Chapter 8

Regional Input-Output Data

Angel Aguiar

This chapter documents the input-output tables (IOTs) used in constructing the GTAP 12 Data Base. The GTAP Data Base consists mainly of intersectoral transactions and the primary source for this data is a large collection of single-country IOTs contributed to GTAP by researchers from around the world. This chapter summarizes this collection process. Documentation for each country contribution to this version is available in sub-chapters.[1] Other existing countries submitted prior to GTAP 12 can be found in the documentation for the relevant version.[2] In this chapter we describe what's new in the contributed I-O tables in the GTAP 12 Data Base and outline the screening and preliminary adjustments we make to the contributed tables. We also briefly discuss the processing of these tables. Finally we provide some summary statistics of the contributed IOT.

8.1 What's New in Version 12?

Compared to the GTAP 11 Data Base, version 12 has more regional detail, but the same sectoral coverage. The lists of regions and sectors are provided in Chapter 2. The additional detail provides considerable scope for users of the GTAP Data Base to investigate a variety of issues related to these new regions.

The GTAP 12 Data Base includes data for 163 regions. Of these 163, 145 are countries developed from contributed I-O tables; the remaining 18 are aggregate regions. Version 11 had 160 regions, 141 of which were countries. Table 8.1 summarizes the sources and reference period for all the regional I-O tables underpinning the GTAP 12 Data Base.

Compared to version 11, in version 12, the number of 'rest of' composite regions was reduced by 1. We removed the aggregate region *Rest of South and Central Africa* because we received IO data for Angola and São Tomé and Príncipe.[3]

The inclusion of a new country into the data base is driven by the needs of the users of the GTAP Data Base. Country I-O tables are prepared by contributors who have a particular interest

[1] The GTAP 12 Data Base Documentation is available on the GTAP website.

[2] Links to country specific documentation can also be found in the summary documentation of each country, which can be obtained via this webpage.

[3] The standard country list used in GTAP is comprehensive and covers more than 200 countries.

in including the country in the GTAP Data Base. Users interested in contributing I-O tables are referred to GTAP Technical Paper No. 01 on this subject (Huff et al. 2000). Relative to version 11, there are 4 new and 16 updated country IOTs that have been incorporated.[4] The new countries extracted from previous regional aggregates are: Angola, Burundi, Mauritania, and São Tomé and Príncipe. References to the IOTs used for each of these new and updated countries are available on the GTAP website[5] and listed in Table 3.1.[6]

8.2 Checking the I-O Tables

After receiving an I-O table, we first check that it satisfies certain formal requirements. If there are serious deviations from these requirements, we advise the contributor and request changes. The procedures for checking the I-O tables are continuously being reviewed and improved during the production process. Further details about the checking procedures are provided in Huff et al. 2000 and on the contributors' website.

There are 5 groups of checks made on the I-O tables. These include:

— Data structure. This includes a number of checks. Firstly, we ensure that there are at least 30 sectors and that agriculture and energy are separate from other sectors.[7] Secondly, we check that the contributor has mapped the original data to the sectors according to the concordances[8]; and finally, we ensure that there are no serious data omissions.

— Balance condition. Each table should be balanced. A check is made to ensure that total sales equal total costs for each sector in the contributed I-O table.

— Sign. There are certain requirements about the signs of elements in the tables. For example, the value of capital services must be positive reflecting the normal return to capital services.

— Tax rates. A check is made to ensure that there are no ridiculous tax rates implied by the data. Taxes or subsidies over 100% are flagged to the contributor.

— Other. We also check that the other government services (osg, edu, hht) and dwellings (dwe) sectors have been treated in the preferred way and therefore that the I-O table is consistent with the other I-O tables. Both of these problems are prevalent in many of the tables. In the case of government services modifications have been made in the construction process to rectify tables with this problem (see Chapter C).

[4]Two additional IOTs are considered for historical reference years. Canada and the UK submitted two reference years during the GTAP 12 cycle.
[5]For new and updated country information included in version 12, please refer to the online documentation.
[6]For information on all countries available in GTAP, please refer to the Regional coverage webpage.
[7]The Center has instituted a peer-review system for countries with less than 30 sectors.
[8]GTAP sector concordances against the Central Product Classification (CPC) and International Standard Industry Classification (ISIC) are available in this webpage

— I-O structure. Finally we compare the I-O structure to that of an average I-O table to ensure that there are no unusual entries. The results of these checks are then given to the contributor, who then satisfies him/herself that any substantial differences are explainable or, in the case of errors, these are fixed. Further details on the method used to compare an I-O table to the average I-O table can be found in Walmsley and McDougall 2007. We increasingly rely on these entropy measures to highlight errors in mappings and in the underlying I-O tables. In some cases, where shares are exceedingly strange, tables have been rejected.

In general, we require substantive, but not rigorous compliance with all these conditions. For example, we accept tables with negative entries in cells that should have non-negative entries but only if we judge that the negative values are economically insignificant; that is, that we can remove them without substantially altering the I-O structure. Then in our initial processing of the tables, we remove these minor defects.

8.3 Processing of I-O Tables

Once accepted, the I-O tables go through a number of stages before they can be integrated into the GTAP Data Base.

First, despite all the preliminary checks made, we do accept tables with minor deviations; hence some cleaning of the I-O tables is usually required to remove any minor problems or deviations in sign or balance.

Second, agricultural production targets are applied to the majority of I-O tables before the main data construction phase. In the GTAP 5 Data Base, the data for European Union (EU) member countries contained considerable inaccuracies in levels and international distribution of agricultural production. As a result, since GTAP version 6, we have been targeting agricultural production in IOTs based on data from the Organization for Economic Co-operation and Development, OECD. Since version 10, we also use data from the Food and Agricultural Organization (FAO) as documented in Chapter 9A.

Third, as mentioned above many tables contain inappropriate treatment of government services. Under standard national accounting conventions (UN 2009), government consumption includes the outputs of "non-market processes of production" and excludes their inputs, these being accounted as intermediate usage by various industries, notably, public administration and defense. Most I-O tables contributed to GTAP apply this convention, but some do not. For those that do not, modifications have been made in the construction process to rectify the problem. The procedure is outlined in Chapter 9C.

Fourth, having cleaned the I-O tables as required, we take those that have the full 65-sector GTAP sectoral classification and calculate from them a representative table (see Chapter 9D) as a linear combination, giving each region's I-O table its appropriate GDP weight.

Fifth, for the tables that do not have the full 65 sectors, we disaggregate, as described in Chapter 9B. The GTAP 12 Data Base provides details on 65 sectors – the new standard since GTAP 10. Of the contributed tables, 96 do not contain all sectors and required disaggregation, of which 50 required agricultural disaggregation and 94, non-agricultural disaggregation. Table 8.2 lists the contributed I-O tables and the level of aggregation. This disaggregation is done for agricultural and food sectors separately from other goods. The disaggregation of agricultural and food commodities is undertaken using a database constructed by Everett Peterson and described in Chapter 9B. For the non-agricultural commodities we use the representative I-O table to disaggregate the sectors (see Chapters 9B and 9D).

Finally, for each region where we have no contributed table, we calculate a composite table, as a linear combination of I-O tables for selected primary regions. We make a different selection of primary regions for each composite region, matching as closely as possible the composite region's income level and production pattern, as described in Chapter 9D.

At this point we have a set of tables covering all GTAP regions and the IOTs are ready to be incorporated into the GTAP Data Base and reconciled with the other macroeconomic datasets. First, you may have noticed in Table 8.1 that the reference periods for the regional IOTs vary across regions. The reason for this is that IOTs for most of the regions are available at five year or longer intervals and they are often published several years after the data have been collected. This means that it is impossible to keep source data up-to-date. Fortunately the I-O coefficients tend to change relatively slowly, and the data are updated to reflect macroeconomic aggregates, trade, energy, and protection targets for 2004, 2007, 2011, 2014, 2017, 2019, and 2023. The procedure used to update the I-O tables is described in Chapter A. We believe that the resulting estimated domestic data bases are of reasonably high quality in almost all cases.

In the final stages, revisions are made to the value-added in the I-O table. You may have noticed that contributed I-O tables only contain data on the aggregate value of labor. Using other data sources, we split these values between skilled and unskilled labor, and also revise primary factor usage in agriculture and resource-intensive industries (Chapter 14).

8.4 Concluding Remarks

We have yet to mention the work undertaken by the contributor in preparing an I-O table for incorporation into the GTAP Data Base. There are numerous problems and issues that a contributor has to consider when preparing an I-O table. In the following sub-chapters, the contributors provide detailed information about the source of the data, how it was prepared, and any problems encountered and how they were dealt with.

References

Huff, Karen et al. (2000). *Contributing Input-Output Tables to the GTAP Data Base*. GTAP Technical Paper 01. Department of Agricultural Economics, Purdue University, West Lafayette, IN: Global Trade Analysis Project (GTAP). URL: https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=304.

UN (2009). *System of National Accounts*. United Nations. URL: http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf.

Walmsley, Terrie and Robert McDougall (2007). *Using Entropy to Compare IO tables*. GTAP Research Memorandum 09. Department of Agricultural Economics, Purdue University, West Lafayette, IN: Global Trade Analysis Project (GTAP). URL: https://doi.org/10.21642/GTAP.RM09.

Table 8.1: Sources of I-O tables in GTAP Version 12 Data Base

No.	Code	Country Name	Period	Source of I-O Table	Contributor(s)	Version
1	AUS	Australia	2018	NSO link; see also archive items.	Glyn Wittwer	11
2	NZL	New Zealand	2013	New Zealand Input Output Table (Supply and Use Tables)	Erwin Corong, Anna Strutt	10, Interim Release 1
3	CHN	China	2017	National Bureau of Statistics of China	Yu Liu	11
4	HKG	China, Hong Kong Special Administrative Region	1988	Tormey (1993)	SALTER project	1 , Final Release 1
5	JPN	Japan	2011	Director-General for Policy Planning (Statistical Standards), the Ministry of Internal Affairs and Communications (2015). “2011 Input-Output Tables for Japan”.	Susumu Suzuki	10, Final Release 1
6	KOR	Republic of Korea	2020	The Bank of Korea	Jong-Hwan Ko	12
7	MNG	Mongolia	2016	National Statistics Office	Erwin Corong, Bayarmaa Baatarsuren, Tserenkhand Bideriya	10, Interim Release 1
8	TWN	Taiwan	2006	Taiwan Input Output Table	Hsing-Chun Lin, Shih-Hsun Hsu	8 , Interim Release 1
9	BRN	Brunei Darussalam	2005	BRUNEI DARUSSALAM’S INPUT-OUTPUT TABLES 2005 by Department of Economic Planning and Development, Prime Ministers Office, Brunei Darussalam; publicly available from web page	Ken Itakura	8 , Interim Release 2
10	KHM	Cambodia	2003	Primary: Economic Institute of Cambodia (EIC); Secondary: Cambodian National Institute of Statistics (NIS), National Bank of Cambodia and other international organizations (the World Bank and IMF)	Sothea Oum	7 , Final Release 1
11	IDN	Indonesia	2017	Indonesian Statistical Agency	Angel Aguiar	11
12	LAO	Lao People’s Democratic Republic	2017	ADB	Sumathi Chakravarthy, Badri Gopalakrishnan	11
13	MYS	Malaysia	2019	Malaysian Input-output tables for the year 2019, Department of Statistics, 2019.	Jingjing Liu and Norlida Hanim Mohd Salleh	12

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No.	Code	Country Name	Period	Source of I-O Table	Contributor(s)	Version
14	PHL	Philippines	2018	2018 Philippine Input-Output Table	Caesar Cororaton	11
15	SGP	Singapore	2007	Singapore Input-output tables for 2007	Nhi Tran	8 , Interim Release 1
16	THA	Thailand	2015	2015 Input-Output Table of Thailand from the Office of the National Economic and Social Development Council (NESDC, formerly NESDB), available at: web page.	Tosapol Apaitan	11
17	VNM	Viet Nam	2016	WB SAM	Angel Aguiar	11
18	AFG	Afghanistan	2017	National Statistics & Information Authority (NSIA)	Sebnem Sahin	11
19	BGD	Bangladesh	2012	Bangladesh Planning Commission	Selim Raihan, Bazlul Haque Khondker	10, Final Release 1
20	IND	India	2015	Ministry of Statistics and Programme Implementation, http://mospi.nic.in/publication/supply-use-tables	Devender Pratap	11
21	NPL	Nepal	2007	An Input-output technology matrix of year 2001 from the Planning Commission of Nepal and the Central Bureau of Statistics (CBS) which has been updated; National Accounts from CBS; Trade data from UNCOMTRADE; domestic tax data from department of inland revenue; import duties from Department of Customs. Also, Nepal Labour Force Survey and Nepal Living Standard Survey by CBS	Selim Raihan, Bazlul Khondker	8 , Final Release 1
22	PAK	Pakistan	2017	Mariasingham, J 2019, 'ADB Multi-Region Input-Output Database: Sources and Methods', Asian Development Bank. Asian Development Bank (2017), 'Compendium of Supply and Use Tables for Selected Economies in Asia and the Pacific", Manila, Philippines.	Muhammad Zeshan	11
23	LKA	Sri Lanka	2011	Department of Census and Statistics Sri Lanka	Jeevika Weerahewa, Senal Weerasooriya, Jay Bandaralage	10, Final Release 1
24	CAN	Canada	2019	Statistics Canada	Philip Bagnoli	12
25	USA	United States of America	2012	BEA, IOT 2012	Erwin Corong, Marinos Tsigas	11
26	MEX	Mexico	2013	Inegi	Carmen Estrades	11
27	ARG	Argentina	2000	Secretaría de Agricultura, Ganaderia, Pesca y Agricultura – Ministerio de Economía	Martin Cicowiez	10, Final Release 1

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No.	Code	Country Name	Period	Source of I-O Table	Contributor(s)	Version
28	BOL	Bolivia (Plurinational State of)	2014	Bolivia: Matriz de Insumo-Producto	José Elías Durán Lima and Angel Aguiar	10, Interim Release 1
29	BRA	Brazil	2010	Instituto Brasileiro de Geografia e Estatística - IBGE	Joaquim Bento Ferreira-Filho	10, Interim Release 1
30	CHL	Chile	2016	Central Bank of Chile 2016's Input-Output Table	Alonso Gonzalez Marentis, Jonas Luckmann, Khalid Siddiq	11
31	COL	Colombia	2014	Departamento Administrativo Nacional de Estadística (DANE)	Gabriel Piraquive Galeano, Erick Céspedes Rangel, Nicolás Ramírez Guerrero	11
32	ECU	Ecuador	2019	IOT from NSO	Angel Aguiar	11
33	PRY	Paraguay	2014	Central Bank of Paraguay- Results of CAB	Edgar GóMez Leiva, Natalia Peña	10, Interim Release 1
34	PER	Peru	2022	Input-output table estimated by the Banco Central de Reserva del Perú	Martín Cicowiez and Angel Aguiar	12
35	URY	Uruguay	2016	Central Bank of Uruguay	Carmen Estrades, Erwin Corong	11
36	VEN	Venezuela (Bolivarian Republic of)	2007	Central Bank of Venezuela	Francesco Leone, Roberto Ferrer Jorge Hernandez	9 , Interim Release 1
37	CRI	Costa Rica	2017	Central Bank of Costa Rica	Marlon Molina, Diego Agüero, Henry Vargas, Gabriela Saborio, Francisco Monge, Arlina Gómez, Marlene Salazar, Kimberly Valverde	11
38	GTM	Guatemala	2001	Guatemalas Secretaría General de Planificación (SEGEPLAN).	Carlos Ludena, Jose Duran	7

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No.	Code	Country Name	Period	Source of I-O Table	Contributor(s)	Version
39	HND	Honduras	2004	Honduras 2004 SAM	José Elías Durán Lima, Gonzalo R. Véliz Marín, Carlos Eduardo Ludeña, Mauricio Pereira Flores	8 , Final Release 1
40	NIC	Nicaragua	2000	Sanchez and Vos (2006) and Central Bank of Nicaragua	Marco Sanchez and Rob Vos, Carlos Ludena	7
41	PAN	Panama	2016	El Instituto Nacional de Estadística y Censo (INEC)	Raymond Mi	11
42	SLV	El Salvador	2000	Social Accounting Matrix, year 2000, from IFPRI (International Food Policy Reasearch Institute)	José Elías Durán Lima, Carlos Ludeña, Mauricio Pereira, Gonzalo Véliz	8 , Final Release 1
43	DOM	Dominican Republic	2005	Banco Central de la República Dominicana	Carlos Ludena, Mark Horridge	8 , Interim Release 2
44	HTI	Haiti	2012	Social Accounting Matrix	Angel Aguiar	11
45	JAM	Jamaica	2007	Hope Perkins, Statistical Institute of Jamaica	Carlos Ludena, Mark Horridge	8 , Interim Release 2
46	PRI	Puerto Rico	2000	Nelson D. López Esquerdo, Programa Planificación Económica y Social de Puerto Rico	Carlos Ludena, Mark Horridge	8 , Interim Release 2
47	TTO	Trinidad and Tobago	2000	Inter-American Institute for Cooperation on Agriculture (IICA)	Carlos Ludena, Mark Horridge	8 , Interim Release 2
48	AUT	Austria	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
49	BEL	Belgium	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
50	BGR	Bulgaria	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
51	HRV	Croatia	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
52	CYP	Cyprus	2010	EUROSTAT	Angel Aguiar	11

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No.	Code	Country Name	Period	Source of I-O Table	Contributor(s)	Version
53	CZE	Czechia	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
54	DNK	Denmark	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
55	EST	Estonia	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
56	FIN	Finland	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
57	FRA	France	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
58	DEU	Germany	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
59	GRC	Greece	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
60	HUN	Hungary	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
61	IRL	Ireland	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
62	ITA	Italy	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
63	LVA	Latvia	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
64	LTU	Lithuania	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2

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No.	Code	Country Name	Period	Source of I-O Table	Contributor(s)	Version
65	LUX	Luxembourg	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
66	MLT	Malta	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
67	NLD	Netherlands	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
68	POL	Poland	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
69	PRT	Portugal	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
70	ROU	Romania	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
71	SVK	Slovakia	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
72	SVN	Slovenia	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
73	ESP	Spain	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
74	SWE	Sweden	2010	EUROSTAT	Jose M. Rueda-Cantuche, Tamas Revesz, Bert Saveyn	9 , Interim Release 2
75	GBR	United Kingdom of Great Britain and Northern Ireland	2019	UK Office for National Statistics	Robert Leck	12

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No.	Code	Country Name	Period	Source of I-O Table	Contributor(s)	Version
76	CHE	Switzerland	2014	Input Output Table Swiss Federal Office of Statisics	Renger van Nieuwkoop, Carsten Nathani	11
77	NOR	Norway	2017	NSO	Robbie Andrew, Glen Peters	11
78	ALB	Albania	2000	(1) Albanian Ministry of Finance publication, (2001) (2) Ms. Godiva Rembeci, Institute of Statistics, (3) IMF (2000) (4) INSTAT (2000) (5) Albanian Ministry of Finance publication (2001), and also discussions with taxation officials.	Mark Horridge	5 , Interim Release 3
79	SRB	Serbia	2015	Statistical Office of the republic of Serbia (SORS).	Diamantis Koutsandreas	11
80	BLR	Belarus	2010	2010 I-O tables from the Belarus Statistical Committee	Csilla Lakatos, Irina Tochitskaya	8 , Interim Release 1
81	RUS	Russian Federation	2016	ROSSTAT	Sindhu Bharathi Mandharachalam, Sumathi Chakravarthy	11
82	UKR	Ukraine	2017	NSO	Maksym Chepeliev	11
83	KAZ	Kazakhstan	2017	National Committee Of Statistics of the Republic of Kazakhstan	Aigerim Kushumbayeva	11
84	KGZ	Kyrgyzstan	2003	Miles Light	Aziz Atamanov, Lucio Vinhas de Souza Joe Francois	7
85	TJK	Tajikistan	2011	Agency on Statistics under the President of the Republic of Tajikistan	Parviz Khakimov	9 , Interim Release 1
86	UZB	Uzbekistan	2018	Combined official, academic, and private sources.	David Roland-Holst	11
87	ARM	Armenia	2002	The table is based on a table included in a social accounting matrix developed by Miles K. Light, Ekaterine Vashakmadze, and Artsvi Khatchatryan. Their table has 25 sectors and is produced using official data provided by Armenian Ministries and Departments including the National Statistical Service, the Customs Authorities, and the Tax Authorities.	Jesper Jensen, David Tarr and Oleksandr Shepotylo	7
88	AZE	Azerbaijan	2021	Input-output table. Available from: web page.	Parviz Aliev	12
89	GEO	Georgia	2001	Unofficial table provided by the Economic Policy Research Center (EPRC) in Georgia	Jensen, Jesper	7

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No.	Code	Country Name	Period	Source of I-O Table	Contributor(s)	Version
90	BHR	Bahrain	2005	General national accounts data for 2005, Central Informatics Organisation, Bahrain. Detailed national accounts statistics 2006 and 2007, Central Informatics Organisation, Bahrain. UN trade data (Comtrade) for imports and exports. Kuwait I/O table for 2005 with 44-sectors.	David Green	8 , Final Release 1
91	IRN	Iran (Islamic Republic of)	2012	Iran Statistical Center	Wajiha Saeed	11
92	IRQ	Iraq	2011	Debowicz, Dario. 2013. A Social Accounting Matrix for Iraq, 2011. Washington, D.C.: International Food Policy Research Institute (IFPRI). Debowicz, D. 2016. "A Social Accounting Matrix for Iraq." Journal of Economic Studies 5 (24). https://doi.org/10.1186/s40008-016-0057-4.	Angel Aguiar	10, Interim Release 1
93	ISR	Israel	2004	Domestic institutions in Israel, including but not limited to: the Israeli Central Bureau of Statistics, the Central Bank of Israel, and the Israeli Tax Authority (ITA). See the extended documentation for more details.	Khalid Siddig, Dorothee Flaig; Jonas Luckmann; Harald Grethe	8 , Final Release 1
94	JOR	Jordan	2018	2018 Supply-Use Table from the Jordanian Department of Statistics available here./	Louise Roos	12
95	KWT	Kuwait	2005	Detailed 54-sector I/O table for 2000 published by the Kuwait Central Statistics Office. Abbreviated 29-sector I/O table for 2005 (unpublished) provided by the Kuwait Ministry of Planning. The National Accounts Statistics 2005 published by the Kuwait Central Statistics Office in 2008. UN Comtrade trade data.	David Green	8
96	LBN	Lebanon	2010	The staff of the United Nations Economic and Social Commission for Western Asia (UNESCWA) made these tables available to us.	Angel Aguiar	10, Interim Release 1
97	OMN	Oman	2018	NSO	Angel Aguiar and Mohamed Chemingui	12
98	PSE	State of Palestine	2011	The original data source for this IOT is the 2011 SAM for the West Bank (Agbahey et a., 2016), which is itself based on the national accounts, the supply and use table and other data sets mostly provided by the Palestinian Central Bureau of Statistics (PCBS).	Johanes Agbahey, Khalid Siddig Harald Grethe	10, Interim Release 1

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No.	Code	Country Name	Period	Source of I-O Table	Contributor(s)	Version
99	QAT	Qatar	2005	Annual Statistical Abstract, 2007, Qatar Statistics Authority. Economic Statistics Bulletin, 2008, Qatar Statistics Authority. UN trade data (Comtrade) for imports and exports. Kuwait I/O table for 2005 with 44 sectors, 2011.	David Green	8 , Final Release 1
100	SAU	Saudi Arabia	2021	https://www.stats.gov.sa/en/1158	Muhammad Aamir Khan	12
101	SYR	Syrian Arab Republic	2007	Staff of the United Nations Economic and Social Commission for Western Asia (UNESCWA) made these tables available to us.	Angel Aguiar	10, Interim Release 1
102	TUR	Turkey	2012	The original data source of Turkeys input-output (I/O) table is published by the Turkish Statistical Institute (TURKSTAT) in December 2016.	Yasin Biyik, Prof. Dr. Lerzan Özkale	10, Final Release 1
103	ARE	United Arab Emirates	2014	National Accounts	Maria Seara e Pereira and Mohamed Chemingui	12
104	DZA	Algeria	2015	NSO	Angel Aguiar	11
105	EGY	Egypt	2003	Mr. Afara, Director of National Accounts, National Planning Unit of Egypt	Noura Abdelwahab and Miles Light	6 , Interim Release 2
106	MAR	Morocco	2019	2019 Supply Use Tables	Maria Seara e Pereira and Zakaria El Faiz	12
107	TUN	Tunisia	2005	Drine, I., Y. Jmal and J. Thurlow. 2012.	Lacina Balma	9 , Interim Release 1
108	BEN	Benin	2003	Base de données MCS 2003 du Bénin	Badri Narayanan	8 , Interim Release 1
109	BFA	Burkina Faso	2005	Ministry of Agriculture, Hydraulic and Fisherie Resources	Lacina Balma, Dramane Bako	8 , Interim Release 1
110	CMR	Cameroon	2019	Supply and use table	Achille Carlos Deffo	12
111	CIV	Côte d'Ivoire	2015	Cote dIvoires Social Accounting Matrix	Souleymane Sadio Diallo	11
112	GHA	Ghana	2005	A 2005 Social Accounting Matrix (SAM) for Ghana, published in October 2007, by Ghana Statistical Services (GSS), International Food Policy Research Institute (IFPRI) under the Ghana Strategy Support Program (GSSP)	Charles Adjasi, Emmanuel Kinful	8

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No.	Code	Country Name	Period	Source of I-O Table	Contributor(s)	Version
113	GIN	Guinea	2005	MATRICE DE COMPTABILITE SOCIALE DE LA GUINEE, Ismael FOFANA & Lacina BALMA, International Food Policy Research Institute (IFPRI), West and Central Africa Office (Janvier 2012). Source: TRE 2005, Comptes Nationaux 1997-2006, EIBEP 2002-2003	Lacina Balma, Ismael Fofana	8 , Interim Release 1
114	MLI	Mali	2017	NSOs SUTs	Kadidia Traore	11
115	MRT	Mauritania	2017	NSO	Abdoulaye Tandia	12
116	NER	Niger	2019	Tableau des ressources-emplois 2019	Laouali Chaibou	11
117	NGA	Nigeria	2018	2018 Social Accounting Matrix for Nigeria. A Nexus Project SAM by James Thurlow International Food Policy Research Institute, Washington DC, USA	Angel Aguiar and Maria Seara e Pereira	12
118	SEN	Senegal	2005	Diagne, Abdoulaye, François Joseph Cabral, Fatou Cissé, and Anne-Sophie Robilliard. 2011. Country Study: Assessing Development Strategies to Achieve the MDGs in the Republic of Senegal. United Nations Department for Social and Economic Affairs, March.	Angel Aguiar	8 , Interim Release 2
119	TGO	Togo	2006	Unpublished research by a PEP network team member.	Lacina Balma, Damien AGBODJI	8 , Interim Release 1
120	AGO	Angola	2015	Supply and Use Table (SUT)	Henrique Nsingui	11.1
121	CAF	Central African Republic	2017	Les Comptes économiques de la République centrafricaines, 2017, ICASEES, Ministère du Plan, de lEconomie et de la Coopération Internationale	Roger Yele	11
122	TCD	Chad	2016	National Institute of Statistics, Economics and Demographics Studies	Ibn Ali Youssouf	11
123	COG	Congo	2016	Direction des Synthèses et Analyses Economiques	Alain Patrick Makouala	11
124	COD	Democratic Republic of the Congo	2019	National Institute of Statistics	Gloire Kadima	12
125	GNQ	Equatorial Guinea	2017	INEGE	Severo Ngua Bibang Obono	11
126	GAB	Gabon	2017	Direction Générale de la Statistique/Ministère de lEconomie et de la Relance	Paul Mapessi	11
127	STP	Sao Tome and Principe	2019	Contas Nacionais	Ana Justina Filipe Da Costa	11.1
128	BDI	Burundi	2016	National Bureau of Statistics	Lydia Bukuru	11.1

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No.	Code	Country Name	Period	Source of I-O Table	Contributor(s)	Version
129	COM	Comoros	2017	Tableaux Ressources Emploi de 2017, Données d'Enquêtes, INSEED COMORES	Mohamed Said Ali	11
130	ETH	Ethiopia	2002	Social Accounting Matrix 2001/02 compiled by IDS in collaboration with EDRI	Angel Aguiar, This is a minor fix to previously contributed table by Dirk Willenbockel and Sherman Robinson in version 7.1.	8 , Final Release 1
131	KEN	Kenya	2001	Several structural and annual data sources such as national accounts, government accounts, balance of payments and foreign trade data, as well as the most recent IO table (1997 SAM constructed by the Kenya Institute for Public Policy Research and Analysis KIPPRA), SAMs for earlierbase years constructed by the Kenyan Central Bureau of Statistics and the 1997 Welfare Monitoring Survey	Peter Wobst, Benjamin Schraven	8
132	MDG	Madagascar	2019	INSTAT	Samuel Randriambolamanitra	12
133	MWI	Malawi	2007	Douillet, M., K. Pauw and J. Thurlow (2012) "A Standard 2007 Social Accounting Matrix for Malawi." Washington DC, USA: International Food Policy Research Institute.	Zekarias Hussein, James Thurlow	8 , Interim Release 1
134	MUS	Mauritius	2018	Supply and Use Table (SUT) and Input-Output Table (IOT) 2018 compiled by Statistics Mauritius and provided by Mr Meethoo JAWAHIR, Statistician in the National Accounts Unit	Celine Niwemahoro	12
135	MOZ	Mozambique	2015	WB SAM	Angel Aguiar	11
136	RWA	Rwanda	2006	Arnault, E. C. 2007. "The 2006 Social Accounting Matrix of Rwanda: Methodology Note." Unpublished memo, University of Yaounde II, Yaounde, Cameroon.	Zekarias Hussein	8 , Interim Release 1

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No.	Code	Country Name	Period	Source of I-O Table	Contributor(s)	Version
137	SDN	Sudan	2012	Major data sets used include the 2012 National Accounts and Trade Statistics of the CBS, the 53rd Annual Report of the Central Bank of the Sudan, the 2011 Labor Force Survey, the 2009 Household Income and Expenditure Survey, The 2009-2012 Agricultural Production Cost Survey and the 2005 Industrial Survey. Data from external sources are used to complement national sources. These sources include IMF studies on government finances, FAO reports and data on agriculture and ILO reports on labor.	Khalid Siddig	10, Interim Release 1
138	TZA	United Republic of Tanzania	2007	Xinshen D., J. Thurlow, S. Benin, and S. Fan (eds) 2012. Strategies and priorities for African agriculture: economy wide perspectives from country studies. International Food Policy Research Institute (IFPRI)	Zekarias Hussein, James Thurlow	8 , Interim Release 1
139	UGA	Uganda	2007	Thurlow, J. 2008. A 2007 Social Accounting Matrix for Uganda. International Food Policy Research Institute, Washington, DC. Electronic database (Uganda 2007 SAM.xlsx), downloaded on 7 October 2015 from: https://dataverse.harvard.edu/dataset.xhtml?persistentId=hdl	Isabel Teichmann	9 , Interim Release 1
140	ZMB	Zambia	2007	Chikuba, Z., M. Syacumpi, J. Thurlow and E. Zulu (2012) "A Standard 2007 Social Accounting Matrix for Zambia." Washington DC, USA: International Food Policy Research Institute.	Zekarias Hussein, James Thurlow	8 , Interim Release 1
141	ZWE	Zimbabwe	2017	NSO	Rob Davies, Dirk van Seventer	11
142	BWA	Botswana	2016	Botswana 2016 Supply and Use Table	Lekoko Simako	11
143	SWZ	Eswatini	2017	Supply Use Table (SUT) 2017 for Eswatini	Nsika Melusi Dlamini	11
144	NAM	Namibia	2004	Marie-Lange, G. (2008). A social accounting matrix for Namibia, 2004: A tool for analysing economic growth, income distribution and poverty, Namibian Economic Research Unit,	Michael Begg, Lelly Nghixulifwa	8 , Final Release 1
145	ZAF	South Africa	2017	Statistics South Africa, 2021a, Benchmarked and rebased estimates of Gross Domestic Product, 2021, Report 04-04-04, SUT 2013-2018,	Dirk van Seventer, Rob Davies	11

Table 8.2: Number of Sectors in the Contributed I-O Tables

No.	Code	Country Name	Version	GTAP Sector Classification	Total # of sectors	Agriculture	Food	Manufacturing and services
1	AUS	Australia	11	3	65	12	8	45
2	NZL	New Zealand	10.1	3	55	6	6	43
3	CHN	China	11	3	53	2	7	44
4	HKG	China, Hong Kong Special Administrative Region	1	2	37	6	5	26
5	JPN	Japan	10	3	65	12	8	45
6	KOR	Republic of Korea	12	3	63	11	7	45
7	MNG	Mongolia	10.1	3	50	8	5	37
8	TWN	Taiwan	8.1	2	57	12	8	37
9	BRN	Brunei Darussalam	8.2	2	34	1	1	32
10	KHM	Cambodia	7	2	57	12	8	37
11	IDN	Indonesia	11	3	65	12	8	45
12	LAO	Lao People's Democratic Republic	11	3	31	1	1	29
13	MYS	Malaysia	12	3	54	7	5	42
14	PHL	Philippines	11	3	60	10	6	44
15	SGP	Singapore	8.1	2	43	2	5	36
16	THA	Thailand	11	3	59	9	7	43
17	VNM	Viet Nam	11	3	65	12	8	45
18	AFG	Afghanistan	11	3	31	4	1	26
19	BGD	Bangladesh	10	3	57	12	8	37
20	IND	India	11	3	57	10	4	43
21	NPL	Nepal	8	2	57	12	8	37
22	PAK	Pakistan	11	3	35	1	1	33
23	LKA	Sri Lanka	10	3	51	8	6	37
24	CAN	Canada	12	3	50	2	4	44
25	USA	United States of America	11	3	57	7	6	44
26	MEX	Mexico	11	3	55	5	6	44
27	ARG	Argentina	10	2	33	8	6	19
28	BOL	Bolivia (Plurinational State of)	10.1	3	31	5	5	21
29	BRA	Brazil	10.1	3	56	11	8	37
30	CHL	Chile	11	3	56	7	6	43
31	COL	Colombia	11	3	64	12	7	45
32	ECU	Ecuador	11	3	43	5	6	32

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No.	Code	Country Name	Version	GTAP Sector Classification	Total # of sectors	Agriculture	Food	Manufacturing and services
33	PRY	Paraguay	10.1	3	36	2	7	27
34	PER	Peru	12	3	54	3	7	44
35	URY	Uruguay	11	3	56	11	7	38
36	VEN	Venezuela (Bolivarian Republic of)	9.1	2	49	7	6	36
37	CRI	Costa Rica	11	3	64	12	7	45
38	GTM	Guatemala	7	2	50	12	7	31
39	HND	Honduras	8	2	42	7	7	28
40	NIC	Nicaragua	7	2	34	5	5	24
41	PAN	Panama	11	3	43	8	5	30
42	SLV	El Salvador	8	2	38	7	6	25
43	DOM	Dominican Republic	8.2	2	30	4	4	22
44	HTI	Haiti	11	3	18	1	1	16
45	JAM	Jamaica	8.2	2	35	6	5	24
46	PRI	Puerto Rico	8.2	2	38	1	7	30
47	TTO	Trinidad and Tobago	8.2	2	43	6	7	30
48	AUT	Austria	9.2	2	57	12	8	37
49	BEL	Belgium	9.2	2	57	12	8	37
50	BGR	Bulgaria	9.2	2	57	12	8	37
51	HRV	Croatia	9.2	2	57	12	8	37
52	CYP	Cyprus	9.2	2	57	12	8	37
53	CZE	Czechia	9.2	2	57	12	8	37
54	DNK	Denmark	9.2	2	57	12	8	37
55	EST	Estonia	9.2	2	57	12	8	37
56	FIN	Finland	9.2	2	57	12	8	37
57	FRA	France	9.2	2	57	12	8	37
58	DEU	Germany	9.2	2	57	12	8	37
59	GRC	Greece	9.2	2	57	12	8	37
60	HUN	Hungary	9.2	2	57	12	8	37
61	IRL	Ireland	9.2	2	57	12	8	37
62	ITA	Italy	9.2	2	57	12	8	37
63	LVA	Latvia	9.2	2	57	12	8	37
64	LTU	Lithuania	9.2	2	57	12	8	37
65	LUX	Luxembourg	9.2	2	57	12	8	37
66	MLT	Malta	9.2	2	57	12	8	37
67	NLD	Netherlands	9.2	2	57	12	8	37

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No.	Code	Country Name	Version	GTAP Sector Classification	Total # of sectors	Agriculture	Food	Manufacturing and services
68	POL	Poland	9.2	2	57	12	8	37
69	PRT	Portugal	9.2	2	57	12	8	37
70	ROU	Romania	9.2	2	57	12	8	37
71	SVK	Slovakia	9.2	2	57	12	8	37
72	SVN	Slovenia	9.2	2	57	12	8	37
73	ESP	Spain	9.2	2	57	12	8	37
74	SWE	Sweden	9.2	2	57	12	8	37
75	GBR	United Kingdom of Great Britain and Northern Ireland	12	3	49	1	5	43
76	CHE	Switzerland	11	1	40	1	1	38
77	NOR	Norway	11	3	38	1	1	36
78	ALB	Albania	5.3	2	57	12	8	37
79	SRB	Serbia	11	3	40	1	1	38
80	BLR	Belarus	8.1	2	40	12	1	27
81	RUS	Russian Federation	11	3	48	1	5	42
82	UKR	Ukraine	11	3	46	2	4	40
83	KAZ	Kazakhstan	11	3	46	1	1	44
84	KGZ	Kyrgyzstan	7	2	31	1	1	29
85	TJK	Tajikistan	9.1	2	37	1	2	34
86	UZB	Uzbekistan	11	3	41	1	2	38
87	ARM	Armenia	7	2	30	6	4	20
88	AZE	Azerbaijan	12	3	42	1	2	39
89	GEO	Georgia	7	2	57	12	8	37
90	BHR	Bahrain	8	2	37	5	1	31
91	IRN	Iran (Islamic Republic of)	11	3	48	2	3	43
92	IRQ	Iraq	10.1	3	65	12	8	45
93	ISR	Israel	8	2	43	8	4	31
94	JOR	Jordan	12	3	54	8	5	41
95	KWT	Kuwait	8	2	37	5	1	31
96	LBN	Lebanon	10.1	3	65	12	8	45
97	OMN	Oman	12	3	29	1	1	27
98	PSE	State of Palestine	10.1	2	44	6	5	33
99	QAT	Qatar	8	2	37	5	1	31
100	SAU	Saudi Arabia	12	3	44	1	2	41
101	SYR	Syrian Arab Republic	10.1	3	65	12	8	45

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No.	Code	Country Name	Version	GTAP Sector Classification	Total # of sectors	Agriculture	Food	Manufacturing and services
102	TUR	Turkey	10	2	32	1	1	30
103	ARE	United Arab Emirates	12	3	28	1	1	26
104	DZA	Algeria	11	3	65	12	8	45
105	EGY	Egypt	6.2	2	31	3	4	24
106	MAR	Morocco	12	3	30	1	1	28
107	TUN	Tunisia	9.1	2	31	5	2	24
108	BEN	Benin	8.1	2	29	6	1	22
109	BFA	Burkina Faso	8.1	2	38	8	6	24
110	CMR	Cameroon	12	3	60	9	7	44
111	CIV	Côte d'Ivoire	11	3	40	8	6	26
112	GHA	Ghana	8	2	41	7	5	29
113	GIN	Guinea	8.1	2	30	8	3	19
114	MLI	Mali	11	3	30	2	1	27
115	MRT	Mauritania	12	3	48	8	6	34
116	NER	Niger	11	3	65	12	8	45
117	NGA	Nigeria	12	3	37	9	2	26
118	SEN	Senegal	8.2	2	31	2	4	25
119	TGO	Togo	8.1	2	30	3	4	23
120	AGO	Angola	11.1	3	52	9	7	36
121	CAF	Central African Republic	11	3	49	8	8	33
122	TCD	Chad	11	3	51	9	7	35
123	COG	Congo	11	3	61	11	7	43
124	COD	Democratic Republic of the Congo	12	3	55	9	7	39
125	GNQ	Equatorial Guinea	11	3	33	4	3	26
126	GAB	Gabon	11	3	44	8	5	31
127	STP	São Tomé and Príncipe	11.1	3	25	5	1	19
128	BDI	Burundi	11.1	3	48	8	7	33
129	COM	Comoros	11	3	34	5	4	25
130	ETH	Ethiopia	7.1	2	39	6	5	28
131	KEN	Kenya	8	2	33	10	2	21
132	MDG	Madagascar	12	3	58	11	8	39
133	MWI	Malawi	8.1	2	36	9	4	23
134	MUS	Mauritius	12	3	42	3	5	34
135	MOZ	Mozambique	11	3	65	12	8	45
136	RWA	Rwanda	8.1	2	34	8	4	22

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No.	Code	Country Name	Version	GTAP Sector Classification	Total # of sectors	Agriculture	Food	Manufacturing and services
137	SDN	Sudan	10.1	2	37	9	2	26
138	TZA	United Republic of Tanzania	8.1	2	39	11	6	22
139	UGA	Uganda	9.1	2	30	4	2	24
140	ZMB	Zambia	8.1	2	36	9	5	22
141	ZWE	Zimbabwe	11	3	54	12	5	37
142	BWA	Botswana	11	3	35	2	4	29
143	SWZ	Eswatini	11	3	43	3	5	35
144	NAM	Namibia	8	2	29	3	2	24
145	ZAF	South Africa	11	3	65	12	8	45

A Angola

Henrique Nsingui

A.1 Introduction

This document describes the adaptation of the 2015 Angolan input-output (I-O) table for input to the Global Trade Analysis Project (GTAP). The paper is organized as follows. Section 2 briefly describes the source data. Section 3 discusses strengths and limitations of the published input-output (I-O) data. Section 4 discusses the processing to correct anomalies in the raw data. Section 5 presents the mapping between the 145 Angolan I-O sectors, 52 GTAP sectors, and the more aggregated 52 sectors of the submitted table.

