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Sunset over the ATPDEA: Implications for Bolivian Employment

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Abstract

This paper derives panel estimates of the long-run relationship between trade and employment at the industry level for Bolivia using Blundell and Bond's system-GMM estimator. We combine these estimates with a partial-equilibrium simulation of the trade shock that would follow from the elimination of nonreciprocal preferences on the US market under the ATPDEA. We find that the reduction in market access is substantial (Bolivian exports to the US contract on average by 20%) but because the US represents only 12.7% of Bolivia's exports, the numbers remain small ($32 million or 2.5% of Bolivia's total exports). The long-run impact on domestic employment is negligible (less than 1%). The highest effect is in the textile and apparel sector where it is still less than 2% of initial employment. The net effect of a reciprocal FTA is similarly limited both on the export and import sides, as are the trade-diversion effects on Andean markets if Andean countries sign with the US.

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1. Introduction

The trade relationship between the US and Andean countries –Bolivia, Colombia, Ecuador and Peru– is currently ruled by a unilateral trade preferences agreement known as the Andean Trade Preference and Drug Eradication Act (ATPDEA). Like all nonreciprocal preference regimes based on "soft" criteria (and unlike the GSP which is based on a "hard" income criterion), the ATPDEA is not WTO-consistent[1] and is thus likely to evolve through either transformation into a reciprocal FTA or outright elimination.

Enacted in 1991 and amended in 2002 by the ATPDEA, the original Andean Trade Preference Act (ATPA) provided duty-free treatment for a wide range of Andean exports[2] in return for cooperation in the struggle against narcotics production and traffic in the Andean region. It expired in December 2001, but in February 2002, the ATPDEA not only restored its benefits but also extended preferential (duty-free) treatment to about 700 products that were previously not eligible, including petroleum and petroleum products, certain footwear, tuna in flexible containers, and certain watches and leather products. The most significant extension of the benefits was in the apparel sector, although, as we will see later on, the rate of utilization of ATPDEA preferences in the textile & apparel sector subsequently went *down* rather than up. The ATPA, as amended, was set to expire on December 31, 2006, but an additional extension was approved by the 109th Congress til June 30, 2007, and for an additional six months for countries forming reciprocal free-trade agreements with the US before then. The final end date is January/February

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[1] FTAs are covered by Article XXIV of the GATT or by the Enabling Clause. In both case, "substantially all trade" must be liberalized in order to make the agreement WTO-consistent, a requirement that cannot be met if the preferences are non-reciprocal. Non-reciprocal preferences granted by industrial countries to developing ones, like the GSP, must base eligibility on a verifiable and universal criterion (like the level of income). Cooperation in areas like the war on drugs (the criterion used by the US in its agreements with Andean countries) or the environment (the criterion used by the EU in the so-called "GSP-plus") is a not such a criterion.

2 Exceptions for Bolivia are listed in section 4.1 and included, inter alia, certain textile & apparel products, footwear, and petroleum products.

2008. So far Colombia and Peru have concluded FTAs with the United States, but Bolivia and Ecuador have not, Bolivia's president having expressed a preference for the renewal of the ATPDEA rather than the signature of an FTA.

A recent study of Bolivia's Ministry of Economic Development (Bolivia 2006) argued that the expiration of the ATPDEA would only have minor and localized effects on Bolivian exports, as it would only affect clothing, leather manufacturing and the wood industry , situated mainly in La Paz and El Alto. The rest of the products exported to the USA would still enter the US market duty-free under the GSP.

We revisit the issue with a two-step approach in which we first derive estimates of the long-run relationship between trade and employment at the sectoral level using Blundell and Bond's system-GMM estimator. Then we combine those estimates with the results of a partial-equilibrium simulation exercise in which we eliminate the tariff preferences enjoyed by Bolivia on the US market under the ATPDEA. Although the ensuing trade shock is sizeable (Bolivian exports to the US contract on average by 23%), the transmission to employment is weak. The reason is not so much that estimated long-run elasticities of employment to export are small (although they are), but simply that the initial level of exports to the US is too small to make a difference. The only exception is the textile and apparel sector where the highest estimate of job cuts is around 7% of initial employment.

In a second set of simulations, we explore the effect of ATPDEA's transformation into a full-fledged FTA with the United States. The effect on employment is now coming from both the import side (because US imports are granted tariff-free treatment) and the export side (essentially because of trade diversion on the market of other Andean countries that simultaneously sign FTAs with the US). Again, the effects are very small. Simulated US export gains on the Bolivian market are quantitatively small and their transmission to employment levels is insignificant in most econometric specifications. Simulated export losses on Andean markets are larger, but they should be interpreted cautiously since they depend crucially on the assumed magnitude of the elasticity of substitution, of which we know little. All in all, the simulations suggest that if other Andean countries sign, Bolivia is, albeit marginally, better off signing as well.

2. Trade and jobs in Bolivia

Giussani and Olarreaga (2005) noted that in Bolivia, GDP and export growth do not seem to have been correlated in the past. In addition, Bolivia's exports are highly concentrated in the mining and oil sectors, both of which are capital-intensive. In spite of recent diversification, manufacturing exports represent about 10% of the total. Thus, the linkage between overall export growth and employment is likely to be tenuous. In order to be able to capture some linkage, we will, in the following section, estimate the link between exports and employment in the manufacturing sector at the ISIC-3 level.

The importance (or unimportance) of manufactured products in Bolivia's exports is not the same across all destinations. For instance, jewellery and apparel account for a higher than average share of exports to the US; whereas exports to the EU are essentially primary products. Exports to Andean markets are dominated by soy products. Overall, exports to the US market, which are of interest to us for our discussion of ATPDEA's transformation, represent less than 13% of Bolivia's exports. They are shown by HS section in Table 1.

Table 1
Bolivia's exports by HS section: To the US and total

Bolivia's imports are also highly concentrated; they are dominated by capital goods (60% of the total). The US represents 14% of the total. Thus, whether on the export or import side, action in the trade relationship with the US is likely to have relatively small effects on Bolivia's total trade.

Employment growth in Bolivia's manufacturing sector has been anaemic over the sample period. Figure 1, which shows a histogram of employment growth by ISIC industry, is centered at close to zero.

Figure 1
Distribution of employment growth, by ISIC industry

In spite of this weak performance and of the dominance of primary products in Bolivia's portfolio exports, employment in the export sector is important for Bolivia since it accounts for 40% of manufacturing employment (Giussani and Olarreaga 2006). Exports to the United States have the highest labor content, followed by exports to Andean countries. Exports to MERCOSUR are less labor-intensive by half.

3. Parametric evidence

We know explore empirically the linkage between trade and manufacturing employment. Estimates of this linkage will allow us to relate trade shocks to job creation and destruction in Bolivia. As mentioned, we estimate the relationship on the basis of ISIC-3 data for the manufacturing sector.

3.1 The approach

Our approach is a standard one following, *inter alia*, Greenaway et al. (1998) and Castro et al. (2007). Start from a Cobb-Douglas production function at the industry (*i*) level:

$$Y_{it} = A_{it} K_{it}{}^{\alpha} L_{it}{}^{\beta} \tag{1}$$

where Y_{it} is value added, A_{it} is an industry-specific Hicks-neutral technical-change term, and K_{it} and L_{it} are respectively industry aggregates of capital and labor inputs. Profit maximization by competitive firms implies

$$L_{it} = \beta \frac{p_{it} Y_{it}}{w_{it}} = \beta \frac{A_{it} p_{it}}{w_{it}} K_{it}{}^{\alpha} L_{it}{}^{\beta} \tag{2}$$

which, after solving for L_{it}, gives a labor demand of the form

$$L_{it} = \left[\beta \frac{A_{it} p_{it} K_{it}{}^{\alpha}}{w_{it}} \right]^{1/(1-\beta)}. \quad (3)$$

In (3), trade shocks affect employment through several channels: (i) directly, via price changes Δp_{it}, and indirectly via its effect on changes in total factor productivity (CTFP) ΔA_{it}. The beginning-of-period capital stock is in principle not affected by contemporaneous shocks on trade even if investment is. Thus, (3) suggests an estimable labor-demand equation of the form

$$\ln L_{it} = \alpha_0 + \alpha_1 \ln w_{it} + \alpha_2 \ln K_{it} + \alpha_3 \ln M_{it} + \alpha_4 \ln X_{it}, \quad (4)$$

where M_{it} and X_{it} are sectoral imports and exports. This forms the basis of our empirical approach, although several estimation issues will need to be discussed in section 3.3 below. Note that we treated capital and output differently in the derivation. By substituting for output in (2), like Castro et al. we black-boxed the output response to changes in RHS variables. This suggests an empirical strategy that slightly differs from Greenaway et al.'s because it does not condition employment variations on output but directly on trade and other RHS variables. Similarly, capital could have been replaced by a capital-demand term obtained from profit maximization in a fully-specified long-run model. However as we will discuss in the next section, our time series are too short for the estimation of a long-run model. Thus, we have chosen a hybrid specification where we condition on variations in the capital stock –which turn out to be important determinants of employment variations– but deal with their endogeneity simply by instrumentation rather than by specifying the model as a long-run one at the outset.

