# Compilation of 2012 China's Multi-provincial Input-output Model

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# Contents

# 1. Introduction

- State Information Center(SIC) has been working on the construction of inter-regional Input-Output table since early 1980s. Our main products include a series of China multi-regional Input-Output (CMRIO) tables , the Transnational Interregional Input-Output (TIIO) Tables and the Asian Input-Output (AIO) tables (in collaboration with the IDE-JETRO )

  - CMRIO: 1997, 2002 and 2007
  - TIIO: 2000(China and Japan), 2005(China, Japan and Korea)
  - AIO: 1985, 1990, 1995, 2000 and 2005

- Our current work on the construction of 2012 China CMRIO is effectively using the more reliable 2012 provincial input-output table. We adopted the sector classification used by the National Bureau of Statistics (NBS). We aggregated some of the service industries, so that the models are classified at 29-industry level. It is basically comparable at the industrial classification. The regional division is the same for the 1997, 2002 and 2007 models
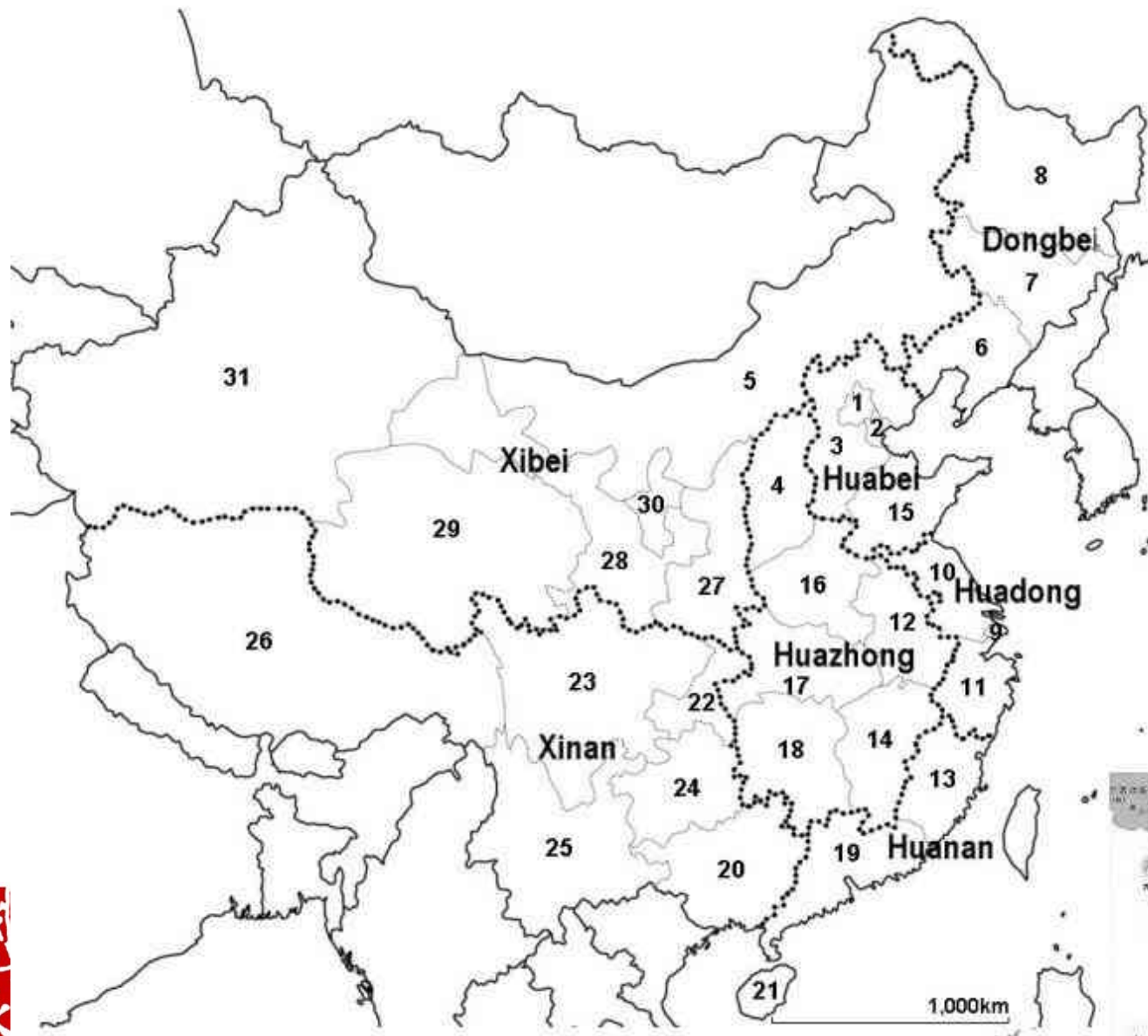
# 2. The main features of CMRIO compilation

