Productivity Growth in China: Industrial and Aggregate Measures, Drivers and International Comparisons in Asia

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PRODUCTIVITY GROWTH IN CHINA: INDUSTRIAL AND AGGREGATE MEASURES, DRIVERS AND INTERNATIONAL COMPARISONS IN ASIA

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Total Factor Productivity could help to identify whether China's rapid growth in the recent three decades is mainly driven by productivity or factor accumulation. While mostly existing studies of China TFP were using aggregate data. Advantages for industrial TFP measures are a) we could trace aggregate trends to industry origins; b) Less restrictive assumptions. While there are also disadvantages as follows: a) Difficult to assemble data at the same level of detail; b) Less timely and more volatile data. Facing the trade-off between the advantages and disadvantages, we provides industrial and aggregate measures of TFP based on our previous measures for 1981-2005, and then analyzes the industry contribution to aggregate TFP in order to find what the predominant source of China industry economic growth is. A preliminary international comparison for TFP is also provided based on a newly released Asia KLEMS dataset.

1. INTRODUCTION

Based on our previous work on China's productivity measures[2], we extend and update our China KLEMS database to the period of 1981-2005 with 33 industries covering the entire Chinese economy using a time series of input–output tables. In this research, we will introduce our detailed methodologies for Input-Output table time series construction, capital, labor, energy and intermediate inputs measures, estimation and aggregation of China's industrial and total-economy TFP. Then based on our results for 1981-2005 productivity measures, we will also decompose aggregate GDP growth into industrial contributions and source of growth to locate the drivers of China's thirty-year economic growth "miracle". In the last part, we will run an international comparison between our China KLEMS results and other Asia countries from newly released Asia KLEMS dataset, to identify China's performance benchmarking with other advanced and emerging economies in the same region.

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[2] Presented on the 1st World KLEMS conference, Harvard University, August 2010, http://www.worldklems.net/conferences/index.htm

2. CONSTRUCTING INPUT-OUTPUT TABLE SERIES

There are two major challenges to construct a comparable Input-Output Table (IOT) series in China. The first one is the difference in the compilation methodology over time. The China's statistical system was under the Material Product System (MPS) in early 1980s, and a MPS Input-Output table was compiled in 1981. After 1987, China's statistical system was gradually transformed to the System of National Accounts (SNA), so did the IOTs. This process led huge inconsistency issues for the existing IOTs. This is why we discover a 3-dimension Cross-checking Approach to specifically deal with the IOT coverage and definition changes over time.

The second challenge for China's IOT updates is the recent structure changes in China's real economy, such as the accelerating processing trade, the impacts from 2008 crisis to China's export-oriented manufacturers, …, etc. These all lead to a question about whether we could use the most recent 2007 benchmark IOT and another outside source, World Input-Output Database (WIOD), to extrapolate our current IOT series to 2011.

Thus In this section, we will introduce our key approach to construct the historical Input-Output Table (IOT) series, and some attempts to update it to more recent years.

2.1. *Major differences in the compilation methodology and 3-dimension Cross-checking Approach*

Since China's statistical system was gradually transformed to the System of National Accounts (SNA) after 1987, the existing benchmark IOTs (1987, 1992, 1997, 2002, and 2007) as well, there is huge inconsistency issue needed to be pre-adjusted for a comparable IOT series. We discover a 3-dimension Cross-checking Approach to specifically deal with the IOT coverage and definition changes over time. Here in the Figure 2.1 is the fundamental framework when we design the 3-dimension Cross-checking Approach.

We gather the following materials for the process of the 3-dimension Cross-checking Approach:

1) Gross output, value-added & its components by industry (labor compensation, taxes, depreciation, operating surplus), and all the underlying supporting materials;
2) Final use by industry (household & government consumption, fixed capital formation, inventory, exports & imports), and all the underlying supporting materials;
3) 1981 MPS IOT;
4) 1987, 1992, 1997, 2002 benchmark IOTs;
5) 1990, 1995, 200, 2005 extended IOTs;
6) Price indies by industry and all the underlying supporting materials;
7) Financial virtual consumption and trade adjustments materials;

We cooperated with Input-Output Division from China's National Bureau of Statistical (NBS) on the demanding materials collection.

After we get the materials ready for the cross-checking, we follow the procedures shown in Figure 2.2 to conduct the 3-dimension Cross-checking Approach to compile the comparable IOTs for 1981-2005. Since for most of the years, there are more than one inconsistency issues, we usually need to run the approach for several rounds, as the arrows shown in the figure. The details for the procedure and compilation of IOT series (including all the definition, explanation and adjustments) are included in Ren Ruoen, et al. (2013).

Figure 2.1 Three-dimension Cross-checking Approach, framework

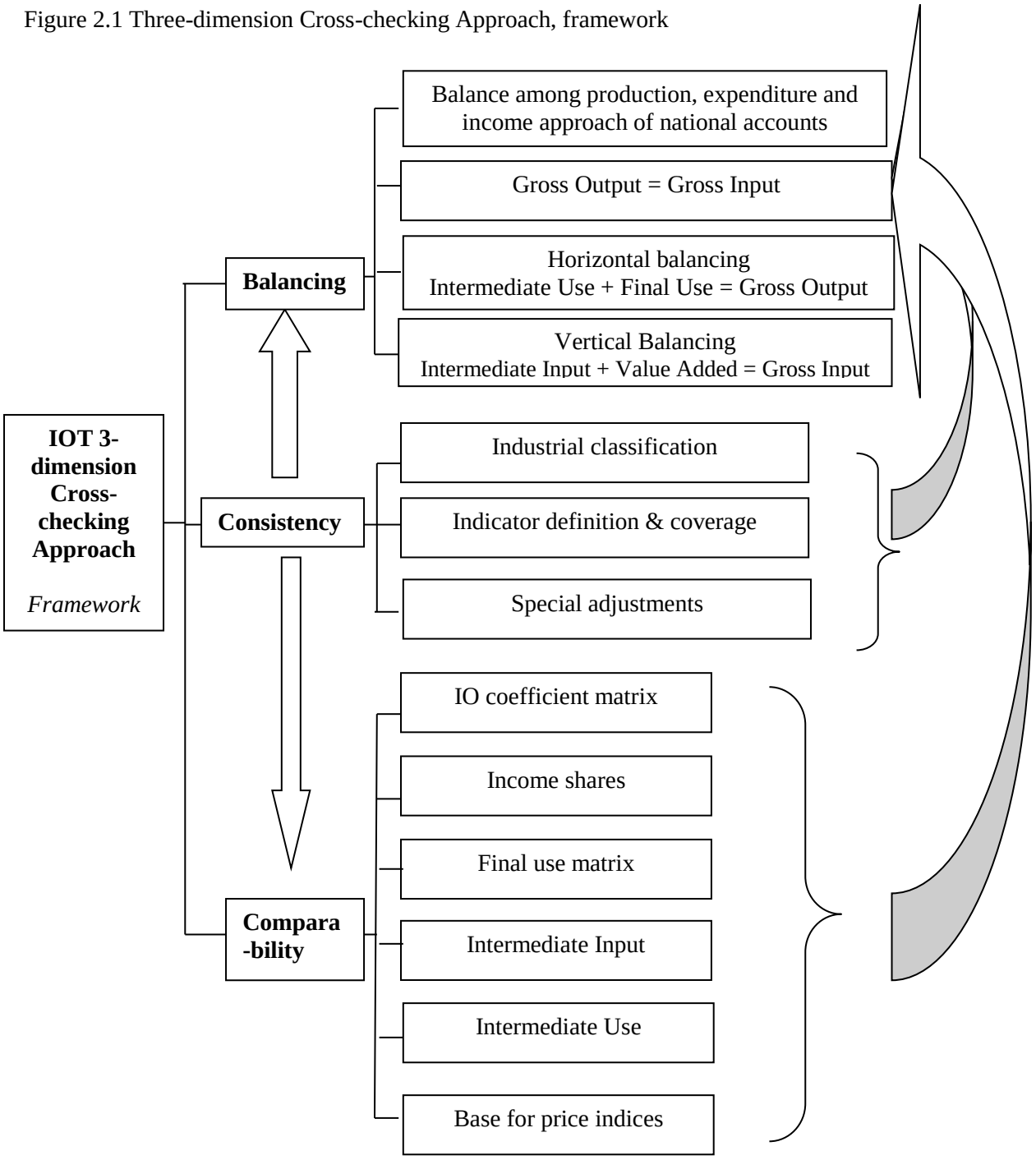
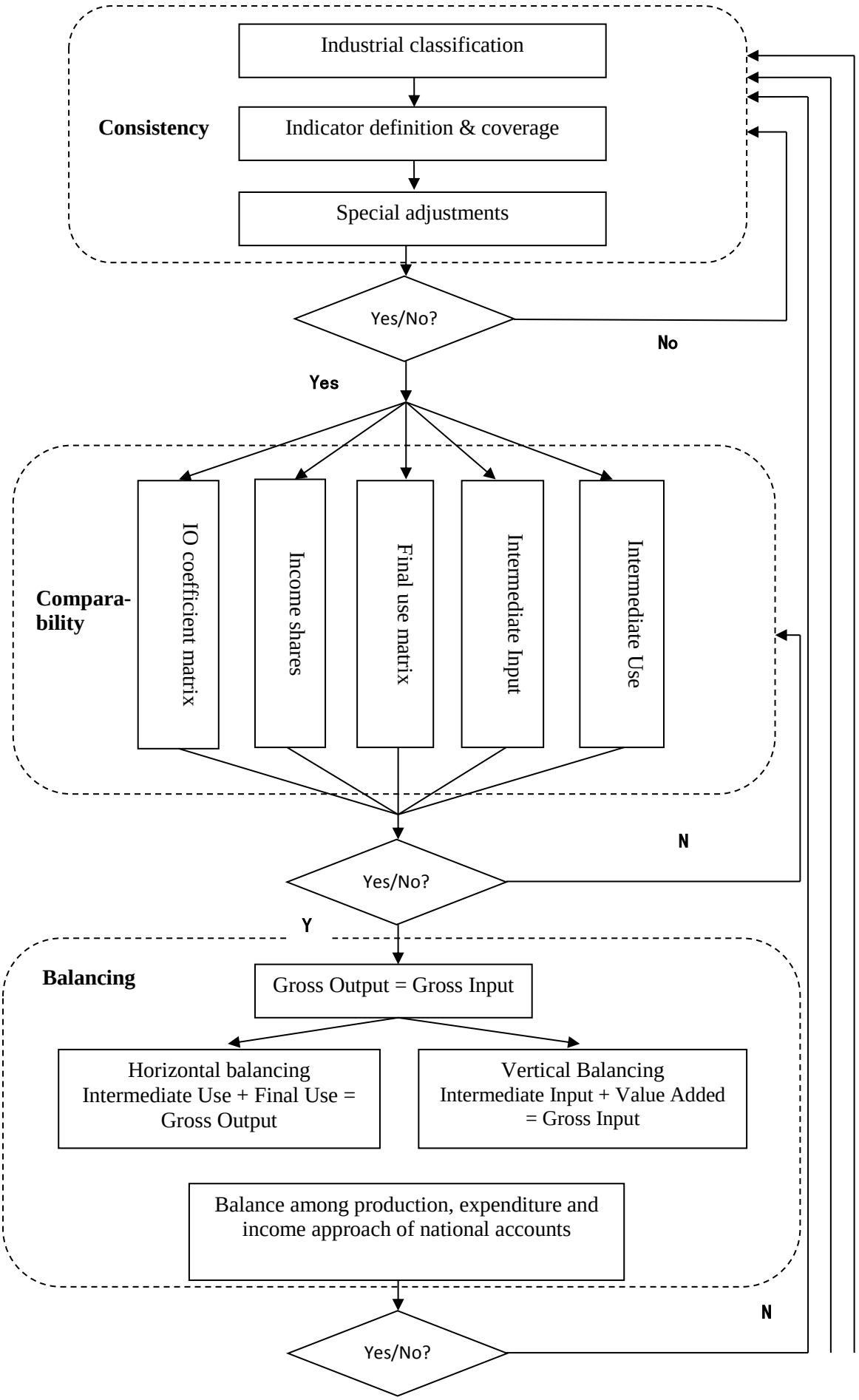
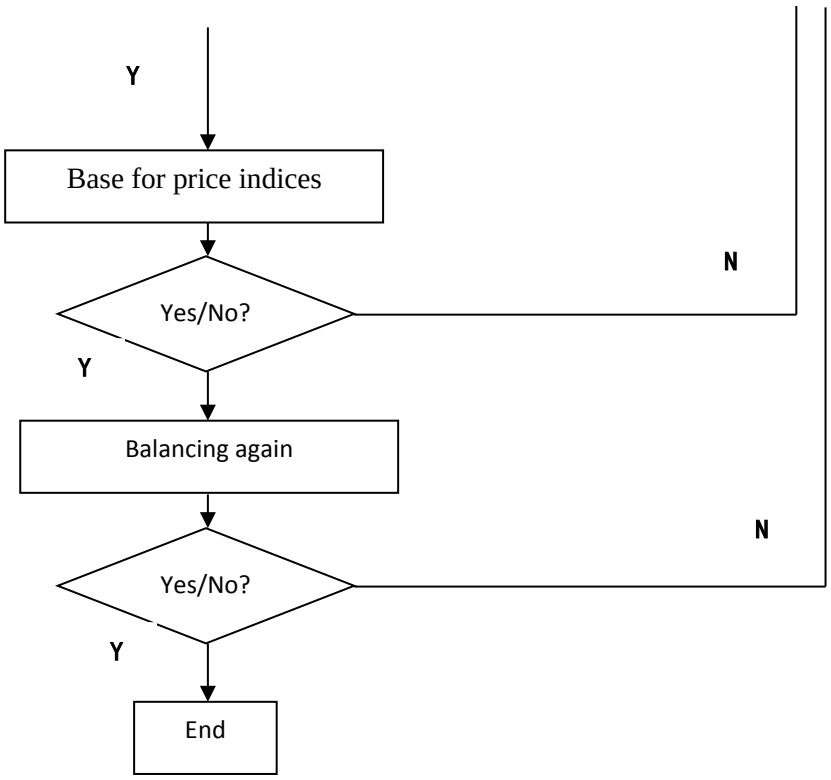


