2.5	-0.6	-2.0	0.4	1.2
Ecuador	-0.4	-1.6	-0.3	-1.3	0.2	0.8
EU	-4.6	-1.9	-3.7	-1.5	2.1	0.9
ROW	-5.3	-1.3	-4.2	-1.1	2.5	0.6
Total	15.7	1.0	12.1	0.8	-5.2	-0.3

This growth in the first two scenarios would occur at the expense of export reductions to other countries (ranging between -3.0% and -0.6% in the first scenario, and between -2.3% and -0.5% in the second one). In the third scenario, Bolivian exports to the US would decrease, while exports to other regions of the world would increase in modest percentages (between 0.3% and 1.5%). The structure of Bolivian exports would not experience abrupt changes in comparison with the pre-simulation scenario (Table 6). That is, Bolivia would continue exporting products with a relatively low degree of transformation (such as mining products that include natural gas) and goods with a relatively high natural resources content.

Table 6: Bolivian Exports by Sector of the Economy

Commodity sector	Base Scenario (pre-simulation)		Scenario 1 FTA		Scenario 2 Restricted FTA		Scenario 3 No ATPDEA	
	USD	Share (%)	USD	Share (%)	USD	Share (%)	USD	Share (%)
Agriculture	95	5.8	93	5.7	94	5.7	95	5.9
Mining	467	28.7	466	28.4	466	28.5	467	28.9
Manuf. int. in nat. resources	340	21.0	345	21.0	337	20.6	343	21.1
Manuf. intensive in labor	209	12.9	235	14.3	237	14.5	195	12.0
Manuf. intensive in capital	287	17.6	279	17.0	281	17.2	291	17.9
Services	227	13.9	222	13.6	223	13.6	229	14.2
Total	1,625	100.0	1,641	100.0	1,637	100.0	1,620	100.0

Changes on imports

The reduction of import tariffs between Bolivia and the United States would increase the demand for imports from the US at the expense of imports from other regions (Table 7). Under a full FTA (Scenario 1), the value of Bolivian imports from the US would grow annually by 46%. This growth would be at the expense of reductions in imports from other sources. Given that Brazil and Argentina hold such large shares in the structure of Bolivian imports, these two countries would suffer the most from trade diversion. The large increase in Bolivian imports from the US overcomes the reduction of Bolivian imports from other sources, yielding a net increment of 2.3% in the value of total imports.

Table 7: Change in Bolivian Imports by Trade Partner

Country	Scenario 1 FTA		Scenario 2 Restricted FTA		Scenario 3 No ATPDEA	
	Value (million USD)	% change	Value (million USD)	% change	Value (million USD)	% change
United States	125.3	46.3	116.7	43.1	-1.1	-0.4
Argentina	-11.8	-4.3	-10.1	-3.7	-1.0	-0.4
Venezuela	-0.9	-5.4	-0.9	-5.5	0.0	-0.2
Colombia	-2.1	-4.4	-2.1	-4.5	-0.2	-0.5
Brazil	-21.6	-5.8	-21.0	-5.6	-1.8	-0.5
Peru	-4.2	-4.1	-3.8	-3.7	-0.5	-0.5
Chile	-5.4	-3.3	-5.2	-3.2	-0.9	-0.5
Ecuador	-0.3	-4.4	-0.3	-4.0	0.0	-0.6
EU	-17.9	-6.3	-18.2	-6.4	-1.4	-0.5
ROW	-16.9	-4.8	-16.3	-4.6	-1.9	-0.6
Total	44.2	2.3	38.8	2.1	-8.8	-0.5

