Dataset of China's non-competitive constant price input-output tables for 2007 and 2012

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1. Data

In this paper, China’s IO tables for 2007 and 2012 [2], which were published by the National Bureau of Statistics in 2009 and 2015, respectively, are used as supplementary to Ref. [1].

The China’s non-competitive constant price input-output tables for 2007 and 2012 can be found as the excel spreadsheet “new IO2007” and “new IO2012” upon decompressing the supplemental file “data.zip”.

Besides that, China’s electricity consumption data for various industrial sectors and China’s price indices data is used.

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2. Experimental design, materials, and methods

The following four steps are used to process the data in this article. The first step is to adjust the sector divisions used in the 2012 IO table (IO2012) based on the 2007 IO table (IO2007). In order to ensure the consistency of the sectors in the IO2007 and IO2012, some sectors have been merged and 40 sectors are retained. The second step is to use RAS method to adjust IO2007 from the current price to the 2012 price. Because there are only 30 sectors that have electricity consumption data. The third step is to merge the 40 sectors of IO2007 and IO2012 to the 30 sectors. The fourth step is to change the competitive IO2007 and IO2012 to non-competitive IO tables.

We use electricity consumption data for various industrial sectors published by the National Bureau of Statistics in 2007 and 2012. In addition, we also use China’s IO tables for 2007 and 2012, which were published by the National Bureau of Statistics in 2009 and 2015, respectively. The sector divisions used in the two IO tables are inconsistent, which is shown in Table 1. In IO2007, “Transport, Storage” and “Post” are merged to “Transport, Storage and Post”. “Scientific Research and Development” and “Technical Services” are merged to “Scientific Research and Development, Technical Services”. There are 40 sectors in the new IO2007. Then the sectors in the IO2012 are adjusted based on this new IO2007. There are also 40 sectors in the new IO2012 (see Tables 2–8).
| Code | 2007 IO table                                      | 2012 IO table                                      |
|------|--------------------------------------------------|--------------------------------------------------|
| 1    | Agriculture, Forestry, Animal Husbandry & Fishery | Farming, Forestry, Animal Production and Fishery  |
| 2    | Mining and Washing of Coal                      | Mining and Washing of Coal                       |
| 3    | Extraction of Petroleum and Natural Gas          | Extraction of Crude Petroleum and Natural Gas    |
| 4    | Mining of Metal Ores                             | Mining of Metal Ores                              |
| 5    | Mining and Processing of Nonmetal Ores and Other Ores | Mining and Quarrying of Nonmetal Mineral and Other Mineral |
| 6    | Manufacture of Foods and Tobacco                 | Manufacture of Food and Tobacco                  |
| 7    | Manufacture of Textile                          | Manufacture of Textiles                          |
| 8    | Manufacture of Textile Wearing Apparel, Footwear, Caps, Leather, Fur, Feather and Its products | Manufacture of Textile Wearing Apparel, Footwear, Leather, Fur, Feather and Its Products |
| 9    | Papermaking, Printing and Manufacture of Articles for Culture, Education and Sports Activities | Papermaking, Printing and Manufacture of Articles for Culture, Education and Sports Activities |
| 10   | Processing of Petroleum, Coking, Processing of Nuclear Fuel | Processing of Petroleum, Coke Products, Processing of Nuclear Fuel |
| 11   | Chemical Industry                               | Manufacture of Chemicals and Chemical Products   |
| 12   | Manufacture of Nonmetallic Mineral Products      | Manufacture of Nonmetallic Mineral Products       |
| 13   | Smelting and Rolling of Metals                   | Manufacture and Processing of Metals             |
| 14   | Manufacture of Metal Products                    | Manufacture of Fabricated Metal Products, Except Machinery and Equipment |
| 15   | Manufacture of General Purpose and Special Purpose Machinery | Manufacture of General Purpose Machinery         |
| 16   | Manufacture of Transport Equipment               | Manufacture of Special Purpose Machinery         |
| 17   | Manufacture of Electrical Machinery and Equipment | Manufacture of Transport Equipment               |
| 18   | Manufacture of Communication Equipment, Computer and Other Electronic Equipment | Manufacture of Communication Equipment, Computer and Other Electronic Equipment |
| 19   | Manufacture of Measuring Instrument and Machinery for Cultural Activity & Office Work | Manufacture of Measuring Instruments             |
| 20   | Manufacture of Artwork, Other Manufacture        | Other Manufacture                                 |
| 21   | Production and Supply of Electric Power and Heat Power | Scrap and Waste                                 |
| 22   | Production and Distribution of Gas               | Repair of Fabricated Metal Products, Machinery and Equipment |
| 23   | Production and Distribution of Water             | Production and Supply of Electricity and Steam    |
| 24   | Construction                                    | Production and Distribution of Gas               |
| 25   | Transport, Storage                              | Production and Distribution of Water             |
| 26   | Post                                            | Construction                                     |
| 27   | Information Transmission, Computer Services and Software | Wholesale and Retail Trade                      |
| 28   | Wholesale and Retail Trades                      | Transport, Storage and Post                      |
| 29   | Hotels and Catering Services                     | Accommodation, Food and Beverage Services        |
| 30   | Financial Intermediation                         | Information Transmission, Software and Information Technology Services |
| 31   | Real Estate                                     | Finance                                          |
| 32   | Renting and Leasing, Business Services           | Renting and Leasing, Business Services           |
| 33   | Scientific Research and Development              | Scientific Research and Development, Technical Services |
| 34   | Technical Services                               | Management of Water Conservancy, Environment and Public Facilities |
| 35   | Management of Water Conservancy, Environment and Public Facilities | Management of Water Conservancy, Environment and Public Facilities |
| 36   | Services to Households and Other Services        | Services to Households, Repair and Other Services |
| 37   | Education                                       | Education                                        |
| 38   | Health, Social Security and Social Welfare       | Health Care and Social Work Activities           |
| 39   | Culture, Sports and Entertainment                | Culture, Sports and Entertainment                |
| 40   | Public Management and Social Organization        | Public Management, Social Security and Social Organization |
### Table 2
Adjustment the row vector of “Papermaking, Printing and Manufacture of Articles for Culture, Education and Sports Activities” sector.

