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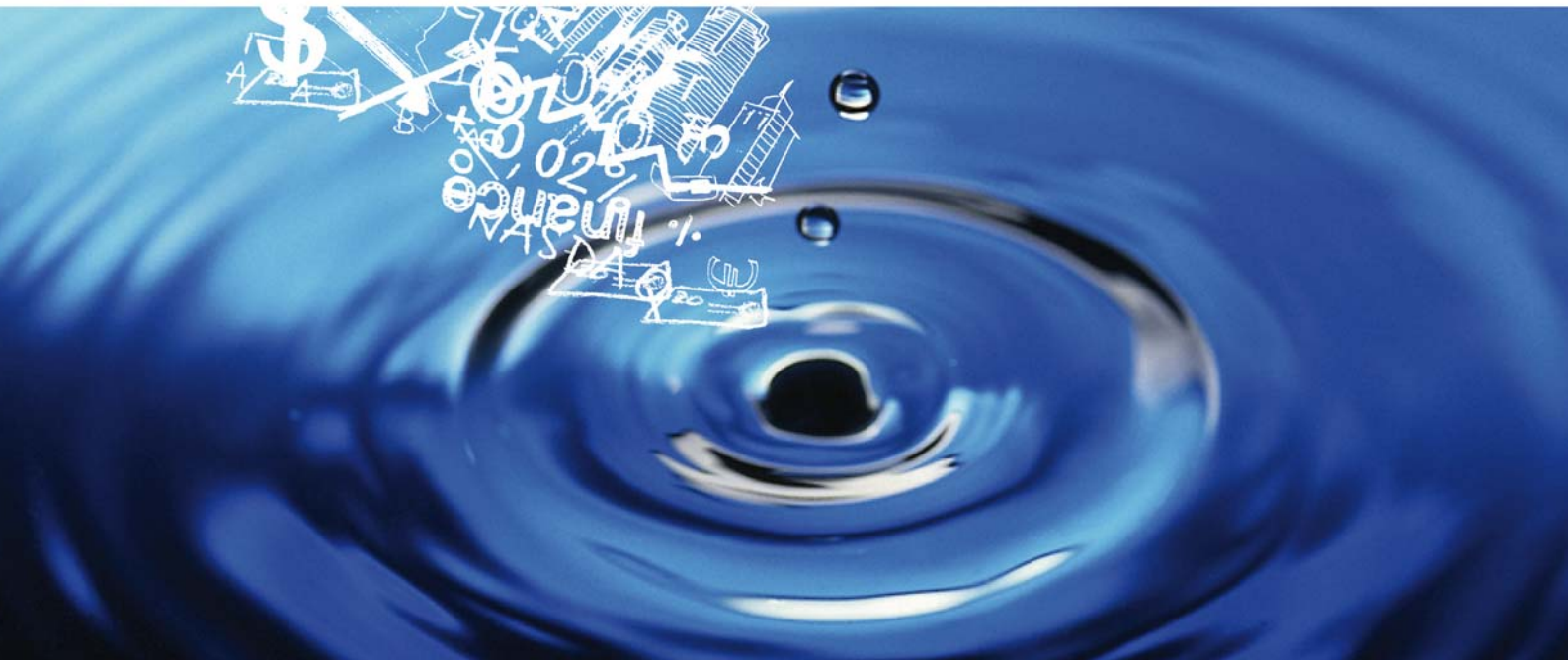

# Does Bolivia under-trade?

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Abstract

This notes estimates a gravity equation to assess to what extent Bolivia "under-trades". The counterfactual is the predicted value of a gravity equation estimated for aggregate trade over 1992-2005, using random effects and controlling for both remoteness and landlockedness. We address potential endogeneity of right-hand side variables by using Hausman and Taylor's IV estimator. Using this correct counterfactual, we find that, on aggregate (i.e. in its trade with all partners), Bolivia "under-exports" by a margin of about 10% under predicted values (although the gap has been widening over the last decade) but does not "under-import"; instead, it "over-imports" by a small and stable margin of about 3% above predicted values.

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# 1 Introduction

Bolivia's trade-to-GDP ratio is around the average for Latin America (slightly above 40%) and higher than it is for other Andean nations. How should we judge this performance? Beyond usual determinants such as size, factor endowments and trade policies, international trade flows are affected by three additional factors: the distance between trading partners, the quality of their infrastructure, and whether they are landlocked. For Bolivia all three factors loom large, so in evaluating the country's trade performance it is crucial to use the right counterfactual.

By how much is Bolivia's trade reduced by these factors? Various techniques are available to assess whether countries trade more or less than they should in some sense. These include the comparison of openness indices such as exports and imports over GDP, the regression of such openness indices on various country characteristics, and the estimation of gravity equations. We discuss here estimates from a gravity equation.