Under a restrictec FTA (Scenario 2), the substantial growth in the value of Bolivian imports from the US (43%) would also reduce imports from other countries of the world, yielding a net increase in the value of total imports of 2.1%. If the ATPDEA is eliminated (scenario 3), Bolivia would import less from all countries included in this regional aggregation, resulting in a net reduction in the value of total imports of 0.5%. These changes in imports are explained by the difference between these scenarios. That is, when comparing the first and second liberalization scenarios, the second one imposes quantitative restrictions for sensitive products, which lower the possibilities of increasing the exchange of commodities. In the third scenario, US import tariffs for some Bolivian products actually increase, which further restricts the possibilities of exchanging products between both countries. Considering sharper increases in imports relative to exports, the Bolivian trade balance would experience a deficit of about 1.4% and 1.3% under Scenarios 1 and 2 respectively, while a positive (although negligible) trade balance of 0.12% would occur under Scenario 3 (results not shown here).

Under Scenarios 1 and 2, Bolivia would reduce tariffs to US commodities, lowering US imported supply prices. This would make US products more competitive and provide an incentive to Bolivian firms, households and government to increase their imports of intermediate products and goods for final consumption. Sensitivity analyses were conducted to evaluate changes in the Armington elasticities values, which are key elements in the determination of the trade results. Simulations indicated that regardless of whether the Armington elasticities increased or decreased, the results would not change in qualitative terms. That is, gains in both welfare and GDP were always higher in Scenario 1 in

comparison with Scenario 2, while Scenario 3 represented in all cases the worst case for Bolivia. [3]

IV.2 Micro results

This section turns to the micro-simulation results to investigate the impact of the three trade scenarios on the different type of households in Bolivia.

Market price changes by type of trade reform

Table 8 shows that prices of commodities decline under the first two scenarios, and increase under the third one for most sectors. These results were expected given that the first two scenarios reduce import protection tariffs, which would push down domestic prices and promote wider competition from abroad. However, results show that such reductions in tariff protection would not produce large reductions in domestic prices, but moderate ones because of the relatively low rates of protection in Bolivia. Under the elimination of the ATPDEA, changes in most commodity prices would be positive, though negligible. That is because in this scenario Bolivia does not change its protection tariffs, while the US increases import tariffs for some Bolivian products (no ATPDEA), resulting in negligible price impacts in Bolivia.

The trade policy scenarios on the income side result in mixed effects for Bolivian production factors (bottom part of Table 8). While there are price reductions in returns to land and natural resources under Scenarios 1 and 2, there are increases in returns to all other production factors (i.e., unskilled labor, skilled labor and capital). In the case of the third scenario, results are the opposite. That is, there are positive changes in returns to the use of land and natural resources and negative returns to unskilled labor, skilled labor and capital.

These results are mainly explained by the way in which we modeled changes in demand for some endowment factors in the GTAP model. That is, we assumed that land and natural resources were sluggish factors, meaning that these are sector specific and do not move between sectors. Results show that demand for both land and natural resources decreased in the first two scenarios implying, in the face of a very inelastic supply curve, a reduction in the price of land and natural resources. In the third scenario, there is an increase in the demand for land and natural resources, which leads to an increase in their relative prices.

With regard to unskilled and skilled labor and capital, they are assumed to be mobile factors, with a more elastic supply curve. There is an increase in the demand for these factors under the first two scenarios, which increased their prices. The opposite occurs in the third scenario, where demand for these three production factors is reduced, leading to a reduction in their relative prices.

[3] A dynamic model would have led to further insights evaluation of tariff elimination for sensitive products over time. However, the dynamic GTAP model and database do not include Bolivia as an individual country (the dynamic model is not based on version 6.2 of the GTAP database that was used in this research, but on version 5.0, with base year 1997). This database limitation does not allow evaluating the specific impacts of a FTA on the Bolivian economy. In addition, the focus of our research was to use the macro-micro approach to evaluate poverty effects. For that, we would like to know the "cumulative" poverty impacts of trade liberalization, for which the static model serves our purpose.