| Industry | \(A_1\) | \(A_2\) | \(\ldots\) | \(A_{40}\) | \(\ldots\) | Total Output |
|----------|---------|---------|----------|---------|---------|------------|
| (Manufacture of Artwork) Other Manufacture | \(\uparrow 24.11\% X_1\) | \(\uparrow 24.11\% X_2\) | \(\ldots\) | \(\uparrow 24.11\% X_{40}\) | \(\ldots\) | \(\rightarrow 75.89\% X_1\) | \(\rightarrow 75.89\% X_2\) | \(\ldots\) | \(\rightarrow 75.89\% X_{40}\) |
| New Papermaking, Printing and Manufacture of Articles for Culture, Education and Sports Activities | \(X_1\) | \(X_2\) | \(\ldots\) | \(X_{40}\) |

Value added

Total Output

Note: “\(\uparrow\)” indicates increment, and “\(\rightarrow\)” indicates final value.

### Table 3
Adjustment the column vector of “Papermaking, Printing and Manufacture of Articles for Culture, Education and Sports Activities” sector.

| Industry | Capital Formation (ten thousand yuan) | Ratios of Capital Formation | Errors | Ratios of Errors |
|----------|--------------------------------------|-----------------------------|--------|-----------------|
| Manufacture of Fabricated Metal Products, Except Machinery and Equipment | 29338047.57 | 3.96% | -451902.6 | -9.0% |
| Manufacture of General Purpose and Special Purpose Machinery | 338654875.7 | 45.74% | 2215443.7 | 44.1% |
| Manufacture of Transport Equipment | 271622619.2 | 36.69% | 2384374.7 | 47.4% |
| Manufacture of Electrical Machinery and Apparatus | 87350294.17 | 11.80% | 409123.0 | 8.1% |
| Manufacture of Measuring Instruments | 11903422.64 | 1.61% | 5773.6 | 0.1% |
| Manufacture of Artwork, Other Manufacture | 1505483.174 | 0.20% | 464888.7 | 9.2% |
| Total | 740374742.4 | 1 | 5027701.1 | 1 |

Note: “\(\uparrow\)” indicates increment, and “\(\rightarrow\)” indicates final value.
2.1. Sector adjustment of IO2012

We use the departmental consolidation method of constructing the IDE-JETRO International Input Output table used by Meng et al. (2013) [3] and adjusts the divisions used in the IO2012 based on the IO2007.

2.1.1. Manufacture of Artwork, Other Manufacture

2.1.1.1. Current presentation. There are “Manufacture of Artwork, Other Manufacture” sector in the IO2007 and “Other Manufacture” sector in the IO2012. These two sectors are different. It’s because that “Manufacture of Artwork” sector is divided into “Papermaking, Printing and Manufacture of Articles for Culture, Education and Sports Activities” sector in IO2012. So “Papermaking, Printing and Manufacture of Articles for Culture, Education and Sports Activities” sector is also different between the IO2007 and IO2012.

2.1.1.2. Adjustment procedure

(1) With the help of the China Industry Statistical Yearbook 2013, we could find the industrial sales output value of “Manufacture of Artwork” sector (655.033 billion yuan) and “Papermaking, Printing and Manufacture of Articles for Culture, Education and Sports Activities” sector (2716.915 billion yuan) in 2012. The percentage of “Manufacture of Artwork” sector in “Papermaking, Printing and Manufacture of Articles for Culture, Education and Sports Activities” sector was 24.11% in 2012.

(2) Using the ratio thus derived, the row vector of “Papermaking, Printing and Manufacture of Articles for Culture, Education and Sports Activities” sector is expanded to a matrix for intermediate transactions.

(3) This ratio is also applied to demarcating the column vector of “Papermaking, Printing and Manufacture of Articles for Culture, Education and Sports Activities” sector.

