Z India

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Z.1 Introduction

This chapter describes the adaptation of India input-output transaction table (IOTT), 2015-16 for contribution to the Global Trade Analysis Project (GTAP) Database version 11. 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.

Z.2 Data Source and Pre-Processing of the IO Table

The core data used in present exercise has been compiled from the IOTT, 2015-16, prepared by Chadha, Saluja and Sivamani (2020) The 131 sector IOTT is a transformed version of Supply and Use Tables (SUTs), 2015-16 released by the Ministry of Statistics and Programme Implementation, Government of India.

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 original stricture of IOTT , whereas the data template in which IO table is further used as a raw data format in given in Table 2. 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.

As stated earlier, the original IOTT consists of 131 sectors of production (Table 4). To meet the specific requirement of the present exercise, the table which was originally valued at at basic prices is further converted to producer prices. For undertaking this exercise, we require product -wise commodity tax rate across intermediate use and final use. The column for product taxes comprising of central excises, import duty, export duty, services tax, sale tax, stamps, other taxes, and subsidy as available in SUT 2015-16 for 140 product sectors is used. These taxes as reported as a single column indicating total commodity taxes paid for sales across rows into intermediate and final uses. The subsidy common has been netted out to arrive at net domestic commodity taxes. A suitable alignment of 140 product sectors vis. a. vis. 131 IOTT sectors is done to arrive at a net commodity tax rate (Ti) to total use at producer prices. This net product rate (Ti) is further used to blow up row wise IOTT flows (intermediate and final use) to producer prices. A point worth mentioning here is here is that no import taxes are assigned in this exercise, though the column for this kept in the raw data template. Hence, the commodity tax allocation across rows are apportioned with the share of commodity taxes in total output at producer prices . All these

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apportioning are made uniformly across rows to make the table further balanced both at row totals and column total. This provides a matrix for commodity taxes at the intermediate use and final-use level. However, Gross Value of Output (GVO) at basic prices given as column totals in IOTT is preserved. Taking these GVO values as control total the IOTT is finally balanced at producer prices. Similarly, the product tax net of subsidy at the bottom row of value-added segment (Table 2) is eliminated as these values get subsumed into intermediate and final use when we consider flows at producer prices. Net production taxes which is a part of valued added segment is also emply.

Z.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. The 131 sectors IOTT was validated for these consistency checks. Wherever, inconsistencies occur, the necessary changes were made by adjusting the value of exports and imports or 'change in stock' to re-balance the data. The table finally is matched at both income and expenditure side.

Z.4 Sector Classification

The constitution of 131 sectors of production includes 37 primary, 69 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 9 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.[29]

Z.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 components 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

[29]Refer to Chadha, et al. (2020) for detailed description of for all 131 sectors which is also given in Table 4.

data. Each of tablo codes run for performing a specific data job does not proceed further until consistency checks are minimally address.

Distribution of Value-Added

The distribution of the value-added into three primary inputs namely land, labor and capital is based on KLEM database (RBI, 2021) where share of labour and capital in GVA is available for 27 sectors. This data is used for taking at values at broader sectors and further disaggregation is based on industry shares NAS database. The factor allocation of GVA are done before hand for 131 sectors only. In case of agricultural sectors, 1-20, the share of capital jointly comprised of land and capital shares. The bifurcation of the share of land is computed by taking the land share based on cost of cultivation data of Ministry of Agriculture, Government of India for disaggregated sectors.

Mapping Scheme for Aggregation

There was no major changes in the coverage and nomenclature of 131 sectors of IO table 2015-16 vis. a. vis. that of earlier year 2007-08 which was used in previous data contribution. The mapping of GTAP 57 sectors, 65 GSC3 sectors and 131 sectors of India IO table which has been originally provided in GTAP 10 database is further revised (Table 4). The present chapter documents the data contribution for GTAP individual and composite 57 sectors for ver 11 of database.