A.2 Data Sources

The primary raw input was 145-sector input-output data published by Department of National Account and Statistical Coordination (DNASC) from Account National Statistics Office of Angola (NSO)[9]. The 2015 I-O data was measured in thousands of 2015 Angolan kwanzas. We converted this to millions of kwanzas. First of all, the 2015 DNA raw input-output data satisfy the sectoral balance condition, and contain most of the data ready for conversion to the GTAP format. These data include:

1. Supply and Use tables at purchasers' prices for 145 sectors. The Supply table shows the total outputs of 145 domestic commodities, total imports, transport and trade margins, and taxes on domestic and imported goods, by commodity. The Use table shows the demand for those commodities by industries, private households, government, investment, changes in inventories, and exports.

2. A MAKE matrix of domestic production at basic prices, commodity by activity. The matrix shows the output of 38 activities by 145 commodities. Many industries produce more than one commodity, and many commodities are produced by more than one industry.

3. An Absorption matrix at basic prices showing the use of 145 domestically-produced commodities by 38 industries and by five final users (private consumption, government consumption, investment, exports, and changes in stocks). The matrix also contains the values of compensation of employees and operating surplus, by industry.

4. An Absorption matrix at basic prices showing the use of 145 imported commodities by 38 industries and by five final users (private consumption, government consumption, investment, exports, and changes in stocks).

5. An Absorption matrix of domestic production at market prices, commodity by activity.

[9]Input-output tables Angola 2015, Department of National Accounts and Statistical Coordination, May 2015.

In addition, we have the following data from the Department of National Accounts and Statistical Coordination:

1. Two matrices for trade and transport margins on domestic and imported commodities, 2015.
2. Two matrices of commodity taxes on domestic and imported commodities, 2015.
3. Detailed government revenues by revenue sources for the year 2015[10].
4. Data on the composition of the workforce, by type of employment (namely, wage workers, own-account workers, and non-paid family members), 2015.
5. Data on the composition of the labor force, capital (namely, compensation of employees, gross operating surplus and mixed income), 2015.
6. Data on depreciation, land rentals and capital rentals for ten aggregate sectors, 2015.

A.3 Strengths and Limitations of the Original Input- Output Data

We have conducted a number of checks on the data. They include checks of the non-negativity condition and the balancing conditions of the tables. We also check the plausibility of tax rates, margin rates implied in the data, and the structure of industries' costs and sales. This section discusses the strengths and limitations of the data. The procedures that we used to address these limitations are discussed in the next section.

Strengths

1. As can be seen from the previous section, the original data contain detailed supply and use data for 145 commodities and 38 activities. They provide most of the data, specifically:
   (a) There are separate domestic and import matrices at basic values;
   (b) There are separate trade and transport margins on domestic and imported commodities; and
   (c) There are separate tax data for domestic and imported commodities.
2. The tables are balanced.

Limitations

1. There is no negative signal in the inventory flows in the use matrix.

[10]These data are reported by budget statistical from Ministry of Finance, Angola, 2015.

2. There are non-zero flows for changes in inventories of services, and there are margins and taxes on them. In overall, flows should be zeros, because services cannot be stored.

3. NPIHS was not considered as one indicator. It was aggregate in the household consumption. At the industry level, 38 out of 145 sectors in the IO tables 2015 have labour share of less than 20%. Some examples include fruit and vegetable preservation and processing, dairy products, oils and fats, confectionery, etc.

4. The majority of employees are allocated in the Agricultural industry at least 52% and the minimum is oils and fats 0.01% Discussions with DOS reveal that one of the reasons for the low shares is that the labour payment only includes payment to employed workers, not those on self-employment, or unpaid family workers. We will use additional data on these workers to reallocate value added in the economy. We also reduce the level of variability of the industry factor shares.

5. We have negative values in tax minus subsidies because most of the taxes are higher than subsidies in that period.

6. There are no separate values for capital and land rentals. They are grouped in only one vector of operating surplus.

7. There are no data on production taxes.

8. There are no separate data for tariffs or export taxes.

9. There is a value for household consumption of "domestic services," but these services, it´s one of the industry we used to estimate it.

A.4 Data Processing

In this section we discuss the adjustments procedures, the additional data sources, and the assumptions that we adopted to address the data issues described in the previous section.

1. With regard to some negative values in the tables: because they are very small, we replaced them with zeros.

2. We removed all the non-zeros values of inventories of services in the basic, tax and margin tables. Inventories, taxes and margins for other commodities would be scaled in a later RAS to restore the aggregate inventories, tax and margin values in the original I-O tables.

3. We set the entire export column in the absorption matrix for imports to zeros, and then deduct the same amount from the export column of the absorption matrix for domestically produced goods[11]. This procedure ensures that the balance of trade remains unchanged. Again, other exports and imports will be scaled later in a RAS to restore their aggregate values in the original I-O tables.

[11]This procedure is recommended in the Handbook of Input-Output Table Compilation and Analysis, United Nations, New York, 1999.

4. In concerning a commodity Domestic Service to accommodate the value of 7.808,3 million of Kwanzas consumed by households in the original I-O tables. As this industry essentially represents services by domestic servants, we use the following assumption to create the industry's sales and costs structure: All output of the sector is consumed by households (7.808,3 akz million).

5. The indicators as GVA, Compensation of employees, Other Taxes minus subsidies on production and Operating Surplus and Mixed Income are not allocated to Household consumption, Households and NPISH Final Consumption Expenditure, General Government Final Consumption Expenditure, Gross Fixed Capital Formation costs in the sector is payment to labour, and 5% of costs are intermediate inputs. The inputs used in the sectors include soap and detergents, rubber gloves, textile products, motor vehicle, land transport, air transport, business services, public administration, education, and health. They are used in the same proportion as in household consumption bundle.

6. We adjusted the labour payment data for each sector to account for the income of the own account workers and unpaid family workers (non-wage labour). In the original I-O tables, this income of non-wage labour – normally a mix of capital and labour income – was treated as a form of business income. This means that the values of compensation of employees are underestimated, while the values of capital rentals are overestimated. One of the remedies that can be employed in addressing this problem is to impute labour compensation for those workers who are self-employed. To do that, we use the data on sectoral composition of the workforce in Angola in 2015, as reported in Table 1. The data is classified into 1 broad sectors.

Table 8.3 shows that self-employed and unpaid family members comprise over a fifth of the workforce. The shares of self-employed and unpaid family members can be as high as over 70% in the Fishing sector, and more than a half in Agriculture and Forestry sectors. Therefore, there is clearly a need to impute the payment to them to correctly account to the contribution of labour in industry value added.

The adjusted compensation of employees of each sector can be implemented via the following formula[12]:

$$AdjustedCOE_i = OriginalCOE_i \times \frac{TW_s}{NOE_s} \tag{8.1}$$

where COE_i is the compensation of employees in industries i within sector s; NOE_s is the number of wage employees in sector s, calculated from Table 1; TW_s is the total workforce in sector s, calculated from Table 1.

In the above formula, $\frac{TW_s}{NOE_s}$ is the ratio of the total number of workers to the number of wage workers in sectors. We recalculate the COE values of I-O industries by assuming that:

(a) All industries within each sector have the same $\frac{TW_s}{NOE_s}$ ratio; and

[12]This formula the ratio of the total number of workers to the number of wage workers in sectors

Table 8.3: Composition of Angolan workforce in 2015 (unit: thousand persons)

Sector	Wage workers	Non-wage workers		Non-wage workers in total workforce
	Employees	Own Account Worker	Unpaid Family Workers	
Agriculture, Hunting & Forestry	133.1	723.5	537.7	41.9%
Fishing	180.7	5.06	2.4	2.4%
Mining & Quarrying	149.4	0.46	0.92	3.8%
Manufacturing	135.3	0.83	8.8	47.3%
Electricity, Gas & Water Supply	12.6	0	0	0%
Construction	177.4	2.7	0.4	0.8%
Wholesale & Retail Trade	56.8	2.11	2.7	3.7%
Hotels & Restaurants	129.4	2.57	1.1	2%
Transport, Storage	174.1	0.1	0.03	0.1%
Communications	9.5	0	0.04	0.4%
Financial Intermediation	21.9	0	0	0%
Real Estate, Renting & Business activities	2.2	0	0	0%
Public Admin & Defense	627.9	0.97	1.71	3.3%
Other Service	249.2	0.33	0.4	0.9%
Total	2059.5	738.63	556.2	22.7%

Source: Department of National Accounts and Statistical Coordination

(b) The average wage rate of non-wage workers is the same as that for the wage workers.

Assumption (b) was later relaxed for eight IO industries for which the formula led to labour payment values that exceeded the industries' total value added. The industries included paddy, food crops, vegetables, fruits, oil palm, flower plants, and restaurants. For these industries, we assumed that the share of capital in total value added was half of their original share in the I-O tables, and recalculated the wage rate of the non-wage workers. This led to the result that non-wage workers received about 50-70% of wage workers in these sectors, which seems plausible.

We adopted the new labour payment figures for manufacturing and services industries, and then recalculated the payment to capital as the difference between the industries value added and payment to labour.

For primary industries (i.e. agriculture and mining industries), we split the value added not only to labour and capital, but also to land. The concept of land includes not only cultivated land area, forest land, and water surface for aquaculture, but also natural resources, such as mines and oil fields, livestock area. Therefore, all the primary industries (i.e. agriculture, forestry, fishery, and mining) must have non-zero values for land. The National Accounts of Angola has provided us with data for capital rental and land rental for all industries. However, in our model, we recognise as land users only agricultural and mining industries. As a result, we allocated operating surplus to land rentals only in those industries.

1. Because of the implausibility of many commodity tax rates, and because there is no data on production taxes in the original I-O tables, we used additional data on government revenues[13] and tax legislation to re-create matrices for 6 types of commodity taxes and 2 types of production taxes[14]. The main procedure is: for each of the tax type,

   (a) we identify the tax rates and tax payers (tax bases) based on Angolan tax legislation. For items where no specific tax payers can be identified, such as "other indirect taxes", all goods and services are assumed to bear the tax;

   (b) we multiply the tax rates on the bases (e.g. commodity flows in IO tables) to get the expected value for the tax revenue on each of the commodity flows. Because of compliance issue, the total expected tax revenues often differ from the total actual revenue reported in government revenue book. We then

   (c) scale the expected tax revenue so that they sum to the reported actual revenue.

2. After making the above adjustment, we used the SUT procedure to rebalance all sectors and to set GDP expenditure items to the officially published values.

Table 8.4 reports some summary data from our final input-output table.

[13] Ministry of Finance Angola (2015).

[14] Because GTAP does not require detailed tax data by tax types, in the submitted data we aggregate them to only one commodity tax and one production tax.

Table 8.4: Macro Aggregates from the 2015 Angolan IO table

GDP components on the expenditure side			GDP components on the income side		
Item	Levels, MYR m	Share (%)	Item	Levels, MYR m	Share
1 Consumption	8 488 054	53.7	1 Labor	4 186 175	26.5
2 Investment	4 595 522	29.1	2 Capital	11 269 868	71.3
3 Government	2 768 769	17.5	3 Subsidies	-227 626	-1.4
4 Stocks	5 768	0	Indirect Tax	578 900	3.7
5 Exports	4 160 173	26.3			
6 Negative Imports	- 4 210 969	-26.6			
GDP	15 807 317	100	GDP	15 807 317	100

A.5 Converting the Angolan IO table into GTAP Format

Converting the IO Table From COM x IND to COM x COM

GTAP prefers commodity by commodity input-output tables. Our initial I-O table is commodity by industry. To convert it to a commodity by commodity table, we use the technology assumption and the procedure described in Horridge et al. 2008.

Putting Margins into Respective Rows for Margin Commodities

There were eight margin services in the initial I-O data. The data contained separate values for direct usage and margin usage of these margin commodities. The GTAP Data Base does not distinguish these uses. Therefore, for each margin commodity, we summed total usage (margin and direct) by each user and allocated that usage to the respective row for the margin commodity.

Mapping Between Angolan I-O Sectors and GTAP Sectors

The 145 sectors of the Angola I-O table were aggregated to a set of 52 sectors that best correspond to elements of GTAP's standard 65 commodities. The mappings from 145 and 52 sectors are reported in Table 8.5.

Table 8.5: Concordance between 145 Angola I-O sectors and 52 sectors in the Contributed table

No.	52 Sectors	145 Angolan I-O Sectors
1	gro	Milho
2	wht	Trigo
3	pdr	Arroz
4	gro	Outros cereais
5	v_f	Feijäo
6	v_f	Amendoim

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No.	52 Sectors	145 Angolan I-O Sectors
7	osd	Soja
8	v_f	Mandioca
9	v_f	Batata rena
10	v_f	Batata doce
11	v_f	Outros legumes, raízes e tubérculos
12	v_f	Banana
13	v_f	Manga
14	v_f	Ananas
15	v_f	Abacate
16	v_f	Citrinos
17	v_f	Outras frutas e nozes
18	ocr	Outros produtos agrícolas
19	ctl	Gado bovino
20	ctl	Gado caprino
21	oap	Gado suino
22	oap	Aves domésticas
23	oap	Outros gados e animais vivos
24	rmk	Leite
25	oap	Ovos
26	oap	Outros produtos de origem animal
27	frs	Lenha
28	ocr	Outros produtos relacionados com agricultura, produção animal, caça e floresta
29	obs	Serviços relacionados com a agricultura, produção animal, caça e floresta
30	fsh	Peixe vivo, fresco e refrigerado do mar e águas interiores
31	fsh	Outros produtos do mar e águas interiores, e Serviços de apoio à pesca do mar e águas interiores
32	fsh	Peixe vivo e fresco e refrigerado da Aquacultura
33	fsh	Outros produtos da aquacultura e Serviços de apoio à aquacultura
34	oil	Petróleo bruto e gás associado
35	oil	Serviços petrolíferos
36	coa	Diamantes
37	coa	Sal Terreste e marinho
38	coa	Pedra, areia e argila
39	coa	Minerais metálicos, outros minerais e Serviços relacionados com a exploração de outras indústrias extractivas
40	cmt	Carne de gado bovino e miudezas comestíveis
41	cmt	Carne de gado caprino e miudezas comestíveis
42	omt	Carne de porco e miudezas comestíveis
43	cmt	Carne de outros gados e miudezas comestíveis
44	omt	Carne de aves e miudezas comestíveis
45	omt	Outros produtos à base de carne
46	omt	Produtos preparados e congelados da pesca e da aquacultura
47	omt	Produtos das pescas conservados, secados e salgados
48	vol	Óleos e gorduras animais e vegetais
49	mil	Leite e derivados
50	mil	Outros Produtos Lácteos
51	ofd	Farinha e fuba de milho
52	ofd	Farinha e fuba de mandioca
53	ofd	Farinha de Trigo
54	ofd	Outros produtos de transformação de cereais e leguminosas, de amidos e féculas e de produtos afins

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No.	52 Sectors	145 Angolan I-O Sectors
55	ofd	Pães e Outros produtos afins de padaria
56	ofd	Produtos de pastelaria, bolachas e biscoitos
57	ofd	Vegetais, legumes e batatas preparados ou em conserva
58	ofd	Frutas e nozes preparações e em conservas
59	sgr	Açúcar e melaço de açúcar
60	ofd	Alimentos para animais (rações)
61	ofd	Outros produtos alimentícios (Inclui pratos y comidas preparadas (nao restaurantes))
62	b_t	Cerveja e malte
63	b_t	Outras bebidas alcoólicas, excepto cerveja e malte
64	b_t	Bebidas não alcoólicas
65	b_t	Produtos de tabaco
66	tex	Produtos têxteis
67	wap	Produtos de vestuário
68	lea	Couro curtido, couro artificial e artigos de couro
69	lea	Calçado e suas partes em diferentes matérias
70	lum	Madeira Serrada, folheada e contraplacados laminados
71	lum	Produtos de madeira, cortiça, de espartaria e de cestaria, excepto mobília
72	ppp	Pasta para papel, papel, cartão, outros artigos de papel e cartão
73	ppp	Impressão e ediçao de jornais, livros e outras publicações
74	p_c	Gasóleo
75	p_c	Fuel Oil
76	p_c	Gasolina para aviões
77	p_c	Outras Gasolinas
78	p_c	Petróleo Iluminante
79	p_c	LPG, gás butano e propano
80	p_c	Outros oleos e lubrificantes
81	p_c	Outros produtos derivados do petróleo e produtos de combustiveis nuclear
82	chm	Produtos químicos de base
83	chm	Adubos, compostos azotados, e pesticidas
84	chm	Tintas, vernizes e produtos similares, tintas de impressão e mastiques
85	chm	Sabões, sabonetes, detergentes e produtos de limpeza
86	chm	Outros produtos químicos diversos, matérias plásticas, borracha sintética sob formas primárias e fibras sintéticas ou artificiais
87	bph	Produtos farmacêuticos
88	rpp	Produtos de Borracha
89	rpp	Produtos de Plástico
90	nmm	Vidro e Produtos de Vidro
91	nmm	Produtos cerâmicos não estruturais
92	nmm	Produtos refratários e produtos estruturais de argila não refratários
93	nmm	Cimento e clinquer; cal e gesso
94	nmm	Outros produtos minerais não metálicos
95	fmp	Produtos metálicos básicos e elaborados, excepto maquinaria e equipamento
96	ome	Maquinaria para usos gerais, partes e peças
97	ome	Maquinaria para usos especiais e outras maquinarias e equipamento, partes e peças
98	omf	Eletrodomésticos e suas partes e peças
99	otn	Equipamentos de transporte, partes e peças
100	omf	Mobiliarios e Colchões
101	omf	Outros bens manufacturados
102	omf	Desperdicios e sucata

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No.	52 Sectors	145 Angolan I-O Sectors
103	trd	Serviços de reparação, manutenção e instalação de máquinas e equipamentos
104	omf	Serviços de fabricação
105	ely	Energía Electrica
106	ely	Distribuição de energía eléctrica, comercialização e serviços de apoio a la distribuição de electricidade
107	ely	Tranporte de Electricidade e serviços de apoio ao transporte de electricidade
108	ely	Gás da cidade, vapor e água quente, gelo e neve
109	ely	Água natural captada, tratada e distribuída
110	ely	Recolha, drenagem e tratamento de résíduos e águas residuais, valorização de materiais e descontaminação
111	cns	Edifícios residenciais
112	cns	Edifícios não residenciais
113	cns	Obras de engenharia civil e outras construções
114	cns	Serviços especializados e gerais de construção
115	trd	Serviços de comércio
116	trd	Manutenção e reparação de veículos automóveis
117	afs	Serviços de alojamento
118	afs	Serviços de restauração
119	otp	Serviços de transporte ferroviário
120	otp	Serviços de tranporte rodoviário
121	wtp	Serviços de Transporte por água
122	atp	Serviços de Transporte aereo
123	whs	Armazenagem e serviços de apoio aos transportes
124	cmn	Serviços Postais e Correios
125	cmn	Telecomunicações
126	cmn	Actividade de Televisão, Rádio, Cinema, Videos e Produções afins
127	cmn	Consultoria, Programação informatica, serviços de informação e outras relacionadas
128	ofi	Serviços de Banco Central
129	ofi	Outros serviços financieros e serviços de banca de investimento
130	ofi	Serviços de intermediação financeira indirectamente medidos (SIFIM)
131	ins	Serviços de seguros, resseguros e fundos de pensões
132	ins	Serviços auxiliares de intermediação financeira, de seguros e de fundos de pensões
133	dwe	Serviços de aluguer de vivendas
134	rsa	Serviços de arrendamento ou aluguer de edificios nao residenciais e Outros serviços imobiliários
135	obs	Serviços profesionales, ciêntíficos, técnicos e similares
136	osg	Serviços administrativos e de apoio
137	osg	Serviços administrativos do governo e de segurança social obrigatória
138	edu	Serviços de educação pública
139	hht	Serviços de saúde Pública
140	edu	Serviços de educação privada
141	hht	Serviços de saúde e serviços de acção social privados
142	ros	Serviços artísticos, de espectáculos, desportivas e recreativas
143	ros	Reparação de computadores e de bens de uso pessoal e doméstico
144	obs	Outros serviços
145	ros	Serviços domésticos

A.6 Checking Sectoral Balance and Non-negativity Conditions

After converting the Angolan I-O tables to the format required by GTAP Data Base, we conducted the sectoral balance and non-negativity checks. The new data base passed the sectoral balance check and non-negativity conditions.

References

Horridge, Mark et al. (2008). *Exercises in Contributing I-O Tables to the GTAP Data Base*. Department of Agricultural Economics, Purdue University, West Lafayette, IN: Global Trade Analysis Project (GTAP). URL: https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=2850.

B Azerbaijan

Parviz Aliev[15]

B.1 Introduction

This document describes the adaptation of the 2021 Azerbaijanian input-output (I-O) table for input to the Global Trade Analysis Project (GTAP). The paper is organized as follows. Section 2 briefly describes the source data. Section 3 discusses strengths and limitations of the published input-output (I-O) data. Section 4 discusses the processing to correct anomalies in the raw data. Section 5 presents the mapping between the 81 Azerbaijanian I-O sectors, 65 GTAP sectors, and the more aggregated 42 sectors of the submitted table. Section 6 is about the final check for non-negativity and balance.

B.2 Data sources

The primary raw input was 81-sector input-output data published by the State Statistical Committee of the Republic of Azerbaijan (SSC).[16] The 2021 I-O data was measured in thousands of 2021 Azerbaijanian manat. At first fight, the 2021 raw input-output data satisfy the sectoral balance condition, and contain most of the data ready for conversion to the GTAP format. These data include: The Supply table shows the total outputs of 81 domestic commodities, imports, CIF/FOB, trade and transport margins and net taxes on product, by commodity, at basic prices.

1. The Use table shows the demand for those commodities by industries (intermediate consumption), private households, government, non-profit organizations serving households, investment (gross fixed capital formation), changes in inventories, and exports, by commodity, at basic prices.
2. The IO table shows the intermediate consumption of 81 domestic commodities by 81 industries, final consumption expenditure by households, final consumption expenditure by government, final consumption expenditure by non-profit organizations serving households (NPISH), gross fixed capital formation, changes in inventories, export, import and CIF/-FOB on its row accounts. The column accounts show the spending by 81 industries on 81 domestic commodities, as well as, net taxes, CIF/FOB, compensation of employees, social contributions, net income, taxes on production and consumption of fixed capital.

In addition, we have the following data from the SSC:

1. Gross national income aggregates, current prices, million manats for the year 2021. This table was used for calculating taxes on imports for each commodity.

[15]Department of Agricultural Economics, Purdue University

[16]Input-output tables Azerbaijan 2021, The State Statistical Committee, Azerbaijan, March 2024.

2. Foreign Trade of Azerbaijan for the year 2021. This table was used for cross-checking the values of imports and exports.

B.3 Strengths and Limitations of the Original Input-Output Data

We have conducted a number of checks on the data. They include checks of the non-negativity condition and the balancing conditions of the tables. We also check the plausibility of tax rates, margin rates implied in the data, and the structure of industries' costs and sales. This section discusses the strengths and limitations of the data. The procedures that we used to address these limitations are discussed in the next section.

Strengths

As can be seen from the previous section, the original data contain detailed supply and use data for 81 commodities and activities. Moreover, there are two separate tables for calculating additional indicators, as well as cross-checking trade data.

Limitations

1. There are some small negative flows in six sectors.
2. The "Coal and lignite" column account consists of only zeros.
3. The "Sewerage services; sewage sludge", "Waste collection, treatment and disposal services; materials recovery services" and "Remediation services and other waste management services" sectors have negative capital returns.
4. We have data regarding the aggregate imports across commodities. However, there is a requirement for disaggregated data delineating the proportion of imports within each respective sector.
5. In case of taxes, again, we have aggregated data, which need to be disaggregated.

Data processing

In this section we discuss the adjustments procedures, the additional data sources, and the assumptions that we adopted to address the data issues described in the previous section.

1. With regard to some negative values in the tables: because they are very small, we replaced them with zeros.

2. In order to solve the problem regarding zeros in the “Coal and lignite” column account we aggregated it to the “Crude petroleum and natural gas” column account.

3. To eliminate negative capital returns from the aforementioned sectors we used positive returns from IO table for 2016.

4. The summation of the ”Compensation of employees” and ”Social contributions” row accounts from the original IO table was conducted to derive the consolidated ”Compensation of employees” row account for the GTAP IO table.

5. The “Net taxes on production and imports” GTAP row account is derived by aggregating the “Net taxes” and “Taxes on production” row accounts from the original IO table.

6. The “Consumption of fixed capital” GTAP row account is derived by aggregating the “Net income” and “Consumption of fixed capital” row accounts from the original IO table.

7. The allocation of the total value of taxes on imports, derived from the ”Gross National Income Aggregates” table, among row accounts was determined based on the proportional distribution of industries’ imports relative to total imports.

8. It has been clarified from the ”Gross National Income Aggregates” table that no subsidies are allocated to imports.

9. To derive the ”Government consumption” column account within the GTAP framework, the aggregate of the ”Final consumption expenditure by government” and ”Final consumption expenditure by non-profit organizations serving households (NPISH)” column accounts from the original Input-Output (IO) table was computed.

10. The “Investment” GTAP column account is derived by aggregating the “Gross fixed capital formation” and “Changes in inventories” column accounts from the original IO table.

11. We derived disaggregated import data by transforming the import vector into an import matrix, utilizing the proportional representation of each sector within the total intermediate consumption. It was assumed that the sectoral shares in the total intermediate consumption mirrored their respective shares in the importation of the given commodity.

12. We used the same approach to disaggregate tax data, resulting in the transformation of the tax vector into a tax matrix.

Table 8.6 reports some summary data from our final input-output table.

Mapping Between Azerbaijanian I-O Sectors and GTAP Sectors

The 81 sectors of the Azerbaijan I-O table were aggregated to a set of 42 sectors that best correspond to elements of GTAP’s standard 65 commodities. The mappings from 81 and 65 sectors to these 42 sectors are reported in Table 8.7.

Table 8.6: Macro Aggregates from the 2021 Azerbaijan IO table

	Income method	thousand manat
A	Compensation of Employees	22,740,900
B	Gross Profits	56,781,389
C	Net taxes + Taxes on Production	7,922,475
D	Consumption of fixed capital	5,758,520
	GDP = A + B + C + D	93,203,285

	Expenditure method	thousand manat
A	Consumption	48,507,368
B	Investment	15,917,800
C	Government Spending	13,221,900
D	Net exports (Exports - Imports)	15,556,216
	GDP = A + B + C + D	93,203,285

	Value added method	thousand manat
A	Value of Output	139,316,353
B	Value of Intermediate Consumption	46,113,069
	GDP = A - B	93,203,285

Table 8.7: Concordance between 81 Azerbaijanian I-O sectors, GTAP 65 sectors and 42 sectors in the Contributed table

42 sectors	65 GTAP sectors	81 Azerbaijanian IO sectors
Agro	pdr, wht, gro, v_f, osd, c_b, pfb, ocr, ctl, oap, rmk, wol	1.Products of agriculture, hunting and related services
Frs	frs	2.Products of forestry, logging and related services
Fsh	fsh	3.Fish and other fishing products; aquaculture products; support services to fishing
CoOilGas	coa	4.Coal and lignite
	oil, gas	5.Crude petroleum and natural gas
Oxt	oxt	6.Metal ores, 7.Other mining and quarrying products, 8.Mining support services
Food	cmt, omt, vol, mil, pcr, sgr, ofd	9.Food products
B_T	b_t	10.Beverages, 11.Tobacco products
Tex	tex	12.Textiles
Wap	wap	13.Wearing apparel
Lea	lea	14.Leather and related products
Lum	lum	15.Wood and of products of wood and cork, except furniture; articles of straw and plaiting materials
Ppp	ppp	16.Paper and paper products, 17.Printing and recording services
P_C	p_c	18.Coke and refined petroleum products
Chm	chm	19.Chemicals and chemical products
Bph	bph	20.Basic pharmaceutical products and pharmaceutical preparations
Rpp	rpp	21.Rubber and plastics products
Nmm	nmm	22.Other non-metallic mineral products

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42 sectors	65 GTAP sectors	81 Azerbaijanian IO sectors
Metals	i_s, nfm	23.Basic metals
Fmp	fmp	24.Fabricated metal products, except machinery and equipment
Ele	ele	25.Computer, electronic and optical products
Eeq	eeq	26.Electrical equipment
Ome	ome	27.Machinery and equipment not elsewhere classified
Mvh	mvh	28.Motor vehicles, trailers and semi-trailers
Otn	otn	29.Other transport equipment
Omf	omf	30.Furniture, 31.Other manufactured goods
Electr	ely, gdt	33.Electricity, gas, steam and air conditioning
Wtr	wtr	34.Natural water; water treatment and supply services, 35.Sewerage services; sewage sludge, 36.Waste collection, treatment and disposal services; materials recovery services, 37.Remediation services and other waste management services
Cns	cns	38.Constructions and construction works
Trd	trd	32.Repair and installation services of machinery and equipment, 39.Wholesale and retail trade services; repair services of motor vehicles and motorcycles
Afs	afs	45.Accommodation services, 46.Food and beverage serving services
Otp	otp	40.Land transport services and transport services via pipelines
Wtp	wtp	41.Water transport services
Atp	atp	42.Air transport services
Whs	whs	43.Warehousing and support services for transportation
Cmn	cmn	47.Publishing services, 48.Motion picture, video and television programme production services, sound recording and music publishing, 49.Programming and broadcasting services, 50.Telecommunications services, 51.Computer programming, consultancy and related services, 52.Information services
Fin_ins	ofi, ins	53.Financial services, except insurance and pension funding, 54.Insurance, reinsurance and pension funding services, except compulsory social security, 55.Services auxiliary to financial services and insurance services
Dwe_rsa	rsa, dwe	56.Real estate services
Obs	obs	44.Postal and courier services, 57.Legal and accounting services, 58.Services of head offices; management consulting services, 59.Architectural and engineering services; technical testing and analysis services, 60.Scientific research and development services, 61.Advertising and market research services, 62.Other professional, scientific and technical services, 63.Veterinary services, 64.Rental and leasing services, 65.Employment services, 66.Travel agency, tour operator and other reservation services and related services, 67.Security and investigation services, 68.Services to buildings and landscape, 69.Office administrative, office support and other business support services
Ros	ros	75.Creative, arts and entertainment services, 76.Library, archive, museum and other cultural services, 77.Gambling and betting services, 78.Sporting services and amusement and recreation services, 79.Services furnished by membership organizations, 80.Repair services of computers and personal and household goods, 81.Other personal services
Osg	osg	70.Public administration and defense services; compulsory social security services
Edu	edu	71.Education services
Hht	hht	72.Human health services, 73.Residential care services, 74.Social work services without accommodation

C Burundi

Lydia Bukuru

C.1 Introduction

This document describes the process of adapting the 2016 Supply-Use Table into a table compatible with the Global Trade Analysis Project (GTAP) Data Base.

This document is structured as follows: Section 1 briefly presents the data sources, Section 2 examines the strengths and limitations of the basic data, Section 3 describes the treatment applied to correct anomalies in the raw data; Section 4 presents the correspondence between the 80 sectors of Burundi's Supply-Use Table and the GTAP sectors and Section 5 the verification of sectoral balance and non-negativity conditions.

C.2 Data sources

The main data sources used in this work come mainly from the 2016 Supply-Use Table as produced by the Technical Department of the National Institute of Statistics of Burundi.

The TAR is constructed in an aggregated manner, at the level of the classification of activities used in the compilation of national accounts. The raw data from the TAR do not correspond to the GTAP format from the outset. The TAR must first be disaggregated at level 2 of the activity classification and then the correspondence between the National Accounts nomenclature and that of the GTAP, thus by constructing the TAWP TAWP which will be used later for the preparation of a TES in GTAP format. The data are in millions of Burundian francs.

Description of the Supply-Use Table under the GTAP Nomenclature: The Resources Table includes the production of 80 products, imports, transport and trade margins, and taxes on domestic and imported products, by product. The table of Uses presents the demand for these products by branch of activity in the form of intermediate consumption, the demand by product for the consumption of households, governments and NPIs, investments, changes in stocks and exports by product.

The National Production Matrix at Basic Prices, Product by Activity: This matrix shows the output of each industry for the 80 products. It is symmetrical, because the products correspond to the branches of activity, however, it is not diagonal. There are industries that produce more than one product, and products that come from more than one industry.

The intermediate consumption matrix, which shows the demand for local and imported products of the 80 branches of activity, is symmetrical, because the branches of activity correspond to the products, and allows us to see the use of the 80 products by branch of activity, but also the products that a particular branch of activity needs to ensure its production. The matrix also includes household final consumption expenditure, investment, exports, and changes in inventories

by product. It also contains the values of compensation of employees and operating surplus, by sector of activity, not to mention the matrix of jobs by sector.

C.3 Strengths and limitations of the baseline data

This section details the strengths and limitations of the source data used for this work.

Strengths

The data used in this work provide detailed information on supply and demand for the 80 products and industries. They provide most of the data needed to develop the Input-Output Table in GTAP format, including the matrices on domestic and imported products, with their base values; trade and transport margins by product, data related to taxes and duties by product, etc., and all these tables are balanced.

Limitations

1. The goods export matrix shows some export flows that are higher than the value of locally produced goods, implying that these products are re-exported.
2. The import matrix is not measured at a completed basic price, i.e. the Supply Table presents separately the value of imports and the value of taxes on imports.
3. The Resources table presents separate matrices on taxes on products.
4. There are no separate values for capital and ground rents. They are grouped together in a single vector of income account/mixed income.

C.4 Data processing

This part describes the procedures or actions that are implemented to resolve the data issues described in the previous section.

1. Customs statistics were used to exclude re-exports in the export matrix, allowing only domestic exports to be retained.
2. To bring imports back to the completed basic price, the import matrix has been modified, including taxes on imports, to remove them from the total taxes thereafter.
3. All taxes and duties on products have been aggregated: non-deductible VAT, taxes on exports, subsidies on products, and other taxes on products.
4. By default, all capital and land rents have been allocated to the capital variable, and the

Converting the Resource-Use Table of PROD x BRANC into a PROD x PROD Input-Output Table

GTAP requires input-output tables on a product-by-product basis, and Burundi's Basic Supply-Use Table is developed on an industry-by-industry basis. To convert it into a product-by-product table, the assumption is that of industrial technology (Model B) and the tool used in this work is the one developed by the Real Sector Division of the Statistics Department of the International Monetary Fund for its countries.

The latter follows the best practices in the System of National Accounts, 2008; Eurostat Handbook on Supply and Use Tables and Input Output Tables with Extensions and Applications (New York 2018); Miller, Ronald E., and Peter D. Blair. Input-Output Analysis: Foundations and Extensions. Cambridge University Press, 2009.

Correspondence between the nomenclature of the Table of Resources-Empis of the Burundi and the APWG

The 80 sectors of Burundi's Supply-Use Table have been grouped into a set of sectors that correspond to the elements of the GTAP's standard commodities. The correspondence of the latter is presented in the table below.

Table 8.8: Concordance between the nomenclature of the Table of Supply-Use of Burundi and the nomenclature of the GTAP

No.	Code	Labeled	Correspondence
1	A01001	Grain	pdrwhtgro
2	A01002	Tubers and dried leguminous vegetables	v_f
3	A01003	Oilseeds	osd
4	A01004	Vegetables	v_f
5	A01005	Cherry Coffee	ocr
6	A01007	Café marchand (green coffee)	ocr
7	A01008	Green tea	ocr
8	A01009	Banana	v_f
9	A01010	Seed cotton	pfb
10	A01011	Products of Cotton Ginning	pfb
11	A01012	Sugar cane,	c_b
12	A01013	Fruits	v_f
13	A01014	Plants (nurseries); horticultural products	ocr
14	A01015	Other products n.e.c.	ocr
15	A02001	Cattle	ctlrmk
16	A02002	Sheep and goats	Oaprol
17	A02003	Live pigs	Oaprol
18	A02004	Poultry	Oaprol
19	A02005	Animals n.e.c.	Obs
20	A02006	Support service for cultivation and breeding	Obs
21	A03	Products of forestry and logging	frs
22	A04000	Fisheries, fish farming and aquaculture products	fsh

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No.	Code	Labeled	Correspondence
23	B05	Extractive products	mine
24	C06001	Products of the Slaughter, Processing and Preservation of Meat	cmtomt
25	C06002	Processing products and preservation of fish, crustaceans and molluscs	ofd
26	C06003	Fruit and vegetable processing and preservation products	ofd
27	C06004	Dairy products, ice cream; Fats of animal and vegetable origin	mil
28	C06005	Grain and starch products	pcr
29	C06006	Sugar Manufacturing	SGR
30	C06007	Processed coffee	ofd
31	C06008	Processed tea	ofd
32	C06009	Other agri-food products	theft
33	C06010	Alcoholic beverages	b_t
34	C06011	Table water and soft drinks	b_t
35	C07001	Yarns, fabrics and textiles	tex
36	C07002	Clothing	wap
37	C07003	Leather goods	lea
38	C08001	Sawn and planed wood	lum
39	C09001	Paper and paperboard articles	ppp
40	C09002	Printing and Related Products, Reproduction of Recordings	ppp
41	C10001	Petroleum products	p_c
42	C10002	Chemicals, plastics and rubber	chmrpp
43	C10003	Pharmaceuticals and traditional medicines	bph
44	C11001	Glass and other ceramic products	nmm
45	C11002	Cement, lime and plaster and products thereof	nmm
46	C12001	Metallurgical and foundry products, metal products	i_snfmfmp
47	C13001	Electronics, computers and electrical equipment products	eleeeqome
48	C13002	Transport equipment	mvhotn
49	C14001	Mattresses, box springs and furniture	omf
50	C14002	Products of other manufacturing industries n.e.c.	omf
51	C14003	Installation and repair service for industrial machinery and equipment	omf
52	D15000	Generation, transmission and distribution of electricity, gaseous fuels and ice	elygdt
53	E16	Water production and distribution and waste treatment	wtr
54	F17	Construction and civil engineering	cns
55	G18	Trade Department	trd
56	H19001	Ground Transportation Service	OTP
57	H19002	Water Transportation Service	wtp
58	H19003	Air Transport Service	ATP
59	H19004	Related transportation services	whs
60	H19005	Universal postal, mail and distribution service	cmn
61	I20000	Accommodation, catering and drinking establishments	Afs
62	Day 21	Information and Communication Service	cmn
63	K22001	Central banking services	ofiins
64	K22002	Other monetary intermediation services	ofiins
65	K22003	Insurance Service	ofiins
66	K22004	Financial and insurance auxiliary services	ofiins
67	L23000	Real Estate Services	rsadwe
68	M24	Professional, scientific and technical services	Obs
69	N25000	Support and clerical services	Obs
70	O26	Public administration services	OSG
71	P27000	Teaching Service	edu
72	Q28000	Health and social services	hht
73	R29000	Art, Sports and Recreational Services	Praise

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No.	Code	Labeled	Correspondence
74	S30001	Religious, trade union, political, and other associative and professional organizations	OSG
75	S30002	Home Equipment Repair Service	Praise
76	S30003	Other personal services	Praise
77	T31000	Specialized Household Services	Praise
78	U32000	Territorial correction	OSG
79	V33000	CAFFAB	OSG
80	Z99999	Products on hold	OSG

C.5 Verification of sectoral balance and non-negativity conditions

After conversion of the Burundi Supply-Use Table into an Input-Output Table in the required format of the GTAP database, sectoral balance and non-negativity verification tests were applied and the latter met the required conditions.

D Cameroon

Achille Carlos Deffo

D.1 Introduction

This paper document the compilation of Cameroon's input-output table (IOT) for contribution to GTAP data base with data referring to the year 2019. Cameroon was first included as an individual country in GTAP version 8, with data for the year 2003.

D.2 Reference information for the source table

The reference source data for this contribution of Cameroon's IOT to the GTAP data base are the detailed national accounts (NA) statistics data base compiled by the National Institute of Statistics (NIS) of Cameroon. These national accounts data refer to the year 2019 of the latest national accounts benchmark year 2016 following the 2008 system of national accounts (SNA).

NA statistics are not usually disseminated at the detailed level of the classifications used for compilation, especially for product and industry classifications. Regarding the practice in Cameroun, the disseminated supply and use tables (SUT) resulting from the compilation process is much more aggregated than the detailed compilation data. This SUT comprises forty-six industries and forty-seven products, whereas the detailed compilation data comprises 98 industries and 232 products.

D.3 Description of the source table

The reference year for the source table is 2019. The figures in the table are in millions of CFA francs (XAF).

The source data used for IOT compilation was industry by commodity. It included data on both basic and purchaser's prices for many of the product transactions.

The source data included uses at basic and purchaser prices with the corresponding valuation components (taxes on products, trade margins, and transport margins). However, for intermediate consumption at basic price only the total use by commodity is included; the breakdown of intermediate consumption by industry is not available at basic price. Proportional allocation was used to obtain this breakdown.

The source data did not include the split of uses between domestic and imported commodities as requested by GTAP. To comply with this IOT and GTAP requirement, original data were adjusted using proportional allocation with logical constraints. The details of payments for primary factors by industry are available only for labor and capital, and not for land.

The mapping between the detailed product classification (232) and the GTAP sectors was developed. The development of the concordance table between 232 positions of the country commodity classification and the 65 GTAP sectors resulted in 60 distinct GTAP compliant sectors. Therefore, the supplied table is a 60 by 60 IOT. Consistency checks were developed throughout the transformation process so that the final IOT is consistent with the original data.

D.4 Data adjustments

No additional data sources were used to handle inconsistencies. Proportional allocation was used to deal with inconsistencies between source data and GTAP requirements. Specially to determine intermediate uses by industry and to split uses between domestic production and imports.

D.5 Deviations from GTAP data base requirements

The supplied table is consistent in term of structure with the table required for GTAP database. Only the payments for land factor are not provided and hence are zero value.

A concordance table was developed between the detailed product classification and the GTAP sectors with 60 distinct sectors (see table 8.9 in the Appendix). Sign constraints are respected. The sectoral balance conditions are respected.

D.6 Strengths and weaknesses

The supplied table is compiled using a detailed NA database, supplemented with assumptions where needed. It is therefore more consistent with the data disseminated by the NIS. Meaning that there are no or lesser discrepancies with the original data. No data losses were incurred during the compilation process.

One weakness of this table is that the concordance table does not match all the 65 GTAP sectors distinctly. Nonetheless, this is a huge improvement compared to past contributions, given that the concordance table was developed at a detailed level of national commodity classification.