(4) The “Papermaking, Printing and Manufacture of Articles for Culture, Education and Sports Activities” thus derived is added on to the table.

(5) The row and column vectors of “Papermaking, Printing and Manufacture of Articles for Culture, Education and Sports Activities” are changed to a new one which excluded “Manufacture of Artwork” sector. And “Other Manufacture” sector added “Manufacture of Artwork” sector to form “Manufacture of Artwork, Other Manufacture” sector.

### Table 5
Adjustment the intermediate transactions of “Repair of Fabricated Metal Products, Machinery and Equipment” sector.

| Industry | A1  | A2  | … | A40 | … | Total Output |
|----------|-----|-----|---|-----|---|-------------|
| Manufacture of Fabricated Metal Products, Except Machinery and Equipment | \(\uparrow 3.96\% X_1\) | \(\uparrow 3.96\% X_2\) | … | \(\uparrow 3.96\% X_{40}\) | … | \(\uparrow 3.96\% X_{40}\) |
| Manufacture of General Purpose and Special Purpose Machinery | \(\uparrow 45.74\% X_1\) | \(\uparrow 45.74\% X_2\) | … | \(\uparrow 45.74\% X_{40}\) | … | \(\uparrow 45.74\% X_{40}\) |
| Manufacture of Transport Equipment | \(\uparrow 36.69\% X_1\) | \(\uparrow 36.69\% X_2\) | … | \(\uparrow 36.69\% X_{40}\) | … | \(\uparrow 36.69\% X_{40}\) |
| Manufacture of Electrical Machinery and Apparatus | \(\uparrow 11.80\% X_1\) | \(\uparrow 11.80\% X_2\) | … | \(\uparrow 11.80\% X_{40}\) | … | \(\uparrow 11.80\% X_{40}\) |
| Manufacture of Measuring Instruments | \(\uparrow 1.61\% X_1\) | \(\uparrow 1.61\% X_2\) | … | \(\uparrow 1.61\% X_{40}\) | … | \(\uparrow 1.61\% X_{40}\) |
| Manufacture of Artwork, Other Manufacture | \(\uparrow 0.20\% X_1\) | \(\uparrow 0.20\% X_2\) | … | \(\uparrow 0.20\% X_{40}\) | … | \(\uparrow 0.20\% X_{40}\) |
| Repair of Fabricated Metal Products, Machinery and Equipment | X1 | X2 | … | X40 |

Value added

Total Output

Note: “\(\uparrow\)” indicates increment.
2.1.2. Repair of Fabricated Metal Products, Machinery and Equipment

2.1.2.1. Current presentation. There is standalone “Repair of Fabricated Metal Products, Machinery and Equipment” sector in the IO2012.

2.1.2.2. Adjustment procedure

(1) With the help of the Chinese Standard Industrial Classification (GB/T 4754–2011), the machines list under the “Repair of Fabricated Metal Products, Machinery and Equipment” sector are assumed to be repaired. The industries of these machines include: “Manufacture of Fabricated Metal Products, Except Machinery and Equipment”; “Manufacture of General Purpose and Special Purpose Machinery”; “Manufacture of Transport Equipment”; “Manufacture of Electrical Machinery and Apparatus”; “Manufacture of Measuring Instruments”; “Manufacture of Artwork, Other Manufacture”;

Table 6
Adjustment the errors of “Repair of Fabricated Metal Products, Machinery and Equipment” sector.

| Industry | A1 | A2 | … | A40 | … | Errors | Total Output |
|----------|----|----|----|-----|----|--------|-------------|
| Manufacture of Fabricated Metal Products, Except Machinery and Equipment |  |  |  |  |  |  |  |
| Manufacture of General Purpose and Special Purpose Machinery |  |  |  |  |  | 9.0% Y |  |
| Manufacture of Transport Equipment |  |  |  |  |  | 44.1% Y |  |
| Manufacture of Electrical Machinery and Apparatus |  |  |  |  |  | 0.1% Y |  |
| Manufacture of Measuring Instruments |  |  |  |  |  | 47.4% Y |  |
| Manufacture of Artwork, Other Manufacture |  |  |  |  |  | 9.2% Y |  |
| Repair of Fabricated Metal Products, Machinery and Equipment |  |  |  |  |  |  |  |

Note: “†” indicates increment.

Table 7
Adjustment the total output of “Repair of Fabricated Metal Products, Machinery and Equipment” sector.

| … | … | Total Output | Total Output ratio |
|----|----|--------------|--------------------|
| Manufacture of Fabricated Metal Products, Except Machinery and Equipment |  | 400661.8 | 4.249% |
| Manufacture of General Purpose and Special Purpose Machinery |  | 4316898.8 | 45.778% |
| Manufacture of Transport Equipment |  | 3437249.5 | 36.450% |
| Manufacture of Electrical Machinery and Apparatus |  | 1120198.2 | 11.879% |
| Manufacture of Measuring Instruments |  | 154723.4 | 1.641% |
| Manufacture of Artwork, Other Manufacture |  | 331.1 | 0.004% |
| Repair of Fabricated Metal Products, Machinery and Equipment |  |  |  |

Note: “†” indicates increment.
Machinery and Apparatus”; “Manufacture of Measuring Instruments”; “Manufacture of Artwork, Other Manufacture”.