- The entire development is based on 31 provinces (municipalities, autonomous regions), various regional versions of MRIO model can be made after aggregating different province groups

- Before adjusting provincial tables: inconsistency check between national and provincial IO- biggest difference with 2007 CMRIO

- Adjusting provincial tables: dealing with entrepot trade to compiling

   import-inflow non-competitive provincial tables

- Estimation of interregional trade coefficients: we propose specific model based on entropy maximizing and gravity models, especially improved the proportion of road transportation

- when conducting balance adjustment, each province's table are fully used in total control that the sum of all provinces' tables equals to national table

# 2. The main features of CMRIO compilation

| | | | Intermediate Use | | | | | | Domestic Final Use | | | Export | Total Output |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Region 1 | | | ... | Region m | | | Region 1 | ... | Region m | | |
| | | | sector1 | ... | Sector n | | sector1 | ... | Sector n | | | | | |
| Intermediate Input | Region 1 | Sector 1 | $x_{11}^{11}$ | ... | $x_{1n}^{11}$ | ... | $x_{11}^{1m}$ | ... | $x_{1n}^{1m}$ | $F_1^{11}$ | ... | $F_1^{1m}$ | $E_1^1$ | $X_1^1$ |
| | | ⋮ | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| | | Sector n | $x_{n1}^{11}$ | ... | $x_{nn}^{11}$ | ... | $x_{n1}^{1m}$ | ... | $x_{nn}^{1m}$ | $F_n^{11}$ | ... | $F_n^{1m}$ | $E_n^1$ | $X_n^1$ |
| | ⋮ | ⋮ | | | ... | | | ... | | ... | ... | ... | | ... |
| | Region m | Sector 1 | $x_{11}^{m1}$ | ... | $x_{1n}^{m1}$ | ... | $x_{11}^{mm}$ | ... | $x_{1n}^{mm}$ | $F_1^{m1}$ | ... | $F_1^{m1}$ | $E_1^m$ | $X_1^m$ |
| | | ⋮ | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| | | Sector n | $x_{n1}^{m1}$ | ... | $x_{nn}^{m1}$ | | $x_{n1}^{mm}$ | ... | $x_{nn}^{mm}$ | $F_n^{m1}$ | ... | $F_n^{m1}$ | $E_n^m$ | $X_n^m$ |
| Import | | | $M_1^1$ | ... | $M_n^1$ | ... | $M_1^m$ | ... | $M_n^m$ | $FM^1$ | ... | $FM^m$ | | |
| Value Added | | | $V_1^1$ | ... | $V_n^1$ | ... | $V_1^m$ | ... | $V_n^m$ | | | | | |
| Total Input | | | $X_1^1$ | ... | $X_n^1$ | ... | $X_1^m$ | ... | $X_n^m$ | | | | | |

# 3. The inconsistency check between national and provincial IO

1. **Inconsistency of non-zero items:** it refers to the item is zero in the national input-output table while the corresponding data in the provincial tables is not zero, which is mainly showed in the intermediate inputs and the final demand
   - for the intermediate transactions
     - ✓ the non-zero inconsistency of intermediate input sector mainly from extraction of crude petroleum and natural gas, mining of metal ores, mining and quarrying of nonmetallic mineral and other mineral of nonmetal ores and other ores,
     - ✓ the main source of non-zero inconsistency of intermediate use sectors are manufacture of communication equipment , computer and other equipment, manufacture of measuring instruments, manufacture of food and tobacco.