Appendix

Table 8.9: Concordance between 232 Cameroon product classification, 60 sectors in the contributed I-O table and 65 GTAP sectors

N_SEC	SEC	Contributed IOT sectors	GTAP sectors	OSEC	National product classification
1	pdr	Paddy rice	pdr	A114	Riz paddy
2	wht	Wheat	wht	A111	Blé (tendre et dur)
3	gro	Cereal grains nec	gro	A112	Graine de maïs séchée
3	gro	Cereal grains nec	gro	A113	Mil et Sorgho
3	gro	Cereal grains nec	gro	A115	Autres Céréales
4	v_f	Vegetables, fruit, nuts	v_f	A121	Manioc frais
4	v_f	Vegetables, fruit, nuts	v_f	A122	Manioc séché
4	v_f	Vegetables, fruit, nuts	v_f	A123	Macabo et Taro
4	v_f	Vegetables, fruit, nuts	v_f	A124	Autres tubercules
4	v_f	Vegetables, fruit, nuts	v_f	A131	Bananes plantains
4	v_f	Vegetables, fruit, nuts	v_f	A132	Bananes douces
4	v_f	Vegetables, fruit, nuts	v_f	A161	Agrumes
4	v_f	Vegetables, fruit, nuts	v_f	A162	Ananas
4	v_f	Vegetables, fruit, nuts	v_f	A163	Autres fruits
4	v_f	Vegetables, fruit, nuts	v_f	A171	haricot sec et niébé
4	v_f	Vegetables, fruit, nuts	v_f	A172	autres légumineuses et légumes secs
4	v_f	Vegetables, fruit, nuts	v_f	A173	Épices et condiments
4	v_f	Vegetables, fruit, nuts	v_f	A174	Légumes feuilles locales et champignons
5	osd	Oil seeds	osd	A141	Arachides graines
5	osd	Oil seeds	osd	A142	Noix de palme
5	osd	Oil seeds	osd	A143	Autres plantes oléagineuses
5	osd	Oil seeds	osd	A153	Graines de coton
6	c_b	Sugar cane, sugar beet	c_b	A113	Canne à sucre
7	pfb	Plant-based fibers	pfb	A151	Coton graine
7	pfb	Plant-based fibers	pfb	A152	Coton fibre
8	ocr	Crops nec	ocr	A175	Plantes, fleurs et autres produits de l'horticulture
8	ocr	Crops nec	ocr	A18	Fève de cacao séchée
8	ocr	Crops nec	ocr	A191	Café arabica parche
8	ocr	Crops nec	ocr	A192	Café robusta séché
8	ocr	Crops nec	ocr	A193	Thé
8	ocr	Crops nec	ocr	A111	Tabac brut y compris tabac préparé (coupé, séché, tabac de cape, y.c. le chanvre)
8	ocr	Crops nec	ocr	A112	Latex y compris caoutchouc brut
8	ocr	Crops nec	ocr	A114	Plantes aromatiques ou médicinales
8	ocr	Crops nec	ocr	A115	Noix de kola, Bitter Kola, autres stupéfiants n.c.a.
8	ocr	Crops nec	ocr	A116	Autres produits cultivés n.c.a. et services de soutien à l'agriculture
9	anp	Animal products	ctl, oap, rmk, wol	A21	Bovins sur pieds et lait de vache brut

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N_SEC	SEC	Contributed IOT sectors	GTAP sectors	OSEC	National product classification
9	anp	Animal products	ctl, oap, rmk, wol	A221	Ovins, caprins et lait brut
9	anp	Animal products	ctl, oap, rmk, wol	A222	Porcins vivants
9	anp	Animal products	ctl, oap, rmk, wol	A223	Volailles vivantes et œufs
9	anp	Animal products	ctl, oap, rmk, wol	A224	Equins, asins et autres animaux d'élevage vivants
9	anp	Animal products	ctl, oap, rmk, wol	A225	Produits de l'apiculture (Miel naturel, cire d'abeilles et gelée royale)
9	anp	Animal products	ctl, oap, rmk, wol	A231	Gibier frais, fumé ou séché
9	anp	Animal products	ctl, oap, rmk, wol	A232	Services de soutien à l'élevage
9	anp	Animal products	ctl, oap, rmk, wol	C713	Cuirs et peaux brutes
10	frs	Forestry	frs	A31	Bois bruts (grumes)
10	frs	Forestry	frs	A32	Bois de construction
10	frs	Forestry	frs	A33	Bois de chauffage
10	frs	Forestry	frs	A34	Charbon de bois
10	frs	Forestry	frs	A35	Autres produits forestiers et cueillette
10	frs	Forestry	frs	A36	Bois sur pied et services forestiers de soutien
11	fsh	Fishing	fsh	A411	Poissons frais
11	fsh	Fishing	fsh	A412	Crustacés et autres produits de la pêche
11	fsh	Fishing	fsh	A42	Produits de pêche continentale et aquaculture
12	coa	Coal	coa	B53	Autres combustibles fossiles
13	oil	Oil	oil	B51	Pétrole brut
13	oil	Oil	oil	B63	services de soutien aux industries extractives et minières
14	gas	Gas	gas	B52	Gaz naturel et GPL
15	oxt	Other Extraction (formerly omn Minerals nec)	oxt	B61	Minérais métalliques
15	oxt	Other Extraction (formerly omn Minerals nec)	oxt	B62	Autres minerais non métalliques
16	mtp	Meat products	cmt, omt	C711	Viande de bovins
16	mtp	Meat products	cmt, omt	C712	Viande d'ovins, caprins, porcs et autres
16	mtp	Meat products	cmt, omt	C714	Préparations à base de viande et services de soutien
17	vol	Vegetable oils and fats	vol	C111	Huile brute de palme
17	vol	Vegetable oils and fats	vol	C112	Autres huiles brutes
17	vol	Vegetable oils and fats	vol	C113	Tourteaux
17	vol	Vegetable oils and fats	vol	C121	Huile raffinée de palme
17	vol	Vegetable oils and fats	vol	C122	Autres huiles raffinées
17	vol	Vegetable oils and fats	vol	C123	Margarine et matières grasses diverses
17	vol	Vegetable oils and fats	vol	C13	Provende et autres aliments pour animaux
18	mil	Dairy products	mil	C121	Lait, beurre et glaces

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N_SEC	SEC	Contributed IOT sectors	GTAP sectors	OSEC	National product classification
19	pcr	Processed rice	pcr	C82	Riz graine décortiqué
20	sgr	Sugar	sgr	C93	Sucre et mélasses
21	ofd	Food products nec	ofd	C721	Poissons congelés ou surgelés et conserves
21	ofd	Food products nec	ofd	C722	Poissons séchés, salés, fumés
21	ofd	Food products nec	ofd	C811	Farine de blé (froment)
21	ofd	Food products nec	ofd	C812	Farine de maïs
21	ofd	Food products nec	ofd	C813	Farine d'autres céréales et semoules
21	ofd	Food products nec	ofd	C831	Bâton de manioc (ebobolo, myondo, mintoumba)
21	ofd	Food products nec	ofd	C832	Produits de l'hydrolyse de l'amidon
21	ofd	Food products nec	ofd	C911	Cacao en masse
21	ofd	Food products nec	ofd	C912	Beurre et poudre de cacao
21	ofd	Food products nec	ofd	C913	Chocolat, confiseries et préparations à base de chocolat
21	ofd	Food products nec	ofd	C921	Café torréfié ; produits dérivés du café
21	ofd	Food products nec	ofd	C922	Thé conditionné
21	ofd	Food products nec	ofd	C111	Pain et pâtisserie fraîche
21	ofd	Food products nec	ofd	C112	Biscuits et biscottes
21	ofd	Food products nec	ofd	C113	Beignets de tout genre a base de farine (blé, maïs, manioc, haricot, mil, riz, etc.)
21	ofd	Food products nec	ofd	C114	Pâtes alimentaires
21	ofd	Food products nec	ofd	C1221	Jus de fruits et légumes
21	ofd	Food products nec	ofd	C1222	Condiments , assaisonnements et produits alimentaires divers
22	b_t	Beverages and tobacco products	b_t	C1311	Bière
22	b_t	Beverages and tobacco products	b_t	C1312	Malt
22	b_t	Beverages and tobacco products	b_t	C1321	Boissons alcoolisées modernes
22	b_t	Beverages and tobacco products	b_t	C1322	Boissons alcoolisées artisanales
22	b_t	Beverages and tobacco products	b_t	C133	Boissons non alcoolisées et eaux minérales
22	b_t	Beverages and tobacco products	b_t	C14	Cigarettes et autres produits à base de tabac
23	tex	Textiles	tex	C1511	Fibres de coton préparés
23	tex	Textiles	tex	C1512	Fils et filés ; tissus ; services d'ennoblissement textile
23	tex	Textiles	tex	C1513	Opérations sous-traitées intervenant dans la fabrication de produits textiles
23	tex	Textiles	tex	C152	Linge de maison, literie et autres articles en textiles
24	wap	Wearing apparel	wap	C1531	Vêtements en textiles

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N_SEC	SEC	Contributed IOT sectors	GTAP sectors	OSEC	National product classification
24	wap	Wearing apparel	wap	C1532	Opérations sous-traitées intervenant dans la fabrication d'articles d'habillement
25	lea	Leather products	lea	C161	Cuir travaillé et articles de voyage
25	lea	Leather products	lea	C162	Chaussures et articles chaussants
25	lea	Leather products	lea	C163	Opérations sous-traitées dans la fabrication de cuir, articles de voyages et de chaussures
26	lum	Wood products	lum	C1711	Bois sciés
26	lum	Wood products	lum	C1712	Bois profilés, traités et autres sous-produits du bois
26	lum	Wood products	lum	C172	Placages, contre-plaqués et panneaux à base de bois
26	lum	Wood products	lum	C1731	Charpentes et menuiseries de bâtiment en bois
26	lum	Wood products	lum	C1732	Emballages et ouvrages en liège
26	lum	Wood products	lum	C1733	Opérations sous-traitées intervenant dans le travail du bois et la fabrication d'articles en bois
27	ppp	Paper products, publishing	ppp	C181	Pâte à papier, articles en papier et carton
27	ppp	Paper products, publishing	ppp	C1821	Impression des journaux et services connexes
27	ppp	Paper products, publishing	ppp	C1822	Reproduction d'enregistrements audio vidéo et informatique
28	p_c	Petroleum, coal products	p_c	C191	Essences
28	p_c	Petroleum, coal products	p_c	C192	Kérosène (Jet A1, Carburéacteurs)
28	p_c	Petroleum, coal products	p_c	C193	Gazoles
28	p_c	Petroleum, coal products	p_c	C194	Fuel lourd et léger
28	p_c	Petroleum, coal products	p_c	C195	Autres produits pétroliers raffinés liquides
28	p_c	Petroleum, coal products	p_c	C196	Produits pétroliers raffinés gazeux
28	p_c	Petroleum, coal products	p_c	C197	Graisses lubrifiantes et bitumes
28	p_c	Petroleum, coal products	p_c	C198	Produits de la cokéfaction; produits des industries nucléaires
29	chm	Chemical products	chm	C211	Gaz industriels et produits chimiques
29	chm	Chemical products	chm	C212	Produits azotés et engrais
29	chm	Chemical products	chm	C213	Matières plastiques et caoutchouc synthétique
29	chm	Chemical products	chm	C22	Savons et détergents, produits de toilette
29	chm	Chemical products	chm	C233	Produits agrochimiques, peintures et vernis, allumettes et fibres

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N_SEC	SEC	Contributed IOT sectors	GTAP sectors	OSEC	National product classification
30	bph	Basic pharmaceutical products	bph	C231	Produits pharmaceutiques
30	bph	Basic pharmaceutical products	bph	C232	Produits de la médecine traditionnelle
31	rpp	Rubber and plastic products	rpp	C2111	Caoutchouc sec
31	rpp	Rubber and plastic products	rpp	C2112	Pneumatiques et ouvrages en caoutchouc
31	rpp	Rubber and plastic products	rpp	C212	Tubes, profilés, plaques, emballages et articles divers en matière plastique
32	nmm	Mineral products nec	nmm	C2211	Clinkers
32	nmm	Mineral products nec	nmm	C2212	Ciment
32	nmm	Mineral products nec	nmm	C2221	Verre et articles en verres
32	nmm	Mineral products nec	nmm	C2222	Produits en céramique, autres produits minéraux non métalliques
33	i_s	Ferrous metals	i_s	C231	Produits sidérurgiques, métaux précieux
34	nfm	Metals nec	nfm	C232	Métaux précieux
34	nfm	Metals nec	nfm	C233	Alumine
34	nfm	Metals nec	nfm	C234	Aluminium et demi-produits en aluminium
35	fmp	Metal products	fmp	C235	Armes et munitions
35	fmp	Metal products	fmp	C236	Ouvrages en métaux, autres métaux non ferreux
36	ele	Computer, electronic and optical products	ele	C251	Equipements, appareils audiovisuels et de communication
36	ele	Computer, electronic and optical products	ele	C252	Instruments médicaux, de précision, d'optique et d'horlogerie
36	ele	Computer, electronic and optical products	ele	C253	Produits électroniques et informatiques
37	eeq	Electrical equipment	eeq	C243	Appareils domestiques
37	eeq	Electrical equipment	eeq	C244	Autres machines, accumulateurs et piles électriques
38	ome	Machinery and equipment nec	ome	C241	Equipements mécaniques et machines d'usage général
38	ome	Machinery and equipment nec	ome	C242	Autres machines d'usage spécifique
39	mvh	Motor vehicles and parts	mvh	C2611	Véhicules automobiles
39	mvh	Motor vehicles and parts	mvh	C2612	Carrosseries et remorques, pièces et accessoires pour véhicules
40	otn	Transport equipment nec	otn	C2613	Motocycles, cycles et autres matériels roulants
40	otn	Transport equipment nec	otn	C2621	Matériel de transport naval, entretien et réparation naval
40	otn	Transport equipment nec	otn	C2622	Matériel ferroviaire roulant

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N_SEC	SEC	Contributed IOT sectors	GTAP sectors	OSEC	National product classification
40	otn	Transport equipment nec	otn	C2623	Matériels aéronautiques et spatials et matériels connexes
40	otn	Transport equipment nec	otn	C2624	Véhicules militaires de combat
41	omf	Manufactures nec	omf	C2711	Meubles en bois
41	omf	Manufactures nec	omf	C2712	Autres meubles et prestations connexes à l'ameublement, sommiers et matelas
41	omf	Manufactures nec	omf	C2721	Monnaies et bijoux
41	omf	Manufactures nec	omf	C2722	Instruments de musique, articles de sport et autres produits manufacturés n.c.a
41	omf	Manufactures nec	omf	C28	Réparation et installation des machines et équipements
42	elg	Electricity and gaz	ely, gdt	D29	Electricité et supports énergétiques
43	wtr	Water	wtr	E31	Eau captée et distribuée
43	wtr	Water	wtr	E32	Assainissement, voirie et gestion des déchets, activités de recupération
44	cns	Construction	cns	F3111	Démolition et préparation des sites
44	cns	Construction	cns	F3112	Logements
44	cns	Construction	cns	F3113	Bâtiments non résidentiels
44	cns	Construction	cns	F3114	Ouvrages et travaux de construction d'ouvrages de génie civil
44	cns	Construction	cns	F3121	Travaux d'installation (électrique, plomberie, etc.)
44	cns	Construction	cns	F3122	Travaux de finition, autres travaux spécialisés
45	trd	Trade	trd	G3211	Vente de véhicules, motocycles et des accessoires
45	trd	Trade	trd	G3212	Vente de carburant
45	trd	Trade	trd	G322	ventes en gros de produits agricoles ou manufacturés et d'animaux vivants y.c. bois bruts
45	trd	Trade	trd	G323	ventes au détail
45	trd	Trade	trd	G33	Réparations et entretien de véhicules et motocycles
46	afs	Accommodation, Food and service activities	afs	I351	Services d'hébergement
46	afs	Accommodation, Food and service activities	afs	I3521	Services de restaurants
46	afs	Accommodation, Food and service activities	afs	I3522	Services des débits de boissons et cafés
46	afs	Accommodation, Food and service activities	afs	U47	Correction territoriale
47	otp	Transport nec	otp	H341	Transport ferroviaire passagers et marchandises
47	otp	Transport nec	otp	H3421	Transport de voyageurs par taxis

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N_SEC	SEC	Contributed IOT sectors	GTAP sectors	OSEC	National product classification
47	otp	Transport nec	otp	H3422	Transport de voyageurs par taxi-motos
47	otp	Transport nec	otp	H3423	Autres transports routiers de voyageurs urbains
47	otp	Transport nec	otp	H3424	Autres transports routiers de voyageurs interurbains
47	otp	Transport nec	otp	H3425	Transports routiers de marchandises
47	otp	Transport nec	otp	H345	Transports par conduites
48	wtp	Water transport	wtp	H343	Transports par eau
49	atp	Air transport	atp	H344	Transports aériens
50	whs	Warehousing and support activities	whs	H346	Services de manutention, d'entreposage et des infrastructures de transports
51	cmn	Communication	cmn	H347	Services des postes et de courrier
51	cmn	Communication	cmn	J3611	Produits de l'édition et logiciels
51	cmn	Communication	cmn	J3612	Service de production et distribution de film, video, émission, enregistrement
51	cmn	Communication	cmn	J362	Services de télécommunications (y compris Call-box)
51	cmn	Communication	cmn	J363	Programmation informatique et conseil, services d'information
52	ofi	Financial services nec	ofi	K3711	SIFIM
52	ofi	Financial services nec	ofi	K3712	Services de banque centrale hors SIFIM
52	ofi	Financial services nec	ofi	K3713	Autres services d'intermédiation monétaire hors SIFIM (banques, microfinance)
52	ofi	Financial services nec	ofi	K3714	Services de holding; Trusts, fonds et autres services financiers hors assurance
52	ofi	Financial services nec	ofi	K3731	Services d'auxiliaires financiers et d'assurances
52	ofi	Financial services nec	ofi	K3732	Service de banque à distance (mobile money, mobile banking, etc)
53	ins	Insurance (formerly isr)	ins	K3721	Assurance non vie (IARD)
53	ins	Insurance (formerly isr)	ins	K3722	Assurance vie
53	ins	Insurance (formerly isr)	ins	K3723	Réassurance
54	rsa	Real estate activities	rsa	L3811	Transactions sur biens immobiliers propres
54	rsa	Real estate activities	rsa	L3812	Services de location de logements
54	rsa	Real estate activities	rsa	L3813	Services de location d'autres biens immobiliers, y compris les terrains
54	rsa	Real estate activities	rsa	L382	Service des agences immobilières

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N_SEC	SEC	Contributed IOT sectors	GTAP sectors	OSEC	National product classification
55	obs	Business services nec	obs	M3911	Services juridiques, comptables et conseil de gestion
55	obs	Business services nec	obs	M3912	Services d'architecture et d'ingénierie, de contrôle et d'analyses techniques
55	obs	Business services nec	obs	M3913	Services de publicité, études de marché et autres services professionnels
55	obs	Business services nec	obs	M392	Services de Recherche et Développement
55	obs	Business services nec	obs	M393	Services vétérinaires
55	obs	Business services nec	obs	N41	Location de matériel de transport, de machines, équipements et de bienssans opérateurs
55	obs	Business services nec	obs	N42	Services des agences de réservation et voyagistes, services liés aux ressources humaines
55	obs	Business services nec	obs	N43	Services de soutien aux entreprises; soutien aux bâtiments et sécurité
56	ros	Recreational and other services	ros	R441	Services créatifs, artistiques et de spectacle
56	ros	Recreational and other services	ros	R442	Services de conservation et valorisation du patrimoine
56	ros	Recreational and other services	ros	R443	Services sportifs, récréatifs et de loisirs , jeux au hasard
56	ros	Recreational and other services	ros	S451	Services fournis par les organisations religieuses, politiques et autres associations
56	ros	Recreational and other services	ros	S452	Réparations diverses
56	ros	Recreational and other services	ros	S453	Services personnels
56	ros	Recreational and other services	ros	T46	Services des ménages en tant qu'employeurs de personnel domestique
57	osg	Public Administration and defense	osg	O4111	Administration publique générale, tutelle des activités économiques et sociales
57	osg	Public Administration and defense	osg	O4112	Services de prérogative publique
57	osg	Public Administration and defense	osg	O412	Service de sécurité sociale
58	edu	Education	edu	P421	Enseignement primaire et maternelle
58	edu	Education	edu	P422	Enseignement secondaire
58	edu	Education	edu	P423	Enseignement supérieur
58	edu	Education	edu	P424	Autres enseignements
59	hht	Human health and social work activities	hht	Q4311	Services hospitaliers

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N_SEC	SEC	Contributed IOT sectors	GTAP sectors	OSEC	National product classification
59	hht	Human health and social work activities	hht	Q4312	Soins médicaux et dentaires; Autres services de santé humaine
59	hht	Human health and social work activities	hht	Q432	Services d'action sociale
60	dwe	Dwellings	dwe	L3812li	Loyer impute

E Canada

Philip Bagnoli[17]

E.1 Introduction

This document describes the adaptation of the 2017 and 2019 Canadian symmetric input-output (IOT) tables for input to the Global Trade Analysis Project (GTAP). The paper is organized as follows. Section 2 briefly describes the source data. Section 3 discusses strengths and limitations of the published input-output data. Section 4 discusses the processing to correct anomalies in the raw data. Section 5 presents the mapping between the 234 Canadian input-output sectors, 65 GTAP sectors, and the more aggregated 58 sectors of the submitted table.

Throughout the remainder of this note we will explicitly distinguish between symmetric industry-to-industry-based IOT tables, and non-symmetric industry-to-product-based supply and use tables (SUT).

E.2 Data sources

The primary inputs were the 234-sector symmetric industry-to-industry IOT tables published by Statistics Canada (Statcan).[18]

The 2017 and 2019 Statcan source symmetric data are balanced and contain most of the data ready for conversion to the GTAP format. These data include:

1. The symmetric IOT tables that show the inter-industry transactions – that is, all purchases of an industry from all other industries including expenditures on imports and inventory withdrawals as well as all expenditures on primary inputs.

2. The final demand component of the table shows all purchases by detailed final demand categories (consumption, investment and government). It also includes expenditures on imports and inventory withdrawals.

3. The symmetric income component of the table shows all income accruing to labour and capital, including mixed income. It also includes direct and indirect taxes and subsidies.

4. The 2017 and 2019 SUT (non-symmetric, or rectangular) were also used to helped disaggregate the agricultural, leather and clothing, and oil and gas sectors in the primary symmetric tables.

[17]Office of the Parliamentary Budget Officer, Canada

[18]Symmetric input-output tables, 2017, based on supply and use tables released November 9, 2020, Industry Accounts Division / Statistics Canada, Catalogue 15-207-X. Symmetric input-output tables, 2019, based on supply and use tables released November 8, 2022, Industry Accounts Division / Statistics Canada, Catalogue 15-207-X

In addition, we have the following data for symmetric tables from Statistics Canada:

1. trade and transport margins on domestic and imported outputs, 2017 and 2019.[19]
2. taxes by domestic and imported outputs, 2017 and 2019.[20]
3. government revenues by revenue sources for the year 2017, 2019.
4. composition of the workforce, by type of employment (namely, wage workers or own-account workers), gross operating surplus by firms, and employer's social contributions for employees, 2017 and 2019.

E.3 Strengths and Limitations of the Source I-O Data

Various checks were done on the data tables. Specifically, for non-negativity conditions, and balancing conditions. In addition, tax rates, and margin rates were checked for plausibility. This section discusses the strengths and limitations of the data. The procedures that we used to address these limitations are discussed in the next section.

Strengths

1. As was outlined in the previous section, the original source contains detailed data for 234 industries. They provide most of the data needed for the GTAP tables.

   Specifically:

   (a) There are separate domestic and import matrices at basic values (excluding subsidies);

   (b) There are separate trade and transport margins on domestic and imported outputs;

   (c) There are separate tax data for domestic and imported outputs.

2. The tables are balanced.

Limitations

1. Statistics Canada publishes a version of basic prices that do not incorporate subsidies. For GTAP, basic prices should incorporate subsidies. We corrected the tables for this (see below).

[19] Symmetric input-output tables, 2017, based on supply and use tables released November 9, 2020, Industry Accounts Division / Statistics Canada, Catalogue 15-207-X. Symmetric input-output tables, 2019, based on supply and use tables released November 8, 2022, Industry Accounts Division / Statistics Canada, Catalogue 15-207-X

[20] Symmetric input-output tables, 2017, Domestic and import use tables , based on supply and use tables released November 9, 2020, Industry Accounts Division / Statistics Canada, Catalogue 15-207-X. Symmetric input-output tables, 2019, Domestic and import use tables , based on supply and use tables released November 8, 2022, Industry Accounts Division / Statistics Canada, Catalogue 15-207-X.

2. With the original data at a higher level of disaggregation than required for the GTAP Data Base, conversion from the Canadian IOT format to the GTAP format required aggregating the data.

3. In some cases (particularly agricultural sectors, oil and gas, and leather and clothing), the GTAP Data Base required a finer level of disaggregation than provided for by the source symmetric IOT data.

4. Notwithstanding our efforts to expand coverage in the agricultural sector, we were unable to provide supply and use detail for three GTAP agricultural sectors: Paddy Rice, Sugar Cane & Sugar Beet, and Plant-based Fibers.

5. There are non-zero flows for some changes in inventories of services, and there are margins and taxes on them. Generally, these flows should be zeros because services cannot be stored.

6. There is a "mixed income" value-added entry in each sector which represents the value-added of unincorporated businesses.

7. Re-exports appear as a separate column in the IOT tables and as part of imports.

8. The IOT tables show machinery and equipment disinvestment by commodity as a negative adjustment column. This leads to negative total investment for some commodities (scrap metal and used cars).

While the source data are more disaggregated than is required for GTAP, agriculture and a few other sectors are less disaggregated. The following table describes the sectors where there was an insufficient amount of disaggregated detail.

E.4 Data processing

This section outlines adjustments, additional data sources, and assumptions used to address various issues in the tables. These procedures are similar to those used by Jeff Bennett and Shenjie Chen for the Canadian contribution to GTAP 10 database (though no collaboration occurred or is implied).

Conversion to basic prices

The Canadian IOT tables value transactions at "modified" basic prices. That is, the price for a good or service that the producing establishment receives at the "factory gate", excluding sales and excise taxes levied after the final stage of production. This means that modified basic prices do not include subsidies. But GTAP basic prices reflect subsidies.

To convert the modified basic prices to basic prices, added back subsidies. However, the IOT tables only show the total value of subsidies received by each industry; information on which product is being subsidized is not available. Converting the tables to GTAP basic prices

Table 8.10: List of GTAP Sectors with insufficient IOT data for disaggregation

GTAP database		Canadian source data	
GSC3 code	GSC3 Description	CanGSC	CanGSC description
1	Paddy rice	5	Crops nec
2	Wheat	2	Wheat
3	Cereal grains nec	3	Other Grains: maize (corn), sorghum, barley, rye, oats, millets, other cereals
4	Vegetables, fruit, nuts	4	Veg & Fruit: vegetables, fruit and nuts, edible roots and tubers, pulses
5	Oil seeds	1	Oilseeds
6	Sugar cane, sugar beet	5	Crops nec
7	Plant-based fibers	5	Crops nec
8	Crops nec.	5	Crops nec
9	Bovine cattle, sheep and goats, horses	6	Cattle
10	Animal products nec.	8	Animal products nec
11	Raw milk	7	Raw milk
12	Wool, silk-worn cocoons	8	Animal products nec
19	Bovine cattle, sheep and goat, horse meat	15	Meats
20	Meat products nec	15	Meats
21	Vegetable oils and fats	16	Other foods and vegetable oils
23	Processed rice	16	Other foods and vegetable oils
25	Food products, n.e.c.	16	Other foods and vegetable oils

was accomplished by allocating subsidies according to the main products that each industry was producing (nominally, sales to industries that represented more than 5% of the sectors output). That threshold was lowered in cases where there were a number of purchasing sectors just below 5%. We then proportionally adjusted up the value of demand by an equivalent amount.

Negative outputs in the industry by product supply and use tables

The Supply and Use Tables (SUT) contain negative secondary outputs of wholesaling margins by some industries. Unless these negatives are removed, they can cause negative inter-industry transactions in the symmetric tables. These negative margins were therefore removed from the SUT by re-allocating them to the wholesaling industry and balancing the industries in the 'other operating surplus' commodity. This causes the distribution of total gross output and GDP to be slightly altered as compared to the SUT. The differences, however, are very minor.

Allocation of "Net income of unincorporated businesses"

Mixed income (of unincorporated businesses) was split for each industry based on the shares of employee compensation (wages and salaries, employers' social contributions) and gross operating surplus for each industry.

Machinery and equipment disinvestment

The IOT tables show machinery and equipment disinvestment as a negative adjustment column. This leads to negative total investment for some sub-sectors (scrap metal and used cars). To avoid negative values in investment, these were moved to inventories.

Re-exports

Re-exports appear as a separate column in the IOT tables and also as part of imports. Re-exports were netted out of imports and eliminated. An exception was in the Warehousing and Storage sector, where re-exports were larger than imports. In that sector, they were added to exports. Trade and transport margins on re-exports, relatively small values, were added to exports.

E.5 Conversion into GTAP Format

This section outlines how the Canadian IOT tables were mapped (and in some cases, converted) into a format that is compatible with GTAP. As previously mentioned, the original data from Statistics Canada is at a higher level of disaggregation than required for the GTAP Data Base. Converting from the Canadian IOT format to the GTAP format required aggregating the data. Annex 1

provides a table linking the 247 Canadian IOT industries to 58 of the 65 GTAP sectors format. Additional processing of the agricultural sectors by the staff at the GTAP center extended it to the full 65 sectors.

Industry splitting and combining

In cases where the GTAP disaggregation was more detailed than the Statistics Canada symmetric tables, the Statistics Canada-sourced rectangular SUT (for 2017 and 2019) were converted into symmetric tables with more disaggregation in particular industries than existed in the original Statistics Canada symmetric tables.[21] Those author-created symmetric tables were then used to disaggregate Statistics Canada's symmetric tables.

Specifically, the industries,

1. "Support for crop and animal production [BS115A00]" was split into " Crops nec" and "Animal production nec".
2. "Clothing and leather and allied product manufacturing [BS31B000]" was split into "Clothing apparel" and "Leather apparel".
3. "Gas and Oil extraction (except oil sands) [BS211110]" was split into "Natural gas" and "Crude oil". The latter was combined with oil sands extraction.

The symmetric IOT table industry "Support activities for oil and gas extraction [BS21311A]" was not split. Instead, it was wholly incorporated into Oil extraction.

E.6 Checking Sectoral Balance and Non-negativity Conditions

After converting the Canadian IOT tables to the format required by GTAP Data Base, we conducted the sectoral balance and non-negativity checks. The new data base passed the sectoral balance check and non-negativity conditions.

[21] For details on methodology see chapter 12 in Handbook on Supply, Use and Input-Output Tables with Extensions and Applications, 2017. New York, United Nations. We used a Fixed Industry Sales Structure.

Table 8.11: Annex 1: Concordance of Canadian I-O industries to GTAP industries

IOIC	Canadian IO industries description	GSCCan	GSCCan Description
BS111121	Canola farming	1	Oilseeds
BS1111Y0	Oilseed (except soybean and canola) and pulse farming	1	”
BS111140	Wheat farming	2	Wheat
BS1111X0	Grain farming	3	Other Grains: maize (corn), sorghum, barley, rye, oats, millets, other cereals
BS111211	Potato farming	4	Veg & Fruit: vegetables, fruit and nuts, edible roots and tubers, pulses
BS111W00	Vegetable (except potato), melon, fruit and tree nut farming	4	”
BS111900	Other crop farming	5	Crops nec
BS1114A0	Greenhouse, nursery and floriculture production (except cannabis)	5	”
BS111CL0	Cannabis production (licensed)	5	”
BS111CU0	Cannabis production (unlicensed)	5	”
BS112110	Beef cattle ranching and farming, including feedlots	6	Cattle
BS112120	Dairy cattle and milk production	7	Raw milk
BS112200	Hog and pig farming	8	Animal products nec
BS112300	Poultry and egg production	8	”
BS112X00	Other animal production	8	”
BS115A00	Support activities for animal and crop production	5	Crops nec, Animal products nec
BS113000	Forestry and logging	9	Forestry: forestry, logging and related service activities
BS115300	Support activities for forestry	9	”
BS112500	Aquaculture	10	Fishing: hunting, trapping and game propagation including related service activities, fishing, fish farms; service activities incidental to fishing
BS114000	Fishing, hunting and trapping	10	”
BS212100	Coal mining	11	Coal: mining and agglomeration of hard coal, lignite and peat
BS211110	Gas and Oil extraction (except oil sands)	12	Natural gas, Crude oil
BS211140	Oil sands extraction	13	”
BS21311A	Support activities for oil and gas extraction	13	”
BS212210	Iron ore mining	14	Other Mining Extraction (formerly omn): mining of metal ores; other mining and quarrying
BS212220	Gold and silver ore mining	14	”
BS212230	Copper, nickel, lead and zinc ore mining	14	”
BS212290	Other metal ore mining	14	”
BS212310	Stone mining and quarrying	14	”

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IOIC	Canadian IO industries description	GSCCan	GSCCan Description
BS212320	Sand, gravel, clay, and ceramic and refractory minerals mining and quarrying	14	”
BS212392	Diamond mining	14	”
BS21239A	Other non-metallic mineral mining and quarrying (except diamond and potash)	14	”
BS212396	Potash mining	14	”
BS21311B	Support activities for mining	14	Other Mining Extraction (formerly omn): mining of metal ores; other mining and quarrying
BS311600	Meat product manufacturing	15	Meats
BS311100	Animal food manufacturing	16	Other foods and vegetable oils
BS311200	Grain and oilseed milling	16	”
BS311400	Fruit and vegetable preserving and specialty food manufacturing	16	”
BS311700	Seafood product preparation and packaging	16	”
BS311800	Bakeries and tortilla manufacturing	16	”
BS311900	Other food manufacturing	16	”
BS311500	Dairy product manufacturing	17	Milk: dairy products
BS311300	Sugar and confectionery product manufacturing	18	Sugar and molasses
BS312110	Soft drink and ice manufacturing	19	Beverages and Tobacco products
BS312120	Breweries	19	”
BS3121A0	Wineries and distilleries	19	”
BS312200	Tobacco manufacturing	19	”
BS31A000	Textile and textile product mills	20	Manufacture of textiles
BS31B000	Clothing, leather, and allied product manufacturing	21	Clothing apparel, Leather apparel
BS321100	Sawmills and wood preservation	23	Lumber: manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
BS321200	Veneer, plywood and engineered wood product manufacturing	23	”
BS321900	Other wood product manufacturing	23	”
BS322100	Pulp, paper and paperboard mills	24	Paper & Paper Products: includes printing and reproduction of recorded media
BS322200	Converted paper product manufacturing	24	”
BS323000	Printing and related support activities	24	”
BS324110	Petroleum refineries	25	Petroleum & Coke: manufacture of coke and refined petroleum products

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IOIC	Canadian IO industries description	GSCCan	GSCCan Description
BS3241A0	Petroleum and coal product manufacturing (except petroleum refineries)	25	”
BS325100	Basic chemical manufacturing	26	Manufacture of chemicals and chemical products
BS325300	Pesticide, fertilizer and other agricultural chemical manufacturing	26	”
BS325500	Paint, coating and adhesive manufacturing	26	”
BS325600	Soap, cleaning compound and toilet preparation manufacturing	26	”
BS325900	Other chemical product manufacturing	26	”
BS325400	Pharmaceutical and medicine manufacturing	27	Manufacture of pharmaceuticals, medicinal chemical and botanical products
BS325200	Resin, synthetic rubber, and artificial and synthetic fibres and filaments manufacturing	28	Manufacture of rubber and plastics products
BS326100	Plastic product manufacturing	28	”
BS326200	Rubber product manufacturing	28	”
BS327A00	Non-metallic mineral product manufacturing (except cement and concrete products)	29	Manufacture of other non-metallic mineral products
BS327300	Cement and concrete product manufacturing	29	Manufacture of other non-metallic mineral products
BS331100	Iron and steel mills and ferro-alloy manufact.	30	Iron & Steel: basic production and casting
BS331500	Foundries	30	”
BS332100	Forging and stamping	30	”
BS332A00	Cutlery, hand tools and other fabricated metal product manufacturing	30	”
BS332300	Architectural and structural metals manufacturing	30	”
BS332400	Boiler, tank and shipping container manufacturing	30	”
BS331300	Alumina and aluminum production and processing	31	Non-Ferrous Metals: production and casting of copper, aluminium, zinc, lead, gold, and silver
BS331400	Non-ferrous metal (except aluminum) production and processing	31	”
BS331200	Steel product manufacturing from purchased steel	32	Manufacture of fabricated metal products, except machinery and equipment
BS332500	Hardware manufacturing	32	”
BS332600	Spring and wire product manufacturing	32	”

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IOIC	Canadian IO industries description	GSCCan	GSCCan Description
BS332700	Machine shops, turned product, and screw, nut and bolt manufacturing	32	”
BS332800	Coating, engraving, heat treating and allied activities	32	”
BS334100	Computer and peripheral equipment manufacturing	33	Manufacture of computer, electronic and optical products
BS334200	Communications equipment manufacturing	33	”
BS334A00	Other electronic product manufacturing	33	”
BS334400	Semiconductor and other electronic component manufacturing	33	”
BS339100	Medical equipment and supplies manufacturing	33	”
BS335100	Electric lighting equipment manufacturing	34	Manufacture of electrical equipment
BS335200	Household appliance manufacturing	34	”
BS335300	Electrical equipment manufacturing	34	”
BS335900	Other electrical equipment and component manufacturing	34	”
BS333100	Agricultural, construction and mining machinery manufacturing	35	Manufacture of machinery and equipment n.e.c.
BS333200	Industrial machinery manufacturing	35	”
BS333300	Commercial and service industry machinery manufacturing	35	”
BS333400	Ventilation, heating, air-conditioning and commercial refrigeration equipment manufacturing	35	”
BS333500	Metalworking machinery manufacturing	35	”
BS333600	Engine, turbine and power transmission equipment manufacturing	35	”
BS333900	Other general-purpose machinery manufacturing	35	”
BS336110	Automobile and light-duty motor vehicle manufacturing	36	Manufacture of motor vehicles, trailers and semi-trailers
BS336120	Heavy-duty truck manufacturing	36	”
BS336200	Motor vehicle body and trailer manufacturing	36	”
BS336310	Motor vehicle gasoline engine and engine parts manufacturing	36	Manufacture of motor vehicles, trailers and semi-trailers
BS336320	Motor vehicle electrical and electronic equipment manufacturing	36	”

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IOIC	Canadian IO industries description	GSCCan	GSCCan Description
BS336330	Motor vehicle steering and suspension components (except spring) manufacturing	36	”
BS336340	Motor vehicle brake system manufacturing	36	”
BS336350	Motor vehicle transmission and power train parts manufacturing	36	”
BS336360	Motor vehicle seating and interior trim manufacturing	36	”
BS336370	Motor vehicle metal stamping	36	”
BS336390	Other motor vehicle parts manufacturing	36	”
BS336400	Aerospace product and parts manufacturing	37	Manufacture of other transport equipment
BS336500	Railroad rolling stock manufacturing	37	”
BS336600	Ship and boat building	37	”
BS336900	Other transportation equipment manufacturing	37	”
BS337100	Household and institutional furniture and kitchen cabinet manufacturing	38	Other Manufacturing: includes furniture
BS337200	Office furniture (including fixtures) manufacturing	38	”
BS337900	Other furniture-related product manufacturing	38	”
BS339900	Other miscellaneous manufacturing	38	”
BS221100	Electric power generation, transmission and distribution	39	Electricity; steam and air conditioning supply
BS221200	Natural gas distribution	40	Gas manufacture, distribution
BS221300	Water, sewage and other systems	41	Water supply; sewerage, waste management and remediation activities
BS23A000	Residential building construction	42	Construction: building houses factories offices and roads
BS23B000	Non-residential building construction	42	”
BS23C100	Transportation engineering construction	42	”
BS23C200	Oil and gas engineering construction	42	”
BS23C300	Electric power engineering construction	42	”
BS23C400	Communication engineering construction	42	”
BS23C500	Other engineering construction	42	”
BS23D000	Repair construction	42	”
BS23E000	Other activities of the construction industry	42	”

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IOIC	Canadian IO industries description	GSCCan	GSCCan Description
BS411000	Farm product wholesaler-distributors	43	Wholesale and retail trade; repair of motor vehicles and motorcycles
BS412000	Petroleum product wholesaler-distributors	43	”
BS413000	Food, beverage and tobacco wholesaler-distributors	43	”
BS414000	Personal and household goods wholesaler-distributors	43	”
BS415000	Motor vehicle and parts wholesaler-distributors	43	”
BS416000	Building material and supplies wholesaler-distributors	43	”
BS417000	Machinery, equipment and supplies wholesaler-distributors	43	”
BS418000	Miscellaneous wholesaler-distributors	43	”
BS419000	Wholesale electronic markets, and agents and brokers	43	Wholesale and retail trade; repair of motor vehicles and motorcycles
BS441000	Motor vehicle and parts dealers	43	”
BS442000	Furniture and home furnishings stores	43	”
BS443000	Electronics and appliance stores	43	”
BS444000	Building material and garden equipment and supplies dealers	43	”
BS445000	Food and beverage stores	43	”
BS446000	Health and personal care stores	43	”
BS447000	Gasoline stations	43	”
BS448000	Clothing and clothing accessories stores	43	”
BS451000	Sporting goods, hobby, book and music stores	43	”
BS452000	General merchandise stores	43	”
BS453A00	Miscellaneous store retailers (except cannabis)	43	”
BS453BL0	Cannabis stores (licensed)	43	”
BS453BU0	Cannabis stores (unlicensed)	43	”
BS454000	Non-store retailers	43	”
BS562000	Waste management and remediation services	43	”
BS811100	Automotive repair and maintenance	43	”
BS811A00	Repair and maintenance (except automotive)	43	”
BS721100	Traveller accommodation	44	Accommodation, Food and service activities
BS721A00	RV (recreational vehicle) parks, recreational camps, and rooming and boarding houses	44	”
BS722000	Food services and drinking places	44	”
BS482000	Rail transportation	45	Land transport and transport via pipelines

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IOIC	Canadian IO industries description	GSCCan	GSCCan Description
BS484000	Truck transportation	45	”
BS485100	Urban transit systems	45	”
BS48A000	Other transit and ground passenger transportation and scenic and sightseeing transportation	45	”
BS485300	Taxi and limousine service	45	”
BS486A00	Crude oil and other pipeline transportation	45	”
BS486200	Pipeline transportation of natural gas	45	”
BS488000	Support activities for transportation	45	”
BS483000	Water transportation	46	Water transport
BS481000	Air transportation	47	Air transport
BS493000	Warehousing and storage	48	Warehousing and support activities
BS491000	Postal service	49	Information and communication
BS492000	Couriers and messengers	49	”
BS511110	Newspaper publishers	49	”
BS5111A0	Periodical, book and directory publishers	49	”
BS511200	Software publishers	49	”
BS5121A0	Motion picture and video industries (except exhibition)	49	”
BS512130	Motion picture and video exhibition	49	”
BS512200	Sound recording industries	49	”
BS515100	Radio and television broadcasting	49	”
BS515200	Pay and specialty television	49	”
BS517000	Telecommunications	49	”
BS518000	Data processing, hosting, and related services	49	Information and communication
BS519000	Other information services	49	”
BS521000	Monetary authorities - central bank	50	Other Financial Intermediation: includes auxiliary activities but not insurance and pension funding
BS5221A0	Banking and other depository credit intermediation	50	”
BS522130	Local credit unions	50	”
BS522200	Non-depository credit intermediation	50	”
BS522300	Activities related to credit intermediation	50	”
BS52A000	Financial investment services, funds and other financial vehicles	50	”
BS524100	Insurance carriers	51	Insurance (formerly isr): includes pension funding, except compulsory social security
BS524200	Agencies, brokerages and other insurance related activities	51	”

Continued . . .