(2) For the commodities identified in (1), the distribution ratio for each industry (column) is derived from the Capital Formation Matrix*1, at the level of grouping permitted by the data’s classification.

(3) Using the ratios thus derived, the row vector of “Repair of Fabricated Metal Products, Machinery and Equipment” sector is expanded to a matrix for intermediate transactions.

(4) There are entries at the intersection of “Repair of Fabricated Metal Products, Machinery and Equipment” and Errors, the ratios are derived with respect to Errors. Using the ratios thus derived, the entries are distributed along the Errors. Entries at the intersection of “Repair of Fabricated Metal Products, Machinery and Equipment” and domestic transactions and import matrix are zero.

(5) The sums of increased values are calculated row-wise, which form the total output of “Repair of Fabricated Metal Products, Machinery and Equipment” activity for each type of machinery. The total output ratios are calculated, which are then applied to demarcating the column vector of “Repair of Fabricated Metal Products, Machinery and Equipment” sector.

(6) The “Repair of Fabricated Metal Products, Machinery and Equipment matrix” thus derived is added on to the table.

(7) The row and column vectors of “Repair of Fabricated Metal Products, Machinery and Equipment” are deleted.

2.1.3. Sector classifications

After sector adjustment of IO2012, the sector divisions of IO2007 and IO2012 IO are the same which includes 40 sectors. Table 9 shows the sector classification.

2.2. RAS method for deflating Chinese IO table

In order to focus on real rather than nominal changes in our decomposition analysis, the IO table used should be corrected based on constant prices. The method that has been most widely used for the estimation of IO tables in constant prices is Double Deflation (DD) [4]. Though this method is generally accepted, it still involves certain problems which have been reported in Sevaldson (1976), Wolff (1994), and Dietzenbacher and Hoen (1998) [5–7]. The two main problems can be summarized as follows: First, under this method, an entire row in the IO table is deflated using the price index of gross output.

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Table 8
Adjustment the column vector of “Repair of Fabricated Metal Products, Machinery and Equipment” sector.

| | Manufacturer of Fabricated Metal Products, Except Machinery and Equipment | Manufacturer of General Purpose Special Purpose Machinery | Manufacturer of Transport Equipment | Manufacturer of Electrical Machinery and Apparatus | Manufacturer of Measuring Instruments and Apparatus | Manufacturer of Artwork, Other Manufacture | Total Output |
|---|---|---|---|---|---|---|---|
| Value added | 1400661.79 | 14316698.76 | 13437249.45 | 11120198.20 | 1154723.35 | 153115 | Total Output |
| Total Output | 4.24% | 45.77% | 36.45% | 11.87% | 1.64% | 0.004% | 100% |

Note: “|” indicates increment
This method ignores the practical situation where price indices are likely to be different within a row of intermediate deliveries, since most sectors produce more than one good, and each sector requires a different mix of these goods as an input. Second, the published IO table available to the normal user is already largely aggregated, meaning that the user can only adjust the IO table in constant prices via deflation after aggregation. Therefore, the aggregation error may influence the accuracy of the deflation.

To encountering the above problems, Dietzenbacher and Hoen (1998) propose an alternative method from the user’s viewpoint [7]. Under their method, the intermediate deliveries in constant prices are estimated on the basis of intermediate deliveries in current prices, and the row and column sums in constant prices. This estimation precisely satisfies the requirements for applying the RAS method. And this method performs better than DD.

The RAS-procedure is a biproportional projection method that was developed for “updating” a given matrix (say $A_0$, not necessarily square), such that the updated matrix ($A_1$) satisfies exogenously given row and column sums. The RAS-method proceeds iteratively. In the first step the rows are adjusted. Each row $i$ is multiplied by a scalar $r_i$ such that the $i$-th row sum equals the prespecified row sum of $A_1$. The resulting matrix after step 1 may be denoted as $A_1(1) = r_1A_0$. In the second step, the columns of $A_1(1)$ are adjusted so as to satisfy the column sum requirement. This yield $A_1(2) = A_1(1)S_2 = r_1A_0S_2$. It is likely, however, that the row sum requirements are violated. Therefore the rows are adjusted again; $A_1(3) = r_3A_1(2)S_2 = r_3r_1A_0S_2$. Next, the columns are adjusted again: $A_1(4) = A_1(3)S_4 = r_3r_1A_0S_2S_4$, and so forth. Starting with column adjustments in the first step yields
\( \bar{A}_1(4) = \hat{r}_3 \hat{r}_1 \bar{A}_0 \hat{s}_2 \hat{s}_4 \) after the fourth step. It can be shown that under mild conditions the iterative procedure converges. The updated matrix can be written as \( \bar{A}_1 = \hat{r} \bar{A}_0 \hat{s} \) and does not depend on whether the procedure is started with a row adjustment or with a column adjustment.

