

China

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1. Introduction

The China I-O table in the GTAP 8 Data Base is constructed from key 2007 I-O table published by National Bureau of Statistics of China (NBS) and some other data sources, for example, HS 10-digit international trade data from China Customs and Yearbook of China Agricultural Products Processing Industries. The original I-O table doesn't have "multi-product" sector. After some adjustments, the data tables are reclassified and re-balanced to provide the matrices required by GTAP. The format of GTAP tables that we submit is the original version, the second type of permitted format. Many Mark's methods are used in updating data base process, and here we give many thanks to Mark Horridge.

2. Data Source

The source of China's contributed data is from "Input-Output Table of China-2007" published by National Bureau of Statistics of China (NBS) in 2009.

The original 2007 I-O table includes 135 sectors, of which there are 5 sectors for agriculture, 90 sectors for manufacture, and 40 sectors for services. The units are 10 thousand Yuan (RMB) at current producer's price, which includes value-added tax but excludes commercial margin, transportation and telecommunication cost. However, for reducing calculation error, the table we contributing is in ten million yuan.

The intermediate input matrix of China's 2007 I-O table is a commodity by commodity matrix, and each sector only produces one commodity. Final demanders include household consumption, government consumption, capital formation, changes in stock and exports. The table also includes an import value column, which valued at c.i.f. price.

The general form of China 2007 I-O table is as follows:

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Table 1. The General Form of China 2007 I-O Table (Producer Price, ten thousand yuan RMB)

Output Input	Intermediate Use			Final Use								
	Sector1	... Sector135		Rural Consumption	Urban Consumption	Government Consumption	Capital Formation	Stock Change	Export	Import	Other	Total Output
Intermediate Input	Sector1 : Sector135											
Value added	Labor Payment (VA001) Net Production Tax (VA002) Capital Depreciation (VA003) Operating Surplus (VA004)											
	Total Input											

3. *Sector Classification*

The sector classification in 2007 contributed table is somewhat different from 2002 contributed table contributed by Li Shangdong, i.e we contribute 45 sectors, 3 more sectors than his. It includes all sectors for manufacturing and services in the GTAP Sectoral Classification, revision 2 (GSC2). The concordance from GSC2 to the sectoral classification used in the contributed table is listed in Table A1, while Table A2 gives the concordance from the 135 sectors in the 2007 China I-O table to the sector classification in the contributed table.

4. *Processing of the Source Data*

The NBS 2007 I-O table doesn't fully satisfy all aspects of the GTAP requirements set out in Huff, McDougall and Walmsley, so main adjustments to I-O table are as follows:

The removal of the "Error" item

- Treatment of Negative Value for Operating Surplus
- Sectoral split
- Split of Import and Domestic Matrices
- Construct of Tax Matrices
- The final balancing of the database

4.1 *Treatment of the "Error" Item*

There is an "Error" vector of each commodity in the original 2007 I-O table. The errors are relatively large, 25 of them (135 sectors) beyond 4 percent of sectoral gross output, and the biggest is 7.8 percent for livestock sector. We treat as follows: first, we add Error item to stock change, forming new Stock change, and then remove the Error vector; second, we control that the absolute value of new Stock change doesn't exceed 3 percent of sectoral gross output, for example, if the new stock change exceed 3 percent of sectoral gross output, we make it equal to 3 percent; third, RAS approach is used to make sure sectoral balance.

4.2 *Treatment of the "Negative Value for Operating Surplus"*

In original 2007 I-O table, all sectors' Operating Surplus are positive except "Post" sector. However, we treat sector's capital revenue as the sum of fixed capital Depreciation and Operating Surplus, so we needn't adjust Post Sector's Operating Surplus for their sum is positive.

4.3 *Sectoral Split*

There are two sectors in the original 2007 I-O table to be split to be consistent with the manufacturing and service sector classifications in GSC2. These are "Grinding of Grains (sector 13011)" and "Real

Estate (72119)” sectors.

Table 2. Sectoral Splits, Percentage Shares

2007 I-O Table	GSC2	Share (%)
13011 Grinding of Grains	9 Processed Rice	31.58
	13 Other Grains Grinding	68.42
72119 Real Estate	45 Dwellings	68.95
	42 Business services	31.05

The split of sector 13011 of the 2007 I-O table was estimated based on data from Yearbook of China Agricultural Products Processing Industries³, and the total output value of Processed Rice sector is 125.71 billion yuan. From the 2007 original I-O table, the total output value of Grinding of Grains is 398.1 billion yuan. The output share of Processed Rice in Grinding of Grains is 31.58%. Assuming the input structure basic flow structure of Processed Rice is simply same as Grinding of Grains, we split out Processed Rice sector.