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IOIC	Canadian IO industries description	GSCCan	GSCCan Description
BS71A000	Performing arts, spectator sports and related industries, and heritage institutions	51	”
BS713A00	Amusement and recreation industries	51	”
BS713200	Gambling industries	51	”
BS531100	Lessors of real estate	52	Real estate activities
BS531A00	Offices of real estate agents and brokers and activities related to real estate	52	”
BS532100	Automotive equipment rental and leasing	53	Other Business Services nec
BS532A00	Rental and leasing services (except automotive equipment)	53	”
BS533000	Lessors of non-financial intangible assets (except copyrighted works)	53	”
BS541100	Legal services	53	”
BS541200	Accounting, tax preparation, bookkeeping and payroll services	53	”
BS541300	Architectural, engineering and related services	53	”
BS541400	Specialized design services	53	”
BS541500	Computer systems design and related services	53	”
BS541600	Management, scientific and technical consulting services	53	”
BS541700	Scientific research and development services	53	”
BS541800	Advertising, public relations, and related services	53	”
BS541900	Other professional, scientific and technical services	53	”
BS551113	Holding companies	53	”
BS561100	Office administrative services	53	”
BS561A00	Facilities and other support services	53	”
BS561300	Employment services	53	”
BS561400	Business support services	53	”
BS561500	Travel arrangement and reservation services	53	”
BS561600	Investigation and security services	53	”
BS561700	Services to buildings and dwellings	53	”
BS812A00	Personal care services and other personal services	54	Recreation & Other Services: recreational, cultural and sporting activities, other service activities; private households with employed persons (servants)
BS812200	Funeral services	54	”
BS812300	Dry cleaning and laundry services	54	”

Continued . . .

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IOIC	Canadian IO industries description	GSCCan	GSCCan Description
BS813000	Professional and similar organizations	54	”
BS814000	Private households	54	”
NP710000	Arts, entertainment and recreation	54	”
NP813100	Religious organizations	54	”
NP813A00	Grant-making, civic, and professional and similar organizations	54	”
NP999999	Other non-profit institutions serving households	54	”
GS911100	Defence services	55	Other Services (Government): public administration and defense; compulsory social security, activities of membership organizations n.e.c., extra-territorial organizations and bodies
GS911A00	Other federal government services (except defence)	55	”
GS912000	Other provincial and territorial government services	55	”
GS913000	Other municipal government services	55	”
GS914000	Other aboriginal government services	55	”
BS610000	Educational services	56	Education
NP610000	Educational services	56	”
GS611100	Elementary and secondary schools	56	”
GS611200	Community colleges and C.E.G.E.P.s	56	”
GS611300	Universities	56	”
GS611A00	Other educational services	56	”
BS621100	Offices of physicians	57	Human health and social work
BS621200	Offices of dentists	57	”
BS621A00	Miscellaneous ambulatory health care services	57	”
BS623000	Nursing and residential care facilities	57	”
BS624000	Social assistance	57	”
NP621000	Ambulatory health care services	57	”
NP624000	Social assistance	57	”
GS622000	Hospitals	57	”
GS623000	Nursing and residential care facilities	57	”
BS5311A0	Owner-occupied dwellings	58	Dwellings: ownership of dwellings (imputed rents of houses occupied by owners)

F Democratic Republic of the Congo

Gloire Kadima

F.1 Introduction

This input-output table for the Democratic Republic of Congo was constructed from the supply and use table (SUT) provided by the National Institute of Statistics (INS). The data provided comes from the national accounts of the DRC for the year 2019. The official data from the accounts for the year 2019 have been transformed to meet the requirements of the GTAP database, by disaggregating the 32 sectors of the official SUT into 65 GTAP[22] sectors based on basic data on nearly 600 products. The resulting SUT of 65 sectors was then transformed to produce the input-output table (IOT) as well as the various other matrices required by GTAP.

This document describes the construction of the DRC input-output table for the GTAP 10 database. The provision of data for the DRC was made possible by the Central Africa Sub-Regional Office (BSR-AC) of the Economic Commission for United Nations for Africa (UNECA), as part of its objective to support the countries of the Economic Community of Central African States (ECCAS) in the implementation of the Continental Free Trade Area (AfCFTA). In this context, the BSR-AC plans to ensure the completeness of the ECCAS countries in the GTAP database. This integration will allow it to be able to carry out a comprehensive analysis of the AfCFTA which takes into account trade and industrial policies, with the implementation of a computable general equilibrium (CGE) model which takes into account international trade links and capacity of production, potential economic impacts of the AfCFTA on all countries in the Central African region.

In accordance with the unified format requirements of the GTAP database, as described in Huff, McDougall and Walmsley (2000), data for the DRC were provided in four matrices:

— UF matrix: The table of supplies and uses of 65 domestic and imported GTAP products excluding product taxes, and three production factors (Land, Labor and Capital);

— UP Matrix: The table of supplies and uses of 65 domestic and imported GTAP products with taxes on products, and three production factors (Land, Labor and Capital);

— MF Vector: The vector of imports of 65 GTAP products;

— OP Vector: The vector of outputs of 65 GTAP products.

We took an incremental approach to arrive at the final GTAP-compliant IOT format starting from the most basic level to reconstruct the detailed SUT of 65 sectors instead of 32 as in official SUT. This exercise made it possible to guarantee the conformity of the disaggregated data with the actual data of the elementary products used to constitute the national accounts.

[22] GTAP sectors.

Section 1 describes the main data sources used, while section 2 describes the processing of the source data to arrive at a disaggregated supply and use table; Section 3 describes how we converted this detailed SUT into IOT required by GTAP; The last section discusses the adaptation of the SUT to the GTAP model as well as the data consistency tests.

F.2 Source data

The main data sources used to construct the DRC input-output table for GTAP 10 were all provided by the National Institute of Statistics mainly and the Central Bank for certain secondary data, including:

— Tax and statistical declarations for 2019, 2013, 2010, 2006 and 2005 which allow in particular the estimation of labor and capital, and household survey data for the estimation of household consumption and sector production informal;

— Data on international trade in the DRC for the year 2019;

— The table of product resource-use balances for the year 2019;

— The 2019 intermediate production and consumption matrices;

— Detailed price statistics;

— The aggregated table of supplies and uses of 32 Products by 32 Industries for the year 2019;

— Tables of supplies and uses from previous years.

The national accounts from 2005 to 2019 of the DRC are all drawn up in accordance with the National Accounting System 1993 (SNA 1993), the main part of our work was to reconstruct a detailed SUT based on these sources. The format of the official aggregated supply and use table is given in the appendix. The production of industries is first evaluated at the base price, imports are expressed on a CIF basis, intermediate consumption and final demand are evaluated at purchasers' prices. Transport and trade margins, non-deductible VAT, taxes on imports and exports, other taxes and duties on products are provided separately. The production factors Labor and Capital are also provided. All amounts are expressed in millions of Congolese francs.

F.3 Processing of source data and construction of the disaggregated SUT

Since 2005, the National Institute of Statistics has used a VBA Excel tool to prepare national accounts and SUTs. This requires as input, among other things:

— price statistics;

— the vectors of production and demand (Intermediate consumption and final demands) of 5 main modes of production (Formal, Informal, Households, Public administrations, Non-profit institutions serving households);

— Data on imports and exports;

— Data on taxes and duties;

— The intermediate production and consumption matrices of the previous year in order to serve as an estimation basis for the matrices of the current year if these are not yet available.

— The resource-employment balance matrix of the previous year to serve as an estimation basis for that of the current year if it is not yet available.

In order to achieve a SUT that best covers the 65 GTAP sectors, we have an iterative process with 3 major stages which can be schematized as in Figure 1 below.

Mapping of sectors

Firstly, we grouped the elementary products (593) within the GTAP sectors based on:

— The correspondence between the sectoral classification of GTAP 10 and the ISIC, Rev.4 on the one hand and the CPC v.2.1 on the other hand as indicated on the GTAP project website.

— The grouping of 593 elementary products in the 32 aggregated national sectors and in the ISIC, Rev.4 and CPC v.2.1 classifications.

This exercise resulted in the following correspondence between the official SUT sectors and the GTAP sectors. Note the absence of two sectors (wol and gas), which are in fact non-existent in the DRC. This exercise therefore resulted in data from 63 sectors out of the 65 in GTAP.

Data aggregation in GTAP sectors

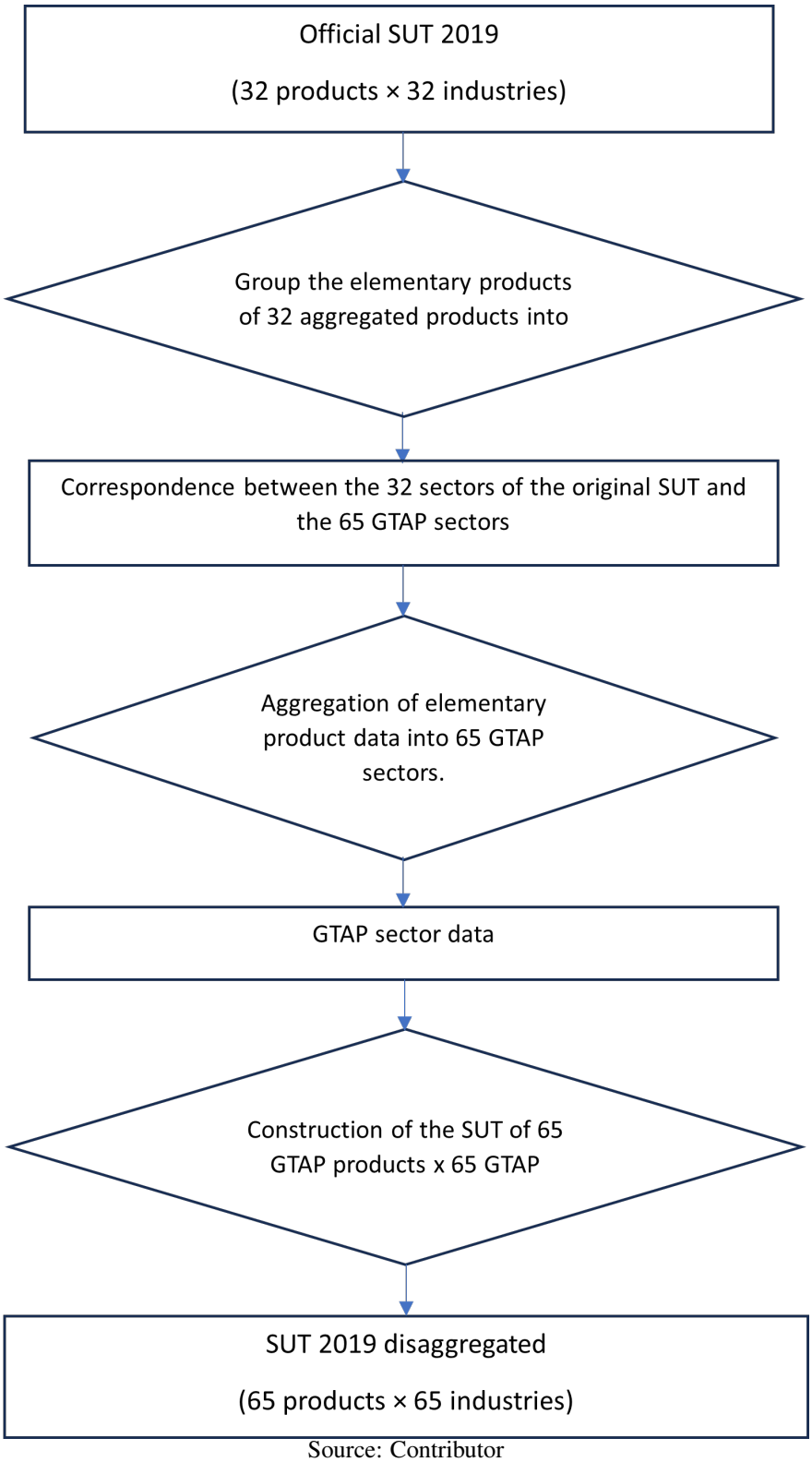
The second step consisted of the aggregation of elementary product data into 63 GTAP sectors. This allowed us to have, among other things, the intermediate consumption matrix detailed by mode of production, the production matrix detailed by mode of production and the matrix of resource-employment balances for 63 sectors.

Table 8.12: Correspondence between the official SUT sectors and GTAP sectors

N°		Official SUT Sectors (32)	GTAP Sectors (65)
1	10	Subsistence farming products	pdr wht gro v_f osd ocr
2	20	Products of industrial agriculture and export	v_f osd c_b ocr
3	30	Livestock products, fishing, fish farming	ctl oap rmk wol fsh
4	40	Forest products, logging,...	frs
5	51	Hydrocarbons, coal, ..	coa oil gas oxt
6	52	Non-metallic minerals	oxt
7	53	Clays, stones....	oxt
8	54	Diamonds and precious stones	oxt
9	60	Food products, beverages tobacco	cmt omt vol mil pcr sgr ofd b_t
10	70	Textiles and leather	pfb tex wap lea
11	80	Wood and articles of wood	lum
12	90	Papers, publishing products, recordings	ppp
13	100	Pd. Oil. Raf.; cokes; prd. industries Nuclea.	p_c chm bph
14	110	Rubber or plastic products	rpp
15	120	Other non-metallic mineral products	nmm
16	130	Machinery, equipment	i_s nfm fmp ele eeq ome omf
17	140	transport equipment	mvh otn
18	150	Furniture industries and miscellaneous products	omf
19	160	Electricity, water, gas,....	ely gdt wtr
20	170	Construction and public works	cns
21	180	Sales	trd
22	190	Vehicle and motorcycle repair service	trd
23	200	Hotel and restaurant services	afs
24	210	Transport services and transport auxiliaries	otp wtp atp whs
25	220	Postal and telecommunication services	cmn
26	230	Banking and insurance services	ofi ins
27	240	Real estate service, business service	cmn rsa obs dwe
28	250	Public administration service	osg
29	260	Educational services	edu
30	270	Health and social work services	hht
31	280	Other community, social and personal services	wtr cmn ros
32	290	Financial intermediation services indirectly measured	

Source: Contributor

Figure 8.1: Detailed SUT development process



Source: Contributor

Construction of the detailed supplies and uses table

The third stage consisted of the reconstruction of the table of supplies and uses for the 63 sectors, scrupulously following the same procedures used within the National Institute of Statistics, ensuring at each stage, consistency with the official aggregate supply and use table.

Note that of the 63 sectors taken into account in the disaggregated SUT, 8 industries do not produce, the corresponding products being produced secondarily by other industries or imported, these are:

Table 8.13: GTAP sectors with zero production

	Non-producing industries	
GTAP code	Resources as secondary production of	Part of the resources is imported
pfb	tex	Yes
rmk	ctl	Yes
coa	oxt	Yes
pcr	ofd	Yes
i_s	nfm	Yes
eeq	ome	Yes
mvh	otn	Yes
gdt	fmp	Yes

Source: Contributor

This detail is important since during the conversion to IOT, the operational constraints of the mathematical process to be used will force us to delete empty rows by merging these sectors with similar sectors, for example coa will be aggregated with oil.

F.4 Conversion of disaggregated SUT to IOT

The last step to take before moving the data to GTAP format was to convert our detailed 63 sector SUT to IOT, the latter being easily convertible to GTAP format. To do this, we have the guidelines of the Handbook on Supply and Use Tables and Input Output-Tables of the Nations-Unions.

— So firstly, we made sure to value supplies and uses at the appropriate price, i.e. the base price. Secondly, we split the demand into:

— Demand (intermediate and final) for domestic products and

— Demand (intermediate and final) for imported products.

Valuation at base price

In the detailed SUT of 63 sectors, production is valued at the base price, imports at the CIF price, intermediate consumption and the components of final demand at the acquisition price. However,

IOTs are generally established at the base price and not at the acquisition price, for this we must have: - The table of supplies for domestic products at the base price; - The vector of imports at the CIF price; - The table of uses of domestic supplies at the base price; - The table of uses of supplies imported at the base price. The supplies of our SUT being already at the base price, we were left with the valorization of uses at the base price. The base price was calculated using the formula below: Base price = purchasers' price – (Taxes on products excluding VAT charged + non-deductible VAT or similar tax payable by the purchaser - Subsidies on products + Transport margins + Commercial margins) Given that for each component of demand, we arrange the elements of the parentheses of this formula for the products of our detailed SUT[23] in the form of vectors in the matrix of use-resource balances, we were able to estimate the use tables at the base price.

To value the final demand at the base price, the operation was simple, it was enough to subtract from the vector of each component, the vectors of the additional costs listed above.

On the other hand, for intermediate consumption the process was a little more laborious. It was first necessary to break down the vectors of additional costs of intermediate consumption by industry in order to obtain matrices which could then be subtracted from the matrix of intermediate consumption to value it at the base price. In the absence of additional information that would allow us to have this breakdown precisely, we had to make an estimate by making a pro rata distribution of the intermediate consumption of products by industries.

So, for example, the share of trade margins m_{ij} supported by industry j is equal to the trade margins mi due to the intermediate consumption of product i, multiplied by the intermediate consumption c_{ij} of industry j of product i, all divided by the total intermediate demand c_i in product i.

$$m_{ij} = m_i c_{ij} / c_i$$

Table of use of domestic products and table of use of imported products

We first established the table of use of imports which we then subtracted from the table of uses. Given that we did not have information that could tell us how imports were distributed between the different components of demand, we carried out a pro rata distribution similar to the previous point, this time taking into account the components of the final request.

The following figures borrowed from the United Nations manual[24] illustrate the formats of two use tables required for the transition to IOT at base price.

Switching to the inputs - outputs table

The ideal input – output table for the contribution to GTAP is an IOT product by product at the base price. Given that we already had at this stage various tables necessary for this conversion, we

[23] See the SUT official format.

[24] Handbook on Supply and Use Tables and Input Output-Tables with Extensions and Applications.

Figure 8.2: Structure of the domestic use table

Industries / Products	Industries					Final uses				Total use at basic prices
	Agriculture	Manufacturing	...	Services	Total	Final Consumption	Gross capital formation	Exports	Total	
Agriculture Manufacturing ... Other services	Domestic products for intermediate consumption at basic prices					Domestic products for final uses at basic prices				Total use by product
Total at basic prices	Domestic intermediate inputs at basic prices					Final uses at basic prices				
Use of imported products, CIF	Total imported products for intermediate consumption					Total imported products for final uses				
Taxes less subsidies on products	Net taxes on products for intemediate consumption					Net taxes on products for final use				
Adjustments						Adjustments on final uses				
Total at purchasers' prices	Intermediate inputs at purchasers' prices					Final uses at purchasers' prices				
Compensation of employees Other net taxes on production Consumption of fixed capital Net operating surplus/net mixed income	Value added by component and by industry									
Value added at basic prices	Total value added by industry									
Total inputs at basic prices	Total input by industry									

Empty cells

Source: United Nations

Figure 8.3: Structure of the domestic use table

Industries / Products	Industries					Final uses				Total use at basic prices
	Agriculture	Manufacturing	...	Services	Total	Final Consumption	Gross capital formation	Exports	Total	
Agriculture Manufacturing ... ... Other services	Imported products for intermediate consumption at CIF values				Total imported products for intermediate consumption	Imported products for final uses at CIF values			Total imported products for final uses	Imported total use
Total	Intermediate consumption by industry					Total final uses by category				

Source: United Nations

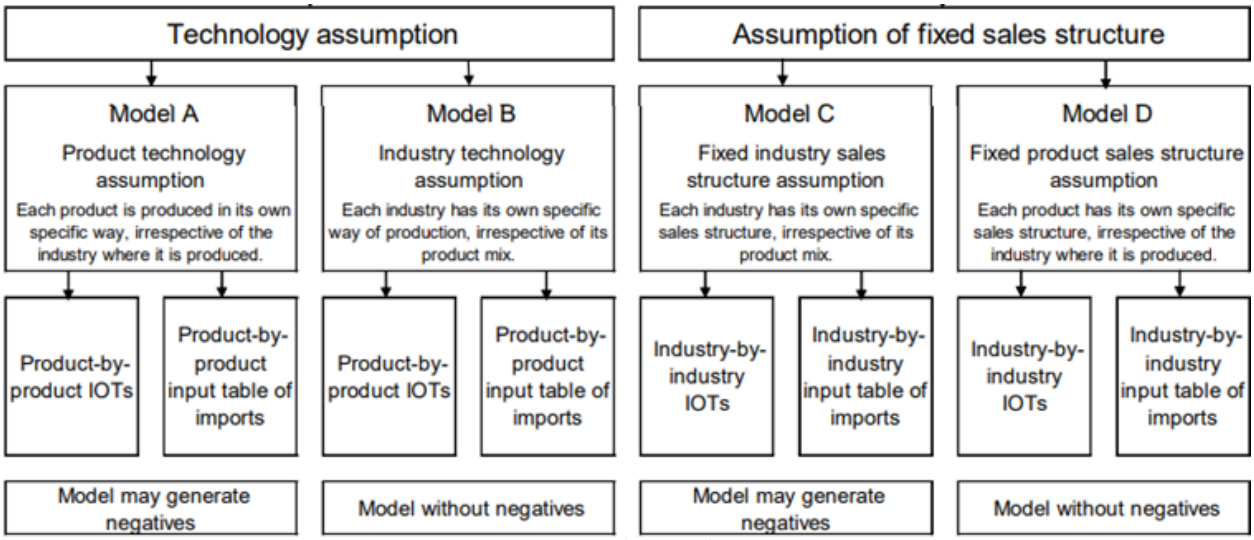
once again based ourselves on the Nations manual on SUTs and IOTs. However, before carrying out this conversion, we had to aggregate the 8 non-producing industries with similar industries to finally have 55 sectors instead of 63 of the SUT, this is necessary since there is an inversion of the diagonal matrix of production total industries thereafter.

There are generally 4 models for converting a SUT into an IOT, each based on a hypothesis:

Our choice to obtain a product-by-product IOT was based on model B given that with model A, there is a risk of obtaining negative values in the IOT.

The complete procedure for applying Model B is explained in the United Nations manual (P. 379 - 388).

Figure 8.4: Models for converting SUTs to IOTs



Source: United Nations

F.5 Conversion of IOT to GTAP format and data validity tests

This conversion was easy, the matrices UF, UM, OP, UP were simply extracted from different matrices obtained in the establishment of the IOT. The most important thing during this step was to ensure the consistency of the data. To do this, we carried out four checks:

— Sign check: checks that all values are of the correct sign;

— Balance check: checks that the table balances;

— Tax: checks that there are no ridiculous tax rates;

— Entropy: checks for unusual shares (Walmsley and McDougall 2007).

The data passed the first three tests without major problems. Concerning the fourth test on entropy values, we had to explain certain differences between the global averages and the values calculated on the data we provided. This was mainly due to the very high shares of capital in certain sectors and the very high share of the mining sector in exports.

For the first case, various possible explanations can justify the significant share of capital in value added in the DRC. There is, among other things, the general low level of wages in the DRC due largely to the exploitation of workers by expatriate companies and multinationals (mainly in primary industries), a significant lack of protection of workers by the state.

For the second case, it should be remembered here that the economy of the DRC is extroverted and highly dependent on raw materials. In 2021, for example, mining exports alone still represented 95% according to Central Bank statistics. Combined with those of hydrocarbons, we reached 99%.

Figure 8.5: Annex: Format of the official SUT of the DRC

Supplies	Total of supplies at purchaser's prices	Trade margins	Transport margins	Non-deductible VAT	Subsidies on products	Other taxes on products	Export taxes	Import taxes	Total of supplies at basic price	Industries		Total of production	CIF/FOB adjustment	Imports CIF
Products	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	– ⋮ –	– ⋮ –	⋮	⋮	⋮

Use of products	Total uses at acquisition price	Trade margins	Transport margins	Non-deductible VAT	Subsidies on products	Other taxes on products	Export taxes	Import taxes	Total uses at base price	Industries		Total of intermediate consumption	Exports	Final consumption			Gross fixed capital formation	Inventory changes
														Households	Government	NPISH		
Products	⋮									– ⋮ –	– ⋮ –	⋮	⋮	⋮	⋮	⋮	⋮	⋮
GVA										–	–							
Labor										–	–							
Taxes on production										–	–							
Subsidies										–	–							
Capital										–	–							

Source: Contributor

References

Walmsley, Terrie and Robert McDougall (2007). *Using Entropy to Compare IO tables*. GTAP Research Memorandum 09. Department of Agricultural Economics, Purdue University, West Lafayette, IN: Global Trade Analysis Project (GTAP). URL: https://doi.org/10.21642/GTAP.RM09.

G Jordan

Louise Roos[25]

G.1 Introduction

This document describes the adaptation of the 2018 Supply Use Tables (SUT) for input to the Global Trade Analysis Project (GTAP). We first transform the SUT data into a typical ORANI-G style database (Dixon et al. 1982; Horridge 2014) and then transform the database into the required GTAP format. In transforming the SUT to the required format we follow:

1. Horridge et al. 2008 Exercises in contributing I-O Tables to the GTAP Data Base.
2. Horridge 2019 contains a TABLO program to convert a standard ORANI-G data file into the format required to contribute data to GTAP.[26]

The paper is organised as follows. Section 2 briefly describes the source data. Section 3 discusses strengths and limitations of the published input-output (I-O) data. Section 4 discusses the processing to correct anomalies in the raw data. Section 5 presents the mapping between the Jordanian sectors and the 65 GTAP sectors.

G.2 Data Sources

The primary input is an 84 commodity and 40 industry SUT published by the Jordanian Department of Statistics (DOS n.d.(a); DOS n.d.(c); DOS n.d.(b); DOS n.d.(d)).[27]

The 2018 data was measured in thousands of Jordanian dinar (JD). We converted this to millions of JD by dividing all values by 1000.

Prima facie, the 2018 DOS data satisfy the sectoral balance condition, and contain most of the data ready for conversion to the GTAP format (Huff et al. 2000. These data include:

1. Supply and Use tables at purchasers' prices for 40 sectors. The Supply table shows the total outputs of 84 domestic commodities, imports of goods and services, transport and trade margins, and net taxes on domestic and imported goods, by commodity. The Use table shows the demand for those commodities by industries, private households, government, investment, changes in inventories, and exports.
2. A MAKE matrix of domestic production at basic prices, commodity by activity. The matrix shows the output of 84 commodities by 40 industries. This matrix is not diagonal with many

[25]Centre of Policy Studies (CoPS), Victoria University, Melbourne, Australia.
[26]TABLO program is part of the GEMPACK suite of programs (J. and Pearson 1996; J.M. et al. 2018).
[27]Available at: link.

industries producing more than one commodity, and many commodities are produced by more than one industry.

3. Use matrix at purchases prices showing the use of 84 commodities, sourced domestically and imported, by 40 industries and by five final users (private consumption, government consumption, investment, exports, and changes in stocks).

4. At the bottom of the Use matrix, value added by industry is presented. This table shows values of compensation of employees, gross operating surplus and net production tax for each industry.

5. Use matrix at basic prices showing the use of 84 commodities, sourced domestically and imported, by 40 industries and by five final users (private consumption, government consumption, investment, exports, and changes in stocks). The table shows row values for net commodity taxes and customs paid by each user.

G.3 Strengths and Limitations of the Original Input- Output Data

We have conducted a number of checks on the data. They include checks of the non-negativity condition and the balancing conditions of the tables. We also check the plausibility of tax rates, margin rates implied in the data, and the structure of industries' costs and sales. This section discusses the strengths and limitations of the data. The procedures that we used to address these limitations are discussed in the next section.

Strengths

The primary data contain detailed supply and use data for 84 commodities and 40 activities. A strength of the SUT is that we have both the Use Table at purchasers' price and basic price. This allows us to determine a matrix, for non-margin commodities by user, showing the sum of indirect tax and margins required to facilitate the flow of commodity c to user u. We split this matrix into separate matrices, namely the tax matrices showing the tax revenue by commodity and users and margin matrices showing the use of margin commodity m, in facilitating the flow of commodity c from source s to user u. Another strength is that the tables are balanced.

Limitations

— The SUT contains information by 84 commodities by 40 industries. It would suit our purposes better if the industry dimension were extended as to conform to the GTAP specification. We therefore extend our IO database by increasing 40 industries to 84. Thereafter we map the commodities and industries to the GTAP classification.

— There are two columns showing the customs and other tax revenue by commodity. There is no distinction between who pays tax on the commodities or on the source dimension i.e. VAT on domestically produced and imported goods.

— Payments to labour are not distinguished by occupation or gender. We use additional employment data to split the labour payments into payments for different occupations.

— There are no separate values for capital and land rentals. They are grouped together in one vector in the GVA namely operating surplus. We spit operating surplus into two matrices using a separate set of data on capital and land rentals adopted from the Jordan database in GTAP.

— There are no detailed data on the structure of capital creation for each of the industries. There is only one investment column in the Use Table showing the total use of commodities into investment. This vector will need to be split into investment for 84 industries.

— The investment column further shows negative values. The use of commodities for investment purposes cannot be negative.

— Exports in the Use Table includes 4 columns namely, (1) Exports of goods (2) Exports of Services, (3) Exports of Travel and (4) Re-Exports. Re-Exports implies that goods are imported and then re-exported. Traditional CGE models do not have a source dimension for Exports and therefore we cannot accommodate the imported of export commodities. One way to handle Re-exports is to following the UN recommends that "Goods that are imported or returned unprocessed are omitted from exports and deducted from imports" (UN 2009; UN 2018). Instead of removing the imports of exported commodities, we create a dummy industry that imports commodities and exports these commodities.

G.4 Data Processing

In this section we discuss the adjustments procedures, the additional data sources, and the assumptions that we adopted to address the data issues described in the previous section.

1. Step1: With regard to negative investment values in the Use table, we move these values to the change in inventories column. In the investment column these values are then zero.

2. Step 2: For the export of imported commodities (Re-export column), we create a dummy industry and commodity in the SUT. In the Use table we move the values in the re-exports column to this newly created dummy industry. This column then represents the imports of commodities. We assume there are no capital and labour used in this dummy industry. In the Supply Table we allocate in the multi-production matrix, the total value of the costs of this industry. We then adjust the use of this commodity by allocated the value to the export column. In this way do to not disturb the commodity balance or the GDP balance.

3. Step 3: In this step, we extend the industry dimension that the multi-production matrix (in the Supply table) and the intermediate use of commodities by industries (in the Use tables) are square. For example, the multi-production matrix in the supply table shows that the industry called crops produces five agricultural commodities (Figure 8.6 Panel A). The commodities are; (1) Wheat, (2) Other cereals, (3) Vegetables, (4) Fruits and nuts and (5) Other products of agriculture. Our task is to disaggregate the single agricultural industry into five industries, each industry producing a unique agricultural commodity (Figure 8.6 Panel B). Thus, the wheat industry produces a commodity called wheat while the vegetables industry produces a commodity called vegetables.

Figure 8.6: Production of agricultural products (JD million)

Panel A

		Wheat industry
1	Wheat	14.7
2	Other cereals	52.1
3	Vegetables	637.0
4	Fruits and nuts	261.2
5	Other products of agriculture	120.8

Panel B

		Wheat	Other cereals	Vegetables	Fruits and nuts	Other agric products
1	Wheat	14.7				
2	Other cereals		52.1			
3	Vegetables			637.0		
4	Fruits and nuts				261.2	
5	Other agric products					120.8

First, we adjust the multi-production matrix in the Supply Table and split the Wheat industry into the above mentioned 5 industries. We then move the production value of each commodity to the associated industry. Thus, for the 5 commodities and industries, we fill in the diagonal values as in Panel B.

$$MAKE_{(c,c)} = SUP_{(c,c)} = SUP^{initial}_{(c,\text{“}wheat'')} \forall c \in AGRIC^{28} \tag{8.2}$$

where

— $SUP_{(c,c)}$ is a matrix of 5 commodities and industries with zero non-diagonal values. The diagonal values are filled in. This matrix is also the MAKE matrix.

— $SUP_{(c,\text{“}wheat'')}$ is the commodity value of the 5 agricultural commodities produced by the Wheat industry as presented in the initial SUT.

We then calculate the share of each industries output in total agriculture output.

$$MAKESHR_{(i)} = \frac{MAKE_{(i)}}{\sum_{i \in CROPS} MAKE_{(i)}} \tag{8.3}$$

For all agricultural industries (or commodities) i.

[28]The SET AGRIC includes (1) Wheat, (2) Other cereals, (3) Vegetables, (4) Fruits and nuts and (5) Other products of agriculture.

We now adapt the Use Tables to show the intermediate use of each of the commodities by the agricultural commodities. We do not have any additional information on the use of agricultural commodities by the agricultural industries and therefore assume that each industry uses their own commodity.

$$USE_{(c,c)} = USE^{initial}_{(c,\text{“}wheat'')} \forall c \in AGRIC \tag{8.4}$$

where

— $USE_{(c,c)}$ (for both matrices valued as basic and purchaser's price) is a matrix of 5 commodities and industries with diagonal values filled in; and

— $USE_{(c,\text{“}wheat'')}$ (for both matrices valued as basic and purchaser's price) is the commodity value of the 5 agricultural values use by the industry called Wheat as presented in the $initial$ Use tables.

The Use table further shows the use of non-agricultural commodities by the Wheat industry. We distribute these non-agricultural commodities over the agricultural industries by multiplying the intermediate use of non-agricultural commodities by the Wheat industry with the MAKESHR.

We then multiply the share with the appropriate use values.

$$USE_{(c,i)} = USE^{initial}_{(c,i)} \times MAKESHR_{(i)} \forall c \in NONAGRIC \tag{8.5}$$

NONAGRIC is defined as COM – AGRIC[29]

In creating the source dimension for the flow of commodities to the different users, we assume that all commodities in the newly created industry.

We follow the same procedure as explained above to disaggregate the following industries in the initial database to include new industries. After this step, we have square multi-production matrix.

	Initial industry	New industries
1	Animal production	(1) Live animals, (2) Raw Milk, (3) Eggs of hens or other birds, (4) Other animal products, (5) Fish and other fishing products
2	Mining and quarrying	(1) Crude petroleum and natural gas, (2) Stone, sand and clay, (3) Ores, fertilizer minerals
3	Processing and reserving of meat and fish	(1) Meat and meat products, (2) Prepared and preserved fish
4	Manufacture of other food products	(1) Animal and plant fats and oils, (2) Dairy products and egg products, (3) Other food products
5	Manufacture of beverages and tobacco	(1) Beverages and (2) Tobacco products

Continued . . .

[29]Non-agricultural commodities for example includes Electricity, Water and a number of service commodities. For a complete list see the initial Use Tables.

...Continued

	Initial industry	New industries
6	Manufacture of wood and paper and printing	(1) Products of wood, cork, straw and plaiting materials, (2) Pulp, paper and paper products
7	Manufacture of chemicals and chemical products	(1) Basic chemicals, (2) Other chemical products
8	Manufacture of other non-metallic mineral products	(1) Glass and ceramic and refractory products, (2) Articles of concrete, cement, and plaster , (3) Building stone and Other non-metallic mineral products
9	Manufacture of basic metals and fabricated metal products	(1) Basic metals, (2) Fabricated metal products, except machinery and equipment, (3) Special-purpose machinery
10	Manufacture of other products	(1) General-purpose machinery, (2) Electrical machinery and apparatus, (3) Furniture, (4) Jewellery and related articles, (5) Musical instruments, sports goods, toys, and games, (6) Other manufactured articles n.e.c, (7) Radio, television and communication equipment and apparatus, (8) Motor Vehicles and Parts (9) Other transportation equipment
11	Construction	(1) Residential buildings, (2) Non-residential buildings, (3) Civil engineering works, (4) Construction services
12	Water supply; sewerage, waste management and remediation activities	(1) Water, (2) Sewerage and waste management
13	Financial and insurance activities	(1) FISIM, (2) Insurance services, (3) Other financial services
14	Professional, scientific and technical activities	(1) Legal and accounting services, (2) Professional, technical and business services
15	Administrative and support service activities	(1) Leasing or rental services without operator, (2) Support services
16	Wholesale trade	(1) Wholesale trade, (2) Maintenance and repair (except construction) services
17	Transportation by air, rail, pipeline, and water	(1) Passenger Air transport, (2) Passenger Rail transport, (3) Passenger Water transport, (4) Freight Air transport, (5) Freight Rail transport, (6) Freight Water transport
18	Transport by road	(1) Passenger Road transport, (2) Freight Road Transport

4. Step 4: In this step we create the four core matrices required by the CGE database. These matrices are:

   — The use of domestically produced commodity c by user u, valued at basic prices;

   — The use of imported commodity c by user u valued at basic prices;

   — The use of margin commodity m, to facilitate the flow of commodity c from source s to user u;

   — The indirect taxes paid on commodity c, from source s by user u.

   We begin by creating a matrix showing the use of commodity c, from source s, used by user u valued at basic prices. To do so, we begin by assuming that the values in the newly created Re-exports industry are all imported. We then calculate imports by commodity (as

in the Supply table) adjusted for by the values in the Re-exports industry. We then calculate the share of imports in total use and multiply this share with the use table valued at basic price. The output of this step is a matrix showing the value of imported commodity c used by user u valued at basic price. Sum over user yields the import value as shown in the Supply Table. The value of commodity c to user u that is domestically sourced is calculated as the difference between the use table at basic price and the import table.

The Supply Table shows, for each commodity, the value of customs duties, commodity tax and other taxes. The task is to create a tax matrix showing the tax paid on each commodity, from source s by user u. We do not have any additional information and allocate taxes over source and user by creating a tax factor (TAXFACT). TAXFACT is a weighting matrix that indicates the weight assigned to each tax by user. In creating the TAXFACT, we make the following assumptions:

- All users of imported commodities pay customs duties (tariffs) and assign a weight of 1.
- There are no customs duties payable on domestically produced commodities.

The incidence to pay commodity taxes (e.g., VAT and other taxes) falls on the final users of commodities e.g. households and is paid on domestically produced and imported commodities.

- For all intermediate (industrial) users, we assign an initial factor of 1.
- Commodity taxes are mainly paid by households on the consumption of commodities and services. Thus, the tax burden falls on households and we assign a factor of 4.
- No taxes are paid on commodities that are exported.
- No taxes are paid on inventories.
- Other taxes include taxes on beverages, tobacco and petroleum. We allocate the taxes on the commodities proportionately over users.

To create a tax matrix showing the tax by commodity, source and user we multiply the tax factor by the use table at basic prices.

Margin rates on commodity flows should be plausible. For example, it is likely that the rates of trade margin on commodities sold to producers are not higher than those on the same commodities sold to households. This is because the commodities sold to producers are often transacted in wholesale markets, whereas commodities sold to households are often transacted through retail markets.

The Supply table shows the total value of trade and transport margins used to facilitate the flow of commodity c from source s to user u. In creating the margins matrix, we create MARFACT which distributes margins over users. We assume that:

- Commodity-specific margins are allocated proportionately over user and source.

To create a margins matrix showing the value of margin m used to facilitate the flow of commodity c, from source s to user u, we multiply the margin factor by the use table at basic prices.

5. Step 5: In this step we scale the matrices created in Step 4 so that the sum of the VBAS, VMAR and VTAX matrices yields the values in the Use Table. We assume the following: The conditions are:

    — for each commodity and user the margins + basic + tax is equal to the use value at purchasers.

    — sum over the users of domestically sourced commodities valued at basic price is equal to the sum over industries in the MAKE matrix.

    — sum over users of the of imported commodities valued at basic price is equal to the sum over the import columns in the Supply table.

    — for each non-margin commodity, sum over source and user of the margin matrices is equal to the positive value of the margins in the supply table

    — For margin commodities the sum over commodity, user and source of the margin matrices is equal to the margin commodities in the supply table (these values are negative in the supply table)

    — The sum over source and user for all tax matrices is equal to the numbers in the net tax columns in the supply table

    Then we RAS the matrices (Horridge 2009). This process is automated, and the program is available from Horridge 2024.

6. Step 6: In this step we create land rental values for agricultural and mining industries. The data suggests that the average share of capital in factor costs for the agricultural industries was 89.6 per cent. This seems too high and it is likely that this payment includes returns to land. As a result, we use the Gross Operating Surplus (GOS) data in the SUT and split the values for agriculture and mining between return to capital and returns to land. In the absence of any data, we borrow the factor shares from the GTAP Data Base for Jordan (Aguiar et al. 2019).

7. Step 7: In this step we split labour payments by industry over occupations. The SUT provides information on the total value of labour payments by industry. We require labour payments to be disaggregated by occupation and industry. To split the aggregate labour payments for each industry, we use employment data from the DOS as well as data from the Statistical Yearbook (2017). Specifically, we use data on the number of people employed in 9 occupations by 22 main sectors to inform on this distribution of 9 occupations by industries.

Based on the employment data from DOS, we first calculate the occupational share of 9 occupations in 22 main industries. We then map the database industries to the 22 main sectors and multiply the share with the labour payments by industries. For example, one of the main sectors is Agriculture, Forestry and Fishing. We map all the Agricultural, Forestry and Fishing industries in the database, to the main industry called Agriculture, Forestry and Fishing. As a consequence, all Agricultural, Forestry and Fishing industries in the database has the same occupational distribution.

