

1. Introduction

This chapter describes the adaptation of India input-output transaction table (IOTT), 2007-08 for contribution to the Global Trade Analysis Project (GTAP) Database version 10. The chapter is organized as follows. Section 2 describes key data sources, data template for raw data and early stage processing of IO table. Initial consistency checks in the IO table are explained in section 3. Section 4 explains sector classification of 130 sectors of IOTT. Data Processing is described in section 5. Section 6 finally enumerates the Adjustment carried out during data construction process.

2. Data Source and Processing of the IO Table

The core data used in present exercise has been compiled from the IOTT, 2007-08, published by the Central Statistical Organization (CSO), Government of India (CSO, 2012). The data exercise for India contribution to GTAP database builds on the method suggested by Horridge, McDougall, Narayanan, and Walmsley (2008). Table 1 presents the template for raw data format in which original IO table is prepared. This further uses GEMPACK and MS-DOS batch files to accomplish the steps involved in this exercise to transform raw data finally into GTAP format.

The original IO Table consists of 130 sectors of production (Table 2). To meet the specific requirement of the present exercise, the IO table which was originally published at factor cost, was converted to producer prices. The net indirect taxes (NITs) comprising of central excises, import duty, export duty, services tax, sale tax, stamps, other taxes, and subsidy available for 130 sectors are used. All the components of indirect taxes excluding import tariff are clubbed as domestic commodity taxes. The subsidy common has been netted out to arrive at net domestic commodity taxes. These taxes are reported as columns indicating total tax paid for sales across a row into intermediate usage and final demand. A notable point to be made here is that no import taxes are assigned in this case, though the column for this kept in the raw data template. The tax allocation across rows are apportioned with the share commodity taxes in total output at producer prices. All these apportioning are made to the IO table at uniform commodity by commodity level to make the table further balanced both at row totals and column total. Similarly, the product tax net of subsidy at the bottom row of value added segment is zero as these values get subsumed into intermediate and final use when we consider flows at producer prices. Commodity taxes include union and state excise duties, sales tax, custom duties (on imports and exports), and various other duties and taxes.

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3. Consistency checks in the IO table

Certain basic checks to ensure the consistency in the IOTT were used. These were in the form of checking whether values of imports in a sector exceed to that of total domestic sales (excluding inventories). Another check applied was that for any sector value of exports shouldn't exceed to that of total output. We noticed that six sectors, viz. bauxite (32), mica (36), other non-metallic minerals (37), ships and boats (95), aircraft and spacecraft (104) and water transport (111) needed further processing. The necessary changes were done by adjusting the value of exports and imports or 'change in stock' to re-balance the data.

The original India IO Table combines wheat and wheat milling into one sector namely Wheat. This reported nearly 17.6 per cent share of wheat going as inputs to wheat sector itself. The proportion of wheat milling which turns out to be nearly 33 percent is taken out from original wheat sector and clubbed into miscellaneous food products. This further corrected the input structure of revised wheat sector to 4.9 per cent in order to make it congruent with the cost of cultivation studies.

4. Sector Classification

The constitution of 130 sectors of production includes 37 primary, 68 manufacturing and 25 sectors of services. The primary sectors include 20 agricultural sectors, 4 animal husbandry, forestry, fishing and 11 mining sectors. The manufacturing sectors comprise of 8 agro processing sectors, 9 textile and wearing apparel sectors, and 51 other manufacturing sectors. The 25 service sectors include construction, electricity, water supply, transport, storage, communication, trade, hotels, banking and insurance among other.²

5. Data Processing

In this section we undertake several exercises which build upon series of TABLO files linked through a batch file. This further helps running several TABLOs to perform stage-wise specific data manipulation jobs with certain inbuilt diagnostic checks. The initial checks entail in terms of checking whether the table is balanced and signs are appropriate. The next part of batch file distinguish the domestic and imported part of commodity usage and ensure that there should be no negative entries in both domestic and imported usage except in inventory column. Furthermore, one task is to split the taxes and separate the basic and tax part of each of the flows. At this stage too the diagnostic checks are applied, and data finally is assembled into format required by GTAP data.

5.1 Distribution of Value-Added

The distribution of the value-added into three primary inputs namely land, labor and capital is based on KLEM data where share of labour and capital in GVA is available for 26 sectors. This data is used for interpolating values at broader sectors and further disaggregation is based on GTAP 8 Data Base. The factor allocation of GVA are done before hand for 130 sectors only. In case of

² Refer to Chapter 2 of CSO (2012) for detailed description of primary sources of data for all 130 sectors which is also given in Table 2.

agricultural sectors, 1-20, the share of capital has been composite of land and capital shares. The bifurcation of share of land has been worked by using the cost of cultivation data of Ministry of Agriculture, Government of India for disaggregated sectors.