Table 3. Splits of Sector 13011, (billion yuan, %)

	Processed Rice	Grinding of Grains	Share of Processed Rice
Sectoral Output	125.71	398.1	31.58

Source: Yearbook of China Agricultural Products Processing Industries, 2008

We use the same assumption in splitting sector 72119 Real Estate of 2007 IO table. There is no sector of household dwelling in original I-O table, however, there is a real estate sector (72119) of which household consumption and capital formation are only final demander. The household consumption proportion mainly refers to imputed expenditure by the owner occupied dwellings, and the remained proportion refers to real estate service. So we use household consumption share of final demand to split out Dwelling sector from the Original Real Estate in 2007 I-O table.

Table 4. Split of Sector 72119, (billion, %)

	Household Consumption	Capital Formation	Share of Household Consumption
Real estate	756.45	340.63	68.95

Source: 2007 China Input-Output table, NBS

³ It is published by China Agricultural Press in 2008, but its data is China’s 2007 economic data.

4.4 *Split of Import and Domestic Matrices*

There is only one column vector reporting total import by commodity in the original I-O table. Using method suggested by Mark Horridge, we first calculate the share of total import in total domestic use (intermediate and final). Assuming the import shares of all user using each commodity are same, then multiplying the import share by total use by all user we obtain Import Matrix. Subtracting Import Matrix from Total Use Matrix, Domestic Use Matrix is obtained.

4.5 *Construct of Tax Matrices*

After splitting out Import and Domestic Matrices, Domestic Tax and Import Tax Matrices are split out. We assume different users pay different tax rates, for example, tax factors of industry and export are both 0.5, of stock is 0, and of all remain users are 1. Domestic Commodity tax vector is used to split out Domestic Tax Matrix according to tax factor and domestic commodity usage value of different users. Similarly, Import Commodity tax vector (MTax) is used to split out Import Tax Matrix according to corresponding tax factor and import commodity usage.

4.6 *Balancing the Data Base*

Once all adjustments are completed, RAS method is used to ensure data balance condition: total output equals total costs of each sector; total sales equal total output of each commodity; income GDP equals expenditure GDP. After RAS balance, the data meets GTAP's requirements.

5. *Improvements*

Compared with early China's data contributed to GTAP, some aspects that we are improving include: we contribute 45 sectors, more sectors and more detailed than ever China's contributed data, including Processed rice, Vegetable oils and fats, and Sugar; when splitting import value of each commodity into three types, import value-added tax (Mtax), import tariff (Mtar) and import c.i.f. value, we aggregate HS 10-digit international trade data from China Customs, and then obtain weighted average of tariff rate and value-added tax rate of each commodity.

6. *Diagnostics*

The China GTAP Data Base was checked to ensure that:

- (a) All sign conditions are met. All pre-tax commodity usage values (except changes in stocks) are non-negative, where pre-tax commodity usage values are strictly positive, post-tax values are also strictly positive, and all factor usage values are non-negative.
- (b) All balance conditions are met. Total output equal total costs of each sector, and total sales equal to total output of each commodity.
- (c) No ridiculous tax rates exist in data. Taxes on domestic and imported commodities are all non-negative.
- (d) The GTAP entropy I-O cost shares appear correct.

References

- Huff, Karen, Robert McDougall and Terrie Walmsley. 2000." Contributing Input-Output Tables to GTAP Data Base", GTAP technical Paper No.01, 2000
- Li Shantong and He Janus. 2008." GTAP 7 Data Documentation- Chapter 7 I-O Table: China", GTAP Resources, #2882
- Department of National Economy Accounting, National Bureau Statistic (NBS). 2009." Input-Output Table of China-2007"
- Ministry of Science and Technology. 2009." Yearbook of China Agricultural Products Processing Industries"
- Terry Maidment and Owen Gabbitas. 2005." GTAP 7 Data Base Documentation- Chapter 7 I-O Table: Australia", GTAP Resources, #2945

Appendix

Table A1. Concordance from GSC2 to the Classification Used in the Contributed Table

