11.H
India

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11.H.1 Original Input-Output Table

The original matrices used in the input-output table for India in the GTAP 6 Data Base are from "Input-Output Transactions Table, 1993-94" (Government of India, 2000).The matrix is available for 115 x 115 sectors. The units are in Rupees Lakh (1 Lakh = 100,000). The exchange rate in 1993-94 is 1 US $ = Rs. 31.37.

The total transactions matrix (domestic plus import use) is presented at both commodity-by-industry (absorption matrix) and industry-by-commodity (make matrix) basis. This matrix is also available at commodity-by-commodity basis. Similarly, the import flow matrix is presented as commodity-by-industry. The import flow matrix was subtracted from the aggregate transactions matrix to arrive at the domestic flow matrix. We converted both the domestic and the import flow matrices to the commodity-by-commodity level and then tallied it with the aggregate matrix at commodity-by-commodity basis as available at the Central Statistical Organization. The two matrices were used in preparing the I-O table for India for the GTAP 6 Data Base.

All the entries in the I-O transactions table are at factor cost, i.e. the values exclude trade and transport margins. The table was originally prepared at purchasers' prices, i.e. the prices at which the actual transactions take place. The values at factor cost were arrived at by removing the components of trade and transport margins and net indirect taxes (indirect taxes minus subsidies).

The final uses of gross domestic product are classified into six categories, namely: (i) private final consumption expenditure, (ii) government final consumption expenditure, (iii) gross fixed capital formation, (iv) changes in stocks, (v) exports, and (vi) imports.

Imports include the imports of merchandise and other items like transport services of merchandise, imports by resident industries, other transport and communication services by non-residents and miscellaneous commodities, etc. Imports are reported at *c.i.f.* values and exclusive of import duties and domestic taxes. Exports are comprised of merchandise exports at *f.o.b*. values and other items like transport and communication in respect of exports other than merchandise and insurance, etc.

Indirect taxes are distinguished as commodity taxes and other indirect taxes. Commodity taxes include union and state excise duties, sales tax, custom duties on imports and exports, and other duties and cess. Other indirect taxes include tax and stamp duty, etc.

11.H.2 Allocation of Gross Value-Added

Gross value-added (GVA) is given as a row vector. The I-O matrix does not provide the distribution of GVA into different components. An attempt was made to allocate GVA into three different components, namely, land, labor, and capital. This allocation, as computed for 57 GTAP sectors, is based on a Social Accounting Matrix (SAM). The SAM-based estimates are based on GVA distribution into wage (including imputed) and non-wage components. The SAM was initially prepared for the year 1993-94 and was subsequently updated for the year 1997-98 in a revised form at National Council of Applied Economic Research (NCAER). It has 60 sectors which are directly mapped with the 115 sectors of the I-O table of India. The latter is still in press.

Both versions of the SAM explain in detail the method of distribution of GVA into wage and non-wage components. The estimates for the agricultural sectors were distributed on a pro-rata basis. The distribution of value-added for the manufacturing sectors was estimated by taking care of both registered and unregistered components. The former used data from the Annual Survey of Industries, 1997-98, while the latter were compiled from the National Sample Survey for 1993-94. The estimates for the unorganized sectors are further based on three different establishments, namely, directory manufacturing enterprises (DME), non-directory manufacturing enterprises (NDME), and own account enterprise (OAE). In the case of the services sectors, the estimates of wage and non-wage components are directly available in the National Account Statistics (NAS) for the organized sectors. Similarly, for the unorganized part, these were derived from follow-up surveys of economic census.

We have directly taken the series of GVA distribution into wage and non-wage components from the latest version of the SAM, 1997-98. On the basis of this distribution, the estimated weights of labor (wage income) and capital (non-wage) were first applied to the 115 sectors of the I-O table of India. This distribution was further mapped with the 57 GTAP sectors. In this way, we arrived at the GVA distribution into labor and capital for the GTAP sectors. The estimates for capital were further apportioned into land on a pro-rata basis for 8 GTAP primary agriculture sectors. The weights used for land to non-wage income are 0.777 and 0.7999 for food crops and cash crops, respectively. For a detailed methodological note on the GVA distribution, see section IV of the SAM (Pradhan, et al., 1999).