5.2 Mapping Scheme for Aggregation

There was no change in the coverage and nomenclature of 130 sectors of IO table 2007-08 vis. a. vis. that of earlier year 2003-04 which was used in previous data contribution. The mapping of GTAP 50 sectors, 57 GSC2 sectors and 130 sectors of India IO table has been originally followed from GTAP 8 (Table 3). The disaggregation of the 50 sectors into 57 GSC2 sectors first executed by the GTAP research team into 57 for version 9. The present chapter documents the data contribution for GTAP Ver 9, and team further transitioned GSC2 57 sectors into 65 for GTAP data ver. 10.

The mapping of few of the GTAP sectors had been one-on-one with India IOTT sectors. Other had Concorde with more than one sectors of India Table and vice-versa. For example, India IOTT sector 53 (readymade garments and made up textile goods) is mapped one-on-one with GSC2 sector 28 (wap).³ Quite a few of GTAP sectors has been mapped with multiple IO table sectors. For example, the GSC2 sector 31 (ppp) is mapped with IOT sectors 57 (paper, paper products and newsprint) and 58 (printing, publishing and allied activities). On the other hand, two GSC2 sectors viz., 1 (pdr) and 23 (pcr) have been mapped with a single IOT sector 1 (paddy, rice milling). More complex relationships include mapping of the aggregate IOTT sectors 22 (animal services), 23 (poultry and eggs) and 24 (other livestock products) with the aggregate of GSC2 sectors 9 (ctl), 10 (oap) and 12 (wol). This aggregate sector has been referred as MCOW (Table 3). Similarly, IOTT sectors 42 (tea and coffee processing) and 43 (miscellaneous food products) have been aggregated and mapped with the aggregate of four GSC2 sectors viz., 19 (cmt), 20 (omt), 22 (mil) and 25 (ofd). This composite sector is referred as COMO. The aggregate of IOTT sectors 63 (petroleum products and LPG) and 64 (coal tar products) has been mapped with aggregate of GSC2 sectors 32 (p_c) and 44 (gdt); jointly named as PTGD.

6. Adjustments

Following are the changes made to address certain inconsistencies observed during the procedure cited above.

6.1 Adjustment of negative pre-tax domestic flows

In few cases, the domestic flow values turned out to be negative due to reported high values of imports. For such sectors, import values have been adjusted by taking of ratio of intermediate use to import and further adjusting export as well as the CIS values in corresponding rows.

6.2 Sectoral Balance and Non-negativity Conditions

³ For GSC2 sector numbers and codes refer Karen et al (2000) and for IOTT sector numbers and names refer Table 2.

After transforming the India IO table to the format required by GTAP Data Base, we did several consistency checks to maintain the sectoral balance and non-negativity checks. The data successfully passed the balance check and non-negativity conditions.

References

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Table 1: Input output Table at Producer Prices, 2007-08

Commodities	Industries				Household	Government	Investment	Inventories	Exports	Domestic Commodity Tax	Imports			Total Use
	1	2		N	C	G	I	DSTOCKS	X	-DOMTAX	-Mcif	- Mtax	- Mtar	
1														
2														
.....														
N														
Land	N=130; FC =Factor Cost; Domestic Commodity Taxes are Net indirect tax <u>less</u> Import tariff and Import Tax.													
Capital														
Labour														
Prod Tax														
Total Output at FC														

Source: Adapted from CSO (2012)

Table 2: Sector Specification of the Input Output Table 2007-08

IOTT Sector	Sector Name	IOTT Sector	Sector Name
1	Paddy	43	Miscellaneous food products
2	Wheat	44	Beverages
3	Jowar	45	Tobacco products
4	Bajra	46	Khadi, cotton textiles (handlooms)
5	Maize	47	Cotton textiles
6	Gram	48	Woolen textiles
7	Pulses	49	Silk textiles
8	Sugarcane	50	Art silk, synthetic fiber textiles
9	Groundnut	51	Jute, hemp, mesta textiles
10	Coconut	52	Carpet weaving
11	Other oilseeds	53	Readymade garments
12	Jute	54	Miscellaneous textile products
13	Cotton	55	Furniture and fixtures-wooden
14	Tea	56	Wood and wood products
15	Coffee	57	Paper, paper prods. & newsprint
16	Rubber	58	Printing and publishing
17	Tobacco	59	Leather footwear
18	Fruits	60	Leather and leather products
19	Vegetables	61	Rubber products
20	Other crops	62	Plastic products
21	Milk and milk products	63	Petroleum products
22	Animal services(agricultural)	64	Coal tar products
23	Poultry & Eggs	65	Inorganic heavy chemicals
24	Other liv.st. produ. & Gobar Gas	66	Organic heavy chemicals
25	Forestry and logging	67	Fertilizers
26	Fishing	68	Pesticides
27	Coal and lignite	69	Paints, varnishes and lacquers
28	Natural gas	70	Drugs and medicines
29	Crude petroleum	71	Soaps, cosmetics & glycerin
30	Iron ore	72	Synthetic fibers, resin
31	Manganese ore	73	Other chemicals
32	Bauxite	74	Structural clay products
33	Copper ore	75	Cement
34	Other metallic minerals	76	Other non-metallic mineral prods.
35	Lime stone	77	Iron, steel and ferro alloys
36	Mica	78	Iron and steel casting & forging
37	Other non metallic minerals	79	Iron and steel foundries
38	Sugar	80	Non-ferrous basic metals
39	Khandsari, boora	81	Hand tools, hardware
40	Hydrogenated oil (vanaspati)	82	Miscellaneous metal products
41	Edible oils other than vanaspati	83	Tractors and agri. Implements
42	Tea and coffee processing	84	Industrial machinery (F & T)
85	Industrial machinery(others)	108	Water supply
86	Machine tools	109	Railway transport services
87	Other non-electrical machinery	110	Land tpt including via pipeline
88	Electrical industrial Machinery	111	Water transport