# 3.The inconsistency check between national and provincial IO

- For the final demands, the non-zero inconsistency primary showed in rural consumption, urban consumption, government consumption and fixed assets
  - ✓ Construction has the strongest inconsistency in rural and urban consumption, the number of inconsistent province achieves 28.
  - ✓ For government consumption, the strongest inconsistent sector is services to households, repair and other services, the number of inconsistent province is 10.
  - ✓ For fixed assets, the strongest inconsistent provinces are Inner Mongolia and XinJiang, and the strongest inconsistent sector is other manufacture.

2. **Inconsistency of error term:** the national table has the column of error term in final demand while most provincial tables do not have. Nearly all sectors in the NIO have such discrepancy , however, only Liaoning, Jilin, Jiangsu, Shandong, Henan, Hubei, Chongqing, Xizang, Shaanxi, Gansu and Ningxia tables contain error term

3.  **Inconsistency of the control totals:** the total amounts of total output, value added, final demand and intermediate input/use of 31 provinces and not equal to the corresponding data in national input-output table.
    - the sum of total output , total intermediate use, the sum of value added and total final use  of 31 provinces are higher than that in national IO of 6.72, 5.77, 8.60 and 73.4 percentage points respectively.
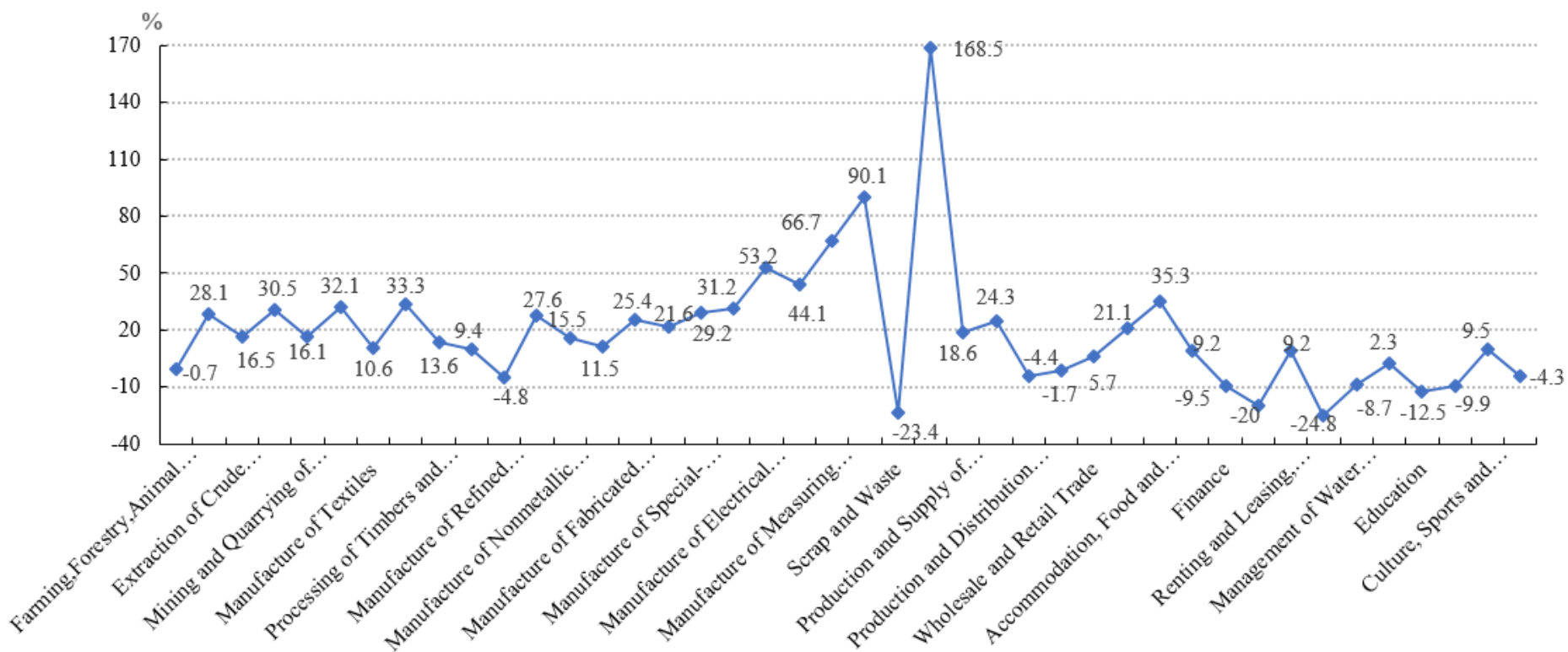
4. **Inconsistency at the sector level of the total output:** the Sum of the most manufacturing sector's output of 31 provinces is higher than that in the national IO table, mining of metal ores is the biggest, the data of national table is lower than the sum of 31 provinces 52.3 percent points
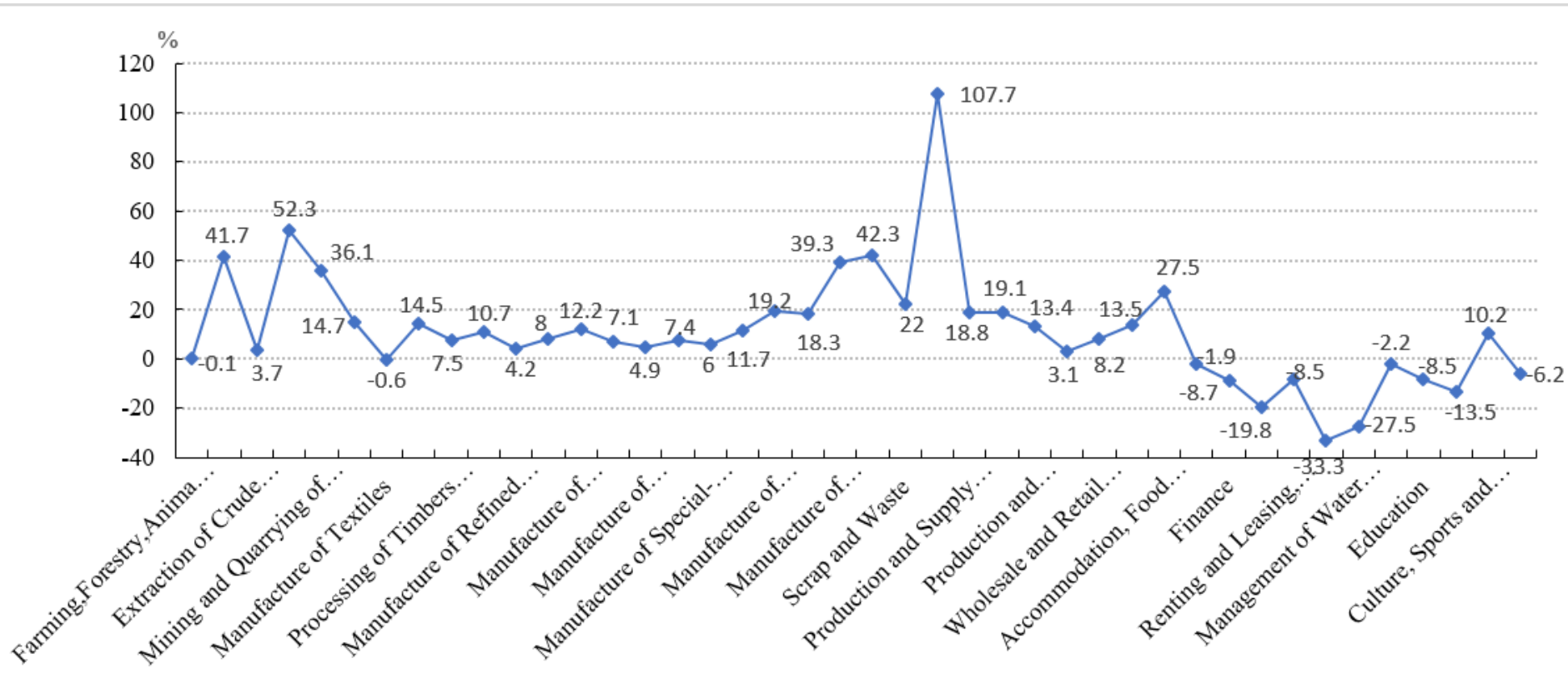
4. **Inconsistency at the sector level of the value added:** the sum of 31 provinces is 8.60 percentage points higher than that in national table. Most of the sectors are larger than the corresponding data in national IO table