Classification in the Contributed table	GSC2 sectors
1 Crops	1 Paddy rice
	2 Wheat
	3 Cereal grains nec
	4 Vegetables, fruit, nuts
	5 Oil seeds
	6 Sugar cane, sugar beet
	7 Plant-based fibers
	8 Crops nec
2 Livestock	9 Cattle, sheep, goats, horses
	10 Animal products nec
	11 Raw milk
	12 Wool, silk-worm cocoons
3 Forestry	13 Forestry
4 Fishing	14 Fishing
5 Coal	15 Coal
6 Oil Gas	16 Oil Gas
7 Minerals n.e.c	18 Minerals nec
8 Processed rice	23 Processed rice
9 Vegetable oils and fats	21 Vegetable oils and fats
10 Sugar	24 Sugar
11 Meat products	19 Meat: cattle, sheep, goats, horse
	20 Meat products nec
12 Dairy products	22 Dairy products
13 other food products	25 Food products nec
14 Beverages and tobacco products	26 Beverages and tobacco products
15 Textiles	27 Textiles
16 Wearing apparel	28 Wearing apparel
17 Leather products	29 Leather products
18 Wood products	30 Wood products
19 Paper products, publishing	31 Paper products, publishing
20 Petroleum, coal products	32 Petroleum, coal products
21 Chemical, rubber, plastic products	33 Chemical, rubber, plastic prods
22 Mineral products nec	34 Mineral products nec
23 Ferrous metals	35 Ferrous metals
24 Metals nec	36 Metals nec
25 Metal products	37 Metal products
26 Motor vehicles and parts	38 Motor vehicles and parts
27 Transport equipment nec	39 Transport equipment nec
28 Electronic equipment	40 Electronic equipment
29 Machinery and equipment nec	41 Machinery and equipment nec

30	Manufactures nec	42	Manufactures nec
31	Electricity	43	Electricity
32	Gas manufacture, distribution	44	Gas manufacture, distribution
33	Water	45	Water
34	Construction	46	Construction
35	Trade	47	Trade
36	Transport nec	48	Transport nec
37	Sea transport	49	Sea transport
38	Air transport	50	Air transport
39	Communication	51	Communication
40	Financial services nec	52	Financial services nec
41	Insurance	53	Insurance
42	Business services nec	54	Business services nec
43	Recreation and other services	55	Recreation and other services
44	PubAdmin/Defence/Health/Educat	56	PubAdmin/Defence/Health/Educat
45	Dwellings	57	Dwellings

Table A2. Concordance from the Classification Used in the Contributed Table to the Sectoral Classification of Chinese Input-Output Table

Classification in the Contributed Table		Classification in the China's 2007 I-O Table	
1	Crops	01001	Farming
2	Livestock	03003	Animal Husbandry
3	Forestry	02002	Forestry
4	Fishing	04004	Fishery
5	Coal	06006	Mining and Washing of Coal
6	Oil Gas	07007	Extraction of Petroleum and Natural Gas
7	Minerals nec	08008	Mining of Ferrous Metal Ores
		08009	Mining of Non-Ferrous Metal Ores
		10010	Mining and Processing of Nonmetal Ores and Other Ores
	Processed rice	13011	
8		*	Grinding of Grains
9	Vegetable oils and fats	13013	Refining of Vegetable Oil
10	Sugar	13014	Manufacture of Sugar
11	Meat products	13015	Slaughtering and Processing of Meat
12	Dairy products	14019	Manufacture of Liquid Milk and Dairy Products
		13011	
13	Other food products	*	Grinding of Grains
		13012	Processing of Forage
		13016	Processing of Aquatic Product
		13017	Processing of Other Foods
		14018	Manufacture of Convenience Food
		14020	Manufacture of Flavoring and Ferment Products
		14021	Manufacture of Other Foods
14	Beverages and tobacco products	15022	Manufacture of Alcohol and Wine

		15023	Processing of Soft Drinks and Purified Tea
		16024	Manufacture of Tobacco
15	Textiles	17025	Spinning and Weaving, Printing and Dyeing of Cotton and Chemical Fiber
		17026	Spinning and Weaving, Dyeing and Finishing of Wool
		17027	Spinning and Weaving of Hemp and Tiffany
		17028	Manufacture of Textile Products
		17029	Manufacture of Knitted Fabric and Its Products
		28047	Manufacture of Chemical Fiber
16	Wearing apparel	18030	Manufacture of Textile Wearing Apparel, Footwear and Caps
17	Leather products	19031	Manufacture of Leather, Fur, Feather(Down) and Its Products
18	Wood products	20032	Processing of Timbers, Manufacture of Wood, Bamboo, Rattan, Palm and Straw Products
		21033	Manufacture of Furniture
19	Paper products, publishing	22034	Manufacture of Paper and Paper Products
		23035	Printing, Reproduction of Recording Media
20	Petroleum, coal products	25037	Processing of Petroleum and Nuclear Fuel
		25038	Coking
21	Chemical, rubber, plastic products	26039	Manufacture of Basic Chemical Raw Materials
		26040	Manufacture of Fertilizers
		26041	Manufacture of Pesticides
		26042	Manufacture of Paints, Printing Inks, Pigments and Similar Products
		26043	Manufacture of Synthetic Materials
		26044	Manufacture of Special Chemical Products
		26045	Manufacture of Chemical Products for Daily Use
		27046	Manufacture of Medicines
		29048	Manufacture of Rubber
		30049	Manufacture of Plastic