G.5 Converting the Jordanian database into GTAP Format

The 88 sectors were aggregated to 65 sectors in the GTAP's standard classification. This mapping is presented in Table 8.15.

Table 8.15: Concordance between 88 Jordan I-O sectors and the Contributed table

	Jordan database	GTAP	
	Sectors	Code	Description
1	Wheat	wht	Wheat: seed, other
2	Other cereals	gro	Other Grains: maize (corn), sorghum, barley, rye, oats, millets, other cereals
3	Vegetables	v_f	Veg & Fruit: vegetables, fruit and nuts, edible
4	Fruits and nuts	v_f	roots and tubers, pulses
5	Other products of agriculture	oap	Other Animal Products: swine; poultry; other live animals; eggs of hens or other birds in
6	Live animals, Other animal products	oap	shell, fresh; reproductive materials of animals; natural honey; snails, fresh, chilled, frozen,
7	Eggs of hens or other birds in shell, fresh	oap	dried, salted or in brine, except sea snails; edible products of animal origin n.e.c.; hides,
8	Other animal products	oap	skins and furskins, raw; insect waxes and spermaceti, whether or not refined or coloured
9	Raw milk	rmk	Raw milk
10	Forestry and logging products	frs	Forestry: forestry, logging and related service activities
11	Fish and other fishing products	fsh	Fishing: hunting, trapping and game propagation including related service activities, fishing, fish farms; service activities incidental to fishing
12	Coal and peat	coa	Coal: mining and agglomeration of hard coal, lignite and peat
13	Crude petroleum and natural gas	oil	Oil: extraction of crude petroleum, service activities incidental to oil and gas extraction excluding surveying (part)
14	Stone, sand and clay	oxt	Other Mining Extraction (formerly omn): mining of metal ores;
15	Ores and chemical and fertilizer minerals	oxt	other mining and quarrying
16	Electricity, town gas, steam and hot water	ely	Electricity; steam and air conditioning supply
17	Natural water	wtr	Water supply; sewerage, waste management and remediation activities
18	Meat and meat products	cmt	"Cattle Meat: fresh or chilled; meat of buffalo, fresh or chilled; meat of sheep, fresh or chilled; meat of goat, fresh or chilled; meat of camels and camelids, fresh or chilled; meat of horses and other equines, fresh or chilled; other meat of mammals, fresh or chilled; meat of mammals, frozen; edible offal of mammals, fresh, chilled or frozen"

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	Jordan database		GTAP
	Sectors	Code	Description
19	Prepared and preserved fish	ofd	”Other Food: prepared and preserved fish, crustaceans, molluscs and other aquatic invertebrates; prepared and preserved vegetables, pulses and potatoes; prepared and preserved fruits and nuts; wheat and meslin flour; other cereal flours; groats, meal and pellets of wheat and other cereals; other cereal grain products (including corn flakes); other vegetable flours and meals; mixes and doughs for the preparation of bakers’ wares; starches and starch products; sugars and sugar syrups n.e.c.; preparations used in animal feeding; lucerne (alfalfa) meal and pellets; bakery products; cocoa, chocolate and sugar confectionery; macaroni, noodles, couscous and similar farinaceous products; food products n.e.c.”
20	Animal and plant fats and oils	vol	”Vegetable Oils: margarine and similar preparations; cotton linters; oil-cake and other residues resulting from the extraction of vegetable fats or oils; flours and meals of oil seeds or oleaginous fruits, except those of mustard; vegetable waxes, except triglycerides; degras; residues resulting from the treatment of fatty substances or animal or vegetable waxes; animal fats”
21	Dairy products and egg products	mil	Milk: dairy products
22	Bakery products	ofd	”Other Food: prepared and preserved fish, crustaceans, molluscs and other aquatic invertebrates; prepared and preserved vegetables, pulses and potatoes; prepared and preserved fruits and nuts; wheat and meslin flour; other cereal flours; groats, meal and pellets of wheat and other cereals; other cereal grain products (including corn flakes); other vegetable flours and meals; mixes and doughs for the preparation of bakers’ wares; starches and starch products; sugars and sugar syrups n.e.c.; preparations used in animal feeding; lucerne (alfalfa) meal and pellets; bakery products; cocoa, chocolate and sugar confectionery; macaroni, noodles, couscous and similar farinaceous products; food products n.e.c.”
23	Beverages	b_t	Beverages and
24	Tobacco products	b_t	Tobacco products
25	Knitted or crocheted fabrics; wearing apparel	wap	Manufacture of wearing apparel
26	Leather and leather products; footwear	lea	Manufacture of leather and related products
27	Other food products	ofd	See above

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	Jordan database		GTAP
	Sectors	Code	Description
28	Yarn and thread; Textile articles other than apparel	tex	Manufacture of textiles
29	Products of wood, cork, straw and plaiting materials	lum	Lumber: manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
30	Pulp, paper and paper products	ppp	Paper & Paper Products: includes printing and reproduction of recorded media
31	Coke oven products; refined petroleum products; nuclear fuel	p_c	Petroleum & Coke: manufacture of coke and refined petroleum products
32	Basic chemicals	chm	Manufacture of chemicals and chemical products
33	Pharmaceutical products	bph	Manufacture of pharmaceuticals, medicinal chemical and botanical products
34	Other chemical products	chm	Manufacture of chemicals and chemical products
35	Rubber and plastics products	rpp	Manufacture of rubber and plastics products
36	Glass and ceramic and refractory products	nmm	Manufacture of other non-metallic mineral products
37	Articles of concrete, cement, and plaster	nmm	
38	Building stone and Other non-metallic mineral products	nmm	
39	Furniture	omf	Other Manufacturing: includes furniture
40	Jewellery and related articles	omf	
41	Musical instruments, sports goods, toys, and games	omf	
42	Other manufactured articles n.e.c	omf	
43	Basic metals	i_s	Iron & Steel: basic production and casting
44	Fabricated metal products, except machinery and equipment	fmp	Manufacture of fabricated metal products, except machinery and equipment
45	General-purpose machinery	ome	Manufacture of machinery and equipment n.e.c.
46	Special-purpose machinery	ome	
47	Office, accounting and computing machinery	ome	
48	Radio, television and communication equipment and apparatus	ome	
49	Electrical machinery and apparatus	eeq	Manufacture of fabricated metal products, except machinery and equipment
50	Medical appliances and other precision instruments	omf	Other Manufacturing: includes furniture
51	Motor vehicles, trailers and parts thereof	mvh	Manufacture of motor vehicles, trailers and semi-trailers
52	Aircraft and spacecraft, and parts thereof	otn	Manufacture of other transport equipment
53	Other transportation equpmint	otn	
54	Residential buildings	cns	Construction: building houses factories offices and roads
55	Non-residential buildings	cns	
56	Civil engineering works	cns	
57	Construction services	cns	

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	Jordan database		GTAP
	Sectors	Code	Description
58	Wholesale trade services	trd	Wholesale and retail trade; repair of motor vehicles and motorcycles
59	Retail trade services	trd	
60	Accommodation services	afs	Accommodation, Food and service activities
61	Food and bevarage services	afs	
62	Passenger transport by road	otp	Land transport and transport via pipelines
63	Freight transport by road	otp	
64	Passenger transport by air, rail, pipeline, and water	atp	Air transport
65	Freight transport by air, rail, pipeline, and water	atp	
66	Other transportation services	whs	Warehousing and support activities
67	Telecommunications, broadcasting and information services	cmn	Information and communication
68	FISIM	ofi	Other Financial Intermediation: includes auxiliary activities but not insurance and pension funding
69	Insurance services	ins	Insurance (formerly isr): includes pension funding, except compulsory social security
70	Other financial services	ins	
71	Real estate services	rsa	Real estate activities
72	Leasing or rental services without operator	obs	Other Business Services nec
73	Legal and accounting services	obs	
74	Professional, technical and business services	obs	
75	Support services	obs	
76	Maintenance and repair (except construction) services	obs	
77	Other services	obs	
78	Domestic services	obs	
79	Re-exports	obs	
80	Recreational, cultural and sporting services	ros	Recreation & Other Services: recreational, cultural and sporting activities, other service activities; private households with employed persons (servants)
81	Public administration services	osg	Other Services (Government): public administration and defense; compulsory social security, activities of membership organizations n.e.c., extra-territorial organizations and bodies
82	Sewage and waste collection services	osg	
83	Services of membership organizations	osg	
84	Private Education services	edu	Education
85	Public Education services	edu	
86	Private Human health and social care services	hht	Human health and social work
87	Public Human health and social care services	hht	
88	Imputed rent	dwe	Dwellings: ownership of dwellings (imputed rents of houses occupied by owners)

References

Aguiar, Angel et al. (June 2019). "The GTAP Data Base: Version 10". In: *Journal of Global Economic Analysis* 4.1, pp. 1–27. DOI: 10.21642/JGEA.040101AF.

Dixon, P. et al. (1982). *ORANI: A Multisectoral Model of the Australian Economy, Contributions to Economic Analysis*. Amsterdam: North-Holland Publishing Company.

DOS (n.d.[a]). *Employment data*. URL: http://dosweb.dos.gov.jo/labourforce/employment-in-establishment/tables-of-employment-in-establishment/.

— (n.d.[b]). *Industry Survey*. URL: http://dosweb.dos.gov.jo/product-category/industry/.

— (n.d.[c]). *Input and Output Tables*. URL: http://dosweb.dos.gov.jo/nationalaccount/input-and-output/input-output-2016/.

— (n.d.[d]). *Statistical Yearbooks*. URL: http://dosweb.dos.gov.jo/product-category/statistical-yearbook/.

Horridge, Mark (2009). *GEMPACK code examples showing 4 ways to RAS a matrix*. Archive facility. In the archive, search for TPMH0093: Centre of Policy Studies. URL: https://www.copsmodels.com/archivep.htm.

— (2014). *ORANI-G: A generic single-country Computable General Equilibrium Model*. Centre of Policy Studies. URL: https://www.copsmodels.com/ftp/gpextra/oranig06doc.pdf.

— (2019). *Converting an ORANI-G database into a database used by GTAP*. Archive facility. In the archive, search for TPMH0186: Centre of Policy Studies. URL: https://www.copsmodels.com/archivep.htm.

— (2024). *How to make a non-square SUT square and diagonal*. Archive facility. In the archive, search for TPMH0207: Centre of Policy Studies. URL: https://www.copsmodels.com/archivep.htm.

Horridge, Mark et al. (2008). *Exercises in Contributing I-O Tables to the GTAP Data Base*. Department of Agricultural Economics, Purdue University, West Lafayette, IN: Global Trade Analysis Project (GTAP). URL: https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=2850.

Huff, Karen et al. (2000). *Contributing Input-Output Tables to the GTAP Data Base*. GTAP Technical Paper 01. Department of Agricultural Economics, Purdue University, West Lafayette, IN: Global Trade Analysis Project (GTAP). URL: https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=304.

J., Harrison W. and R. K. Pearson (1996). "Computing Solutions for Large General Equilibrium Models using GEMPACK". In: 9.

J.M., Horridge et al. (2018). *GEMPACK manual*. GEMPACK Software.

UN (2009). *System of National Accounts*. United Nations. URL: http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf.

— (2018). *Handbook on supply, Use and Input-Output Tables with extensions and applications*. United Nations. URL: https://unstats.un.org/unsd/nationalaccount/docs/SUT_IOT_HB_Final_Cover.pdf.

H Republic of Korea

Jong-Hwan Ko

H.1 Introduction

This chapter describes the procedure and considerations underlying the construction of the Korean input-output (I-O) table for the Global Trade Analysis Project (GTAP) Data Base version 12. The document is organized as follows. Section 2 provides a short description of the general characteristics of the Korean I-O table. Section 3 shows how the Korean I-O table is mapped to the GTAP concordance. Section 4 explains how negative values in the initial Korean I-O table are adjusted, and Section 5 shows how commodity taxes on domestic products and imports are calculated. The final section mentions information not available from the Korean I-O table.

H.2 Data Source

The Korean I-O table used for the GTAP database version 12 was compiled by the Bank of Korea in Seoul (The Bank of Korea, 2024). The reference year of the Korean I-O table is 2020, and the unit of accounts is million Korean won (KRW). The Korean I-O table for 2020 is grouped commodity by commodity and includes 380 commodities. It was calculated by multiplying the supply table of 380 commodities and 278 industries by the use table of 380 commodities and 278 industries. The I-O table for 2020 is one of the I-O tables compiled using survey data, like the Korean I-O table for 2015 used for the GTAP database version 11.[30]

The Korean I-O tables for 2020 are evaluated at 3 different prices: purchaser prices, producer prices, and basic prices. Each of the Korean I-O tables for 2020 evaluated at 3 different prices includes three different transaction tables: a transaction table of domestically produced goods and services, a transaction table of imported goods and services, and a transaction table of composite goods and services composed of domestic and imported goods and services.

The final demand matrix in the three transaction tables includes private consumption, government expenditure, private fixed capital formation, government fixed capital formation, change in stocks, acquisition less disposal of valuables, and exports.[31] Acquisition less disposal of valuables was added to change in stocks. Government fixed capital formation was added to private

[30]The Bank of Korea has compiled an I-O table using survey data every 5 years (for example, the I-O tables for 2005, 2010, 2015, and 2020) and an annual I-O table (for example, the I-O tables for 2016, 2017, 2018, and 2019) using non-survey data based on the I-O table compiled using survey data. By the way, the I-O tables for 2016, 2017, 2018, and 2019 were evaluated at producer prices only, while the I-O tables for 2005, 2010, 2015, and 2020 were evaluated at 3 different prices: purchaser prices, producer prices and basic prices, which makes it possible to calculate commodity taxes on domestically produced goods and services and commodity taxes on imported goods and services by subtracting relevant data at basic prices from relevant data at producer prices (refer to 5. Calculating commodity taxes on domestic products and imports for more details). Therefore, the I-O table for 2019 was not used for the GTAP database version 12, but the I-O table for 2020 was used.

[31]The final demand matrix of the transaction table of imported goods and services includes a column of exports equal to zero.

fixed capital formation to get a vector of investment usage of domestic products and a vector of investment usage of imports.

The matrix of value added in the transaction table of composite goods includes compensation of employees, operating surplus, depreciation of fixed capital, and net indirect taxes (less subsidies). Depreciation of fixed capital was added to operating surplus to obtain a vector of employment of capital.

H.3 Mapping the Korean I-O table to the GTAP sectoral classification

Table A in the appendix shows how 380 sectors of the Korean I-O table are mapped to the GTAP sectoral classification (GSEC3). There is no domestic production of sugar cane and sugar beet in Korea, and the Korean I-O table does not include sugar cane and sugar beet (sector 6 of the GTAP database). Eight sectors should be split into more than one sector of the GTAP database: sector 2 (wheat and other crops), sector 18 (other livestock breeding), sector 25 (agriculture, forestry, and fishing services), sector 35 (slaughtering and meat processing), sector 41 (polished rice, barley, and others), sector 49 (animal and vegetable fats and oils), sector 335 (services auxiliary to finance and insurance), and sector 336 (residential services) of the Korean I-O table. The data required to calculate the splits are based on the data on supplies of domestic and imported goods attached to the Korean I-O tables for 2020. For splitting the eight sectors of the Korean I-O table into more than one sector of the GTAP database, the data on the total supply of more than 3,400 commodities consisting of domestic production and imports are used, which are attached to the Korean I-O table.

Sector 2 (wheat and other crops) of the Korean I-O table includes wheat and other crops and is split into sector 2 (wheat) and sector 3 (cereal grains nec) of the GSEC3, as seen in Tables 8.16 and 8.17. The * signifies the Korean I-O table sector affected by the split. 27.38 percent and 72.62 percent of sector 2 (wheat and other crops) of the Korean I-O table were assigned to sector 2 (wheat) and sector 3 (cereal grains nec) of the GSEC3, respectively, as shown in Table 8.17.

Table 8.16: Split of sector 2 (wheat and other crops) of the Korean I-O table in accordance with GSEC3

GTAP (GSEC3)		Korean I-O table	
02	Wheat	2*	Wheat and other crops
03	Cereal grains nec	2*	Wheat and other crops

Sector 18 (other livestock breeding) of the Korean I-O table is split into sector 9 (bovine cattle, sheep and goats, horses), sector 10 (animal products nec), and sector 12 (wool, silk-worm cocoons) of the GSEC3, as shown in Table 8.18. The shares of components of sector 18 (other livestock breeding) of the Korean I-O table are presented in Table 8.19. 59.21 percent, 21.19 percent and 19.6 percent of sector 18 (other livestock breeding) of the Korean I-O table were assigned to sector 9 (bovine cattle, sheep and goats, horses), sector 10 (animal products nec), and sector 12 (wool, silk-worm cocoons) of the GSEC3, respectively, as shown in Table 8.19.

Table 8.17: Shares of components of sector 2 (wheat and other crops) of the Korean I-O table

Commodity	Domestic production (mil. won)	Imports (mil. won)	Total supply (mil. won)	Share (%)
Wheat	16,463	1,145,544	1,162,007	27.16
Buckwheat	7,125	2,053	9,178	0.21
By-product (wheat)	407	0	407	0.01
Subtotal	23,995	1,147,597	1,171,592	27.38
Rye	69,871	359	70,230	1.64
Unhulled barley	24,381	5,465	29,846	0.7
Beer barley	24,447	11,999	36,446	0.85
Corn	110,996	2,797,696	2,908,692	67.99
Miscellaneous	26,863	32,898	59,761	1.4
By-product (grain)	1,752	94	1,846	0.04
Subtotal	258,310	2,848,511	3,106,821	72.62
Total	282,305	3,996,108	4,278,413	100

Table 8.18: Split of sector 18 (other livestock breeding) of the Korean I-O table in accordance with GSEC3

GTAP (GSEC3)		Korean I-O table	
09	Bovine cattle, sheep and goats, horses	15	Beef cattle
		18*	Other livestock breeding
		25*	Agriculture, forestry and fishing services
10	Animal products nec	16	Swine
		17	Poultry and eggs
		18*	Other livestock breeding
		25*	Agriculture, forestry and fishing services
12	Wool, silk-worm cocoons	18*	Other livestock breeding

Table 8.19: Shares of components of sector 18 (other livestock breeding) of the Korean I-O table

Commodity	Domestic production (mil. won)	Imports (mil. won)	Total supply (mil. won)	Share (%)
Goats	152,573	0	152,573	14.24
Goat milk	364,296	0	364,296	33.99
Deer	23,156	0	23,156	2.16
Antlers of the deer	38,200	56,337	94,537	8.82
Subtotal	578,225	56,337	634,562	59.21
Honey	139,180	18,279	157,459	14.69
Nectar	25,389	27,467	52,856	4.93
Dog	0	5,357	5,357	0.5
Rabbit	4,496	990	5,486	0.51
Other livestock products	0	5,988	5,988	0.56
Subtotal	169,065	58,081	227,146	21.19
Silk-worm cocoons	8,318	62	8,380	0.78
Fur	291	57,546	57,837	5.4
Green skin and pelt	0	31,654	31,654	2.95
By-products	19,118	93,040	112,158	10.47
Subtotal	27,727	182,302	210,029	19.6
Total	775,017	296,720	1,071,737	100

Sector 25 (agriculture, forestry and fishing services) of the Korean I-O table is split into sectors 1-4, 7-11, 13 and 14 of the GSEC3, as shown in Table 8.21. Services of agriculture, livestock, forestry and fishing in the data on supplies of domestic and imported goods attached to the Korean I-O tables for 2020 are shown in Table 8.20. By the way, sector 25 (agriculture, forestry and fishing services) of the Korean I-O table is only one sector, not split into four parts for agriculture, livestock, forestry and fishing in the Korean I-O table. After 16.63 percent and 6.02 percent of sector 25 (agriculture, forestry and fishing services) of the Korean I-O table were assigned to sector 13 (for) and sector 14 (fsh) of the GTAP DB, respectively, as seen in Table 8.20, 58.88 percent of sector 25 (agriculture, forestry and fishing services) of the Korean I-O table were assigned to sectors 1-4, 7-8 of GSEC3, and 18.48 percent to sectors 9-11 of GSEC3, as shown in Table 8.21.

Table 8.20: Agriculture, forestry and fishing services (sector 25) of the Korean I-O table

Services by sector	Domestic production (mil. won)	Shares (%)
Agriculture services	707,274	58.88
Livestock services	221,950	18.48
Forestry services	199,755	16.63
Fishing services	72,335	6.02
Total	1,201,314	100.00

Table 8.21: Split of sector 25 (agriculture, forestry and fishing services) of the Korean I-O table in accordance with GSEC3

GTAP (GSEC3)		Korean I-O table	
01	Paddy rice	01	Unmilled rice
		25	Agriculture, forestr
02	Wheat	02	Wheat and other cro
		25	Agriculture, forestr
03	Cereal grains nec	02	Wheat and other cro
		25	Agriculture, forestr
04	Vegetables, fruit, n	03	Pulses
		05	Vegetables
		06	Fruits
		25	Agriculture, forestr
05	Oil seeds	11	Seeds
06	Sugar cane, sugar be	No	existent
07	Plant-based fibers	13	Other inedible crops
		25	Agriculture, forestr
08	Crops nec	04	Potatoes
		07	Floricultural crops
		08	Cultivated medicinal
		09	Leaf tobacco
		10	Natural rubber
		12	Other edible crops
		25	Agriculture, forestr
09	Bovine cattle, sheep	15	Beef cattle
		18	Other livestock bree
		25	Agriculture, forestr
10	Animal products nec	16	Swine
		17	Poultry and eggs
		18	Other livestock bree
		25	Agriculture, forestr
11	Raw milk	14	airy farming
		25	Agriculture, forestr
12	Wool, silk-worm coco	18	Other livestock bree
13	Forestry	19	Forest planting and
		20	Raw timber
		21	Edible forestry prod
		22	Misc. forestry produ
		25	Agriculture, forestr
14	Fishing	23	Fishing
		24	Aquaculture
		25	Agriculture, forestr

Table 8.22: Shares of sectors 1-24 of the Korean I-O table for the split of sector 25 (agriculture, forestry and fishing services) of the Korean I-O table

GTAP sectors		Sectors of Korean I-O table		Domestic production (mil. Won)	Share (%)	Share (%) used
01	pdr	01	Unmilled rice	8,040,659	15.28	11.82
02	wht	02*	Wheat and other crop	23,995	0.05	0.04
03	gro	02*	Wheat and other crop	258,310	0.49	0.38
04	v_f	03	Pulses	563,361	1.07	
		05	Vegetables	12,041,256	22.88	
		06	Fruits	4,588,736	8.72	
Subtotal of 04 v_f				17,193,353.00	32.67	25.27
07	pfb	13	Other inedible crops	13,213	0.03	0.02
08	ocr	04	Potatoes	1,326,961	2.52	
		07	Floricultural crops	509,972	0.97	
		08	Cultivated medicinal	1,826,596	3.47	
		09	Leaf tobacco	74,403	0.14	
		10	Natural rubber	0	0	
		12	Other edible crops	598,694	1.14	
Subtotal of 08 ocr				4,336,626.00	8.24	6.37
09	ctl	14*	Dairy farming	2,580,497	4.9	
		15	Beef cattle	6,050,783	11.5	
		18*	Other livestock bree	578,225	1.1	
Subtotal of 09 ctl				9,209,505	17.5	13.53
10	oap	16	Swine	6,672,392	12.68	
		17	Poultry and eggs	4,518,022	8.58	
		18*	Other livestock bree	169,065	0.32	
Subtotal of 10 oap				11,359,479	21.58	16.69
11	rmk	14*	Dairy farming	2,195,991	4.17	3.23
Total				52,631,131	100	77.35

Sector 35 (slaughtering and meat processing) of the Korean I-O table is split into sector 19 (bovine cattle, sheep and goats, horse meat products) and sector 20 (meat products nec) of the GSEC3, as shown in Tables 8.18 and 8.19. 38.18 percent and 61.82 percent of sector 35 (slaughtering and meat processing) of the Korean I-O table were assigned to sector 19 (bovine cattle, sheep and goats, horse meat products) and sector 20 (meat products nec) of the GSEC3, respectively, as seen in Table 8.19.

References

Huff, K., R. McDougall, and T. Walmsley (2000). "Contributing Input-Output Tables to the GTAP Data Base," Technical Paper No. 1, Center for Global Trade Analysis, Purdue University.

Ko, J.-H. and I. Cheong (2002). "Chapter 11.E: Korea", in Dimaranan, Betina V. and Robert A. McDougall (eds.). Global Trade, Assistance, and Production: The GTAP 5 Data Base, Center for Global Trade Analysis, Purdue University.

Ko, J.-H. (2006). "Chapter 11.D: Korea," in Dimaranan, Betina V. (ed.). Global Trade, Assistance, and Production: The GTAP 6 Data Base, Center for Global Trade Analysis, Purdue University.

Ko, J.-H. (2008). "Chapter 7.C: Korea," in Badri Narayanan G. and Terrie L. Walmsley (eds.). Global Trade, Assistance, and Production: The GTAP 7 Data Base, Center for Global Trade Analysis, Purdue University.

Ko, J.-H. (2012). "Korea", in Badri Narayanan G., Angel Aguiar and Robert McDougall (eds.), Global Trade, Assistance, and Production: The GTAP 8 Data Base, Center for Global Trade Analysis, Purdue University.

Ko, J.-H. (2016). " Chapter 7.K: Korea", in Aguiar, Angel, Badri Narayanan, & Robert McDougall. "An Overview of the GTAP 9 Data Base." Journal of Global Economic Analysis 1, no. 1 (June 3, 2016): 181-208. Retrieved from https://jgea.org/ojs/index.php/jgea/article/view/23.

Ko, J.-H. (2019). "Chapter 7.K: Korea", in Aguiar, A., Chepeliev, M., Corong, E., McDougall, R., & van der Mensbrugghe, D. (2019). The GTAP Data Base: Version 10. Journal of Global Economic Analysis, 4(1), 1-27. Retrieved from link.

Ko, J.-H. (2022). "Chapter 8.AE: Korea", in Aguiar, A., Chepeliev, M., Corong, E. & van der Mensbrugghe, D. (2022). The GTAP Data Base: Version 11. Journal of Global Economic Analysis, 7(2), 1-37. Retrieved from https://www.jgea.org/ojs/index.php/jgea/article/view/181

The Bank of Korea (2007). Input-Output Tables of Korea 2003. Seoul.

The Bank of Korea (2009). Input-Output Tables of Korea 2007. Seoul.

The Bank of Korea (2014). Input-Output Tables of Korea 2010. Seoul.

The Bank of Korea (2016). Input-Output Tables of Korea 2014. Seoul.

The Bank of Korea (2019). Input-Output Tables of Korea 2015. Seoul.

The Bank of Korea (2024). Input-Output Tables of Korea 2020. Seoul.

The United Nations Statistical Commission (2009). System of National Accounts 2008. (http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf)

Appendix

Table 8.23: Table A: A mapping of 380 sectors of Korean I-O table to GTAP sectoral classification

GTAP sectoral classification (GSC3)			Korean I-O table sectoral classification
1	pdr	Paddy rice	1 Unmilled rice
			25* Agriculture, forestry and fishing services
2	wht	Wheat	2* Wheat and other crops
			25* Agriculture, forestry and fishing services
3	gro	Cereal grains nec	2* Wheat and other crops
			25* Agriculture, forestry and fishing services
4	v_f	Vegetables, fruit, nuts	3 Pulses
			5 Vegetables
			6 Fruits
			25* Agriculture, forestry and fishing services
5	osd	Oil seeds	11 Seeds
6	c_b	Sugar cane, sugar beet	Not existent
7	pfb	Plant-based fibers	13 Other inedible crops
			25* Agriculture, forestry and fishing services
8	ocr	Crops nec	4 Potatoes
			7 Floricultural crops
			8 Cultivated medicinal herbs
			9 Leaf tobacco
			10 Natural rubber
			12 Other edible crops
			25* Agriculture, forestry and fishing services
9	ctl	Bovine cattle, sheep and goats, horses	15 Beef cattle
			18* Other livestock breeding
			25* Agriculture, forestry and fishing services
10	oap	Animal products nec	16 Swine
			17 Poultry and eggs
			18* Other livestock breeding
			25* Agriculture, forestry and fishing services
11	rmk	Raw milk	14 Dairy farming
			25* Agriculture, forestry and fishing services
12	wol	Wool, silk-worm cocoons	18* Other livestock breeding
13	for	Forestry	19 Forest planting and conservation
			20 Raw timber
			21 Edible forestry products
			22 Misc. forestry products
			25* Agriculture, forestry and fishing services
14	fsh	Fishing	23 Fishing
			24 Aquaculture
			25* Agriculture, forestry and fishing services
15	col	Coal	26 Anthracite
			27 Bituminous coal
16	oil	Oil	28 Crude petroleum
17	gas	Gas	29 Natural gas
18	omn	Minerals nec	30 Iron ores
			31 Other nonferrous metal ores
			32 Sand and stones
			33 Limestone
			34 Misc. nonmetallic minerals

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GTAP sectoral classification (GSC3)			Korean I-O table sectoral classification
19	cmt	Bovine cattle, sheep and goat, horse meat products	35* Slaughtering and meat processing
20	omt	Meat products nec	35* Slaughtering and meat processing
			36 Poultry slaughtering and processing
			37 Prepared meat products
21	vol	Vegetable oils and fats	49* Animal and vegetable fats and oils
22	mil	Dairy products	38 Dairy products
23	pcr	Processed rice	41* Polished rice, barley and others
24	sgr	Sugar	43 Raw sugar
			44 Refined sugar
25	ofd	Food products nec	39 Processed fish and sea foods
			40 Frozen, salted, dried and smoked fish and sea foods
			41* Polished rice and barley and others
			42 Flour and cereal preparations
			45 Starches, glucose, glucose syrup and maltose
			46 Bakery and confectionery products
			47 Noodles
			48 Seasonings
			50 Canned or cured fruits and vegetables
			51 Coffee and tea
			52 Ginseng products
			53 Miscellaneous foodstuffs
			54 Prepared livestock feeds
26	b_t	Beverages and tobacco products	55 Ethyl alcohol for beverages
			56 Distilled spirits (soju)
			57 Beer
			58 Other liquors
			59 Nonalcoholic drinks and ice
			60 Tobacco products
27	tex	Textiles	61 Natural and chemical fiber yarns
			62 Other fiber yarn
			63 Natural and chemical fiber fabrics
			64 Other fiber fabrics
			65 Knitted fabrics
			66 Fiber bleaching and dyeing
			67 Textile products
			68 Non-woven fabric and pelt
			69 Misc. textile products
28	wap	Wearing apparel	70 Textile wearing apparels
			71 Knitted wearing apparels
			72 Leather wearing apparels
			73 Fur wearing apparels and products
			74 Clothing accessories
29	lea	Leather products	75 Leather
			76 Fur
			77 Luggage and handbags
			78 Footwear
			79 Other leather products
30	lum	Wood products	80 Lumber
			81 Plywood

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GTAP sectoral classification (GSC3)			Korean I-O table sectoral classification
			82 Reconstituted and densified wood
			83 Wooden products for construction
			84 Wooden containers
			85 Other wooden products
31	ppp	Paper products, printing	86 Pulp
			87 Printing paper
			88 Other raw paper and paperboard
			89 Corrugated paper and solid fiber boxes
			90 Paper containers
			91 Stationery paper and office paper
			92 Sanitary paper products
			93 Other paper products
			94 Publishing and reproduction of recorded media
32	p_c	Petroleum, coal products	95 Coal products
			96 Naphtha
			97 Gasoline
			98 Jet oil
			99 Kerosene
			100 Light oil
			101 Heavy oil
			102 Liquefied petroleum gas
			103 Refined mixed oil
			104 Lubricants and grease
			105 Misc. petroleum refinery products
33	chm	Chemical products	106 Aliphatic petrochemical basic products
			107 Aromatic petrochemical basic products
			108 Petrochemical intermediate products
			109 Other basic organic chemicals
			110 Industrial gases
			111 Basic inorganic chemicals
			112 Dyes, pigments, and tanning materials
			113 Synthetic resins
			114 Synthetic rubber
			115 Chemical fibers
			117 Fertilizers and nitrogen compounds
			118 Pesticides
			119 Paints, varnishes, and allied products
			120 Printing ink
			121 Soap, detergents and dentifrices
			122 Cosmetics
			123 Adhesives, gelatin and sealants
			124 Photographic chemical products
			125 Misc. chemical products
34	bph	Basic pharmaceutical products	116 Medicaments
35	rpp	Rubber and plastic products	126 Primary plastic products
			127 Plastic products for construction
			128 Plastic products for package
			129 Plastic products for assembly & transport equip.
			130 Misc. plastic products
			131 Tires and tubes
			132 Industrial rubber products

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GTAP sectoral classification (GSC3)			Korean I-O table sectoral classification
			133 Misc. rubber products
36	nmm	Mineral products nec	134 Sheet glass and primary glass products
			135 Glass products for electronics
			136 Industrial glass products except 135
			137 Other glass products
			138 Pottery, china and earthenware for home use
			139 Industrial pottery products
			140 Clay refractories
			141 Clay products for construction
			142 Cement
			143 Ready mixed concrete
			144 Concrete blocks, bricks, and other concrete
			145 Lime, gypsum, and plaster products
			146 Cut stone & stone products
			147 Abrasives
			148 Asbestos and asphalts
			149 Misc. nonmetallic mineral products
37	i_s	Ferrous metals	150 Pig iron
			151 Ferroalloys
			152 Steel ingots and semifinished products
			153 Steel rods and bars
			154 Section steel
			155 Rails and wires
			156 Steel plates (with more than 3 mm thick)
			157 Hot rolled steel sheets
			158 Fabricated wire products
			159 Steel pipe and tubes
			160 Cold rolled steel sheet, strip, and bars
			161 Coated steel plates
			162 Misc. primary iron and steel products
38	nfm	Metals nec	163 Copper smelting, refining and alloy
			164 Aluminium smelting, refining and alloy
			165 Lead and zinc smelting, refining and alloy
			166 Gold and silver ingots
			167 Other nonferrous metal ingots
			168 Primary copper products
			169 Primary aluminium products
			170 Other nonferrous metal castings and forgings,
39	fmp	Metal products	171 Metal foundries
			172 Metal products for construction
			173 Structural metal products
			174 Metal tanks and reservoirs
			175 Industrial boiler and steam generator
			176 Metal forgings and metallurgical products
			177 Metal pressed products
			178 Treatment and coating of metals
			179 Products made of coated metals
			180 Household metallic utensils
			181 Fastening metal products
			182 Hand tools
			183 Bolts, nuts, screws, rivets, and washers

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GTAP sectoral classification (GSC3)			Korean I-O table sectoral classification
			184 Metal cans, barrels, and drums
			185 Other metal products
40	ele	Computer, electronic and optical equipment	186 Semiconductor devices
			187 Integrated circuits
			188 LCD flat display
			189 Misc. electronic display equipment
			190 Printed circuit boards
			191 Electric resistors, storage batteries, electric coils, and transformers
			192 Misc. electronic components
			193 Computers
			194 Computer memory storage
			195 Computer and peripheral equipment
			196 Wire telephone and telegraph equipment
			197 Mobile communications equipment
			198 Misc. communication and broadcasting equipment
			199 Television receiving sets
			200 Film production equipment
			201 Audio and sound equipment
			207 Motors and generators
41	eeq	Electrical equipment	208 Electric transformers
			209 Capacitors and rectifiers
			210 Electric circuit switch and connection equip.
			211 Panel boards and automatic control panels
			212 Batteries
			213 Insulated wires and cables
			214 Household refrigerators and freezers
			215 Cooking appliances and heating apparatus
			216 Other household electronic appliances
			217 Electric bulbs and lamps
			218 Electric lighting fixtures
			219 Misc. electric equipment and supplies
			220 Engines and turbines
42	ome	Machinery and equipment nec	221 Pumps and compressors
			222 Valves
			223 Bearings, gears, gearing and driving elements
			224 Conveyors and conveying equipment
			225 Air-conditioning equipment and industrial refrigeration equipment
			226 Filtering or purifying machinery for liquid and Gases
			227 Office machines and devices
			228 Misc. machinery and equipment of general purpose
			229 Agricultural implements and machines
			230 Construction and mining machines
			231 Metal forming equipment
			232 Metal molds and industrial patterns
			233 Semiconductor machines
			234 Display machines
			235 Food processing machines

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GTAP sectoral classification (GSC3)			Korean I-O table sectoral classification
			236 Textile and apparel machines
			237 Industrial robots
			238 Printing machines
			239 Rubber and plastic surgery equipment
			240 Misc. special purpose equipment
			202 Medical instruments and supplies
			203 Measuring and analytical instruments
			204 Industrial automatic regulators
			205 Cinematograph cameras and projectors
			206 Watches and clocks
43	mvh	Motor vehicles and parts	241 Passenger automobiles
			242 Electric passenger cars
			243 Buses and vans
			244 Trucks
			245 Motor vehicles with special equipment
			246 Trailers and containers
			247 Motor vehicles engines
			248 Motor vehicle chassis, bodies and parts
44	otn	Transport equipment nec	249 Steel ships
			250 Other ships
			251 Ship repairing and ship parts
			252 Railroad vehicles and parts
			253 Aircraft and parts
			254 Motorcycles and parts
			255 Bicycles and parts and misc. transportation
45	omf	Manufactures nec	256 Wood furniture
			257 Metal furniture
			258 Other furniture
			259 Toys and games
			260 Sporting and athletic goods
			261 Musical instruments
			262 Pens, pencils, and other artists' materials
			263 Jewelry and plated ware
			264 Models and decorations
			265 Misc. manufactured products
			266 Manufacturing and processing services
			267 Repairs of industrial machinery and equipment
46	ely	Electricity	268 Water power generation
			269 Thermal power generation
			270 Atomic power generation
			271 In-house power generation
			272 New energy
			273 Renewable energy
47	gdt	Gas manufacture, distribution	274 Manufactured gas supply
48	wtr	Water	275 Steam and hot water supply
			276 Water supply
			277 Treatment of sewage, waste water, and night soil (public)
			278 Treatment of sewage, waste water, and night soil (commercial)
			279 Collection and disposal of wastes (public)

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GTAP sectoral classification (GSC3)			Korean I-O table sectoral classification
			280 Collection and disposal of wastes (commercial)
			281 Resource recycling services
49	cns	Construction	282 Residential building construction
			283 Nonresidential building construction
			284 Building repairs
			285 Road construction
			286 Railroad construction
			287 Breakwater, pier, and harbor construction
			288 Dam, levee, and flood control project
			289 Water main line and drainage project
			290 Land clearing and reclamation, and irrigation
			291 Land leveling and athletic field construction
			292 Environmental purification facilities
			293 Power plant facilties
			294 Industrial plant construction
			295 Miscellaneous construction
50	trd	Trade	296 Wholesale and retail trade
			374 Motor repair services
51	afs	Accommodation, food and service activities	311 General eating places
			312 Misc. eating places
			313 Drinking places
			314 Non-alcohol beverage store
			315 Hotels and other lodging places
52	otp	Land transport and transport via pipelines	297 Railroad passenger and freight transportation
			298 Road passenger transportation
			299 Road freight transportation
53	wtp	Water transport	300 Coastal and inland water transportation
			301 Deep sea transportation
54	atp	Air transport	302 Air transportation
55	whs	Warehousing and support activities	303 Services incidental to road transportation
			304 Services incidental to water transportation
			305 Airports, flying, fields and airport terminal
			306 Cargo loading or unloading operations
			307 Warehousing and storage
			308 Other services incidental to transportation
56	cmn	Information and communication	309 Postal services
			310 Parcel delivery service
			316 Wire communication services
			317 Wireless & satellite communication services
			318 Communication resale & intermediation service
			319 Misc. communication services
			320 Terrestrial broadcasting
			321 Cable and satellite broadcasting
			322 Information provision service
			323 Game software publication
			324 Software development and supply
			325 Misc. IT services
			326 Newspapers and publishing
			327 Movie and audio production and distribution
			328 Showing of movies
57	ofi	Financial services nec	329 Central bank and banking institutions

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GTAP sectoral classification (GSC3)			Korean I-O table sectoral classification
			330 Financial investment institutions
			331 Other financial intermediaries
			335* Services auxiliary to finance and insurance
58	isr	Insurance	332 Life insurance
			333 Pension fund
			334 Casualty insurance
			335* Services auxiliary to finance and insurance
59	rsa	Real estate activities	336* Residential services
			337 Non-residential building rental
			338 Real estate development and supply
			339 Real estate related services
60	obs	Other business services	340 Research and development(public)
			341 Research and development (non-profit)
			342 Research and development (commercial)
			343 Research and development in enterprise
			344 Legal and accounting services
			345 Market survey and management consulting
			346 Advertising services
			347 Architectural and civil engineering services
			348 Engineering-related services
			349 Science and technology services
			350 Misc. special services
			351 Lease of equipment, appliances and intellectual
			352 Maintenance of business facilities and landscape
			353 Manpower supply services
			354 Misc. business services
61	ros	Recreational and other services	366 Culture services (public)
			367 Theatrical producers, bands, and entertainers
			368 Other culture services
			369 Travel agency and travel-related services
			370 Sports services
			371 Amusement and recreation services
			372 Business associations and professional
			373 Religious, political, labor, and other social
			375 Electronic communication devices and home
			376 Barber and beauty shops
			377 Laundry and cleaning services
			378 Domestic services
			379 Other personal services
62	osg	Public administration and defense;	355 Central government
			356 Local government
			357 Social insurance (public)
63	edu	Education	358 Education services (public)
			359 Education services (non-profit)
			360 Education services (commercial)
64	hht	Human health and social work activities	361 Medical and health services (public)
			362 Medical and health services (non-profit)
			363 Medical and health services (commercial)
			364 Social welfare services (public)
			365 Social welfare services (non-profit)

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	GTAP sectoral classification (GSC3)		Korean I-O table sectoral classification
65	dwe	Dwellings 336* Residential services (imputed rent)	

I Madagascar

Samuel Randriambolamanitra

I.1 Introduction

Waiting on Contributor

I.2 Data Source

J Malaysia

***Jingjing Liu*[32] *and Norlida Hanim Mohd Salleh.*[33]**

J.1 Introduction

This document describes the adaptation of the 2019 Malaysian input-output (I-O) table for input to the Global Trade Analysis Project (GTAP). The structure of this paper is as follows. Section 2 describes the source data. Section 3 discusses strengths and limitations of the published input-output (1-O) data. Section 4 addresses the procedures for data processing. Section 5 presents the mapping between the 124 Malaysian I-O sectors, 65 GTAP sectors, and the more aggregated 56 sectors of the submitted table.

