Paraguay

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1. Introduction

This document describes the steps behind the creation of the first Input-Output (I-O) table of Paraguay for the Global Trade Analysis Project (GTAP)[1]. The GTAP Input-Output table for Paraguay is based on the 1994 Supply and Use matrices compiled by the Central Bank of Paraguay. The Central Bank of Paraguay is the only official provider of these data in Paraguay, and is in charge of collecting and processing data on National Accounts.

This document is divided in 4 sections. The next section explains the data, their particular characteristics and its salient economic features. Section 3 describes the process of building the database, outlining some of the assumptions made about the structure of the source data so it can be consistent with GTAP specifications. Section 4 describes briefly the sectorial aggregation and splits. Finally, section 5 describes source data missed in the process of moving to the GTAP specification.

2. Source Data

2.1 Characteristics

The 1994 Supply and Use tables of Paraguay have a commodity (product) by industry (activity) format. The units are in thousands of local currency (guaranies) in nominal terms at purchasers' prices, and include 46 commodities and 33 activities. Appendix 1A provides a list of commodities with descriptions and concordances between the Paraguay I-O commodity classification and the SIC rev.3 (ISICr3). Similarly, Appendix 1B provides the concordance between the Paraguay I-O commodity data and GTAP sector classification (GSC2).

2.2 Main Economic Features

In Paraguay, the Central Bank constructs Supply and Use matrices, and is in charge of preparing the Paraguayan system of National Accounts. The Central Bank has available Supply-Use matrices for the period 1991-1997 (at constant and nominal values), with 1994 as the base year. We use 1994 to construct the Paraguay I-O table, because 1994 was the only year for which the make matrix was available in constant value terms rather than nominal terms.

The Use table in Paraguay can be seen as one matrix with four sub-matrices:

I. The total supply of goods and services sub-matrix, which includes column data for domestic production, imports, taxes, and margins. Row totals of these columns yield total supply, which is

[1] Special thanks for their help in supplying the data to Gustavo Biedermann, and Cesar Rojas from the Division of National Accounts, and Dr. Emilio Ortiz, Director of Economic Studies at the Central Bank of Paraguay.

measured at purchasers' prices. Total domestic production by commodity comes from the make matrix. This matrix has 46 commodities and 33 industries, and describes the origin of domestic supply of goods and services. Taxes included a matrix of tariffs, taxes and subsidies.

II. Intermediate demand sub-matrix, representing industry's consumptions of goods and services, valued at purchasers' prices.

III. Final demand or final utilization sub-matrix, which represents consumption of households, consumption of government, gross fixed capital formation, changes in stock, and exports. Final demand is valued at purchasers' prices.

IV. Output sub-matrix, a matrix that registers gross production by industry and value added generated by these industries.

3. I-O Table Construction

3.1 Make Matrix

Because the GTAP model and its database are commodity by commodity, the multi-product (commodity by industry) Make table of Paraguay had to be converted to a single-product (commodity by commodity) table. We expanded the Make table from commodity by industry (46x33) to commodity by commodity (46x46), by moving values of a commodity *j* across industries *i* to industry *j*, to produce a diagonal matrix. For example, tables 2 and 3 denote the make matrix before and after diagonalization. The activity "Agriculture" produced two commodities, "Tubers" and "Fruits and Other Agr.". The diagonalization eliminates the multi-product nature of the make matrix, moving what is produced of "Tubers" in "Agriculture" into a sector "Tubers".

This means that if we started with an Agricultural industry that produced "Tubers" commodities as well as "Fruits and Other Agr." commodities we ended up with a sector "Tubers" that produced only tubers and a sector "Fruits and Other Agr." that produced only fruits and other agricultural products.

To end up with a diagonal make matrix, we applied commodity shares of total output within the same industry *j* in the make matrix to distribute values by commodity from industry *i* to industry *j* in this matrix. We aggregated the product of each of the various industries which produce the same commodity to yield a sector that produces a single commodity.