3.2 The data

Employment, wage, production, value added and investment data at the ISIC 3-digit level (27 industries) are from UNIDO. Note that manufacturing employment, according to UNIDO data, adds up to slightly more than 50'000 jobs. This is a very small number. To put it in perspective, according to the WDI Bolivia's labor force was 3.55 million people in 2000 and 4.2 million in 2006. Of those, 28% were in industry in 2000 (the most recent figure available), i.e. roughly 1 million. If only 50'000 were in the manufacturing sector, 950'000 would have to be in mining, which is not very plausible. However, a very similar number of manufacturing jobs (49'403) is indicated in the WTO's latest TPR on Bolivia (table A-IV, p. 145) citing the *Estadísticas Anuales de la Industria Manufacturera* (Annual statistics for the manufacturing industry) of Bolivia's National Institute of Statistics (Instituto Nacional de Estadísticas, INE). Thus we have no choice but to take this number. We circumvent the difficulty by giving employment variations in percentage of initial employment rather than in raw numbers. In any case, the variations are so small that the message is unlikely to be affected.

Trade data is from COMTRADE, aggregated from the HS6 level and mirrored. The sample period runs nominally from 1992 to 2004, but data past 2000 is fragmentary, producing an unbalanced panel. We tried two versions of the equation, one using the flow of investment and one using the stock of capital. The capital-stock variable was constructed by the Perpetual Inventory Method assuming a depreciation rate of 3% and using investment data going back to 1976. We used an iterative procedure consisting of using first an arbitrary initial value, for which we substituted the industry average of the first-round estimates, and so on until convergence. Results were slightly better with the investment data, so we report those in the next section. Table 2 gives descriptive statistics for all the variables.

Table 2
Descriptive statistics

It can be seen that our sample size is small. Because many industries have no domestic data between 2001 and 2004, individual series are often very short in the time dimension and the information contained in the "within" variation of employment and its covariates is likely to be small.

3.3 Estimation issues

Estimation of (4) raises several econometric issues. The first –and easiest to deal with– is that industries are heterogeneous in a variety of ways, which implies potential heteroskedasticity of the error term; we deal with this by reporting robust standard errors. Second, the right-hand side variables in (4) are unlikely to be exogenous, so we instrument them by using their lagged values. Third, as noted above, the very short duration of our panel makes it *a priori* unlikely that information contained in the "within" variation of employment and its correlates would be sufficient to identify a stable relationship. The natural fix for such a problem would be to use a random-effect estimator, but the RE estimator is vulnerable to endogeneity bias if unobserved industry-specific characteristics, bunched in the error term under the RE approach, correlate with some of the RHS variables. We will see that this is indeed likely to be a problem in our sample judging by the results of a Hausman test. Fourth, employment is a persistent variable, suggesting the possible inclusion of its lagged value as one of the regressors. But it is well-known that fixed-effect estimates are biased in the presence of a lagged dependent variable on the RHS, calling for the use of GMM instead. However, our sample is too small for GMM to be efficient. Thus, there is no perfect fix for all the potential problems plaguing our dataset and we accordingly report results from a variety of estimators: Fixed effects, random effects, pooled OLS on first differences, GMM, and system GMM. Point estimates differ, but qualitative results are robust.

3.4 Results

Table 3 shows results from the estimation of a stochastic version of (4) with fixed effects (FE), random effects (RE), first differences (FD), and GMM estimators using the lagged wages, investments, import penetration defined as $\mu_m = M/C = M/(Y+M-X)$, and "export rate" defined similarly as $\mu_x = X/C = X/(Y+M-X)$.[3] It can be seen that results are qualitatively similar across specifications, although point estimates vary substantially. A

[3] Results are unchanged when using exports over total output. Although (4) suggests a log-log specification, it fits the data poorly so we stick to a linear specification and will take this into account in the simulations reported in section 4.

Hausman test on (1) and (2) rejects the RE specification with a chi-square value of -7.66.[4]

Table 3
Regression results using import penetration and export rate

Table 4 reports regression results using trade values instead of import penetration and export rates. Equation (5) uses all lagged explanatory variables as instruments in the difference equation, whereas equation (6) uses only lagged wages and investments, resulting in a lower value of the Hansen test statistic. Results are qualitatively similar, although import values are barely significant in most specifications, suggesting that the job-destruction effect of import competition is not identified precisely. Whether this reflects the small size of our sample or a true lack of substitutability between domestic and imported goods we cannot tell at this stage. Export values and rates both correlate positively with employment levels, suggesting that the job-creating effect of exports, by contrast, is substantial or stable enough to be traceable statistically.

Table 4
Regression results using import and export values

Our results can be used to examine the correlation between export growth and its effect on employment by industry. The horizontal axis of Figure 2 measures export growth by ISIC category over the sample period. The vertical axis measures the partial correlation between export and employment, calculated from our estimation results. That is, the partial correlation is calculated, for each ISIC industry, as the correlation $\rho\left(X,\tilde{L}\right)$ between (i) exports and (ii) employment *purged of the influence of other covariates* using estimated regression coefficients $\hat{\beta}_k$. Formally,

$$\tilde{L}_{it} = L_{it} - \hat{\beta}_W W_{it} - \hat{\beta}_I I_{it} - \hat{\beta}_M M_{it}. \tag{5}$$

[4] The test statistic $(\hat{\boldsymbol{\beta}}_{FE} - \hat{\boldsymbol{\beta}}_{RE})'(\mathbf{V}_{FE} - \mathbf{V}_{RE})^{-1}(\hat{\boldsymbol{\beta}}_{FE} - \hat{\boldsymbol{\beta}}_{RE})$ □ is distributed as a $\chi 2(3)$.

Thus the correlation that appears on the vertical axis of Figure 2 is after controlling for other covariates of employment. The size of the bubbles is proportional to total employment in the industry, averaged over the sample period.

Figure 2
Export growth and its correlation with employment

Industries in the NE quadrant of the figure (essentially food products, minerals, and apparel) displayed over the sample period both positive export growth and positive association with employment. These are the contributors to employment growth. Industries in the SE quadrant (textiles, beverages and metal products) had positive export growth but negative association with employment, so their growth on export markets was apparently accompanied by labor-saving technology changes.

Taken at face value, these simple results suggest that the food-products industry –whose activity centers around soy derivatives– stands out in terms of both the growth of its exports and of its high labor content, making it a good target for promotion programs aimed at fostering employment growth in the export sector. Of course, these results should be taken very cautiously as they are dependent on regression estimates which, as discussed, were obtained on a small and noisy sample.

4. Simulations

In this section we bring together our econometric estimates from the previous section with partial-equilibrium simulation results in order to evaluate the effect of several policy scenarios on sectoral employment. First, we simulate the trade shock that would follow the unilateral elimination of preferences that Bolivia enjoys on the US market under the Andean Trade Promotion & Drug Enforcement Act (ATPDEA). Second, we explore the trade shock that would follow the replacement of ATPDEA by a reciprocal free-trade agreement with the US, looking inter alia at the trade diversion effect for Bolivian exports on Andean markets after Andean countries sign FTAs with the US.

4.1 Unilateral elimination of ATPDEA

As discussed in the introduction, the ATPDEA can evolve either by elimination or by transformation into a reciprocal, WTO-consistent FTA. We consider the first alternative in this section using a partial-equilibrium framework very close to that used in the SMART model and described in full in Appendix 1. Essentially the model is based on the so-called "Armington assumption" whereby products are differentiated by country of origin, generating monopolistic competition between differentiated national varieties. Consumer preferences have a nested structure that makes it possible to apply "two-stage budgeting", the upper-stage allocation being between goods (say, shirts) and the lower-stage between national varieties of those goods (say, Bolivian vs. Mexican shirts).

The trade analysis follows the traditional Vinerian approach and distinguishes between trade-creation and trade-diversion effects. The magnitude of the former is determined by interaction between the price elasticity of the exporter's supply, μ_k^{BOL}, and that of the importer's demand, ε_k^{US} (our elasticity estimates are from Kee, Nicita and Olarreaga 2004).[5] The magnitude of the latter is determined by interaction between the exporter's elasticity of supply, μ_k^{BOL} again, and the importer's elasticity of substitution, σ_k^{US}. No reliable estimates of elasticities of substitution are available at the product level so the conventional approach is to use a plausible across-the-board value for σ_k^{US}, σ.