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).[30] Quite a few of GTAP sectors has been mapped with multiple IO table sectors. For example, the GSC3 sector 31 (ppp) is mapped with IOT sectors 57 (paper, paper products and newsprint) and 58 (printing, publishing and allied activities). A complex mapping occurs while taking a composite of IOTT sectors 22 (animal services), 23 (poultry and eggs) and 24 (other livestock products) with an aggregate of GSC3 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 GSC3 sectors viz., 19 (cmt), 20 (omt), 22 (mil), 23 (pcr) and 25 (ofd). This composite sector is referred as COMRO. The aggregate of IOTT sectors 64 (petroleum products and LPG) and 65 (coal tar products) has been mapped with aggregate of GSC2 sectors 32 (p_c) and 44 (gdt); jointly named as PTGD. The sector OBS includes RSA (Real estate activities as well).

Z.6 Adjustments

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

[30]For GSEC3 sector numbers and131 IOTT sector numbers, please refer Table 3.

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.

Sectoral Balance and Non-negativity Conditions

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. Finally, 57 sector core data is keyed in har raw.har file to be use for further data construction job.

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Table 8.44: Input output Table at Basic Prices, 2015-16

Commodities	Industries	Household	Government	Investment	Inventories	Exports	Imports	Total
	1,2, ..., N	C	G	I	STOCKS	X	-M	Use
1								
2								
...								
N								
GVA								
Net Product Taxes								
Total Output at BP								

Source: Adapted from CSO(2012)

Table 8.45: Input output Table at Producer Prices, 2015-16

Commodities	Industries	Household	Government	Investment	Inventories	Exports	Domestic Commodity Tax	Imports			Total
	1,2, ..., N	C	G	I	DSTOCKS	X	-DomTax	-Mcif	-Mtax	-Mtar	Use
1											
2											
...											
N											
Land	N=131; FC =Factor Cost; Domestic Commodity Taxes are Net indirect tax less Import tariff and Import Tax.										
Capital											
Labor											
Prodtax											
Total Output at FC											

Source: Adapted from Horridge et al.(2008)

Table 8.46: Mapping of the GTAP sectors with India IO 2015-16

S.No	GTAP 57 sectors*	GSC_65	IO-India_131
1	1_RICE	1_PDR	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_COA	15_COA	27
14	16_OIL	16_OIL	29
15	17_GAS	17_GAS	28
16	18_OXT	18_OXT	30-37
17	COMRO	19_CMT, 20_OMT, 22_MIL, 23_PCR, 25_OFD	42+43+44
18	21_VOL	21_VOL	40-41
19	24_SGR	24_SGR	38-39
20	26_B_T	26_B_T	45-46
21	27_TEX	27_TEX	47-54
22	28_WAP	28_WAP	55
23	29_LEA	29_LEA	60-61
24	30_LUM	30_LUM	56
25	31_PPP	31_PPP	57-58
26	PTGD	32_P_C, 44_GDT	64+65
27	33_CHM	33_CHM	66-73
28	34_BPH	34_BPH	74
29	35_RPP	35_RPP	62-63
30	36_NMM	36_NMM	75-77
31	37_I_S	37_I_S	78-79
32	38_NFM	38_NFM	81
33	39_FMP	39_FMP	80, 82-83
34	40_MVH	40_MVH	99
35	41_OTN	41_OTN	97-98, 100-103
36	42_ELE	42_ELE	93-96,104
37	43_EEQ	43_EEQ	89-92
38	45_OME	45_OME	84-88
39	46_OMF	46_OMF	59,105-106
40	47_ELY	47_ELY	108
41	48_WTR	48_WTR	109
42	49_CNS	49_CNS	107
43	50_TRD	50_TRD	117
44	51_AFS	51_AFS	118
45	52_OTP	52_OTP	110-111,114
46	53_WTP	53_WTP	112
47	54_ATP	54_ATP	113
48	55_WHS	55_WHS	115
49	56_CMN	56_CMN	116

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S.No	GTAP 65 sectors	GSC_65	IO-India_131
50	57_OFI	57_OFI	119
51	58_INS	58_INS	120
52	OBS_RSA	59_RSA, 60_OBS	124-129
53	61_ROS	61_ROS	130
54	62_EDU	62_EDU	122
55	63_HHT	63_HHT	123
56	64_OSG	64_OSG	131
57	65_DWE	65_DWE	121