4. **Inconsistency at the sector level of the intermediate transaction:** the sum of intermediate use of 31 provinces is 5.77 percentage point higher than that in the national table
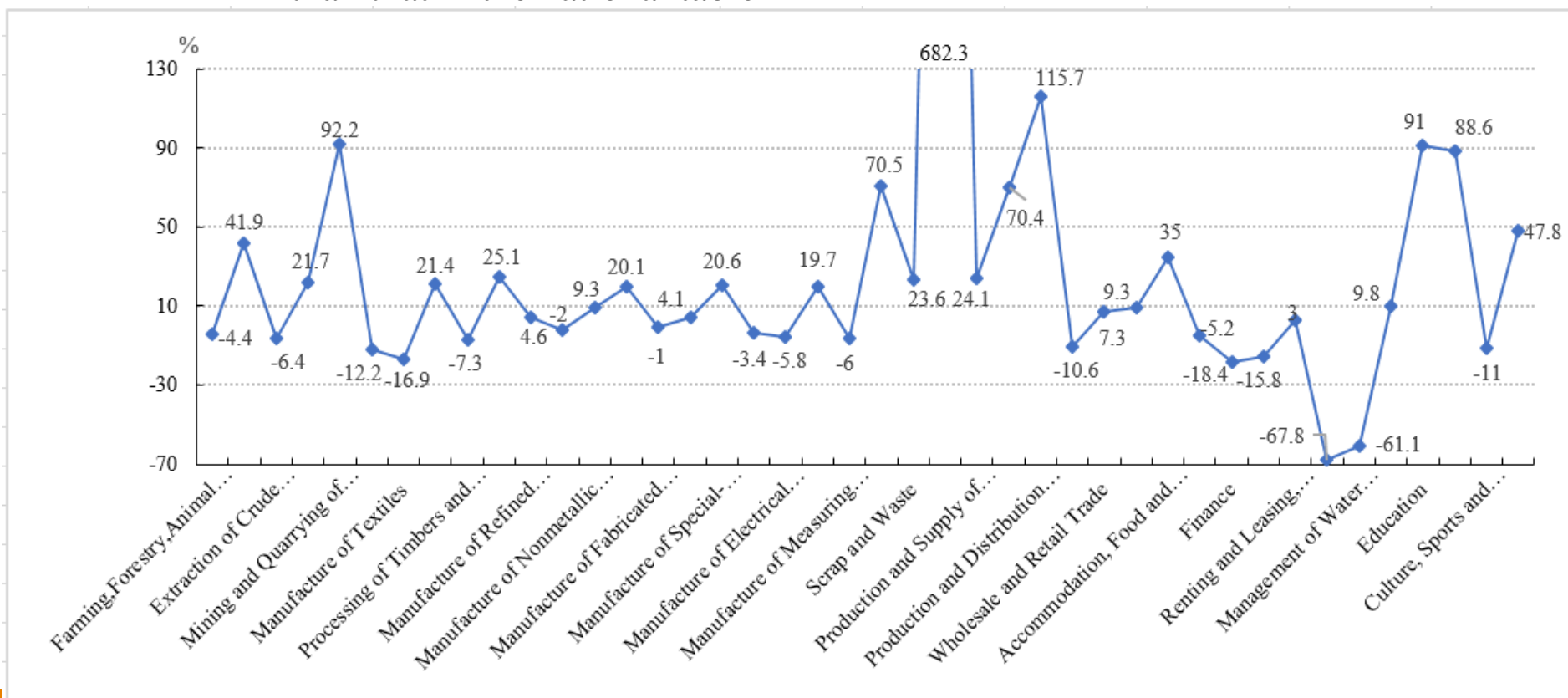
# 3.The inconsistency check between national and provincial IO