Our procedure consists of:

1. Replacing tariff-free treatment for eligible (and preference-requesting) Bolivian exports by GSP treatment at the US border;
2. Generating the implied changes in trade flows using a highly disaggregated partial-equilibrium framework;
3. Calculating the long-run employment effect of these variations in trade values onto sectoral employment using the panel estimates of section 3.

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[5] We are grateful to Marcelo Olarreaga for making his data available to us.

The equation generating the change in Bolivian exports to the US is

$$\Delta m_k^{BOL \mapsto US} = \begin{cases} \phi_k m_k^{BOL \mapsto US} \; t_k^{US,MFN} & \text{if } \left| \phi_k \; t_k^{US,MFN} \right| \leq 1 \\ -m_k^{BOL \mapsto US} & \text{otherwise} \end{cases}$$

where

$$\phi = \mu^{BOL} \left(\frac{\varepsilon^{US}}{\mu^{BOL} - \varepsilon^{US}} + \frac{\sigma}{\mu^{BOL} \left(1 + \tilde{m}\right) - \sigma} \right) < 0 \, ,$$

$\tilde{m} = m^{BOL \mapsto US} / m^{ROW \mapsto US}$, and $m_k^{BOL \mapsto US}$ is the initial (2005) level of Bolivian exports to the US. These expressions are derived in full in the appendix.

Before we present and discuss the results, two more issues must be dealt with. First, ATPDEA has a few exceptions, although the most important ones were eliminated when the ATPA was transformed into the ATPDEA. For Bolivia, they cover canned tuna except in flexible containers, rum and tafia, certain products of sugar, a few textile and apparel products, and certain types of skins and leatherwear. These exceptions are marginal leftovers from the ATPA which had more exceptions and were taken out of the simulated tariff changes.

Second, like other preferential trade agreements, the ATPDEA is not fully used by Bolivian exporters. Data on the utilization rate of US preferences is available from the US ITC for virtually all regimes and countries exporting to the US. Table 5 shows the utilization rate of US preferences by Bolivian exporters, calculated as the ratio of Bolivian shipments recorded by US customs as “imported under ATPDEA/ATPA regime” to total Bolivian shipments (including GSP or MFN). The data is from the US ITC and is originally at the HS8 sector; we aggregated it into broader ISIC sectors.

Table 5
Utilization rate of ATPDEA preferences by Bolivian exporters, 1997-2005

Positive utilization rates are reported for only three sectors: textiles (ISIC 321), apparel (322), and footwear (323). For textiles, they are very low and nonzero only in three years: 2000, 2001 and 2004. For apparel, they were substantial only from 1997 to 99, and then dropped sharply to very low levels (4.2% in 2005).[6] For footwear, and applied the export reductions obtained from simulations only to "preferential" shipments (total Bolivian exports to the US times the utilization rate).

The distribution of export changes for product lines where initial exports were nonzero is shown in a histogram in Figure 3.

Figure 3
Distribution of percent change in Bolivian exports to US, elimination of ATPDEA

It can be seen that the bulk of the changes are between 0 and 40% of initial exports (the top decile in absolute value is at -37%) with a mean of -16.4% and a median of -9.1%. These are simple statistics on HS4 values and all relative to total exports to the US. Overall, the effect is -20% (which is of course equal to a weighted average across HS4 lines). This is a substantial shock as far as Bolivia's exports to the US are concerned. However, the US market represents only 12.7% of Bolivia's overall exports (20% of its manufactured exports); knocking out a quarter of that means reducing overall exports by only about 3%. In dollar terms, Bolivia looses about $16 million in textile & apparel (the largest loss) and $5 million in food products. The total loss is $32.8 million.

[6] The reason for this precipitous drop in the utilization of ATPA preferences is not clear. The timing corresponds roughly to the transition from ATPA to ATPDEA. The ATPA's general rule of origin was a local-content rule of 35% with diagonal cumulation across Andean countries, CBI, and the US. (US Customs Service, *A Basic guide to importing*, McGraw Hill, 1995, p. 27.) and this presumably applied to apparel products. The 2002 (ATPDEA) rule of origin for apparel products seemed to be even more stringent than a double transformation, since the requirement was "Apparel articles sewn or otherwise assembled in one or more beneficiary ATPDEA countries, or in the United States, or both, from fabrics or fabric components *wholly formed*, or components knit-to-shape, *in the United States, from yarns wholly formed in the United States or in one or more beneficiary ATPDEA countries"* (italics added). It is not clear whether this was the reason for the drop in utilization rate, but clearly such a requirement is very stringent. See http://www.mincetur.gob.pe/COMERCIO/OTROS/Atpdea/productos_textiles/atpdea_textile.htm.

Another way of looking at the data is displayed in Figure 4, which is a scatter plot of simulated (post-elimination of ATPDEA) against initial exports to the US, by HS chapter.[7]

Figure 4
Initial and final (simulated) exports to the US

It can be seen that most values lie along or close to the diagonal, which is the "no-change" locus. It is also apparent that export values are highly skewed, as exports of jewelry (HS heading 7113) and tin (HS heading 8001) largely dominate Bolivia's US-bound exports.[8]

Our simulated trade variations can now be fed into employment changes, industry by industry, by combining panel estimates from the previous section with a concordance table between HS 4 and ISIC categories. Note that because our employment data covers only the manufacturing sector, the trade shock's simulated effect on employment can be evaluated only for that sector. An analysis of the trade shock's poverty effects covering the agricultural sector is provided in a companion paper (Cadot, Fonseca and Sakho 2008).

Table 6 shows simulation results based on system-GMM estimates. Employment effects, expressed in percent of initial employment in the last column, are very small.

Table 6
Simulated employment effects, by ISIC sector

Only in the textile & apparel sector is the effect traceable, at 1.92% of initial employment, confirming the Ministry of Economic Development's conclusions.

[7] HS chapters have two digits and number 99. The next more aggregated level is sections (21 of them) and the next less aggregated level is headings (two digits, about a thousand of them).
[8] This observation is however sensitive to aggregation. Looking back at Table 1 shows that once exports are aggregated at the section level, textile and clothing, where tariff preferences matter much more, is equal to base metals as an export item on the US market.

4.2 Transformation of ATPDEA into a reciprocal FTA

The transformation of ATPDEA into a reciprocal FTA involves several simultaneous trade shocks if all Andean countries sign it simultaneously: (i) a direct one due to (ia) improved market access for US products on the Bolivian market, and (ib) improved market access for Bolivia's products; and (ii) an indirect one due to more intense US competition for Bolivian products on Andean markets. We treat these shocks as additive rather than letting prices adjust endogenously as in GSIM. We are justified in doing this by the small magnitude of the adjustments involved, even relative to Bolivian and other Andean markets.

4.2.1 Domestic-market effects

Here we simulate, on Bolivia's import side, the trade and employment effects of the elimination of the tariff on US imports as part of the transformation of the ATPDEA into a reciprocal FTA. The formulae used in the simulation are given in the appendix. They are simpler than those used in section 4.1 because the large size of the US makes it possible to treat the US export supply elasticity as infinite, so that the appropriate framework is SMART's "small-country" version. The analysis proceeds in three steps that parallel those of Section 4.1, but the results must be interpreted much more carefully since only FE, RE and one of the three GMM specifications of the employment equation returned a significant coefficient on imports. The large standard error of the estimated effect (reflected in its low level of significance), implies that simulation results are affected by a larger uncertainty on the import side than on the export side.

The simulated rise in imports from the US adds up to $8.75 million (2.86% of initial imports from the US and 0.36% of overall initial imports). The small size of the shock reflects the fact that (i) Bolivia's MFN tariffs are low, as discussed earlier in this paper, and (ii) The US accounts for only about 15% of Bolivia's imports (by comparison, Argentina, Brazil and Chile together account for about three quarters of Bolivia's imports) .

Machinery ($1 million), textile & apparel ($1.62 million), and food products ($1.17 million) record the largest increases in absolute value. Taken together, these products accounted for about half of Bolivia's imports from the United States, but only 9% of its total imports. (7.5% for machinery, 1% for food and vegetables and 0.5% for textile and clothing). In terms of relative increase, footwear, textile & apparel, and sugar are the steepest. However, these products together account for less than 1% of Bolivia's imports from the US. Feeding these simulation results into employment data using our estimates gives the results shown in Table 7.