Table 1. Selected Production of Commodity *i* by Industry *j* - Original Make Matrix
-In thousands of Guaranies

		1	2	… 33	
Commodity \ **Industry**		Agriculture	Livestock		Total 1+2
1	Tubers	404,367,471	0		404,367,471
2	Fruits and Other Agr.	312,949,700	0		312,949,700
3	Bovine Cattle	0	667,687,806		667,687,806
⋮					
35					
	Total 1+2+3	717,317,171	667,687,806		1,385,004,977

Table 2. Selected Production of Commodity *i* by Commodity *j* - Diagonal Make Matrix
-In thousands of Guaranies

		1	2	3	… 35	
Commodity \ **Industry**		Tubers	Fruits and Other Agr.	Bovine Cattle		Total 1+2
1	Tubers	404,367,471	0	0		404,367,471
2	Fruits and Other Agr.	0	312,949,700	0		312,949,700
3	Bovine Cattle	0	0	667,687,806		667,687,806
⋮						
35						
	Total 1+2+3	404,367,471	312,949,700	667,687,806		5,547,814

3.2 Value Added to ORANIG Factors

Value added in the source data accounted for labor and capital as a) wages and salaries, b) capital consumption, c) income from owner-operator, and d) profits, as well as net indirect taxes. We assigned value added amongst different factors of production in the source data according to the shares in Table 3 to do both, account for land and distribute income from owner-operator to labor, land, and capital. We apply these shares differently, depending on whether the industry use or not natural resources.

For manufacturing and service –sectors for which we assumed no use of natural resources– the process of obtaining factors of production categories consisted of adding to labor (wages and salaries) and capital the assumed fraction of owner-operators' income imputed to labor and capital, respectively. By definition, value added for land was set to zero in these sectors.

For those sectors that used natural resources such as primary agriculture, forestry, fish, oil, and mining, we followed the same procedure as in the sectors discussed before, except that the fraction assigned to land was positive.

Table 3. Shares of Factor Endowment in Value Added

Description	Factor Share[1]
Non-agricultural owner-operator income given to labor	0.6
Non-agricultural owner-operator income given to capital	0.4
Agricultural owner-operator income given to labor	0.6
Agricultural owner-operator income given to land	0.2
Agricultural owner-operator income given to capital	0.2
Gross fixed capital formation given to land	0.3
Gross fixed capital formation given to capital	0.7

[1]. Source: Mark Horridge, Center of Policy Studies, Monash University.

To distribute ownership of Dwellings, we applied the following shares across factors: a) 10% to labor, b) 10% to Land, and c) 80% to Capital. Finally, we expanded value added from industries to commodities using the cost shares of the make matrix, to maintain the same cost structure in the new expanded sectors.

For "Fishing", where only owner-operator income existed, we distributed value added among labor, capital and land using factor shares from the I-O table from Ecuador. These shares were 61.4% (labor), 21.3% (capital), and 17.3% (land).

3.3 Re-export Adjustment

Paraguay is a small economy between two large countries: Argentina and Brazil. Both countries during the seventies and eighties used import substitution policies to strengthen their domestic production[2]. As a result, Paraguay established trade policies, characterized by high tariff rates (for goods produced domestically and final consumption goods), multiple exchange rates, and export taxation. As a result of these changes, trade was characterized by high levels of non-registered trade. Exports were smuggled to Brazil and Argentina, and most imports were re-exported to these two countries. Most of the products affected included perfumes, beverages and tobacco products, electronics, home appliances, computers, etc. These products were highly protected by Brazil and Argentina due to their import substitution policies.

During the 90's, there were three important changes in Paraguay. 1) A change in the exchange rate policy, 2) a fiscal reform which introduced a value added tax, and 3) the signature in 1991 of MERCOSUR by Argentina, Brazil, Paraguay and Uruguay. These changes increased the level of registered exports; however, it did not decrease the level of re-exports to Brazil and Argentina. Reexports in Paraguay during the 1990's accounted for a large share of imports. According to estimates from the Central Bank, reexports accounted on average for 64% of total imports into the country for the period 1990-1997. For 1994, the share of reexports on total imports was estimated to be 71%, or 10% of GDP. More recently, for the period 2000-2002, reexports averaged 48% of total imports.

