

1. *Introduction*

The original 2012 input output table doesn't have "multi-product" sector and are reclassified and rebalanced to meet the requirements of GTAP data base. The format of GTAP tables that we contribute is the original version, the second type of permitted format. Many methods developed by Horridge are used in updating the data base, and here we give many thanks to Professor Mark Horridge.

2. *Data Source*

The source of China's contributed data is "2012 Input-Output Table of China" (original 2012 IO table) published by National Bureau of Statistics of China (NBS) in 2015. Some trade related data (Import CIF value, Import tariff rate and VAT rate) is from China Customs.

The China's 2012 IO table includes 139 sectors, of which there are 5 sectors for agriculture, 97 sectors for manufacturing, and 37 sectors for services. The unit are 10 thousand Yuan (RMB) at current producers' prices, which includes VAT but do not include margins (makeup and transportation cost). However, for reducing calculation error, the table we contributing are in ten million Yuan (RMB).

The intermediate input matrix of China's 2012 IO table is a commodity by commodity matrix, and each sector only produces one commodity. Final demands include household consumption, government consumption, capital formation, changes in stock and exports. The table also includes an import value column, which valued at CIF price.

The general layout of China's 2012 IO table is as follows:

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Table1. The general layout of China's 2012 IO Table (Current Producers' Prices, ten thousand Yuan)

Output Input	Intermediate Use		Final Demand								
	Sector 1	... Sector 139	Rural Consumption	Urban Consumption	Government Consumption	Capital Formation	Stock Change	Exports	Imports	Error	Total Output
Intermediate Input	Sector 1 : Sector 139										
Value added	Labor Payment (VA001) Net Production Tax (VA002) Capital Depreciation (VA003) Operating Surplus (VA004)										
	Total Input										

3. *Sector Classification*

The 2012 contributed table includes 45 sectors and has the same sector classification as 2007 contributed table. The correspondences between GSC2 and the sector classification used in the contributed table is listed in Table A1. While Table A2 gives information on correspondences between the 139 sectors in China’s 2012 IO table to the 45 sectors in the contributed table.

4. *Data Processing*

The original 2012 IO table doesn’t fully satisfy the requirements of the GTAP data base described in Huff, McDougall and Walmsley. So main adjustments to IO table are as follows:

- Removal of the “Error” item;
- Treatment of negative value for Operating Surplus;
- Sector split;
- Split Total Domestic Use into import and domestic matrices;
- Construct of Tax Matrices;
- Rebalance of the database.

3.1 *Treatment of the “Error” Item*

There is an “Error” term for each commodity in the original 2012 IO table. The errors are relatively large, 8 of them (139 sectors) beyond 2% of sector gross output, and the biggest is 3% for Manufacture of Chemical Products for Daily Use. The adjustments are as follows: first, we add the Error term 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% of sector gross output, for example, if the new stock change exceed 3% of sector gross output, we make it equal to 3%; Third, RAS approach is used to make sure sector balance.

3.2 *Treatment of the “Negative Value for Operating Surplus”*

In original 2012 IO table, all sectors’ Operating Surplus is positive. However, we treat sector’s capital revenue as the sum of Capital Depreciation and Operating Surplus, so even if there is negative Operating Surplus it doesn’t matter, because the sum often is positive.

3.3 *Sector Split*

Two sectors in the original 2012 IO table need to be split to be consistent with the manufacturing and service sector classifications in GSC2. These are “GrainMillOil” and “Real Estate” (Table 2).

Table 2 Sector Split in the 2012 table

2012 IO Table	GSC2
GrainMillOil	Processed Rice
	OtherGrainMill
Real Estate	Dwellings
	Business Real Estate

The output share of Processed Rice in GrainMillOil sector is estimated based on data from Yearbook of China Agricultural Product Processing Industries. According to Yearbook of China

Agricultural Product Processing Industries, total output of Processed Rice sector is 309.31 Billion Yuan. From the original 2012 IO table, the total output of GrainMillOil sector is 951.57 Billion Yuan. Thus, the output share of Processed Rice in GrainMillOil is 32% (Table 3). Assuming that the input-output structure of Processed Rice sector is simply the same as GrainMillOil sector, then we get the structure of Processed Rice sector.