Table 7
Trade & employment effects of ATPDEA replacement by a reciprocal FTA with USS

The estimated impacts in employment are, unsurprisingly, negligible. The industries that experienced a negative change in employment (though very modest) were food products, textiles, apparel, chemicals and machinery; and were basically the US exports categories that expanded the most in absolute values.

4.2.3 Export-expansion effect

We took a drastic view of the improvement in Bolivia's market access by eliminating all remaining exceptions to the ATPDEA (recall that those exceptions are already fewer than under the ATPA). However, we assumed no change in rules of origin and accordingly maintained the same rate of utilization. The result is shown again in Table 7. They are very small, adding up to a mere $2.2 million.

4.2.3 Trade-diversion effects

On Andean markets, we assumed unchanged market access for Bolivia's products to Andean countries (tariffs are already zero and nontariff barriers are unlikely to be significantly affected in the short run). So the effect that remains is a trade diversion due to enhanced competition of US products on Andean markets. Although such FTAs would not necessarily involve much trade diversion on the Andean side, as far as Bolivia is concerned we are interested only by those effects.

The total loss is $4.9 million. Action is largely confined to food products on the Columbian market, which is an outlet for Bolivian soybeans (-3.7 million dollars). Table 10 displays export changes and associated employment changes, which, unsurprisingly, are again negligible.

Table 8
Simulated Bolivian export reductions on Andean markets

5. Concluding remarks

Since its inception, 17 years ago, the Andean Trade Promotion Agreement (ATPA) has granted duty-free access to the US market to goods from Colombia, Peru, Ecuador and Bolivia, albeit with exceptions. In 2002, the ATPA became ATPDEA with a smaller number of exceptions.[9] In July 2006, Thomas Shannon, US Assistant Secretary of State for Western Hemisphere Affairs, hailed it as "an important counterpoint to drug production in the region, [having] produced hundreds of thousands of jobs."[10] However, notwithstanding the fact that ATPDEA was unlikely to have created so many jobs given the low uptake of preferences, like the EU's Cotonou convention, it was not consistent with the enabling clause and had to give way to a reciprocal FTA or be phased out. The ATPDEA was extended in 2006 and the final date for its expiration is February 2008. As a replacement for this agreement, Colombia and Peru signed FTAs with the United States, while Ecuador and Bolivia kept negotiating for an extension of the ATPDEA. Its transformation into a full-fledged FTA has been resisted on both sides. Some members of the US Congress are reluctant to grant free-trade status to a government that they

[9] Exceptions eliminated included petroleum products, certain footwear, tuna in flexible containers, and certain watches and leather products (see Ribando 2007).
[10] Cited in Ribando 2007, p. 22.

perceive as hostile, while support for trade liberalization is uneven in Bolivian public opinion.

In this paper, we tried to quantify the effects on Bolivian manufacturing employment of either alternative (phase-out or transformation into a reciprocal FTA). On the basis of partial-equilibrium simulation results, we find that the trade shock is in all cases very small. All simulations suggest trade variations below $100 million. Of course like all simulations ours are a mere reflection of a choice of elasticity values. This may be a source of underestimation of results if the elasticity of supply is too low. The mean value of the export elasticities we used is 7, by any means a high value for an export elasticity (in a small manufacturing sector like Bolivia's, bottlenecks are very likely to appear quickly). Thus if anything reality is likely to involve smaller supply elasticities. As to the demand side, we use a standard elasticity of substitution (5), which again is probably on the high side when one thinks of substitutability between Bolivian and US products on Andean markets. Thus again, if anything the trade-diversion effects we identify are too large rather than too small. The transmission of those effects to employment data is via panel estimates, which pick up long-run relationships. In this case as well, short-run impact effects are likely to be smaller. Yet they are all very small.

So does this mean that preferential trade arrangements with the US have no effect for Bolivia? Experience in other parts of the world suggests that when well-designed, preferences can generate new exports (like textile and apparel for some sub-Saharan African countries under AGOA) that were not even part of those countries' initial "portfolio" of exports. This is probably the most relevant source of under-estimation of the trade and employment effects of preferences. However for US preferences to have an effect on Bolivia comparable to AGOA, they would have to be drastically redesigned with a relaxation of rules of origin comparable to AGOA's special regime so as to induce both a better uptake of preferences and a potential effect on FDI in Bolivia. This might be the only high-stake area in the ATPDEA's renewal negotiations for Bolivia.

References

Arellano, Manuel, and S. Bond (1991), “Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations”, Review of Economic Studies 58, 277–97.

Besedes, Tibor, and T. Prusa (2006a), “Surviving the U.S. Import Market: The Role of Product Differentiation”, Journal of International Economics 70, 339-358.

– and – (2006b), “Ins, Outs, and the Duration of Trade”, Canadian Journal of Economics 39, 266-95.

Blundell, Robert, and S. Bond (1998), “Initial conditions and moment restrictions in dynamic panel data models”, Journal of Econometrics 87, 11–143.

Carrère, Céline; V. Strauss-Kahn and O. Cadot (2007), “Export Diversification: What’s Behind the Hump?”; CEPR discussion paper 6590.

Castro, Lucio; M. Olarreaga and D. Saslavsky (2007); “The Impact of Trade with China and India on Argentina’s Manufacturing Employment”; World Bank Policy Research Paper 4153.

Fretes-Cibils, Vicente; M. Giugate, and C. Luff, eds., Bolivia: Public-policy options for the well-being of all; The World Bank.

Giussani, Bruno, and M. Olarreaga (2006), “Trade and Integration Policies”, in Vicente Fretes-Cibils, M. Giugate, and C. Luff, eds., Bolivia: Public-policy options for the well-being of all, pp 237-251.

Greenaway, David; D. Hine and P. Wright (1999), “An Empirical Assessment of the Impact of Trade on Employment in the United Kingdom”; European Journal of Political Economy 15, 485-500.

Jammes, Olivier and M. Olarreaga (2005) “Explaining SMART and GSIM”; mimeo, The World Bank.

Kee, Hiau Looi, M. Olarreaga and A. Nicita (2004), "Import Demand Elasticities and Trade Distortions" . World Bank Policy Research Working Paper No. 3452.

Rauch, James (1999), “Networks versus Markets in International Trade”; Journal of International Economics 48, 7-35.

Ribando, Clare M. (2007) , “Bolivia: Political and Economic Developments and Relations with the United States”; Washington, DC: Congressional Report Service.

Roodman, David. 2006. “How to Do xtabond2: An Introduction to ‘Difference’ and ‘System’ GMM in Stata. Working Paper 103, Center for Global Development, Washington.

Bolivia (2006), “El ATPDEA : Un análisis de situación y perspectivas”; Ministerio de Planificación del Desarrollo Unidad de Análisis de Políticas Sociales y Económicas (UDAPE) Nota de Conyunctura N#3. Available at http://www.udape.gov.bo/Notas%20de%20coyuntura/notas3.pdf

Appendix: Simulation equations

A.1 Elimination of US preferences

This appendix describes the equations used in our simulation exercise, which are derived from the SMART model.[11] The reader is referred to Jammes and Olarreaga (2005) for a complete description. US consumers have Dixit-Stiglitz preferences with a quasi-linear "upper-stage" (defined over goods), of the form

$$U\left(c_0, c_1, \ldots, c_n\right) = c_0 + \sum_{k=1}^{n} u\left(c_k\right) \tag{6}$$

where c_0 stands for consumption of a composite good used as numéraire and c_k for consumption of good *k* (defined at the HS6 level). The function $u(.)$ is increasing, concave and identical in all countries.

Goods themselves are composites of differentiated national "varieties". That is, each country produces a variety *i* and those varieties are combined in the "lower-level" of US preferences through a Constant Elasticity of Substitution (CES) aggregator of the type

$$c_k = \left[\sum_j \left(c_k^j\right)^{1-\sigma}\right]^{1/(1-\sigma)}. \tag{7}$$

This formulation makes it possible to construct an aggregate price level for all varieties of good *k*:[12]

$$p_k = \left[\sum_j \left(p_k^j\right)^{1-\sigma}\right]^{\frac{1}{1-\sigma}}. \tag{8}$$

---

[11] The type of simulation we perform here, which does not involve a formula-based final tariff, is not programmed directly in SMART, so we replicated the equations in Stata.
12 We omit the derivation of this price index which is somewhat tedious.

This is the “price” to which US consumers will react in trade-creation effects (by contrast, trade-diversion effects will be driven by changes in the relative prices of national varieties).