GTAP does not support reexports in the database. For this reason, we eliminated re-exports from Paraguay's I-O table. Specifically, we subtracted re-exports from total exports, and from total imports (including import duties). Using data provided by the Central Bank, we estimated the share of reexports on total imports. The Central Bank of Paraguay provided with exports series in thousands of U.S. dollars for 1991-1997. These export series had three types of exports: a) registered exports, b) re-exports, and c) non-registered exports. The amount of non-registered exports was the difference of total exports of goods (from the Balance of Payments) minus registered exports and reexports. For some products, these non-registered exports accounted for more than 50% of total value of exports. They were distributed by the shares of reexports (excluding electricity), using the National Classification of Paraguayan Products (CNPP in Spanish)[3].

To estimate the share of re-exports on total imports, we first assumed that non-registered exports included reexports. Thus, we distributed non-registered exports using the relative proportions between registered exports and reexports. Second, we estimated the proportion of total reexports on total imports, which was 49% (Table 4). We adjusted down these shares for three sectors (Rubber, Machinery and Equipment, and Other Manufactured Products), where the share of reexports was too high, resulting in negative adjusted total exports. The new adjusted shares were large enough to make exports for these three sectors equal to zero.

[2] Information provided by Francisco Ruiz Diaz, Ministry of Finance, Paraguay.

[3] Total exports values did not match total values of exports in the supply-use tables. We adjusted these values to match the supply-use values using the proportions of registered exports, re-exports and non-registered exports in total exports.

Table 4. Reexports as a share of total Imports in Paraguay (1994)

No.	Commodity	Shares	Adjusted Shares (*in italics*)
1	Cotton	0	0
2	Sugar Cane	0	0
3	Other Industrial Crops	0	0
4	Soybean	0	0
5	Other Cereals	0	0
6	Tubers	0	0
7	Fruits and Other Agr. Products	0.02	0.02
8	Bovine Cattle	0	0
9	Other Type of Cattle	0	0
10	Other Livestock Products	0	0
11	Forestry	0	0
12	Fishing	0.85	0.85
13	Mining	0	0
14	Bovine Meat	0	0
15	Other Meat	0.05	0.05
16	Oils and Vegetable Oils	0.06	0.06
17	Milk Products	0	0
18	Milling and Bakery Products	1.00	1.00
19	Sugar	0	0
20	Other Food Products	0.33	0.33
21	Beverages and Tobacco	1.00	1.00
22	Textiles and Wearing Apparel	0.15	0.15
23	Leather and leather products	0.39	0.39
24	Wood and Wood Products	0.00	0.00
25	Paper and Paper Products	0.09	0.09
26	Fuel and Lubricant Products	0	0
27	Chemical Products	0.04	0.04
28	Pharmaceutical and Beauty Products	0.73	0.73
29	Tires, and other rubber products	0.39	*0.38*
30	Non Metallic Mineral Products	0.29	0.29
31	Iron and Non Ferrous Metal Products	0	0
32	Metal Products	0.23	0.23
33	Machinery and Equipment, home appliances and others	0.85	*0.82*
34	Motor Vehicles	0.03	0.03
35	Other Manufactured Products	0.91	*0.84*
36	Electricity and Water	0.07	0.07
37-46	Rest of Sectors	0	0
Total Reexport Share in Total Imports		49%	48%

3.4 Taxes

There were 5 types of taxes registered in the Supply-Use data from Paraguay: a) Value Added Tax (called IVA), b) Tax on consumption, c) Other commodity taxes, d) subsidies (which were zero), and e) Tariffs. The first tax (IVA) is a tax on goods and services that firms collect over various steps, but that in the end final consumers pay for it. Producers are not required by the government to declare IVA, because they are allowed to deduct the tax that they paid for their own intermediate consumption or gross fixed capital formation. Both domestic and import sales pay IVA, but exports do not. Primary agricultural products, real state, and refined oil products are IVA exempt.

