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The Impact of Trade Barriers on Exports:
The Case of Peru, 1992-2002[1]

by
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Abstract

This paper proposes a straightforward methodology to assess and estimate the impact of trade barriers on exports from the Peruvian economy. The results of the application of this methodology indicate that most favored nation (MFN) and/or generalized system of preferences (GSP) tariff rates imposed by developed countries on Peruvian exports are relatively low and, conversely, the number of non-tariff barriers (NTBs) and the average number of NTBs per export tariff line are relatively high. This difference produces a higher estimation of the export impact of the NTBs. An implication of these results is that the new wave of regional preferential trade agreements among developed and developing countries (which face a similar trade barrier structure to the Peruvian one) may not have meaningful effects on trade flows unless it is accompanied by substantial reductions in the number of NTBs per export tariff line.

Keywords: Most Favored Nation (MFN), Non Tariff Barriers (NTBs), Generalized Systems of Preferences (GSP), Tariffs, Gravity Equation.

Introduction

The continual decline of tariff rates as a result of eight GATT rounds of multilateral trade negotiations[2] and the proliferation of regional preference agreements among groups of countries has increased the relative importance of non-tariff barriers[3], both as protection and regulatory trade instruments[4] (United Nations Conference on Trade and Development [UNCTAD], 2005; World Bank, 2005). This shift on the use trade barrier instruments has originated two branches of literature: one on the measures and quantification of NTBs (e.g., Bora, Kuwahara, & Laird, 2002)[5] and the other on their trade impact. This paper deals with the second branch and provides, on the one hand, a straightforward methodology (that could be

used as a firsthand tool by government authorities) to asses the trade impact of both tariffs and NTBs faced by export firms from a particular developing country. On the other hand, it provides empirical evidence of the trade impact of these barriers for a medium size and middle-low income developing South American country, Peru. The empirical literature on the trade impact of NTBs starts in the 1970s when data was gathered and countries started to shift their standard tariff and quota instruments (within the core measures) to other NTBs (within core and non-core measures). Surveys of this literature are found in Haveman, Nair-Reichert, and Thursby (2003), Maskus and Wilson (2004), Maskus, Otsuki, and Wilson (2004), and Francois and Reinert (1997). This, in general, is concentrated upon the analysis of industrialized countries

(in particular the Organization for Economic Co-operation and Development (OECD) or European Community) with mixed results in terms of the significance and the magnitude of the effects of NTBs on trade flows.

Using a straightforward methodology, this paper, by analyzing one medium size developing country and using data at the six-digit level of the NABANDINA[6] classification system of Peru, attempts to eliminate estimation errors of multi-country methodologies as a result of the following factors: (a) the heterogeneity of the countries analyzed in previous work, (b) the difference in the degree of competitiveness factors among countries that may affect the impact of trade barriers[7], and (c) the high level of data aggregation. In addition, the simple gravity model used here allows the estimation of an index of the export share impact of eliminating the NTBs. The paper is organized in four sections. Section 1 provides a summary of the main trade barriers facing the Peruvian economy in 2002. Section 2 formulates the model specification and lists the variables and data used. Section 3 presents the main results. Finally, concluding remarks are presented in Section 4.

Trade Barriers in the Peruvian Economy, 2002[8]

Tables 1 and 2 report the weighted averages of the most favored nation (MFN) ad-valorem tariff rates and the number of non-tariff barriers imposed by Peruvian trading partners and by the International Standard Industrial Classification (ISIC) sector respectively in the year 2002. The figures for each ISIC sector only take into account export tariff lines with positive Peruvian export values. Within each sector and export country of destination, the weights are the Peruvian export share of each export value of the export tariff line out of the value of Peruvian export goods of that ISIC sector and country[9]. Data sources used here have been diverse. These include COMTRADE (United Nations, 2007); FTAA (Free Trade Area of the Americas, 2007), The Peruvian Customs office (ADUANET, 2006), The Integrated Tariff System of European Community, TARIC (European Commission, 2007) and the Trade Analysis and Information System, TRAINS (UNCTAD, 2007a).

The figures in the tables include 31 countries and two regions of countries[10]: the European Union or Community (EU)[11] and the Andean Community (And. Com). In these two cases and that of the United States, two sets of average tariffs have been computed: one from the MFN ad-valorem tariffs and the other from the GSP tariffs rates that these sets of countries have granted to Peruvian exports[12]. For the Andean Community, the tariffs reported are the ones established in the community trade agreement up to the year 2002[13]. Table 1 also reports the external tariff figures imposed by the individual Andean countries.

The figures reported in both tables together with the figures of the export composition and direction of trade reported in the last row of Table 1 indicate the following features[14]:

1. The major Peruvian export partners, which account for 70% of the total export value of Peru in 2002, are United States (US), European Union or Community (EU), Switzerland (SWI) and the Andean Community (And.Com). Each of them has a weighted average ad-valorem (MFN or preferential) tariff rate lower than 2,7%. The rest of the major Peruvian export partner countries have an ad-valorem tariff between 2,6% and 23,6%, the latter being the rate for India (IND).

2. Around 70% of the Peruvian total value exports in 2002 are goods belonging to ISIC sectors such as agricultural products, mining of uranium, thorium and metal ores, manufacture of processed food and beverages and manufacture of basic metals. In most of these sectors, the average (MFN or preferential) tariff rates are practically zero.

3. There is a negative association between export value share and the weighted ad-valorem tariff rate[16].

4. Contrarily to the case of the ad-valorem tariff, most of the major countries and regions impose NTBs on Peruvian exports, and some of them, such as the United States, the Andean Community and the European Union, impose the highest number of NTBs among the countries reported in Table 2.

5. Peruvian export of goods which face the highest number of NTBs belong to the following ISIC sectors: agricultural products, manufacture of processed food products and beverages, textiles, wearing apparels and chemical products.

6. The total number of NTBs that trade partner countries impose on the rest of the world is much higher than the number they impose on export goods from Peru. Thus, potential export firms from a developing economy such as Peru not only need to search out and exploit the country comparative advantage products, develop and create competitive advantage products, and overcome domestic market distortions but also need to deal with the extra costs caused by the NTBs imposed by trade partner countries.

These features of the data suggest that as a result of the GATT rounds, the regional preferential trade agreements and the generalized system of preferences (granted by large economies such as United States and the European Community), tariffs rates have been reduced close to nil for most of the main Peruvian export goods, in particular, those from the mining and metal ore ISIC sectors. However, the major Peruvian export partners (from both developed and developing countries) are still using non-tariff measures as an alternative way to impede market access, in particular, in the agricultural

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Table 1

Most Favored Nation Weighted Average Ad-Valorem Tariffs Faced by Peruvian Export Goods by ISIC Sector and Country of Destination, 2002