Table 3. Split of GrainMillOil Sector (%)

	Processed Rice	OtherGrainMill	GrainMillOil
Share of Sectoral Output	32	68	100

Source: Yearbook of China Agricultural Products Processing Industries, 2015

Real Estate sector can be split into residential part (Dwellings) and business services part. We use the share of consumption in "final demand" (sum of consumption part and capital formation part of real estate) to split out residential part. According to the original 2012 IO table, the consumption part of Real Estate is about 2066.82 billion Yuan, with 3007.46 Yuan for "final demand". Thus, the output share of Dwellings in Real Estate is about 69% (Table 4). We employ the same assumption to get the input-output structure of Dwellings sector and Business Real Estate sector.

Table 4. Split of Real Estate Sector (%)

	Dwellings	Business Real Estate	Real Estate
Share of Sectoral Output	69	31	100

Source: 2012 Input-output table of China, NBS

3.4 Split Import and Domestic Matrices

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

3.5 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.

3.6 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; GDP from income side equals GDP from expenditure side. After RAS balance, the data meets GTAP data base's requirements.

5. *Improvements*

Compared with early China's data contributed to GTAP, there are two aspects that we are improving. First, we are using the latest input-output tables, its benchmark year is 2012. Second, 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 is checked to ensure that:

- 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.
- All balance conditions are met. Total output equal total costs of each sector, and total sales equal to total output of each commodity.
- No ridiculous tax rates exist in data. Taxes on domestic and imported commodities are all non-negative.
- The GTAP entropy IO 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

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Appendix

Table A1. Concordance between GSC2 and the 45 sectors in the Contributed data
45 sectors in the contributed table **GSC2 sectors**

1	Crops	1	Paddy rice
		2	Wheat
		3	Cereal grains n.e.c
		4	Vegetables, fruit, nuts
		5	Oil seeds
		6	Sugar cane, sugar beet
		7	Plant-based fibers
		8	Crops n.e.c
2	Livestock	9	Bovine Cattle, sheep and goats, horses
		10	Animal products n.e.c
		11	Raw milk
		12	Wool, silk-worm cocoons
3	Forestry	13	Forestry
4	Fishing	14	Fishing
5	Coal	15	Coal
6	OilGas	16	Oil
		17	Gas
7	Minerals n.e.c	18	Minerals n.e.c
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 n.e.c
12	Dairy products	22	Dairy products
13	other food products	25	Food products n.e.c
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 prods	33	Chemical, rubber, plastic prods
22	Mineral products n.e.c	34	Mineral products n.e.c
23	Ferrous metals	35	Ferrous metals
24	Metals n.e.c	36	Metals n.e.c
25	Metal products	37	Metal products
26	Motor vehicles and parts	38	Motor vehicles and parts
27	Transport equipment n.e.c	39	Transport equipment n.e.c
28	Electronic equipment	40	Electronic equipment
29	Machinery and equipment n.e.c	41	Machinery and equipment n.e.c

45 sectors in the contributed table**GSC2 sectors**

30	Manufactures n.e.c	42	Manufactures n.e.c
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 n.e.c	48	Transport n.e.c
37	Sea transport	49	Sea transport
38	Air transport	50	Air transport
39	Communication	51	Communication
40	Financial services n.e.c	52	Financial services n.e.c
41	Insurance	53	Insurance
42	Business services n.e.c	54	Business services n.e.c
43	Recreation and other services	55	Recreation and other services
44	PubAdmin/Defence/Health/Education	56	PubAdmin/Defence/Health/Education
45	Dwellings	57	Dwellings

Table A2. Concordance between the 45 Sectors in the Contributed Table and the 139 Sectors of China's 2012 Input-Output Table