* Sector name includes Serial Number of the GSC3 sector followed by corresponding code for identifying the names of the composite sectors have four alphabets; Except; OBS which includes RSA is named as OBS. MCOW: Meat, CTL, OMT, WOL COMRO: CMT, OMT, MIL, PCR, OFD PTGD: Petroleum products, Gas distribution and coal tar products OBS: Professional, Scientific and technical activities; and administrative and support services RSA: Real estate activities.
Source Chadha, et al. (2020) and GSEC3

Table 8.47: Sector Specification of the Input-Output Table 2015-16

IOTT Sector	Sector Name	IOTT Sector	Sector Name
1	Paddy	49	Silk textiles
2	Wheat	50	Art silk, synthetic fiber textiles
3	Jowar	51	Jute, hemp, mesta textiles
4	Bajra	52	Carpet weaving
5	Maize	53	Miscellaneous textile products
6	Gram	54	Ready made garments
7	Pulses	55	Wood and wood products except furniture
8	Sugarcane	56	Paper, Paper products and newsprint
9	Groundnut	57	Publishing, printing and allied activities
10	Coconut	58	Furniture & Fixtures
11	Other oilseeds	59	Leather footwear
12	Jute	60	Leather and leather products
13	Cotton	61	Rubber products
14	Tea	62	Plastic products
15	Coffee	63	Petroleum products
16	Rubber	64	Coal tar products
17	Tobacco	65	Inorganic heavy chemicals
18	Fruits	66	Organic heavy chemicals
19	Vegetables	67	Fertilizers
20	Other crops	68	Pesticides
21	Milk and milk products	69	Paints, varnishes and lacquers
22	Poultry & Eggs	70	Soaps, cosmetics & glycerin
23	Other liv.st. produ.	71	Synthetic fibers, resin
24	Animal Services	72	Other chemicals
25	Forestry and Logging	73	Drugs and medicine
26	Fishing & Aquaculture	74	Structural clay products
27	Coal and Lignite	75	Cement
28	Crude petroleum	76	Other non-metallic mineral prods.
29	Natural Gas	77	Iron, steel and ferro alloys
30	Iron ore	78	Iron and steel casting & forging
31	Manganese ore	79	Iron and steel foundries
32	Bauxite	80	Non ferrous basic metals (including alloys)
33	Copper ore	81	Hand tools, hardware
34	Other Metallic minerals	82	Miscellaneous metal products
35	Lime stone	83	Tractors and agri. Implements
36	Mica	84	Industrial machinery(F & T)
37	Other non metallic minerals	84	Industrial machinery(others)
38	Sugar	86	Machine tools
39	Khandsari, boora	87	Machine tools
40	Hydrogenated oil(vanaspati)	88	Other non-electrical machinery
41	Edible oils other than vanaspati	89	Electrical industrial Machinery
42	Tea and coffee processing	90	Electrical wires & cables
43	Miscellaneous food products	91	Batteries
44	Grain Mill products, starch and starch products	92	Other electrical Machinery
45	Tobacco Products	93	Electrical appliances
46	Khadi, cotton textiles(handlooms)	94	Electronic equipments(incl.TV)
47	Cotton textiles	95	Watches and clocks
48	Woolen textiles	96	Communication equipment

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IOTT Sector	Sector Name	IOTT Sector	Sector Name
97	Ships and boats	115	Storage and warehousing
98	Rail equipments	116	Communication services
99	Motor vehicles	117	Trade
100	Motor cycles and scooters	118	Hotels & Restaurant
101	Bicycles, cycle-rickshaw	119	Financial services
102	Other transport equipments	120	Insurance services
103	Aircraft & spacecraft	121	Ownership of dwellings
104	Medical, precision&optical instru.s	122	Education and research
105	Jems & jewelry	123	Medical and Health
106	Miscellaneous manufacturing	124	Legal services
107	Construction and construction services	125	Computer related services
108	Electricity	126	Other Business services
109	Water Supply	127	Real estate services
110	Railway Transport	128	Renting of machinery & equipment
111	Land transport	129	Community, social and personal services
112	Water Transport	130	Other services
113	Air transport	131	Public administration and defence
114	Supportive and Auxiliary transport activities		

Source: Chadha, Saluja and Sivamani (2020)