The imbalance issue is due to

(1) The estimation of 4-conlumn tables and non-competitive import-inflow table compilation

- No primary official data source of interregional trade Inflow and outflow . We estimated such data for some provincial tables based on the "Industrial Enterprises Inflows and Outflows Survey" launched by National Bureau of Statistics.  The survey did not distinguish the destination and source for each sector at provincial level
- Import and export are based on the Customs data directly. It may not be the same with those in the provincial tables, and it includes the total value of processing trade
- Import/inflow and export/outflow do not taking into account the re-export issue

# 3.The inconsistency check between national and provincial IO

The imbalance issue is also due to

(2) The estimation of each sector's control totals for each province

(3) The various discrepancies within the provincial tables. Concept inconsistency between national and provincial table: some provincial tables do not completely following the national level standard

# 4. The model of Estimating China's inter-provincial trade coefficients

• In this paper, the following model is proposed to estimate China's inter-provincial trade coefficients:

$$T_i^{rs} = A_i^r B_i^s X_i^{ro} X_i^{os} f(^k D_i^{rs})$$

Where,

$$A_i^r = [\sum_s B_i^s X_i^{os} f(^k D_i^{rs})]^{-1}$$

$$B_i^s = [\sum_r A_i^r X_i^{ro} f(^k D_i^{rs})]^{-1}$$

*A* and *B* are the balancing factors, $X_i^{ro}$ and $X_i^{os}$ are respectively the total outflow of commodity *i* from region *r* and the total inflow to region *s, D* is the time-distance from region r to s by commodity and transportation mode

# 4. The model of Estimating China's inter-provincial trade coefficients

• Based on the existing literature review and our experiences, the following distance deterrence equation can be considered to estimate $f(d)$:

$$f(^{k}D_{i}^{rs}) = \sum_{k} {}^{k}M_{i}(^{k}D_{i}^{rs})^{-^{k}\alpha_{i}^{s}}$$