Description	ARG	ARGEL	AUS	BOL	BRA	BUL	CAN	CHI	CHIN	COL	S KOR	ECU	USA
Agricultural products	9.6	11.0	0.0	10.0	7.9	N.E.	0.2	6.8	21.2	14.2	2.0	10.9	4.7
Livestock	N.E.	N.E.	0.0	10.0	N.E.	N.E.	0.0	3.6	17.0	10.0	N.E.	8.7	0.0
Forestry	6.0	N.E.	N.E.	10.0	7.5	N.E.	0.4	7.0	13.0	10.0	5.6	10.0	0.1
Fishing	6.1	N.E.	N.E.	10.0	N.E.	35.0	0.0	7.0	16.2	N.E.	10.5	N.E.	0.4
Mining of coal and lignite; Extraction of peat	N.E.	N.E.	N.E.	10.0	N.E.	N.E.	N.E.	7.0	N.E.	N.E.	N.E.	5.0	N.E.
Extraction of crude petroleum and natural gas	0.0	N.E.	N.E.	N.E.	N.E.	N.E.	0.0	7.0	N.E.	N.E.	N.E.	N.E.	0.0
Mining of uranium, thorium and metal ores	2.0	N.E.	0.0	N.E.	3.5	0.0	0.0	7.0	4.2	5.0	1.0	5.0	0.0
Other mining and quarrying	0.0	N.E.	0.0	10.0	5.5	N.E.	0.2	7.0	17.0	5.0	3.0	5.0	0.4
Manufacture of processed food and beverages	10.8	17.5	1.1	9.9	11.2	4.6	1.7	6.9	8.5	15.1	8.9	13.7	3.9
Manufacture of tobacco products	N.E.	N.E.	N.E.	N.E.	21.5	N.E.	N.E.	7.0	N.E.	N.E.	N.E.	N.E.	0.0
Manufacture of textiles	18.0	15.7	2.3	8.9	17.5	22.0	14.5	6.8	13.5	4.3	5.5	15.6	15.9
Manufacture of wearing apparel	34.1	20.4	9.5	10.0	21.5	N.E.	18.6	7.0	N.E.	N.E.	12.7	20.0	18.1
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	11.8	N.E.	0.5	10.0	0.4	N.E.	10.7	3.4	N.E.	N.E.	8.0	15.4	5.3
Manufacture of wood and products of wood and cork	12.0	30.0	1.3	10.0	15.1	N.E.	0.3	0.0	15.0	14.9	8.0	14.4	7.8
Manufacture of paper and paper products	16.0	23.5	0.0	10.0	13.0	N.E.	0.0	0.0	N.E.	N.E.	N.E.	7.5	2.3
Manufacture of coke and refined petroleum products	0.0	N.E.	N.E.	10.0	0.0	N.E.	2.3	0.0	14.3	0.0	N.E.	0.3	0.0
Manufacture of chemical and chemical products	9.5	17.0	0.0	10.0	13.0	N.E.	2.0	7.0	12.3	7.2	8.0	9.1	4.0
Manufacture of rubbers and plastic products	14.1	11.1	0.1	10.0	8.8	N.E.	4.8	7.0	N.E.	N.E.	8.0	18.7	4.1
Manufacture of other non-metallic mineral products	9.8	17.0	2.3	10.0	13.5	N.E.	1.4	7.0	17.0	15.0	8.0	13.6	4.4
Manufacture of basic metals	6.1	N.E.	0.2	10.0	8.2	N.E.	0.7	7.0	12.9	5.0	7.9	5.7	2.8
Manufacture of fabricated metal products except machinery and equipment	16.6	26.2	0.6	9.9	15.5	N.E.	5.7	7.0	18.0	9.3	8.0	12.5	5.9
Manufacture of machinery and equipment n.e.c	14.5	5.1	0.7	8.3	13.8	N.E.	0.7	7.0	8.7	10.0	8.0	11.3	18.2
Manufacture of office machinery	8.6	N.E.	0.0	10.0	6.6	N.E.	0.4	7.0	N.E.	N.E.	N.E.	8.0	23.3
Manufacture of electrical machinery, radio and television apparatus	10.9	N.E.	1.2	7.4	17.5	N.E.	2.4	6.7	16.0	12.3	8.0	0.0	12.3
Manufacture of medical and optical instruments, watches and clocks	16.2	N.E.	0.0	10.0	15.5	N.E.	1.7	6.4	12.1	0.7	8.0	13.6	20.5
Manufacture of motor vehicles	25.7	9.5	6.5	6.9	35.0	N.E.	5.6	7.0	N.E.	N.E.	8.0	10.1	6.6

Trade Barriers

Continuation…

Description	ARG	ARGEL	AUS	BOL	BRA	BUL	CAN	CHI	CHIN	COL	S KOR	ECU	USA
Manufacture of other transport equipment	20.0	N.E.	N.E.	10.0	N.E.	N.E.	19.9	4.7	N.E.	N.E.	N.E.	18.0	7.8
Manufacture of furniture and manufacturing n.e.c.	18.4	17.7	0.0	10.0	19.5	N.E.	5.0	7.0	N.E.	N.E.	8.0	19.7	22.6
Others	0.3	N.E.	0.0	3.7	0.1	N.E.	0.2	1.8	9.6	5.2	0.9	7.7	0.1
Weighted average (%)	7.1	10.3	0.4	9.5	7.1	0.1	1.4	6.6	7.5	10.6	1.9	11.5	6.4
Exports value share (%)	0.2	0.2	0.5	1.2	2.5	0.4	1.8	3.3	7.8	2.1	2.2	1.8	25.8

Table 1

Most Favored Nation Weighted Average Ad-Valorem Tariffs Faced by Peruvian Export Goods by ISIC Sector and Country of Destination, 2002

ISIC Sector	USA-GSP	ELS	PHIL	And.Com	GUA	HON	IND	INDO	IRAN	JAP	MEX
Agricultural products	0.0	N.E.	N.E.	3.0	8.8	15.0	35.0	5.0	N.E.	4.9	22.2
Livestock	0.0	N.E.	N.E.	0.4	N.E.	N.E.	N.E.	N.E.	N.E.	0.0	11.5
Forestry	0.0	N.E.	N.E.	0.0	N.E.	N.E.	35.0	N.E.	N.E.	0.2	14.4
Fishing	0.0	N.E.	3.0	0.0	N.E.	N.E.	18.0	3.3	N.E.	4.4	20.0
Mining of coal and lignite; extraction of peat	N.E.	N.E.	N.E.	0.0	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.
Extraction of crude petroleum and natural gas	0.0	1.0	N.E.	0.0	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.
Mining of uranium, thorium and metal ores	0.0	N.E.	N.E.	0.0	N.E.	N.E.	5.0	N.E.	N.E.	0.0	13.0
Other mining and quarrying	0.3	N.E.	N.E.	2.3	0.0	10.0	29.5	5.0	5.0	0.0	8.9
Manufacture of processed food and beverages	1.7	16.6	3.0	3.2	7.9	4.1	35.0	0.1	0.0	1.6	14.7
Manufacture of tobacco products	0.0	N.E.	N.E.	0.0	N.E.	55.0	N.E.	N.E.	N.E.	N.E.	N.E.
Manufacture of textiles	0.7	3.8	10.0	0.5	17.6	11.2	30.0	5.0	N.E.	2.0	27.9
Manufacture of wearing apparel	9.3	21.7	10.0	0.0	22.0	15.0	N.E.	15.0	20.0	6.1	35.0
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	3.2	19.7	N.E.	0.0	15.0	15.0	N.E.	N.E.	N.E.	1.2	19.8
Manufacture of wood and products of wood and cork	7.5	0.5	N.E.	0.0	3.8	0.0	N.E.	N.E.	N.E.	1.6	20.7
Manufacture of paper and paper products	1.9	0.1	N.E.	0.0	0.1	3.1	N.E.	N.E.	N.E.	0.0	13.0
Manufacture of coke and refined petroleum products	0.0	0.0	N.E.	0.0	6.1	13.3	N.E.	0.0	N.E.	0.0	8.8
Manufacture of chemical and chemical products	2.5	2.6	3.8	0.0	2.8	4.6	32.5	0.7	5.0	0.1	21.9
Manufacture of rubbers and plastic products	0.7	6.9	N.E.	0.0	4.7	5.0	N.E.	15.0	2.5	5.4	19.6
Manufacture of other non- metallic mineral products	2.8	13.7	5.0	0.0	7.8	15.0	32.0	N.E.	N.E.	1.1	19.9
Manufacture of basic metals	1.5	0.0	2.3	0.0	0.1	0.0	35.0	2.6	N.E.	0.2	13.1
Manufacture of fabricated metal products except machinery and equipment	4.4	14.8	5.0	0.0	9.2	8.5	N.E.	N.E.	N.E.	1.0	23.5
Manufacture of machinery and equipment n.e.c	18.0	2.0	N.E.	0.0	2.3	13.0	N.E.	N.E.	N.E.	0.0	13.1
Manufacture of office machinery	23.3	0.0	N.E.	0.0	0.0	N.E.	N.E.	N.E.	N.E.	N.E.	0.0

Trade Barriers

Continuation…

ISIC Sector	USA-GSP	ELS	PHIL	And.Com	GUA	HON	IND	INDO	IRAN	JAP	MEX
Manufacture of electrical machinery, radio and television apparatus	12.3	12.5	N.E.	0.0	0.4	4.4	35.0	N.E.	N.E.	0.0	18.2
Manufacture of medical and optical instruments, watches and clocks	20.5	0.5	N.E.	0.0	0.0	0.0	N.E.	N.E.	N.E.	0.0	20.1
Manufacture of motor vehicles	6.6	0.1	N.E.	0.0	14.9	8.0	N.E.	N.E.	N.E.	0.0	19.2
Manufacture of other transport equipment	7.8	0.0	N.E.	0.6	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	30.0
Manufacture of furniture and manufacturing n.e.c.	22.4	15.0	N.E.	1.5	15.0	15.0	N.E.	10.0	N.E.	1.0	21.6
Others	0.0	5.7	3.6	0.0	8.5	9.8	22.4	2.0	0.0	0.0	5.5
Weighted average (%)	2.6	3.0	3.1	0.5	5.1	7.2	23.6	0.1	0.1	0.8	13.4
Exports value share (%)	25.8	0.3	0.2	6.5	0.4	0.1	0.3	0.3	0.3	4.9	1.7

