14.3

Andean countries

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This chapter documents the procedure followed in compiling the input-output (I/O) tables for Colombia, Venezuela and "the rest of the Andean Group" (Bolivia, Ecuador and Peru). The first two countries account for close to 75% of the total exports in 1993, 71% of the total trade and 65% of GDP. The chapter is organized as follows. The first Section presents the general characteristics of the national I/O tables, and the sources used to obtain all of the information required by the Global Trade Analysis Project (GTAP). Section 2 elaborates on the mapping between GTAP and the national classifications.

14.3.1 Characteristics of the I/O matrix in each country and secondary sources

As a preliminary step we surveyed and analyzed the information available in each of the five Andean countries: were there I/O tables available? Did they include all of the variables required by GTAP? If not, was it possible to get supplementary information from alternative sources? For which year were the physical I/O coefficients available?

We decided to work with Colombia, Venezuela and "the rest of the Andean Group" based on the relatively high economic weight of those two countries, and on the answers to the previous questions. Physical I/O coefficients were quite old in Ecuador, Bolivia and Peru, and Peru will have an entirely new I/O matrix in 1999.

We worked with the 1992 matrix for Colombia (prepared by DANE, the Statistical Office) and the 1986 matrix for Venezuela (prepared by Cordiplan)[1]. Physical I/O coefficients are relatively recent in Venezuela (1986), but quite old in Colombia, based on engineering studies undertaken during the 70s.

The I/O matrix for Venezuela (1986) is published at producer prices (which includes indirect taxes, but excludes commercial margins) in millions of bolívares. It has 108 subsectors, with a classification based on the UN Industrial Classification (ISIC revision 2, the first 4 digits are similar); the correlation is not as neat for agriculture. There are no columns for production, imports, tariffs, commercial margins or indirect taxes, and the only information available on imports is a row vector with total imports for intermediate consumption and final demand. We modified the structure of the original matrix to arrive at a more standard presentation[2].

The Colombian I/O matrix (1992) is published at basic prices (commercial margins and indirect taxes are not included) in millions of Colombian pesos. It has 32 rows and 33 columns (an extra column for Banking Services) and, as in the previous case, its classification is based on the UN Industrial Classification. We distributed the "extra" column proportionally to the value added in the row “banking, insurance, and services” to obtain a squared matrix[3]. Additionally, since DANE reports characteristic and non-characteristic outputs (metal plows produced in the agricultural sector are considered as agricultural production) we adjusted the figures to produce a standard product by product matrix[4]. We also added commercial margins to each cell to arrive at the accounting identities implicit in the GTAP format.

14.3.1.1 Secondary sources

No matrix contains all of the information required, and secondary sources were used to complete the square matrices on imports, tariffs and domestic taxes. We also relied on some secondary information to arrive at the level of aggregation (50 by 50) required by GTAP in the version 4. For Colombia, we draw extensively on the work of Valderrama & Gutierrez (1992) and on their figures for imports and taxes. We also used the detailed “Supply-Use Tables” built during the 1970's. The Central Bank of Venezuela collaborated fully with our project, providing information on indirect

[1] We did not use the 1993 matrix build by PDVSA (Venezuela’s oil company). Its level of aggregation was much higher (45 sectors vs 108 sectors for the matrix of 1986) and it was not available to the general public. We used it as an additional source of information when required.

[2] Tariffs are included in value added, and there are figures for value added in the columns for household and government consumption. See Clemente & Puente (1989). We deducted tariffs from value added, and shifted some value added figures in order to reproduce the standard presentation.

[3] Adjusting the “profits” row to maintain accounting balances.

[4] We used information provided by DANE, following the methodology suggested by Valderrama & Guitierrez (1992). See also (Lora, 1987).

taxes and tariffs. We used detailed data on tariffs and trade flows available at the Organization of American States (for both countries) and, in a few cases, we relied on the GTAP (version 4) matrices for Mexico (as a proxy for Venezuela), Indonesia and Peru's (proxies for Colombia)[5].