Table 8: Changes on Commodity and Production Factors Prices in Bolivia (in Percentage Changes)

Sector	Scenario 1 FTA	Scenario 2 Restricted FTA	Scenario 3 No ATPDEA
Agriculture			
Rice	-0.03	-0.00	0.00
Wheat	-1.27	-0.00	0.00
Cereals	-2.04	-2.04	0.00
Vegetables, Fruits and Nuts	-0.69	-0.69	0.00
Oil Seeds	-0.01	-0.00	0.00
Other Agriculture	-0.74	-0.73	0.00
Raw Milk	-0.00	-0.00	0.00
Animal	-0.59	-0.59	0.00
Fishing	-0.02	-0.02	0.00
Mining			
Gas	-3.38	-3.38	-0.00
Energy	-0.95	-0.95	-0.00
Mining	-1.90	-1.90	0.00
Manufactures intensive in natural resources			
Meat	-0.95	-0.95	0.00
Vegetable Oils and Fats	-0.09	-0.09	0.00
Dairy Product	-0.26	-0.00	0.00
Food Products	-0.51	-0.50	0.00
Sugar	-1.04	-1.03	0.00
Manufactures intensive in labor			
Textiles	-0.62	-0.00	0.00
Apparel	-0.78	-0.78	0.00
Leather Products	-0.44	-0.00	0.00
Wood Products	-1.22	-1.22	0.00
Other Light Manufacturing	-1.09	-1.09	0.00
Manufactures intensive in capital			
Petroleum and Coal Refinement	-0.11	-0.11	-0.00
Chemical, Rubber and Plastic	-0.88	-0.88	0.00
Metals Nec	-1.00	-1.00	-0.00
Metal Products	-0.93	-0.93	0.00
Motor Vehicles	-1.43	-1.43	0.00
Machinery and Equipment	-2.69	-2.69	0.00
Production factors			
Land	-0.27	-0.41	0.15
Unskilled Labor	1.07	0.90	-0.40
Skilled Labor	1.08	0.91	-0.38
Capital	0.95	0.78	-0.34
Natural Resources	-1.85	-1.68	0.86

Changes in income and in expenditures by production factor

Overall results of the impacts of the trade reforms on households' private utility by production factor indicate that, under the first two trade liberalization scenarios, private utility would increase for households depending on all production factor categories, except for

agriculture-dependent households (Table 9). If the ATPDEA is eliminated (Scenario 3), private utility would increase only for agriculture-dependent households, and decrease for all other factor-dependent households. The rise in private utility in all production factors (except agriculture under Scenarios 1 and 2) is explained by increased returns to production factors, as reflected by Laspeyres index for income's values greater than 100, and by reduced commodity prices that reduce households' expenditure on their consumption bundle (reflected by values of the Laspeyres index for expenditure lower than 100).

Table 9: Impacts of Trade Reform Scenarios on Household Private Utility by Production Factor

Production factor	*Lapeyres* index for income			*Lapeyres* index for expenditure			Private utility (% change)		
	FTA	Restricted FTA	No ATPDEA	FTA	Restricted FTA	No ATPDEA	FTA	Restricted FTA	No ATPDEA
Agriculture	98.33	99.01	100.55	99.76	99.40	100.00	-1.42	-0.39	0.55
Non-agriculture	100.65	100.49	99.33	99.36	99.37	100.00	1.30	1.12	-0.67
Capital	100.86	100.69	99.49	99.36	99.38	100.00	1.50	1.32	-0.51
Natural resources	101.00	100.83	99.65	99.36	99.37	100.00	1.64	1.46	-0.35
Diversified	100.86	100.69	99.48	99.36	99.38	100.00	1.50	1.32	-0.52

Private utility was projected to be, for most production factors, somewhat higher in Scenario 1 than Scenario 2. This is because returns to factors of production (i.e. unskilled labor, skilled labor and capital, bottom part of Table 8) tend to grow at a faster rate in Scenario 1 relative to Scenario 2. In the third scenario, the drop in private utility for all households, except Agriculture, is explained by declines in returns to their factors of production, which were not compensated by changes in the cost of the consumption bundle. This would result in a decline of net income and hence a reduction in private utility.