Table 1

Most Favored Nation Weighted Average Ad-Valorem Tariffs Faced by Peruvian Export Goods by ISIC Sector and Country of Destination, 2002

ISIC Sector	RDOM	RUS	SING	SWI	TAIL	TAIW	TTOB	TUR	EU	EU-SGP	VEN
Agricultural products	20.4	5.0	0.0	0.0	N.E.	4.6	0.0	7.9	1.7	0.8	13.9
Livestock	N.E.	N.E.	0.0	0.0	N.E.	N.E.	N.E.	N.E.	0.3	0.0	5.0
Forestry	N.E.	N.E.	N.E.	0.0	N.E.	9.0	N.E.	N.E.	0.8	0.0	10.0
Fishing	20.0	10.0	0.0	0.0	15.0	5.0	N.E.	N.E.	5.7	0.0	19.7
Mining of coal and lignite; extraction of peat	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E	N.E.	N.E.
Extraction of crude petroleum and natural gas	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	0.0	0.0	N.E.
Mining of uranium, thorium and metal ores	NE.	5.0	N.E.	0.0	1.0	N.E.	0.0	N.E.	0.0	0.0	N.E.
Other mining and quarrying	9.8	N.E.	0.0	0.0	4.9	1.2	N.E.	N.E.	0.0	0.0	5.0
Manufacture of processed food and beverages	18.2	5.1	0.0	0.0	7.0	1.3	10.6	0.0	7.5	0.3	16.9
Manufacture of tobacco products	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E	N.E.	20.0
Manufacture of textiles	7.5	10.6	0.0	0.0	9.6	1.9	20.0	0.0	6.5	0.0	19.8
Manufacture of wearing apparel	20.0	0.1	0.0	0.0	13.7	12.3	N.E.	N.E.	11.7	0.0	20.0
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	20.0	N.E.	N.E.	0.0	N.E.	15.0	20.0	0.0	0.1	0.0	18.8
Manufacture of wood and products of wood and cork	14.5	N.E.	N.E.	0.0	N.E.	0.0	N.E.	0.0	1.1	0.0	16.2
Manufacture of paper and paper products	9.1	N.E.	N.E.	N.E.	N.E.	N.E.	0.0	N.E.	0.0	0.0	12.8
Manufacture of coke and refined petroleum products	N.E.	0.0	N.E.	0.0	N.E.	N.E.	N.E.	N.E.	0.0	0.0	10.0
Manufacture of chemical and chemical products	4.5	5.0	0.0	0.0	9.5	2.0	5.0	0.0	3.9	0.0	13.7
Manufacture of rubbers and plastic products	12.8	N.E.	N.E.	0.0	N.E.	N.E.	10.9	N.E.	3.7	0.0	19.3
Manufacture of other non- metallic m.neral products	11.5	N.E.	N.E.	0.0	N.E.	10.0	20.0	0.0	4.0	0.0	15.0
Manufacture of basic metals	9.7	N.E.	0.0	0.0	8.6	0.3	N.E.	N.E.	0.1	0.0	8.7
Manufacture of fabricated metal products except machinery and equipment	14.8	N.E.	N.E.	0.0	N.E.	N.E.	2.0	N.E.	3.3	0.0	23.7

Continuation…

ISIC Sector	RDOM	RUS	SING	SWI	TAIL	TAIW	TTOB	TUR	EU	EU-SGP	VEN
Manufacture of machinery and equipment n.e.c	18.8	N.E.	N.E.	0.0	5.0	2.7	18.4	N.E.	0.6	0.0	16.4
Manufacture of office machinery	6.0	N.E.	N.E.	N.E.	N.E.	N.E.	2.0	N.E.	1.3	0.0	5.0
Manufacture of electrical machinery, radio and television apparatus	7.6	N.E.	N.E.	0.0	N.E.	15.5	5.0	N.E.	0.9	0.0	11.3
Manufacture of medical and optical instruments, watches and clocks	3.0	N.E.	0.0	N.E.	N.E.	N.E.	2.0	N.E.	1.9	0.0	7.9
Manufacture of motor vehicles	14.3	N.E.	6.7	0.0	N.E.	N.E.	N.E.	N.E.	6.8	0.0	17.1
Manufacture of other transport equipment	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	4.5	0.0	20.0
Manufacture of furniture and manufacturing n.e.c.	20.0	20.0	0.0	0.0	N.E.	0.5	20.0	N.E.	2.2	0.0	18.3
Others	0.4	N.E.	0.0	0.0	1.3	0.4	1.3	N.E.	0.0	0.0	15.1
Weighted average (%)	9.8	5.1	0.0	0.0	3.0	0.8	3.6	0.1	2.1	0.1	16.3
Exports value share (%)	0.2	0.3	0.0	7.3	0.3	1.4	0.2	0.1	26.3	26.3	1.5

Note. Author's elaboration. United Nations (2007), ADUANET (2006), FTTA (2007), European Commission (2007). N.E. means there are no Peruvian export goods in all the export tariff lines of the respective ISIC sector. N.A. means no available tariff data in the respective ISIC Sector.

and manufacturing sectors wherein Peru has a relative comparative advantage. Another implication of the data and a result of the trade agreements carried out by the United States and the European Community with some Latin American countries (such as Central America, Chile, Colombia, Peru and Mexico) is that the new wave of regional agreements which started in the 1980s (Bhagwati & Panagariya, 1996; Ethier, 1998) between large developed economies and medium and small developing countries seems to provide instruments for developed countries (a) to replace unilateral concessions such as the GSP tariffs for reciprocal concessions wherein, in terms of ad-valorem tariff, those countries might be the net winners[17]; (b) to reinforce the establishment of the non-tariff barriers without eliminating them; and (c) to gain concessions in other trade-related areas such as trade in services, intellectual property rights and investment.

The Gravity Model Specification

For the purpose of the analysis for a particular developing country that faces trade barriers in its major export markets, the most simple model specification and the adequate in theoretical terms [18] to evaluate the trade barrier impact on the volume of trade is the gravity equation. The general specification can be written as

$$[G]\ X_{ijt} = \prod_{r}^{nr} Z_{rijt}{}^{\alpha_{rijt}}.\exp\left[\sum_{k=1}^{k} a_{r'k} R_{kijt}\right] e^{\varepsilon_{ijt}},\ \text{for}\ r' = nr + 1.$$

A simpler version proposed here is similar to [G] with a reduced set of independent variables. This version is

$$[1]\ VX_{ijt} = A.Y_{it}{}^{\alpha_1}.Y_{ijt}{}^{\alpha_2}.\exp\left[\sum_{k=1}^{2} a_{3k} R_{kijt}\right] e^{\varepsilon_{ijt}}.$$

Wherein VX_{ijt} (or VM_{ijt}) is the Peruvian exports fob value (in dollars) to (or the import value of Peruvian goods of) country of goods belonging to sector or export tariff line at period ; is the gross domestic product (GDP, in dollars) of the domestic developing country (D), Peru, which exports goods from sector or export tariff line i at period t; Y_{it} is the GDP (in dollars) of the foreign country (F), j, which imports goods from the Peruvian sector or export tariff line i at period t; R_{kijt} is the trade barrier instrument k imposed by country j to goods from sector or export tariff line i at period t; for R_{kijt}, is the ad-valorem tariff rate (in percentages), and for $k = 2$, R_{2ijt} is the number of non-tariff barriers; ε_{ijt} is the stochastic error; $A, \alpha_1, \alpha_2, \alpha_{31}$, and α_{32} are parameters to be estimated.