Consider now a representative good. We use superscript i for Bolivia and ℓ for other exporters to the US. Let $\tilde{m} = m^i / m^\ell$ be the ratio of a US imports of the composite good from *i* and ℓ respectively, and $\tilde{p} = p^i / p^\ell$ the ratio of their landed (duty-paid) prices. The elasticity of substitution σ between the two origins of our representative good is

$$\sigma = \frac{\tilde{p}}{\tilde{m}} \frac{d\tilde{m}}{d\tilde{p}} < 0 . \qquad (9)$$

and the elasticity of import demand (in algebraic value, i.e. negative) is

$$\varepsilon = \frac{p}{m} \frac{dm}{dp} < 0 . \qquad (10)$$

where *p* is the CES aggregate of the landed prices of all of the representative good’s varieties in the importer country given by (8) and *m* is aggregate imports of all varieties of good *i*. For each variety *i*, the relationship between the producer and landed price is

$$p^i = p^{i*} \left(1 + t^i\right) \qquad (11)$$

and t^i is the applied tariff, i.e. the MFN tariff reduced by the preference margin:

$$t^i = t^{MFN} \left(1 - \delta^i\right) . \qquad (12)$$

We assume that Bolivia's export supply curve is upward sloping with supply elasticity μ^i, which means that we apply a "large-country" framework.

Trade creation

What we are looking for here is a « trade-destruction » effect rather than a trade-creation one since the experiment consists of raising US tariffs on Bolivia (from zero back to their MFN level) instead of cutting them on an preferential basis. The logic is however the same.

We have three unknowns to determine: the change in Bolivian exports to the US, dx^i (equal to dm^i), the change in the landed price of Bolivian exports on the US market, dp^i, and the change in the producer price of Bolivian exports to the US, dp^{i*}, all in terms of the tariff change dt^i. In order to have a solution we need three equations: (i) The definition of the supply elasticity,

$$\mu^i = \frac{p^{i*}}{x^i}\frac{dx^i}{dp^{i*}}, \tag{13}$$

(ii) the equation linking the exporter's producer price, the tariff, and the domestic price, given by (11) and (iii) the definition of the importer's price elasticity of import demand, given by (10). We close this simple system of equations by noting that US imports from Bolivia equal Bolivian exports to the US.

Starting from (10), differentiating totally (11), and substituting from (13) gives

$$\begin{aligned} dx^i &= \frac{\varepsilon x^i}{p^i} dp^i \\ dp^i &= p^{i*} dt^i + \left(1+t^i\right) dp^{i*} \\ dp^{i*} &= \frac{p^{i*}}{\mu^i x^i} dx^i; \end{aligned} \tag{14}$$

replacing x^i by m^i, evaluating p^{i*} at unity, and combining all three equations in (14) gives

$$dm^i\Big|_{TC} = \left(\frac{\mu^i \varepsilon}{\mu^i - \varepsilon}\right) m^i \frac{dt^i}{\left(1+t^i\right)} . \tag{15}$$

Recall that ε is in algebraic value and is thus normally negative, so trade creation is *positive* when the tariff goes *down*. Here, the US tariff on Bolivia would go *up* from zero to its MFN level upon the elimination of the ATPDEA; thus, $t^i = 0$, $\Delta t^i = t^{US,MFN}$, and the formula used in our simulation is

$$\Delta m^{BOL \mapsto US}\Big|_{"TC"} = \left(\frac{\mu^{BOL} \varepsilon^{US}}{\mu^{BOL} - \varepsilon^{US}}\right) m^{BOL \mapsto US} \; t^{US\ MFN} \tag{16}$$

Trade diversion

Here again, we are looking for anti-trade diversion effects since preferences are being eliminated. Observe first that using an expression similar to (13) for the rest of the world's elasticity of supply gives, after a bit of algebra,

$$\frac{d\tilde{p}}{\tilde{p}} = \frac{dt}{1+t} + \frac{1}{\mu^i}\frac{dx^i}{x^i} + \frac{1}{\mu^\ell}\frac{dx^\ell}{x^\ell} . \tag{17}$$

Using again the fact that $x \equiv m$ for both i (Bolivia) and ℓ (the rest of the world) and that, along trade diversion, $dm^\ell \equiv -dm^i$, (17) can be rewritten as

$$\frac{d\tilde{p}}{\tilde{p}} = \frac{dt}{1+t} + \left(\frac{1}{\mu^i m^i} + \frac{1}{\mu^\ell m^\ell}\right) dm^i . \tag{18}$$

Going back to the definition of the elasticity of substitution, (9), we have also

$$d\tilde{m} = \sigma \tilde{m} \frac{d\tilde{p}}{\tilde{p}} ; \tag{19}$$

expanding $d\tilde{m}$ gives

$$\frac{m^{\ell} dm^{i} - m^{i} dm^{\ell}}{\left(m^{\ell}\right)^{2}} = \sigma \frac{m^{i}}{m^{\ell}} \frac{d\tilde{p}}{\tilde{p}}. \tag{20}$$

Using again the fact that $dm^{\ell} \equiv -dm^{i}$, rearranging (20) and using (18) gives then

$$\begin{aligned} dm^{i}\Big|_{TD} &= \sigma \left(\frac{m^{i} m^{\ell}}{m^{i} + m^{\ell}} \right) \frac{d\tilde{p}}{\tilde{p}} \\ &= \sigma \left(\frac{m^{i} m^{\ell}}{m^{i} + m^{\ell}} \right) \left[\frac{dt^{i}}{\left(1 + t^{i}\right)} + \left(\frac{1}{\mu^{i} m^{i}} + \frac{1}{\mu^{\ell} m^{\ell}} \right) dm^{i} \right] \\ &= \sigma \left(\frac{\psi_{1}}{1 - \sigma \psi_{1} \psi_{2}} \right) \frac{dt^{i}}{\left(1 + t^{i}\right)} \end{aligned} \tag{21}$$

where

$$\psi_{1} = \frac{m^{i} m^{\ell}}{m^{i} + m^{\ell}} \tag{22}$$

and

$$\psi_{2} = \frac{1}{\mu^{i} m^{i}} + \frac{1}{\mu^{\ell} m^{\ell}}. \tag{23}$$

For us, the relevant tariff change is from $t^{i} = 0$ to $t^{i} = t^{US,MFN}$, so

$$\frac{dt^{i}}{1 + t^{i}} = t^{US,MFN}.$$

As a (plausible) simplification, consider now the case where the ROW's supply curve is flat ($\mu^{ROW} \to +\infty$). Then $\psi_{2} = 1/\mu^{BOL} m^{BOL \mapsto US}$ and

$$\Delta m^{BOL \mapsto US}\Big|_{"TD"} = \sigma \left[\frac{\mu^{BOL} m^{BOL \mapsto US} m^{ROW \mapsto US}}{\mu^{BOL} \left(m^{BOL \mapsto US} + m^{ROW \mapsto US} \right) - \sigma m^{ROW \mapsto US}} \right] t^{US,MFN} \tag{24}$$

Thus, the total change in Bolivian exports ("trade diversion" and "trade creation", keeping in mind that we are working backward on the *elimination* of preferences), is

$$\Delta m^{BOL} = \phi m^{BOL \mapsto US} \; t^{US,MFN} \tag{25}$$

where

$$\begin{aligned}\phi &= \left(\frac{\mu^{BOL}\varepsilon^{US}}{\mu^{BOL}-\varepsilon^{US}}\right)+\sigma\left[\frac{\mu^{BOL}m^{ROW\mapsto US}}{\mu^{BOL}\left(m^{BOL\mapsto US}+m^{ROW\mapsto US}\right)-\sigma m^{ROW\mapsto US}}\right] \\ &= \mu^{BOL}\left(\frac{\varepsilon^{US}}{\mu^{BOL}-\varepsilon^{US}}+\frac{\sigma}{\mu^{BOL}\left(1+\tilde{m}^{US}\right)-\sigma}\right)<0.\end{aligned} \tag{26}$$

Note that if one makes use of the fact that $\tilde{m}^{US} = m^{BOL\mapsto US} / m^{ROW\mapsto US}$ is very small, the last expression can be simplified into

$$\phi \simeq \mu^{BOL}\left(\frac{\varepsilon^{US}}{\mu^{BOL}-\varepsilon^{US}}+\frac{\sigma}{\mu^{BOL}-\sigma}\right). \tag{27}$$

Observe also that ϕ is always negative because both ε and σ are in algebraic form; it is also an increasing function of σ and could be, in absolute value, larger than $1/t^{US,MFN}$, in which case the displacement of Bolivian exports by other suppliers on the US market could be more than their initial value.[13] We accordingly bound these effects at the initial level of Bolivian exports.[14] Thus, the expressions used in our simulations are, for each product *k*, (26) and

[13] In practice, given an elasticity of substitution around 5 (the value used in our benchmark scenario) this requires small values of the elasticities of supply and demand and large values of the US MFN tariff. The constraint is binding in only 3% of Bolivia's active export lines.
[14] In this we depart slightly from SMART which applies a smooth downward correction to eliminate corner solutions.

$$\Delta m_k^{BOL\mapsto US} = \begin{cases} \phi_k m_k^{BOL\mapsto US} \ t_k^{US,MFN} & \text{if } \left|\phi_k \ t_k^{US,MFN}\right| \leq 1 \\ -m_k^{BOL\mapsto US} & \text{otherwise} \end{cases} \tag{28}$$

where $m_k^{BOL\mapsto US}$ is of course the *initial* level of Bolivian exports to the US.