22	Mineral products nec	31050	Manufacture of Cement, Lime and Plaster
		31051	Manufacture of Products of Cement and Plaster
		31052	Manufacture of Brick, Stone and Other Building Materials
		31053	Manufacture of Glass and Its Products
		31054	Manufacture of Pottery and Porcelain
		31055	Manufacture of Fire-resistant Materials
		31056	Manufacture of Graphite and Other Nonmetallic Mineral Products
23	Ferrous metals	32057	Iron-smelting
		32058	Steelmaking
		32059	Rolling of Steel
		32060	Smelting of Ferroalloy
24	Metals nec	33061	Smelting of Non-Ferrous Metals and Manufacture of Alloys
		33062	Rolling of Non-Ferrous Metals
25	Metal products	34063	Manufacture of Metal Products
26	Motor vehicles and parts	37074	Manufacture of Automobiles
27	Transport equipment nec	37073	Manufacture of Railroad Transport Equipment
		37075	Manufacture of Boats and Ships and Floating Devices
		37076	Manufacture of Other Transport Equipment
28	Electronic equipment	40082	Manufacture of Communication Equipment
		40083	Manufacture of Radar and Broadcasting Equipment
		40084	Manufacture of Computer
		40085	Manufacture of Electronic Component
		40086	Manufacture of Household Audiovisual Apparatus
		40087	Manufacture of Other Electronic Equipment
29	Machinery and equipment nec	35064	Manufacture of Boiler and Prime Mover
		35065	Manufacture of Metalworking Machinery

		35066	Manufacture of Lifters
		35067	Manufacture of Pump, Valve and Similar Machinery
		35068	Manufacture of Other General Purpose Machinery
		36069	Manufacture of Special Purpose Machinery for Mining, Metallurgy and Construction
		36070	Manufacture of Special Purpose Machinery for Chemical Industry, Processing of Timber and Nonmetals
		36071	Manufacture of Special Purpose Machinery for Agriculture, Forestry, Animal Husbandry and Fishery
		36072	Manufacture of Other Special Purpose Machinery
		39077	Manufacture of Generators
		39078	Manufacture of Equipments for Power Transmission and Distribution and Control
		39079	Manufacture of Wire, Cable, Optical Cable and Electrical Appliances
		39080	Manufacture of Household Electric and Non-electric Appliances
		39081	Manufacture of Other Electrical Machinery and Equipment
		41088	Manufacture of Measuring Instruments
		41089	Manufacture of Machinery for Cultural Activity & Office Work
30	Manufactures nec	24036	Manufacture of Articles for Culture, Education and Sports Activities
		42090	Manufacture of Artwork, Other Manufacture
		43091	Scrap and Waste
31	Electricity	44092	Production and Supply of Electric Power and Heat Power
32	Gas manufacture, distribution	45093	Production and Distribution of Gas
33	Water	46094	Production and Distribution of Water
34	Construction	47095	Construction
35	Trade	63111	Wholesale and Retail Trades
		65112	Wholesale and Retail Trades
		66113	Hotels

36	Transport n.e.c	37114	Catering Services
		51099	Transport Via Railway
		52100	Transport Via Road
		53101	Urban Public Traffic
		56104	Transport Via Pipeline
		57105	Loading, Unloading, Portage and Other Transport Services
		58106	Storage
		74125	Tourism
37	Water transport	54102	Water transport
38	Air transport	55103	Air transport
39	Communication	59107	Post
		60108	Telecom & Other Information Transmission Services
40	Financial service nec	68115	Banking, Security, Other Financial Activities
41	Insurance	70117	Insurance
42	Business services nec	05005	Services in Support of Agriculture
		61109	Computer Services
		62110	Software Industry
		72119	
		*	Real Estate
		73123	Leasing
		74124	Business Services
		75126	Research and Experimental Development
		76127	Professional Technical Services
43	Recreation services nec	82133	Services to Households
		83134	Other Services
		88139	Journalism and Publishing Activities

		89140	Broadcasting, Movies, Televisions and Audiovisual Activities
		90141	Cultural and Art Activities
		91142	Sports Activities
		92143	Entertainment
	Public administration and defense, education, health		
44	services	77128	Services of Science and Technology Exchanges and Promotion
		78129	Geological Prospecting
		79130	Management of Water Conservancy
		80131	Environment Management
		81132	Management of Public Facilities
		84135	Education
		85136	Health
		86137	Social Security
		87138	Social Welfare
		93144	Public Management and Social Organization
		72119	
45	dwellings	*	Real Estate

*Denotes a China IO table sector splitting into more than one GTAP GSC2 sector.