Even though the analysis of an economy at the six-digit level of aggregation of the Harmonized classification system may overcome errors of multi-country analysis as a result of the heterogeneity of the countries, the level of country competitiveness and development and the level of aggregation problems, other data disadvantages may arise. One is the omitted variables' bias due to the non inclusion of additional and relevant independent variables such as the terms of trade, real exchange rates and a set of cultural, geographic and monetary features between the Peruvian economy and its major trade partners, among others. The set of the trade partners' features in general is not correlated with the GDP variables (Y_{it} and Y_{ijt}), so it will not affect the bias of the estimators of the simple version of the gravity equation. On the other hand and

Trade Barriers

Table 2

Number of Non Tariff Barriers Facing Peruvian Exports by ISIC Sector and Country of Destination, 2002

ISIC Sector	ARG	ARGEL	AUS	BOL	BRA	BUL	CAN	CHI	CHIN	COL	S. Kor	ECU
Agricultural products	0	0	2	45	99	N.A.	76	687	5	106	0	389
Livestock	N.E.	N.E.	3	21	N.E.	N.A.	3	41	3	3	N.E.	72
Forestry	0	N.E.	N.E.	1	10	N.A.	5	18	0	12	0	27
Fishing	1	N.E.	N.E.	29	N.E.	N.A.	7	207	0	18	0	N.E.
Mining of coal and lignite; extraction of peat	N.E.	N.E.	N.E.	0	N.E.	N.A.	N.E.	2	N.E.	N.E.	N.E.	0
Extraction of crude petroleum and natural gas	3	N.E.	N.E.	N.E.	N.E.	N.A.	0	0	N.E.	N.E.	N.E.	N.E.
Mining of uranium, thorium and metal ores	0	N.E.	0	N.E.	0	N.A.	0	0	4	1	0	0
Other mining and quarrying	0	N.E.	0	4	12	N.A.	0	18	0	0	0	15
Manufacture of processed food and beverages	11	0	11	272	378	N.A.	55	1,002	2	165	3	496
Manufacture of tobacco products	N.E.	N.E.	N.E.	N.E.	5	N.A.	N.E.	0	N.E.	N.E.	N.E.	N.E.
Manufacture of textiles	21	0	0	2	2	N.A.	67	15	7	56	0	42
Manufacture of wearing apparel	0	0	4	0	0	N.A.	72	0	N.E.	N.E.	0	87
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	0	N.E.	0	0	0	N.A.	6	0	N.E.	N.E.	0	6
Manufacture of wood and products of wood and cork	0	0	0	0	2	N.A.	6	106	1	17	0	0
Manufacture of paper and paper products	13	0	0	3	1	N.A.	0	0	N.E.	N.E.	N.E.	3
Manufacture of coke and refined petroleum products	19	N.E.	N.E.	16	52	N.A.	0	0	16	17	N.E.	31
Manufacture of chemical and chemical products	9	0	3	201	1,468	N.A.	0	993	2	99	0	556
Manufacture of rubbers and plastic products	4	0	0	2	35	N.A.	2	8	N.E.	N.E.	0	19
Manufacture of other non- metallic mineral products	0	0	0	0	3	N.A.	0	0	0	0	0	4
Manufacture of basic metals	0	N.E.	0	0	3	N.A.	14	0	3	6	0	14
Manufacture of fabricated metal products except machinery and equipment	26	0	1	2	2	N.A.	7	0	0	3	0	14
Manufacture of machinery and equipment n.e.c	4	0	6	6	103	N.A.	0	27	2	3	0	22
Manufacture of office machinery	0	N.E.	1	0	3	N.A.	0	3	N.E.	N.E.	N.E.	0
Manufacture of electrical machinery, radio and television apparatus	74	N.E.	0	0	87	N.A.	1	20	0	11	0	0
Manufacture of medical and optical instruments, watches and clocks	14	N.E.	0	11	67	N.A.	0	15	0	1	0	38
Manufacture of motor vehicles	0	0	0	24	166	N.A.	2	64	N.E.	N.E.	0	148
Manufacture of other transport equipment	0	N.E.	N.E.	0	N.E.	N.A.	0	1	N.E.	N.E.	N.E.	12
Manufacture of furniture and manufacturing n.e.c.	3	0	0	0	11	N.A.	2	2	N.E.	N.E.	0	4
Others	12	N.E.	0	13	47	N.A.	1	47	6	1	0	30

Trade Barriers

Continuation…

ISIC Sector	ARG	ARGEL	AUS	BOL	BRA	BUL	CAN	CHI	CHIN	COL	S. Kor	ECU
Weighted average	2.4	0.0	0.4	1.0	2.6	N.A.	0.2	2.1	0.9	7.6	0.0	4.3
Number of NTBs faced by Peruvian X's	214	0	31	652	2,556	N.A.	326	3,276	51	519	3	2,029
Total number of NTBs	2,848	79	1,415	2,933	42,821	N.A.	2,122	14,707	1,566	13,971	151	7,750

Table 2

Number of Non Tariffs Barriers Facing Peruvian Exports by ISIC Sector and Country of Destination, 2002

Description	USA	ELS	PHIL	And.Com	GUA	HON	IND	INDO	IRAN	JAP	MEX
Agricultural products	352	N.E.	N.E.	1,419	0	0	1	7	N.A.	60	78
Livestock	43	N.E.	N.E.	127	N.E.	N.E.	N.E.	N.E.	N.A.	0	65
Forestry	20	N.E.	N.E.	18	N.E.	N.E.	1	N.E.	N.A.	1	14
Fishing	102	N.E.	0	96	N.E.	N.E.	1	3	N.A.	28	3
Mining of coal and lignite; extraction of peat	N.E.	N.E.	N.E.	0	N.E.	N.E.	N.E.	N.E.	N.A.	N.E.	N.E.
Extraction of crude petroleum and natural gas	2	0	N.E.	8	N.E.	N.E.	N.E.	N.E.	N.A.	N.E.	N.E.
Mining of uranium, thorium and metal ores	4	N.E.	N.E.	0	N.E.	N.E.	0	N.E.	N.A.	0	0
Other mining and quarrying	2	N.E.	N.E.	12	0	0	1	0	N.A.	0	0
Manufacture of processed food and beverages	2,077	0	1	3,247	0	0	2	8	N.A.	294	251
Manufacture of tobacco products	0	N.E.	N.E.	8	N.E.	0	N.E.	N.E.	N.A.	N.E.	N.E.
Manufacture of textiles	497	1	0	402	0	0	1	0	N.A.	14	243
Manufacture of wearing apparel	1,372	0	0	378	0	0	N.E.	0	N.A.	0	283
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	12	0	N.E.	101	0	0	N.E.	N.E.	N.A.	0	92
Manufacture of wood and products of wood and cork	112	1	N.E.	184	0	0	N.E.	N.E.	N.A.	0	44
Manufacture of paper and paper products	0	5	N.E.	38	0	0	N.E.	N.E.	N.A.	0	14
Manufacture of coke and refined petroleum products	0	0	N.E.	150	2	0	N.E.	3	N.A.	0	10
Manufacture of chemical and chemical products	258	6	0	5,637	4	0	0	1	N.A.	1	107
Manufacture of rubbers and plastic products	30	3	N.E.	139	0	0	N.E.	0	N.A.	0	51
Manufacture of other non- metallic mineral products	6	0	0	53	0	0	0	N.E.	N.A.	0	53
Manufacture of basic metals	48	1	0	132	0	0	0	0	N.A.	0	2
Manufacture of fabricated metal products except machinery and equipment	42	1	0	49	0	0	N.E.	N.E.	N.A.	0	31
Manufacture of machinery and equipment n.e.c	76	6	N.E.	114	0	0	N.E.	N.E.	N.A.	0	71
Manufacture of office machinery	14	2	N.E.	0	0	N.E.	N.E.	N.E.	N.A.	N.E.	0
Manufacture of electrical machinery, radio and television apparatus	144	4	N.E.	64	0	0	0	N.E.	N.A.	0	89
Manufacture of medical and optical instruments, watches and clocks	20	1	N.E.	141	0	0	N.E.	N.E.	N.A.	0	35
Manufacture of motor vehicles	342	0	N.E.	331	0	0	N.E.	N.E.	N.A.	0	21
Manufacture of other transport equipment	38	0	N.E.	57	N.E.	N.E.	N.E.	N.E.	N.A.	N.E.	1
Manufacture of furniture and manufacturing n.e.c.	92	1	N.E.	37	0	0	N.E.	0	N.A.	0	89
Others	80	3	0	204	0	0	3	0	N.A.	1	71
Weighted average	2.4	0.2	0.0	6.9	0.4	0.0	0.4	0.0	N.A.	1.2	2.0