The second type of taxes called "Selective Tax on Consumption" is a tax that targets mainly two specific sectors: Beverage and tobacco products, and refined oil products. For Beverages and tobacco, it varies between 5% (alcohol) and 10% (cognac, gin, etc.), and for refined oil products, it varies between 1% (turbo fuel) to 50% (unleaded fuel).

Other commodity taxes include taxes that firms pay for their existence, such as taxes on wages and salaries, commercial and professional licenses, etc. For this reason, only one sector is affected by this tax in the supply-use matrices: "Enterprise services". In is worth to note that on the original tax matrix, the total value of the matrix matched the value of the tax vector in the supply matrix. However, total taxes by product did not. For this reason we RASed this matrix to match the total values by commodity from the tax vector.

We created a tax matrix, allocating all tax vectors across intermediate and final demand (excluding change in stocks and exports) using a share matrix of product consumption in intermediate and final demand. For IVA, we allocated it across intermediate and final use, because after some initial tests, we found that not all IVA was included in final private consumption. Other commodity taxes were also allocated across intermediate and final use, and the "Selective Tax on Consumption" was allocated only to final private consumption.

Finally, the tariff vector (adjusted by reexports) was also expanded to matrix form using the share matrix of product consumption in intermediate and final demand.

3.5 Use Matrix, tax inclusive (UP), and tax excluded (UF)

We made the following three corrections to the source Use matrix to meet GTAP specifications:

1. As outlined in the previous section, we subtracted reexports from both total exports and total imports (including import duties), since reexports are not allowed in GTAP.
2. We transformed the Use matrix from a commodity-by-industry matrix to a commodity-by-commodity matrix. To perform this change, we applied commodity shares of total output within the same industry *j* in the Make table to distribute values by commodity from industry *i* to industry *j* in the Use matrix. We aggregated each of the various industries which consumed a given commodity *x* to yield the intermediate use of that commodity *x*, each of the various industries which consumed another given commodity *y* to yield the intermediate use of that commodity *y*, and so on. These new sectors have a cost structure that is a share-weighted sum of the cost structure of the parent industries that produce these commodities (in the Make matrix).
3. We included the values of the column vector called "Distribution Margins (*Márgenes de Distribución*) of the Make matrix into the commodity "Commerce" of the modified commodity-by-commodity Use matrix. This adjustment captured margins across commodities, and allowed to maintain the balance between sales and costs.

These modifications resulted in the Use matrix, tax inclusive (UP). To produce the Use matrix tax excluded (UF), we subtracted the tax matrix and the tariff matrix estimated in section 3.4 from the UP matrix. However, both matrices needed to be split between domestic and import use. The next section shows how this was done.

3.6 Split between Domestic and Import Use

To split the UP and UF matrices between domestic and import use we first estimated a share matrix of intermediate and final demand use by product (excluding exports, allocated entirely to domestic use). Based on these shares, we distributed the import vector (with import duties) across intermediate and final demand to estimate an import matrix, import duties included, but other taxes excluded. We estimated domestic use (tax excluded) by subtracting the import matrix from the UF matrix. All exports were included in the domestic use matrix.

To estimate both domestic and import use tax inclusive, we first split the matrix of taxes (IVA and other taxes) into domestic and import taxes. We did this by using a share matrix of import use in total use, estimated by dividing the import use matrix (tax excluded) by the UF matrix. Using this share matrix, we calculated two tax matrices, one for domestic use and one for import use. We then added these two matrices to the corresponding domestic and import use (tax excluded) to calculate both domestic and import use, tax inclusive.

The resulting domestic and import tax matrices were finally subtracted from both domestic and import use (tax inclusive) to obtain both domestic and import use free of taxes.