14.3.2 Mapping between the original I/O matrices and GTAP

14.3.2.1 Venezuela

Table 14.3.1 presents the concordance between the GTAP version 4 and the 108 sectors (S108) considered in the Venezuelan I/O matrix. There were no major problems for the industrial sectors, both classifications being based on the UN industrial classification.

As expected, in most cases, a single GTAP sector may correspond to one or more S108s. Thus, GTAP 26 (beverages and tobacco) is related to seven S108 sub-sectors: 30, 3131, drinks; 31, 3132, wine industry; 32, 3133, malt drinks and malt; 33, 3134, non alcoholic drinks and soft drinks; and 34, 3140, tobacco.

Calculations were more complex when a single S108 sector was related to multiple GTAP sectors. This was the case in the two non-agricultural sectors (S108 60, 3530, refining oil and gas; and S108 108, 9000, other services), and in four S108 agricultural sectors: 1, 1111, cereals; 13, 112-3 Y 9, services, hunting, and other agricultural products; 19, cattle; and 24, 3116, products of mill industry.

To obtain the relevant information on production, we used the GTAP data for Mexico, assuming that the distribution among sectors was similar in both countries. As an example, the value for Cereals (S108, 1, 11111) was distributed in the same proportions as in the Mexican GTAP matrix between GTAP 1, paddy rice; 2, wheat; and 3, cereal grains n.e.c. The same assumption was made for indirect taxes.

We allocated imports based on our calculations of imports for each GTAP sector, the latter being based on the detailed information on imports (harmonized system, 10 digits) and the concordance between GTAP and the harmonized system. Import tariffs were assigned proportionally according to the values of the product of the imports and the average legal tariffs.

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[5] We compared income per capita and the share of agriculture, manufacturing and exports in GDP for those countries available in the GTAP data base. Oil is the main commodity exported by Mexico and Venezuela; and coffee the main commodity exported by Columbia and Indonesia.

Table 14.3.1 GTAP version 4 concordance for Venezuela

GTAP	Description	S108	IO	Description
1	Paddy Rice	1	11111	Cereals
	Wheat	1	11111	Cereals
3	Cereal Grains n.e.c.	1	11111	Cereals
4	Vegetables, Fruit	2	11115	Fruits
		4	1111R	Other Vegetables
5	Oil Seeds	13	112-3 Y 9	Services, Hunting and other Agric. Prod
6	Sugar Cane, Sugar	13	112-3 Y 9	Services, Hunting and other Agric. Prod
7	Plant-based Fibers	13	112-3 Y 9	Services, Hunting and other Agric. Prod
8	Crops n.e.c.	3	11119	Coffee and Cocoa
		13	112-3 Y 9	Services, Hunting and other Agric. Prod
9	Bovine Cattle	19	3111	Cattle Slaughtering
10	Animal Products n.e.c.	9	111320	Fowl
		10	111339	Eggs
11	Raw Milk	5	111331	Crude milk
12	Wool, Silk-worm, Cotton	35	112-3 Y 9	Services, Hunting and other Agric. Prod
13	Forestry	11	1200	Forest
14	Fishing	12	1300	Fishing
15	Coal	16	2100	Coal mining
16	oil	18	2200	Crude Petroleum & natural gas production (gas only)
17	Gas	60	3530	Refining of oil and gas
18	Minerals	14	2301	Iron ore mining
		15	23024	Gold
		17	23-29	Other non metallic mineral
19	Bovine Cattle	6	111311	Bovine meat
		8	111319	Other meats (not fowl)
		19	3111	Slaughtering, preparing & preserving meat
20	Meat Products n.e.c.	7	111312	Meat of swine
21	Vegetable Oils and Fats	23	3115	Manufacturing of vegetable and animal oils 7 fats
22	Dairy Products	20	3112	Manufacture of dairy products
23	Processed Rice	24	3116	Grain mill products (processed rice only)
24	Sugar	26	3118	Sugar factories and refineries
25	Food Products n.e.c.	21	3113	Packed and Fruit Conservation
		22	3114	Fish Elaboration
		24	3116	Grain mill products (processed rice only)
		25	3117	Manufacture of Bakery Products
		27	3119	Cocoa manufacture, Chocolate & Confectionery
		28	3121	Various Foods
		29	3122	Animal Food