11.H.3 Mapping Procedure

The 57 sectors of the GTAP 6 Data Base (GSC2) were mapped with the 115 sectors in India’s I-O transactions table (io93-94). In doing this, items included under both schemes were carefully examined. Some of the GSC2 sectors match directly with that of India's io93-94. For other sectors, a suitable concordance between GSC2 and io93-94 was prepared. The weights used for apportioning io93-94 into GSC2 sectors were based on either value of output or wholesale price indices (WPI). In mapping GSC2 with io93-94, we also examined the National Industrial Classification of All Economic Activities-1987 (NIC 1987) (GOI, 1987) at the three-digit level. The classification of agriculture and food products sectors in GSC2 (sectors 1-13,19-26) are based on the Central Product Classification, version 1, while that for manufacturing and service sectors are based on the International Standard Industrial Classification of All Economic Activities, Revision

3 (ISIC3). The details of sectors as provided in GSC2 are at the two- or three-digit level of the CPC or ISIC3 and are given in GTAP Technical Paper 1. We carefully examined the CPC and ISIC3 at the four-digit level while identifying comparable product items under io93-94 and/or NIC 1987. The mapping between GSC2 and India's I-O table is given in table 11.H.A1 in the Appendix. A description of the sectors in India's I-O table is available in table 11.H.A2.

The first eight sectors of GSC2 were compared with the first 18 sectors of io93-94. GSC2 sectors 1, 2, 3, and 6 have direct mapping while the remaining sectors were mapped with the help of a weighting scheme. For this purpose, a weighting scheme of wholesale price indices was used. The combined weight of sectors 6 - 7 and 12 - 17 of io93-94 is 6.47057. It includes the item-wise weights under two broader groups, namely, Food Articles and Non-Food Articles. The weights for commodities under Food Articles are: (i) pulses (0.60320), (ii) fruits and vegetables (2.91655), (iii) condiments and spices (0.66233), (iv) other food articles (0.23927). Similarly, the group Non-Food Articles is comprised of: (i) Fibers excluding raw cotton and raw jute (0.05789), (ii) oilseeds excluding groundnuts (1.63734), and (iii) other non-food articles excluding {(a) sugarcane (1.30493), (b) hides, raw (0.00079), (c) skin, raw (0.00082), (d) logs and timber (0.28811)} (0.35399). Finally, the composite weight of this group becomes 6.47057. The final weights are 0.4507, 0.2530, 0.0090, and 0.2873 for distributing sectors 6 - 7 and 12 - 17 of io93-94 into GSC2 sectors 4, 5, 7 and 8, respectively. Table 11.H.A1 shows that GSC2 sectors 4, 5, 7, 8 are mapped either individually or along with other sectors.

Similarly, sectors 10 and 12 of GSC2 were mapped by looking at the value of output of the livestock sector at 1993-94 prices (GOI, 2003). The major items included under these two groups are: first, (a) eggs (Rs 2282 crore), (b) meat by-products mainly hides, skins and other by-products (1250 crore), and (c) dung (6214 crore); and second, (a) wool and hair (178 crore) and (b) silk worm cocoon and honey (970 crore). The total output values for these two groups are Rs 9747 and Rs 1148 crore, respectively. These two values provide weights for GSC2 sectors 10 and 12 of 0.8947 and 0.1053, respectively.

The weights for sector 16 and 17 were calculated on the basis of production of crude oil and natural gas (averaged for three years 1992-93, 1993-94 and 1994-95), which are 28,738 and 18,592 thousand metric tons, respectively. The weights are 0.6072 and 0.3928, respectively.