Trade Barriers

Continuation…

Description	USA	ELS	PHIL	And.Com	GUA	HON	IND	INDO	IRAN	JAP	MEX
Number of NTBs faced by Peruvian X's	5,785	35	1	13,146	6	0	10	22	N.A.	399	1,718
Total number of NTBs	10,640	1,704	273	29,874	156	7	2,199	940	N.A.	1,232	14,430

Table 2

Number of Non Tariffs Barriers Facing Peruvian Exports by ISIC Sector and Country of Destination, 2002

Description	RDOM	RUS	SING	SWI	TAIL	TAIW	TTOB	TUR	EU[1]	VEN
Agricultural products	N.A.	1	0	123	N.E.	186	0	0	42	70
Livestock	N.A.	N.E.	1	4	N.E.	N.E.	N.E.	N.E.	8	6
Forestry	N.A.	N.E.	N.E.	3	N.E.	4	N.E.	N.E.	6	15
Fishing	N.A.	0	1	0	0	1	N.E.	N.E.	12	7
Mining of coal and lignite; extraction of peat	N.A.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.
Extraction of crude petroleum and natural gas	N.A.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	1	N.E.
Mining of uranium, thorium and metal ores	N.A.	0	N.E.	0	0	N.E.	0	N.E.	0	N.E.
Other mining and quarrying	N.A.	N.E.	0	1	0	8	N.E.	N.E.	3	0
Manufacture of processed food products and beverages	N.A.	0	3	98	0	173	1	0	426	326
Manufacture of tobacco products	N.A.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	4
Manufacture of textiles	N.A.	0	0	1	0	0	0	N.A.	552	16
Manufacture of wearing apparel	N.A.	0	0	3	0	4	N.E.	N.E.	498	20
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	N.A.	N.E.	N.E.	0	N.E.	0	0	N.A.	90	45
Manufacture of wood and products of wood and cork	N.A.	N.E.	N.E.	0	N.E.	0	N.E.	N.A.	17	8
Manufacture of paper and paper products	N.A.	N.E.	N.E.	0	N.E.	N.E.	0	N.E.	0	8
Manufacture of coke and refined petroleum products	N.A.	0	N.E.	14	N.E.	N.E.	N.E.	N.E.	36	53
Manufacture of chemical and chemical products	N.A.	0	0	2	0	50	0	N.A.	29	146
Manufacture of rubbers and plastic products	N.A.	N.E.	N.E.	0	N.E.	N.E.	0	N.E.	3	28
Manufacture of other non- metallic mineral products	N.A.	N.E.	N.E.	0	N.E.	0	0	0	17	8
Manufacture of basic metals	N.A.	N.E.	0	0	0	1	N.E.	N.E.	16	9
Manufacture of fabricated metal products except machinery and equipment	N.A.	N.E.	N.E.	0	N.E.	N.E.	0	N.A.	19	25
Manufacture of machinery and equipment n.e.c	N.A.	N.E.	N.E.	0	0	1	2	N.E.	1	27
Manufacture of office machinery	N.A.	N.E.	N.E.	N.E.	N.E.	N.E.	0	N.E.	0	0
Manufacture of electrical machinery, radio and television apparatus	N.A.	N.E.	N.E.	0	N.E.	4	0	N.E.	18	20
Manufacture of medical and optical instruments, watches and clocks	N.A.	N.E.	0	N.E.	N.E.	N.E.	0	N.E.	2	0
Manufacture of motor vehicles	N.A.	N.E.	0	0	N.E.	N.E.	N.E.	N.E.	0	38
Manufacture of other transport equipment	N.A.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	0	0
Manufacture of furniture and manufacturing n.e.c.	N.A.	0	0	3	N.E.	0	0	N.E.	58	35
Others	N.A.	N.E.	0	0	0	5	0	N.E.	5	4
Weighted Average	N.A.	0.0	0.0	0.0	0.0	1.5	3.6	0.0	0.7	2.0
Number of NTBs faced by Peruvian X's	N.A.	1	5	252	0	437	3	0	1,859	918
Total Number of NTB	N.A.	434	206	2,048	27	4,691	42	768	4,524	5,220

Note. Author's elaboration. United Nations (2007), ADUANET (2006), FTTA (2007), European Commission (2007). N.E. means there are no Peruvian export goods in all the export tariff lines of the respective ISIC sector. N.A. means no available non-tariff data for the Peruvian export tariff lines of the respective ISIC sector. 1 The number of restrictions for the EU is the average of the restrictions of the 11 countries in the European Union.

under the maintained hypothesis that trade barriers affect negatively trade flows, the expected value of the estimator of the simpler version could still be negative under a wide range of values of the overall effect of the remaining omitted variables.[19] Another major disadvantage of the simpler specification is that, usually, there are no time series data for tariffs and NTBs. This implies that the time series regression given in [1] cannot be estimated. To overcome this latter problem, equation [1] is estimated in two stages according to the following specifications:

[1.1] $d\ln(VX_{ijt}) = d\ln A + \alpha_1.d\ln(Y_{it}) + \alpha_2.d\ln(Y_{ijt}) + \mu_{ijt}$; $t = 1992....2002$

[1.2] $\ln VX_{ijt*}\,e = \ln(VX_{it\,(t*-1)}) + d\ln(VX_{ijt*})e$

[1.3] $\ln VX_{ijt*}\,.e = \alpha_0 + \sum_{k=1}^{k=2} \alpha_{3k}.R_{kijt*} + \varepsilon_{ijt*}$; $i = 1,..., N_h$

Where in $d\ln(VX_{ijt*}e)$ and $\ln(VX_{ijt*}e)$ are variables estimated using the regression estimates of equation [1.1] and equation [1.2] respectively; t^* is the year 2002, and N_h is the number of export tariff lines of sector h. The time series first stage of equation [1] is estimated in differential of the natural logarithm to avoid spurious correlations (i.e., using [1.1]). Cross section and/or time series evidence, mostly for developed countries, yield positive signs of the estimates α_1 and α_2 which are consistent with the theoretical basis of the gravity equation [20]. Thus, an increase of the GDP of both the exporting and importing country will increase export (import) flows, either as a result of: (a) the high trade share of the differentiated and manufactured monopolistic competitive goods, or (b) because of the increasing divergence in the capital and labor endowment of these countries (Evenett & Keller, 2002), or (c) under constant elasticity of substitution between goods of the demand for imports and constant elasticity of transformation among goods in the supply of exports (Bergstrand, 1985). For developing countries with comparative advantage in natural resources and, to a lesser extent, in unskilled labor and in time series data, negative signs of parameter α_1 and α_2 are also feasible. Thus, an increase in the domestic (foreign) GDP, because of a higher level of capital or higher price of the import substituting products, by supply or output reallocation of resources effect or because of a higher domestic demand, will decrease exports (imports).

In the second stage cross section equation [1.3], the α_{3k} parameter that measures the trade impact of NTBs could also have different signs. In the case of tariffs (i.e., $k = 1$), under standard comparative advantage trade models, the sign of α_{31} is negative[21]. That is, an increase in the tariff rate of the foreign country will decrease the export (or import) value of the domestic country. The impact of NTBs on trade flows (i.e., for $k = 2$), however, will depend upon (a) the measure of the NTBs, (b) the type or group of NTBs and (c) the type of theoretical arguments about the NTBs' impact.

According to Bora (2003), studies on the trade impact of NTBs (related to: (a) domestic support and export subsidies, (b) quantitative restrictions, and export cartels) show that these produce negative effects on trade flows.

Theoretical arguments, partial and general equilibrium models[22] and evidence of NTBs, related to technical standards or barriers, and harmonization of international trade procedures, mostly for developed countries, yield mixed impacts. Maskus and Wilson (2004) summarized the literature for this group of NTBs. Technical standards may promote exports (imports). By adhering to compatibility requirements, countries can improve their integration with global information and telecommunications networks. On the other hand, some forms of coordination of the international harmonization of technical standards could expand market access and exports (imports). The arguments for a negative impact on exports (imports) of technical barriers are based upon (a) increasing cost of production, (b) restraining competition or the creation of market segmentation and the raising of market power, (c) lack of facilities for certification and testing in developing countries and (d) increasing transaction costs for protectionist reasons (e.g., producing inspection delays and/or imposing arbitrary fees; Maskus et al., 2004). The econometric and survey studies are also consistent with the theoretical mixture of trade impacts (e.g., Henson, Loader, Swinbank, Bredahl, & Lux, 2000; Moenius, 1999; OECD, 1999; Swann, 1996; United States International Trade Commission, 1998).