Figure 2.2 Three-dimension Cross-checking Approach, procedures





2.2. *Comparisons with more recent IOTs*

In this section, we will discussion the possibilities to update the currect 1981-2005 with 2007 benchmark IOT or China IOTs from WIOD.

WIOD's compilation is mainly based on China's public benchmark tables, while the NBS public tables always contain inconsistency because 1) since China's statistical system is still improving over time, 2) 5-year intervals is a relatively long enough time to introduce some real structure change. One perfect example for this is processing trade.

In 2002 benchmark table, there's no special adjustment for processing trade. Although that was only one year after China joined WTO in the end of 2001, Chinese manufacturing industry has already built up its capacity for processing trade in some of east-coast private and Small-Medium size enterprises, which has already started to import some materials for the export-oriented products. However, considering the interdependence among industries, the NBS team made some major adjustments to measure the real impacts from processing trade in the next 2007 benchmark table. After the adjustments, the total output for processing trade is measured by processing cost. While in the 2002 benchmark table, the same activity was measured by the entire purchase price of the export products. Any interpolation between the 2002 and 2007 benchmark tables will introduce certain bias without fixing the inconsistency of the processing trade adjustment. Table 2.1 shows the adjustments for processing trade in 2007 benchmark table.

In China KLEMS compilation methodology, the NBS internal materials played the most crucial role in the adjustments and balancing. The followings are the major additional information provided by NBS:

1) For the industrial enterprises' survey, there's scale-based system in China. For the enterprises with more than 5 million RMB's annual revenue, they supposed to follow a much detailed and systematic survey system. While for the enterprises under this designed scale, the cost and expense accounting is usually less detailed. Specific supply structure for SMEs in provided.

2) China's IOTs' total output by products is at producer price. The value-added tax expenditure by products is provided

3) For import data in IOT, value creation for the import goods by the transportation enterprises, import tariff , consumption tax for imported goods, and adjustments for processing trade are all provided;

4) For export data in IOT, the FOB price excluding turnover cost, and adjustments for processing trade are all provided;

5) Most of underlying survey material comes from the use sectors, which accounting price is purchaser price. Turnover cost matrix (including business additional expenditure and transportation) is provided, which could be subtracted from the purchaser price table and construct the tables at producer price.

Another factor could be possible have impacts on IOT's data quality is China's IO survey methodology. Euro-stats surveys on supply and use table, then apply the transformation method to construct IOT. China's IO survey is designed for IOT by product. Any product which has the same function, the same intermediate inputs structure and production technology should be reported as one product sector. Under this framework, the SUT-RAS methodology will potentially introduce more uncertainty by using estimated supply and use table to transform the IOT.

Here are some comparison results following the compiling process.

Firstly, we compare both of the series aggregate level data, such as total output, total intermediate use, and total value-added with Chinese public benchmark IOT and historical national accounts time series. Table 2.2 lists out the comparison with GDP benchmark. WIOD matches exactly the GDP level, while China KLEMS table made some adjustments based on the knowledge of the differences between GDP accounts and IO accounts.

Secondly, we compare the two series with China's public benchmark tables. We cross-checked the China's Benchmark Use tables (BU2002 & BU2007), WIOD Use tables (WIOT 2002, 2005 & 2007), and China KLEMS Use tables (CNUSE 2002 & 2005). The results list in Table 2.3 – WIOT is much closer to China's Benchmark Tables, which fits in its compilation methodology. While, if the benchmark table itself shows the structural changes within 5-year intervals, the WIOT Use table will present a break in-between the five years.

Thirdly, we cross-check the Input Coefficient Matrix between the two series. We focused on the cells with zero input coefficient, which can show the coverage and definition differences. We also focused on the key Input Coefficient, which the sum-up of the coefficient is bigger than 60% of the industry's total intermediate inputs. This observation could lead us to the production technology assumption from both of the table series.

Fourthly, we compared the two Use table series at both current and constant price. The Weight Absolute Percentage Error (WAPE) result showed in Table 2.5 indicates that the difference between two series varies a lot depends on sectoral aggregation. We decided to choose 19*19 as our aggregation level for the next step. While there are several sectors which are crucial to China's economic growth, so the adjusted aggregation level is 22*22.

Lastly, we transformed the SUT into IOTs. The WAPE results for the two IOT series list in Table 2.6.

Then by combining in the Index of Power of Dispersion (IPD) and Index of Sensitivity of Dispersion (ISD) in one chart shown in Figure 2.3, we can get an observation on typological presentation for each industry's function, which also provide us a straightforward visualized way to measure the IOTs' bias at an inter-industry level. As we can tell from the charts, both IPD and ISD is getting more scattered since 2005, and the patterns shown in 2009 are not consistent with before, which indicates major changes in inter-industry intermediate use. This will lead to bigger residuals when we extrapolate the IOTs.

The above methodology differences and results of comparisons indicate it would introduce some systematical problem when we extrapolate our current 1981-2005 IOTs with either 2007 benchmark or China IOTs from WIOD.

Table 2.1 The adjustments for processing trade in 2007 benchmark table

Unit: billion RMB

		(1)	(2)	(3)	(4) = (1) - (2)+(3)	(5)	(6)	(7) = (5) - (6)
1	Agriculture	66.60	0.00	0.00	66.60	236.87	4.08	232.80
2	Mining	72.14	12.85	4.72	64.01	1,086.90	53.01	1,033.89
3	Construction	40.89	0.00	0.00	40.89	22.13	0.00	22.13
4	Food and related	200.38	11.23	2.06	191.21	164.99	6.84	158.15
5	Textiles, Leather, Apparel	1,475.14	113.33	27.04	1,388.85	200.53	57.82	142.71
6	Wood and related	248.72	7.68	1.41	242.45	29.78	2.73	27.05
7	Paper, printing and publishing	268.72	49.96	7.69	226.44	96.16	13.30	82.86
8	Petroleum	97.55	24.12	3.36	76.78	145.24	0.23	145.01
9	Chemicals & Rubber	751.13	35.02	7.68	723.79	973.66	63.14	910.52
10	Other mineral	149.55	1.64	0.46	148.37	40.26	2.53	37.73
11	Metals	892.74	25.83	4.48	871.40	534.78	44.26	490.52
12	Machinery	587.09	17.79	4.38	573.69	712.38	8.05	704.33
13	Electrical & Electronics	3,564.18	510.37	90.24	3,144.06	2,767.84	401.46	2,366.38
14	Transport equipment	331.63	4.27	0.85	328.22	301.35	1.03	300.32
15	Misc. manufacturing	152.83	23.24	4.56	134.14	182.81	19.76	163.05
16	Utility	6.51	0.00	0.00	6.51	1.80	0.00	1.80
17	Trade	400.76	40.10	40.10	400.76	0.00	0.00	0.00
18	Transportation services	398.30	5.29	5.29	398.30	106.32	0.00	106.32
19	Communications	49.51	0.00	0.00	49.51	43.97	0.00	43.97
20	Finance, insurance and real estate	8.62	0.00	0.00	8.62	12.92	0.00	12.92
21	Other private services	465.31	0.00	0.00	465.31	413.10	0.00	413.10
22	Public services	4.20	0.00	0.00	4.20	6.51	0.00	6.51
	Total	10,232.50	882.72	204.32	9,554.10	8,080.31	678.25	7,402.06

Notes:

(1): All exports
(2): Exports of processing with foreign supplied material
(3): Charges for processing with foreign supplied material
(4): Exports for IOT
(5): All imports
(6): Imports for processing with foreign supplied material
(7): Imports for IOT

Table 2.2 Percentage difference of GDPs between China KLEMS/WIOT with National Accounts and 2002 Benchmark IO