•Where $^{k}M_{i}$ represents the share ratio of freight mode $k$ in the transportation of commodity $i$ from $r$ to $s$. $^{k}D_{i}^{rs}$ is the time-distance from region $r$ to $s$ by commodity and transportation mode. $^{k}\alpha_{i}^{s}$ is the power parameter, reflecting the influence magnitude of time-distances for trade activities.
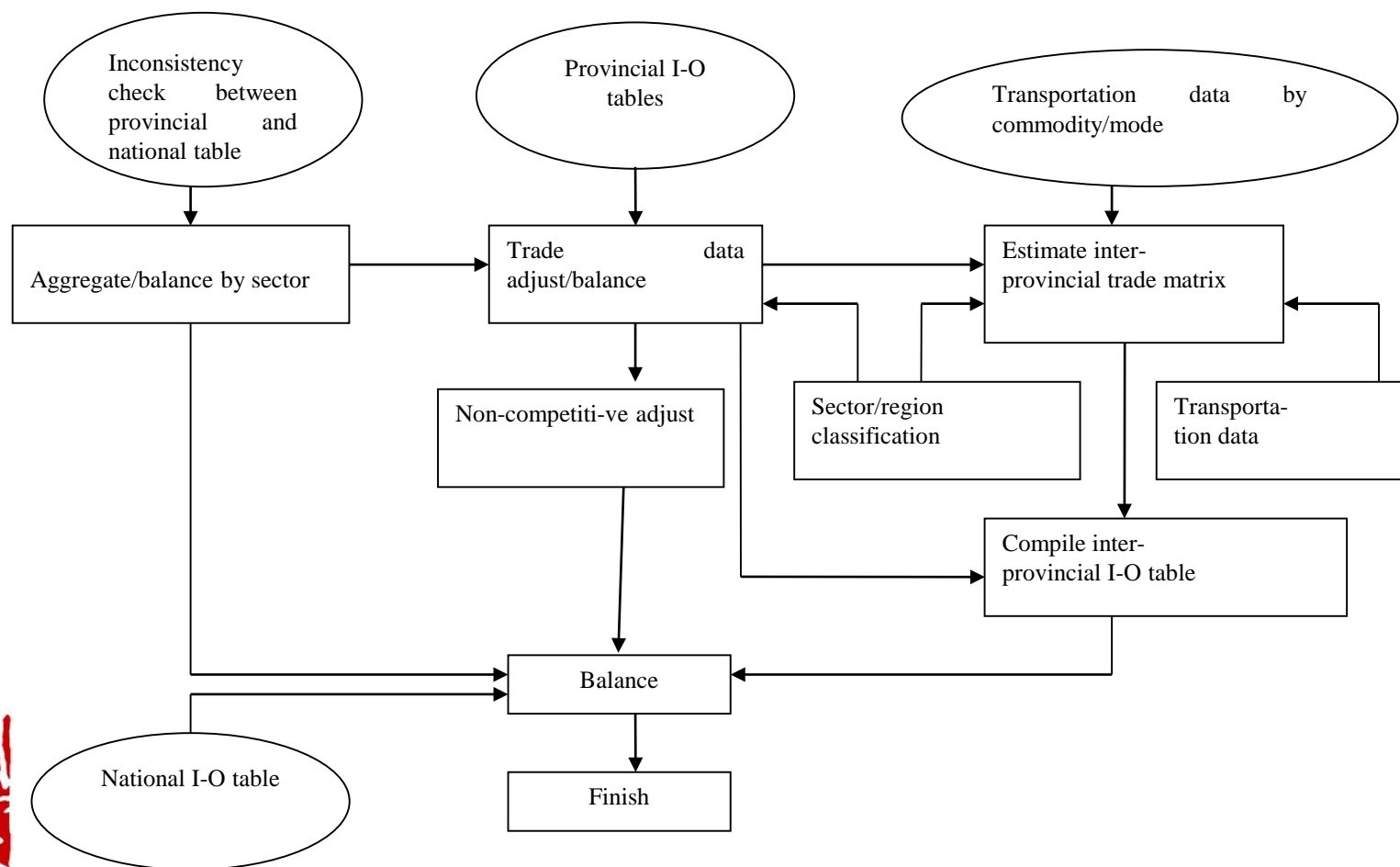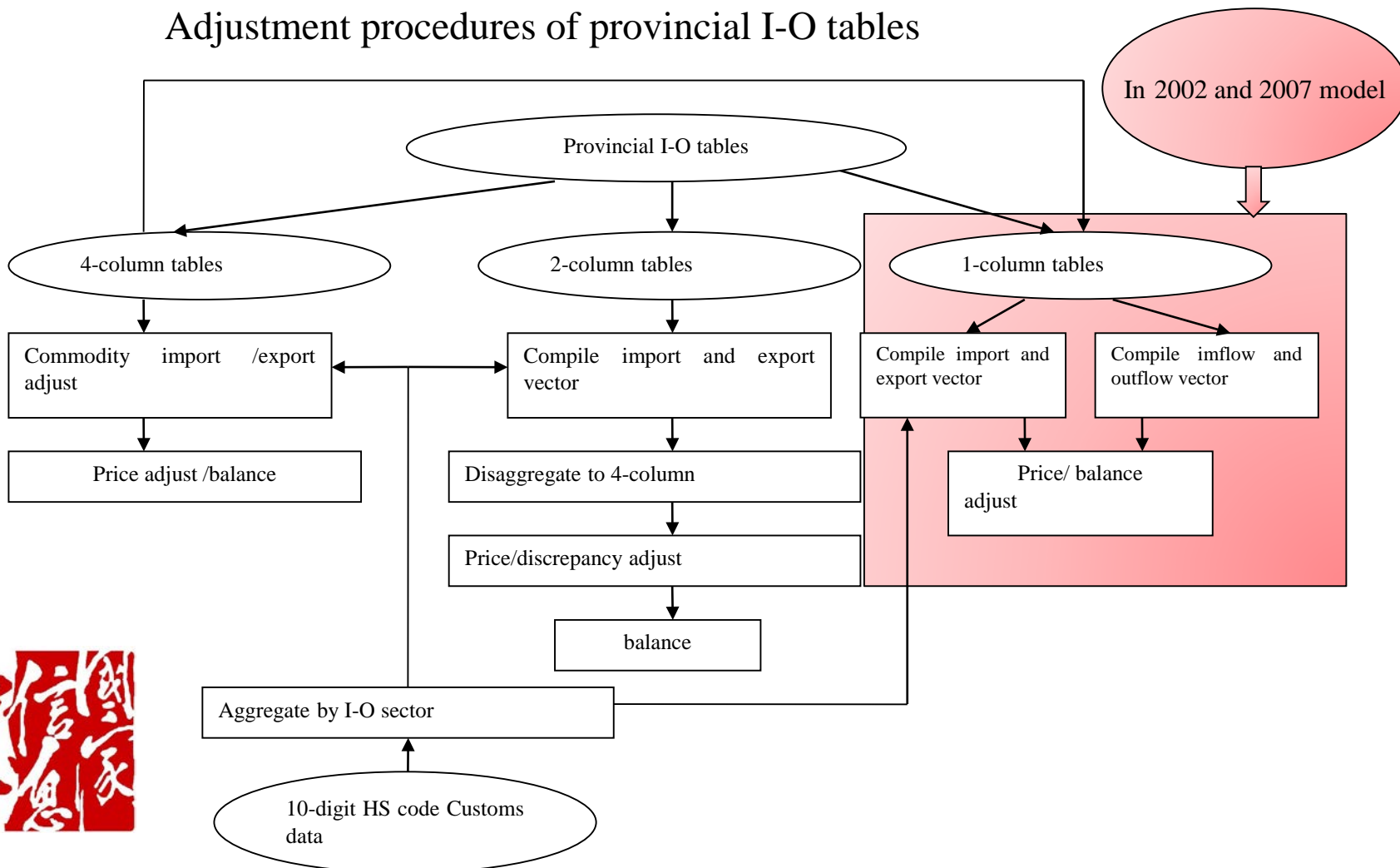
# 5. Compilation procedure of 2012 China's Multi-provincial Input-output Model