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Table 14.3.1 GTAP Version 4 Concordance for Venezuela (continued)

GTAP	Description	S108	IO	Description
26	Beverages and Tobacco	30	3131	Drinks
		31	3132	Wine industry
		32	3133	Malt Drinks and Malt
		33	3134	Non Alcoholic Drinks and Soft Drinks
		34	3140	Tobacco
27	Textiles	35	3211	Spun, Fabric and Complete Fabrics
		36	3212	Made Fabric Articles
		37	3213	Knitting mills
		38	3214	Tapestries and Carpet Manufactures
		39	3215	Cord Making
		40	3219	Other n.e.c.
28	Wearing Apparel	41	3220	Wearing Apparel
29	Leather Products	42	3232	Tannery
		43	3233	Leather Products
		44	3240	Footwear
30	Wood Products	45	3311	Sawmill
		46	3312	Wood and Cork Products
		47	3319	Other Wood Products n.e.c.
		48	3320	Wood Furniture
31	Paper Products	49	3411	Paper and Cellulose
		50	3412	Carton
		51	3419	Other n.e.c.
		52	3420	Printed Editorial and Similar
32	Petroleum, coal prod.	60	3530	Petroleum refineries
		61	3540	Derivatives of Oil and Coal
33	Chemical, rubber	53	3511	Basic Chemistry
		54	3512	Credit and Pesticides
		55	3513	Resins
		56	3521	Paintings, Glazes and Lacquer
		57	3522	Medicines
		58	3523	Soaps
		59	3529	Other n.e.c.
		62	3551	Tire Industry
		63	3559	Rubber Products
		64	3560	Plastic
34	Mineral products n.e.c.	65	3610	Mud, Crockery and Porcelain
		66	3620	Glass
		67	3691	Clay Products
		68	3692	Cement, Lime and Patter
		69	3699	Other n.e.c.

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Table 14.3.1 GTAP version 4 concordance for Venezuela (continued)

GTAP	Description	S108	IO	Description
35	Ferrous Metals	70	3710	Basic Iron Industry and Steel
36	Metals n.e.c.	71	3720	Non Ferrous Metals
37	Metal Products	72	3811	Cutlery Tools and General Hardware
		73	3812	Metallic Furniture
		74	3813	Metallic Structure
		75	3819	Other n.e.c.
38	Motor vehicles	85	3843	Car Vehicles
		86	3844	Motorcycles and Bicycles
39	Transport Equipment	79	3829	Other Machinery n.e.c.
		84	3841	Ships
		87	3849	Other Material Transport
40	Electronic Equipment	80	3831	Electric Equipment
		81	3832	Equipment and Radio and TV Appliances
		82	3833	Electrical Appliances of Residential Use
41	Machinery & Equipment	76	3822	Machinery and Equipment for Agriculture
		77	3823	Machinery and Wood Equipment and MET
		78	3824	Machinery and Equipment Industry
		83	3839	Other n.e.c.
		88	3851	Measure Instruments and Control
		89	3852	Photographic Appliances
		93	3909	Other n.e.c.
42	Manufactures n.e.c.	90	3901	Jewels and Related Articles
		91	3902	Music Instruments
		92	3903	Sport Articles
43	Electricity	96	4101	Electricity
44	Gas Manufacture	D108	9000	Other Services
45	Water	97	4200	Water
46	Construction	94	5000 RE	Residential Construction
46	Construction	95	5000 NR	Not Residential Construction
47	Retail, Transport	98	713	Air Transport
		99	712	Water Transport
		100	7112-7113	Passenger Land Transport
		101	7114	Load Land Transport
		102	7116	Other Transport
		103	61-62	Retail
		104	630	Restaurants and Hotels
		105	719	Storage
		106	720	Communications
48	Financial, business	107	8000	financial Establishments and Real Estate
49	Public Admin	D108	9000	Other Services
50	Dwellings	108	9000	Other Services