China KLEMS					
Deviation in %	GDP, total	Agriculture	Industry	Construction	Service
1995	2.67%	1.73%	3.33%	1.89%	2.57%
1996	2.66%	1.88%	3.19%	1.91%	2.59%
1997	2.60%	2.08%	2.91%	1.92%	2.60%
1998	2.11%	1.09%	2.14%	1.90%	2.60%
1999	1.68%	0.52%	1.43%	1.75%	2.44%
2000	1.24%	0.71%	0.02%	1.99%	2.60%
2001	1.28%	0.71%	-0.06%	1.99%	2.69%
2002	1.27%	0.71%	-0.12%	1.99%	2.68%
2003	1.10%	0.71%	-0.38%	1.77%	2.58%
2004	0.88%	0.27%	0.30%	0.98%	1.66%
2005	0.71%	3.00%	0.92%	4.98%	-0.78%
2002 Benchmark IO	0.00%	0.00%	-2.29%	0.00%	2.22%

WIOD					
Deviation in %	GDP, total	Agriculture	Industry	Construction	Service
1995	0.00%	0.00%	0.00%	0.00%	0.00%
1996	0.00%	0.00%	0.00%	0.00%	0.00%
1997	0.00%	0.00%	0.00%	0.00%	0.00%
1998	0.00%	0.00%	0.00%	0.00%	0.00%
1999	0.00%	0.00%	0.00%	0.00%	0.00%
2000	0.00%	0.00%	0.00%	0.00%	0.00%
2001	0.00%	0.00%	0.00%	0.00%	0.00%
2002	0.00%	0.00%	0.00%	0.00%	0.00%
2003	0.00%	0.00%	0.00%	0.00%	0.00%
2004	0.00%	0.00%	0.00%	0.00%	0.00%
2005	0.00%	0.00%	0.00%	0.00%	0.00%
2002 Benchmark IO	-1.25%	-0.71%	-2.17%	-1.95%	-0.46%

Table 2.3 Weight Absolute Percentage Error (WAPE) between Benchmark IOT, WIOD and China KLEMS in selected years

WAPE	BU2002 vs. BU2007	BU2002 vs. WIOT2002	BU2007 vs. WIOT2007	WIOT2002 vs. WIOT2007	WIOT2002 vs. WIOT2005	WIOT2005 vs. WIOT2007	BU2002 vs. CNUSE2002	CNUSE2005 vs. BU2002	CNUSE2005 vs. BU2007	CNUSE 2002 vs. CNUSE 2005
Total Intermediate %	9.46	0.92	0.08	8.57	5.72	3.02	0.00	7.88	2.33	7.88
Total Intermediate % by industry	8.39	1.15	1.32	8.82	5.91	3.01	3.22	9.00	6.26	7.55
Direct consumption coefficient - all	30.58	13.49	14.68	31.18	26.15	9.08	14.10	25.74	33.89	15.22
Final consumption coefficient - all	22.96	9.69	9.95	20.64	16.38	10.00	7.54	20.94	18.07	17.00
Final household consumption	25.56	14.06	12.22	31.57	20.65	12.39	5.96	19.20	24.41	14.11
Final government consumption	18.72	12.74	9.17	6.09	12.63	7.92	8.54	10.44	8.46	1.91
Gross capital formation	17.69	7.26	9.61	11.57	10.20	8.96	1.47	27.85	22.64	27.05
Export	28.09	13.84	17.91	29.18	20.45	9.47	12.74	26.59	20.77	22.07
Import	24.74	0.54	0.83	24.76	17.98	11.25	8.98	20.64	14.06	19.88

Table 2.4 Number of discrepancies between WIOD and China KLEMS in key input coefficient and zero input coefficient

		Key Input Coefficient												Zero Input Coefficient										
	Industry (#discrepancy)	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**Total**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**Total**
1	Agriculture	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	1	0	5
2	Mining	3	3	1	4	4	2	2	2	2	2	2	27	0	0	0	0	0	0	0	0	1	1	0	2
3	Construction	0	2	2	2	4	2	2	4	3	3	4	28	0	0	0	0	0	0	0	0	1	1	0	2
4	Food and related	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	3
5	Textiles and related	0	0	0	0	2	0	0	0	0	0	1	3	0	0	1	1	1	1	1	1	2	2	1	11
6	Leather	0	0	0	0	1	1	1	1	1	0	0	5	1	1	2	2	2	2	2	2	2	2	1	19
7	Wood and related	3	2	2	4	3	2	2	1	2	2	2	25	1	1	2	2	2	2	2	2	2	2	1	19
8	Paper related	0	0	1	1	1	2	2	2	1	3	3	16	0	0	1	1	1	1	1	1	2	2	2	12
9	Petroleum	1	1	1	1	1	0	0	1	0	0	0	6	0	0	2	2	2	2	2	2	1	1	2	16
10	Chemicals	1	0	2	2	0	2	1	1	3	2	1	15	0	0	0	0	0	0	0	0	1	1	2	4
11	Rubber	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	2	2	2	9
12	Other mineral	3	2	3	0	1	1	3	3	2	3	1	22	0	0	0	0	0	0	0	0	1	1	1	3
13	Metals	0	2	1	1	2	2	4	2	1	2	2	19	0	0	1	1	1	1	1	1	1	1	1	9
14	Machinery	2	0	0	0	2	2	2	2	1	1	1	13	0	0	1	1	1	1	1	1	1	1	2	10
15	Electrical & Electronics	1	0	1	0	1	0	0	0	1	1	1	6	0	0	0	0	0	0	0	0	1	1	1	3
16	Transport equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	9
17	Misc. manufacturing	3	4	4	4	4	3	3	3	3	5	3	39	0	0	0	0	0	0	0	0	1	1	1	3
18	Utility	2	4	2	4	4	1	0	0	1	2	2	22	0	0	1	1	1	1	1	1	1	1	1	9
19	Trade	1	3	1	3	4	1	3	1	2	2	3	24	0	0	1	1	1	0	0	0	1	1	1	6
20	Transportation services	2	0	0	0	2	1	1	1	1	0	1	9	0	0	0	0	0	0	0	0	1	1	1	3
21	Communications	4	1	4	5	4	6	4	4	8	8	7	55	1	1	1	3	3	1	1	1	2	2	1	17
22	Finance related	2	1	2	1	0	0	0	1	2	1	2	12	0	0	1	0	1	0	0	0	1	1	1	5
23	Other private services	1	1	2	2	1	3	0	0	1	2	2	15	0	0	0	0	0	0	0	0	1	1	1	3
24	Public services	4	2	1	1	1	3	3	4	5	3	3	30	1	1	0	1	1	1	2	2	2	2	2	15

Table 2.5.1 Weighted average percentage error (WAPE) between two Use table series by different level of aggregations (current price series)

30 X 24 - WAPE (%)	95	96	97	98	99	00	01	02	03	04	05
Whole matrix	9	9	9	10	10	11	10	9	10	9	10
Intermediate use matrix	21	21	21	28	30	26	23	21	23	26	28
Direct consumption coefficient matrix	21	20	19	23	25	24	22	21	24	28	31
Final use matrix	24	20	17	19	18	14	15	12	15	18	21
Final consumption coefficient matrix	32	28	25	38	40	72	35	11	37	52	75
Value-added	8	8	10	11	11	15	13	13	12	8	10
Total output by industry	10	10	11	14	14	14	13	13	11	8	9

30 X 19 - WAPE (%)	95	96	97	98	99	00	01	02	03	04	05
Whole matrix	8	8	8	10	10	11	10	9	9	9	9
Intermediate use matrix	20	20	20	27	29	26	23	20	22	25	27
Direct consumption coefficient matrix	22	21	20	25	26	22	20	20	23	27	30
Final use matrix	24	20	17	19	18	14	15	12	15	18	21
Final consumption coefficient matrix	32	28	25	38	40	72	35	11	37	52	75
Value-added	7	7	9	10	10	14	13	12	12	8	9
Total output by industry	8	8	9	12	12	14	12	11	11	7	7

30 X 9 - WAPE (%)	95	96	97	98	99	00	01	02	03	04	05
Whole matrix	7	7	7	8	9	9	8	7	8	8	8
Intermediate use matrix	17	17	17	23	26	21	19	17	18	19	21
Direct consumption coefficient matrix	19	19	17	22	25	23	21	20	23	27	30
Final use matrix	24	20	17	19	18	14	15	12	15	18	21
Final consumption coefficient matrix	32	28	25	38	40	72	35	11	37	52	75
Value-added	3	3	3	4	3	7	6	5	5	2	2
Total output by industry	3	4	3	9	10	10	7	5	6	5	4

19 X 19 - WAPE (%)	95	96	97	98	99	00	01	02	03	04	05
Whole matrix	8	8	8	9	9	11	10	9	9	8	8
Intermediate use matrix	19	18	18	24	27	24	22	19	20	22	24
Direct consumption coefficient matrix	19	19	18	22	24	20	19	18	21	24	27
Final use matrix	22	19	16	17	16	13	13	12	13	13	17
Final consumption coefficient matrix	29	26	24	35	32	55	24	10	30	29	54
Value-added	7	7	9	10	10	14	13	12	12	8	9
Total output by industry	8	8	9	12	12	14	12	11	11	7	7

9 X 9 - WAPE (%)	95	96	97	98	99	00	01	02	03	04	05
Whole matrix	5	5	5	7	7	8	6	5	6	6	6
Intermediate use matrix	9	10	9	17	19	15	12	9	13	13	15
Direct consumption coefficient matrix	10	11	10	15	17	15	13	10	15	19	21
Final use matrix	15	13	12	14	14	8	8	7	8	6	8
Final consumption coefficient matrix	21	16	16	23	26	36	18	7	22	14	35
Value-added	3	3	3	4	3	7	6	5	5	2	2
Total output by industry	3	4	3	9	10	10	7	5	6	5	4

Table 2.5.2 Weighted Average Percentage Error (WAPE) between two Use table series by different level of aggregations (constant price series)

30 X 24 - WAPE (%)	95	96	97	98	99	00	01	02	03	04	05
Whole matrix	9	9	9	10	10	11	10	9	10	9	10
Intermediate use matrix	21	21	21	28	30	26	23	21	23	26	28
Direct consumption coefficient matrix	21	20	19	23	25	24	22	21	24	28	31
Final use matrix	24	20	17	19	18	14	15	12	15	18	21
Final consumption coefficient matrix	32	28	25	38	40	72	35	11	37	52	75
Value-added	8	8	10	11	11	15	13	13	12	8	10
Total output by industry	10	10	11	14	14	14	13	13	11	8	9

30 X 19 - WAPE (%)	95	96	97	98	99	00	01	02	03	04	05
Whole matrix	8	8	8	10	10	11	10	9	9	9	9
Intermediate use matrix	20	20	20	27	29	26	23	20	22	25	27
Direct consumption coefficient matrix	22	21	20	25	26	22	20	20	23	27	30
Final use matrix	24	20	17	19	18	14	15	12	15	18	21
Final consumption coefficient matrix	32	28	25	38	40	72	35	11	37	52	75
Value-added	7	7	9	10	10	14	13	12	12	8	9
Total output by industry	8	8	9	12	12	14	12	11	11	7	7