The equation is fitted over a panel of 167 countries for which bilateral trade data is available between 1992 and 2005. The technique used corrects both for idiosyncratic factors at the *country-pair* level (rather than just at the country level as is usually done) and for possible endogeneity of right-hand side variables. We also add proxies for the combined effects of landlockedness and the quality of infrastructure in trading countries and their landlocked partners.[1]

[1] By contrast, we do not dwell on the recent debate about how to treat zero-trade observations as there is no consensus about the importance of the problem and how best to fix it. For Bolivia, there are numerous zero-trade observations, but it should be kept in mind that the coefficients are estimated on the whole sample, so whether the country of interest has few or lots of zeroes is inconsequential for the reliability of estimates.

## 2 Landlockedness & trade

Practically, the gravity equation relates the natural logarithm of the dollar value of trade between two countries to the log of their respective GDPs,[2] a composite term measuring barriers and incentives to trade between them (typically the log of the distance between their capitals, the presence of a common border, a common language, past colonial ties, etc.), and terms measuring barriers to trade between each of them and the rest of the world.

The rationale for including these last terms, dubbed "multilateral trade-resistance" (MTR) terms by Anderson and van Wincoop (2004), is as follows. Ceteris paribus, two countries surrounded by other large trading economies, say Belgium and the Netherlands surrounded by France and Germany, will trade less between themselves than if they were surrounded by oceans (like Australia and New Zealand) or vast stretches of difficult terrain (like Bolivia and Chile). Several alternative ways of proxying MTR terms are possible. One is to use iterative methods to construct estimates of the price-raising effects of barriers to multilateral trade (Anderson and van Wincoop 2003). A simpler alternative is to control for each country's "remoteness" by using a formula that measures its average distance to trading partners. We make use of this measure of multilateral trade resistance in our formulation here. An even simpler –and widely used– method consists of using country fixed effects for importers and exporters (Rose and van Wincoop 2001).

If country fixed effects control for other idiosyncratic factors affecting each country's propensity to export or to import, they do not control for idiosyncratic factors affecting bilateral trade between two countries. In addition, it would be difficult to estimate a country's under-trading in a

[2] Two approaches to making GDPs internationally comparable have been followed in the literature, one using GDPs expressed in dollars at nominal exchange rates as provided in the IMF's International Financial Statistics (IFS), and one using GDPs expressed in dollars at Purchasing Power Parity (PPP) as provided in the Penn World Tables (PWT). Both lead to similar results. We use nominal GDPs here.

specification with fixed country effects, since they would pick up a lot of what we would want to isolate (idiosyncratic factors that make it difficult for a country to trade with its neighbours, such as high mountains, informal trade barriers, and so on).

When the gravity equation is estimated on panel data as it is here, improved estimates can be obtained by controlling instead for time-invariant country-pair factors with *country-pair* fixed or random effects. Modeling these factors as random rather than fixed (see Brun et al. 2005 or Carrère 2006) preserves the possibility of estimating separately the effect of bilateral factors such as distance, common borders etc. which would otherwise be confounded with the fixed effects. However it raises an additional problem. When idiosyncratic country-pair factors are subsumed in the error term (the random-effect technique), if they happen to be correlated with some of the regressors (like GDPs), estimates are inconsistent. (For instance, mountainous terrain can be associated with both low GDP and low trade because it reduces agricultural productivity and raises trade costs.) An instrumental-variable technique developed by Hausman and Taylor (1981) must then be used. This technique is what we use here. Finally, time effects control for factors affecting trade worldwide such as oil-price changes or global booms and recessions.

Estimates from such equations have proved remarkably stable across studies. As most magnitudes are expressed in natural logarithms, coefficients obtained from linear estimation can be read directly as elasticities. The elasticity of trade to distance, for instance, is usually between -1 and -1.5, so a 10% increase in distance between two countries cuts their trade, on average, by 10 to 15%. Elasticities with respect to importing-country GDPs are also typically unitary, suggesting unitary income elasticities of imports at the aggregate level.

All else constant, landlocked countries tend to trade less with all their partners than coastal countries. Thus, landlockedness should be included in the gravity equation as a –negative– determinant of trade. Landlockedness can be approximated simply by the use of a dummy variable equal to one for

landlocked countries and zero otherwise.[3] Previous work on the issue shows that landlockedness measured this way proves to be a significant barrier to trade. This is what we find in the estimates reported in Table 1, obtained from a sample of 167 countries tracked over 1992-2005 (resulting in a sample size of 185'967 observations, the unit of observation being a country pair in a year).

In table 1, the first columns reports Generalized Least Squares (GLS) estimates of the random-effect model, i.e. estimates that do not correct for the possible correlation of regressors with the error term. The following three column report estimates using the Hausman-Taylor (HT) estimator, the first one using the same regressors, the second using populations as additional controls, and the third using the log of the real exchange rate between the two countries. All regressions use a proxy for the trading countries' transport and communication infrastructure taken from Limao and Venables (2001). This proxy is an index constructed as a weighted average of the density of road, paved-road, rail and fixed-telephony networks, and the reader is referred to the original paper for more details.