The RAS-method has been applied to estimate next year’s coefficients matrix (\( A_1 \)) on the basis of this year’s matrix (\( A_0 \)), given next year’s row and column sums. In this paper we apply the RAS-procedure to estimate the input-output table in constant prices, on the basis of the table in current prices, given the row and column totals in constant prices.

The input-output table in current prices is given in Table 10, the table in constant prices, using the RAS method, in Table 11.

The \( n \times C \) matrix \( Z \) denotes the intermediate demand matrix, the vector \( f \) the final demands (rural household consumption, urban household consumption, government consumption, gross fixed capital formation, changes in inventories and exports), the vector \( m \) the imports, the vector \( e \) the errors, \( x \) denotes the vector with sectoral outputs. \( v \) is a row vector, the elements of which are value added of industrial sectors. In Table 11, the subscript \( d \) (for deflated) is used to indicate that the corresponding matrices and vector are in constant prices.

In this paper we apply the RAS-procedure to estimate the input-output table in constant prices, on the basis of the table in current prices, given the row and column totals in constant prices. In this method, the sectoral outputs (\( x_d \)), the final demands (\( f_d \)), the imports (\( m_d \)), the errors (\( e_d \)) and the value-added vector (\( v_0 \)) are required to be known.

The element \( p_i \) of the vector \( p \) denotes the price deflator in industrial sector \( i \). It is defined as the ratio of the base year price and the current price. \( \pi_i = \frac{P_{2012}^i}{P_{2007}^i} \) (2012 price is the base year price). To simplify the calculation process, we assume each industry sector has the same price deflator (Liu Qiyun, Peng Zhilong, 2010). For \( x_d + m_d - f_d - e_d = \pi(x + m - f - e) \), if price deflators \( \pi_i \) could be got, \( x_d + m_d - f_d - e_d \) would be computable. And if price deflator of value added could be got, \( x_d - v_d \) also can be derived. Then, the intermediate demand matrix in constant prices (\( Z_d \)) could be estimated by the RAS-method.

### 2.3. Price deflator

#### 2.3.1. Price deflators of industrial sectors

Because producer price is used in China’s IO table. Relevant producer price indices are used to calculate price deflator of primary industry and secondary industry sectors.\(^1\)

Using the following formula to calculate the price deflator of primary industry and secondary industry sectors:

\[^1\) For “Construction”, there isn’t relevant producer price, so we use “Price Indices for Investment in Fixed Assets (preceding year = 100), Construction and Installation” instead.\]
Table 12
Relationship between tertiary industry and price indices.

| Industry Sector                                                                 | Price Index (preceding year = 100) |
|---------------------------------------------------------------------------------|-------------------------------------|
| Transport, Storage and Post                                                     | Consumer Price Indices, Transportation and Communication |
| Information Transmission, Software and Information Technology Services          | Consumer Price Index |
| Wholesale and Retail Trade                                                       | Retail Price Indices |
| Accommodation, Food and Beverage Services                                      | Consumer Price Indices, Dining Out |
| Renting and Leasing, Business Services                                           | Consumer Price Index |
| Scientific Research and Development, Technical Services                          | Consumer Price Index |
| Management of Water Conservancy, Environment and Public Facilities              | Consumer Price Index |
| Services to Households, Repair and Other Services                               | Consumer Price Indices, Household Services and Maintenance and Renovation |
| Education                                                                       | Consumer Price Indices, Education |
| Health Care and Social Work Activities                                           | Consumer Price Indices, Health Care Services |
| Culture, Sports and Entertainment                                                | Consumer Price Indices, Cultural and Recreational Articles |
| Public Management, Social Security and Social Organization                      | Consumer Price Index |

where, $P_{i}^{2012}$, $P_{i}^{2011}$, $P_{i}^{2010}$, $P_{i}^{2009}$, $P_{i}^{2008}$ denote the producer price in sector $i$ in year 2012, 2011, 2010, 2009, 2008 (preceding year = 100). Data sources: National Bureau of Statistics of China.

For tertiary industry exclude “Finance” and “Real Estate” sector, we use relevant consumer price indices follow Liu Qiyun and Peng Zhilong (2010) [8]. This is because China don’t have producer price indices for tertiary industry. The relation between the tertiary industry and the price indices in Table 12. The formulas to calculate the price deflator of these industry sectors are as follows:

$$\pi_i = \frac{P_{i}^{2012}}{P_{i}^{2007}} = \frac{P_{i}^{2011}}{P_{i}^{2010}} \frac{P_{i}^{2010}}{P_{i}^{2009}} \frac{P_{i}^{2009}}{P_{i}^{2008}} \frac{P_{i}^{2008}}{P_{i}^{2007}} \quad i = 27, 28, ..., 39, 40 \text{ and } i \neq 31, 32$$

where, $P_{i}^{2012}$, $P_{i}^{2011}$, $P_{i}^{2010}$, $P_{i}^{2009}$, $P_{i}^{2008}$ denote the producer price in sector $i$ in year 2012, 2011, 2010, 2009, 2008 (preceding year = 100). Data sources: National Bureau of Statistics of China.