An alternative approach to measure the negative impact of trade barriers on exports is by estimating what Kee et al. (2006) called the market access overall trade restrictiveness index. Using a multi-country complex econometric methodology and the theory of the trade restrictiveness indices (e.g., Anderson & Neary, 1992, 1994, 1996), they compute, for the case of Peru and with trade barriers (tariffs and NTBs) data for 2000-2001, that the ad-valorem equivalent tariff[23] to the set of trade barriers faced by Peruvian exporters (from the rest of the world) increases from 10,8% to 16,5 % when NTBs are taken into account. This means that the tariff effect of NTBs increases by more than 50% the equivalent tariff resulting from the effect of tariff barriers. As shown below, this result is consistent with the estimations obtained with the simple one-country methodology presented in this paper.

Regardless of these different approaches and evidence, the maintained conjecture in this paper is that the trade flow impact of a NTB is always negative for firms from developing countries whenever the NTB (a) produces international markets distortion, (b) is conclusively a protectionist barrier and (c) yields a long-term benefit for firms as a result of standards harmonization or shared standards. In the first two cases, the NTB needs to be eliminated. In the third case, the short-term impact may still be negative because firms in developing countries face a set of domestic distortions that limit or distort the

comparative and competitive advantage of the country[24]. Even if, in the long run, standard harmonization (shared or not) and coordination among countries could have a positive impact, in the short term or in the transition period, they add an extra cost for developing countries' exporters and potential firms that could deter even further the access to foreign markets[25]. In this case, because of the asymmetry among firms' degree of development and/or the potential inequality of the trade gains distribution that might arise as a result of standardization efforts, a redistributive mechanism needs to be created in order to eliminate the additional costs for firms in developing countries.

The impact of trade barriers as a result of estimations of equations [1.1]-[1.3] can be summarized using the export impact indexes. Here, two indices are defined: the partial impact index and the total impact index. In the first case, the index measures the change of the country export share of sector i (out of the total Peruvian export value) when the tariffs and/or the number of NTBs of the export tariff lines of that sector, imposed by country j, is reduced by one unit. The total impact index measures the changes of the same export shares when all the tariffs and/or NTBs of country j are completely eliminated in that sector. When the sector i is the total Peruvian export sector, the partial export impact index is defined by equation [1.7]', derived from equations [1.4]-[1.7] in the following way:

[1.4] $(\Delta VX_{ij} / VX_{ij}) = \alpha_{3kj}.\Delta R_{kij}; k = 1,2$

[1.5] $\Delta VX_{ij} = \alpha_{3kj}.VX_{ij}.\Delta R_{kij};$

[1.6] $PEII_{ij} = \sum_{i=1}^{N} (\Delta VX_{ij} / VX_{t}).100;$ is the total export value at period t.

[1.7] $PEII_{j} = \alpha_{3kj}.e.\left[\sum_{i=1}^{N} VX_{ij}.(\Delta R_{kij})/VX_{t}\right].100;$ is the number

of export tariff lines in sector ;

[1.7]′ $PEII_{j} = \alpha_{3kj}.e.S_{kj}.S_{j};$

Where S_{kj} is the share of the export value of the export tariff lines with positive trade barrier k out of the total (Peruvian) export value to country j; S_{j} is the share (multiplied by 100) of the value of exports to country j out of the total country export value, and $\alpha_{3kj}e$ represents the estimated coefficients from regression equation [1.3]. The total export impact index is defined by

[1.8] $TEII_{j} = \alpha_{3kj}.e.Ra_{kj}.S_{j};$

Wherein Ra_{kj} is the weighted average[26] of the trade barrier k imposed by (the foreign) country j to goods from Peru (the domestic country).

The export impact indices, partial and total, for changes of the trade barriers of the sector h from country j are, analogously, defined respectively by

[1.9] $PEII_{jh} = \alpha_{3khj}e.S_{khj}.S_{hj}.S_{j};$

[1.10] $TEII_{jh} = \alpha_{3khj}e.Ra_{khj}.S_{hj}.S_{j};$

Where S_{khj} is the share of export value of sector h with a positive trade barrier k out of the total export value of sector h; S_{h}, is the share of the export value of sector h to country j out of the total export value to country j; Ra_{khj} is the weighted average of the trade barrier k imposed by country j in sector h. It is clear from these indices, that to the extent that tariff barriers (i.e., $k = 1$) have been reduced (i.e., $S_{1hj} = S_{1j} = Ra_{1hj} = R_{a1j} \longrightarrow 0$), the NTBs are barriers that may produce the higher levels of export impact in developing countries.

Estimations and Results

Tables 3 and 4 report the estimated figures of the regression coefficients of equations [1.1] and [1.3] and the computations of the export impact indices according to equations [1.7]'-[1.10] for five Peruvian export partners which represent 75% of the total Peruvian export value of goods in 2002. In the case of the European Union, regression equations have been estimated taking into account the average export value of goods and the GDP dollar value of the main 11 export partner countries of the European Union[27]. Tariff rates and NTBs are the same for any of these countries. Also, for each country and the main export partners of the European Union, the regression coefficients of equation [1.3] have been estimated from sectors with a feasible number of observations (i.e., numbers of export tariff lines) for estimation purposes and in which Peruvian exporters face variable ad-valorem tariff rates and/or meaningful numbers of NTBs.

Although statistically the estimation results for the first stage equation [1.1] are relatively weak, the sign of the coefficients estimated seems to be consistent with Peruvian comparative advantage in natural resources and unskilled labor and foreign country comparative (e.g., in capital goods or unskilled labor) and competitive advantages. On the other hand, estimation results of the second stage equation [1.3] (with statistical significance for the majority of the regression coefficients, in particular from the two major export partners, the United States and the European Union) are consistent with a negative impact of both trade barriers (tariffs and NTBs) on exports[28]. Moreover, the estimates are also consistent with those from more complex and complete gravity specifications found in the literature (e.g., Kee et al., 2006; Tello, 2008). Figures from Table 4 show a series of features of the trade barriers and their impact on exports in the Peruvian export sector:

1. Except for Chile, the share of Peruvian exports which face NTBs (out of the total export value to a country) is higher that the respective share of exports which face tariff barriers.

Trade Barriers

Table 3

Regression Results

Country- HS sector	Export[1] share 2002 (%)	GDP coefficients		No	Trade barriers coefficients		No
		$(\alpha_1; D)$	$(\alpha_2; F)$		$(\alpha_{31}; T)$	$(\alpha_{32}; NTB)$	
United States (US)	25.8	-0.680 (-1.647)*	1.133 (0.485)	7475	-0.222 (-16.8)*	-0.229 (-11.1)*	1652
Fish and crustaceans, molluscs and other aquatic invertebrates (03)	0.29				-0.434 (-0.799)	-1.056 (-5.90)*	44
Edible vegetables and certain roots and tubers (07)	0.44				-0.283 (-2.12)*	-0.272 (-2.53)*	35
Articles of apparel and clothing, accessories, knitted or crocheted (61)	0.80				-0.182 (-3.00)*	-0.509 (-5.73)*	79
Articles of apparel and clothing, accessories, not knitted or crocheted (62)	0.24				-0.423 (-5.98)*	-0.306 (-4.50)*	77
Other made-up textile articles; sets; worn clothing and worn textile articles; rags (63)	0.02				-0.762 (-6.36)*	-0.310 (-1.64)	24
European Union (EU)	26.3	-0.403 (-1.13)	0.210 (0.531)	5717		-1.219 (-10.9)*	892
Fish and crustaceans, molluscs and other aquatic invertebrates (03)	0.83					-4.20 (-3.20)*	33
Edible vegetables and certain roots and tubers (07)	0.54					-3.53 (-2.37)*	29
Articles of apparel and clothing, accessories, knitted or crocheted (61)	0.66					-2.23 (-9.15)*	43
Articles of apparel and clothing, accessories, not knitted or crocheted (62)	0.09					-1.82 (-6.33)*	41
Other made-up textile articles; sets; worn clothing and worn textile articles; rags (63)	0.01					-2.87 (-9.07)*	23
China (CHIN)	7.8	-1.050 (-0.139)	1.889 (0.206)	81	-0.550 (-11.05)*	-0.375 (-0.430)	53
Mineral Products (25-27)	2.7				-0.185 (-0.859)	-2.143 (-0.404)	6
Textiles and Textile Articles (50-63)	0.11				-0.532 (-7.11)*	-0.175 (-0.882)	10
Fish and crustaceans, molluscs and other aquatic invertebrates (03)[2]	0.13					-1.414 (-0.345)	5
Japan[2] (JAP)	4.9	-0.049 (-0.221)	0.358 (2.12)*	1038	-0.087 (-1.98)*	0.060 (1.62)	258
Prepared foodstuffs; beverages, spirits, and vinegar; tobacco and manufactured tobacco substitutes (16-24)[2]	1.46				-0.335 (-3.16)*	0.051 (1.25)	25
Textiles and Textile Articles (50-63)[2]	0.19				-0.174 (-2.16)*		68