30 X 9 - WAPE (%)	95	96	97	98	99	00	01	02	03	04	05
Whole matrix	7	7	7	8	9	9	8	7	8	8	8
Intermediate use matrix	17	17	17	23	26	21	19	17	18	19	21
Direct consumption coefficient matrix	19	19	17	22	25	23	21	20	23	27	30
Final use matrix	24	20	17	19	18	14	15	12	15	18	21
Final consumption coefficient matrix	32	28	25	38	40	72	35	11	37	52	75
Value-added	3	3	3	4	3	7	6	5	5	2	2
Total output by industry	3	4	3	9	10	10	7	5	6	5	4

19 X 19 - WAPE (%)	95	96	97	98	99	00	01	02	03	04	05
Whole matrix	8	8	8	9	9	11	10	9	9	8	8
Intermediate use matrix	19	18	18	24	27	24	22	19	20	22	24
Direct consumption coefficient matrix	19	19	18	22	24	20	19	18	21	24	27
Final use matrix	22	19	16	17	16	13	13	12	13	13	17
Final consumption coefficient matrix	29	26	24	35	32	55	24	10	30	29	54
Value-added	7	7	9	10	10	14	13	12	12	8	9
Total output by industry	8	8	9	12	12	14	12	11	11	7	7

9 X 9 - WAPE (%)	95	96	97	98	99	00	01	02	03	04	05
Whole matrix	5	5	5	7	7	8	6	5	6	6	6
Intermediate use matrix	9	10	9	17	19	15	12	9	13	13	15
Direct consumption coefficient matrix	10	11	10	15	17	15	13	10	15	19	21
Final use matrix	15	13	12	14	14	8	8	7	8	6	8
Final consumption coefficient matrix	21	16	16	23	26	36	18	7	22	14	35
Value-added	3	3	3	4	3	7	6	5	5	2	2
Total output by industry	3	4	3	9	10	10	7	5	6	5	4

Table 2.6 (1) WAPE for Input Coefficient

	3 X 3	9 X 9	22 X 22
1995	5.4012	10.9195	22.4781
1996	5.0516	11.6403	21.9748
1997	4.8686	10.6875	21.5217
1998	7.6006	15.4038	24.4379
1999	8.3456	16.9765	25.5048
2000	9.7785	15.7557	24.6090
2001	7.2619	13.6196	23.2286
2002	5.7797	11.2226	21.7435
2003	8.2485	15.1014	23.8525
2004	8.3130	18.2287	26.2566
2005	11.1422	20.6259	28.8212

Table 2.6 (2) WAPE for Leontief Inverse Matrix

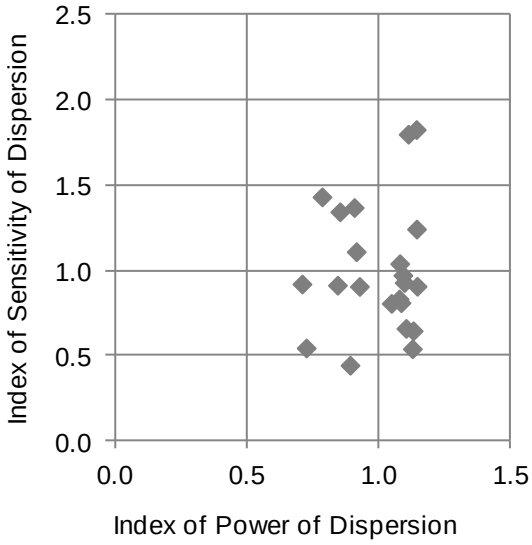
	3 X 3	9 X 9	22 X 22
1995	3.4364	5.1701	11.7211
1996	3.2411	5.9910	11.7387
1997	3.1399	5.1626	12.0529
1998	6.6239	10.0881	16.2333
1999	7.9818	11.4189	17.4502
2000	6.4111	8.0273	13.2698
2001	4.7685	6.5884	12.6575
2002	3.8196	5.0391	11.5834
2003	5.2244	7.0101	12.8548
2004	4.6575	9.0670	14.1428
2005	5.3162	10.6757	15.7759

Table 2.6 (3) WAPE for Leontief Inverse Matrix imports adjusted

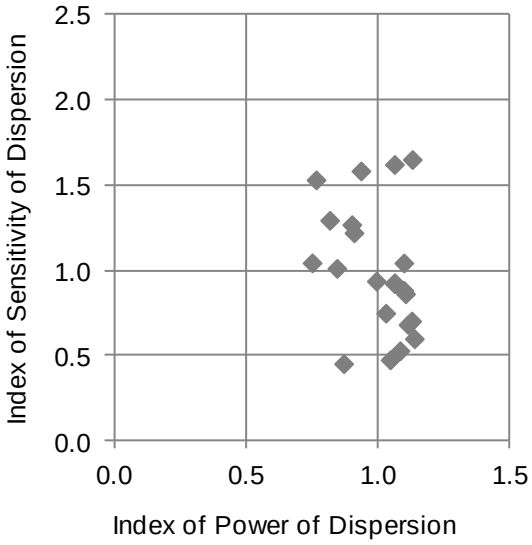
	3 X 3	9 X 9	22 X 22
1995	3.2183	4.8459	10.8288
1996	3.0263	5.5886	10.9882
1997	3.2814	5.0714	11.4303
1998	7.1319	10.1850	15.8042
1999	8.3656	11.3709	17.1393
2000	6.0379	7.6108	12.3959
2001	4.4262	6.1242	11.7571
2002	3.6727	4.7969	10.8856
2003	4.6872	6.6362	12.0584
2004	3.8930	8.2865	13.0389
2005	4.8897	9.9147	14.9168

Figure 2.3 (1) IPD-ISD from China KLEMS

China KLEMS 1995



China KLEMS 2000



China KLEMS 2005

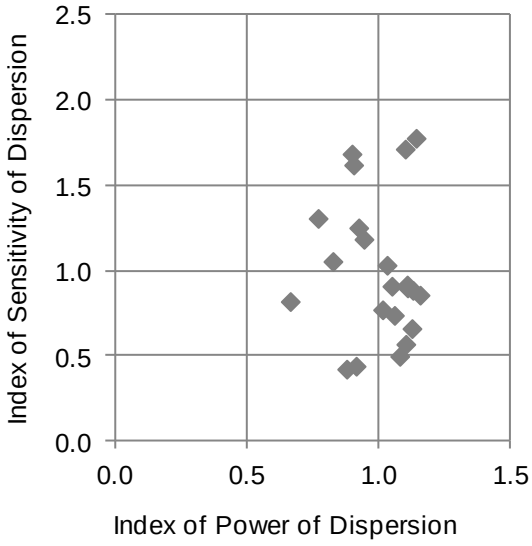
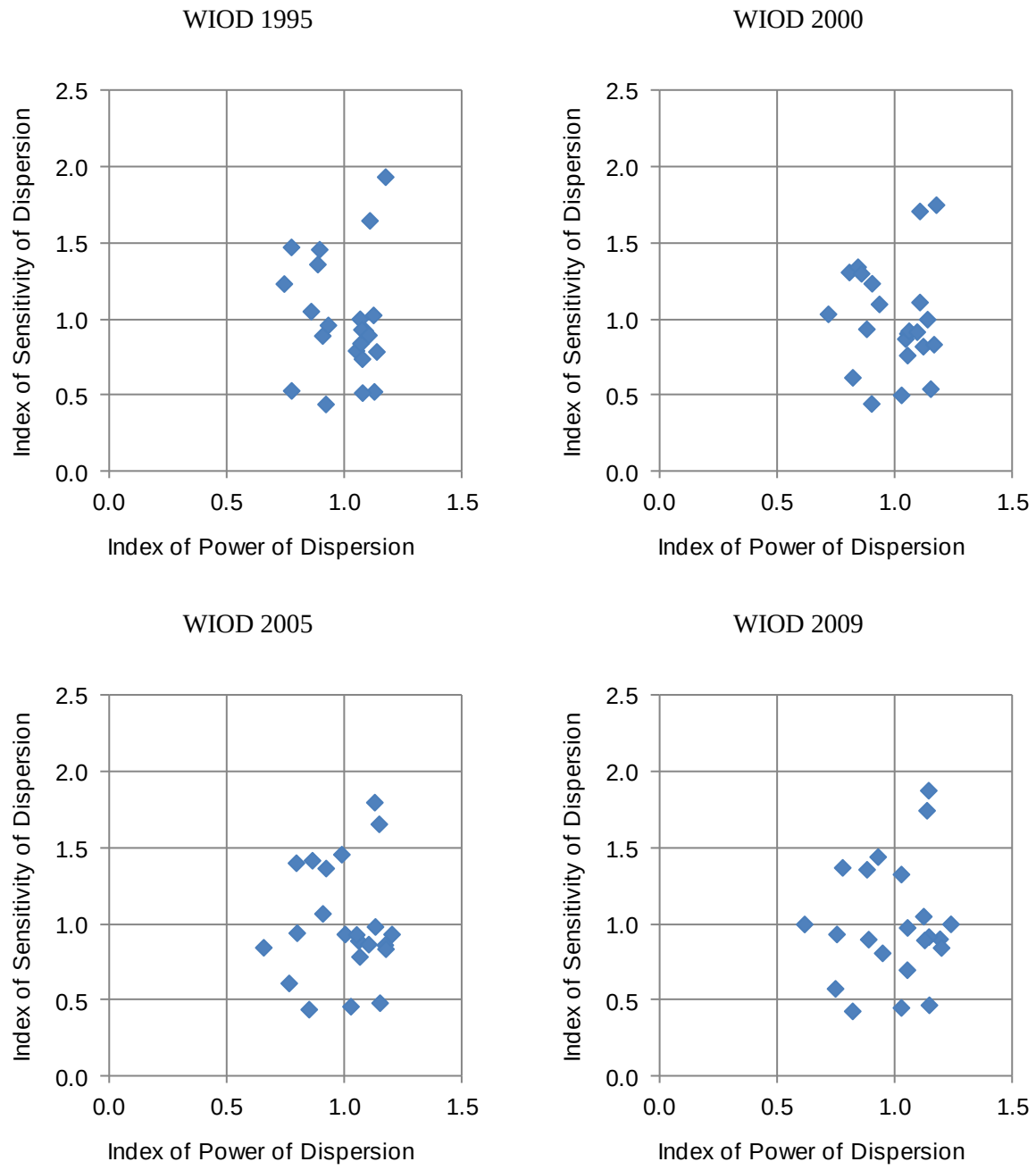


Figure 2.3 (2) IPD-ISD from WIOD



3. MEASURING CAPITAL INPUT

We build up the Capital Input Index based on capital stock under Perpetual Inventory Method (PIM). For Capital stock estimation we need the following data: 1) a capital stock benchmark; 2) the investment series in current prices; 3) Investment deflator; 4) Depreciation rate.

Based on the above data request, in this section we will introduce the following key steps when measuring capital input: 1) Prepare the investment series in current prices, and cross-classify the capital of each sector by 3 types of assets: structure, equipment, and auto; 2) Estimate the capital stock under the PIM; 3) Estimate the capital rental price with the help of the capital compensation from the input-output series; 4) Aggregation of capital service over different asset types with the weights of capital rental price.