IOTT Sector	Sector Name	IOTT Sector	Sector Name
89	Electrical wires & cables	112	Air transport
90	Batteries	113	Supporting and aux. tpt activities
91	Electrical appliances	114	Storage and warehousing
92	Communication equipment	115	Communication
93	Other electrical Machinery	116	Trade
94	Electronic equipments (incl.TV)	117	Hotels and restaurants
95	Ships and boats	118	Banking
96	Rail equipments	119	Insurance
97	Motor vehicles	120	Ownership of dwellings
98	Motor cycles and scooters	121	Education and research
99	Bicycles, cycle-rickshaw	122	Medical and health
100	Other transport equipments	123	Business services
101	Watches and clocks	124	Computer & related activities
102	Medical, precision & optical instruments	125	Legal services
103	Gems & jewelry	126	Real estate activities
104	Aircraft & spacecraft	127	Renting of machinery & equipment
105	Miscellaneous manufacturing	128	O.com, social & personal services
106	Construction	129	Other services
107	Electricity	130	Public administration

Source: Appendix 3, CSO (2012)

Table 3: Mapping of the GSC2 sectors with India IO 2007-08

S.No	GTAP 50 sectors*	GSC 57	IO-India 130
1	RICE	1_PDR, 23_PCR	1
2	2_WHT	2_WHT	2
3	3_GRO	3_GRO	3-5
4	4_V_F	4_V_F	6-7,18-19
5	5_OSD	5_OSD	9-11
6	6_C_B	6_C_B	8
7	7_PFB	7_PFB	12-13
8	8_OCR	8_OCR	14-17,20
9	MCOW	9_CTL, 10_OAP, 12_WOL	22+23+24
10	11_RMK	11_RMK	21
11	13_FOR	13_FOR	25
12	14_FSH	14_FSH	26
13	15_COL	15_COL	27
14	16_OIL	16_OIL	29
15	17_GAS	17_GAS	28
16	18_OMN	18_OMN	30-37
17	COMO	19_CMT, 20_OMT, 22_MIL, 25_OFD	42+43
18	21_VOL	21_VOL	40-41
19	24_SGR	24_SGR	38-39
20	26_B_T	26_B_T	44-45
21	27_TEX	27_TEX	46-52, 54
22	28_WAP	28_WAP	53
23	29_LEA	29_LEA	59-60
24	30_LUM	30_LUM	56
25	31_PPP	31_PPP	57-58
26	PTGD	32_P_C, 44_GDT	63+64
27	33_CRP	33_CRP	61-62, 65-73
28	34_NMM	34_NMM	74-76
29	35_I_S	35_I_S	77-78
30	36_NFM	36_NFM	80
31	37_FMP	37_FMP	79, 81-82
32	38_MVH	38_MVH	97
33	39_OTN	39_OTN	95-96, 98-100
34	40_ELE	40_ELE	92,94
35	41_OME	41_OME	83-91, 93, 101
36	42_OMF	42_OMF	55,102-105
37	43_ELY	43_ELY	107

S.No	GTAP 50 sectors*	GSC 57	IO-India 130
38	45 WTR	45 WTR	108
39	46 CNS	46 CNS	106
40	47 TRD	47 TRD	116-117
41	48 OTP	48 OTP	109-110, 113-114
42	49 WTP	49 WTP	111
43	50 ATP	50 ATP	112
44	51 CMN	51 CMN	115
45	52 OFI	52 OFI	118
46	53 ISR	53 ISR	119
47	54 OBS	54 OBS	123-128
48	55 ROS	55 ROS	129
49	56 OSG	56 OSG	121-122, 130
50	57 DWE	57 DWE	120

Notes:

*Sector name includes Serial Number of the GSC2 sector followed by corresponding code; for identification the names of the composite sectors have four alphabets

RICE: Paddy and **Rice**

MCOW: **M**eat, **C**TL, **O**MT, **W**OL

COMO: **C**MT, **O**MT, **M**IL, **O**FD

PTGD: **P**etroleum products, **G**as **d**istribution and coal tar products.

Source: Adapted from GTAP Database Version 8.