Trade Barriers

Continuation…

Country- HS sector	Export[1] share 2002 (%)	GDP coefficients		No	Trade barriers coefficients		No
		$(\alpha_1; D)$	$(\alpha_2; F)$		$(\alpha_{31}; T)$	$(\alpha_{32}; NTB)$	
Chile[2] (CHI)	3.3	-0.112 (-0.232)	0.575 (1.67)*	4233		-0.003 (-0.226)	281
Live animals; animal products (01-05)[2]	0.02					-0.015 (-0.132)	11
Textiles and textile articles (50-63)[2]	0.33					-0.298 (-1.54)	5

Note: Author's estimations. [1]ADUANET (2006); [2]The second stage regression includes the constant term. No= Number of export tariff lines. Numbers in parentheses are t-statistics; * means at most 10% level of significance.

2. The main Peruvian export partners from developed countries (with or without GSP) are using NTBs as the main instruments to limit market access to Peruvian exports. On the other hand, the main Peruvian export partners from developing countries are still using tariff barriers as the main trade barrier to limit the market access of Peruvian goods[29];

3. The main Peruvian export partners from developed countries use at least one type of trade barrier whenever the other type is reduced or eliminated. Thus, the lower the average tariff rate (or the number of NTBs per export tariff line) in a sector, the higher the average number of NTBs per export tariff line.

4. Elimination of all NTBs from the major Peruvian export partners from developed countries is estimated to increase the export share value of exports by more than double (i.e., 38,9%) the increase of this share in the case that all ad-valorem tariff rates are eliminated (i.e., 15,2%) in those countries. This result is a direct consequence of the lower level of the tariff rates (i.e., on average lower than 2,7%).

These results suggest that regional trade preferential agreements between developed and developing countries, with a similar trade barrier structure to that in the Peruvian economy, may not promote exports and GDPs in a meaningful way in these developing countries[31]. The export impact of those agreements will be higher if both tariff and NTBs are simultaneously eliminated or, alternatively, if tariff rates and distorting NTBs are eliminated and standards harmonization and country coordination, which produces a long-term positive export impact, are implemented with some kind of transfer mechanism from developed countries' to developing countries' export firms that avoids the extra cost caused by the harmonization and coordination of these standards.

Conclusions and Final Remarks

This paper has presented a straightforward metho-dology that can be used by country authorities as a firsthand (although gross) tool to assess and estimate the impact of trade barriers on exports faced by a particular developing country. The methodology uses few and feasible variables that are found in standard statistics from developing countries and trade data at a six-digit level of aggregation of the harmonized classification system. The application of this methodology to the Peruvian case yields consistent results similar to multi-country sophisticated and complete methodologies. The main results of the trade barrier analysis and their impact on exports for the Peruvian economy are as follows:

1. The increased importance of NTBs (as protectionist and regulatory trade instruments) and the continual decline of tariff rates that resulted from the eight GATT rounds of multilateral trade negotiations and the proliferation of regional preference agreements among regions of countries have implied that by 2002, more than 70% of the total Peruvian exports (to the main trade partners[32]) face low levels of ad-valorem tariff rates simultaneously with relatively high levels of the number of NTBs and the average number of NTBs per export line.

2. Tariffs and NTBs faced by Peruvian exports of goods, in particular from developed countries are concentrated on agricultural products, manufacture of processed food and beverages, and textiles.

3. Both tariffs and NTBs are estimated to have a negative impact on Peruvian export of goods. This impact is consistent with theoretical arguments, partial and general equilibrium models and previous empirical evidence and with more complex methodologies which are extensive in the use of data sources and variables.

These results suggest that the new wave of regional preferential trade agreements among developed and developing countries, which face similar trade barrier structures to those faced by Peruvian exports, may not have meaningful effects on trade flows unless it is accompanied by substantial reductions in the number of NTBs per export tariff line.

Trade Barriers

Table 4

Export Share Trade Barriers Impact Indexes for the Peruvian Economy: 2002

Country-HS sector (h)	Sj (%)/ Sjh	Sjt/ Sjth	Sjntb/ Sjntbh	Weighted average per tariff line		Tariff impact (%)		Non tariff barrier impact (%)	
				Tariff	NTB	Partial	Total	Partial	Total
United States	25.8	0.149	0.336	2.6	2.44	0.85	14.9	1.99	14.4
Fish and crustaceans, molluscs and other aquatic invertebrates (03)	0.012	0.067	0.999	0.17	6.5	0.01	0.02	0.33	2.1
Edible vegetables and certain roots and tubers (07)	0.018	0.371	1.0	3.7	15.0	0.05	0.48	0.12	1.9
Articles of apparel and clothing, accessories, knitted or crocheted (61)	0.032	0.919	1.0	11.3	9.0	0.14	1.69	0.22	3.7
Articles of apparel and clothing, accessories, not knitted or crocheted (62)	0.010	0.945	1.0	9.1	11.2	0.10	0.95	0.07	0.9
Other made-up textile articles; sets; worn clothing and worn textile articles; rags (63)	0.001	0.661	1.0	6.4	4.7	0.01	0.10	0.01	0.03
European Union	26.3	0.021	0.207	0.1	0.654	na	na	6.62	20.9
Fish and crustaceans, molluscs and other aquatic invertebrates (03)	0.033	0.002	0.011	3.6	0.669	na	na	0.040	2.426
Edible vegetables and certain roots and tubers (07)	0.021	0.018	0.003	6.3	0.216	na	na	0.006	0.430
Articles of apparel and clothing, accessories, knitted or crocheted (61)	0.026	0.000	0.999	0.0	5.016	na	na	1.536	7.707
Articles of apparel and clothing, accessories, not knitted or crocheted (62)	0.003	0.000	0.999	0.0	4.847	na	na	0.167	0.808
Other made up textile articles; sets; worn clothing and worn textile articles; rags (63)	0.000	0.000	0.965	0.0	5.766	na	na	0.018	0.108
China	7.8	0.766	0.938	7.5	0.95	3.287	32.16	2.742	2.778
Mineral products (25-27)	0.346	0.324	0.905	4.2	0.91	0.162	2.10	.228	5.261
Textiles and textile articles (50-63)	0.015	0.999	0.893	13.6	1.40	0.061	0.830	0.018	0.028
Switzerland	7.3	0.000	0.556	0.0	1.016	Nd	nd	2.127	3.887
Fish and crustaceans, molluscs and other aquatic invertebrates (03)	0.017	0.000	1.0	0.0	1.322	nd	nd	0.176	0.233
Japan	4.9	0.132	0.332	0.8	1.175	0.056	0.350	-0.098	-0.34
Prepared foodstuffs; beverages, spirits, and vinegar; tobacco and manufactured tobacco substitutes (16-24)	0.300	0.049	0.295	0.164	1.020	0.024	0.081	-0.022	-0.077
Chile	3.3	0.944	0.203	6.603	2.150	Nd	Nd	0.002	0.021
Live animals; animal products (01-05)	0.006	0.995	1.000	6.97	24.888	nd	nd	0.0003	0.007
Textiles and textile articles (50-63)	0.102	0.972	0.033	6.81	0.042	Nd	Nd	0.003	0.004

Note. Author's elaboration Table 3.