3.7 Output (OP) and Imports, duty free (MF)

To obtain a vector of output of sector *i* non-commodity net indirect tax included (vector "OP" in GTAP notation), we added together the sum of domestic and imports intermediate use, value added, and production taxes/subsidies. Finally, to produce a vector of imports by commodities with import duties excluded (vector "MF" in GTAP notation) we removed import duties from the vector of total imports by commodity (tax excluded).

4. Commodity Aggregation and Splits

According to the sectorial concordance between GSC2 sectors and the Paraguay I-O table (Appendix 1B) we aggregated the 46 sectors from Paraguay into 41 sectors, assuring balance was maintained. For example, "Tubers" and "Fruits and Other Agr." were aggregated to the GSC2 sector "Vegetables, fruit, nuts".

For sectoral splits, we used value shares information of total supply from an unbalanced 268 commodity matrix from the Central Bank of Paraguay. Appendix 2 contains the shares used to split Paraguay's sectors into GTAP sectors. We disaggregated "Other Cereals" into the corresponding 3 GTAP commodities: paddy rice (pdr) 9%, wheat (wht) 26%, and other cereals (gro) 65%; "Textiles and Wearing Apparel" into the 2 corresponding GTAP commodities: textiles (tex) 71%, and wearing apparel (wap) 29%. "Iron and Non Ferrous Metal Products" into Ferrous metals (i_s) 88%, and metals nec. (nfm) 12%; "Machinery and Equipment, home appliances and others" into Electronic Equipment (ele) 47%, and Machinery and equipment nec. (ome) 53%; "Motor Vehicles" into motor vehicles and parts (mvh) 91%, and transport equipment nec. (otn) 9%; "Electricity and Water" into Electricity (ely) 86%, and Water (wtr) 14%; "Transportation" into transport nec. (otp) 77%, sea transport (wtp) 10%, and air transport (atp)

13%; The last split was “Financial and Insurance Services” into Financial services nec. (ofi) 89%, and Insurance (isr) 11%. This disaggregation expanded total commodities from 41 to 51 commodities.

The rest of the sectoral split to map the 51 Paraguayan sectors in the aggregated I-O to the 57 GSC2 sectors was performed at the GTAP Center, using the cost structure of their “GTAP Representative Table” and the agriculture I-O split procedure (chapters 13, Dimaranan and McDougall, 2002).

Appendix 3 provides a summary diagram of the procedures applied to the source data to bring it into the GTAP format.

5. Final Comments

At the moment of writing this document, we cannot split some of Paraguay’s sectors to map them correctly to the GTAP sectors. This will be possible in the short term once we use commodity shares derived from Supply-Use matrices with a more detailed product disaggregation. These tables contain 268 products and 33 activities. However, the problem with these Supply-Use tables is that they are not balanced. We plan to use entropy methods to balance and disaggregate our 46x33 tables to the 268x33 dimension. This more disaggregated I-O table for Paraguay will be included in version 7 of the GTAP database.

References

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APPENDIX 1A. Commodity classification and Concordance between Paraguay I-O Table and ISICr3