In a slightly different way, sectors 19, 22, 23 and 25 were mapped using the value of output of food products, i.e. sectors 20 and 21 of NIC 1987. This output value was computed by adding the output value of: (i) ASI factory sector and (ii) Unregistered sectors, i.e. composed of (a) Own Account Enterprise, (b) Directory Manufacturing Establishments, (c) Non-Directory Manufacturing Establishments. The share of value of output for three NIC three-digit products, namely: (a) meat products (code 200), (b) manufactures of dairy products (code 201), and (c) grain milling (code 204) in total food products (code 20-21) was computed. These three were allocated weights for sectors 19, 22 and 23 of GSC2 whereas sector 25 became a residual[1]. Similarly, the share of rice milling in grain milling is 75.24 per cent hence the weight of rice

[1] Sector 23 of GSC2, i.e PCR, is mapped directly with the grain milling sector of the India I-O table. An estimate suggests that the share of rice milling in grain milling is 75.24 per cent in 2000. If we assign this weight to PCR and allocate sector 37-38 of Indian I-O table, it provides an absurd value where there is less consumption of paddy rice and more of grains other than paddy. There could be an apprehension that rice milling is included under sector 1, i.e., paddy under the India I-O table. Hence, the comparable sector for PCR in the Indian I-O table is the grain milling sector only.

milling is 0.1475. This gives values for sectors 19, 22, 23 and 25 from the value of food products (sector 37-38 of io93-94). We were not able to provide a weight for sector 20 of GSC2.

GSC2 provides three different categories of transport. They are land transport (OTP), water transport (WTP), and air transport (ATP). The corresponding sectors available in io93-94 are Rail Transport Services (103) and other Transport Services (104). To apportion two sectors into GSC2, gross domestic product (GDP) value weights from the National Accounts Statistics (NAS) were used. NAS provides data on four different types of transport activities, namely, land transport, water transport, air transport, and services incidental to transport. The GDP values for these categories are Rs 22759, Rs 5361, Rs 1727, and Rs 2193 crores, respectively. The computed weights for these categories are 0.7103, 0.1673, 0.0540, and 0.0684, respectively. Adding the two weights for land transport (0.7103) and services incidental to transport (0.0684) amounts to 0.7787. This composite weight is applied to apportion sector 104. The resulting value is further added to two more sectors "railways transport services (103)" and "storage and warehouses (105)" of io93-94. This provides an estimate for GTAP sector OTP. Similarly, weights for two other sectors water transport (0.1673) and air transport (0.0540) are also applied to sector 104 to arrive at values for the WTP and ATP sectors, respectively. Finally, adding two broader groups results in weights for sectors 54 and 55 of GSC2. The first group considers (i) real estate (Rs 317 crore), (ii) business services (Rs 3273 crore), and (iii) legal services (Rs 1587 crore). The second group is composed of: (i) recreational and entertainment services (Rs 559 crore), (ii) Radio and Television (Rs 140 crore iii), and (iii) Personal Services (Rs 8282 crore). The items combined under these two groups finally become Rs 5177 and 8981 crores, respectively. Hence, the weights for GTAP sectors OBS and ROS are 0.3657 and 0.6343, respectively.

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Appendix

Table 11.H.A1 Sectoral Mapping between GSC2 and India's I-O Transactions Table, 1993-94

Sector No.	GSC2	I-O 1993-94 Sector Mapping
1	PDR	1
2	WHT	2
3	GRO	3-5
4	V_F	0.4507*(6-7 and 12-17)
5	OSD	9+0.2530*(6-7 and 12-17)
6	C B	8
7	PFB	10-11+0.0090*(6-7 and 12-17)
8	OCR	0.2873*(6-7 and 12-17)
9	CTL	19
10	OAP	(0.8947*20)
11	RMK	18
12	WOL	(0.10153*20)
13	FRS	21
14	FSH	22
15	COA	23
16	OIL	0.6072*24
17	GAS	0.3928*24
18	OMN	25-32
19	CMT	0.0045*(37-38)
20	OMT	--
21	VOL	35-36
22	MIL	0.1020*(37-38)
23	PCR	0.1958*(37-38)
24	SGR	33-34
25	OFD	0.6977*(37-38)
26	B_T	39-40
27	TEX	41-47 and 49
28	WAP	48
29	LEA	54-55
30	LUM	51
31	PPP	52-53
32	P_C	58 and 59
33	CRP	56-57, 60-68
34	NMM	69-71

Continued

Table 11.H.A1 Sectoral Mapping between GSC2 and India's I-O Transactions Table, 1993-94 (Contd)