14.3.2.2 Colombia

Table 14.3.2 presents the concordance between the 50 sectors included in the GTAP version 4, the 32 sectors included in the Colombian I/O matrix, and the 170 sectors (S170) considered in the “Balances Supply - Utilization” (prepared by DANE in the 1970s). We used the information from the I/O matrix in those few cases where there was a unique relationship between both variables (e.g. GTAP 18, S32, 7), but in most cases, we had to assign a value based on S170.

Single GTAP sectors were related to one or more S170s in most cases, as for example, GTAP sector 27 (textiles), being related to S170s 16.1 and 16.2. Calculations were more complex when one S170 was related to multiple GTAP sectors as for the case of S170 10.1 (cereal transformation) and 10.2 (other mill products). In these cases we used imports as proxies for production, and we obtained imports from detailed information at the 10 digits harmonized system, and used the concordances between GTAP and the harmonized system. In a few cases, we used the GTAP matrices for Indonesia and Peru. Again, domestic taxes were distributed according to production, and foreign taxes according to the product of imports and average tariffs.

Table 14.3.2 GTAP version 4 concordance for Columbia

GTAP	Description	S132 I/O Matrix 1992	S170 Balances supply-uses, 1970's	Description
1	Paddy Rice	2	02.1.4	Rice
2	Wheat	2	02.1.1	Wheat
3	Cereal Grains n.e.c.	2	02.1.2	Corn
		2	02.1.3	Barley
		2	02.1.5	Sorghum
		2	02.1.6	Oats and Other Products
4	"Vegetables, Fruit, Nuts"	2	02.5	Vegetables
		2	02.6	Fruits
5	Oil Seeds	2	02.7	Oilseeds and Fruits
6	"Sugar Cane, Sugar Beet"	2	02.2	Sugar Cane
7	Plant-Based Fibers	2	02.8	Fibers
8	Crops n.e.c.	1	01.0	Coffee
		2	02.3	Tobacco
		2	02.4	Tubers
		2	02.9	Other Agricultural Products
		2	02.10	Plantations
9	Bovine Cattle, Sheep & Goats, Horses	3	03.1.1	Bovine Cattle
10	Animal Products n.e.c.	3	02.9	Swine
		3	03.1.2	Other Cattle
		3	03.1.3	Poultry
		3	03.2	Animal Production
11	Raw Milk	3	03.3	Milk
12	Wool, Silk-worm Cocoons	3	03.4.2	Other Products
13	Forestry	4	04.0	Forestry
14	Fishing	5	05.0	Fishing
15	Coal	6	06.3	Coal
16	Oil	6	06.1	Crude Oil
17	Gas	6	06.2	Natural Gas
18	Minerals n.e.c.	7	07.0	Other Mining Products
19	Bov. Cattle, Sheep & Goat, Horse meat prods	9	09.1	Non Prepared Meats
20	Meat Products n.e.c.	9	09.2	Prepared Meats
21	Vegetable Oils and Fats	15	15.1	Oil, Fats, Margarine
22	Dairy Products	11	11.0	Dairy Products
23	Processed Rice	10	10.1	Cereal Transformation
		10	10.2	Other Mill Products
24	Sugar	12	12.0	Sugar

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Table 14.3.2 GTAP version 4 concordance for Columbia (continued)