[3] The technique used here makes it possible to assess the effect of landlockedness on the trade of landlocked countries with *all* their partners rather than only with other landlocked partners.

Table 1
Results from baseline gravity equation

| Variables | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Ln importer's GDP | 0.852*** | 1.066*** | 0.973*** | 1.078*** |
| | [141.01] | [35.055] | [28.655] | [29.963] |
| Ln exporter's GDP | 1.069*** | 1.077*** | 0.954*** | 1.168*** |
| | [174.82] | [39.071] | [28.327] | [35.408] |
| Ln remoteness index, importer country | 0.463*** | 0.579*** | 0.409* | 0.503** |
| | [7.21] | [2.648] | [1.753] | [2.206] |
| Ln remoteness index, exporter country | 1.263*** | 0.919*** | 0.722*** | 1.049*** |
| | [19.78] | [4.220] | [3.100] | [4.705] |
| Ln distance | -1.437*** | -1.507*** | -1.494*** | -1.549*** |
| | [73.51] | [31.846] | [29.335] | [31.946] |
| Common border | 1.267*** | 0.984*** | 0.844*** | 0.901*** |
| | [12.48] | [4.364] | [3.443] | [3.877] |
| Importer country's landlockedness | -0.246*** | -0.245*** | -0.348*** | -0.105 |
| | [6.98] | [2.658] | [3.493] | [1.046] |
| Exporter country's landlockedness | -0.504*** | -0.408*** | -0.527*** | -0.287*** |
| | [14.31] | [4.424] | [5.194] | [2.836] |
| Importer country's infrastructure | 0.290*** | 0.269*** | 0.287*** | 0.226*** |
| | [13.13] | [6.519] | [6.850] | [4.694] |
| Exporter country's infrastructure | 0.507*** | 0.204*** | 0.226*** | 0.234*** |
| | [22.87] | [5.043] | [5.517] | [4.991] |
| Ln importer's population | | | 0.169** | |
| | | | [2.569] | |
| Ln exporter's population | | | 0.235*** | |
| | | | [3.720] | |
| Real exchange rate | | | | -0.043*** |
| | | | | [6.445] |
| # of obs | 185'967 | 185'967 | 185'967 | 154'871 |
| # of country pairs | 23'470 | 23'470 | 23'470 | 22'159 |

.

Note
Absolute value of t-statistics in brackets. ***, ** and * significant at the 1%, 5% and 10% level respectively (Absolute values of t-student are presented under the correspondent coefficients). The time dummy variables and the constant are not reported in order to save space.

Focusing on Column 2 (HT estimates, which are anyway not very different from those obtained by Generalized Least Squares reported in Column 1),

results are as expected. Income elasticities are close to unity. The elasticity with respect to distance, at -1.507, is also in line with current estimates in the literature. The effect of common borders is to raise trade by a factor of 2.67, or a whopping 167%.[4] The effect of the real exchange rate (RER), defined here as the value of the importing country's currency in terms of the exporting country's, is significant and negative as expected (an increase in the RER means a real appreciation of the exporting country's currency), although the elasticity is very small (a 10% appreciation reduces trade by half a percentage point). The coefficients on landlockedness are highly significant for both exporting ("*i*") and importing ("*j*") countries, and of course negative in both cases. Using algebra similar to that of footnote 4, landlockedness reduces exports by 33.5% and imports by 21.7%. To see this, simply note that, on the import side,

$$\ln X_{ij}^{L} - \ln X_{ij}^{NL} = -0.245 \qquad (1)$$

so

$$X_{ij}^{L} / X_{ij}^{NL} = e^{-0.245} = 0.7827 \qquad (2)$$

which implies an import reduction equal to 0.7827-1 = -0.21 or -21%.

Trade flows predicted using a gravity equation thus specified provide a good counterfactual to assess whether, and to what extent, Bolivia under-trades. The method simply consists of comparing actual trade with predicted trade for Bolivia, using the coefficients estimates obtained on the whole sample.

On the export side, the results are shown in the scatter plot of Figure 1. The

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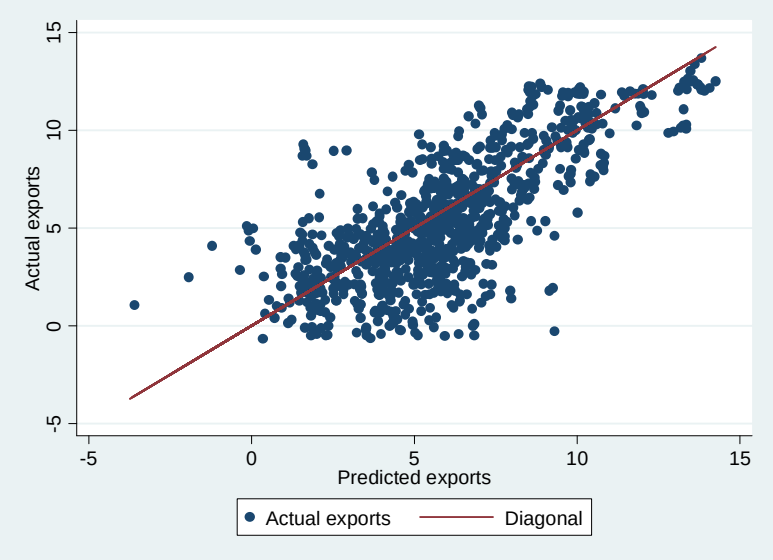
[4] Denote the log of trade between countries *i* and *j* by $\ln(M_{ij}^{cb})$ if they share a common border and by $\ln(M_{ij})$ if they don't. The effect of the common border on the log of trade is thus $\ln(M_{ij}^{cb}) - \ln(M_{ij}) = 0.984$, or $M_{ij}^{cb} / M_{ij} = e^{0.984} = 2.67$. Note that this effect is that of contiguity; borders themselves reduce trade compared to what it would be between two adjacent regions without a border, and that effect has been shown to be very large (see McCallum 1995 and Anderson and van Wincoop 2003).