Changes in income and expenditure by income level

Table 10 summarizes results of household private utility by income level, showing that as a consequence of the full trade liberalization (Scenario 1), private utilities of household heads included in the income categories III, IV, V and VI would increase, while the private utility of the two poorest households would decrease. Under the restricted FTA scenario, the private utility of all household groups (except the poorest income group) would increase. Meanwhile, under Scenario 3 (no ATPDEA), only private utility of household heads belonging to the poorest income category would increase, while private utilities of the rest of the income groups would decrease. An interesting finding emerging from this household classification criterion is that private utility for the first two scenarios decreases for the poorest households and increases for the better off household groups, widening the income gap in a country where income is already badly distributed (UDAPE, 2006).

Table 10: Change in Private Utility by Income Category (Percentage Change)

Income group	Income Range (Bs/month)	Scenario 1 FTA	Scenario 2 Restricted FTA	Scenario 3 No ATPDEA
I	<= 390	-1.03	-0.88	0.34
II	390 – 695	-0.58	0.40	-0.22
III	695 – 1,033	1.64	1.45	-0.37
IV	1,033 – 1,538	1.66	1.47	-0.38
V	1,538 – 2,547	1.68	1.50	-0.38
VI	2,547+	1.70	1.52	-0.38

The results of the third scenario indicate that households belonging to the poorest income group would be better off as a result of the end of the ATPDEA. However, this group represents only a fraction of the whole sample population (Table 2), and considering that more than half of Bolivia's population is estimated to be poor (60% according to official Bolivian sources), it is not convenient to consider the end of the ATPDEA as a good policy option for the Bolivian society as a whole. Such termination would make worse off households in income categories II, III and IV, where the majority of the Bolivian poor are. In addition, almost all household included in the poorest income group are farmers, whose food consumption is significantly satisfied (25% on average) with own agricultural production. Such production is not entirely subject to changes in prices of agricultural commodities, and thus their food security is more certain relative to the poor living in the peri-urban and urban areas of Bolivia (who are mostly in income categories II to IV). Own production is not only important in Bolivia; Arndt (2005) found that in Mozambique roughly half of all measured consumption was supplied by own production. He found that households operating on this type of subsistence basis were less integrated into the domestic economy, so the possibility of them being influenced by changes in domestic prices was reduced. Considering that most household groups would benefit under Scenarios 1 and 2, where the majority of the Bolivian poor are included, the termination of trade preferences provided by the US to Bolivia (Scenario 3) would not be the best option for Bolivia.

Changes in income and in expenditure by geographic location

Analyzing private utility results classified by geographical location provides another perspective. For this, we positioned private utility results according to a one-percent positive or negative threshold approach, as follows: a) Winner (W): a household is a 'winner' if the average household private utility increases by more than 1%; b) Marginal Winner (MW): a household is a 'marginal winner' if the average household private utility increases by less than 1%; c) Loser (L): a household is a 'loser' if the average household private utility decreases by more than 1%; and d) Marginal Loser (ML): a household is a 'marginal loser' if the average household private utility decreases by less than 1%.

We only discuss the first two scenarios, as the third one has been found to be disadvantageous for Bolivia (Table 11). Under Scenario 2, the benefits that a Restricted FTA would accrue to household groups would be more evenly distributed. Not many 'winning' households were projected in this scenario (just 2), and just one 'marginal loser' household area was projected. The majority of the household areas (15 in total) were projected to be 'marginal winners', meaning that they would benefit from a restricted FTA, but those benefits would be smaller than in Scenario 1, and more equably distributed across more household group areas. Scenario 2 implies that the distribution of trade benefits between urban and rural areas narrows at least in the poorest region of Bolivia. That is, rural and urban households of the poorest region of the country (the Altiplano region comprising La Paz, Oruro and Potosí) benefit from the Restricted FTA. This situation was not projected to happen under Scenario 1, but on the contrary under this scenario more benefits would go to urban households and less to rural ones. A large share of total population in the Altiplano region live in rural areas (46% on average or 1,533,000 people), indicating that impacts are important in terms of total number of households involved. More than half of total population of Chuquisaca and Potosí ('Losing' areas under Scenario 1) live in rural areas (55% or 332,000 people in Chuquisaca, and 65% or 503,000 people in Potosí), implying that Scenario 1 of trade liberalisation would negatively affect large numbers of people in Chuquisaca and Potosí. Also, a large share of total population in Oruro and Tarija ('Marginal losers' under Scenario 1) live in rural areas (39% or 265,000 people in Oruro, and 34% or 433,000 people