No.	Sector	Description	ISIC r3
1	Cotton	Cotton	0111
2	Sugar Cane	Sugar Cane	0111
3	Other Industrial Crops	Sunflower, Mate, Coffee, Tobacco, Tung, Mint, Sour orange (leaf)	0111
4	Soybean	Soybean	0111
5	Other Cereals	Rice, Corn, Wheat, Sorghum, rye, oats	
6	Tubers	Cassava, potato	0111
7	Fruits and Other Agricultural Products	Pineapple, Grapefruit, Banana, Watermelon, Melon, Orange, Tangerine, Mango, Lemon, Lime, Guava, Papaya, Grapes, Avocado, Plum, Apple, Pear, Apricots, Strawberries, Raspberries, Other fruits, Peanuts, Tomato, Pea, B, Bean, Carrot, Garlic, Onion, Pumpkin, Squash, Lettuce, Cucumber, Cabbage, Pepper, Sweet Corn, Cauliflower, Eggplant, Other vegetables, Flowers and other agricultural products	0111
8	Bovine Cattle	Bovine Cattle	0112
9	Other Type of Cattle	Sheep and goats, Pigs, Horses, Chickens	0112
10	Other Livestock Products	Milk, Eggs, Wool, Natural Honey, Other Livestock products	0112
11	Forestry	Forestry Products, Other Forestry Products	0200
12	Fishing	Fishing Products	0500
13	Mining	Crude oil, Sand, Rock clay, Other mineral products	1110, 1410
14	Bovine Meat	Clean bovine meta, Frozen bovine meat	1511
15	Other Meat	Poultry Meat, Pork Meat, Sheep and Goats Meat, Edible Offal, Horse Meat, Pig fat, Preserved Meat, Other meat	1511
16	Vegetable oils and fats	Oilcake of soybeans, Oilcake coconut, Oilcake of groundnuts, Oilcake of cotton seeds, Cottonseed Oil, Oilcake sunflower seeds, Sunflower Seed Oil, Other vegetable oils and fats, Soybean pellet, Sunflower Pellet, Coconut Pellet	1514
17	Dairy Products	Milk, Yogurt, Cheese, Milk and cream, Lard, Ice Cream, Other milk products	1520
18	Milling and Bakery Products	Wheat flour, Noodles, Cookie, Bread, Other bakery and milling products	1531, 1541, 1544
19	Sugar	Sugar	1542
20	Other Food Products	Canned Heart palm, Mate, Sweets, Candies, , Roasted and ground coffee, Animal Feed, Vinegar, Other food products	1512, 1532, 1533, 1543, 1549
21	Beverages and Tobacco	Alcoholic Beverages, Wines, Beer, Other alcoholic beverages, Non alcoholic beverages, Mineral Waters, Ice, Other non alcoholic beverages, Cigarettes, Cigars, Manufactured Tobacco	1551, 1552, 1553, 1554, 1600
22	Textiles and Wearing Apparel	Cotton fiber, Cotton Woven fabrics, Other fabrics and textiles, Wearing Apparel	1711, 1721, 1810
23	Leather and leather products	Leather, Footwear, Other leather products	1911, 1920, 1912
24	Wood and Wood Products	Laminated wood, Manufactured wood products	2010, 2020
25	Paper and Paper Products	Paper and paper board, Books, newspaper and magazines, Other paper products, Transfers	2101, 2211, 2109, 222
26	Fuels and lubricants	Gas oils, Gasoline, Turbo fuel, Fuel oils, Kerosene, Other petroleum products	232
27	Chemical Products	Organic chemical bases exc. fertilizers, Chemical products n.e.s., Nitrites, Pesticides, Manufactured plastic and synthetic rubber., Paints and varnishes	2411, 2429, 2412, 2421, 2413, 2422

APPENDIX 1A. Commodity classification and Concordance between Paraguay I-O Table and ISICr3 (Continued)