Classification in the Contributed Table		Classification in the China's 2012 IO Table	
1	Crops	1001	Crops
2	Livestock	3003	Livestk
3	Forestry	2002	Forest
4	Fishing	4004	Fishery
5	Coal	6006	CoaMinPro
6	OilGas	7007	CrudeOilGas
7	Minerals n.e.c	8008	FerrOre
		9009	NFerrOre
		10010	NMtlMine
8	Processed rice	13012	*Processed rice
9	Vegetable oils and fats	13014	VegetOils
10	Sugar Refining	13015	SugarRef
11	Meat products	13016	ProcesMeat
12	Dairy products	14020	DairyPro
13	Other food products	13011	*OthGrainMill
		13013	AnimalFood
		13017	FishProc
		13018	VeFrNuNec
		14019	ConvtProFood
		14021	CondtProFood
		14022	OtherMadFood
14	Beverages and tobacco products	15023	Wines
		15024	OtherBev
		16025	Tobacco
15	Textiles	17026	CottonTextil
		17027	WoolTextiles
		17028	SilkTextiles
		17029	KnitMill
		17030	TextProc
		28049	ChemFiber
16	Wearing apparel	18031	Clothes
		19033	Shoes
17	Leather products	19032	Leather
18	Wood products	20034	Sawmills
19	Paper products, publishing	22036	PaperProd
		23037	Printing
		24038	CultSportEqp
20	Petroleum, coal products	25039	PetrolRef
		25040	Coking
21	Chemical, rubber, plastic products	26041	BasicChem
		26042	Fertlizr
		26043	Pesticide

Classification in the Contributed Table

Classification in the China's 2012 IO Table

		26044	PaintsDyes
		26045	SynthMate
		26046	SpecChem
		26047	ChemDly
		27048	Medicine
		29050	RubberPrd
		29051	PlasticPrd
22	Mineral products n.e.c	30052	CemLimPla
		30053	CemPlaPro
		30054	BrickMaterl
		30055	Glass
		30056	China
		30057	Fireproof
		30058	NMtlMinPr
23	Ferrous metals	31059	SteelIron
		31060	SteelProc
		31061	FerAllPro
24	Metals n.e.c	32062	NFAllCast
		32063	NFRollPro
25	Metal products	33064	MetalProd
26	Motor vehicles and parts	36075	Automobile
		36076	AutoPart
27	Transport equipment n.e.c	37077	RailEqp
		37078	Ships
		37079	OthTransEqp
28	Electronic equipment	39086	Computer
		39087	ElecCommsEqp
		39088	RadarBroEqp
		39089	VidTvEqp
		39090	EleComp
		39091	OthElecEqp
29	Machinery and equipment n.e.c	34065	Boilers
		34066	MtlwrkMch
		34067	CraneEqpMch
		34068	PumpOthMch
		34069	CulOffEqp
		34070	GenerlEqpNEC
		35071	MineSpecIMch
		35072	ChemSpecIMch
		35073	AgrMchn
		35074	SplEqpNEC
		38080	Genratrs
		38081	PTDContrlEqp
		38082	EleWireEqp

Classification in the Contributed Table

Classification in the China's 2012 IO Table

		38083	Battery
		38084	HomeEleEqp
		38085	EleMachNec
		40092	Meters
		43095	MchRepair
30	Manufactures n.e.c	21035	Furniture
		41093	OthManu
		42094	Scrap
31	Electricity	44096	ElecSteam
32	Gas manufacture, distribution	45097	GasSupply
33	Water	46098	WaterSupply
34	Construction	47099	HouseCons
		48100	CiviEngi
		49101	BuildInsta
		50102	BuildDeco
35	Trade	51103	Retail
		61112	Hotels
		62113	CaterServ
36	Transport n.e.c	53104	RailTrans
		54105	RoadTrans
		57108	PipeTrans
		58109	TranAgent
		59110	Storage
37	Transport n.e.c	55106	WaterTran
38	Transport n.e.c	56107	AirTrans
39	Communication	60111	Post
		63114	OthInfSer
40	Financial service n.e.c	66116	FinanSer
		67117	CapitaSer
41	Insurance	68118	Insurance
42	Business services n.e.c	5005	AgriServ
		11011	OthMinSer
		65115	SoTechSer
		70119	* Real estate
		71120	Lease
		72121	BusiSer
		73122	Research
		74123	TechSrvc
		75124	TechExtdSrvc
43	Recreation services n.e.c	79128	HouseSer
		80129	OthServe
		85133	JornalPub
		86134	BrocstFlmTV
		87135	CultureArts

Classification in the Contributed Table		Classification in the China's 2012 IO Table	
		88136	Sports
		89137	RecreatSrvc
44	Public administration and defense, education, health services	76125	WaterTechSvc
		77126	EcoConser
		78127	PubCommi
		82130	Education
		83131	Health
		84132	SociaWork
		93138	PubSecu
		90139	PublicAdmin
45	dwellings	70119	* Dwellings

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