For “Finance” sector, we take a weighted average of “Consumer Price Index (preceding year = 100)” and “Price Indices for Investment in Fixed Assets (preceding year = 100)” to produce a composite number, which is price deflator of “Finance” sector. The weights are derived from ratio between household consumption expenditure and total investment in fixed assets in the whole country. Data sources: National Bureau of Statistics of China.

For “Real Estate” sector, we use the following formula to calculate its price deflator [9].

$$\frac{P_{2012}^{32}}{P_{2007}^{32}} = \frac{1}{P_{2012}^{27} \cdot Q_{2012}^{32} \cdot Q_{2011}^{32} \cdot Q_{2010}^{32} \cdot Q_{2009}^{32} \cdot Q_{2008}^{32} \cdot Q_{2007}^{32}}$$

$P_{2007}^{32} \cdot Q_{2007}^{32}$: 2007 value-added of real estate (at 2007 prices).

$P_{2012}^{32} \cdot Q_{2012}^{32}$: 2012 value-added of real estate (at 2012 prices).

Where $P_{2012}^{32}$, $P_{2011}^{32}$, $P_{2010}^{32}$, $P_{2009}^{32}$, $P_{2008}^{32}$, $P_{2007}^{32}$ denote indices of value-added of real estate (preceding year = 100) in 2012, 2011, 2010, 2009, 2008. Data sources: National Bureau of Statistics of China.

The result price deflators of all the 40 industrial sectors are in Table 13.
2.3.2. Price deflator of value added

The computational process for the value added in current prices is more complex. Firstly, in the same way, the value added deflator $p_j$ is defined as the price ratio between the base year value added price and the current value added price, for product $j$. We could only get 9 value added prices of industrial sectors. They are “Indices of Value-added of Agriculture, Forestry, Animal Husbandry and Fishery Industries”, “Indices of Value-added of Industry”, “Indices of Value-added of Construction”, “Indices of Value-added of Wholesale and Retail Trades”, “Indices of Value-added of Transport, Storage and Post”, “Indices of Value-added of Hotels and Catering Services”, “Indices of Value-added of Financial Intermediation”, “Indices of Value-added of Real Estate” and “Indices of Value-added of Others”. Among them, “Indices of Value-added of Industry” and “Indices of Value-added of Others” cover 24 and 9 industrial sectors respectively. We use the following formula to calculate value added price deflators [9].

| Industry Sector                                                          | Price Deflator |
|-------------------------------------------------------------------------|----------------|
| Farming, Forestry, Animal Production and Fishery                         | 147.8          |
| Mining and Washing of Coal                                              | 154.1          |
| Extraction of Crude Petroleum and Natural Gas                           | 137.9          |
| Mining of Metal Ores                                                    | 120            |
| Mining and Quarrying of Nonmetallic Mineral and Other Mineral           | 130.3          |
| Manufacture of Food and Tobacco                                        | 115.1          |
| Manufacture of Textiles                                                 | 116.2          |
| Manufacture of Textile Wearing Apparel, Footwear, Leather, Fur, Feather and Its Products | 109.9          |
| Processing of Timbers and Manufacture of Furniture                      | 110.5          |
| Papermaking, Printing and Manufacture of Articles for Culture, Education and Sports Activities | 106.7          |
| Manufacture of Refined Petroleum, Coke Products, Processing of Nuclear Fuel | 150.7          |
| Manufacture of Chemicals and Chemical Products                          | 110.5          |
| Manufacture of Nonmetallic Mineral Products                             | 116.1          |
| Manufacture and Processing of Metals                                   | 105.1          |
| Manufacture of Fabricated Metal Products, Except Machinery and Equipment | 108.3          |
| Manufacture of General Purpose and Special Purpose Machinery            | 106.3          |
| Manufacture of Transport Equipment                                      | 101.6          |
| Manufacture of Electrical Machinery and Apparatus                       | 99.6           |
| Manufacture of Communication Equipment, Computer and Other Electronic Equipment | 88.9           |
| Manufacture of Measuring Instruments                                   | 98.5           |
| Manufacture of Artwork, Other Manufacture                               | 116.6          |
| Scrap and Waste                                                         | 102.6          |
| Production and Supply of Electricity and Steam                          | 112            |
| Production and Distribution of Gas                                     | 125            |
| Production and Distribution of Water                                   | 117.7          |
| Construction                                                            | 126.5          |
| Transport, Storage and Post                                            | 96.7           |
| Information Transmission, Software and Information Technology Services  | 117.5          |
| Wholesale and Retail Trade                                              | 115.4          |
| Accommodation, Food and Beverage Services                              | 137.3          |
| Finance                                                                 | 118.1          |
| Real Estate                                                             | 165.8          |
| Renting and Leasing, Business Services                                  | 117.5          |
| Scientific Research and Development, Technical Services                 | 117.5          |
| Management of Water Conservancy, Environment and Public Facilities       | 117.5          |
| Services to Households, Repair and Other Services                       | 149.5          |
| Education                                                               | 106.7          |
| Health Care and Social Work Activities                                  | 103.8          |
| Culture, Sports and Entertainment                                       | 107.4          |
| Public Management, Social Security and Social Organization              | 117.5          |
Table 14
Final sector classification.