J.2 Data Sources

The primary raw input was 124-sector input-output data published by the Department of Statistics Malaysian (DOSM). The 2019 I-O data was measured in thousands of 2019 Malaysian ringgit. The 2019 DOS raw input-output data satisfy the sectoral balance condition, and contain most of the data ready for conversion to the GTAP format. These data include:

1. Supply and Use tables at purchasers' prices for 124 sectors. The Supply table shows the total outputs of 124 domestic commodities, total imports, taxes and subsidies on domestic and imported goods, trade and transport margins, by commodity. The Use table shows the demand for those commodities by industries, private households, government, investment, changes in inventories, and exports.

2. An Absorption matrix at basic prices showing the use of 124 domestically-produced commodities by 124 commodities and by five final users (private consumption, government consumption, investment, exports, and changes in stocks). The matrix also contains the values of import commodities, taxes and subsidies on products, other net taxes on production, compensation of employees and operating surplus, by commodity use.

3. An Import Absorption matrix at basic prices showing the use of 124 imported commodities by 124 commodities and by five final users (private consumption, government consumption, investment, exports, and changes in stocks).

[32]School of International Studies, Wenzhou Business College, Wenzhou, China
[33]Both authors are part of the Faculty of Economics and Management, National University of Malayisa, Selangor, Malaysia

J.3 Strengths and Limitations of the Original Input Output Data

We have conducted a number of checks on the data. They include checks of the non-negativity condition and the balancing conditions of the tables. This section discusses the strengths and limitations of the data.

Strengths

As can be seen from the previous section, the original data contain detailed supply and use data for 124 commodities and activities. They provide most of the data needed for GTAP. Specifically: (a) There are absorption matrices for domestic and imported commodities, Commodity by commodity ; and (b) The absorption matrix commodity by commodity also contains the values of taxes on products, subsidies on products, other net taxes on production, compensation of employees and operating surplus. (c) The tables are balanced.

Limitations

1. There are some negative non-inventory flows in the absorption matrix C*C. For example, there is negative capital return in sector 38 Builders' Carpentry and Joinery.
2. There are non-zero exports flows in the imported good matrix for most of merchandised goods. That is, there are re-exports of these commodities.
3. There are no separate values for land rentals.
4. There are no separate data for tariffs or export taxes.

J.4 Data Processing

In this section we discuss the adjustments procedures, the additional data sources, and the assumptions that we adopted to address the data issues described in the previous section. For the GTAP (Global Trade Analysis Project), we require commodity-by-commodity tables. In Malaysian I-O Table, these are represented by T6_ABSORP CXC and T7_Import CXC, which pertain to domestic and imported commodities, respectively.

1. Table 6 contains a vector of taxes and subsidies on products. There is a need to obtain the net value (tax - subsidy) and convert this into a matrix. In Excel, these values are presented as a row vector, allowing for allocation per input. The net per-product taxes can be allocated proportionally across domestic and imported inputs (based on row shares) for each type of use (intermediate and final).

   The steps are as follows: Sum up the total intermediate input values of domestic and imported inputs for each type of use (intermediate and final). Then, use Excel's functions to

divide the values in Table 6 and Table 7 by the summed row values to obtain the proportion. Multiply this proportion by the net taxes to get the allocated values.

2. T6 includes data for taxes on production, labor (not differentiated by skill), which corresponds to compensation of employees, and capital (gross operating surplus). There is no land component represented in this table.

3. GTAP does not account for exports of imports. Hence, the values in AI11 should be sourced solely from T6.

4. There is a negative capital return in the builders' carpentry and joinery sector. It is necessary to impose the positive returns of a similar industry and regain balance through changes in stock. The gross operating surplus for this sector from the previous I-O table and subsequently from the Malaysian I-O table was identified. Then, a reasonable and positive value was selected and assigned to this value, and the changes in stock were adjusted accordingly.

Converting the Malaysian IO table into GTAP Format

The 124 sectors of the Malaysia I-O table were aggregated to a set of 56 sectors that best correspond to elements of GTAP's standard 65 commodities. The mappings from 124 and 56 sectors to these 65 sectors are reported in Table 8.24.

5. Checking Sectoral Balance and Non-negativity Conditions

After converting the Malaysian I-O tables to the format required by GTAP data base, we conducted the sectoral balance and non-negativity checks. The new data base passed the sectoral balance check and non-negativity conditions.

Table 8.24: Concordance between 124 Malaysia I-O sectors, GTAP 65 sectors and 56 sectors in the contributed table.

56 sectors		65 GTAP sectors		124 Malaysian I-O sectors	
1	afs	1	afs	1	Accommodation
				2	Food and Beverage
2	atp	2	atp	3	Air Transport
3	b_t	3	b_t	4	Spirits, Wines and Liquors
				5	Soft Drinks, Mineral Waters and Other Bottled Waters
				6	Tobacco Products
4	bph	4	bph	7	Pharmaceuticals, Medicinal Chemical & Botanical Products
5	chm	5	chm	8	Basic Chemicals
				9	Fertilizers and Nitrogen Compounds
				10	Paints and Varnishes
				11	Soaps & Detergents, Cleaning & Polishing, Perfumes and Toilet Preparations
				12	Other Chemicals Products

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56 sectors		65 GTAP sectors		124 Malaysian I-O sectors	
6	cmn	6	cmn	13	Postal and Courier Activities
				14	Publishing Activities
				15	Telecommunications
				16	Motion Picture, Programming and Broadcasting Activities
				17	Computer and Information Services
7	cmt_omt	7	cmt	18	Processing and Preserving of Meat
		8	omt		
8	cns	9	cns	19	Residential Buildings
				20	Non-Residential Buildings
				21	Civil Engineering
				22	Specialised Construction Activities
9	coa_oil_gas	10	coa	23	Crude Oil and Natural Gas
		11	oil		
		12	gas		
10	ctl_rmk_wol	13	ctl	24	Other Livestock
		14	rmk		
		15	wol		
11	dwe	16	dwe	25	Ownership of Dwellings
12	edu	17	edu	26	Education
13	eeq	18	eeq	27	Domestic Appliances
				28	Electric Motors, Generators and Transformers
				29	Wiring Devices, Electric Lighting Equipment and Other Electrical
14	ele	19	ele	30	Computers, Peripheral, Office Equipment and Machinery
				31	Electricity Distribution & Control Apparatus, Batteries and Accumulators
				32	Fibre Optic, Electronic and Other Electric Cables
				33	Electronic Components and Boards
				34	Optical Instruments, Photographic Equipment, Magnetic and Optical Media
15	ely_gdt	20	ely	35	Electricity and Gas
		21	gdt		
16	fmp	22	fmp	36	Structural Metal Products, Tanks, Reservoirs and Steam Generators
				37	Other Fabricated Metal Products
17	frs	23	frs	38	Forestry and Logging
18	fsh	24	fsh	39	Fishing and Aquaculture
19	hht	25	hht	40	Health
20	i_s	26	i_s	41	Basic Iron and Steel
				42	Casting of Metals
21	ins	27	ins	43	Insurance/ Takaful and Pension Funding
22	lea	28	lea	44	Leather Products
23	lum	29	lum	45	Sawmilling and Planning of Wood
				46	Veneer Sheets and Wood-based Panels
				47	Builders' Carpentry and Joinery
				48	Wooden Containers and Other Wood Products
24	mil	30	mil	49	Dairy Products
25	mvh	31	mvh	50	Motor Vehicles, Trailers and Semi Trailers
26	nfm	32	nfm	51	Basic Precious and Other Non-Ferrous Metals
27	nmm	33	nmm	52	Glass and Glass Products
				53	Refractory, Clay, Porcelain and Ceramic Products

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56 sectors		65 GTAP sectors		124 Malaysian I-O sectors	
				54	Cement, Lime and Plaster
				55	Non-Metallic Mineral Products
28	oap	34	oap	56	Poultry Farming
29	obs	35	obs	57	Scientific Research and Development
				58	Professional
				59	Business Services
30	ocr_pfb	36;37	ocr; pfb	60	Rubber
				61	Flower Plants
				62	Other Agriculture
31	ofd	38	ofd	63	Processing and Preserving of Seafood
				64	Processing and Preserving of Fruits & Vegetables
				65	Bakery Products
				66	Other Food Processing
				67	Prepared Animal Feeds
32	ofi	39	ofi	68	Monetary Intermediation
				69	Other Financial Service
				70	Activities Auxiliary to Financial Service and Insurance/
					Takaful
33	ome	40	ome	71	Engines & Turbines, Fluid Power Equipment, Other
					Pumps, Compressors, Taps and Valves
				72	Other General Purpose Machinery
				73	Communication Equipment and Consumer Electronics
				74	Irradiation Equipment, Electro Medical and
					Electrotherapeutic
				75	Measuring Equipment, Testing, Navigating and Control
				76	Watches and Clocks
34	omf	41	omf	77	Furniture
				78	Other Manufacturing
				79	Repair & Installation of Machinery and Equipment
35	osd	42	osd	80	Oil Palm
36	osg	43	osg	81	Public Administration
				82	Public Order and Safety
				83	Other Public Administration
				84	Non-Profit Institutions Serving Households
37	otn	44	otn	85	Weapons, Ammunition and Special Purpose Machinery
				86	Motorcycles
				87	Ships, Boats, Bicycles and Invalid Carriages
				88	Other Transport Equipment
38	otp	45	otp	89	Land Transport
				90	Highway Operation Services, Bridge and Tunnel
39	oxt	46	oxt	91	Mining of Metal Ores
				92	Quarrying of Stone, Sand and Clay
				93	Other Mining and Quarrying
40	p_c	47	p_c	94	Coke and Refined Petroleum Products
41	pcr	48	pcr	95	Grain Mill Products, Starches and Starch Products
42	pdr	49	pdr	96	Paddy
43	ppp	50	ppp	97	Paper and Paper Products
				98	Reproduction of Recorded Media
				99	Printing
44	ros	51	ros	100	Arts, Entertainment and Recreation
45	rpp	52	rpp	101	Rubber Tyres and Tubes

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56 sectors		65 GTAP sectors		124 Malaysian I-O sectors	
				102	Rubber Processing
				103	Rubber Gloves
				104	Other Rubber Products
				105	Plastic Products
46	rsa	53	rsa	106	Real Estate
				107	Rental and Leasing
47	sgr	54	sgr	108	Confectionery
48	tex	55	tex	109	Preparation, Spinning and Weaving of Textiles
				110	Finishing of Textiles
				111	Other Textiles
49	trd	56	trd	112	Wholesale & Retail Trade, Repair of Motor Vehicles
					and Motorcycles
50	v_f	57	v_f	113	Vegetables
				114	Fruits
51	vol	58	vol	115	Vegetable & Animal Oils and Fats
52	wap	59	wap	116	Wearing Apparel
				117	Footwear
53	whs	60	whs	118	Warehousing and Support Activities for Transportation
				119	Services Incidental to Water and Air Transportation
54	wht_gro_c_b	61	wht	120	Food Crops
		62	gro		
		63	c_b		
55	wtp	6	wtp	121	Water Transport
				122	Other Private Services
56	wtr	65	wtr	123	Water
				124	Sewerage, Waste Management & Remediation Activities

K Mauritania

Abdoulaye Tandia

K.1 Introduction

L Mauritius

Celine Niwemahoro

L.1 Reference information for the source table

The data used in preparing the GTAP input-output table for the Mauritius economy came from the 2018 Supply and Use Table (SUT) and Input-Output Table (IOT) and was provided by the National Accounts Unit at the Statistics Mauritius.

The Mauritius IOT is grouped commodity by commodity and includes 26 sectors. The unit in which the original SUT and OIT were compiled is in millions of Mauritian rupees (Rs M).

The provided data were highly aggregated. As the mapping with the GTAP sectoral classification requires at least 30 sectors in the original IOT, the source table was disaggregated, and a new 2018 IOT for Mauritius with 58 sectors was created. The RAS method was applied to rebalance the newly created IOT.

In the original Mauritius I-O table, there was only a column vector for total imports by commodity. Following the procedure suggested by Huff, McDougall and Walmsley (2000), an import matrix was constructed by multiplying the pro-rated total use matrix by the import vector. A domestic matrix was then created by subtracting the import matrix from the total use matrix. Original Mauritius provides data on the value-added matrix for labour and capital, but there is no information on returns to agricultural land. The series for returns to land was set to zero.

Net taxes on products were provided in a column vector by commodity in the Mauritius original IOT. Following the procedure suggested by Huff et al. 2000, a net taxes on product matrix was constructed by multiplying the pro-rated total use matrix by net taxes on product vector.

L.2 Description of how inconsistencies between the source table and GTAP were dealt with

A number of checks on the data were conducted. They include checks of the non-negativity condition, the balancing conditions of the tables, and non-ridiculous tax rates.

The source table exhibits the quality of being balanced. However, some weaknesses were observed. Specifically, there are no separate domestic and import matrices at basic values in the original source table. There is no matrix of net taxes on products. Also, sectors are highly aggregated in the source table.

L.3 Mapping Between Mauritius I-O Sectors and GTAP Sectors

A concordance was made from the source classification to the GTAP sectoral classification. Because of data limitations in the original 2018 Mauritius I-O table, some source sectors were too aggregated to match the GTAP sector breakdown. For these sectors, we contributed our data in aggregated form.

The 58 sectors of the Mauritius I-O table were aggregated to a set of 42 sectors that best correspond to elements of GTAP's standard 65 commodities. The mappings of the 58 and 65 sectors to the 42 sectors are reported in Appendix Table 8.25.

We could not assign the category "dwe" in the GTAP classifications to any of the original I-O table. We allocated its value to the "RealEst" together with real estate services.

After converting the Mauritius I-O table to the format required by GTAP Data Base, we conducted the sectoral balance and non-negativity checks. The new data base passed the sectoral balance check and non-negativity conditions.

Table 8.25: Concordance Table for Mauritius SUT and GTAP Sectors

CPC	Sector no.	Long name	OSEC 58 commodities in original table	OSEC sectors related to GTAP sectors	42 SEC		MPIO Map OSEC to SEC		GSEC 65 GTAP sectors	SMAP Map from GSEC to SEC
1	1	Products of agriculture, horticulture and market gardening	AgriProd	pdr, wht, gro, v_f, osd, pfb, ocr	pdr, wht, gro, v_f, osd, pfb, ocr	AgriProd	AgriProd	1	pdr	AgriProd
1802	2	Sugar cane	SugCane	c_b	c_b	SugCane	SugCane	2	wht	AgriProd
2	3	Live animals and animal products	AnimProd	ctl, oap, rmk	ctl, oap, rmk	AnimProd	AnimProd	3	gro	AgriProd
3	4	Forestry and logging products	Forest	frs	wol, tex, wap	Textiles	Forest	4	v_f	AgriProd
4	5	Fish and other fishing products	FishProd	fsh	frs	Forest	FishProd	5	osd	AgriProd
11	6	Coal and peat	CoalPt	coa	fsh	FishProd	CoalPt	6	c_b	SugCane
12	7	Crude petroleum and natural gas	CrudeP	oil, gas	coa	CoalPt	CrudeP	7	pfb	AgriProd
14	8	Metal ores	OresMin	oxt	oil, gas	CrudeP	Mining	8	ocr	AgriProd
15	9	Stone, sand and clay	StoSanda	oxt	oxt	Mining	Mining	9	ctl	AnimProd
16	10	Other minerals	OthMin	oxt	cmt, omt, vol	FoodProd	Mining	10	oap	AnimProd
21	11	Meat, fish, fruit, vegetables, oils and fats	FoodProd	cmt, omt, vol	mil	DairyPr	FoodProd	11	rmk	AnimProd
22	12	Dairy products	DairyPr	mil	pcr, ofd	OthFood	DairyPr	12	wol	Textiles
23	13	Grain mill products, starches and starch products; other food products	OthFood	pcr, ofd	sgr	Sugar	OthFood	13	frs	Forest
235	14	Sugar	Sugar	sgr	b_t	BeveToba	Sugar	19	cmt	FoodProd
24-25	15	Beverages and tobacco	BeveToba	b_t	lea	OthManuG	BeveToba	20	omt	FoodProd
26-28	16	Yarn and thread, textile articles and wearing apparel	Textiles	wol, tex, wap	lum	WoodProd	Textiles	21	vol	FoodProd
29	17	Leather and leather products; footwear	OthManuG	lea	ppp	PaperProd	OthManuG	22	mil	DairyPr
31	18	Products of wood, cork, straw and plaiting materials	WoodProd	lum	p_c	CokeOven	WoodProd	23	pcr	OthFood
32	19	Pulp, paper and paper products; printed matter and related articles	PaperProd	ppp	chm, bph	Chemical	PaperProd	24	sgr	Sugar

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CPC	Sector no.	Long name	OSEC 58 commodities in original table	OSEC sectors related to GTAP sectors	42 SEC		MPIO Map OSEC to SEC		GSEC 65 GTAP sectors	SMAP Map from GSEC to SEC
33	20	Coke oven products; refined petroleum products; nuclear fuel	CokeOven	p_c	rpp	RubPlast	CokeOven	25	ofd	OthFood
34	21	Basic chemicals	BasiChem	chm, bph	nmm	ONonMeta	Chemical	26	b_t	BeveToba
35	22	Other chemical products; man-made fibres	OthChem	chm, bph	i_s, nfm	BasMetal	Chemical	14	fsh	FishProd
36	23	Rubber and plastics products	RubPlast	rpp	fmp	FabMetPr	RubPlast	15	coa	CoalPt
37	24	Glass and glass products and other non-metallic products n.e.c.	ONonMeta	nmm	ele	ElMedc	ONonMeta	16	oil	CrudeP
38	25	Furniture; other transportable goods n.e.c.	Furniture	omf	eeq	Media	Furniture	17	gas	CrudeP
39	26	Wastes or scraps	Wastes	wtr	ome	OffEquip	WaSewWat	18	oxt	Mining
41	27	Basic metals	BasMetal	i_s, nfm	mvh, otn	TransEqu	BasMetal	27	tex	Textiles
42	28	Fabricated metal products, except machinery and equipment	FabMetPr	fmp	omf	Furniture	FabMetPr	28	wap	Textiles
43	29	General-purpose machinery	GenMach	ome	ely, gdt	ElectSer	OffEquip	29	lea	OthManuG
44	30	Special-purpose machinery	SpeMach	ome	wtr	WaSewWat	OffEquip	30	lum	WoodProd
45	31	Office, accounting and computing machinery	OffiEq	ome	cns	Const	OffEquip	31	ppp	PaperProd
46	32	Electrical machinery and apparatus	ElMachin	ele	trd	Trade	ElMedc	32	p_c	CokeOven
47	33	Radio, television and communication equipment and apparatus	Media	eeq	afs	AccomSer	Media	33	chm	Chemical
48	34	Medical appliances, precision and optical instruments, watches and clocks	Medical	ele	otp, wtp, atp, whs	Transpo	ElMedc	34	bph	Chemical
49	35	Transport equipment	TransEqu	mvh, otn	cmn	PubPostI	TransEqu	35	rpp	RubPlast
53-54	36	Constructions	Const	cns	ofi, ins	Finance	Const	36	nmm	ONonMeta
61-62	37	Distributive trade services	Trade	trd	rsa, dwe	RealEst	Trade	37	i_s	BasMetal

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CPC	Sector no.	Long name	OSEC 58 commodities in original table	OSEC sectors related to GTAP sectors	42 SEC		MPIO Map OSEC to SEC		GSEC 65 GTAP sectors	SMAP Map from GSEC to SEC
63	38	Accomodation, food and beverage services	AccomSer	afs	obs	Services	AccomSer	38	nfm	BasMetal
64	39	Passenger transport services	Transp	otp, wtp, atp, whs	ros	LeisureS	Transpo	39	fmp	FabMetPr
65-67	40	Freight and supporting transport services	FreightS	otp, wtp, atp, whs	osg	Governm	Transpo	40	ele	ElMedc
68	41	Postal and courier services	PostSer	cmn	edu	Ed	PubPostI	41	eeq	Media
691	42	Electricity and gas distribution (on own account)	ElectSer	ely, gdt	hht	HealSoc	ElectSer	42	ome	OffEquip
692	43	Water distribution (on own account)	WaterDis	wtr			WaSewWat	43	mvh	TransEqu
71	44	Financial and related services	Finance	ofi, ins			Finance	44	otn	TransEqu
72	45	Real estate services	RealEst	rsa, dwe			RealEst	45	omf	Furniture
73	46	Leasing or rental services without operator	RentalSe	obs			Services	46	ely	ElectSer
81	47	Research and development services	Research	obs			Services	47	gdt	ElectSer
82-83	48	Legal, accounting and other professional, technical and business services	Legal	obs			Services	48	wtr	WaSewWat
84	49	Telecommunications, broadcasting and information supply services	BusSvc	cmn			PubPostI	49	cns	Const
85-87	50	Support and maintenance services	SupMaint	obs			Services	50	trd	Trade
89	51	Publishing, printing and reproduction services	PubInfor	cmn			PubPostI	51	afs	AccomSer
91	52	Pubic administration and other services provided to the commmunity	PublAdmi	osg			Governm	52	otp	Transpo
92	53	Education services	Ed	edu			Ed	53	wtp	Transpo

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CPC	Sector no.	Long name	OSEC 58 commodities in original table	OSEC sectors related to GTAP sectors	42 SEC	MPIO Map OSEC to SEC		GSEC 65 GTAP sectors	SMAP Map from GSEC to SEC
93	54	Human health and social care services	HealSoc	hht		HealSoc	54	atp	Transpo
94	55	Sewage and waste collection, treatment, etc.	Sewage	wtr		WaSewWat	55	whs	Transpo
95	56	Services of membership organisations	MembOrg	osg		Governm	56	cmn	PubPostI
96	57	Recreational, cultural and sporting services	Leisure	ros		LeisureS	57	ofi	Finance
97-98	58	Other services	OthSvc	ros		LeisureS	58	ins	Finance
							59	rsa	RealEst
							60	obs	Services
							61	ros	LeisureS
							62	osg	Governm
							63	edu	Ed
							64	hht	HealSoc
							65	dwe	RealEst

References

Huff, Karen et al. (2000). *Contributing Input-Output Tables to the GTAP Data Base*. GTAP Technical Paper 01. Department of Agricultural Economics, Purdue University, West Lafayette, IN: Global Trade Analysis Project (GTAP). URL: https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=304.

M Morocco

María Filipa Seara e Pereira

M.1 Introduction

This document outlines the preparation of Morocco's 2019 input-output (I-O) table for integration into the Global Trade Analysis Project (GTAP) Data Base. The paper is structured as follows: Section 2 provides an overview of the source data; Section 3 examines the strengths and limitations of the published I-O data; Section 4 describes the procedures used to address anomalies in the raw data; and Section 5 details the mapping process between the original 76 Moroccan I-O sectors and the GTAP sectors.

M.2 Data Sources

The primary input is a 2019 Moroccan Social Accounting Matrix (SAM) received by the High Commission for Planning (HCP, Haut Commissariat au Plan). It is a 76 commodities product-by-industry matrix measured in millions of Dirham.

The SAM contains commodity (Biens et service) account, with detailed agricultural disaggregation. The factor payments in the operating account (exploitation) section are divided into payments to capital (Excédent Brut d'Exploitation), labor (R.salariés) and other taxes on production minus subsidies (Autr I -sub). Institutional accounts are divided into: non-financial corporations (Sociétés non financières), financial corporations (Sociétés financières), government (Administrations publiques), households (Ménages), and non-profit institutions (Institutions sans but lucratif au service des ménages), including primary income allocation (Affactation du revenu primaire), secondary redistribution (Distribution secondaire du revenu) though taxes and social transfers, and use of income (Utilisation du revenu) which reflects final consumption and savings, and a capital account. The SAM includes an aggregated financial account (Financier) that records financial flows corresponding to capital transactions. The rest of the world is divided by current account and capital. The SAM includes trade and transport margins that reconcile producer prices with purchaser prices.

The SAM satisfies the fundamental accounting identity requiring row sums to equal column sums for each account. However, the initial data still requires treatment to meet GTAP's format and the necessary requirements for internal consistency, a sectoral aggregation compatible with GTAP sectors, explicit disaggregation of domestic and imported commodity flows, and final consistency to satisfy the sectoral balance condition. The raw data includes:

1. The intermediate input matrix (Activities × Commodities or Production × Biens et service) records the use of commodities as intermediate inputs by production activities. The matrix features detailed disaggregation for agricultural products and food processing industries, while more aggregated classifications for mining, other manufacturing sectors, and services.

Each cell represents the quantity of a specific commodity consumed as an input by a given production activity.

2. The supply matrix displays domestic production with activity (production) in rows, and commodities (biens et service) in columns. Production activities are aggregated into 28 sectors spanning primary, secondary, and tertiary industries, with less details than the commodity classification. The non-diagonal structure allows for secondary production, in other words, industries can produce multiple commodities.

3. The value-added block contains three main components showing factor payments by industry: compensation of employees or labor (R.salariés) representing wages and salaries paid by each industry, gross operating surplus or capital (Excédent Brut d'Exploitation) capturing profits, rents, and other capital income by industry and other taxes on production minus subsidies (Autr I -sub) recording net production taxes paid by each industry.

4. The Absorption matrix shows final demand for commodities (biens et service) across different uses. It comprises final consumption expenditure by institutional sectors, including non-financial corporations, financial corporations, government, households, and non-profit institutions, plus gross fixed capital formation (FBCF) representing investment demand by commodity, and exports to the rest of the world (RDM). Each row represents a commodity, and each column represents a final demand category, with cell values indicating the amount of each commodity absorbed by each final use, complementing the intermediate consumption shown in the production matrix to complete total commodity demand in the economy.

5. The SAM includes explicit trade and transport margin accounts represented by the respective commodity rows.

6. The SAM includes explicit tax accounts showing other taxes on production minus subsidies (Autr I -sub) in the value-added block by activity, and direct taxes on income along with social contributions in the secondary income distribution accounting flowing from institutional sectors to government.

M.3 Strengths and Limitations of the Original Input- Output Data

Several checks were conducted on the data, including verification of the non-negativity condition and balancing conditions of the tables. The plausibility of tax rates, margin rates implied by the data, and the structure of industries' costs and sales were also examined. This section highlights the strengths and limitations of the data, while the next section describes the procedures used to address these limitations.

Strengths

1. From the data source section, the original data has detailed supply and use data for 76 commodities and 28 activities. They provide most of the data necessary for GTAP. Specifically:

(a) high disaggregated agricultural commodities; (b) there are separate trade and transport margins on commodities; (c) explicit tax accounts showing other production taxes minus subsidies; (d) the SAM separates institutional accounts by economic agents in allocation of primary income, secondary distribution of income, utilization of income, and capital.

2. The tables are balanced

Limitations

1. There is no separate domestic and import matrixes at basic values.
2. Two sectors exhibited re-exports, where the value of exports exceeded domestic production, which is not allowed in the GTAP database.
3. Forestry, textiles, wearing apparel, and leather sectors were not disaggregated in the original data.
4. Large taxes, over 100%, related to domestic inputs were present in the original data, in sectors such other manufactures, petroleum and coke, and electronics.
5. There are no separate values for capital and land rentals. They are grouped in only one vector of operating surplus.
6. There are large shares of labor in government and education.
7. There are no separate data for tariffs or export taxes.

M.4 Data Processing

In this section we discuss the adjustments procedures, the additional data sources, and the assumptions that we adopted to address the data issues described in the previous section.

1. Using the Annuaire Statistique du Maroc (2018), we obtained the coefficients needed to disaggregate the sector Manufacture of textiles, wearing apparel, leather, and leather products (Fabrication de textiles, d'articles d'habillement, de cuir et d'articles de cuir) into the disaggregated sectors of textiles, wearing apparel, and leather, as requested by GTAP.
2. To distinguish forestry from agriculture, we employed the coefficients derived from the previous Morocco SAM.
3. For commodities identified as having re-exports, we estimated the proportion of exports that represented re-exports and subtracted these values from both total exports and total imports to ensure the SAM remained balanced. Because there was no information on which sectors were responsible for re-exporting each commodity, the adjustment was applied evenly across all users. Additionally, since the original data did not distinguish between the use

of imported and domestically produced commodities, the re-exports were removed before separating imports from domestic goods.

4. To ensure that commodity taxes were distributed appropriately across domestic and imported goods, we calculated domestic and import shares for each product by dividing total domestic supply and total imports by total supply. These shares indicate the relative weight of each source in the market and were then used to split the total commodity tax proportionally between domestic and imported components.

M.5 Converting the Moroccan IO table into GTAP Format

Converting the IO Table From COM x IND to COM x COM

GTAP uses commodity-by-commodity input–output tables. Our original I-O table is commodity-by-industry, so we convert it to the commodity-by-commodity format using the associated transformation procedure described in Horridge et al. 2008.

Putting Margins into Respective Rows for Margin Commodities

There were two margin services, trade and transport, in the initial I-O data. We first constructed a margin matrix to allocate the usage of these margins across commodities. Since the GTAP Data Base does not distinguish between direct and margin usage of these services, the values in the margin matrix were aggregated by summing across all commodities for each margin service. The resulting totals were then recorded as single consolidated rows for each margin commodity in the GTAP input-output table, fulfilling the GTAP requirements.

Mapping Between Moroccan I-O Sectors and GTAP Sectors

The 75 sectors of the Morocco I-O table were aggregated to a set of 41 sectors that best correspond to elements of GTAP's standard 65 commodities. The mappings from 75 to these 41 sectors and with the respective 65 original GTAP sectors are reported in Table 8.26.

Table 8.26: Concordance between Morocco I-O sectors, aggregate sectors and GTAP sectors in the Contributed table

Original Sector	Description	Sectors	Original GTAP sectors
A00001111	Durum wheat	wht	wht
A00001112	Soft wheat	wht	wht
A00001113	Maize	gro	gro
A00001114	Barley	gro	gro
A00001119	Straw, bales and other cereals	gro	gro
A00001120	Legumes	ocr	ocr

Continued ...

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Original Sector	Description	Sectors	Original GTAP sectors
A00001130	Oilseeds	osd	osd
A00001141	Sugar beets	c_b	c_b
A00001149	Other vegetables and melons, roots and tubers	v_f	v_f
A00001150	Sugar cane	c_b	c_b
A00001160	Raw tobacco	ocr	ocr
A00001170	Fodder plants	ocr	ocr
A00001190	Other non-permanent crops	ocr	ocr
A00001211	Grapes	v_f	v_f
A00001212	Dates	v_f	v_f
A00001213	Citrus fruits	v_f	v_f
A00001219	Other fruits	v_f	v_f
A00001220	Olives	v_f	v_f
A00001290	Other permanent crops	ocr	ocr
A00	Agriculture, forestry and fishing	oagrfrs	rmk; wol; frs
A05	Fishing and aquaculture	fsh	fsh
B00	Extractive industries	min	coa; oil; gas; oxt
C10001001	Butcher's meat	cmt	cmt
C10001002	Poultry meat	omt	omt
C10001003	Canned and prepared meat	cmt	cmt
C10002001	Freezing and deep-freezing of fish and fish products	ofd	ofd
C10002002	Preparations and preserves of fish and fish products	ofd	ofd
C10003001	Fruit and vegetable juices	ofd	ofd
C10003002	Preparation and preserves of fruits and vegetables	ofd	ofd
C10004001	Olive oils	vol	vol
C10004002	Crude vegetable oils	vol	vol
C10004003	Refined vegetable oils	vol	vol
C10004009	Others	ofd	ofd
C10005001	Liquid milk	mil	mil
C10005009	Other dairy products	mil	mil
C10006001	Wheat flour, groats and semolina	ofd	ofd
C10006002	Flours, groats and semolina of other cereals	ofd	ofd
C10006003	Rice, hulled	pcr	pcr
C10006009	Other cereal- and vegetable-based products	ofd	ofd
C10007001	Fresh bread, and bakery	ofd	ofd
C10007002	Pasta and couscous	ofd	ofd
C10007003	Rusks and biscuits	ofd	ofd
C10081001	Raw sugar	sgr	sgr
C10081002	Refined sugar	sgr	sgr
C10081003	Molasses; beet pulp, bagasse and other sugar-industry residues	sgr	sgr
C10082001	Coffee	b_t	b_t
C10082002	Tea	b_t	b_t
C10082003	Chocolate and confectionery products	ofd	ofd
C10082004	Animal feed	ofd	ofd
C10082009	Other food products	ofd	ofd
CA0	Manufacture of food products and beverages	omf	omf
CB0	Manufacture of textiles, clothing, leather and leather products	texwaplea	tex; wap; lea
CC0	Manufacture of wood and paper products; printing and reproduction of media	lumppp	lum; ppp

Continued . . .

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Original Sector	Description	Sectors	Original GTAP sectors
CD0	Coke production and manufacture of refined petroleum products	p_c	p_c
CE0	Manufacture of chemical products	chm	chm
CF0	Manufacture of basic pharmaceutical products and pharmaceutical preparations	bph	bph
CG0	Manufacture of rubber and plastic products, and other non-metallic mineral products	rpp	rpp
CH0	Manufacture of basic metal products and fabricated metal products, except machinery and equipment	metalsprd	nmm; i_s; nfm; fmp
CI0	Manufacture of computers, electronic and optical products	ele	ele
CJ0	Manufacture of electrical equipment	eeq	eeq
CK0	Manufacture of machinery and equipment	ome	ome
CL0	Manufacture of transport equipment	otn	otn
CM0	Other manufacturing activities (including furniture), repair and installation	omf	omf
DE0	Distribution of electricity and gas, water distribution, sewerage and waste treatment	elygaswtr	ely; gas; wtr
F00	Construction	cns	cns
G00	Wholesale and retail trade; repair of motor vehicles and motorcycles	trd	trd
H00	Transport and storage	transwar	otp; wtp; atp; whs
I00	Accommodation and food services	afs	afs
J00	Information and communication	cmn	cmn
K00	Financial and insurance activities	ofiins	ofi; ins
L68	Real estate activities	rsa	rsa
MN0	Research and development and business services	obsros	obs; ros
O84	Public administration and compulsory social security	osg	osg
PQ8	Education, human health and social work activities	eduhht	edu; hht
RS0	Other services	oser	ros

M.6 Checking Sectoral Balance and Non-negativity Conditions

Once the Moroccan I-O tables were transformed to meet GTAP Data Base specifications, we ran the sectoral balance and non-negativity tests. The new database met both criteria.

References

Horridge, Mark et al. (2008). *Exercises in Contributing I-O Tables to the GTAP Data Base*. Department of Agricultural Economics, Purdue University, West Lafayette, IN: Global Trade Analysis Project (GTAP). URL: https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=2850.

N Nigeria

Angel Aguiar

N.1 Introduction

This chapter describes the transformation of the 2018 Social Accounting Matrix (SAM) for Nigeria into the GTAP Input-Output Table format. The next section presents the source data. Section 3 describes the reformatting steps. Section 4 describes the concordance between the original classification of sectors and the GTAP sectors.

N.2 Source Data

The Nigerian SAM is part of the Nexus Project between the International Food Policy Research Institute (IFPRI) and national statistical agencies. The initial SAM had 42 sectors measured in billions of Naira.[34]. Vectors taxes are available for direct, factor, and activities.

N.3 Data processing

The Input-Output Table (IOT) derived from this SAM does not fully satisfy the requirements of the GTAP data base described in Huff et al. 2000. Main adjustments to the derived IOT are as follows:

— Split total use into import and domestic matrices and

— Construct the Product-Tax Matrix

The derivation of the IOT from a SAM and further adjustments to meet the GTAP IOT format are implemented using the GAMS programs documented in Aguiar and Pereira n.d.[35]

The matrix of imports is estimated assuming the import share is uniform across users, except for exports as it would imply re-exports. Domestic flows are then obtained as residual given the initial data and the newly estimated matrix of imports.

The product-tax matrix is constructed for the newly developed domestic and import components. No taxes are levied on changes in stocks and lower taxes are levied on export and intermediate users.

[34] Available from Thurlow 2021

[35] Programs and further documentation are available upon request.

N.4 Concordance between original sectors and GSEC3

The original data sectors were first aggregated and then mapped to the GTAP classification of 65 sectors (Table 8.27).

Table 8.27: Concordance between Original sectors and GTAP sectors

No.	Original I-O sectors	GTAP 65
maiz	Maize	gro
rice	Rice	pdr
ocer	Other cereals	gro
puls	Pulses	v_f
oils	Oilseeds	osd
root	Roots	v_f
vege	Vegetables	v_f
sugr	Sugarcane	c_b
toba	Tobacco	ocr
cott	Cotton and fibres	pfb
frui	Fruits and nuts	v_f
coff	Coffee, tea and cocoa	ocr
ocrp	Other crops	ocr
catt	Cattle and raw milk	ctl_rmk
poul	Poultry and eggs	oap
oliv	Other livestock	oap
fore	Forestry	frs
fish	Fisheries	fsh
mine	Mining	GTAP15-18
food	Processed foods	GTAP19-25
beve	Beverage and tobacco	b_t
text	Textiles, clothing and footwear	tex
wood	Wood and paper products	GTAP30-31
chem	Chemicals and petroleum	GTAP32-35
nmet	Non-metal minerals	nmm
metl	Metals and metal products	GTAP37-39
mach	Machinery, equipment and vehicles	ome
oman	Other manufacturing	omf
elec	Electricity, gas and steam	GTAP46-47
watr	Water supply and sewage	wtr
cons	Construction	cns
trad	Wholesale and retail trade	trd
tran	Transportation and storage	GTAP52-55
hotl	Accommodation and food services	afs
comm	Information and communication	cmn
fsrv	Finance and insurance	GTAP57-58
real	Real estate activities	GTAP59-65
bsrv	Business services	obs
padm	Public administration	osg
educ	Education	edu
heal	Health and social work	hht
osrv	Other services	ros

N.5 Diagnostics

Before and after conversion, the data met all balance and sign conditions. There were no tax rates over 100% in the data. The GTAP cost shares comparisons appear correct or at least consistent with the original data.

References

Aguiar, Angel H and Maria Seara e Pereira (n.d.). "Transforming a Social Accounting Matrix (SAM) into GTAP format".

Huff, Karen et al. (2000). *Contributing Input-Output Tables to the GTAP Data Base*. GTAP Technical Paper 01. Department of Agricultural Economics, Purdue University, West Lafayette, IN: Global Trade Analysis Project (GTAP). URL: https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=304.

Thurlow, James (Dec. 2021). "2018 Social Accounting Matrix for Nigeria: A Nexus Project SAM". en. In: DOI: 10.2499/p15738coll2.134812. URL: https://hdl.handle.net/10568/143039 (visited on 11/03/2025).

O Oman

Angel Aguiar and Mohamed Chemingui

O.1 Introduction

This chapter describes the transformation of the 2018 Social Accounting Matrix (SAM) for Oman into the GTAP Input-Output Table format. The next section presents the source data. Section 3 describes the reformatting steps. Section 4 describes the concordance between the original classification of sectors and the GTAP sectors.

O.2 Source Data

The Oman SAM was developed by the National Statistical Office. The initial SAM had 28 sectors measured in millions of Omai Rial. Vectors taxes are available for net per product and net taxes on production are available.

O.3 Data processing

The Input-Output Table (IOT) derived from this SAM does not fully satisfy the requirements of the GTAP data base described in Huff et al. 2000. Main adjustments to the derived IOT are as follows:

— Split total use into import and domestic matrices and

— Construct the Product-Tax Matrix

The derivation of the IOT from a SAM and further adjustments to meet the GTAP IOT format are implemented using the GAMS programs documented in Aguiar and Pereira n.d.[36]

The matrix of imports is estimated assuming the import share is uniform across users, except for exports as it would imply re-exports. Domestic flows are then obtained as residual given the initial data and the newly estimated matrix of imports.

The product-tax matrix is constructed for the newly developed domestic and import components. No taxes are levied on changes in stocks and lower taxes are levied on export and intermediate users.

[36]Programs and further documentation are available upon request.

O.4 Concordance between original sectors and GSEC3

The original data sectors were first aggregated and then mapped to the GTAP classification of 65 sectors (Table 8.28).

Table 8.28: Concordance between Original sectors and GTAP sectors

No.	Original I-O sectors	GTAP 65
Agr	Crop and livestock production hunting and related services activities	GTAP1-13
Fish	Fishing and aquaculture	fsh
Oil_Gas	Extraction of crude oil and natural gas	gtap16-17
Mining	Mining activities and support services	gtap15-18
Bev_Tob	Manufacture of food beverage and tobacco products	gtap19-26
Tex	Manufacture of textiles apparel and leather products	gtap27-29
Wood	Wood and paper making and printing	gtap30-31
cook_Rafpe	Manufacture of coke and refined petroleum products	p_c
Chem	Manufacture of chemicals and pharmaceutical products	gtap33-35
N_Met	Manufacture of other non-metallic mineral products	nmm
Met_prod	Manufacture of base metals and forged metal products	gtap37-39
ele	Manufacture of computers electrical equipment machinery and vehicles	gtap40-42
oth_Met	Other manufacturing activities	gtap43-45
el_wat	Electricity water and sewage supply and waste collection	gtap46-48
cons	construction	cns
trade	Wholesale and retail trade Repair of motor vehicles and motorcycles	trd
trans	transport	gtap52-54
support	Warehousing and support activities for transportation and postal activities	whs
acc	Accommodation and food service activities	afs
com	Information and Communication	cmn
fin	Financial and insurance activities	gtap57-58
real	real estate activities	gtap59-65
public	public administration and defense and compulsory social security	osg
educ	education	edu
health	Activities in the field of human health and social work	hht
oth_ser	Other economic activities	ros

O.5 Diagnostics

Before and after conversion, the data met all balance and sign conditions. There were no tax rates over 100% in the data. The GTAP cost shares comparisons appear correct or at least consistent with the original data.

References

Aguiar, Angel H and Maria Seara e Pereira (n.d.). "Transforming a Social Accounting Matrix (SAM) into GTAP format".

Huff, Karen et al. (2000). *Contributing Input-Output Tables to the GTAP Data Base*. GTAP Technical Paper 01. Department of Agricultural Economics, Purdue University, West Lafayette, IN: Global Trade Analysis Project (GTAP). URL: https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=304.

