M China

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M.1 Introduction

This document describes the construction of the Chinese input-output table for the GTAP 11 data base. Section 1 describes the source data. Section 2 discusses the strengths and limitations of the original input-output table. Section 3 presents the sectoral classification of the source data and a mapping between it and the GTAP sectors. Section 4 outlines the processing of source data into a form corresponding to GTAP requirements. Section 5 notes the improvement of this version compared with the early contributed data. Section 6 outlines key diagnostics test applied to the contributed data.

The original 2017 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 et al. (2008) are used in updating the data base, and here we give many thanks to Professor Mark Horridge.

M.2 Data Source

The source of China's contributed data is "2017 Input-Output Table of China" (original 2017 IO table) published by National Bureau of Statistics of China (NBS) in 2019. Some trade related data (Import CIF value, Import tariff rate and VAT rate) is from China Customs.

The China's 2017 IO table includes 149 sectors, of which there are 5 sectors for agriculture, 99 sectors for manufacturing, and 45 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 2017 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 table provides data on inputs of three primary factors of production — labor payment, capital depreciation and operating surplus—by each sector. Figure 8.21 shows the general layout of China's 2017 IO table.

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Figure 8.21: The general layout of China's 2017 IO Table (Current Producers' Prices, ten thousand Yuan)

Output / Input	Intermediate Use			Final Demand							
	Sector 1	···	Sector 149	Rural Consumption	Urban Consumption	Government Consumption	Capital Formation	Stock Change	Exports	Imports	Total Output
Intermediate Input	Sector 1										
	⋮										
	Sector 149										
Value added	Labor Payment (VA001)										
	Net Production Tax (VA002)										
	Capital Depreciation (VA003)										
	Operating Surplus (VA004)										
	Total Input										

M.3 Sector Classification

The 2017 contributed table includes 53 sectors and has four more sectors than the 2012 contributed table. The concordance between the 53 sectors and GTAP sectors is reported in Table A1. While Table A2 gives information on concordance between the 53 sectors in the contributed table and the 149 sectors in original 2017 IO table.

M.4 Strengths and Limitations of the Original Input-Output Table

We have made several checks on the original IO table provided by the NBS. They include checks of the non-negativity conditions and sectoral balance conditions. We also check the plausibility of tax rates and the structure of industries' costs. This section discusses the strengths and limitations of the original IO table. The procedures that we used to address these limitations are outlined in the next section.

Strengths

— The original IO table contains detailed data on supply and use of 149 commodities in China, specifically is 'single product' in nature—a commodity-by-commodity table;

— The original IO table is balanced. There was a column vector reporting "Error" value for each commodity in NBS IO table before 2017, but these errors were removed in NBS 2017 IO table. No treatments are needed to make sure the total sales aligned to total costs for each sector.

Limitations

— There are no import data by commodity and category of use; there is only one column vector reporting total import by commodity in the original IO table;

— There are no tax data by commodity and category of use; there is only one row vector reporting other taxes less subsidies on production;

— There are no separate values for capital and land rentals; they are grouped into capital depreciation and operating surplus.

M.5 Data Processing

The original 2017 IO table doesn't fully satisfy the requirements of the GTAP data base described in Huff, McDougall and Walmsley (2000). So main adjustments to IO table are as follows:

— 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.

4.1 Treatment of the Negative Value for Operating Surplus

In original 2017 IO table, negative value for operating surplus occurred in two sectors. 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.

Sector Split

Two sectors in the original 2017 IO table need to be split to be consistent with the manufacturing and service sector classifications in GTAP. These are "GrainMillOil" and "Real Estate" (Table 8.26).

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 495.6 Billion Yuan. From the original 2017 IO table, the total output of GrainMillOil sector is 1410.0 Billion Yuan. Thus, the output share of Processed Rice in GrainMillOil is 35% (Table 8.27). Assuming

Table 8.26: Sector Split in the 2017 table

2017 IO Table	GTAP Sectors
GrainMillOil	Processed Rice
	OtherGrainMill
Real Estate	Dwellings
	Real Estate activities

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 8.27: Split of GrainMillOil Sector (%)

	Processed Rice	OtherGrainMill	GrainMillOil
Share of Sectoral Output	35	65	100

Source: Yearbook of China Agricultural Products Processing Industries, 2018

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 2017 IO table, the consumption part of Real Estate is about 3548.6 billion Yuan, with 4602.3 billion Yuan for "final demand". Thus, the output share of Dwellings in Real Estate is about 77% (Table 4). We employ the same assumption to get the input-output structure of Dwellings sector and Business Real Estate sector.

Table 8.28: Split of Real Estate Sector (%)

	Dwellings	Business Real Estate	Real Estate
Share of Sectoral Output	77	23	100

Source: 2017 Input-output table of China, NBS

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.

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 is used to split out import tax matrix according to corresponding tax factor and import commodity usage.

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.

M.6 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 2017. Second, when splitting import value of each commodity into three types, import value-added tax, import tariff 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.

M.7 Diagnostics

The China GTAP data base is 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 IO cost shares appear correct.

References

Horridge, M., R. McDougall, B. Narayanan, and T. Walmsley. 2008. "Exercises in Contributing I-O Tables to the GTAP Data Base", GTAP Resources

Huff, K., McDougall, R. and Walmsley, T. 2000. "Contributing Input-Output Tables to GTAP Data Base", GTAP Technical Paper No.1

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), 2019. "Input-Output Table of China-2017"

Maidment T. and O. Gabbitas, 2005. "GTAP 7 Data Base Documentation- Chapter 7 IO Table: Australia", GTAP Resources

Ministry of Science and Technology, 2018. "Yearbook of China Agricultural Products Processing Industries"