horizontal axis measures Bolivia's predicted exports to each trading partner using the gravity equation, and the vertical axis measures actual exports. Points above the diagonal indicate "over-exporting" while points under the diagonal indicate "under-exporting".

Figure 1
Actual vs. predicted exports, Bolivia, 1992-2005

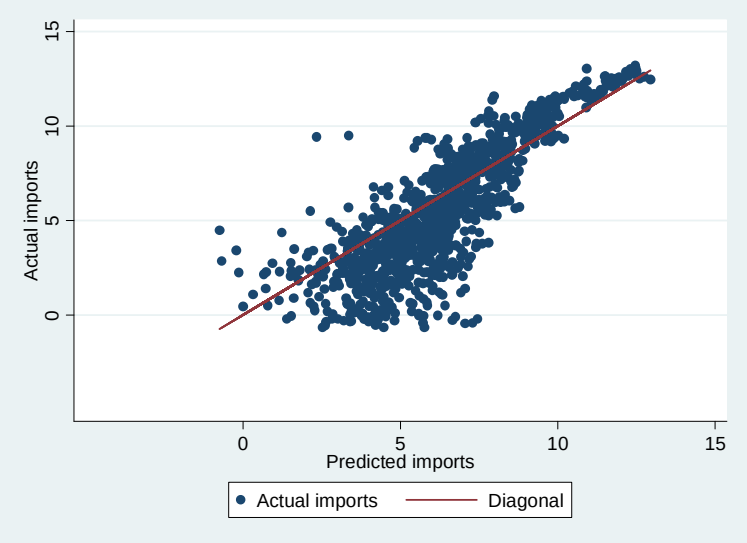



Source: Author calculations from COMTRADE

It can be seen that points –each of which corresponds to aggregate trade between Bolivia and one of its trading partners in a given year– are spread out around the diagonal with no particular pattern.

Figure 2 shows the same picture on the import side, where points are, again, scattered around the diagonal.

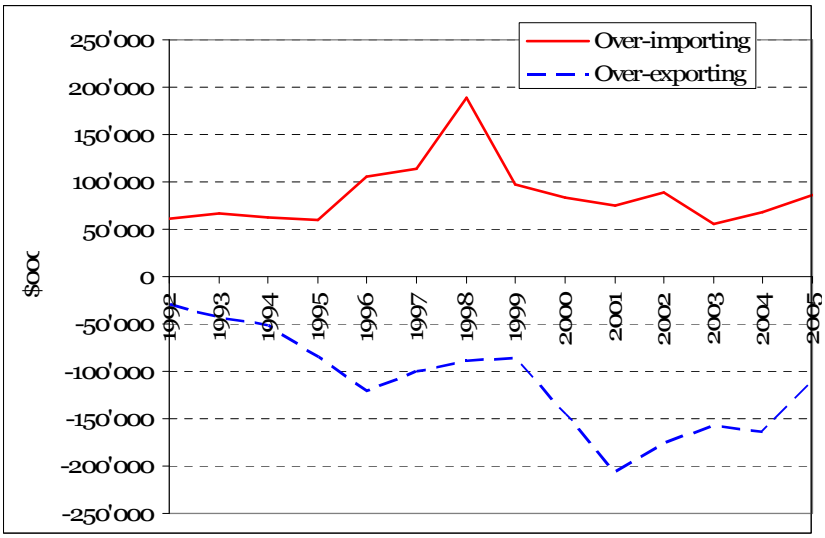
Figure 2
Actual vs. predicted imports, Bolivia, 1992-2005




Source: Author calculations from COMTRADE

In order to get a more synthetic picture, Figure 3 shows trade-weighted averages of Bolivia's over- (under-) trading vis-à-vis all of its trading partners.