P Peru

Martín Cicowiez

P.1 Introduction

This chapter describes the transformation of the 2022 Social Accounting Matrix (SAM) for Peru into the GTAP Input-Output Table format. The next section presents the source data. Section 3 describes the reformatting steps. Section 4 describes the concordance between the original classification of sectors and the GTAP sectors.

P.2 Source Data

The original SAM was developed by the Central Bank of Peru. The contributed table consist of 54 sectors measured in millions of Peruvian Soles. The original SAM contains over 300 commodidities and over 150 activities. Various vectors of taxes are available.

P.3 Data processing

The Input-Output Table (IOT) derived from this SAM does not fully satisfy the requirements of the GTAP data base described in Huff et al. 2000. Main adjustments to the derived IOT are as follows:

— Split total use into import and domestic matrices and

— Construct the Product-Tax Matrix

The derivation of the IOT from a SAM and further adjustments to meet the GTAP IOT format are implemented using the GAMS programs available upon request.

The matrix of imports is estimated assuming the import share is uniform across users, except for exports as it would imply re-exports. Domestic flows are then obtained as residual given the initial data and the newly estimated matrix of imports.

The product-tax matrix is constructed for the newly developed domestic and import components. No taxes are levied on changes in stocks and lower taxes are levied on export and intermediate users.

P.4 Concordance between original sectors and GSEC3

The original data sectors were first aggregated and then mapped to the GTAP classification of 65 sectors (Table 8.29).

Table 8.29: Concordance between Original sectors and GTAP sectors

GTAP code	Description	Contributed
pdr	Paddy rice	S1
wht	Wheat	S1
gro	Cereal grains nec	S1
v_f	Vegetables, fruit, nuts	S1
osd	Oil seeds	S1
c_b	Sugar cane, sugar beet	S1
pfb	Plant-based fibers	pfb
ocr	Crops nec	S1
ctl	Bovine cattle, sheep and goats, horses	S3
oap	Animal products nec	S3
rmk	Raw milk	S3
wol	Wool, silk-worm cocoons	S3
frs	Forestry	frs
fsh	Fishing	fsh
coa	Coal	oil
oil	Oil	oil
gas	Gas	gas
oxt	Other Extraction (formerly omn Minerals nec)	oxt
cmt	Bovine meat products	S9
omt	Meat products nec	S9
vol	Vegetable oils and fats	mil
mil	Dairy products	pcr
pcr	Processed rice	sgr
sgr	Sugar	ofd
ofd	Food products nec	vol
b_t	Beverages and tobacco products	b_t
tex	Textiles	tex
wap	Wearing apparel	wap
lea	Leather products	lea
lum	Wood products	lum
ppp	Paper products, publishing	ppp
p_c	Petroleum, coal products	p_c
chm	Chemical products	chm
bph	Basic pharmaceutical products	bph
rpp	Rubber and plastic products	rpp
nmm	Mineral products nec	nmm
i_s	Ferrous metals	i_s
nfm	Metals nec	nfm
fmp	Metal products	fmp
ele	Computer, electronic and optical products	ele
eeq	Electrical equipment	eeq
ome	Machinery and equipment nec	ome
mvh	Motor vehicles and parts	mvh
otn	Transport equipment nec	otn
omf	Manufactures nec	omf
ely	Electricity	ely
gdt	Gas manufacture, distribution	gdt
wtr	Water	wtr
cns	Construction	cns

Continued ...

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GTAP code	Description	Contributed
trd	Trade	trd
afs	Accommodation, Food and service activities	cmn
otp	Transport nec	afs
wtp	Water transport	otp
atp	Air transport	wtp
whs	Warehousing and support activities	atp
cmn	Communication	whs
ofi	Financial services nec	ofi
ins	Insurance (formerly isr)	ins
rsa	Real estate activities	rsa
obs	Business services nec	ros
ros	Recreational and other services	dwe
osg	Public Administration and defense	osg
edu	Education	edu
hht	Human health and social work activities	hht
dwe	Dwellings	obs

P.5 Diagnostics

Before and after conversion, the data met all balance and sign conditions. There were no tax rates over 100% in the data. The GTAP cost shares comparisons appear correct or at least consistent with the original data.

References

Huff, Karen et al. (2000). *Contributing Input-Output Tables to the GTAP Data Base*. GTAP Technical Paper 01. Department of Agricultural Economics, Purdue University, West Lafayette, IN: Global Trade Analysis Project (GTAP). URL: https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=304.

Q São Tomé and Príncipe

Ana Justina Filipe Da Costa Almeida

Q.1 Introduction

This document describes the adaptation of São Tomé and Príncipe's 2019 input-output (IO) table for input into the Global Trade Analysis Project (GTAP). The article is organised as follows: Section 2 briefly describes the source data. Section 3 discusses the strengths and limitations of the published input-output (IO) data. Section 4 discusses processing to correct anomalies in the raw data. Section 5 presents the mapping between São Tomé and Príncipe's 22 IO sectors, 65 GTAP sectors and 25 more aggregated sectors from the submitted table. And section 6 refers to the sectoral balance and non-negativity checks.

Q.2 Source Data

The main source of data is input-output data for 22 sectors published by the Department of National Accounts of São Tomé and Príncipe. The 2019 OI data was measured in million dobras. We converted this to thousand fold by dividing all values by 1000. The 2019 raw input-output data fulfils the sectoral balance condition and contains most of the data ready for conversion to GTAP format. This data includes:

1. tables of resources and utilisations at purchasers' prices for 22 sectors. The Supply table shows the total production of 22 national products, total imports, transport and trade margins and taxes on national and imported goods, by product. The utilisation table shows the demand for these products by industry, households, government, investment, changes in stocks and exports.
2. A matrix of domestic production at basic prices, product by activity. The matrix shows the production of 22 activities by 22 products. This matrix is symmetrical because the basic products are the same as the industries. However, it is not diagonal. Many branches of activity produce more than one product and many products are produced by more than one branch of activity.
3. An absorption matrix at basic prices showing the use of 22 domestically produced products by 22 industries and five end users (private consumption, government consumption, investment, exports and changes in stocks).
4. National production absorption matrix at market prices, product by branch of activity.

In addition, we have the following data from the National Accounts Department:

1. Two matrices for trade and transport margins for domestic and imported products in 2019. Two matrices for taxes on domestic and imported products in 2019.

2. Public administration revenues detailed in the State Financial Operation Table (TOFE) for year 2

Q.3 Strengths and Limitations of the Original Input-Output Data

We carry out a series of checks on the data. These include checks on the non-negativity condition and the balancing conditions of the tables. We also checked the plausibility of the tax rates, the margin rates implicit in the data and the cost and sales structure of the industries. This section discusses the strengths and limitations of the data.

Strengths

1. As can be seen from the previous section, the original data contains detailed data on the supply and use of 22 products and branches of activities that provide most of the necessary data, namely:
   (a) There are separate domestic and import matrices in basic values;
   (b) There are separate trade margins for domestic and imported products; and
   (c) There are separate tax data for domestic and imported goods.
2. The matrices are balanced.

Limitations

1. There is no detailed data on employment by branch of activity, number of salaried and non-salaried workers.
2. There are no separate figures for capital, labour and land rental. These figures were estimated according to value added and only for capital and labour.
3. There is no data on taxes on production.
4. There is no data for export tariffs or taxes, as exported products are tax-free.

Q.4 Data processing

In this section we discuss the adjustment procedures, the sources of additional data and the assumptions we adopted to solve the data problems described in the previous section.

1. With regard to some negative values in the tables: because they were too small, they were replaced with zeros.

Table 8.30: Macro-aggregates of the São Tomé and Príncipe 2019 IO table Componentes do PIB ótica da despesa Componentes do PIB na ótica da produção

	Item	Value	(%)		Item	Value	(%)
1	Consumo privado	9 902 388	108,75	1	Trabalho	3 349 111	37,0
2	Investimento	1 077 608	11,8	2	capitais	5 023 666	55,0
3	Governo	1 221 132	13,4	3	terreno	0	0
4	Stocks	12 825	0,1	4	Imposto e taxas	732 893	8.0
5	Exportações	1 522 428	16,7				
6	Importações	-4 630 710	-50,95				
	PIB	9 105 670 100	100		PIB	9 105 670 100	100

2. We removed all non-zero values from the service stocks in the basic, tax and margin tables.
3. We set the entire export column in the absorption matrix for imports to zero and then deducted the same value from the export column in the absorption matrix for domestically produced goods. This procedure ensures that the trade balance remains unchanged.
4. We adjusted the data on labour remuneration for each sector to take into account the income of the self-employed and unpaid family workers (self-employed labour). In the original IO tables, this unpaid labour income - usually a mixture of capital and labour income - was treated as a form of entrepreneurial income.

Table 8.30 reports some summarised data from our final input-output table.

Q.5 Converting São Tomé and Príncipe's IO table to GTAP format

GTAP favours commodity-by-commodity input-output tables. Our initial IO table is made up of products and sectors of activity. To convert it into an STP product table for GTAP products, we used the technological assumption and the procedure described in Horridge et al. (2008)10.

Placing margins in respective rows for product margin

There were eight margin services in the initial IO data. The data contained separate values for direct use and product margin use. The GTAP database does not distinguish between these uses. Therefore, for each product margin, we added up the total usage (margin and direct) by each user and allocated this usage to the respective product margin line.

Mapping between STP IO sectors and GTAP sectors

The 22 sectors of the STP IO table were aggregated into a set of 25 sectors that best correspond to the elements of the 65 GTAP standard products. The mappings of sectors 22 and 65 to these 25

sectors are reported in Table 8.31.

Table 8.31: Concordance between 22 STP IO sectors, 65 GTAP sectors and 25 sectors in the contributed table

Number	Code	Code	Description	
1	pdr	113	Rice	
2	wht	111	Wheat	
3	gro	112	Maize (corn)	Cereais
		114	Sorghum	
		115	Barley	
		116	Rye	
		117	Oats	
		118	Millets	
		119	Other cereals	
4	v_f	12	Vegetables	Tuberculos
		13	Fruit and nuts	Banana
		15	Edible roots and tubers with high starch or inulin content	
		17	Pulses (dried leguminous vegetables)	
5	osd	14	Oil seeds and oleaginous fruit	producto de oleaginasos
6	c_b	18	Sugar crops	Outras produtos de agricultura
7	pfb	192	Fibre crops	
8	ocr	16	Stimulant, spice and aromatic crops	Cacau e café
		191	Forage products	
		193	Plants and parts of plants used primarily in perfumery, in pharmacy, or for insecticidal, fungicidal or similar purposes	
		194	Beet seeds (excluding sugar beet seeds) and seeds of forage plants	
		195	Natural rubber in primary forms or in plates, sheets or strip	
		196	Living plants; cut flowers and flower buds; flower seeds	
		197	Unmanufactured tobacco	
		199	Other raw vegetable materials nec	
9	ctl	211	Bovine animals, live	Bovinos vivos (cabeça)
		212	Other ruminants	Ovinos e Caprinos vivos
		213	Horses and other equines	
		299	Bovine semen	
10	oap	214	Swine / pigs	Porcos (porcius)
		215	Poultry	Aves
		219	Other live animals	
		23	Eggs of hens or other birds in shell, fresh	Outros produtos de elevage (ovos, leite, Mel.etc..), produto de caça, serviços relaçionados a caça
		24	Reproductive materials of animals	
		291	Natural honey	

Continued . . .

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Number	Code	Code	Description	
		292	Snails, fresh, chilled, frozen, dried, salted or in brine, except sea snails	
		293	Edible products of animal origin n.e.c.	
		295	Hides, skins and furskins, raw	
		296	Insect waxes and spermaceti, whether or not refined or coloured	
11	rmk	22	Raw milk	
12	wol	294	Raw animal materials used in textiles	
13	frs	3	Forestry and logging products	madeira para fabricação
14	fsh	3	Fishing and aquaculture	Produtos da pesca, piscicultura e aquicultura
		17	Hunting, trapping and related service activities	
15	col	5	Mining of coal and lignite	Producto das Insdustrias extrativas
16	oil	61	Extraction of crude petroleum	
		091(part)	Support activities for petroleum and natural gas extraction (part)	
17	gas	62	Extraction of natural gas	
		091(part)	Support activities for petroleum and natural gas extraction (part)	
18	oxt	7	Mining of metal ores	
		8	Other mining and quarrying	Producto das Insdustrias extrativas
		99	Support activities for other mining and quarrying	
19	cmt	21111	Meat of cattle, fresh or chilled	Produto de abate, transformaçao e conservação de carnes
		21112	Meat of buffalo, fresh or chilled	
		21115	Meat of sheep, fresh or chilled	
		21116	Meat of goat, fresh or chilled	
		21117	Meat of camels and camelids, fresh or chilled	
		21118	Meat of horses and other equines, fresh or chilled	
		21119	Other meat of mammals, fresh or chilled	
		2113	Meat of mammals, frozen	
		2115	Edible offal of mammals, fresh, chilled or frozen	
20	omt	21113	Meat of pigs, fresh or chilled	Produto de abate, transformaçao e conservação de carnes
		21114	Meat of rabbits and hares, fresh or chilled	
		2112	Meat of poultry, fresh or chilled	
		2114	Meat of poultry, frozen	
		2116	Edible offal of poultry, fresh, chilled or frozen	
		2117	Other meat and edible offal, fresh, chilled or frozen	

Continued . . .

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Number	Code	Code	Description	
		2118	Preserves and preparations of meat, meat offal or blood	
		2119	Flours, meals and pellets of meat or meat offal, inedible; greaves	
21	vol	215	Animal fats	
		216	Vegetable oils	Outros produtos agroalimentares ne
		217	Margarine and similar preparations	
		218	Cotton linters	
		219	Oil-cake and other residues resulting from the extraction of vegetable fats or oils; flours and meals of oil seeds or oleaginous fruits, except those of mustard; vegetable waxes, except triglycerides; degras; residues resulting from the treatment of fatty substances or animal or vegetable waxes	
22	mil	22	Dairy products	Outros produtos agroalimentares ne
23	pcr	2316	Rice, semi- or wholly milled, or husked	arroz descascado
24	sgr	235	Sugar and molasses	Açúcar
25	ofd	212	Prepared and preserved fish, crustaceans, molluscs and other aquatic invertebrates	Farinha e outros produtos de transformaçao de cereais e de tubérculos
		213	Prepared and preserved vegetables, pulses and potatoes	
		214	Prepared and preserved fruits and nuts	
		2311	Wheat and meslin flour	
		2312	Other cereal flours	
		2313	Groats, meal and pellets of wheat and other cereals	
		2314	Other cereal grain products (including corn flakes)	
		2317	Other vegetable flours and meals	
		2318	Mixes and doughs for the preparation of bakers' wares	
		232	Starches and starch products; sugars and sugar syrups n.e.c.	
		233	Preparations used in animal feeding; lucerne (alfalfa) meal and pellets	
		234	Bakery products	
		236	Cocoa, chocolate and sugar confectionery	
		237	Macaroni, noodles, couscous and similar farinaceous products	
		239	Food products n.e.c.	

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Number	Code	Code	Description	
26	b_t	24	Beverages	bebidas não alcoólicas, agua potável
		25	Tobacco products	
27	tex	13	Manufacture of textiles	Produtos Textil e artigos em têxtil
28	wap	14	Manufacture of wearing apparel	Produtos Textil e artigos em têxtil
29	lea	15	Manufacture of leather and related products	Couro trabalhado, artigos de viagem e sapatos
30	lum	16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	Madeira trabalhada, obras de madeira ou cestaria (exceto móveis)
31	ppp	17	Manufacture of paper and paper products	Artigos de papel, papel ou cartão
		18	Printing and reproduction of record media	
32	p_c	19	Manufacture of coke and refined petroleum products	Produtos petrolíferos refinados e coque
33	chm	20	Manufacture of chemicals and chemical products	Produtos químicos (nao medicamentos)
34	bph	21	Manufacture of pharmaceuticals, medicinal chemical and botanical products	Produtos farmacêuticos e tradicionais
35	rpp	22	Manufacture of rubber and plastics products	
36	nmm	23	Manufacture of other non-metallic mineral products	Cimento, Materiais e obras em cimento, betão ou reboco
37	i_s	241	Manufacture of basic iron and steel	Artigos de metal; serralharia
		2431	Casting of iron and steel	Cimento, Materiais e obras em cimento, betão ou reboco
38	nfm	242	Manufacture of basic precious and other non-ferrous metals	Artigos de metal; serralharia
		2432	Casting of non-ferrous metals	
39	fmp	25	Manufacture of fabricated metal products, except machinery and equipment	
40	ele	26	Manufacture of computer, electronic and optical products	Produtos eletrônicos, computadores, máquinas e equipamentos
41	eeq	27	Manufacture of electrical equipment	
42	ome	28	Manufacture of machinery and equipment n.e.c.	
43	mvh	29	Manufacture of motor vehicles, trailers and semi-trailers	Veículos, automóveis e acessórios
44	otn	30	Manufacture of other transport equipment	
45	omf	31	Manufacture of furniture	
		32	Other manufacturing	Outros productos
		33	Repair and installation of machinery and equipment	

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Number	Code	Code	Description	
46	ely	351	Production, collection and distribution of electricity	eletricidade, Gás distribuído e outros portadores de energia
		353	Steam and hot water supply	
47	gdt	352	Manufacture of gas; distribution of gaseous fuels through mains	eletricidade, Gás distribuído e outros portadores de energia
48	wtr	36	Collection, purification and distribution of water, water collection, treatment and supply	Água captada e distribuída
		37	Sewerage	
		38	Waste collection, treatment and disposal activities; materials recovery	
		39	Remediation activities and other waste management services	
49	cns	41	Construction of buildings	Trabalho de construçao de Edificios, instalação e acabamentos (finission) e aluguer (location) de equipamento
		42	Civil engineering	
		43	Specialized construction activities	
50	trd	45	Wholesale and retail trade and repair of motor vehicles and motorcycles	Comércio de veículos automóveis e motociclos, peças sobressalentes e acessórios automóveis
		46	Wholesale trade, except of motor vehicles and motorcycles	
		47	Retail trade, except of motor vehicles and motorcycles	
51	afs	55	Accommodation	serviços de hospedagem
		56	Food and beverage service activities	Serviços de restaurantes, catering e locais para beber
52	otp	49	Land transport and transport via pipelines	Serviços de transporte rodoviário de passageiros
53	wtp	50	Water transport	Serviços de transporte maritimo de passageiros
54	atp	51	Air transport	Serviços de transporte aéreo de passageiros
55	whs	52	Warehousing and support activities for transportation	Armazenagem e outros serviços auxiliares de transporte
56	cmn	53	Postal and courier activities	Serviço de correio e correio
		58	Publishing activities	
		59	Motion picture, video and television programme production, sound recording and music publishing activities	
		60	Programming and broadcasting activities	
		61	Telecommunications	
		62	Computer programming, consultancy and related activities	
		63	Information service activities	

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Number	Code	Code	Description	
57	ofi	64	Financial service activities, except insurance and pension funding	Serviços bancários centrais
		66(part)	Activities auxiliary to financial service and insurance activities (part)	
58	ins	65	Insurance, reinsurance and pension funding, except compulsory social security	serviços de seguros e Auxiliares financeiros
		66(part)	Activities auxiliary to financial service and insurance activities (part)	
59	rsa	68	Real estate activities	Aluguel de imóveis e serviços de agência imobiliária
60	obs	M, N	Professional, scientific and technical activities and Administrative and support service activities	Serviços de pesquisa e desenvolvimento e exploração mineral
61	ros	R, S, T	Arts, entertainment and recreation; Other service activities; Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	serviços artísticos, desportivos e recreativos
62	osg	84	Public administration and defence; compulsory social security	serviços da administração pública
		99	Activities of extraterritorial organizations and bodies	correção territorial
63	edu	85	Education	serviço de educação
64	hht	Q	Human health and social work activities	Serviços de saúde humana
65	dwe	n.a.	n.a.	esperando produto

Q.6 Verification of sectoral balance and non-negativity conditions

After converting the STP IO tables into the format required by the GTAP database, we carried out the sectoral balance and non-negativity checks. The new database passed the sectoral balance check and the non-negativity conditions.

R Saudi Arabia

Muhammad Aamir Khan[37], Sultan Altowaim, Abdulaziz Alhamed, Badri G Narayanan

R.1 Introduction

This document describes the adaptation of the 2021 Saudi input-output (I-O) table for input to the Global Trade Analysis Project (GTAP). The short paper is organised as follows. Section 2 briefly describes the source data. Section 3 discusses strengths and limitations of the published input-output (I-O) data. Section 4 discusses the processing to correct anomalies in the raw data. Section 5 presents the mapping between the 85 Saudi I-O sectors, 65 GTAP sectors, and the more aggregated 44 sectors of the submitted KSA IO table.

R.2 Data Sources

The main source of this data is the recently released 85 sector input output table published by Saudi General Statistics (GSTAT) . The 2021 I-O data is measured in thousands of Saudi Riyals. The input-output data satisfy the sectoral balance condition, and contain most of the data ready for conversion to the GTAP format. These data include :

— Intermediate Demand Matrix

— Final Demand Matrix

— Value Added Matrix

— Production Matrix

— Supply and Use Tables

The Supply table shows the total outputs of 85 domestic products, total imports, transport and trade margins, and taxes on domestic and imported goods, by commodity. The Use table shows the demand for those commodities by industries, private households, government, investment, changes in inventories, and exports.

1. A MAKE matrix of domestic production at basic prices, commodity by commodity. The matrix shows the output of 85 activities by 85 commodities. This matrix is symmetric, because commodities are the same as industries.

[37] Saudi General Authority of Foreign Trade.

2. An Absorption matrix at basic prices showing the use of 85 domestically-produced commodities by 85 industries and by five final users (private consumption, government consumption, investment, exports, and changes in stocks). The matrix also contains the values of compensation of employees, consumption of fixed capital formation, other taxes on production, subsidies and operating surplus, by industry.

R.3 Strengths and Limitations of the Original Input-Output Data

We have conducted a number of checks on the data. They include checks of the non-negativity condition and the balancing conditions of the tables. We also check the plausibility of tax rates, margin rates implied in the data, and the structure of industries' costs and sales. This section discusses the strengths and limitations of the data. The procedures that we used to address these limitations are discussed in the next section.

Strengths

1. The biggest strength is the more detailed information about Supply and Use Table for 85 Activities. They provide most of the data needed for GTAP IO.
2. The supply table shows the total outputs of 85 domestic products, total imports, transport and trade margins, and taxes on domestic and imported goods, by commodity.The Use Table shows the demand for those commodities by industries, private households, government, investment, changes in inventories and exports.
3. They have a separate Production and Commodity Tax data. There are separate domestic and import matrices at basic values; (b) There are separate trade and transport margins on domestic and imported commodities; and (c) There are separate tax data for domestic and imported commodities.
4. The tables are balanced.

Limitations

1. There are no separate values for capital and land rentals. They are grouped in only one vector of operating surplus.
2. There are no separate data for tariffs or export taxes.

R.4 Data Processing

The original IOT was a symmetric matrix of 85 products, and 6 final demand accounts: households, Government, non-profit organizations, Fixed capital formation, changes in inventories (stocks) and

Table 8.32: Mapping to GTAP final demands and value added

Original Final Demand Account	Assigned GTAP Account
Households Final Consumption Expenditures	Consumption
Government Final Consumption Expenditures	Government
Non-Profit Institutions	Government
Fixed Capital Formation	Investment
Changes in inventories	Stocks
Exports	Exports
Compensation of employees	Labor
Gross Operating Surplus	Capital
Imports	Imports

exports. On the input side the table provides: compensation of employees, Gross operating surplus. These were mapped to GTAP demand and value-added accounts as follows:

R.5 Mapping Between Saudi I-O Sectors and GTAP Sectors

The 85 sectors of the Saudi I-O table were aggregated to a set of 44 sectors that best correspond to elements of GTAP's standard 65 commodities. The mappings from 85 and 44 sectors are reported in Table 8.33.

Table 8.33: Mapping from Original Sectors (85) to 44 Aggregated Sectors

No.	Original sectors - 85	Aggregated IO Sectors - 44
1	Crop and animal production, hunting and related service activities	CropAniPro
2	Forestry and logging	Forestry
3	Fishing and aquaculture	FishingAqua
4	Mining of coal and lignite	Coal
5	Extraction of crude petroleum and natural gas	Crude
6	Mining of metal ores	MiningQua
7	Other mining and quarrying activities	MiningQua
8	Mining support service activities	MiningQua
9	Manufacture of food products	FoodProd
10	Manufacture of beverages	BevTobacco
11	Manufacture of tobacco products	BevTobacco
12	Manufacture of textiles	Textiles
13	Manufacture of wearing apparel	Wap
14	Manufacture of leather and related products	Leather
15	Manufacture of woods, wood products and cork, except furniture	WoodProd
16	Manufacture of paper and paper products	PaperProd
17	Printing and reproduction of recorded media	PaperProd
18	Manufacture of coke and refined petroleum products	CokePetrolem
19	Manufacture of chemicals and chemical products	Chemical
20	Manufacture of basic pharmaceutical products and pharmaceutical preparations	Pharma

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No.	Original sectors - 85	Aggregated IO Sectors - 44
21	Manufacture of rubber and plastics products	RubberPlasti
22	Manufacture of other non-metallic mineral products	Non_MethMine
23	Manufacture of basic metals	BasicMetals
24	Manufacture of fabricated metal products, except machinery and equipment	FabricatedMe
25	Manufacture of computer, electronic and optical products	CompuElect
26	Manufacture of electrical equipment	ElecEquipmen
27	Manufacture of machinery and equipment n.e.c.	MachineryEqu
28	Manufacture of motor vehicles, trailers and semi-trailers	MotorVehicle
29	Manufacture of other transport equipment	TransportEqu
30	Manufacture of furniture	OthManuFurn
31	Other manufacturing	OthManuFurn
32	Repair and installation of machinery and equipment	MachineryEqu
33	Electricity, gas, steam and air conditioning supply	ElecGasSteam
34	Water collection, treatment and supply	Water
35	Sewerage	Water
36	Waste collection, treatment and disposal activities; materials recovery	Water
37	Remediation activities and other waste management services	Water
38	Construction of buildings	Construction
39	Civil engineering	Construction
40	Specialized construction activities	Construction
41	Wholesale and retail trade and repair of motor vehicles and motorcycles	Trade
42	Wholesale trade, except of motor vehicles and motorcycles	Trade
43	Retail trade, except of motor vehicles and motorcycles	Trade
44	Land transport and transport via pipelines	LanDTranspor
45	Water transport	WaterTrans
46	Air transport	AirTransport
47	Warehousing and support activities for transportation	WareHousng
48	Postal and courier activities	Communicatio
49	Accommodation	Accomodation
50	Food and beverage service activities	Accomodation
51	Publishing activities	Communicatio
52	Motion picture, video and television programme production, sound recording and music publishing activities	Communicatio
53	Programming and broadcasting activities	Communicatio
54	Telecommunications	Communicatio
55	Computer programming, consultancy and related activities	Communicatio
56	Information service activities	Communicatio
57	Financial service activities, except insurance and pension funding	FinanServ
58	Insurance, reinsurance and pension funding, except compulsory social security	Insurance
59	Activities auxiliary to financial service and insurance activities	FinanServ
60	Real estate activities	RSA_DWE
61	Legal and accounting activities	OthBusServ
62	Activities of head offices; management consultancy activities	OthBusServ
63	Architectural and engineering activities; technical testing and analysis	OthBusServ
64	Scientific research and development	OthBusServ
65	Advertising and market research	OthBusServ
66	Other professional, scientific and technical activities	OthBusServ
67	Veterinary activities	OthBusServ
68	Rental and leasing activities	OthBusServ
69	Employment activities	RecreatAct

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No.	Original sectors - 85	Aggregated IO Sectors - 44
70	Travel agency, tour operator, reservation service and related activities	RecreatAct
71	Security and investigation activities	OthBusServ
72	Services to buildings and landscape activities	Construction
73	Office administrative, office support and other business support activities	OthBusServ
74	Public administration and defence; compulsory social security	PubAdmin
75	Education	Education
76	Human health activities	HumanHealth
77	Residential care activities	RecreatAct
78	Social work activities without accommodation	HumanHealth
79	Creative, arts and entertainment activities	RecreatAct
80	Libraries, archives, museums and other cultural activities	RecreatAct
81	Sports activities and amusement and recreation activities	RecreatAct
82	Activities of membership organizations	OthBusServ
83	Repair of computers and personal and household goods	RecreatAct
84	Other personal service activities	RecreatAct
85	Activities of households as employers of domestic personnel	RecreatAct

R.6 Converting the IO Table into GTAP format

As discussed above, the original IO has 85 sectors which are mapped to Aggregated/contributed IO 44 sectors that best correspond to elements of GTAP's original 65 commodities. These 44 contributed sectors are then mapped to 65 corresponding GTAP commodities. The mappings are as reported in the table below.

Table 8.34: Concordance between 65 GTAP Sectors to Contributed IO 44 table

No.	GTAP 65 Sectors - Code	GTAP 65 Sectors - Short Names	Contributed IO Sectors - 44
1	pdr	PaddyRice	CropAniPro
2	wht	Wheat	CropAniPro
3	gro	CerGrains	CropAniPro
4	v_f	VegFruit	CropAniPro
5	osd	OilSeeds	CropAniPro
6	c_b	SugarCane	CropAniPro
7	pfb	Plantfibers	CropAniPro
8	ocr	CropsNec	CropAniPro
9	ctl	Cattle	CropAniPro
10	oap	animalProd	CropAniPro
11	rmk	RawMilk	CropAniPro
12	wol	Wool	CropAniPro
13	frs	forestry	Forestry
14	fsh	Fishing	FishingAqua
15	coa	Coal	Coal
16	oil	Oil	Crude
17	gas	Gas	ElecGasSteam
18	oxt	Minerals	MiningQua
19	cmt	Bovine	FoodProd
20	omt	Meat	FoodProd
21	vol	VegOil	FoodProd
22	mil	Milk	FoodProd

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No.	GTAP 65 Sectors - Code	GTAP 65 Sectors - Short Names	Contributed IO Sectors - 44
23	pcr	ProcRice	FoodProd
24	sgr	Sugar	FoodProd
25	ofd	FoodProd	FoodProd
26	b_t	BevTobaco	BevTobacco
27	Tex	Textiles	Textiles
28	Wap	Wap	Wap
29	Lea	leather	Leather
30	Lum	WoodProd	WoodProd
31	ppp	PaperProd	PaperProd
32	p_c	Petroleum	CokePetrolem
33	chm	Chemical	Chemical
34	bph	Pharma	Pharma
35	rpp	RubberPlasti	RubberPlasti
36	nmm	MineralsPRod	Non_MethMine
37	i_s	FerMetal	BasicMetals
38	nfm	Metals	FabricatedMe
39	fmp	MetalsProd	FabricatedMe
40	ele	ComputerElec	CompuElect
41	eeq	Electrical	ElecEquipmen
42	ome	MachineryEqu	MachineryEqu
43	mvh	MotorVehicle	MotorVehicle
44	otn	TransportEqu	TransportEqu
45	omf	Manufactres	OthManuFurn
46	ely	Electricity	ElecGasSteam
47	gdt	GasDistribut	ElecGasSteam
48	wtr	Water	Water
49	cns	Construction	Construction
50	trd	Trade	Trade
51	afs	Accomodatio	Accomodation
52	otp	RoaTransport	LanDTranspor
53	wtp	WaterTranspo	WaterTrans
54	atp	AirTransport	AirTransport
55	whs	Warehousng	WareHousng
56	cmn	Communicat	Communicatio
57	ofi	Financial	FinanServ
58	ins	Insurance	Insurance
59	rsa	RealEstate	RSA_DWE
60	obs	BusinessServ	OthBusServ
61	ros	Recreational	RecreatAct
62	osg	Public	PubAdmin
63	edu	Education	Education
64	hht	HumanHealth	HumanHealth
65	dwe	Dewllings	OthBusServ

R.7 Checking Sectoral Balance and Non-negativity Conditions

After converting the I-O table of Saudi Arabia to the format required by the GTAP database, the table passes the balance and sign conditions.

S United Arab Emirates

María Filipa Seara e Pereira

S.1 Introduction

This document describes the adaptation of the 2014 United Arab Emirates (UAE) Social Accounting Matrix (SAM) table for input to the Global Trade Analysis Project (GTAP). The paper is organized as follows. Section 2 briefly describes the source data. Section 3 discusses strengths and limitations of the published Social Accounting Matrix (SAM) data. Section 4 discusses the processing to correct anomalies in the raw data. Section 5 presents the mapping between the 28 UAE I-O sectors and the respective GTAP sectors that were submitted.

S.2 Data Sources

The primary raw input was 28-sector SAM data sourced by the Economic and Social Commission for Western Asia (ESCWA) and the Ministry of Economy in UAE. The 2014 SAM data was measured in millions United Arab Emirates Dirham (AED). Prima facie, the 2014 original SAM data satisfy the sectoral balance condition and contains most of the data ready for conversion to the GTAP format. These data include:

1. The SAM for UAE is a square matrix valued at basic prices containing: 28 activities, 28 commodities, 2 factors of production (labor and capital), government and enterprise accounts, final demand components including household consumption, government consumption, savings-investment, capital stock, and exports (rest of the world), and tax, subsidy, and margin accounts including indirect taxes, import taxes, direct taxes, subsidies on products, and trade and transport margins.

2. The UAE SAM is organized in a supply-use framework where the 28 activities can purchase from the 28 commodities as intermediate inputs (use matrix: commodity rows x activity columns) and produce commodity output (supply/make matrix: activity rows x commodity columns). Activities generate value-added by employing labor and capital. Commodities then flow to final uses, such as household consumption, government consumption, savings-investment, inventory changes and exports. The rest of world account captures both imports (commodity supply from abroad) and exports (commodity demand from abroad). In the SAM, government accounts record tax revenues, subsidies, and expenditures on commodity consumption, while enterprise accounts capture payments to labor and capital as part of value-added generation.

3. The initial UAE SAM satisfies fundamental accounting identities where each row total equals its corresponding column total. For commodities, total supply (domestic production plus imports, adjusted for taxes, subsidies, and margins) equals total demand (intermediate use plus final demand). For activities, total output equals total costs (intermediate input plus

value-added plus net production taxes). For factors and institutions, total income equals total expenditure.

S.3 Strengths and Limitations of the Original Input- Output Data

We have conducted several checks on the data. They include checks of the non-negativity condition and the balance conditions of the tables. We also check the plausibility of tax rates, and margin rates implied in the data, and the structure of industries' costs and sales. This section discusses the strengths and limitations of the data. The procedures that we used to address these limitations are discussed in the next section.

Strengths

1. In the previous section we saw that the original data contains detailed supply and use data for 28 commodities and activities. Specifically: (a) detailed tax structure: the SAM distinguishes between multiple tax instruments with separated tax data for domestic and imported commodities; (b) explicit margin reconciliation with trade and transport margins as a separate account; (c) no large tax rates over 100%.
2. The tables are balanced.

Limitations

1. The original SAM, developed with the UAE's Ministry of Economy based on official Supply-Use table, includes only one sector related to agriculture called: agriculture, forestry, and fishing. The sector has been disaggregated into the three sub-sectors required by GTAP: forestry, fishing, and agriculture. The estimation of the new technological coefficients has been based on available micro data but not official data. Therefore, the disaggregation of the agricultural sector is not based on formal data.
2. The UAE data is highly aggregated into 28 sectors, requiring further disaggregation afterward.
3. There are non-zero flows for changes in inventories of services, and there are margins and taxes on the service sector, other services activities. Generally, these flows should be zeros, because services cannot be stored.
4. The SAM does not distinguish between capital and land rentals. There is a single operating surplus vector.
5. Although dwellings should primarily use capital and labor to produce housing services consumed by households, this SAM shows an inconsistent aggregate structure: 37% of inputs come from capital, 25% from labor, while only 32% of the output is sold to households. However, the data for dwellings is entirely sourced from the official input-output table.

S.4 Data Processing

In this section we discuss the adjustments procedures, the additional data sources, and the assumptions that we adopt to address the data issues described in the previous section.

1. We start by verifying the initial data. A balance check was performed to confirm that total sales equaled total costs. A sign check was then conducted to ensure that all intermediate and value-added inputs to production were non-negative, and that all final demand components (except changes in stocks, but including imports) were also non-negative. Additionally, we confirmed that there were no entries for value-added, production taxes, or domestic commodity taxes in the final demand or import categories. Finally, we verified that the final demand categories were ordered in the following order: Investment, Consumption, Government, Changes in Stocks, and Exports, and that the value-added categories were ordered as: Labor, Capital, and Land (which in our case is an empty vector).

2. Since the initial data does not distinguish between the use of domestic products and imports, but this separation is required by GTAP, we had to create separate matrices for the use of domestic products and imports. To express the import matrix at producers' prices, consistent with the domestic product matrix, we calculated import values at producers' prices as the sum of the CIF value, import duties, and commodity taxes. These vectors were combined to obtain total imports at producers' prices by commodity. We then allocated these import values across users under the assumption that imports are zero for exports and that the import share is uniform across all other domestic users. The import share was calculated as import matrix was derived by multiplying the domestic use matrix by the import share.

3. The next step was to separate taxes from the total commodity flows. Since commodity flows are measured at producers' (tax-inclusive) prices, we decomposed them into basic values and tax components. Normally two taxes matrices are required: one for domestic products and one for imports, each indexed by commodity and user. However, since the initial data only provided tax information as vectors, we assumed that the tax-to-value ratio at producers' prices was uniform across the missing index. This ratio was calculated for each commodity and source (domestic production or import). To be able to have uniform or non-uniform tax rates across different uses we follow the same approach as with imports.

4. The final step was to convert the data from the previous stages into the GTAP-compatible format. This step involved only reformatting of the data, with no additional assumptions.

S.5 Converting the UAE IO table into GTAP Format

IO Table COM x COM

GTAP requires input-output tables in a commodity-by-commodity format. Since our initial I-O table is already structured in this way, no further conversion was necessary for this component.

Mapping Between UAE I-O Sectors and GTAP Sectors

The 28 sectors of the UAE input-output table were aligned with 28 corresponding GTAP sectors, with certain sectors combined by aggregating multiple original GTAP sectors where necessary.

S.6 Checking Sectoral Balance and Non-negativity Conditions

After converting the UAE input-output tables into the format required by the GTAP Data Base, we carried out sectoral balance and non-negativity checks. The revised database successfully passed both the sectoral balance verification and the non-negativity criteria.

Table 8.35: Concordance between 28 UAE I-O sectors, GTAP aggregated 28 sectors and the original GTAP sectors in the Contributed table

28 Sectors - Initial table	28 GTAP sectors	Original GTAP sectors
AGR	agr	pdr; wht; gro; v_f; osd; c_b; pfb; ocr; ctl; oap; rmk; wol
FOR	frs	frs
FISH	fsh	fsh
MIFE	extr	coa; oil; gas; oxt
FOOD	food	cmt; omt; vol; mil; pcr; sgr; ofd; b_t
PETR	tex	tex
CHEM	wap	wap
META	lea	lea
MACH	omach	lum; ppp
TEXT	p_c	p_c
APPA	chem	chm; bph; rpp
LEAT	metals	nmm; i_s; nfm; fmp
OTMN	mach	ele; eeq; ome; mvh; otn; omf
ELWA	energ	ely; gdt; wtr
CONS	cons	cns
WRTR	trd	trd
ROTR	otp	otp
WATR	wtp	wtp
AITR	atp	atp
STOR	whs	whs
ACCO	afs	afs
PUBL	ros	ros
COMM	cmn	cmn
FINA	fina	ofi; ins
ADMI	osg	osg
EDUC	edu	edu
HEAL	hht	hht
OTSE	serv	dwe

T United Kingdome of Great Britain and Northern Ireland

Robert Leck

T.1 Introduction

The UK input-output (I-O) table in the GTAP 12 Data Base was constructed from key input output tables supplied by the Office for National Statistics (ONS). The data provided covers the calendar year 2019, with comparison to the previous I-O tables released in 2018. The data were cleaned and transformed to meet GTAP's requirements. Finally, the data tables were reclassified to provide the matrices required by GTAP. This paper describes the construction of the British input-output table for the GTAP 12 Data Base. The provision of the data for the UK was undertaken as part of the Department for Business and Trade's commitment as a member of the GTAP consortium.

In line with GTAP requirements, as outlined in Huff et al. 2000, the data for the UK were provided in four matrices:

— the supply and use of the 65 GTAP products and three primary factors of production (land, labour and capital) without product taxes (GTAP matrix UF);

— the supply and use of the 65 GTAP products and three primary factors with product taxes (GTAP matrix UP);

— output of the 65 GTAP products (GTAP vector OP); and

— imports of the 65 GTAP products (GTAP vector MF).

Data definitions and classifications of I-O information available to undertake the update do not match precisely with the requirements of GTAP; therefore, a 'building block' approach has been adopted. Under this approach, available information was first adjusted or reclassified according to GTAP requirements. When this processing was complete, the individual building blocks so derived were assembled according to the structure of the GTAP Data Base as defined by the tables UF, UP, OP and MF.

Section 1. describes the key data sources used, while section 2. outlines the processing of source data into a form corresponding to GTAP requirements. Section 3. describes how these data were brought together into the GTAP format. Section 4. notes key conceptual differences and sensitivities between this latest version and the UK I-O table in the GTAP 11 Data Base. Finally, section 5 notes key diagnostics tests applied to the data base before its distribution.

T.2 Source Data

The primary data source used to construct the UK I-O table for GTAP were versions of the 2019 I-O tables made publicly available by the UK Office for National Statistics for the calendar year of

2019.[38] The ONS tables contain detailed data on the supply and use of 105 products in the UK and the associated product tax payments (see appendix table 11.B.1 for a list of tables of supply, use and derived tables provided in electronic format for the 105- sector UK I-O product classification).

Two versions of the ONS I-O Table were compared, one from 2018 and one from 2019. They differed only in the year to which they referred as changes to collection methods were applied retrospectively by the ONS. Since the last data submission in 2013, the ONS has updated the Blue Book that governs the way UK National Accounts are compiled. Several changes have been made, including improved estimation of the value of pension contributions and tax treatment of other insurance products.[39] Improvements have also been made to data collection for data relating to travel statistics and trade. Taxes on labour and capital are not explicitly included in the data but analysis of aggregate level ONS releases suggests that tax rates have remained fairly stable in the period since the last data submission.[40]

Strengths

— ONS data are in general regarded as highly reliable and comprehensive.

— Product by product data were available and were balanced with no negative values for intermediates.