3.1. *Investment series with assets type breakdown*

From 1996, there are investment data with disaggregated into structure and equipment by sector. We use 1996 composition for each industry to disaggregate investment before 1996 by sector into structure and equipment. We then apply the domestic revenue of auto to plus the net import value of auto, minus auto consumption by household as auto investment data. With the application of auto investment ratio for the economy into every sector, we estimate the auto investment by sector.

Investment in fixed assets excludes the small-scale investment, but includes the purchase of second-hand capital goods. While gross fixed capital formation is a better investment data for PIM.

> Capital formation
> = investment data – land purchase fee – secondhand capital investment + investment below 500,000 CNY + appreciation of commercial house.

Assuming the investment below 500,000 CNY is 0.2% of total investment in all years (according to an internal consulting with the China National Bureau of Statistics), we compare the sector gross value proportion with sector investment proportion, and find out some sector need to be upward adjustment. These sectors include: textile mill products furniture, rubber, leather, stone clay, and glass. Then we decompose the 0.2% total investment to these sectors.

We also gather the aggregate secondhand capital investment from the fixed asset investment yearbook for 2003-2005. We assume the secondhand capital investment is 1% of total investment for years before 2003 according to the available three years data. These aggregate secondhand capital investments are divided into sector with sector investment proportion.

> Appreciation of commercial house– land purchase fee
> = Capital formation -investment data+ secondhand capital investment- investment below 500,000 CNY (50,000 before 1997)

From the fixed asset investment yearbook, the building investment by sector is available for 2003-2005. We average the 3 years proportions, and then apply the proportion to all years. The value “appreciation of commercial house– land purchase fee” is divided into sector with building investment sector ratio.

3.2. *Estimate the capital stock under the PIM*

PIM can be expressed by the following equation:

(3.1) $$A_t = \sum_{\tau=0}^{\infty} d_\tau I_{t-\tau}$$

A deflator for investment in fixed asset is only available since 1992. The structure investment deflator for 1980-1991 is construction ex-factory price index, which is from the Input-Output Table time series price index. The auto investment deflator for 1980-2005 is the auto ex-factory price index from the IO time series price index. The equipment investment deflator for 1980-1991 is from the China National Bureau of Statistics.

For depreciation rate, we assumed an asset life of 16 years for equipment, and 10 years for auto, 40 years for structure. Under geometrically relative efficiency pattern, with our assumption of assets life, the depreciation rate of equipment is 17%, and structure is 8%, the auto is 26%.

We estimate the structure and equipment benchmark based on the PIM. Under the assumption that the gross value of fixed asset ratio is the same with the capital stock ratio, we estimate the auto capital stock benchmark. Net valued of fixed assets in 1980 for sectors were used to distribute the aggregate capital stock over sectors in 1980.

Although we obtain the agriculture land quantity data from "China Statistical Yearbook," we have to estimate the land price ourselves. We adopt the profit discount method, which denotes the price of land as: P=a/r, where "a" refers to the annual profit, "r" refers to the annual discount rate. From "China Agriculture Statistical Yearbook", we find the data of profit and cost for land.

3.3. *Estimate the capital rental price*

The capital rental price includes rates of return, depreciation, and capital gain for each of asset, expressed as follows:

$$p_t = (1+r)q_{t-1} - q_t + p_{D,t} = rq_{t-1} + \delta_t q_t - (q_t - q_{t-1}) \tag{3.2}$$

Data on asset prices and rates of depreciation for all assets are required for the PIM. And we can solve for the rate of return, given data on capital compensation for the sector:

$$r = \frac{property\ \ compensation - \{\delta q_t - (q_t - q_{t-1})\}A_t}{q_{t-1}A_t} \tag{3.3}$$

The capital rental price can be modified to incorporate China's tax structure:

$$\frac{[rq_{t-1} + \delta q_t - (q_t - q_{t-1})](1+h-u(1+h)z)}{1-u} + q_l^t \tau^t \tag{3.4}$$

where u is the corporate income tax rate, τ is the property tax rate, h is the value-added tax rate, z is the present discounted value of depreciation allowances of 1 CNY investment.

Our data source of sector property compensation is the input-output table time series. We subtract the labor compensation from sector value-added to obtain the capital property compensation. From farm proceeds per unit area, we estimate agriculture capital and labor input compensation ratios for every year.

Our estimation for self-employed compensation is based on the following steps: 1) Estimate the number of self-employed workers (non- agriculture). (From Labor Input estimation from next section) 2) Estimate the capital stock owned by these companies for the whole economy. 3) Allocate the total capital to sector using the sector self-employed workers proportion. 4) The sector self-employed capital compensation could be expressed in the following equation:

The sector self-employed capital compensation
=sector capital rental price* sector capital stock

Based on the above estimation, our final capital compensation could be expressed as:

Final capital compensation
=capital compensation (from Input-Output Table) + self-employed capital compensation

The estimation result for capital rental price and rate of return shows in the Table 3.1 & Table 3.2

3.4. *Aggregation of capital service*

The capital input index is a Translog quantity index of individual capital input:

$$\ln k^{t} - \ln k^{t-1} = \sum_{k} \overline{v_{Kk}} (\ln A_{k}^{t-1} - \ln A_{k}^{t-2}) \tag{3.5}$$

where weights are given by the average shares of each component in the value of property compensation.

$$v_{k} = \frac{1}{2}(v_{k}^{t} + v_{k}^{t-1}) \qquad v_{Kk}^{t} = \frac{k_{K}^{t} p_{Kk}^{t}}{\sum k_{K}^{t} p_{Kk}^{t}}$$

Table 3.1 (1) Capital rental price

	1981			1982			1983			1984		
	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price
01 Agriculture	1.02	1.17	1.27	0.94	1.03	1.17	0.82	0.94	1.07	0.72	0.85	0.96
02 Coal mining	0.02	0.17	0.27	0.05	0.15	0.29	0.06	0.18	0.32	0.07	0.20	0.32
03 Metal and non-metallic mining	0.34	0.49	0.59	0.39	0.49	0.63	0.38	0.50	0.63	0.39	0.52	0.64
04 Oil and gas extraction	0.51	0.66	0.76	0.42	0.52	0.66	0.35	0.47	0.60	0.37	0.50	0.62
05 Construction	0.48	0.64	0.74	0.49	0.59	0.73	0.57	0.69	0.82	0.63	0.75	0.87
06 Food and kindred products	0.99	1.14	1.24	1.10	1.20	1.34	1.04	1.15	1.28	1.08	1.20	1.32
07 Textile mill products	0.65	0.80	0.90	0.64	0.74	0.88	0.57	0.69	0.82	0.48	0.61	0.73
08 Apparel	0.72	0.87	0.97	1.01	1.11	1.24	1.52	1.62	1.76	2.32	2.43	2.55
09 Lumber and wood	0.20	0.35	0.45	0.14	0.25	0.39	0.14	0.26	0.40	0.17	0.30	0.43
10 Furniture and fixtures	0.72	0.87	0.97	0.55	0.65	0.79	0.59	0.71	0.84	0.73	0.86	0.98
11 Paper and allied	0.14	0.30	0.40	0.13	0.23	0.37	0.16	0.28	0.42	0.22	0.35	0.47
12 Printing, publishing and allied	0.22	0.37	0.47	0.20	0.30	0.45	0.25	0.37	0.51	0.33	0.46	0.58
13 Chemicals	0.25	0.40	0.50	0.27	0.37	0.51	0.31	0.43	0.56	0.33	0.46	0.58
14 Petroleum and coal products	0.54	0.69	0.79	0.82	0.92	1.06	0.95	1.06	1.20	1.16	1.28	1.40
15 Leather	0.19	0.34	0.44	0.23	0.33	0.47	0.29	0.41	0.55	0.48	0.61	0.73
16 Stone, clay, glass	0.46	0.61	0.71	0.48	0.58	0.72	0.49	0.61	0.75	0.53	0.66	0.78
17 Primary metal	0.14	0.30	0.40	0.21	0.31	0.45	0.22	0.35	0.48	0.26	0.39	0.51
18 Fabricated metal	0.54	0.69	0.79	0.64	0.73	0.87	0.73	0.85	0.98	0.85	0.98	1.10
19 Machinery, non-elect	0.09	0.25	0.35	0.11	0.22	0.36	0.15	0.27	0.40	0.18	0.32	0.44
20 Electrical machinery	0.40	0.55	0.65	0.45	0.55	0.69	0.54	0.66	0.80	0.79	0.92	1.04
21 Motor vehicles	0.54	0.69	0.79	0.57	0.67	0.81	0.74	0.86	0.99	0.93	1.05	1.17
22 Transportation equipment & ordnance	0.06	0.21	0.31	0.08	0.19	0.33	0.12	0.24	0.38	0.16	0.29	0.41
23 Instruments	0.15	0.31	0.41	0.18	0.28	0.43	0.18	0.31	0.44	0.21	0.34	0.46
24 Rubber and misc plastics	0.19	0.34	0.44	0.27	0.38	0.52	0.39	0.51	0.65	0.55	0.67	0.79
25 Misc. manufacturing	0.72	0.87	0.97	0.50	0.60	0.74	0.43	0.55	0.68	0.49	0.62	0.74
26 Transportation	0.10	0.25	0.35	0.13	0.23	0.37	0.14	0.27	0.40	0.17	0.30	0.42
27 Communications	(0.03)	0.13	0.23	(0.01)	0.10	0.24	(0.00)	0.12	0.26	0.01	0.14	0.26
28 Electric utilities	0.11	0.27	0.37	0.13	0.24	0.38	0.14	0.26	0.40	0.14	0.28	0.40
29 Gas utilities	0.20	0.36	0.46	0.22	0.32	0.46	0.22	0.34	0.48	0.22	0.35	0.47
30 Trade	0.17	0.33	0.43	0.16	0.26	0.40	0.22	0.34	0.47	0.40	0.53	0.65
31 Finance Insurance and Real Estate	0.54	0.69	0.79	0.39	0.49	0.63	0.36	0.48	0.62	0.36	0.49	0.61
32 Other private service	0.41	0.56	0.66	0.33	0.43	0.57	0.31	0.43	0.56	0.31	0.44	0.56
33 Public service	0.18	0.33	0.43	0.12	0.22	0.37	0.08	0.21	0.34	0.07	0.20	0.32