in Tarija), indicating that Scenario 1 would also be detrimental for rural households in these two departments.

Table 11: Mapping of Impacts of Trade Reforms in Bolivia under Scenarios 1 and 2

Situation	Scenario 1: FTA		Scenario 2: Restricted FTA	
	Urban	Rural	Urban	Rural
Winner (W)	**5**: Cochabamba, La Paz, Pando, Beni and Santa Cruz	**1**: Beni	**2**: Beni and Santa Cruz	**0**
Marginal Winner (MW)	**4**: Oruro, Potosí, Chuquisaca and Tarija	**4**: Pando, La Paz, Cochabamba and Santa Cruz	**7**: Chuquisaca, Cochabamba, La Paz, Oruro, Pando, Potosí and Tarija	**8**: Beni, Chuquisaca, Cochabamba, La Paz, Pando, Potosí, Santa Cruz and Tarija
Marginal Loser (ML)	**0**	**2**: Oruro and Tarija	**0**	**1**: Oruro
Loser (L)	**0**	**2**: Potosí and Chuquisaca	**0**	**0**
Total	**9**	**9**	**9**	**9**

Note: 18 household areas correspond to Bolivia's nine departments split in rural and urban areas. A department is a first-level political division in Bolivia. A 'household area' refers to a geographical location where the average household is 'winner', 'loser', 'marginal winner' or 'marginal loser'.

These findings suggest that the complete liberalization of the economy (Scenario 1) would result in broad-based increases in utility for some household areas, while the sector-specific measures (Scenario 2) would yield smaller but more complete economy-wide benefits for most household areas. From an economy-wide and benefit-distribution point of view, Scenario 2 seems to be the most expedite and beneficial for Bolivia. The worst scenario is the elimination of trade preferences from the US, where most Bolivian households would experience reductions in private utility.

V. Conclusions

The general conclusion of this research is that Bolivia's efforts to reach a trade agreement with the US would pay off. While the FTA scenario was identified as the most profitable trade setting for the Bolivian economy as a whole, a restricted FTA, which considers sensitive commodities, was found to be the most prudent and advantageous trade setting for the Bolivian society as benefits would be distributed across more household groups. Meanwhile, the end of US trade preferences to Bolivia under the ATPDEA would be the worst case for both the Bolivian macroeconomic performance and the economic wellbeing of its households. A key reason why a restricted FTA is preferable to a complete FTA is because of the disparity in benefits distribution under a full FTA. That is, under this scenario many Bolivian poor would lose, while the better off households would win. This outcome would further worsen income distribution in Bolivia, a country with a large income gap between the rich and the poor. The restricted FTA would provide a more even distribution of trade benefits for more households, and thus appears a better option for Bolivian society as a whole.