— Commodity and production taxes were separated.

— Separate import and domestic use matrices were available at basic prices.

— Mixed income data are available by sector so it can be apportioned into labour and capital income

Weaknesses

— Taxes on labour and capital are not included in the data.

— Detailed tariff data or information on taxes on imported products are not collected.

— A small number of services experience changes in inventories.

— There are no separate values for capital and land rentals. They are grouped in only one vector of operating surplus and mixed income.

[38]The ONS defines margin activities to be the difference between the price received by producers (basic prices) and the price paid by the purchaser of a good or service (producers' prices). Margin activities fall into two broad groups — mark-ups and taxes. Mark-ups primarily increase the value of goods without otherwise transforming them and include wholesale and retail trade margins and transport margins. Tax margins are taxes or subsidies levied on products and include sales taxes, VAT, excise taxes, customs duties (tariffs).

[39]For full details, follow the link to the ONS website.

[40]See ONS link to National Accounts.

T.3 Data processing

The ONS data, although similar to the format of the GTAP data requirements, did not fully satisfy all aspects of the GTAP requirements as set out in Huff et al. 2000. The main adjustments applied to the ONS data were:

— reconciliation of basic price and producer price flows

— amalgamating export flows into a single vector rather than separating into EU/non-EU.

— re-classification of the ONS primary factor inputs to GTAP input categories

— aggregation of the ONS investment categories to the single GTAP investment category

— Bifurcation of any ONS sectors that overlap multiple GTAP sectors.[41]

— re-classification of flows classified by ONS industry categories to GTAP categories.[42]

The process for creating the UK I-O tables for the GTAP 12 Data Base is described below.

1. Adjusted 2019 ONS Input-Output Tables – product by product (SNA2008). (105 commodities – 105 products)
2. Split one ONS sector to give the 104x104 product by product table.
3. Check balances.
4. Process taxes from vector form to its own matrix and apply this to the basic price matrix.
5. Convert from ONS-104 to GTAP 65, via a GTAP 49 table.[43]

T.4 Reconciling Basic Price and Producer Price Flows

GTAP requires that data on usage of products be reported at basic prices (matrix UF) and at producers' prices (matrix UP) with the difference between the two matrices being taxes on products. The ONS provided data at basic prices together with a vector of commodity taxes by commodity. Commodity taxes include sales taxes, VAT, and excise duties on products. As the various commodity taxes were aggregated and provided in a vector, the amount of tax to be assigned to each element needed to be estimated. In order to develop the producers' price matrix, an estimate of the proportion of commodity tax to be assigned to each element in the I-O table in basic prices must be added to each element in the basic price table. This imputation of the commodity tax was done

[41] This was necessary with services auxiliary to financial service and insurance services.
[42] Labour income was left unadjusted from ONS data in this submission.
[43] The submission aggregated several GTAP 65 sectors, which GTAP will disaggregate. See tables for more details.

on an ad valorem basis, with every commodity and use assumed to face the same tax rate. This assumption relates only to the spread of imputed taxes within each commodity, acknowledging that it is the final sales of the product that faces the taxes and not the inputs. Hence, an intermediate commodity that makes up X% of the total will be assigned X% of that final commodity's taxes. In this way, the balance of the I-O table was preserved while creating the purchasers' price index.

T.5 Reallocation of one commodity sector

The ONS sector named 'Services auxiliary to financial services and insurance services' overlaps two GTAP 65 sectors: other financial intermediation, and insurance. A simple assumption was made to split this sector out into the other ONS sectors that map one-to-one onto GTAP 65 sectors: each element of 'Services auxiliary...' was allocated into the corresponding element of the financial services or insurance sector according to their respective size. In this way, over 70% of the sector was allocated to the ONS financial services sector, with the remainder being allocated into the ONS insurance sector.

T.6 Reclassification of Primary Factors of Production

The use table supplied by the ABS (ABS I-O table 2) provided data on the inputs of two primary factors of production — Compensation of employees (row P1) and Gross operating surplus & mixed income (row P2) — by each industry. These categories overlap with the three primary input categories — land, labour and capital — specified in the GTAP Data Base. To complete the I-O table for GTAP, these ONS categories were left unaltered but for the addition of returns to land, for which each element was recorded as zero.

T.7 Aggregation of Exports & Changes in Stocks

The ONS provided data on commodity sales to each category of final demand —final consumption expenditure disaggregated to private and government; gross fixed capital formation aggregated; changes in inventories; acquisitions less disposal of valuables, and exports disaggregated into services, exports to the EU, and exports to the rest of the world (table 11.B.3). The categorisation is similar to that applied in GTAP, with the exception that the ONS categories of Export of goods to the EU; Export of goods to the Rest of the World; and Exports of Services provide a more detailed breakdown than required for GTAP. To complete the I-O table for GTAP, these categories were aggregated to form the GTAP final demand category, Exports.

Similarly, the ONS categorisation is more detailed than the requirements of GTAP insofar as the ONS breaks it down into changes in inventories, and acquisitions less disposal of valuables. As buying and selling of valuables simply represents a transfer of value rather than production, it is included in the GTAP sector called changes in stocks, although acquisitions less disposal of valuables is subtracted from changes in inventories.

Table 8.36: Final Demand Concordance

ONS Final Demand Category	Concordant GTAP Sector
Final consumption expenditure (FCE)	None (it's a total).
FCE by government	Government
FCE by households	Consumption
FCE by non-profit organisations serving households (NPISH)	Consumption
Gross fixed capital formation	Investment
Changes in inventories	Changes in stocks
Acquisitions less disposals of valuables	Changes in stocks (negative)
Exports of goods to EU	Exports
Exports of Services	Exports

T.8 Treatment of Other Taxes Less Subsidies on Production

The ONS definition of total sectoral usage other taxes less subsidies on production' whereas the GTAP definition of total usage does not (matrices UF and UP). This causes no issues throughout the process.

T.9 Mapping ONS Products to GTAP Counterparts

The UK I-O tables have 105 sectors (these are listed in appendix table 1) compared to the 65 in the GTAP 12 Data Base. To complete the I-O on a 65-sector basis, a concordance was established between the two classifications (appendix tables 2 & 3) and used to map the I-O data from the 105 ONS sectors to the 65 GTAP sectors. The concordance shows that 94 ONS sectors can be linked directly to one of the GTAP sectors without adjustment. However, it also shows that 10 ONS sectors were linked to more than one GTAP sector. For example, the ONS sector Extraction Of Crude Petroleum And Natural Gas & Mining Of Metal Ores is linked to the GTAP sectors oil, gas, and other mining extraction. Hence, the 105 ONS sectors map to 49 submitted sectors, which can then be disaggregated back to GTAP 65.

T.10 I-O Table Supplied to GTAP

In order to convert our data to conform with the data base structure outlined in Huff et al. 2000, we adopted the fragmented approach to create many arrays. Assembly of the final tables involved converting these arrays by doing the following:

— for the matrix UF, merging the domestic usage of domestic production, imported supplies and primary inputs by sector and category of final demand, evaluated at basic prices into a single array.

— for the matrix UP, aggregating estimated product taxes (net) by sector and category of use with estimates of usage at basic prices (matrix UF) to provide estimates of usage of domestic production and imported supplies at producer prices.

— for the vector OP, transferring estimated output by sector from the building block tables to a single array. The value of output is estimated at producers' prices and, as such, is inclusive of all domestically produced and imported inputs, and product and commodity taxes on those inputs (matrix UP) plus other taxes and subsidies on production not included in matrix UF or UP).

— for the vector MF, transferring the total value of imports by sector (single product industry basis) from the input tables to a single array.

T.11 Comparability with Previous UK I-O Tables

The starting point for the UK I-O table in the GTAP 11 Data Base was the UK submission to GTAP of 2013, based on ONS data from the same year. That data base was benchmarked to ONS input-output tables for that year. The starting point for the UK I-O table in the GTAP 12 Data Base was the publicly released I-O table from the ONS for the reference year 2019. Since 2013, the ONS has enacted minor methodological changes to classifications and data collection in a number of areas including insurance; and labour income, which has decreased mixed income growth. A point of difference between the two latest submissions is that mixed income was aggregated with labour income in the previous submission but apportioned into labour and capital in the latest version. The approach taken applies method five[44] from the ONS' approach to splitting mixed income into labour and capital and applies it to each sector individually. This apportionment therefore follows the existing split of labour and capital within each sector. All the data used for the latest submission were publicly available aside from the mixed income data, which were procured separately.

T.12 Diagnostics

The UK I-O table for the GTAP Data Base was checked to ensure that:

— there were no negative values

— the pre and post-disaggregation value of costs and sales balanced

— total sales equalled total costs in total and by sector

— tax rates were positive and sensible for commodity taxes.

— the values for GDP, GDP(I) and GDP(E) were correct

— the components of GDP(I) and GDP(E) were correct, and

[44]Trends in the UK labour share - Office for National Statistics

— the GTAP entropy input-output cost shares appeared[45] correct when comparing the 2018 I-O table and the table previously submitted and then between the 2018 and 2019 I-O tables.

T.13 Entropy Comparisons

Two comparisons were possible thanks to the three I-O tables available for comparison (the 2013 table previously submitted, and the 2018 and 2019 ONS data processed in this endeavour). The inclusion of the 2018 data was purely for the purposes of quality assurance. When comparing the 2013 table with 2018, there are some significant changes as measured by 'entropy.'[46] There are markedly higher self-usages in GTAP sectors construction, gas distribution, and iron and steel. Motor vehicles also no longer supplied inputs to other transport equipment. Aside from those sectors, most other changes were fairly modest. Factors of production shares differed less than intermediate shares, with the most notable changes being a greater use of capital in forestry, and a greater share of labour in the manufacture of computer and electronic products. Overall, the share of value added in final output generally rose slightly.

In order to check that the process was reproducible, it was necessary to then compare the 2018 data with the final 2019 data to be submitted to GTAP. This exercise resulted in minimal changes to the intermediate shares and similarly small changes to valued-added shares. In fact, the only notable changes were further increases of the capital share in forestry and the labour share in manufacture of computer and electronic products.

References

Huff, Karen et al. (2000). *Contributing Input-Output Tables to the GTAP Data Base*. GTAP Technical Paper 01. Department of Agricultural Economics, Purdue University, West Lafayette, IN: Global Trade Analysis Project (GTAP). URL: https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=304.

Walmsley, Terrie and Robert McDougall (2007). *Using Entropy to Compare IO tables*. GTAP Research Memorandum 09. Department of Agricultural Economics, Purdue University, West Lafayette, IN: Global Trade Analysis Project (GTAP). URL: https://doi.org/10.21642/GTAP.RM09.

[45] Any significant changes to sector shares needed to be traced back to the original I-O table or to other ONS data to confirm that the data had changed rather than being a mapping issue.

[46] Following the procedure in Walmsley and McDougall 2007.

Appendix

Table 8.37: Mapping from UK-CGE commodities to the aggregated GSEC3 commodities in the submitted IO table.

Commodity number	ONS industry code	Industry description	Mapping to sectors of submitted IO table	Component GSEC3 commodities
1.	1	Products of agriculture, hunting and related services	AgricHunting	pdr wht gro v_f osd c_b pfb ocr ctl oap rmk wol
2.	2	Products of forestry, logging and related services	frs	frs
3.	3	Fish and other fishing products; aquaculture products; support services to fishing	Fsh	fsh
4.	5	Coal and lignite	Coa	coa
5.	06&07	Extraction Of Crude Petroleum And Natural Gas & Mining Of Metal Ores	oil_gas_omn	oil gas omn
6.	8	Other mining and quarrying products	oil_gas_omn	omn
7.	9	Mining support services	oil_gas_omn	omn
8.	10.1	Preserved meat and meat products	cmt_omt	cmt omt
9.	10.2-3	Processed and preserved fish, crustaceans, molluscs, fruit and vegetables	Ofd_pcr_sgr	ofd
10.	10.4	Vegetable and animal oils and fats	Vol	vol
11.	10.5	Dairy products	Mil	mil
12.	10.6	Grain mill products, starches and starch products	ofd_pcr_sgr	pcr ofd
13.	10.7	Bakery and farinaceous products	ofd_pcr_sgr	ofd
14.	10.8	Other food products	ofd_pcr_sgr	ofd sgr
15.	10.9	Prepared animal feeds	ofd_pcr_sgr	ofd
16.	11.01-6 and 12	Alcoholic beverages & Tobacco products	b_t	b_t
17.	11.07	Soft drinks	b_t	b_t
18.	13	Textiles	tex	tex
19.	14	Wearing apparel	wap	wap
20.	15	Leather and related products	lea	lea
21.	16	Wood and of products of wood and cork, except furniture; articles of straw and plaiting materials	lum	lum
22.	17	Paper and paper products	ppp	ppp
23.	18	Printing and recording services	ppp	ppp
24.	19	Coke and refined petroleum products	p_c	p_c
25.	20.3	Paints, varnishes and similar coatings, printing ink and mastics	chm	chm
26.	20.4	Soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	chm	chm
27.	20.5	Other chemical products	chm	chm
28.	20A	Industrial gases, inorganics and fertilisers (all inorganic chemicals) - 20.11/13/15	chm	chm
29.	20B	Petrochemicals - 20.14/16/17/60	chm	chm
30.	20C	Dyestuffs, agro-chemicals - 20.12/20	chm	chm

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Commodity number	ONS industry code	Industry description	Mapping to sectors of submitted IO table	Component GSEC3 commodities
31.	21	Basic pharmaceutical products and pharmaceutical preparations	bph	bph
32.	22	Rubber and plastic products	rpp	rpp
33.	23OTHER	Glass, refractory, clay, other porcelain and ceramic, stone and abrasive products - 23.1-4/7-9	nmm	nmm
34.	23.5-6	Cement, lime, plaster and articles of concrete, cement and plaster	nmm	nmm
35.	24.1-3	Basic iron and steel	i_s	i_s
36.	25OTHER	Fabricated metal products, excl. machinery and equipment and weapons & ammunition - 25.1-3/25.5-9	fmp	fmp
37.	24.4-5	Other basic metals and casting	nfm	nfm
38.	25.4	Weapons and ammunition	fmp	fmp
39.	26	Computer, electronic and optical products	ele	ele
40.	27	Electrical equipment	eeq	eeq
41.	28	Machinery and equipment n.e.c.	ome	ome
42.	29	Motor vehicles, trailers and semi-trailers	mvh	mvh
43.	30.1	Ships and boats	otn	otn
44.	30.3	Air and spacecraft and related machinery	otn	otn
45.	30OTHER	Other transport equipment - 30.2/4/9	otn	otn
46.	31	Furniture	omf	omf
47.	32	Other manufactured goods	omf	omf
48.	33.15	Repair and maintenance of ships and boats	omf	omf
49.	33.16	Repair and maintenance of aircraft and spacecraft	omf	omf
50.	33OTHER	Rest of repair; Installation - 33.11-14/17/19/20	omf	omf
51.	35.1	Electricity, transmission and distribution	ely	ely
52.	35.2-3	Gas; distribution of gaseous fuels through mains; steam and air conditioning supply	gdt	gdt
53.	36	Natural water; water treatment and supply services	wtr	wtr
54.	37	Sewerage services; sewage sludge	wtr	wtr
55.	38	Waste collection, treatment and disposal services; materials recovery services	wtr	wtr
56.	39	Remediation services and other waste management services	wtr	wtr
57.	41-43	Construction	cns	cns
58.	45	Wholesale and retail trade and repair services of motor vehicles and motorcycles	trd	trd
59.	46	Wholesale trade services, except of motor vehicles and motorcycles	trd	trd
60.	47	Retail trade services, except of motor vehicles and motorcycles	trd	trd
61.	49.1-2	Rail transport services	otp	otp
62.	49.3-5	Land transport services and transport services via pipelines, excluding rail transport	otp	otp
63.	50	Water transport services	wtp	wtp

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Commodity number	ONS industry code	Industry description	Mapping to sectors of submitted IO table	Component GSEC3 commodities
64.	51	Air transport services	atp	atp
65.	52	Warehousing and support services for transportation	whs	whs
66.	53	Postal and courier services	cmn	cmn
67.	55	Accommodation services	afs	afs
68.	56	Food and beverage serving services	afs	afs
69.	58	Publishing services	cmn	cmn
70.	59-60	Motion Picture, Video & TV Programme Production, Sound Recording & Music Publishing services & Programming And Broadcasting services	cmn	cmn
71.	61	Telecommunications services	cmn	cmn
72.	62	Computer programming, consultancy and related services	cmn	cmn
73.	63	Information services	cmn	cmn
74.	64	Financial services, except insurance and pension funding	ofi	ofi
75.	65	Insurance and reinsurance, except compulsory social security & Pension funding	ins	ins
76.	66	Services auxiliary to financial services and insurance services	Was split between . . .	ofi ins
77.	68.1-2	Real estate services, excluding on a fee or contract basis and imputed rent	rsa	rsa
78.	68.2IMP	Owner-Occupiers' Housing Services	dwe	dwe
79.	68.3	Real estate services on a fee or contract basis	rsa	rsa
80.	69.1	Legal services	obs	obs
81.	69.2	Accounting, bookkeeping and auditing services; tax consulting services	obs	obs
82.	70	Services of head offices; management consulting services	obs	obs
83.	71	Architectural and engineering services; technical testing and analysis services	obs	obs
84.	72	Scientific research and development services	obs	obs
85.	73	Advertising and market research services	obs	obs
86.	74	Other professional, scientific and technical services	obs	obs
87.	75	Veterinary services	obs	obs
88.	77	Rental and leasing services	obs	obs
89.	78	Employment services	obs	obs
90.	79	Travel agency, tour operator and other reservation services and related services	obs	obs
91.	80	Security and investigation services	obs	obs
92.	81	Services to buildings and landscape	obs	obs
93.	82	Office administrative, office support and other business support services	obs	obs
94.	84	Public administration and defence services; compulsory social security services	osg	osg
95.	85	Education services	edu	edu

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Commodity number	ONS industry code	Industry description	Mapping to sectors of submitted IO table	Component GSEC3 commodities
96.	86	Human health services	hht	hht
97.	87-88	Residential Care & Social Work services	hht	hht
98.	90	Creative, arts and entertainment services	ros	ros
99.	91	Libraries, archives, museums and other cultural services	ros	ros
100.	92	Gambling and betting services	ros	ros
101.	93	Sports services and amusement and recreation services	ros	ros
102.	94	Services furnished by membership organisations	ros	ros
103.	95	Repair services of computers and personal and household goods	ros	ros
104.	96	Other personal services	ros	ros
105.	97	Services of households as employers of domestic personnel	ros	ros

Table 8.38: Commodities in the submitted IO table

Commodity number	Aggregated GSEC3	Commodity number	Aggregated GSEC3
1	AgricHunting	26	ome
2	frs	27	mvh
3	fsh	28	otn
4	coa	29	omf
5	oil_gas_oxt	30	ely
6	cmt_omt	31	gdt
7	ofd_pcr_sgr	32	wtr
8	vol	33	cns
9	mil	34	trd
10	b_t	35	otp
11	tex	36	wtp
12	wap	37	atp
13	lea	38	whs
14	lum	39	cmn
15	ppp	40	afs
16	p_c	41	ofi
17	chm	42	isr
18	bph	43	rsa
19	rpp	44	dwe
20	nmm	45	obs
21	i_s	46	osg
22	nfm	47	edu
23	fmp	48	hht
24	ele	49	ros
25	eeq		

Table 8.39: Mapping from GSEC3 commodities to sectors of the submitted IO table

	GSEC3 Code	Description	Aggregated GSEC3
1	pdr	Paddy rice	AgricHunting
2	wht	Wheat	AgricHunting
3	gro	Cereal grains nec	AgricHunting
4	v_f	Vegetables, fruit, nuts	AgricHunting
5	osd	Oil seeds	AgricHunting
6	c_b	Sugar cane, sugar beet	AgricHunting
7	pfb	Plant-based fibers	AgricHunting
8	ocr	Crops nec	AgricHunting
9	ctl	Bovine cattle, sheep and goats, horses	AgricHunting
10	oap	Animal products nec	AgricHunting
11	rmk	Raw milk	AgricHunting
12	wol	Wool, silk-worm cocoons	AgricHunting
13	frs	Forestry	frs
14	fsh	Fishing	fsh
15	coa	Coal	coa
16	oil	Oil	oil_gas_omn
17	gas	Gas	oil_gas_omn
18	omn	Minerals nec	oil_gas_omn
19	cmt	Bovine meat products	cmt_omt
20	omt	Meat products nec	cmt_omt
21	vol	Vegetable oils and fats	vol
22	mil	Dairy products	mil
23	pcr	Processed rice	ofd_pcr_sgr
24	sgr	Sugar	ofd_pcr_sgr
25	ofd	Food products nec	ofd_pcr_sgr
26	b_t	Beverages and tobacco products	b_t
27	tex	Textiles	tex
28	wap	Wearing apparel	wap
29	lea	Leather products	lea
30	lum	Wood products	lum
31	ppp	Paper products, publishing	ppp
32	p_c	Petroleum, coal products	p_c
33	chm	Chemical products	chm
34	bph	Basic pharmaceutical products	bph
35	rpp	Rubber and plastic products	rpp
36	nmm	Mineral products nec	nmm
37	i_s	Ferrous metals	i_s
38	nfm	Metals nec	nfm
39	fmp	Metal products	fmp
40	ele	Computer, electronic and optical products	ele
41	eeq	Electrical equipment	eeq
42	ome	Machinery and equipment nec	ome
43	mvh	Motor vehicles and parts	mvh
44	otn	Transport equipment nec	otn
45	omf	Manufactures nec	omf
46	ely	Electricity	ely
47	gdt	Gas manufacture, distribution	gdt
48	wtr	Water	wtr
49	cns	Construction	cns

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	GSEC3 Code	Description	Aggregated GSEC3
50	trd	Trade	trd
51	afs	Accommodation, Food and service activities	afs
52	otp	Transport nec	otp
53	wtp	Water transport	wtp
54	atp	Air transport	atp
55	whs	Warehousing and support activities	whs
56	cmn	Communication	cmn
57	ofi	Financial services nec	ofi
58	isr	Insurance	isr
59	rsa	Real estate activities	rsa
60	obs	Business services nec	obs
61	ros	Recreational and other services	ros
62	osg	Public Administration and defense	osg
63	edu	Education	edu
64	hht	Human health and social work activities	hht
65	dwe	Dwellings	dwe

Chapter 9

Processing of Input-Output Data

A Agricultural Production Targeting

Maksym Chepeliev, Erwin Corong, Pattawee Puangchi and Thiago Simonato

A.1 Background

In GTAP parlance, agricultural production targeting (APT) is a procedure applied to a country's I-O table before the main data construction phase. Except for its agricultural orientation, it is unrelated to the agricultural I-O data disaggregation. Rather, it arises from concerns that arose with the GTAP 5 Data Base, that in the data for European Union (EU) member countries, there were considerable inaccuracies in levels and international distribution of agricultural production, and, consequently, in the budgetary cost of assistance. This led to problems in the analysis of EU agricultural reform.

The investigation revealed that these inaccuracies largely reflected discrepancies between the representation of agriculture in the contributed I-O tables for EU member countries at the time (Leeuwen 2002) and EUROSTAT production data relied upon by EU stakeholders. These arose partly from differences in reference years (the I-O data being older), but more from basic data differences.

In response, a special version of the GTAP 5 Data Base was prepared for the exclusive use of GTAP Consortium members, in which the agricultural production levels in EU member countries were revised. The revisions were made not within the database construction procedure itself but as adjustments to the I-O tables entering into the procedure. In GTAP 6 Data Base, this targeting was incorporated for the first time into a public data release. Since then, Consortium members interested in agricultural policy analysis have pressed for the extension of the targeting to non-EU countries.

The EU tables processed in the initial application provided full GTAP sectoral detail, and the original implementation of the procedure relied on such provision. We now find ourselves

applying it to regions whose contributed tables require dis-aggregation. Rather than enhance the procedure to remove this limitation, we work around it by performing a partial run of the main GTAP data construction procedure, up to and including I-O table fitting, input the fitted tables into the production targeting procedure. The tables input into the production targeting procedure are therefore fully dis-aggregated, as well as cleaned and fitted. That they are fitted is not strictly necessary, but we hope that it may minimize the deviations from the production targets within the main build, discussed in sections A.2 and A.5 below. The tables output from the targeting procedure are then fed into a complete and final run of the main construction procedure.

A special release of GTAP 10 Data Base further expanded the set of countries that are subject to agricultural production targeting based on data from the Food and Agricultural Organization (Chepeliev 2020). Apart from expansion in country coverage, the FAO agricultural output data also eases the incorporation nutritional accounts in the GTAP Data Base, thereby reducing inconsistencies between GTAP and FAO agricultural accounting (Chepeliev 2022). The GTAP 11 Data Base extended this broader coverage to a standard public release, using data from EUROSTAT for EU countries and from Food and Agriculture Organization (FAO) of the United Nations 2022 for the remaining countries, a framework that GTAP 12 continues to follow.

The GTAP 12 Data Base targets agricultural production data from Food and Agriculture Organization (FAO) of the United Nations 2022 for all primary regions (i.e., those for which we have an IOT). The APT procedure is not applied to the composite regions in the GTAP Data Base. The input data for agricultural output targets for FAO-covered countries follows the procedures developed in Chepeliev 2020. The targeting covers twelve agricultural sectors (Table 9.1).

Table 9.1: Commodities Subject to Agricultural Production Targeting

Code	Description	Code	Description
PDR	Paddy rice	C_B	Sugar cane, sugar beet
WHT	Wheat	OCR	Crops n.e.c.
GRO	Cereal grains n.e.c.	CTL	Bovine cattle, sheep and goats, horses
OSD	Oil seeds	OAP	Animal products n.e.c.
V_F	Vegetables, fruit, nuts	WOL	Wool, silk-worm cocoons
PFB	Plant based fibers	RMK	Raw Milk

Note: n.e.c. stands for not elsewhere classified.

A.2 Overview

The purpose of the procedure is to adjust the I-O tables to match the agricultural production targets. But circumstances complicate the situation. The adjustment is done before the data base construction procedure, but parts of that procedure, especially I-O table fitting (Chapter 17) affect agricultural production levels in the I-O tables. In some cases, the agricultural production targets are incompatible with other data targets, more specifically, with export targets. And since the procedure was originally designed to deal with raw I-O tables that have not undergone the cleaning

procedures described in chapter 8, it contains safeguards against anomalous conditions that could abort processing.

In the data base construction process, there are many steps that affect agricultural production levels in the I-O data, but the main step is the fitting of I-O tables to international data-sets. There are many factors that affect agricultural production levels, but three are dominant: the targeting of GDP, exports, and production taxes. GDP targeting is achieved in effect by re-scaling the whole I-O table, so it affects production levels for all commodities. Changes in exports entail corresponding changes in production levels. Changes in production tax rates imply changes in either input or output values; an increase in the production tax rate, for instance, can be achieved either by increasing the money value of output or by reducing the money values of the intermediate and factor inputs. In practice, it is achieved by a combination of the two, leaning toward output value changes for domestically-oriented sectors and input value changes for export- oriented sectors.

It would be futile to target production levels in the incoming I-O tables if these were then altered drastically by the GDP, export, and production tax targeting. We therefore anticipate these adjustments in the production level targeting: we adjust not the production levels only but GDP, exports, and production taxes also. The tables going into the FIT process should therefore require little adjustment in these variables; we may then hope that the FIT process will have little effect on agricultural production levels.

Even though agricultural production targeting is done outside and before the main data construction procedure, it uses the same macroeconomic and protection data as those used in the final GTAP 12 Data Base construction. Since GTAP 12 Data Base, the trade data used agricultural production targeting and the final data construction is slightly different due to adjustments for fossil fuel exports in the latter procedure.

The attempt to anticipate the FIT export adjustments exposes another problem. In some cases, the export and agricultural production targets are simply incompatible. We encounter both hard inconsistencies, where the export target exceeds the production target, and soft inconsistencies, where the export target is lower than the production target, but still leaves very little domestic product available to the domestic market. Since the trade data are central to the whole data reconciliation process, in these cases, it is the production targets, not the export targets, that must give way. Accordingly, in such cases, we adjust the production targets before applying them to the I-O data.

To operationalize the concept of soft inconsistency, we deem a soft inconsistency to exist if the production target is less than the export target plus one quarter of the initial level of domestic absorption. But it would be meaningless to use the absorption level from the initial table, since that table may have any scale. So before testing for inconsistencies, we scale the I-O tables to match the GDP target. Having identified the inconsistencies, we then adjust the inconsistent production targets to exports plus one quarter of initial domestic absorption. In other words, we permit the production targeting to remove no more than three quarters of initial domestic absorption.

The general outline of operations is therefore:

— Clean the I-O tables.

— Adjust the tables to match the GDP targets.

— Identify inconsistencies between export and production and export targets; adjust the production targets.

— Adjust the tables to match export, output subsidy, and agricultural production targets.

Table 9.2 summarises the inconsistency and adjustment statistics across all seven base years. The columns report the number of hard and soft inconsistencies, the share of country–sector pairs with an adjusted target (*Adj.*), the aggregate percentage change in targets after adjustment (Δ Tgt.), the net percentage change in aggregate production implied by APT relative to GDP-scaled I-O values (*Net Adj.*, positive indicating an upward revision), and the percentage gap between final-database production and the adjusted targets (*Net Dev.*).

Table 9.2: Export-production adjustments: Summary statistics by base year

Year	Hard	Soft	Adj.	Adj. (%)	Δ Tgt. (%)	Net Adj. (%)	Net Dev. (%)
2004	348	184	532	32.6	1.59	14.80	−4.34
2007	356	240	596	36.5	1.94	7.07	−2.97
2011	372	219	591	36.2	2.01	7.46	−2.88
2014	359	257	616	37.7	2.22	−2.67	−2.75
2017	354	273	627	38.4	2.61	−9.52	−0.50
2019	359	278	637	39.0	2.37	−6.93	−1.40
2023	371	287	658	40.3	2.36	−6.89	−1.51

Note: To ensure comparability across base years, statistics are computed over the common set of 136 countries that are targeted in every base year (up to 141 countries are targeted in any given year), yielding 1,632 country-sector pairs per year.

The share of adjusted targets has grown gradually across base years, rising from around 33 percent in 2004 to 40 percent in 2023. This gradual increase is driven primarily by a rising number of soft inconsistencies, from 184 in 2004 to 287 in 2023, while hard inconsistencies have remained broadly stable at 348–372 per year. For the 2019 base year, 637 targets are adjusted in total (359 hard and 278 soft), representing 39 percent of the 1,632 possible country–sector combinations; for 2023, the figures are 658 adjusted targets (371 hard and 287 soft), or 40 percent. In all years, the aggregate target increases by between 1.6 and 2.6 percent after adjustment. Although individual adjustments can be severe, overall the targets are well maintained.

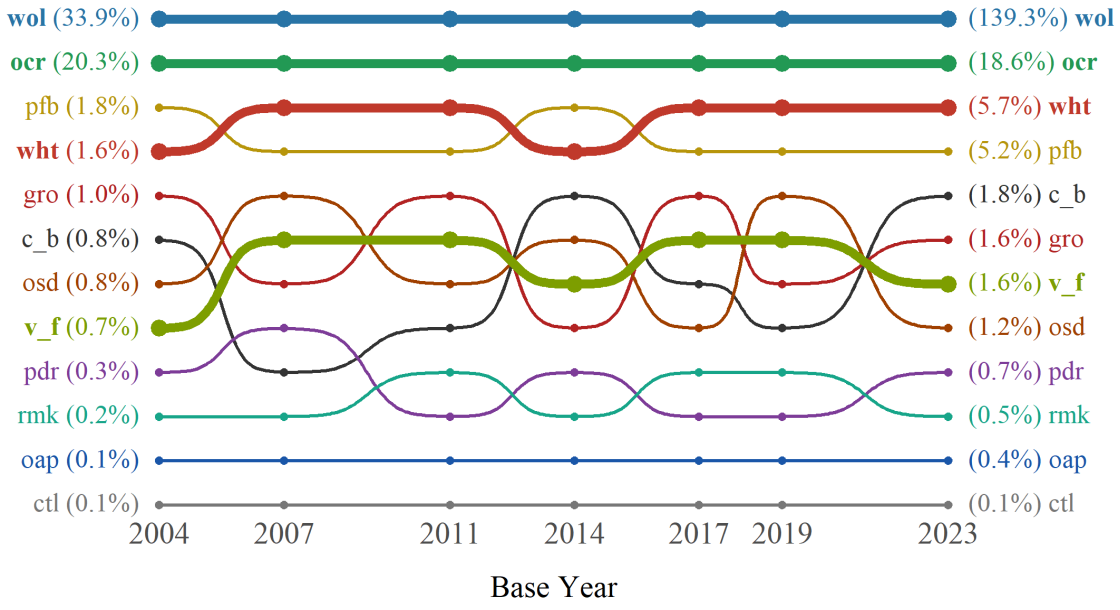
The aggregate statistics in Table 9.2 mask substantial heterogeneity across the twelve targeted sectors. For each base year, sectors are ranked by the aggregate percentage change in production targets, computed as

$$\Delta_{s,t} = \left(\frac{\sum_{c} \mathrm{adjTgt}_{c,s,t}}{\sum_{c} \mathrm{initTgt}_{c,s,t}} - 1 \right) \times 100,$$

where the summation runs over the 136 countries targeted in every base year, and $\mathrm{adjTgt}_{c,s,t}$ and $\mathrm{initTgt}_{c,s,t}$ denote, respectively, the adjusted and initial production targets for country c, sector s, and base year t; rank 1 is assigned to the sector recording the largest aggregate upward revision. Figure 9.1 traces the evolution of these rankings across all seven base years.

The figure reveals a striking degree of persistence in the cross-sectoral ranking structure. Raw wool (*wol*) occupies rank 1 in every base year, reflecting the systematic tendency for initial FAO-based production targets to fall short of recorded export volumes in major wool-exporting countries. Other crops (*ocr*) consistently ranks second, driven primarily by a recurrent hard inconsistency in Australia where export values substantially exceed the initial production target. Wheat (*wht*) and vegetables, fruit and nuts (*v_f*) also remain near the top of the ranking throughout the sample, consistent with the soft inconsistencies documented in section A.3. At the other extreme, cattle (*ctl*) and other animal products (*oap*) rank last in all seven years, indicating that export-production pressures in these sectors are either rare or of modest aggregate magnitude. The stability of this ranking structure across seven independently constructed base years suggests that the patterns reflect systematic structural features,particularly the divergence between FAO output estimates and national trade statistics in specific commodity-exporting countries,rather than idiosyncratic year-specific anomalies.

Figure 9.1: Sector rankings by aggregate percentage adjustment to production targets, 2004–2023



We discuss the handling of export-production inconsistencies further in section A.3, and the production adjustments themselves in section A.4. Finally, in section A.5, we see how well the production targets are maintained in the database construction program. In the discussion that follows we focus primarily on the 2023 reference year of the GTAP 12 Data Base.

A.3 Export-Production Inconsistencies

For the 2019 reference year, a prominent example of a hard inconsistency is Australia's other crops (ocr) sector, where the initial production target falls far short of export levels and is accordingly adjusted substantially upward. A notable soft inconsistency in 2019 is Iraq's vegetables, fruit and nuts (v_f) sector: while the production target exceeds exports, it covers only a small fraction of domestic demand, and the target is accordingly raised by a large amount.

For the 2023 reference year, the same patterns recur. Australia's other crops (ocr) again presents a hard inconsistency, as exports substantially exceed the initial production target, requiring a large upward revision. Iraq's v_f sector is again a prominent soft inconsistency: the production target, while above export levels, leaves inadequate domestic supply and is revised considerably upward. Saudi Arabia's wheat (wht) sector also exhibits a soft inconsistency, where the initial production target falls far short of domestic demand requirements and is raised several-fold.

Table 9.3 reports some of the notable adjustments for the 2023 base year. Here, we select the items for which changes or differences are more significant than others, where the criterion for "most significant" takes into account both the absolute magnitude of the item and the relative magnitude of the change or difference. We see that adjustments are more prevalent among non-EU countries, and particularly for the commodities other crops (ocr), raw wool (wol), vegetable, fruit and nuts (v_f), and wheat (wht).

Table 9.3: Production target tdjustments for 2023: Selected cases (US$ million)

GTAP Region	Sector	Domestic Absorption	Exports	Initial Production Target	Adjusted Production Target
aus	ocr	13110	791	17	4068
nld	ocr	3070	9986	1196	10753
irq	v_f	33407	120	1735	8472
pak	wol	9682	1	35	2422
can	ocr	4250	1386	183	2449
nld	v_f	1316	14566	7273	14895
irq	gro	8046	205	247	2217
ind	ocr	103188	4211	19973	30008
irq	wht	19534	22	1511	4905
ken	osd	6285	7	115	1578
isr	ocr	1001	120	0	370
nld	osd	156	679	4	718
col	ocr	3856	5093	2252	6057
sau	wht	13236	4	770	3313
bra	wol	4567	9	51	1151
are	ocr	11	471	0	474
are	v_f	260	1976	356	2041
irq	pdr	2614	0	8	654
irq	ocr	5457	8	170	1372
hti	v_f	3297	1	37	825

A.4 Production Adjustments

Table 9.4 shows the effects of the production adjustments for the 2023 base year. We compare the production level after GDP scaling (third column) to the adjusted production targets (fifth column). We also report the production levels obtained without the export and production subsidy adjustments being applied (fourth column).

Table 9.4: Production adjustments for 2023: Selected cases (US$ million)

GTAP Region	Sector	Scaled	Without Production Adjustments	With Production Adjustments
chn	v_f	254961	752915	752915
chn	gro	272625	116080	116080
chn	osd	212768	79988	79988
chn	wht	161857	55524	55524
chn	pdr	200346	83016	83016
ind	ocr	104043	19973	30008
ind	pdr	59007	116802	116802
bra	oap	12226	43241	43241
bgd	pdr	50965	17025	17025
rus	oap	8463	34443	34443
chn	wol	34057	4988	8647
irq	v_f	33570	1735	8472
usa	wht	47194	13046	16682
tur	ctl	6081	26872	26872
sdn	ctl	76	6864	6864
fra	v_f	8950	31808	31808
vnm	pdr	40584	14212	14212
rus	v_f	48566	21024	21024
pak	pfb	118	5986	5986
ind	ctl	33995	67449	67449

The results for the 2023 base year show that the largest adjustments are concentrated in China, India, the United States, Russia, and Brazil. China accounts for the most significant cases: vegetables, fruit and nuts (v_f) are adjusted sharply upward, with the FAO target substantially exceeding the GDP-scaled I-O value, while grain crops (gro), oilseeds (osd), wheat (wht), and paddy rice (pdr) are all revised downward, as GDP-scaled values exceed their respective FAO targets. A striking feature of the historical series is the reversal in the direction of the net production adjustment. In the earlier base years, FAO targets were on average above the GDP-scaled I-O values, so agricultural production was adjusted upward: by 14.8 percent in 2004, and by approximately

7 percent in both 2007 and 2011. From 2014 onward, the pattern reversed, with FAO targets generally falling below the GDP-scaled values: production was adjusted downward by 2.7 percent in 2014, 9.5 percent in 2017, 6.9 percent in 2019, and 6.9 percent in 2023. This trend reflects the combination of rising nominal GDP (which scales up the I-O tables) and moderated growth in FAO agricultural output estimates in recent years.

A.5 Deviations from Targets in the Main Data Base Construction Program

As noted above, the production adjustment is performed before the main data construction program. The adjusted targets are attained quite accurately within the adjustment program itself, but nothing in the main program guarantees that they will be maintained through the regular I-O processing. In table 9.5 therefore, we examine the largest deviations between the production targets and the final data.

Table 9.5: Deviations from production targets for 2023: Selected cases (US$ million)

GTAP Region	Sector	Target	Final
arg	oap	8155	21041
vnm	oap	16365	8991
nga	v_f	70758	54510
vnm	pdr	14212	9079
arg	ctl	25455	19566
ken	rmk	4569	2367
are	v_f	2041	4044
vnm	osd	1703	559
ind	wht	40202	33567
are	ctl	1274	2794
dza	v_f	21935	17378
arg	osd	12545	9215
are	ocr	474	1413
ukr	v_f	7820	5373
jpn	v_f	25948	21383
tur	ctl	26872	22450
gin	ocr	176	728
can	ctl	16517	20304
sdn	ctl	6864	4796
gha	v_f	17769	21557

Overall, deviations from the target are not extreme. Key deviations in 2023 are in Argentina, Vietnam, Nigeria, Kenya, and the United Arab Emirates. In terms of commodities, the

sectors with the largest deviations include other animal products (oap), vegetables, fruit and nuts (v_f), cattle (ctl), paddy rice (pdr), and raw milk (rmk). A notable case is Argentina's other animal products (oap) sector, where the final production in the database substantially exceeds the production target. Vietnam's other animal products (oap) and paddy rice (pdr) also show large deviations, as does Nigeria's v_f sector. Bearing in mind that the differences presented are those considered most serious, we may say that the targets are well maintained. The net deviation, overall agricultural production for targeted countries relative to the production targets, has been consistently negative (i.e., the final data fall slightly below the targets) and has generally improved over the sample: from -4.3 percent in 2004 to -3.0 percent in 2007, -2.9 percent in 2011, -2.8 percent in 2014, and -0.5 percent in 2017, before widening slightly to -1.4 percent in 2019 and -1.5 percent in 2023.

References

Chepeliev, Maksym (2020). *The GTAP 10A Data Base with Agricultural Production Targeting Based on the Food and Agricultural Organization (FAO) Data*. GTAP Research Memorandum 35. Department of Agricultural Economics, Purdue University, West Lafayette, IN: Global Trade Analysis Project (GTAP). URL: https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=6180.

— (June 2022). "Incorporating Nutritional Accounts to the GTAP Data Base". In: *Journal of Global Economic Analysis* 7.1, pp. 1–43. DOI: 10.21642/JGEA.070101AF. URL: https://jgea.org/ojs/index.php/jgea/article/view/150.

Food and Agriculture Organization (FAO) of the United Nations (2022). *FAOSTAT*. https://www.fao.org/faostat/.

Leeuwen, Myrna Van (2002). "European Union (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Portugal, Spain, Sweden)". In: *Global Trade, Assistance, and Production: The GTAP 5 Data Base*. Ed. by Betina V. Dimaranan and Robert A. McDougall. Department of Agricultural Economics, Purdue University, West Lafayette, IN. Chap. Data. URL: https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=842.