No.	Sector	Description	ISIC r3
28	Pharmaceutical and Parlor Products	Pharmaceutical products, Parlor Products	2423, 2424
29	Tires, and other rubber products	New rubber tires, Other tires, Other rubber products, Plastic products	2699, 2511, 2519, 2520
30	Non Metallic Mineral Products	Lass products Bricks, and other refractory goods, Cement, lime and plaster, Other non-metallic mineral products,	2610, 2692, 2694, 2695, 2691
31	Iron and Non Ferrous Metal Products	Iron sheets and primary iron products, Primary products, Non ferrous metallic products	2710/31, 2720/32
32	Metal Products	Structural metallic products, General hardware products, Other metallic products exc. machinery and equipment, Metallic accessories	2811/13, 2893, 2891, 2899
33	Machinery and Equipment, home appliances and others	Machinery and equipment, Home appliances, Electric equipment, Agricultural and forestry machinery, Professional, scientific and control equipment, Machinery and electric equipment. tv, radio, Optical equipment, Office, calculating and accounting machines	2911, 2930, 3110/90, 2921, 3311/13, 3210/30, 3320, 3000
34	Motor Vehicles	Motor vehicles, Machinery and special equipment, Boats, Other vehicles	3410, 3420/30, 3422, 3511, 3512, 3520, 3530, 3591/99
35	Other Manufactured Products	Furniture, Music Instruments, Sports goods, Other manufactured products, jewelry and toys	3610, 3692, 3693, 3691, 3694, 3699
36	Electricity and Water	Generated Electricity, Distributed Electricity, Water Supply	4010, 4100
37	Construction	House Construction, Other Building Construction, Agricultural Constructions, Bridge Construction, Tunnel Construction, Ports and Airports Construction, Other Constructions	45
38	Commerce	Commerce	50, 51, 52
39	Transportation	Passenger transport by train, Freight transport by train, Passenger road transportation, Freight road transportation, Other road transportation services, Air Transportation, Water Transportation, Related services to land transport, Related services to water transport, Related services to air transport, Other transport related services	6010, 6021, 6023, 6022, 62, 61, 63
40	Mail and telecommunications	Mail, Telecommunications	641, 642
41	Financial and Insurance Services	Financial Services, Insurance Services	65, 66
42	Real State and Renting Services	Real State Services	7010
43	Business Services	Business Services	70, 71, 72, 73, 74
44	Restaurants and hotels Services	Restaurants Services, Hotel Services	5520, 5510
45	Household Services	Household Services	80, 85, 90
46	Government Services	Government Services	75, 80, 85

APPENDIX 1B. Concordance between GSC2 Sectors and Paraguay I-O table

GSC2 No.	GSC2 Code	GSC2 Description	Paraguay Commodity Name	Paraguay Commodity No.
1	pdr	Paddy rice	Other Cereals	5
2	wht	Wheat	Other Cereals	5
3	gro	Cereal grains nec	Other Cereals	5
4	v_f	Vegetables, fruit, nuts	Tubers, Fruits and Other Agricultural Products	6, 7
5	osd	Oil seeds	Soybean	4
6	c_b	Sugar cane, sugar beet	Sugar Cane	2
7	pfb	Plant-based fibers	Cotton	1
8	ocr	Crops nec	Other Industrial Crops	3[A]
9	ctl	Cattle, sheep, goats, horses	Bovine Cattle	8
10	oap	Animal products nec	Other Type of Cattle	9[B]
11	rmk	Raw milk	Other Livestock Products	10[C]
12	wol	Wool, silk-worm cocoons	Other Livestock Products	10[C]
13	for	Forestry	Forestry	11
14	fsh	Fishing	Fishing	12
15	col	Coal	Mining	13
16	oil	Oil	Mining	13
17	gas	Gas	Mining	13
18	omn	Minerals nec	Mining	13
19	cmt	Meat: cattle, sheep, goats, horse	Bovine Meat	14
20	omt	Meat products nec	Other Meat	15[D]
21	vol	Vegetable oils and fats	Vegetable oils and fats	16
22	mil	Dairy products	Dairy products	17
23	pcr	Processed rice	Milling and Bakery Products	18[E]
24	sgr	Sugar	Sugar	19
25	ofd	Food products nec	Other Food Products	20[E]
26	b_t	Beverages and tobacco products	Beverages and Tobacco	21
27	tex	Textiles	Textiles and Wearing Apparel	22
28	wap	Wearing apparel	Textiles and Wearing Apparel	22
29	lea	Leather products	Leather and leather products	23
30	lum	Wood products	Wood and Wood Products	24[F]
31	ppp	Paper products, publishing	Paper and Paper Products	25
32	p_c	Petroleum, coal products	Fuels and lubricants	26
33	crp	Chemical, rubber, plastic prods	Chemical Products, Pharmaceutical and Parlor Products, Tires, and other rubber products	27, 28, 29
34	nmm	Mineral products nec	Non Metallic Mineral Products	30
35	i_s	Ferrous metals	Iron and Non Ferrous Metal Products	31
36	nfm	Metals nec	Iron and Non Ferrous Metal Products	31
37	fmp	Metal products	Metal Products	32
38	mvh	Motor vehicles and parts	Motor Vehicles	34
39	otn	Transport equipment nec	Motor Vehicles	34
40	ele	Electronic equipment	Machinery and Equipment, home appliances and others	33