| Code | Sector name                                                                 | Code | Sector name                                                                                                     |
|------|-----------------------------------------------------------------------------|------|----------------------------------------------------------------------------------------------------------------|
| 1    | Farming, forestry, animal production and fishery                            | 16   | Manufacture of communication equipment, computer and other electronic equipment                                 |
| 2    | Mining of metal ores                                                        | 17   | Manufacture of measuring instruments                                                                           |
| 3    | Mining and quarrying of nonmetallic mineral products and other mineral       | 18   | Manufacture of artwork, other manufacture                                                                       |
| 4    | Manufacture of food and tobacco                                             | 19   | Scrap and waste                                                                                                |
| 5    | Manufacture of textiles                                                    | 20   | Mining and washing of coal                                                                                    |
| 6    | Manufacture of textile wearing apparel, footwear, leather, fur, and feather   | 21   | Extraction of crude petroleum and natural gas                                                                  |
| 7    | Processing of timbers and manufacture of furniture                          | 22   | Manufacture of refined petroleum, coke products, processing of nuclear fuel                                   |
| 8    | Papercrafting, printing and manufacture of articles for culture, education   | 23   | Production and supply of electricity and steam                                                                 |
|      | and sports activities                                                       |      |                                                                                                                |
| 9    | Manufacture of chemicals and chemical products                              | 24   | Production and distribution of gas                                                                             |
| 10   | Manufacture of nonmetallic mineral products                                 | 25   | Production and distribution of water                                                                            |
| 11   | Manufacture and processing of metals                                        | 26   | Construction                                                                                                   |
| 12   | Manufacture of fabricated metal products, except machinery and equipment    | 27   | Transport, storage and post                                                                                    |
| 13   | Manufacture of general purpose and special purpose machinery                | 28   | Information transmission, software and information technology services                                        |
| 14   | Manufacture of transport equipment                                          | 29   | Wholesale and retail trade, accommodation, food and beverage services                                          |
| 15   | Manufacture of electrical machinery and apparatus                           | 30   | Other service industries                                                                                       |
| 16   | Manufacture of fabricated metal products, except machinery and equipment    | 31   | Other service industries                                                                                       |
| 17   | Manufacture of metal products, except machinery and equipment               | 32   | Other service industries                                                                                       |
| 18   | Manufacture of nonmetallic mineral products                                 | 33   | Other service industries                                                                                       |
| 19   | Manufacture of chemical products                                            | 34   | Other service industries                                                                                       |
| 20   | Manufacture of metal products                                               | 35   | Other service industries                                                                                       |
| 21   | Manufacture of nonmetallic mineral products                                 | 36   | Other service industries                                                                                       |
| 22   | Manufacture of metal products                                               | 37   | Other service industries                                                                                       |
| 23   | Manufacture of fabricated metal products, except machinery and equipment    | 38   | Other service industries                                                                                       |
| 24   | Manufacture of metal products                                               | 39   | Other service industries                                                                                       |
| 25   | Manufacture of nonmetallic mineral products                                 | 40   | Other service industries                                                                                       |
| 26   | Manufacture of metal products                                               |      |                                                                                                                |
| 27   | Manufacture of fabricated metal products, except machinery and equipment    |      |                                                                                                                |
| 28   | Manufacture of metal products                                               |      |                                                                                                                |
| 29   | Manufacture of nonmetallic mineral products                                 |      |                                                                                                                |
| 30   | Manufacture of metal products                                               |      |                                                                                                                |
| 31   | Manufacture of fabricated metal products, except machinery and equipment    |      |                                                                                                                |
| 32   | Manufacture of metal products                                               |      |                                                                                                                |
| 33   | Manufacture of nonmetallic mineral products                                 |      |                                                                                                                |
| 34   | Manufacture of metal products                                               |      |                                                                                                                |
| 35   | Manufacture of fabricated metal products, except machinery and equipment    |      |                                                                                                                |
| 36   | Manufacture of metal products                                               |      |                                                                                                                |
| 37   | Manufacture of nonmetallic mineral products                                 |      |                                                                                                                |
| 38   | Manufacture of metal products                                               |      |                                                                                                                |
| 39   | Manufacture of fabricated metal products, except machinery and equipment    |      |                                                                                                                |
| 40   | Manufacture of metal products                                               |      |                                                                                                                |

\[
\rho_j = \frac{P_{2012}^j}{P_{2007}^j} = \frac{1}{\prod_{2007}^j * Q_{2007}^j} \quad j = 1, 2, \ldots, 9
\]

\[
P_{2007}^j * Q_{2007}^j: \text{2007 value-added of industry } j \text{ (at 2007 prices).}
\]

\[
P_{2012}^j * Q_{2012}^j: \text{2012 value-added of industry } j \text{ (at 2012 prices).}
\]

Where \(P_{2011}^j, Q_{2011}^j\) are indices of value-added of \(j\) industry sector in year 2012, 2011, 2010, 2009, 2008 (preceding year = 100). Data sources: National Bureau of Statistics of China.