GTAP	Description	S132 I/O Matrix 1992	S170 Balances supply-uses, 1970's	Description
25	Food Products n.e.c.	8	08.0	Elaborated Coffee
		9	09.4	Elaborated Fishing Products
		10	10.1	Cereal Transformation
		10	10.2	Other Mill Products
		15	15.2	Fruits and Vegetables
		15	15.3	Chocolates and Sweets
		15	15.4	Food Products
		15	15.5	Dietary Products
26	Beverages and Tobacco Products	13	13.0	Beverages
		14	14.0	Tobacco
27	Textiles	16	16.1	Textiles (Except Synthetic Fabrics)
		16	16.2	Manufacture of Made-up Textile Goods (Excluding Wearing Apparel)
28	Wearing Apparel	16	16.3	Wearing Apparel & Synthetic Fabrics
29	Leather Products	16	16.4	Tanned Leather
		16	16.5	Footwear and Leather Products (Except Those of Rubber and Plastic and Wearing Apparel)
30	Wood Products	17	17.0	Wood and Wood Furniture
31	Paper Products, Publishing	18	18.0	Production of Paper & Printing
32	Petroleum, Coal Products	20	20.0	Oil Products
33	Chemical, Rubber, Plastic Products	19	19.0	Chemicals
34	Mineral Products n.e.c.	21	21.0	Non Metallic Products
35	Ferrous Metals	22	22.1	Iron & Steel
36	Metals n.e.c.	22	22.2	Metal Basic Industries
27	Metal Products	22	22.3	Other Metallic Products Except Equipment
28	Motor Vehicles and Parts	24	24.3	Motor Vehicles
		24	24.5	Transport Material n.e.c.
29	Transport Equipment n.e.c.	24	24.1	Ships and Repair
		24	24.2	Manufacture of Railroad equipment and Repair
		24	24.4	Airship and Repair
		24	24.5	Transport Material n.e.c.

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Table 14.3.2 GTAP version 4 concordance for Columbia (continued)

40	Electronic Equipment	23	23.4	Accounting & Computing Machinery
		23	23.5	Radio, Television and Communication Equipment
		23	23.6	Appliances for Residential Use
		23	23.7	Manufacture of Electric Appliances and Accessories
41	Machinery and Equipment n.e.c.	23	23.1	Machinery and Equipment for Agriculture, Parts and Repairing
		23	23.2	Machinery for Metallic and Wood Products and Parts
		23	23.3	Machinery and Equipment for Industry
		23	23.8	Other Equipment and Appliances
		25	25.1	Professional and Scientific Equipment
42	Manufactures n.e.c.	25	25.2	Photographic Appliances and Optic Instruments
		25	25.3	Watches, Jewelry , & Related Products
		25	25.4	Musical Instruments and Other Manufacture Products
43	Electricity	26	26.1	Electricity
44	Gas Manuf., Distribution	26	26.2	Gas
45	Water	26	26.3	Water
46	Construction	27	27.0	Construction
47	Retail, Transport	28	28.0	Retail
		29	29.0	Transport
		30	30.0	Communications
		33	33.3	Hotels, Coffee Shops, & Restaurants
48	Financial, Business, Recreational Services	31	31.0	Banks, Insurances & Other Financial Institutions
		33	33.1	Recreational Services
		33	33.5	Repair Services
		35	35.0	Private Household Services
49	Public Admin & Defense, Education, Health	33	33.2	Medical Services & Other Health Services
		33	33.4	Private Education
		33	33.6	Other Personal services
		34	34.0	Government Services
50	Dwellings	32	32.0	Dwellings

References

Clemente, L.A., & Puente, A. (1989), "La Matriz Insumo Producto para Venezuela (1981 y 1984): Un Instrumento de Política Económica" *Revista del Banco Central de Venezuela,* vol. 2, pp. 77-136, Abril-Junio.

Lora, E. (1987), *Técnicas de Medición Económica. Metodología y Aplicaciones En Colombia*, Bogotá, Fedesarrollo, Siglo XXI Editores.

Valderrama, F.M., & Gutierrez, J.A. (1992), "Matriz de Contabilidad Social Sam 1992", *mimeo.*