Figure 3
Over-importing and over-exporting, Bolivia, 1992-2005



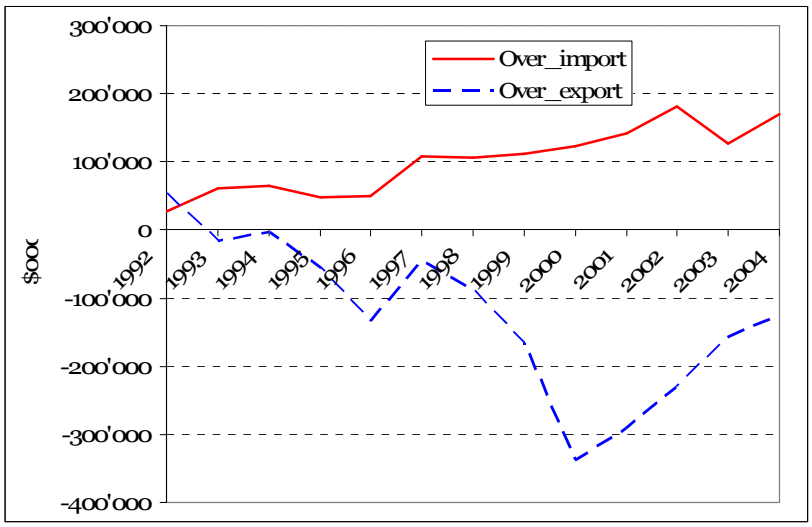

Notes
Thousand US dollars (current)
Source: Authors' calculations using COMTRADE

It can be seen that there is over-importing and under-exporting, although the margins are small (3.11% of predicted values on the import side and 10.8% on

the export side). The "under-exporting margin" seems to have been widening up to 2001, with an apparent reversal over 2001-2005.

Figure 4 shows the same picture vis-à-vis Bolivia's three largest partners in Latin-America: Argentina, Brazil and Chile. The result is essentially the same, which is not overly surprising given their large share in Bolivia's trade (which means that information contained in Figures 3 and 4 is not very different).

Figure 4
Over-importing and over-exporting vis-à-vis LA-3,*
Bolivia, 1992-2005

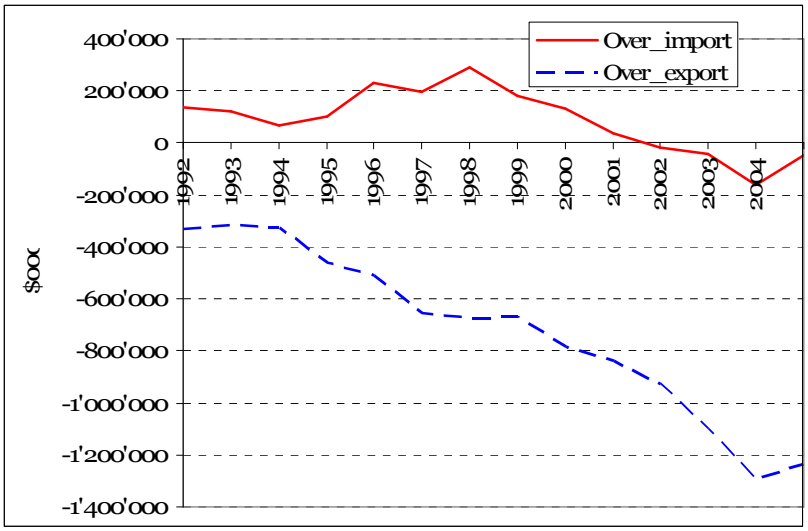



Notes
LA-3: Argentina, Brazil, Chile
Thousand US dollars (current)
Source: Authors' calculations using COMTRADE

Note that the values reported in Figure 4, like in Figure 3, are deviations from predicted values. Thus, they can be larger for a particular group of partners than overall, which is the case here since deviations from predicted values with LA-3 partners are larger than overall deviations. However, notwisthanding the higher volatility apparent in Figure 4, the pattern is roughly the same.

Vis-à-vis the United States, by contrast, the trend is towards increasing undertrading on both the export and import side, as shown in Figure 5.

Figure 5
Over-importing and over-exporting vis-à-vis US,
Bolivia, 1992-2005




Thousand US dollars (current)
Source: Authors' calculations using COMTRADE

The decline in exports to the US relative to predicted values highlights the failure of US preferences under the ATPA/ATPDEA to generate significant incentives for Bolivian exporters (see the companion paper on employment).

## 3. A further look into Bolivia's trade performance

Bolivia implemented trade reforms in the mid-1980s and its trade regime is now an open one characterized by a low and simple tariff structure. The median tariff is around 10% and capital goods bear low (5%) rates although tariff escalation is limited. Bolivia rarely uses contingent protection (e.g. anti-dumping) and does not use quantitative restrictions or licensing (except on public-health grounds) so that the ad-valorem equivalent of non-tariff barriers is, at 6%, one of the lowest on the continent (Giussani and Olarreaga 2006). This is consistent with our finding in the previous section that Bolivia imports more than predicted given its "fundamentals".

In spite of this open regime, Bolivia's trade, while growing, still shows weak integration in global trade networks. Bolivia's exports are highly concentrated geographically, with 60% going to either Mercosur or Andean Community

markets in 2004. At 12.7%, the US represents a relatively small share of Bolivia's exports, as shown in Table 2.