Table 3.1 (2) Capital rental price

	1985			1986			1987			1988		
	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price
01 Agriculture	0.55	0.70	0.73	0.35	0.50	0.77	1.37	1.45	1.50	1.29	1.35	1.49
02 Coal mining	0.07	0.23	0.26	0.07	0.25	0.52	0.03	0.17	0.23	0.03	0.15	0.31
03 Metal and non-metallic mining	0.34	0.49	0.52	0.35	0.51	0.77	0.37	0.49	0.55	0.35	0.45	0.60
04 Oil and gas extraction	0.27	0.43	0.45	0.23	0.39	0.66	0.20	0.32	0.38	0.14	0.25	0.41
05 Construction	0.76	0.92	0.94	0.77	0.90	1.15	1.42	1.50	1.55	1.52	1.57	1.70
06 Food and kindred products	1.08	1.23	1.25	1.07	1.18	1.43	1.04	1.14	1.19	1.08	1.15	1.29
07 Textile mill products	0.57	0.72	0.75	0.57	0.72	0.98	0.55	0.67	0.72	0.55	0.64	0.79
08 Apparel	3.59	3.71	3.73	4.71	4.58	4.74	5.22	5.17	5.17	6.59	6.41	6.46
09 Lumber and wood	0.36	0.51	0.54	0.38	0.54	0.80	0.60	0.72	0.77	0.76	0.84	0.98
10 Furniture and fixtures	1.43	1.58	1.60	1.49	1.57	1.81	1.90	1.96	2.00	2.17	2.19	2.31
11 Paper and allied	0.50	0.65	0.68	0.58	0.72	0.98	0.56	0.68	0.73	0.63	0.72	0.87
12 Printing, publishing and allied	0.55	0.71	0.74	0.52	0.67	0.93	0.52	0.63	0.69	0.55	0.64	0.79
13 Chemicals	0.37	0.53	0.55	0.40	0.55	0.81	0.40	0.52	0.58	0.42	0.51	0.67
14 Petroleum and coal products	0.88	1.04	1.06	0.93	1.05	1.30	0.82	0.92	0.97	0.74	0.83	0.97
15 Leather	0.56	0.72	0.74	0.59	0.73	0.99	0.80	0.91	0.96	0.78	0.86	1.00
16 Stone, clay, glass	0.69	0.84	0.87	0.71	0.84	1.10	0.75	0.86	0.91	0.72	0.81	0.96
17 Primary metal	0.26	0.42	0.44	0.29	0.45	0.72	0.26	0.38	0.44	0.26	0.37	0.52
18 Fabricated metal	0.84	0.99	1.02	1.02	1.14	1.38	1.07	1.17	1.22	1.20	1.27	1.41
19 Machinery, non-elect	0.26	0.42	0.45	0.30	0.46	0.73	0.31	0.43	0.49	0.35	0.45	0.60
20 Electrical machinery	1.34	1.48	1.51	1.06	1.17	1.42	0.77	0.88	0.93	0.81	0.90	1.04
21 Motor vehicles	1.26	1.40	1.43	1.06	1.17	1.42	1.14	1.23	1.28	1.12	1.19	1.33
22 Transportation equipment & ordnance	0.21	0.36	0.39	0.14	0.32	0.58	0.18	0.30	0.36	0.21	0.32	0.47
23 Instruments	0.35	0.51	0.53	0.20	0.37	0.64	0.23	0.35	0.41	0.26	0.37	0.52
24 Rubber and misc plastics	0.64	0.79	0.82	0.72	0.86	1.11	0.66	0.77	0.83	0.85	0.93	1.08
25 Misc. manufacturing	0.58	0.73	0.76	0.61	0.75	1.01	0.52	0.63	0.69	0.50	0.60	0.75
26 Transportation	0.17	0.33	0.36	0.17	0.34	0.61	0.17	0.30	0.36	0.17	0.28	0.43
27 Communications	0.03	0.19	0.22	0.02	0.20	0.47	0.06	0.19	0.25	0.08	0.19	0.35
28 Electric utilities	0.16	0.32	0.34	0.14	0.31	0.58	0.13	0.26	0.31	0.11	0.22	0.38
29 Gas utilities	0.25	0.41	0.44	0.12	0.30	0.57	0.06	0.19	0.25	0.07	0.19	0.34
30 Trade	0.78	0.93	0.95	0.97	1.08	1.33	1.58	1.66	1.70	1.95	1.98	2.10
31 Finance Insurance and Real Estate	0.37	0.52	0.55	0.43	0.58	0.84	0.42	0.54	0.60	0.41	0.51	0.66
32 Other private service	0.33	0.49	0.52	0.27	0.43	0.70	0.21	0.34	0.40	0.21	0.32	0.47
33 Public service	0.06	0.22	0.25	0.04	0.22	0.49	0.07	0.20	0.26	0.07	0.18	0.34

Table 3.1 (3) Capital rental price

	1989			1990			1991			1992		
	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price
01 Agriculture	1.21	1.10	1.26	1.21	1.50	1.59	1.06	1.21	1.24	1.00	1.17	1.27
02 Coal mining	0.07	0.00	0.18	0.01	0.34	0.45	0.03	0.21	0.25	0.03	0.22	0.33
03 Metal and non-metallic mining	0.37	0.29	0.46	0.21	0.54	0.64	0.23	0.41	0.44	0.24	0.43	0.53
04 Oil and gas extraction	0.14	0.07	0.24	0.09	0.42	0.53	0.11	0.30	0.33	0.12	0.30	0.41
05 Construction	1.44	1.33	1.48	1.26	1.55	1.63	1.38	1.52	1.54	1.81	1.96	2.05
06 Food and kindred products	1.14	1.04	1.20	0.89	1.19	1.28	1.02	1.17	1.20	1.11	1.27	1.37
07 Textile mill products	0.54	0.46	0.63	0.35	0.67	0.76	0.39	0.56	0.59	0.39	0.57	0.67
08 Apparel	7.67	7.33	7.40	7.40	7.47	7.48	8.74	8.66	8.61	9.30	9.31	9.36
09 Lumber and wood	0.79	0.70	0.86	0.44	0.75	0.85	0.55	0.72	0.75	0.51	0.69	0.79
10 Furniture and fixtures	2.09	1.96	2.10	1.65	1.92	2.01	1.89	2.01	2.03	2.61	2.75	2.84
11 Paper and allied	0.65	0.56	0.73	0.40	0.72	0.82	0.43	0.60	0.63	0.41	0.59	0.69
12 Printing, publishing and allied	0.60	0.52	0.68	0.44	0.75	0.85	0.47	0.64	0.67	0.38	0.56	0.66
13 Chemicals	0.41	0.34	0.51	0.30	0.62	0.72	0.31	0.48	0.52	0.30	0.48	0.58
14 Petroleum and coal products	0.65	0.57	0.73	0.39	0.71	0.81	0.58	0.75	0.78	0.54	0.72	0.82
15 Leather	0.74	0.65	0.81	0.52	0.84	0.93	0.79	0.95	0.97	0.79	0.96	1.06
16 Stone, clay, glass	0.67	0.59	0.75	0.47	0.79	0.88	0.54	0.70	0.73	0.70	0.87	0.97
17 Primary metal	0.31	0.24	0.41	0.19	0.51	0.61	0.25	0.42	0.46	0.30	0.48	0.59
18 Fabricated metal	1.20	1.09	1.25	0.98	1.28	1.37	1.10	1.25	1.28	1.14	1.31	1.41
19 Machinery, non-elect	0.37	0.30	0.47	0.25	0.58	0.67	0.31	0.48	0.51	0.39	0.57	0.67
20 Electrical machinery	0.83	0.74	0.90	0.55	0.87	0.96	0.64	0.81	0.84	0.67	0.85	0.95
21 Motor vehicles	1.14	1.03	1.19	0.91	1.21	1.30	1.04	1.19	1.22	1.18	1.34	1.44
22 Transportation equipment & ordnance	0.23	0.17	0.34	0.09	0.42	0.52	0.20	0.38	0.41	0.29	0.48	0.58
23 Instruments	0.30	0.23	0.40	0.18	0.51	0.61	0.24	0.42	0.45	0.25	0.43	0.54
24 Rubber and misc plastics	0.88	0.79	0.95	0.70	1.01	1.10	0.88	1.04	1.06	0.93	1.10	1.20
25 Misc. manufacturing	0.56	0.48	0.64	0.40	0.72	0.82	0.50	0.67	0.70	0.51	0.69	0.79
26 Transportation	0.18	0.11	0.28	0.19	0.51	0.61	0.19	0.37	0.41	0.19	0.38	0.48
27 Communications	0.15	0.09	0.26	0.09	0.42	0.53	0.16	0.34	0.37	0.17	0.35	0.45
28 Electric utilities	0.14	0.07	0.24	0.07	0.40	0.50	0.09	0.27	0.31	0.11	0.29	0.40
29 Gas utilities	0.12	0.06	0.23	0.03	0.37	0.47	0.07	0.25	0.29	0.05	0.24	0.34
30 Trade	1.93	1.80	1.94	1.19	1.48	1.57	1.49	1.63	1.65	1.97	2.12	2.21
31 Finance Insurance and Real Estate	0.49	0.41	0.58	0.36	0.68	0.78	0.34	0.51	0.55	0.37	0.55	0.66
32 Other private service	0.21	0.15	0.32	0.15	0.48	0.58	0.17	0.35	0.38	0.19	0.38	0.48
33 Public service	0.09	0.02	0.19	0.05	0.38	0.48	0.08	0.26	0.29	0.08	0.27	0.37