Then these 9 industries’ value added in constant price could be got. But “Industry” and “Other” sectors conclude 24 and 9 sub-classification industries and the value added of these sub-classification industries can’t be derived from the calculation progress above.

Secondly, we use the price deflators of these sub-classification industries to calculate their value added in constant price, then calculate their proportion structure. Using the value added of “Industry” and “Other” sectors and the sub-classification industries’ value added proportion structure, the value added of these sub-classification industries could be computed. Therefore, all these 40 industries’ value added \(\bar{v}_d\) can be got. However, \(x'_d - \bar{v}_d = x_d + m_d - f_d - e_d\).

Thirdly, the final value added vector \(v_d\) is obtained from the balancing equations. That is, the equality of the row sums and the column sums imply \((x_d - \bar{v}_d)u = u'(x_d + m_d - f_d - e_d)\). \(u\) is 40-element column vector, where all the elements are 1.

So \(v'_d = \frac{\bar{v}_d}{\sum_{d'} v'_d}u' (x_d + m_d - f_d - e_d)\), and \(v'_d\) can be derived.
The price deflators of industrial sectors and price deflator of value added are used to adjust 2007 IO table from the current price to the 2012 price.

2.4. Final sector classifications

There are only 30 sectors that have electricity consumption data published by the National Bureau of Statistics in 2007 and 2012. However, there are 40 sectors in the adjusted 2007 and 2012 IO tables. This paper merged the 40 sectors of the adjusted 2007 and 2012 IO tables to the 30 sectors which have electricity consumption data. The final sector classifications are shown in Table 14.

3. Non-competitive IO tables

There are two assumptions: 1. no re-export trade; 2. sector internal product is homogenous. The 2007 and 2012 China’s IO tables published by the National Bureau of Statistic are competitive which include imports.

\[
M = 
\begin{pmatrix} 
    m_1 \\
    \vdots \\
    m_n 
\end{pmatrix}, 
\quad 
Z = 
\begin{pmatrix} 
    z_{11} & \cdots & z_{1n} \\
    \vdots & \ddots & \vdots \\
    z_{n1} & \cdots & z_{nn} 
\end{pmatrix}, 
\quad 
T = 
\begin{pmatrix} 
    \frac{1}{\sum_{p=1}^n z_{1p}} \\
    \vdots \\
    \frac{1}{\sum_{p=1}^n z_{np}} 
\end{pmatrix}, 
\quad p = 1, 2, \ldots, n.
\]

\(M\) is the \(n\)th-dimension import column vector, where \(m_j\) represents the total import of the \(j\)th department. \(Z\) is the \(n \times n\) competitive intermediate demand matrix. The \(z_{ij}\) terms represent interindustry sales by sector \(i\) (also known as intermediate sales) to all sectors \(j\) (including itself, when \(j = i\)), and \(z_{ij}\) includes imports. \(z_{ij} = z^d_{ij} + z^m_{ij}\), where \(z^d_{ij}\) terms represent interindustry sales from the domestic market and \(z^m_{ij}\) terms represent interindustry sales from overseas market. \(T\) is the \(n\)th-dimension column vector.

The same proportion \(\left( m_i / \sum_{p=1}^n z_{ip} \right) \) is used to split \(z^m_{ij}\) from the interindustry sales by sector \(i\), then,

\[
\hat{z}^m_{ij} = \left( m_i / \sum_{p=1}^n z_{ip} \right) z_{ij}.
\]

\[
\hat{Z}^d = 
\begin{pmatrix} 
    \hat{z}^d_{11} & \cdots & \hat{z}^d_{1n} \\
    \vdots & \ddots & \vdots \\
    \hat{z}^d_{n1} & \cdots & \hat{z}^d_{nn} 
\end{pmatrix}
\]

\[
\hat{M}^d \hat{T} \hat{Z} = 
\begin{pmatrix} 
    \left( m_1 / \sum_{p=1}^n z_{1p} \right) z_{11} & \cdots & \left( m_1 / \sum_{p=1}^n z_{1p} \right) z_{1n} \\
    \vdots & \ddots & \vdots \\
    \left( m_n / \sum_{p=1}^n z_{np} \right) z_{n1} & \cdots & \left( m_n / \sum_{p=1}^n z_{np} \right) z_{nn} 
\end{pmatrix}
\]

\(\hat{Z}^d\) is the \(n \times n\) non-competitive intermediate demand matrix, which are excluded imports. \(\hat{M}^d \hat{T} \hat{Z}\) is the \(n \times n\) intermediate import demand matrix. Therefore, \(\hat{Z}^d = Z - \hat{M}^d \hat{T} \hat{Z}\).
Through the above data processing process, the China's non-competitive constant price input-output data for 2007 and 2012 could be got.

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Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dib.2019.104760.

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