Adjustment procedures of provincial I-O tables

calculating outflow and inflow vectors for each province

- the primary data:

  28 four-column tables
  3 two-column tables

# 5. Compilation procedure of 2012 China's Multi-provincial Input-output Model

(1)Compiling the export and import vectors by province

- the primary data:

  - provincial export and import classified at HS 10-digit by location of exporter/importer

- taking the following 2 steps to compile each province commodity export and import vectors:

  - set up converter between input-output sector classification and HS 10-digit code (7163 commodities in 2012), then aggregate by input-output sector

  - estimate trade and transportation margins (TTM) and tariff to modify those vectors

- compiling each province service import and export:

  - assuming that the services import and export are proportional to the total amount of import and export of commodities

# 5. Compilation procedure of 2012 China's Multi-provincial Input-output Model

(2) calculating outflow and inflow vectors for each province

- for the provinces having the two-column tables :

  - deducting the calculated export and import vectors from outflow and inflow vectors

  - the remaining vectors are adjusted by the special survey result of the enterprises' inputs and production distribution in the 2007 I-O general survey by National Bureau of Statistics

# 5. Compilation procedure of 2012 China's Multi-provincial Input-output Model

- The 2012 China MRIO model:

$$T * \left[ x_{ij}^d \right] + T * F^d + E = X$$

$$t_i^{rs} = \frac{T_i^{rs}}{\sum_r T_i^{rs}}$$

- The balancing adjustments

# Conclusion and suggestion

- To compile the more detailed national input-output table

- To compile the import-inflow non-competitive tables of each province

- To compile the import and export of each province by uniformed methodology and data source

- Strengthening and refining the "Industrial Enterprises Inflows and Outflows Survey" launched by National Bureau of Statistics

- To estimate and compile the re-export data

*Thank you!*

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