Table 3.1 (4) Capital rental price

	1993			1994			1995			1996		
	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price
01 Agriculture	0.87	1.10	1.18	1.13	1.23	1.36	1.37	1.44	1.56	1.32	1.45	1.55
02 Coal mining	0.03	0.26	0.35	0.05	0.17	0.31	0.08	0.17	0.29	0.09	0.23	0.34
03 Metal and non-metallic mining	0.24	0.47	0.55	0.34	0.45	0.59	0.37	0.46	0.58	0.35	0.49	0.60
04 Oil and gas extraction	0.12	0.35	0.44	0.16	0.28	0.41	0.16	0.25	0.37	0.14	0.29	0.39
05 Construction	2.21	2.41	2.49	2.07	2.17	2.29	2.18	2.24	2.35	1.79	1.92	2.02
06 Food and kindred products	0.93	1.15	1.23	1.25	1.35	1.48	1.69	1.76	1.88	1.54	1.67	1.77
07 Textile mill products	0.41	0.63	0.72	0.57	0.68	0.82	0.65	0.73	0.85	0.67	0.81	0.91
08 Apparel	13.05	13.08	13.10	12.89	12.86	12.94	13.12	13.07	13.13	13.02	13.04	13.10
09 Lumber and wood	0.93	1.15	1.23	1.66	1.76	1.89	1.90	1.97	2.08	1.74	1.87	1.97
10 Furniture and fixtures	3.09	3.28	3.35	5.64	5.70	5.81	5.98	6.00	6.10	5.92	6.01	6.09
11 Paper and allied	0.38	0.61	0.69	0.62	0.73	0.86	0.86	0.93	1.05	0.83	0.97	1.08
12 Printing, publishing and allied	0.38	0.61	0.70	0.60	0.71	0.84	0.78	0.86	0.97	0.81	0.95	1.05
13 Chemicals	0.25	0.48	0.56	0.30	0.41	0.55	0.36	0.45	0.57	0.33	0.48	0.58
14 Petroleum and coal products	0.54	0.77	0.85	0.66	0.77	0.91	0.76	0.84	0.96	0.57	0.71	0.82
15 Leather	1.11	1.33	1.41	1.64	1.74	1.87	2.45	2.51	2.62	2.92	3.04	3.13
16 Stone, clay, glass	0.71	0.93	1.02	0.83	0.94	1.07	0.94	1.02	1.14	0.87	1.01	1.11
17 Primary metal	0.34	0.57	0.66	0.36	0.47	0.61	0.30	0.39	0.51	0.23	0.37	0.48
18 Fabricated metal	1.34	1.56	1.64	1.68	1.78	1.91	1.75	1.82	1.93	1.70	1.83	1.93
19 Machinery, non-elect	0.37	0.60	0.68	0.43	0.55	0.68	0.56	0.64	0.76	0.59	0.74	0.84
20 Electrical machinery	0.66	0.89	0.97	0.84	0.95	1.08	1.13	1.21	1.33	1.02	1.15	1.26
21 Motor vehicles	1.17	1.38	1.46	1.08	1.18	1.32	1.12	1.19	1.31	0.81	0.95	1.05
22 Transportation equipment & ordnance	0.33	0.56	0.64	0.37	0.49	0.62	0.39	0.47	0.59	0.41	0.55	0.65
23 Instruments	0.30	0.53	0.61	0.34	0.45	0.58	0.38	0.47	0.59	0.40	0.54	0.65
24 Rubber and misc plastics	0.81	1.03	1.11	0.91	1.01	1.15	1.36	1.44	1.55	1.25	1.39	1.49
25 Misc. manufacturing	0.49	0.72	0.80	0.60	0.71	0.84	0.69	0.77	0.89	0.60	0.74	0.85
26 Transportation	0.17	0.40	0.48	0.17	0.28	0.42	0.14	0.23	0.35	0.11	0.26	0.36
27 Communications	0.19	0.42	0.50	0.27	0.38	0.52	0.34	0.43	0.55	0.24	0.39	0.49
28 Electric utilities	0.08	0.32	0.40	0.12	0.24	0.38	0.13	0.22	0.34	0.10	0.25	0.35
29 Gas utilities	0.04	0.27	0.36	0.07	0.18	0.32	0.08	0.17	0.29	0.06	0.20	0.31
30 Trade	1.58	1.79	1.86	1.79	1.89	2.02	2.00	2.06	2.18	1.79	1.92	2.02
31 Finance Insurance and Real Estate	0.31	0.54	0.62	0.33	0.44	0.58	0.33	0.41	0.54	0.26	0.41	0.51
32 Other private service	0.18	0.42	0.50	0.22	0.33	0.47	0.24	0.33	0.45	0.21	0.35	0.46
33 Public service	0.06	0.30	0.38	0.08	0.20	0.33	0.08	0.17	0.29	0.07	0.21	0.32

Table 3.1 (5) Capital rental price

	1997			1998			1999			2000		
	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price
01 Agriculture	1.20	1.35	1.44	1.05	1.18	1.28	0.85	0.98	1.06	0.63	0.79	0.88
02 Coal mining	0.08	0.25	0.34	0.07	0.21	0.31	0.07	0.21	0.29	0.46	0.62	0.71
03 Metal and non-metallic mining	0.38	0.54	0.63	0.39	0.53	0.62	0.39	0.52	0.61	0.57	0.73	0.82
04 Oil and gas extraction	0.14	0.30	0.40	0.22	0.36	0.46	0.22	0.35	0.43	0.23	0.40	0.49
05 Construction	1.53	1.68	1.77	1.28	1.41	1.51	1.10	1.23	1.31	3.29	3.43	3.51
06 Food and kindred products	1.57	1.72	1.81	1.64	1.77	1.87	1.57	1.69	1.77	0.93	1.09	1.18
07 Textile mill products	0.80	0.96	1.05	0.71	0.85	0.95	0.74	0.88	0.96	0.89	1.04	1.13
08 Apparel	14.79	14.83	14.89	11.23	11.29	11.36	10.46	10.52	10.58	10.64	10.70	10.77
09 Lumber and wood	1.74	1.88	1.97	1.38	1.51	1.60	0.74	0.88	0.96	1.56	1.71	1.79
10 Furniture and fixtures	6.18	6.29	6.36	6.47	6.56	6.64	6.12	6.22	6.29	8.74	8.82	8.89
11 Paper and allied	0.69	0.84	0.93	0.57	0.71	0.81	0.56	0.70	0.78	1.11	1.27	1.36
12 Printing, publishing and allied	0.89	1.05	1.14	0.64	0.78	0.87	0.62	0.76	0.84	1.91	2.05	2.14
13 Chemicals	0.30	0.46	0.55	0.28	0.42	0.52	0.28	0.42	0.50	0.25	0.41	0.51
14 Petroleum and coal products	0.49	0.64	0.74	0.53	0.67	0.77	0.55	0.69	0.77	0.33	0.49	0.58
15 Leather	2.98	3.11	3.20	2.92	3.04	3.13	2.92	3.04	3.11	3.14	3.27	3.36
16 Stone, clay, glass	0.83	0.98	1.07	0.72	0.85	0.95	0.70	0.83	0.91	0.37	0.53	0.62
17 Primary metal	0.19	0.35	0.44	0.20	0.34	0.44	0.21	0.35	0.43	0.35	0.51	0.60
18 Fabricated metal	1.80	1.95	2.04	1.76	1.88	1.98	1.79	1.92	2.00	2.55	2.69	2.77
19 Machinery, non-elect	0.67	0.83	0.92	0.57	0.71	0.80	0.55	0.69	0.77	0.91	1.06	1.16
20 Electrical machinery	1.16	1.32	1.41	1.32	1.45	1.54	1.29	1.42	1.50	1.41	1.56	1.65
21 Motor vehicles	0.78	0.94	1.03	0.64	0.78	0.88	0.68	0.82	0.90	1.22	1.37	1.46
22 Transportation equipment & ordnance	0.36	0.52	0.61	0.24	0.38	0.47	0.24	0.38	0.46	0.26	0.42	0.51
23 Instruments	0.45	0.61	0.70	0.48	0.62	0.72	0.52	0.65	0.74	1.03	1.18	1.27
24 Rubber and misc plastics	1.30	1.45	1.54	1.30	1.43	1.53	1.33	1.46	1.54	2.07	2.22	2.30
25 Misc. manufacturing	0.61	0.77	0.86	0.50	0.64	0.73	0.43	0.57	0.65	0.60	0.75	0.85
26 Transportation	0.09	0.25	0.35	0.09	0.23	0.32	0.07	0.21	0.29	0.19	0.35	0.44
27 Communications	0.22	0.38	0.47	0.20	0.34	0.43	0.16	0.29	0.38	(0.06)	0.11	0.20
28 Electric utilities	0.10	0.26	0.35	0.12	0.26	0.35	0.10	0.24	0.32	0.12	0.28	0.38
29 Gas utilities	0.06	0.22	0.31	0.07	0.22	0.31	0.07	0.21	0.29	0.00	0.17	0.26
30 Trade	1.95	2.09	2.18	2.12	2.25	2.34	2.11	2.23	2.31	2.88	3.02	3.11
31 Finance Insurance and Real Estate	0.30	0.46	0.55	0.33	0.47	0.57	0.35	0.48	0.56	0.37	0.53	0.62
32 Other private service	0.23	0.39	0.48	0.23	0.37	0.47	0.22	0.36	0.44	0.56	0.72	0.81
33 Public service	0.06	0.22	0.31	0.07	0.21	0.30	0.07	0.20	0.29	0.22	0.38	0.48

Table 3.1 (6) Capital rental price

	2001			2002			2003			2004		
	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price	structure rental price	equipment rental price	auto rental price
01 Agriculture	4.36	4.39	4.46	3.96	4.06	4.17	2.28	2.45	2.54	2.48	2.66	2.79
02 Coal mining	0.57	0.66	0.74	0.59	0.74	0.86	0.52	0.70	0.80	0.43	0.64	0.78
03 Metal and non-metallic mining	0.72	0.81	0.89	0.82	0.96	1.07	0.78	0.96	1.06	0.72	0.92	1.06
04 Oil and gas extraction	0.23	0.33	0.41	0.20	0.36	0.47	0.25	0.44	0.54	0.27	0.47	0.61
05 Construction	3.97	4.02	4.08	4.35	4.45	4.55	4.27	4.42	4.50	3.80	3.97	4.09
06 Food and kindred products	1.14	1.23	1.30	1.13	1.27	1.38	1.27	1.44	1.54	1.05	1.25	1.38
07 Textile mill products	1.09	1.17	1.25	1.09	1.23	1.34	1.20	1.38	1.48	1.02	1.22	1.35
08 Apparel	10.39	10.34	10.38	9.43	9.47	9.55	11.63	11.70	11.76	5.11	5.26	5.37
09 Lumber and wood	2.30	2.37	2.44	2.61	2.74	2.84	2.90	3.06	3.15	1.92	2.10	2.23
10 Furniture and fixtures	10.49	10.44	10.48	10.76	10.78	10.86	12.20	12.26	12.32	5.63	5.78	5.89
11 Paper and allied	1.00	1.09	1.17	0.78	0.92	1.04	0.88	1.06	1.16	0.77	0.97	1.10
12 Printing, publishing and allied	2.39	2.46	2.53	2.57	2.69	2.80	2.21	2.37	2.47	1.41	1.60	1.74
13 Chemicals	0.35	0.44	0.52	0.37	0.52	0.63	0.42	0.61	0.71	0.39	0.60	0.74
14 Petroleum and coal products	0.43	0.52	0.61	0.43	0.58	0.69	0.49	0.68	0.78	0.48	0.69	0.83
15 Leather	4.05	4.09	4.16	4.14	4.24	4.34	5.65	5.78	5.87	3.89	4.05	4.18
16 Stone, clay, glass	0.55	0.64	0.73	0.67	0.81	0.93	0.97	1.15	1.25	1.00	1.20	1.33
17 Primary metal	0.47	0.56	0.64	0.49	0.64	0.76	0.51	0.70	0.80	0.45	0.66	0.79
18 Fabricated metal	2.95	3.01	3.08	2.84	2.96	3.06	3.35	3.50	3.59	2.29	2.47	2.60
19 Machinery, non-elect	1.13	1.22	1.30	1.20	1.34	1.45	1.37	1.55	1.64	1.22	1.42	1.55
20 Electrical machinery	1.39	1.47	1.55	1.23	1.37	1.48	1.56	1.73	1.83	1.41	1.60	1.73
21 Motor vehicles	1.26	1.34	1.42	1.10	1.24	1.35	1.22	1.40	1.50	0.72	0.93	1.06
22 Transportation equipment & ordnance	0.33	0.43	0.51	0.32	0.47	0.58	0.32	0.51	0.61	0.26	0.47	0.61
23 Instruments	1.16	1.24	1.32	1.08	1.22	1.33	0.99	1.17	1.27	0.82	1.02	1.16
24 Rubber and misc plastics	1.69	1.76	1.84	1.26	1.40	1.51	1.29	1.47	1.57	1.15	1.35	1.48
25 Misc. manufacturing	0.81	0.90	0.98	0.95	1.09	1.20	1.01	1.19	1.29	0.98	1.18	1.32
26 Transportation	0.22	0.32	0.40	0.21	0.36	0.48	0.18	0.37	0.47	0.19	0.40	0.53
27 Communications	(0.03)	0.07	0.15	(0.06)	0.09	0.21	(0.08)	0.11	0.21	(0.08)	0.13	0.27
28 Electric utilities	0.14	0.24	0.32	0.12	0.27	0.39	0.11	0.30	0.40	0.11	0.31	0.45
29 Gas utilities	0.04	0.14	0.22	0.05	0.21	0.32	0.09	0.28	0.38	0.07	0.28	0.42
30 Trade	3.60	3.65	3.72	3.64	3.75	3.85	4.40	4.55	4.64	3.91	4.08	4.20
31 Finance Insurance and Real Estate	0.46	0.56	0.64	0.56	0.71	0.82	0.52	0.71	0.81	0.31	0.52	0.66
32 Other private service	0.66	0.75	0.84	0.68	0.83	0.94	0.65	0.83	0.93	0.70	0.90	1.03
33 Public service	0.29	0.38	0.47	0.29	0.44	0.56	0.26	0.45	0.55	0.24	0.44	0.58