Table 2
Bolivia's exports by HS section: to the US and total

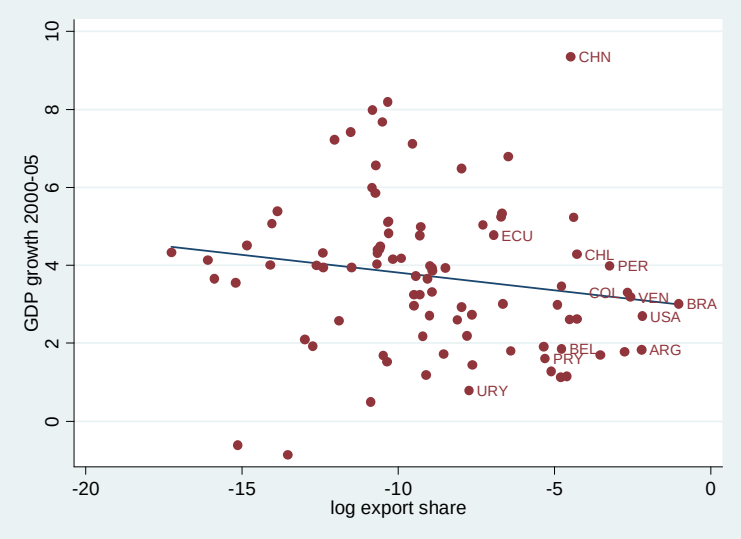
| HS section | | Bolivian exports, 2005 | | |
|---|---|---|---|---|
| | | To US | Total | US as percent of total |
| 1 | Live animals | - | 24'448 | - |
| 2 | Vegetables | 15'930 | 109'121 | 14.6 |
| 3 | Fats & oils | - | 128'188 | - |
| 4 | Food, bev. & tobacc. | 5'383 | 250'211 | 2.2 |
| 5 | Mineral 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* |

Table 2 shows that the US market matters essentially in wood products, textile & clothing, jewelry, and base metals. Of those, the textile & clothing sector might be the most vulnerable to the elimination of preferences, but, as we show in our companion paper (Cadot, Molina and Sakho 2008), the current uptake of preferences is very low.

A lower-than-predicted ability to export can be due to either internal factors –such as weak incentives for exporters or deficient infrastructure– or to slow growth in traditional export markets, if more dynamic markets are, for

instance, the most distant. This is indeed the case for Bolivia, as the correlation between the growth of Bolivia's export *markets* (in terms of real GDP) and their share in Bolivia's export portfolio is negative. A scatterplot of the GDP growth of Bolivia's export markets over 2000-2005 against their average share in Bolivia's exports (calculated over 1990-2005) is shown in Figure 6.

Figure 6
Growth of Bolivia's export markets



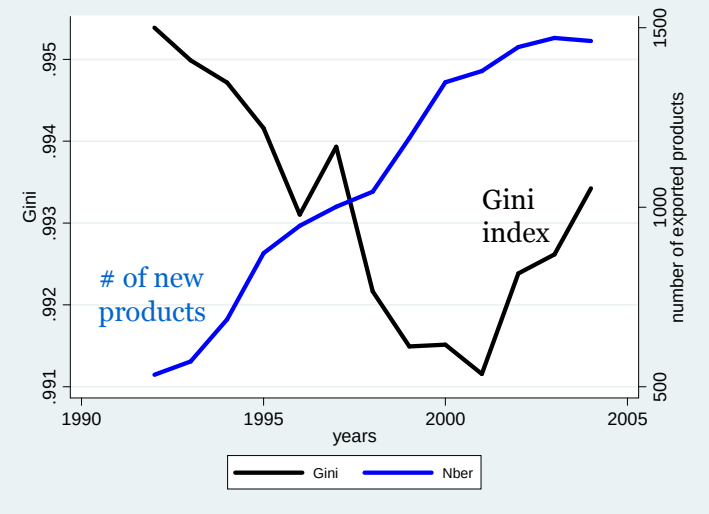

Notes: The vertical axis measures the average growth in the real GDP of countries to which Bolivia exports over 1992-2005. The horizontal axis measures the log of their share in Bolivia's exports over 1990-2005. Note that negative values on the horizontal axis are due to the fact that the log of a number below one (like a share) is negative.
Source: Authors' calculations using COMTRADE data.

It is apparent from Figure 6 that markets that account for a high share of Bolivia's exports (to the right of the figure) are also those that grow relatively slowly. Thus, part of Bolivia's slow export growth is, so to speak, "imported".

Product-wise, Bolivia's trade is highly concentrated product-wise. As Giussani and Olarreaga (2006) noted, in 2004 75% of its exports were traditional products, including soybeans, and close to 90% were primary products including coffee, sugar, fruit, cotton and chestnuts). Weak diversification is to be expected at low levels of income (see Carrère et al. 2007) and even more so for a country that is both landlocked and dependent on primary products (because Dutch-disease phenomena make diversification difficult); so, to

some extent, Guissani and Olarreaga's observations are to be expected. But they should also be nuanced. Over time, the product-wise concentration of Bolivia's exports has followed a non-monotone path shown in Figure 7.