A.2: FTA between Bolivia and the US

Here the exercise is more standard, consisting of replacing the Bolivian tariff on US imports by duty-free treatment. Because of the size asymmetry between the US and Bolivia, we can use the small-country version of SMART and assume that the elasticity of US supply is infinite. The formula for trade creation is then

$$dm^{US\mapsto BOL}\Big|_{TC} = \varepsilon^{BOL} m^{US\mapsto BOL} \left(\frac{t^{BOL,MFN}}{1+t^{BOL,MFN}} \right) \tag{29}$$

where ε^{BOL} is the price elasticity of Bolivia's import demand, and $t^{BOL,MFN}$ is the initial Bolivian tariff on US imports that is eliminated.

The formula for trade diversion is

$$dm^{US\mapsto BOL}\Big|_{TD} = \sigma \left(\frac{m^{US\mapsto BOL} m^{ROW\mapsto BOL}}{m^{US\mapsto BOL} + m^{ROW\mapsto BOL}} \right) \left(\frac{t^{BOL,MFN}}{1+t^{BOL,MFN}} \right); \tag{30}$$

Total effects are given by:

$$\Delta m^{US} = \Delta m^{US\to BOL}\Big|_{TC} + \Delta m^{US\to BOL}\Big|_{TD}$$

$$\Delta m^{US} = \phi_k^{US\to BOL} m^{US\to BOL} \left(\frac{t^{BOL,MFN}}{1+t^{BOL,MFN}} \right) \tag{32}$$

Where

$$\phi_k^{US\to BOL} = \sigma \left(\varepsilon^{BOL} + \frac{1}{1+\tilde{m}_k^{BOL}} \right) \tag{31}$$

and

$$\tilde{m}_k^{BOL} = \frac{m_k^{US\mapsto BOL}}{m_k^{ROW\mapsto BOL}}. \tag{32}$$

imposing the usual upper bound, we get

$$\Delta m_k^{US\rightarrow BOL} = \begin{cases} \phi_k^{US\rightarrow BOL} m_k^{US\rightarrow BOL} \left(\dfrac{t_k^{BOL,MFN}}{1+t_k^{BOL,MFN}} \right) & if \quad \phi_k^{BOL} t_k^{BOL,MFN} \leq 1 \\ m_k^{US\rightarrow BOL} & otherwise \end{cases} \tag{35}$$

Tables and figures

Tables

Table 1
Bolivia's exports by HS section: to the US and total

HS section		Bolivian exports, 2005		
		To US	Total	US as percent of total
1	Live animals	-	24'448	-
2	Vegetables	15'930	109'121	14.6
3	Fats & oils	-	128'188	-
4	Food, bev. & tobacc.	5'383	250'211	2.2
5	Mineral products	12'568	602'354	2.1
6	Chemicals	1'374	9'404	14.6
7	Plastics	317	2'889	11.0
8	Leather	978	24'368	4.0
9	Wood	25'411	46'141	55.1
10	Pulp & paper	92	2'099	4.4
11	Textile & clothing	26'407	51'980	50.8
12	Footwear	114	1'383	8.2
13	Stone, glass, cement	502	4'536	11.1
14	Jewelry	54'070	57'754	93.6
15	Base metals	28'201	70'718	39.9
16	Machinery	2'644	15'215	17.4
17	Transport. Equip.	768	19'322	4.0
18	Optics	320	2'475	12.9
19	Arms	-	10	-
20	Miscellaneous	7'005	16'337	42.9
21	Works of art	80	262	30.5
Total		*182'164*	*1'439'215*	*12.7*

Source: Authors' calculations from COMTRADE.

Table 2
Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
year	388	1'996.99	4.33	1990	2004
isic	388	353.26	24.35	311	390
Number of employees	214	1'790.06	2'223.71	5	11302
Imports ($000)	315	62'175.71	85'412.60	9.86	641'939.70
Exports ($000)	315	21'466.49	59'407.65	0.13	483'337.90
Capital (real)	188	9.43E+11	4.61E+12	18119.57	3.52E+13
Investment (real)	215	6'093.98	11'200.94	-2414.333	74328.19
Wages (real)	214	3.07	1.75	0.28218	11.78791

Table 3
Regression results using import penetration and export rate

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
	RE	*FE*	*FD*	*GMM*	GMM *system*	GMM *system*
Wage	47.754	28.323	-34.219	-107.718	-9.728	-38.377
	-0.75	-0.46	-0.7	(1.70)*	-0.73	-1.2
Investment	0.053	0.024	0.003	0.016	0.014	0.015
	(7.13)***	(4.08)***	-0.95	(3.57)***	(1.86)*	(1.80)*
Import penetration	-483.245	-212.605	-58.293	-258.431	-139.228	-566.702
	(2.69)***	-1.5	-0.66	(2.23)**	(2.96)***	(2.45)**
Export rate	131.598	69.869	27.046	82.165	51.59	163.807
	(2.82)***	(1.94)*	-1.25	(2.37)**	(4.32)***	(3.02)***
L. Number of employees				0.656	0.968	0.931
				(6.61)***	(17.94)***	(14.21)***
Constant	1,387.50	1,521.39	72.11	30.485	126.624	462.333
	(4.32)***	(6.72)***	(2.94)***	-1.63	-1.44	-1.64
Observations	160	160	135	113	138	138
Number of Industries	25	25		24	25	25
R-squared		0.33	0.03			

Notes

Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4
Regression results using import and export values

	(1)	(2)	(3)	(4)	(5)	(6)
	RE	FE	FD	GMM	GMM system	GMM system
Real wage	93.816	84.409	-26.891	-49.833	-13.444	-22.244
	(1.59)	(1.53)	(0.55)	(0.85)	(1.03)	(1.03)
Real investment	0.030	0.011	0.003	0.012	0.015	0.014
	(4.26)***	(2.01)**	(0.93)	(2.92)***	(1.98)**	(1.92)*
Real imports	-0.002	-0.002	-0.000	-0.001	-0.000	-0.001
	(1.71)*	(2.00)**	(1.12)	(0.62)	(1.83)*	(1.41)
Real exports	0.009	0.009	0.001	0.007	0.001	0.002
	(4.75)***	(6.03)***	(1.11)	(4.05)***	(2.16)**	(2.78)***
L. Number of employees				0.370	0.949	0.938
				(3.20)***	(18.85)***	(15.69)***
Constant	1,048.951	1,279.631	80.470	49.598	113.972	209.665
	(3.53)***	(6.73)***	(2.55)**	(2.57)**	(1.54)	(1.26)
Observations	*160*	*160*	*135*	*113*	*138*	*138*
Number of Industries	*25*	*25*		*24*	*25*	*25*
R-squared		0.48	0.03			

Notes
Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5
Utilization rate, ATPA/ATPDEA, 1997-2005