APPENDIX 1B. Concordance between GSC2 Sectors and Paraguay I-O table (Continued)

GSC2 No.	GSC2 Code	GSC2 Description	Paraguay Commodity Name	Paraguay Commodity No.
41	ome	Machinery and equipment nec	Machinery and Equipment, home appliances and others	33
42	omf	Manufactures nec	Other Manufactured Products	35[F]
43	ely	Electricity	Electricity and Water	36
44	gdt	Gas manufacture, distribution	Commerce	38
45	wtr	Water	Electricity and Water	36
46	cns	Construction	Construction	37
47	trd	Trade	Commerce, Restaurants and hotels Services	38, 44
48	otp	Transport nec	Transportation	39
49	wtp	Sea transport	Transportation	39
50	atp	Air transport	Transportation	39
51	cmn	Communication	Mail and telecommunications	40
52	ofi	Financial services nec	Financial and Insurance Services	41
53	isr	Insurance	Financial and Insurance Services	41
54	obs	Business services nec	Business Services	43
55	ros	Recreation and other services	Household Services	45
56	osg	PubAdmin/Defence/Health/Educat	Government Services	46
57	dwe	Dwellings	Real State and Renting Services	42

a. *Other Industrial Crops* included Sunflower production, which should be in *osd* (Oil Seeds). However, most domestic production of *Other Industrial Crops* (90%) was in *ocr* (Crops nec).
b. *Other Type of Cattle* included sheep, goats, and horses, which should be in GTAP sector 9 (ctl). However, 97% of domestic production in *Other Type of Cattle* was pig and poultry production.
c. *Other Livestock Products* included eggs, which should be in GTAP sector 10 (oap). However, 57% corresponded to milk, wool, and honey production.
d. *Other Meat* included sheep and goats meat, edible offals, horse meat, pig fat, which are included in GTAP sector 19 (cmt). However, 64% of domestic production was pork and poultry meat.
e. *Processed Rice* is included in the Paraguayan Sectoral classification as “Other bakery Products” which are 6% of *Milling and Bakery Products.* Most of Milling and Bakery products (94%) belong to GTAP sector 25 (ofd).
f. *Other Manufactured Products* includes Wood Furniture, which should be in GTAP sector 30 (lum). However, no Wood Furniture (0%) is produced domestically.

APPENDIX 2. Total Supply Value Shares for Disaggregation of Paraguay Sectors into GTAP Sectors

GSC2 Code	GSC2 Description	Value Share	Paraguay Commodity Name	Paraguay Commodity No
pdr	Paddy rice	9%	Other Cereals	5
wht	Wheat	26%		
gro	Other Cereals (maize)	65%		
tex	Textiles	71%	Textiles and Wearing	22
wap	Wearing Apparel	29%	Apparel	
i_s	Ferrous metals	88%	Iron and Non Ferrous Metal	31
nfm	Metals nec.	12%	Products	
ele	Electronic Equipment	47%	Machinery and Equipment,	33
ome	Machinery and equipment nec.	53%	home appliances and others	
mvh	Motor vehicles and parts	91%	Motor Vehicles	34
otn	Transport equipment nec.	9%		
ely	Electricity	86%	Electricity and Water	36
wtr	Water	14%		
otp	Transport nec.	77%	Transportation	39
wtp	Sea transport	10%		
atp	Air transport	13%		
ofi	Financial Services nec.	89%	Financial and Insurance	41
isr	Insurance	11%	Services	

APPENDIX 3. Process of creating the Paraguay's I-O table for the GTAP database