Figure 7
New products and concentration in Bolivia's exports




Note: The line labeled "Nber" records the number of product lines added each year and satisfying the following two criteria: (i) the product was not exported in any of the previous two years; (ii) the product is exported for at least two years (the current year and the next).
Source: Authors' calculations from COMTRADE data

The rise of the Gini coefficient over 2000-2004 is a classic reflection of the effect of booming commodity prices on the export concentration of commodity exporters (as commodity prices rise, their already dominant share in total trade also rises, boosting concentration measures).[5] What is more informative is the trend over 1992-2000 which clearly displays shrinking concentration (or rising diversification). Thus, in spite of the severe structural handicaps suffered by Bolivia's exporters, some diversification seems to have taken place; although it, too, could also be the result of a price effect (in the opposite direction, i.e. shrinking commodity prices).

5 Note that the very high values of the Gini coefficient are not peculiar to Bolivia. They are a general feature of export Gini indices calculated at the HS6 level (see Carrère et al. 2007).

Giussani and Olarreaga also observe that "export entrepreneurship" is limited to a very small number of firms –approximately 700 in 2003, only few of which exported in significant amounts. They report that the average length of a Bolivian "export spell" (the number of years in which a given product is exported without interruption onto a given market –see Besedes and Prusa 1996a, 1996b for a full discussion) is shorter than for other LA countries. However, behind this bleak picture, there is also evidence of relatively active "export entrepreneurship". Looking again at Figure 2, the curve labeled "Nber" shows the number of new-product introductions in Bolivia's exports. Specifically, the curve records active product lines in year *t* that satisfy the following two criteria: (i) the products were not exported in any of the previous two years (*t-1* and *t-2*); (ii) they were exported for at least two years (*t* and *t+1*). Its rise over the whole period suggests an expansion of Bolivia's trade at the extensive margin.

Export entrepreneurship is typically high at low levels of income, and this is indeed what drives down export concentration as income rises. Thus again, active export entrepreneurship is to be expected at Bolivia's level of income. However, using predicted values from the regressions in Carrère et al. (2007), Bolivia is observed to have 32% more export entrepreneurship –as measured by the number of new products– than its level of income would warrant, as shown in Table 3. This performance is also higher than Latin America's average (19%).

Table 3
New products: Observed and predicted values, Bolivia vs. other LA countries

| | Nber of available years | observed number of "new exports" | predicted number of "new exports"[a] | Ratio[b] (%) |
|---|---|---|---|---|
| Argentina | 8 | 63.8 | 47.0 | +35.6 |
| Bolivia | 9 | 86.1 | 65.0 | +32.4 |
| Brazil | 12 | 60.3 | 78.2 | -22.9 |
| Chile | 11 | 80.6 | 76.2 | +5.8 |
| Colombia | 10 | 95.6 | 73.6 | +29.9 |
| Costa Rica | 7 | 103.6 | 78.1 | +32.6 |
| Ecuador | 10 | 82.0 | 68.4 | +19.9 |
| El Salvador | 7 | 106.4 | 73.8 | +44.2 |
| Guatemala | 8 | 131.0 | 71.2 | +84.1 |
| Honduras | 6 | 99.8 | 64.4 | +55.1 |
| Mexico | 11 | 49.0 | 71.4 | -31.4 |
| Nicaragua | 8 | 77.5 | 62.5 | +24.0 |
| Paraguay | 12 | 34.4 | 69.6 | -50.5 |
| Peru | 7 | 117.6 | 73.7 | +59.6 |
| Uruguay | 7 | 69.4 | 65.6 | +5.9 |
| Venezuela | 7 | 76.4 | 74.9 | +2.0 |
| **Latin America average** | **8.8** | **83.4** | **69.6** | **+19.8** |
| **East Asia average** | **9.3** | **65.3** | **67.7** | **-3.6** |

a) Computation based on the estimated coefficients reported in table 3.
b) 100*((observed col.2 /predicted col.3)-1).

Moreover, a decomposition of the number of new export products by Rauch's classification[6] (Table 4) shows that this export entrepreneurship is particularly active in differentiated products where Bolivia has almost double the number of predicted new products. In that, Bolivia's pattern of expansion at the extensive margin differs from Latin America's.

[6] Rauch (1999) distinguished between products traded on organized exchanges such as the LME, products with reference prices (listed in widely available publications like the Knight-Ridder CRB Commodity Yearbook), and differentiated products whose prices are determined by branding. He argued that finding markets for differentiated goods involves a sequential search for trading partners that can be long and costly and will in all likelihood involve networks based on ethnic, linguistic or other factors of proximity. Exporting products listed on organized exchanges, by contrast, (or, to a lesser extent, reference-priced products) involves anonymous markets and hence lower search costs. Evidence from a gravity equation supported this view.