		Bolivia: ATPA/ATPDEA utilisation rate (%)								
ISIC 3 code	ISIC category	1997	1998	1999	2000	2001	2002	2003	2004	2005
311	Food products	0	0	0	0	0	0	0	0	0
312	Food products	0	0	0	0	0	0	0	0	0
313	Beverages	0	0	0	0	0	0	0	0	0
314	Tobacco	0	0	0	0	0	0	0	0	0
321	Textiles	0	0	0	10.32	3.90	0	0	4.73	0
322	Wearing apparel except footwear	99.63	72.49	96.50	19.71	55.65	5.25	10.99	14.51	4.22
323	Leather products	95.99	81.94	75.48	77.77	86.14	18.90	78.38	85.35	78.14
324	Footwear except rubber or plastic	0	0	0	0	0	0	0	0	0
331	Wood products except furniture	0	0	0	0	0	0	0	0	0
332	Furniture except metal	0	0	0	0	0	0	0	0	0
341	Paper and products	0	0	0	0	0	0	0	0	0
342	Printing and publishing	0	0	0	0	0	0	0	0	0
351	Industrial chemicals	0	0	0	0	0	0	0	0	0
352	Other chemicals	0	0	0	0	0	0	0	0	0
353	Petroleum refineries	0	0	0	0	0	0	0	0	0
354	Manufacture of miscelaneous product	0	0	0	0	0	0	0	0	0
355	Rubber products	0	0	0	0	0	0	0	0	0
356	Plastic products	0	0	0	0	0	0	0	0	0
361	Pottery china earthenware	0	0	0	0	0	0	0	0	0
362	Glass and products	0	0	0	0	0	0	0	0	0
369	Other non-metallic mineral products	0	0	0	0	0	0	0	0	0
371	Iron and steel	0	0	0	0	0	0	0	0	0
372	Non-ferrous metals	0	0	0	0	0	0	0	0	0
381	Fabricated metal products	0	0	0	0	0	0	0	0	0
382	Machinery except electrical	0	0	0	0	0	0	0	0	0
383	Machinery electric	0	0	0	0	0	0	0	0	0
384	Transport equipment	0	0	0	0	0	0	0	0	0
385	Professional and scientific equipment	0	0	0	0	0	0	0	0	0
390	Other manufactured products	0	0	0	0	0	0	0	0	0

Source: Authors' calculations from US ITC

Table 6
Trade and employment effects of ATPDEA elimination

		Bolivian exports (thousand US dollars)				US tariffs		Export variation		Employment variation	
			To US								
ISIC 3 code		To world	Total	Eligible to ATPDEA	Shipped under ATPDEA	MFN	ATPDEA	Value (US$ 000)	Percent of initial exports	Initial number of employees	Variation (% of initial employment)
311	Food products	399'648	5'140	5'133	0	6.1	0.3	-4'896	-95.2	11'302	-0.09
312	Food products	10'731	1'923	1'923	0	5.5	0.0	-131	-6.8	-	-
313	Beverages	775	151	151	0	5.8	1.1	-43	-28.8	5'752	0.00
314	Tobacco	0	0	0	0	6.0	0.0	-	-	195	0.00
321	Textiles	14'587	379	168	18	7.1	3.6	-21	-5.6	4'000	0.00
322	Wearing apparel exc. footwea	38'566	26'246	26'246	3'808	10.2	0.4	-16'000	-61.0	1'751	-1.92
323	Leather products	22'893	841	841	718	6.0	0.7	-177	-21.0	948	-0.04
324	Footwear exc. rubber or plast	377	22	22	0	12.4	0.0	-5	-20.6	1'107	0.00
331	Wood products except furnit.	44'225	25'267	15'315	0	5.3	1.3	-562	-2.2	2'502	-0.05
332	Furniture except metal	15'795	6'929	2	0	1.3	0.3	0	0.0	1'958	0.00
341	Paper and products	2'731	18	18	0	2.9	1.5	0	-1.5	3'297	0.00
342	Printing and publishing	600	75	68	0	4.0	3.1	-15	-20.0	3'321	0.00
351	Industrial chemicals	14'334	1'486	1'486	0	4.4	0.7	-266	-17.9	253	-0.22
352	Other chemicals	2'365	0	0	0	4.1	1.4	-	-	2'604	0.00
353	Petroleum refineries	4'176	1'270	1'270	0	3.9	2.5	-439	-34.6	760	-0.12
354	Miscelaneous products	0	0	0	0	3.8	3.3	-	-	-	-
355	Rubber products	80	4	4	0	4.1	2.1	0	-4.1	114	0.00
356	Plastic products	2'581	312	257	0	5.3	0.0	-17	-5.5	2'803	0.00
361	Pottery china earthenware	168	22	22	0	4.3	0.0	-1	-4.5	5	-0.04
362	Glass and products	2'363	70	70	0	5.7	0.0	-6	-8.1	475	0.00
369	Other non-metal. min. prod.	2'173	427	393	0	3.5	1.1	-100	-23.4	4'001	-0.01
371	Iron and steel	2'026	3	3	0	3.2	0.8	0	-4.7	313	0.00
372	Non-ferrous metals	75'265	34'166	6'079	0	1.6	0.0	-230	-0.7	-	-
381	Fabricated metal products	1'739	114	114	0	2.6	0.0	-3	-2.6	1'411	0.00
382	Machinery except electrical	7'994	1'618	707	0	1.2	0.4	-35	-2.2	328	-0.02
383	Machinery electric	5'929	591	570	0	2.8	0.8	-35	-5.8	715	-0.01
384	Transport equipment	20'110	1'041	974	0	1.8	0.1	-22	-2.1	398	-0.01
385	Prof. & scientific equip.	2'209	265	257	0	2.1	0.2	-7	-2.6	105	-0.01
390	Other manufactured prod.	50'789	48'433	48'283	0	2.9	0.3	-9'802	-20.2	950	-2.17
Total		*745'230*	*156'812*	*110'377*	*4'544*			*-32'814*	-20.9	*51'368*	*-0.13*

Source : Authors' calculations

Table 7
Trade & employment effects of ATPDEA replacement by reciprocal FTA with the US

		Bolivia's imports		Tariffs		Imports variation from US		Exports variation to US		Employment variation			
ISIC 3 code	Sector	from world	from US	US MFN	ATPDEA	In thousand US dollars	In percent of initial exports	Value ($000)	In percent of initial exports	Initial number of employees	Import side (% init. empl.)	Export side (% init. emp.)	Total
311	Food products	100'422	5'364	6.1	0.3	1'174	21.89	0	0.00	11'302	0.00	0.00	0.00
312	Food products	27'075	2'612	5.5	0.0	512	19.59	0	0.00	0	0.00	0.00	0.00
313	Beverages	14'439	369	5.8	1.1	29	7.80	0	0.00	5'752	0.00	0.00	0.00
314	Tobacco	1'285	122	6.0	0.0	9	7.44	0	-	195	0.00	0.00	0.00
321	Textiles	71'987	6'365	7.1	3.6	744	11.69	39	10.40	4'000	0.00	0.08	0.08
322	Wearing apparel except footwear	22'984	2'611	10.2	0.4	877	33.57	0	0.00	1'751	0.00	0.00	0.00
323	Leather products	3'608	205	6.0	0.7	61	29.67	0	0.00	948	0.00	0.00	0.00
324	Footwear except rubber or plastic	12'071	366	12.4	0.0	130	35.57	0	0.00	1'107	0.00	0.00	0.00
331	Wood products except furniture	3'783	583	5.3	1.3	4	0.63	2'062	8.16	2'502	0.00	4.33	4.33
332	Furniture except metal	8'667	1'763	1.3	0.3	16	0.92	78	1.12	1'958	0.00	0.16	0.16
341	Paper and products	67'919	3'359	2.9	1.5	14	0.41	0	0.00	3'297	0.00	0.00	0.00
342	Printing and publishing	18'226	1'969	4.0	3.1	15	0.78	1	0.72	3'321	0.00	0.00	0.00
351	Industrial chemicals	193'383	24'100	4.4	0.7	1'080	4.48	0	0.00	253	-0.01	0.00	-0.01
352	Other chemicals	126'497	13'128	4.1	1.4	334	2.55	0	-	2'604	0.00	0.00	0.00
353	Petroleum refineries	105'088	4'785	3.9	2.5	341	7.14	0	0.00	760	0.00	0.00	0.00
354	Miscelaneous products	545	236	3.8	3.3	3	1.21	0	0.00	0	0.00	0.00	0.00
355	Rubber products	38'380	2'249	4.1	2.1	33	1.44	0	0.00	114	0.00	0.00	0.00
356	Plastic products	30'633	2'116	5.3	0.0	140	6.61	0	0.01	2'803	0.00	0.00	0.00
361	Pottery china earthenware	4'711	197	4.3	0.0	29	14.75	0	0.00	5	-0.01	0.00	-0.01
362	Glass and products	23'708	3'028	5.7	0.0	165	5.45	0	0.00	475	0.00	0.00	0.00
369	Other non-metallic mineral products	12'811	789	3.5	1.1	8	0.96	0	0.00	4'001	0.00	0.00	0.00
371	Iron and steel	160'270	8'326	3.2	0.8	271	3.25	0	0.00	313	0.00	0.00	0.00
372	Non-ferrous metals	20'532	8'706	1.6	0.0	7	0.07	0	0.00	0	0.00	0.00	0.00
381	Fabricated metal products	53'781	7'473	2.6	0.0	383	5.12	0	0.00	1'411	0.00	0.00	0.00
382	Machinery except electrical	267'285	73'473	1.2	0.4	1'003	1.36	86	5.32	328	0.00	0.18	0.18
383	Machinery electric	152'238	42'269	2.8	0.8	977	2.31	5	0.86	715	0.00	0.01	0.01
384	Transport equipment	177'963	70'873	1.8	0.1	166	0.23	0	0.04	398	0.00	0.00	0.00
385	Professional and scientific equipment	31'179	12'243	2.1	0.2	112	0.91	0	0.02	105	0.00	0.00	0.00
390	Other manufactured products	31'489	6'900	2.9	0.3	120	1.74	1	0.00	950	0.00	0.00	0.00
Total		*1'782'960*	*306'579*			*8'754*	*2.86*	*2'272*	*1.45*	*51'368*	*0.01*	*4.77*	*4.76*