Table No A1 - Country Abbreviations

Country	Abbreviation
Argentina	ARG
Algeria	ALGER
Bolivia	BOL
Brazil	BRA
Bulgaria	BUL
Canada	CAN
Chile	Chi
People Republic of China	CHIN
Colombia	COL
South Korea	S. Kor
Costa Rica	CR
Ecuador	ECU
United States	USA
El Salvador	ELS
Philippines	PHIL
Andean Community	And.Com
Guatemala	GUA
Honduras	HON
India	IND
Iran	IRAN
Japan	JAP
Mexico	MEX
Dominican Republic	RDOM
Country	**Abbreviation**
Russia	RUS
Singapore	SING
Switzerland	SWI
Thailand	TAIL
Trinidad and Tobago	TTOB
Turkey	TUR
European Union	EU
Venezuela	VEN

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Footnotes

1   This paper is a shortened and revised version of the project report "An Inventory of Trade Restrictions and Their Trade Impact for Peru" (Tello, 2004a), financed by the IADB and prepared for the Trade Ministry of Peru. It was partly elaborated while the author held the CEPAL-UPR Celso Furtado Chair at the University of Puerto Rico, Rio Piedras. Edward Rojas provided partial assistance, which it is acknowledged.

2   The share of tariff collection out of government revenues fell from 22,4% in 1975 to 16,2% by 2004 (Fernandez de Cordova, Laird, & Vanzetti, 2006).

3   The NTB instruments used in this paper follow the UNCTAD classification reported in the Trade Analysis and Information System (TRAINS; UNCTAD, 2004a). The NTB measures are codified in the Trade Control Measures Coding System (TCMCS). The system classifies the trade measures in eight groups, wherein the code groups (of 4 digits) called the core measures are tariff measures (1); price control measures (3); finance measures (4); quantity control measures (6), except (a) prior authorization for sensitive product categories (617), (b) quotas for sensitive product categories (627), (c) prohibition for sensitive product categories (637); and monopolistic measures (8). The code groups called non-core measures include automatic licensing measures (5); codes 617, 627 and 637; and technical measures (8).

4   The average of the number of tariff lines per country subject to at least one NTB rose from 1879 in 1994 to 5619 in 2004 (UNCTAD, 2006).

5   This includes the literature on trade restrictions indices (e.g., Anderson & Neary, 1994, 2004; Kee, Nicita, & Olarreaga, 2006; Pantzios, 2000).

6   This is a modified Harmonized Classification System for the Andean Countries (Peru, Colombia, Ecuador, Venezuela and Bolivia).

7   These factors are related to market distortions in developing countries resulting from missing and incomplete insurance and credit markets, undersupply of public infrastructure, inadequate institutions, etc. (Stiglitz & Charlton, 2005).

8   Note, the tariff and non-tariff barriers included in the computations of the figures of Tables and 2 are still in force in 2006, since no new trade agreements between Peru and its export partner countries were implemented between 2002 and 2005.

9   Some data sources contained 10-digit export tariff lines of the Harmonized and NABANDINA systems. The computations were done at the six-digit level. For the 10-digit export tariff lines, a simple average of ad-valorem tariff was computed for all the 10-digit export tariff lines that had the same first six digits.

10 The Peruvian export value to these countries and the EU represented 96% of the total export value of Peru in 2002.

11 The countries included in this group are Belgium, United Kingdom, Finland, France, Germany, Italy, Norway, Portugal, Spain, The Netherlands, and Sweden.

12 The European Union has granted a GSP to countries that

combat drugs (UNCTAD, 2002). This GSP implied that only 54 Peruvian six-digit export tariff lines of the Harmonized system were subject to ad-valorem tariffs, which represented 2,1% of the total Peruvian export value of 2002. Similarly, the United States granted a GSP, called the Andean Trade Preferential Act (ATPA) and thereafter the Andean Trade Preferential Drug Eradication Act (ATPDEA), to Andean countries up to end of 2006.

13 In 2002, the ad-valorem tariffs of 28 Peruvian export tariff lines were non-zero for the Andean Community, and their respective export value represented 8,7% out of the total Peruvian export value to the Andean countries.

14 According to the Central Reserve Bank of Peru, in 2002, close to 63% of the total value of Peruvian export of goods is accounted for by 12 export goods: fish meal, fish oil, cotton, sugar, copper, zinc, gold, refined silver, tin; coffee, iron and lead. Textile goods account for another 9% and other agricultural and fishing products for a further 9%.

15 The simple correlation coefficient is -0,208.

16 The United States has signed free trade agreements with Mexico (1993), Chile (2002), and Central America (2002) and is about to sign one with Peru and Colombia (2007). The European Community has signed free trade agreements with Mexico (2000) and Chile (2003) and is negotiating free trade agreements with Central American, Andean and MERCOSUR countries.

17 Ad-valorem MFN tariff rates are on average higher in developing countries than the ones in developed countries (Table 1; UNCTAD, 2006).

18 Evenett and Keller (2002) present the Heckscher-Ohlin (or factor proportions) theoretical foundation of the gravity model used in this paper. Anderson (1979), Bergstrand (1985, 1990), Deardorff (1998) and Helpman (1998) developed other theoretical alternatives that support the relevance of gravity models.

19 It should be noted that E(αer´k)= αr´k + A, (Johnston, 1997) wherein E is the expected value operator, αer´k is the estimator of αrk in the simpler version and A is the overall effect of the set of omitted variables which are correlated with the included variables of the simpler model. The αr´k estimate in more general and complex gravity specifications provided by Kee et al. (2006) and Tello (2008) and others are found to be negative. In such cases, E(αer´k) will be positive only if A ≥ -αr´k; otherwise the sign of E(αer´k) will be the same as the true value of αr´k.

20 The gravity theoretical models require assumptions such as the standard two sectors, factors and countries' general equilibrium models of perfect and/or monopolistic competition with identical consumer specific preferences and constant and/or increasing returns to scale production functions in each sector.

21 Bergstrand (1990) also shows a gravity model, under intra-industry trade, that yields a negative parameter α3 for tariffs.

22 In these models, technical barriers may shift up the supply and/or demand curve under a partial equilibrium framework (e.g., Thilmany & Barret, 1997) or reduce trade cost and/or increase demand under a general equilibrium framework (e.g., Gasiorek, Smith, & Venables, 1992; Harrison, Rutherford, & Tarr, 1996).

23 This rate is equivalent to the effect of a set of trade barriers faced by exporters of a country from the rest of the world that would keep exports of that country at the observed levels.

24 These distortions are related to institutional inefficiencies, lack of innovation capacity of domestic firms, scarcity of the physical infrastructure for exports, undersupply of human capital and skilled workers, distorting domestic and environmental policies, etc.

25 The higher number of NTBs imposed by Peruvian trade partner countries than the ones faced by the goods exported by domestic (Peruvian) firms shown in Table 2 indicates that there is a high number of export products (corresponding to export tariff lines) that Peruvian firms do not export. One plausible explanation, although not necessarily the only one, may be the extra cost caused by NTBs imposed by trade partner countries.

26 The export shares of the export value of each export tariff line are the weights.

27 These countries include Germany, France, Spain, The Netherlands, Sweden, Portugal, Belgium, Finland, Italy, United Kingdom, and Norway.

28 Only regression coefficients from Japan produce a positive impact on the NTBs.

29 Contrarily, the Andean countries even though they have practically eliminated the ad-valorem tariff rates among members of the Andean agreement, are still imposing a high number of NTBs (Table 2).

30 Tariffs and/or NTBs have been excluded in the regressions for countries whose figures have one or all of the following features: (a) Country or sector tariff rates are zero for most of the Peruvian exports to the country (e.g., EU and SWI); (b) The tariff rate is flat for most Peruvian exports to the country (e.g., CHI); and (c) the sector NTBs are zero for most of the Peruvian exports to the country (e.g., JAP).

31 In a previous work, Tello (2004b), using a computable general equilibrium (GTAP) model with 57 sectors of goods and services, estimated that the increase of exports of a free trade area (i.e., zero tariff rates for all the import and export tariff lines) between the United States and Peru, would increase by 20% the export value of the year 2002 and by 0,28% the real GDP of the Peruvian economy. The partial equilibrium estimations result of the increase of exports of US elimination of tariffs in this paper is 15%.

32 Such as the United States and countries from the European and Andean Communities.

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