Sector No.	GSC2	I-O 1993-94 Sector Mapping
35	I_S	72, 73
36	NFM	75
37	FMP	74, 76, 77
38	MVH	93
39	OTN	91-92, 94-96
40	ELE	82, 88, 90
41	OME	78-81, 83-87, 89, 97
42	OMF	98, 50
43	ELY	100
44	GDT	101
45	WTR	102
46	CNS	99
47	TRD	107, 108
48	OTP	103, (0.7787*104), 105
49	WTP	(0.1673*104)
50	ATP	(0.0540*104)
51	CMN	106
52	OFI	109
53	ISR	110
54	OBS	(0.3657*114)
55	ROS	(0.6343*114)
56	OSG	115, 112, and 113
57	DWE	111

Table 11.H.A2 Description of Sectors in India's Input-Output Table, 1993-94

Sector Number	Sector Name
1	Paddy
2	Wheat
3	Jowar
4	Bajra
5	Maize
6	Gram
7	Pulses
8	Sugarcane
9	Groundnut
10	Jute
11	Cotton
12	Tea
13	Coffee
14	Rubber
15	Coconut
16	Tobacco
17	Other crops
18	Milk and milk products
19	Animal services (agricultural)
20	Other livestock products
21	Forestry and logging
22	Fishing
23	Coal and lignite
24	Crude petroleum, natural gas
25	Iron ore
26	Manganese ore
27	Bauxite
28	Copper ore
29	Other metallic minerals
30	Lime stone
31	Mica
32	Other non metallic minerals
33	Sugar
34	Khandsari, boora
35	Hydrogenated oil (vanaspati)
36	Edible oils other than vanaspati
37	Tea and coffee processing
38	Miscellaneous food products
39	Beverages
40	Tobacco products
41	Khadi, cotton textiles (handlooms)
42	Cotton textiles
43	Woolen textiles
44	Silk textiles
45	Art silk, synthetic fiber textiles
46	Jute, hemp, mesta textiles
47	Carpet weaving
48	Readymade garments
49	Miscellaneous textile products

Continued

Table 11.H.A2 Description of Sectors in India's Input-Output Table, 1993-94 (Contd)

Sector Number	Sector Name
50	Furniture and fixtures-wooden
51	Wood and wood products
52	Paper, paper prods. & newsprint
53	Printing and publishing
54	Leather footwear
55	Leather and leather products
56	Rubber products
57	Plastic products
58	Petroleum products
59	Coal tar products
60	Inorganic heavy chemicals
61	Organic heavy chemicals
62	Fertilizers
63	Pesticides
64	Paints, varnishes and lacquers
65	Drugs and medicines
66	Soaps, cosmetics & glycerin
67	Synthetic fibers, resin
68	Other chemicals
69	Structural clay products
70	Cement
71	Other non-metallic mineral prods.
72	Iron, steel and ferro alloys
73	Iron and steel casting & forging
74	Iron and steel foundries
75	Non-ferrous basic metals
76	Hand tools, hardware
77	Miscellaneous metal products
78	Tractors and agri. Implements
79	Industrial machinery(F & T)
80	Industrial machinery(others)
81	Machine tools
82	Office computing machines
83	Other non-electrical machinery
84	Electrical industrial Machinery
85	Electrical wires & cables
86	Batteries
87	Electrical appliances
88	Communication Equipments
89	Other electrical Machinery
90	Electronic Equipments (incl.TV)
91	Ships and boats
92	Rail Equipments
93	Motor vehicles
94	Motor cycles and scooters
95	Bicycles, cycle-rickshaw
96	Other transport Equipments
97	Watches and clocks
98	Miscellaneous manufacturing

Continued

Table 11.H.A2 Description of Sectors in India's Input-Output Table, 1993-94 (Contd)

Sector Number	Sector Name
99	Construction
100	Electricity
101	Gas
102	Water supply
103	Railway transport services
104	Other transport services
105	Storage and warehousing
106	Communication
107	Trade
108	Hotels and restaurants
109	Banking
110	Insurance
111	Ownership of dwellings
112	Education and research
113	Medical and health
114	Other services
115	Public administration