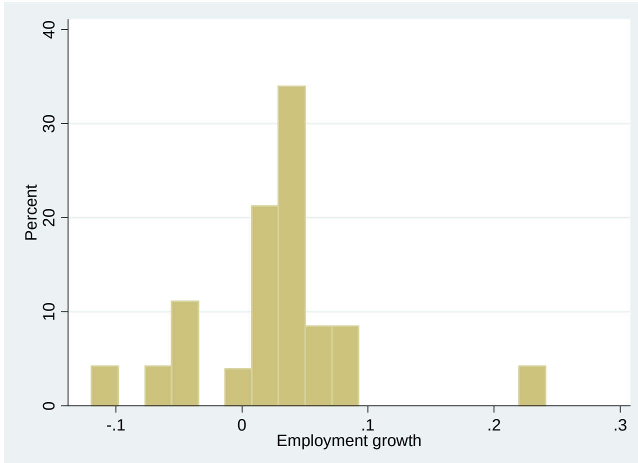
*Import and export values are given in thousands US dollars.

Table 8
Trade and employment effects, FTA between US and Andean countries

	Bolivia's initial exports to Andean countries	Trade diversion, by market: Colombia	Peru	Ecuador	Total	Percent of init. Exports	Employment variation: Initial number of employees	Variation (% of initial employment)
Food products	170'556	-3'793	-328	-14	-4'135	-2.4	11'302	-0.08
Food products	18	0	-1	0	-1	-5.1	-	-
Beverages	78	0	0	0	0	-0.4	5'752	0.00
Tobacco	0	0	0	0	0	0.0	195	0.00
Textiles	9'557	-265	-26	-1	-292	-3.1	4'000	-0.02
Wearing apparel except footwear	113	0	0	-1	-2	-1.6	1'751	0.00
Leather products	13	0	0	0	0	-1.1	948	0.00
Footwear except rubber or plastic	450	0	0	0	0	-0.1	1'107	0.00
Wood products except furniture	6	0	0	0	0	-0.5	2'502	0.00
Furniture except metal	26	0	0	0	0	-0.7	1'958	0.00
Paper and products	764	0	-10	0	-10	-1.3	3'297	0.00
Printing and publishing	42	-1	0	0	-1	-2.5	3'321	0.00
Industrial chemicals	3'883	0	-21	-3	-24	-0.6	253	-0.02
Other chemicals	1'788	0	-33	-1	-34	-1.9	2'604	0.00
Petroleum refineries	1'766	0	-61	0	-61	-3.5	760	-0.02
Miscelaneous products	0	0	0	0	0	0.0	0.00	0.00
Rubber products	2	0	0	0	0	-6.7	114	0.00
Plastic products	305	0	-4	0	-4	-1.3	2'803	0.00
Pottery china earthenware	11	0	0	0	0	-0.3	5	0.00
Glass and products	751	0	-2	0	-2	-0.3	475	0.00
Other non-metallic mineral products	1'925	0	-5	0	-5	-0.3	4'001	0.00
Iron and steel	2'284	0	-328	0	-328	-14.4	313	-0.22
Non-ferrous metals	113	0	0	-1	-1	-0.5	0	0.00
Fabricated metal products	217	0	-4	-3	-7	-3.1	1'411	0.00
Machinery except electrical	535	-5	-8	-13	-26	-4.9	328	-0.02
Machinery electric	85	0	-2	-2	-4	-4.5	715	0.00
Transport equipment	66	0	-2	0	-2	-3.2	398	0.00
Professional and scientific equipment	137	-1	0	-7	-9	-6.3	105	-0.02
Other manufactured products	11	0	0	0	0	-1.3	950	0.00
	195'503	*-4'065*	*-835*	*-46*	*-4'947*	-2.53	*51'368*	-0.02

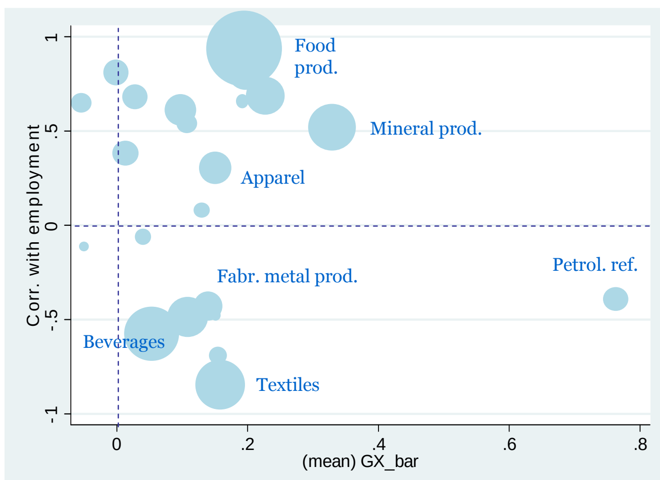
Figures

Figure 1
Distribution of employment growth, by ISIC industry



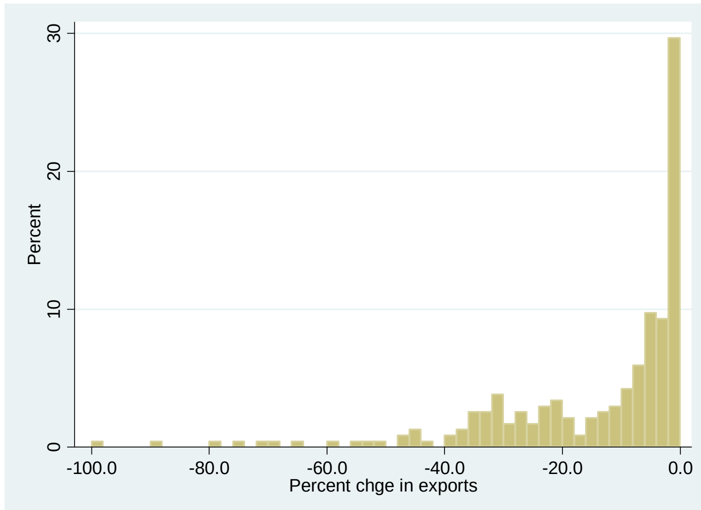
Source: Autors' calculations from UNIDO data

Figure 2
Export growth and its correlation with employment



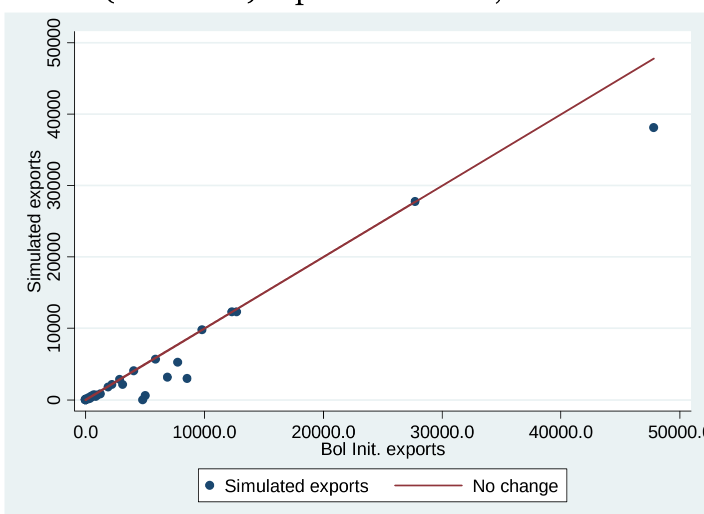
Note: Cumulated export growth on the horizontal axis
Source: Autors' calculations from UNIDO and COMTRADE data

Figure 3
Distribution of percent change in Bolivian exports, elimination of ATPDEA



Notes: Change in exports is in percent of initial values.
Source: Authors' calculations

Figure 4
Initial and final (simulated) exports to the US, elimination of ATPDEA



Notes: Export values are in thousand US dollars.
Source: Authors' calculations

Figure 5
Distribution of percent change in Bolivian imports, FTA scenario