The main implication of this research is that Bolivia should not remain apart from the processes and economic dynamism that characterize the current wave of trade liberalization. Protectionist trade policies and end of trade relations with the US have to be avoided if economic growth and household wellbeing are to be improved. Bolivia has to advance with caution and based on a negotiation strategy that provides protection to certain commodities, while strengthening major exporting sectors. Additionally, the Bolivian government with the

help of international institutions and donors should implement domestic policies to compensate losers of trade liberalization. Such policies should include income transfers, especially for those sectors hardest hit by trade liberalization. An example of such a program is PROCAMPO, a program for the poor in Mexico to help them cope with increased competition from the US and Canada, and help them transition from, for example, traditional staple production to high value added products. Other programs, already implemented in many developing countries include direct income transfers and directed subsidies to poor households. At the same time, such policies should not have major impacts on domestic prices and consumption decisions of other population segments, and should not put an additional burden on Bolivia's budgetary restrictions and economic goals.

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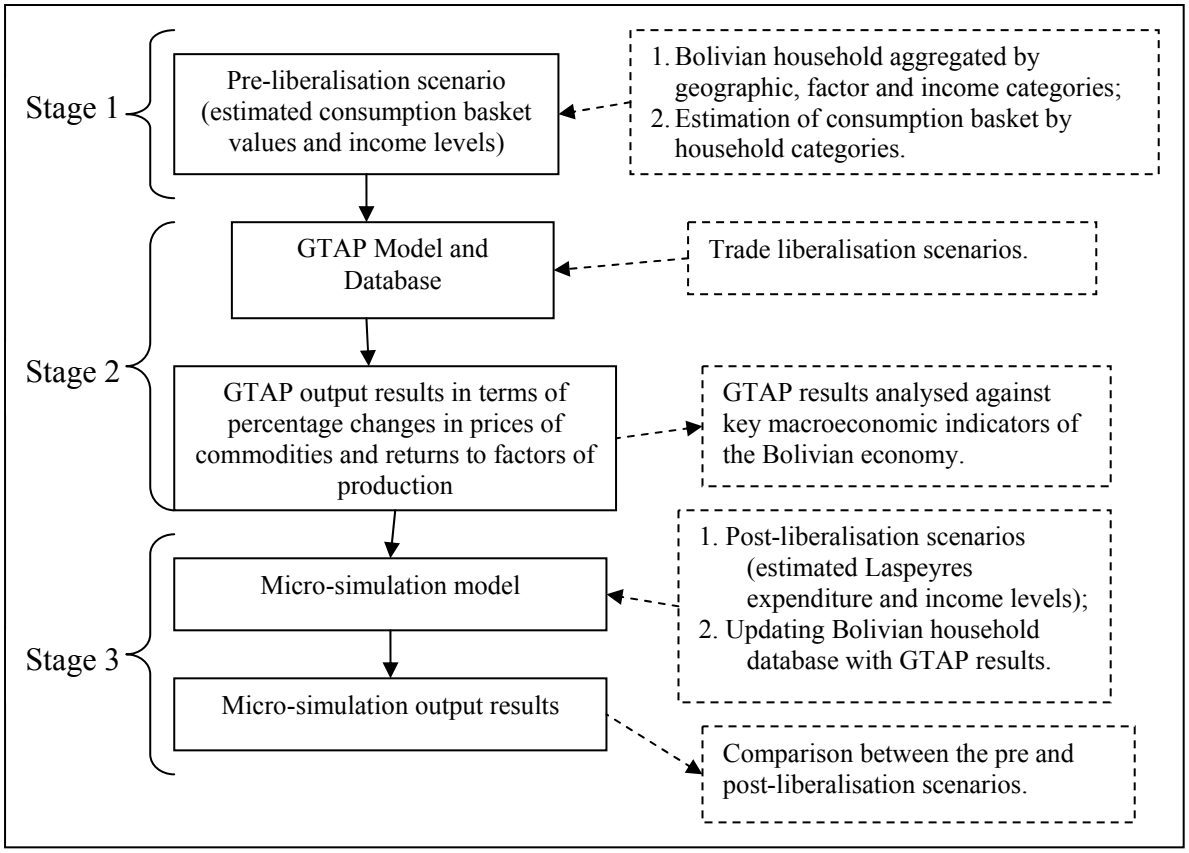

Figure 1: Macro-micro simulation stages