Table 4
New products, by Rauch categories: Bolivia vs. other LA countries

| | Observed share in total new exports | | | Ratio observed/predicted | | |
|---|---|---|---|---|---|---|
| | Homo. | Ref. price | Diff. | Homo. | Ref. price | Diff. |
| Argentina | 0,32 | 0,27 | 0,42 | +53,5 | +21,2 | +51,9 |
| Bolivia | 0,09 | 0,16 | 0,76 | -53,5 | -48,9 | +95,4 |
| Brazil | 0,20 | 0,31 | 0,50 | +28,1 | -19,6 | -0,6 |
| Chile | 0,23 | 0,39 | 0,38 | +50,8 | +4,6 | -22,6 |
| Colombia | 0,13 | 0,34 | 0,53 | -21,9 | -3,4 | +14,9 |
| Costa Rica | 0,17 | 0,15 | 0,69 | +10,9 | -61,9 | +36,5 |
| Ecuador | 0,14 | 0,50 | 0,36 | -23,8 | +52,9 | -12,5 |
| El Salvador | 0,09 | 0,48 | 0,43 | -42,7 | +34,0 | -7,3 |
| Guatemala | 0,11 | 0,41 | 0,47 | -32,8 | +20,8 | +7,4 |
| Honduras | 0,30 | 0,30 | 0,41 | +58,8 | -3,2 | +6,6 |
| Mexico | 0,20 | 0,29 | 0,51 | +22,2 | -15,2 | +11,2 |
| Nicaragua | 0,09 | 0,31 | 0,60 | -53,9 | +5,4 | +63,8 |
| Paraguay | 0,26 | 0,34 | 0,40 | +50,9 | +1,1 | -6,2 |
| Peru | 0,09 | 0,54 | 0,37 | -46,7 | +52,6 | -20,0 |
| Uruguay | 0,21 | 0,42 | 0,37 | +21,6 | +31,7 | -9,6 |
| Venezuela | 0,12 | 0,37 | 0,50 | -20,4 | +2,8 | +4,0 |
| *Latin America average* | *0,17* | *0,35* | *0,48* | *+2,3* | *+2,8* | *+10,1* |
| *East Asia average* | *0,13* | *0,35* | *0,52* | *-25,0* | *+7,7* | *+25,2* |

# 4. Concluding remarks

Overall, evidence on Bolivia's under-trading is less than overwhelming. Using the coefficients of a gravity equation estimated on a large panel of countries, if one does not take landlockedness into account, Bolivia exports 43% less than predicted. However, landlockedness by itself reduces trade by 33% on average; thus, once Bolivia's landlocked position is taken into account, its under-exporting is reduced to a mere 10%. This pales relative to the penalizing effect of landlockedness itself. In addition, landlockedness has a very different meaning for, say, the Czech republic which has direct access to the EU's dense highway network, vs. for Bolivia which is surrounded by very difficult terrain and relatively poor transportation infrastructure in neighbouring countries (in

addition to its own). [7]

These results highlight the importance of choosing the right counterfactual to evaluate the country's relative trade performance. On the import side, Bolivia trades *more* than predicted, which is consistent with the fact that it has a trade policy that is rather open for its level of income. This is added to the fact that landlockedness has a lesser effect (-21%) on the import side than on the export side, so even apparent under-trading is smaller on the import side.

Bolivia's under-performance on the export side also cannot be analyzed in isolation to its international environment, and this raises a similar issue as to "what is the counterfactual". Shares in Bolivia's "export portfolio" are negatively correlated with the real GDP growth rates of its markets (i.e. it sells relatively more to slow-growing markets). Lastly, a relatively vigorous export entrepreneurship is apparent in our data given Bolivia's level of income.

[7] It is worth noting that infrastructure plays a neutral role for Bolivia as its infrastructure index is almost the same as the Latin American average in our sample. However infrastructure indices must be taken very cautiously, being at best incomplete measures of the true state and practicability of roads.

## References


Anderson, J. and E. van Wincoop. 2004. Trade Costs, *Journal of Economic Literature* 42, 691-751.

Brun, J.F., Carrère, C., Guillaumont, P. and Melo, J. de, 2005, "Has Distance Died? Evidence from a Panel Gravity Model", *World Bank Economic Review* 19, 99-120.

Carrère, C., 2006, Revisiting the effects of regional trade agreements on trade flows with proper specification of the gravity model, *European Economic Review*, 50, 223-247.

Giussani, Bruno and M. Olarreaga (2005), "Bolivia's CEM: Trade policy and Institutions"; mimeo, The World Bank.

Hausman, J.A. and Taylor, E., 1981, Panel data and unobservable individual effects, *Econometrica* 49, 1377-1398.

Limao, N. and A. Venables, 2001, Infrastructure, Geographical Disadvantage, Transport Costs and Trade. *World Bank Economic Review* 15, 451-479.

World Bank (2005), Bolivia CEM.