Table 3.1 (7) Capital rental price

	2005		
	structure rental price	equipment rental price	auto rental price
01 Agriculture	2.45	2.55	2.66
02 Coal mining	0.53	0.66	0.79
03 Metal and non-metallic mining	0.77	0.89	1.02
04 Oil and gas extraction	0.31	0.45	0.57
05 Construction	4.41	4.48	4.59
06 Food and kindred products	1.09	1.21	1.33
07 Textile mill products	0.93	1.05	1.18
08 Apparel	3.62	3.69	3.81
09 Lumber and wood	1.52	1.63	1.76
10 Furniture and fixtures	4.22	4.28	4.39
11 Paper and allied	0.66	0.79	0.91
12 Printing, publishing and allied	1.18	1.30	1.42
13 Chemicals	0.39	0.52	0.65
14 Petroleum and coal products	0.70	0.82	0.95
15 Leather	4.10	4.17	4.27
16 Stone, clay, glass	0.84	0.96	1.08
17 Primary metal	0.44	0.56	0.69
18 Fabricated metal	1.80	1.90	2.02
19 Machinery, non-elect	1.13	1.25	1.37
20 Electrical machinery	1.25	1.36	1.49
21 Motor vehicles	0.67	0.79	0.92
22 Transportation equipment & ordnance	0.34	0.47	0.60
23 Instruments	0.95	1.07	1.19
24 Rubber and misc plastics	1.04	1.16	1.29
25 Misc. manufacturing	1.27	1.39	1.51
26 Transportation	0.21	0.34	0.47
27 Communications	(0.04)	0.09	0.22
28 Electric utilities	0.13	0.26	0.39
29 Gas utilities	0.07	0.20	0.33
30 Trade	3.88	3.96	4.07
31 Finance Insurance and Real Estate	0.26	0.39	0.52
32 Other private service	0.69	0.82	0.94
33 Public service	0.24	0.38	0.50

Table 3.2 (1) Rate of Return

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
01 Agriculture	0.87	0.77	0.69	0.60	0.47	0.27	1.12	1.08	0.98	1.13	0.90	0.95	0.98	0.96	1.11
02 Coal mining	(0.01)	(0.01)	0.02	0.04	0.06	0.06	0.02	0.07	0.04	0.15	0.04	0.11	0.25	0.06	0.03
03 Metal and non-metallic mining	0.26	0.29	0.30	0.31	0.29	0.27	0.30	0.32	0.29	0.32	0.21	0.29	0.43	0.30	0.28
04 Oil and gas extraction	0.42	0.32	0.27	0.30	0.23	0.18	0.15	0.16	0.10	0.22	0.11	0.19	0.33	0.15	0.10
05 Construction	0.40	0.38	0.46	0.52	0.66	0.59	1.17	1.27	1.17	1.18	1.17	1.64	2.14	1.75	1.78
06 Food and kindred products	0.84	0.92	0.87	0.92	0.94	0.82	0.86	0.92	0.92	0.87	0.87	1.04	1.03	1.06	1.38
07 Textile mill products	0.54	0.51	0.47	0.39	0.49	0.44	0.45	0.49	0.43	0.42	0.34	0.42	0.58	0.50	0.50
08 Apparel	0.60	0.83	1.29	2.00	3.13	3.60	4.31	5.35	6.28	6.23	7.33	8.07	11.50	10.78	10.93
09 Lumber and wood	0.14	0.08	0.09	0.13	0.31	0.29	0.49	0.65	0.63	0.50	0.48	0.53	1.03	1.41	1.55
10 Furniture and fixtures	0.60	0.43	0.48	0.62	1.25	1.14	1.56	1.79	1.71	1.50	1.59	2.33	2.90	4.73	4.96
11 Paper and allied	0.09	0.06	0.11	0.16	0.43	0.45	0.46	0.55	0.52	0.47	0.37	0.44	0.56	0.54	0.68
12 Printing, publishing and allied	0.16	0.13	0.19	0.27	0.48	0.40	0.42	0.49	0.48	0.50	0.40	0.41	0.56	0.52	0.61
13 Chemicals	0.19	0.19	0.24	0.26	0.32	0.31	0.33	0.38	0.33	0.39	0.27	0.34	0.44	0.27	0.27
14 Petroleum and coal products	0.44	0.67	0.80	0.99	0.77	0.72	0.67	0.64	0.52	0.46	0.50	0.55	0.69	0.58	0.60
15 Leather	0.13	0.15	0.22	0.40	0.49	0.45	0.66	0.67	0.59	0.57	0.67	0.76	1.19	1.39	2.01
16 Stone, clay, glass	0.37	0.37	0.40	0.44	0.60	0.54	0.61	0.63	0.54	0.53	0.46	0.69	0.84	0.71	0.75
17 Primary metal	0.09	0.13	0.16	0.20	0.22	0.23	0.21	0.26	0.24	0.29	0.22	0.34	0.53	0.32	0.22
18 Fabricated metal	0.44	0.51	0.61	0.72	0.73	0.78	0.88	1.01	0.97	0.95	0.94	1.07	1.39	1.42	1.42
19 Machinery, non-elect	0.05	0.05	0.09	0.14	0.22	0.23	0.25	0.33	0.30	0.35	0.27	0.42	0.55	0.38	0.43
20 Electrical machinery	0.32	0.34	0.44	0.67	1.16	0.82	0.63	0.70	0.67	0.59	0.55	0.66	0.80	0.72	0.91
21 Motor vehicles	0.45	0.45	0.61	0.79	1.09	0.81	0.93	0.95	0.92	0.89	0.88	1.10	1.24	0.92	0.89
22 Transportation equipment & ordnance	0.02	0.02	0.07	0.11	0.18	0.11	0.14	0.21	0.18	0.21	0.18	0.34	0.51	0.33	0.29
23 Instruments	0.10	0.11	0.13	0.16	0.30	0.16	0.18	0.25	0.24	0.29	0.21	0.30	0.49	0.30	0.28
24 Rubber and misc plastics	0.14	0.19	0.31	0.45	0.55	0.56	0.54	0.73	0.71	0.71	0.75	0.88	0.93	0.78	1.10
25 Misc. manufacturing	0.60	0.39	0.34	0.40	0.50	0.47	0.42	0.45	0.45	0.47	0.43	0.52	0.65	0.52	0.54
26 Transportation	0.05	0.06	0.09	0.12	0.15	0.13	0.13	0.18	0.14	0.29	0.18	0.25	0.37	0.16	0.08
27 Communications	(0.06)	(0.06)	(0.03)	(0.02)	0.02	0.02	0.04	0.10	0.11	0.22	0.15	0.23	0.39	0.24	0.25
28 Electric utilities	0.07	0.07	0.09	0.10	0.14	0.11	0.10	0.13	0.10	0.20	0.09	0.18	0.30	0.12	0.07
29 Gas utilities	0.15	0.14	0.16	0.16	0.22	0.10	0.04	0.10	0.09	0.17	0.07	0.13	0.26	0.08	0.03
30 Trade	0.12	0.09	0.16	0.32	0.67	0.74	1.30	1.61	1.57	1.12	1.26	1.78	1.59	1.52	1.63
31 Finance Insurance and Real Estate	0.44	0.29	0.28	0.29	0.32	0.33	0.34	0.38	0.39	0.43	0.30	0.41	0.50	0.29	0.24
32 Other private service	0.33	0.24	0.24	0.25	0.29	0.21	0.17	0.21	0.16	0.26	0.16	0.25	0.39	0.20	0.17
33 Public service	0.13	0.06	0.04	0.03	0.05	0.04	0.05	0.10	0.06	0.18	0.08	0.16	0.28	0.09	0.03

Table 3.2 (2) Rate of Return

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
01 Agriculture	1.07	0.95	0.81	0.63	0.47	3.48	3.22	1.86	2.07	1.96
02 Coal mining	0.04	0.02	(0.02)	(0.02)	0.33	0.33	0.41	0.38	0.35	0.37
03 Metal and non-metallic mining	0.26	0.27	0.25	0.25	0.42	0.46	0.60	0.60	0.59	0.57
04 Oil and gas extraction	0.09	0.07	0.11	0.10	0.14	0.05	0.09	0.16	0.21	0.19
05 Construction	1.46	1.23	1.00	0.84	2.71	3.16	3.55	3.53	3.17	3.59
06 Food and kindred products	1.26	1.27	1.31	1.24	0.73	0.81	0.86	1.01	0.87	0.83
07 Textile mill products	0.53	0.62	0.52	0.55	0.69	0.76	0.83	0.96	0.84	0.70
08 Apparel	10.88	12.39	9.39	8.74	8.88	8.51	7.79	9.69	4.26	2.93
09 Lumber and wood	1.43	1.41	1.08	0.55	1.25	1.77	2.10	2.38	1.59	1.19
10 Furniture and fixtures	4.93	5.14	5.37	5.08	7.28	8.59	8.91	10.17	4.70	3.42
11 Paper and allied	0.67	0.52	0.40	0.39	0.87	0.69	0.56	0.69	0.63	0.48
12 Printing, publishing and allied	0.65	0.70	0.46	0.45	1.54	1.85	2.06	1.80	1.17	0.91
13 Chemicals	0.25	0.20	0.16	0.16	0.15	0.15	0.22	0.30	0.32	0.25
14 Petroleum and coal products	0.45	0.35	0.37	0.39	0.22	0.21	0.27	0.36	0.40	0.50
15 Leather	2.41	2.45	2.38	2.38	2.58	3.23	3.38	4.68	3.24	3.32
16 Stone, clay, glass	0.70	0.64	0.53	0.51	0.25	0.32	0.47	0.76	0.82	0.62
17 Primary metal	0.16	0.10	0.09	0.10	0.23	0.25	0.33	0.38	0.37	0.29
18 Fabricated metal	1.40	1.46	1.40	1.43	2.08	2.32	2.29	2.75	1.90	1.42
19 Machinery, non-elect	0.47	0.51	0.40	0.39	0.70	0.80	0.92	1.10	1.01	0.86
20 Electrical machinery	0.82	0.93	1.03	1.01	1.13	1.01	0.95	1.25	1.17	0.96
21 Motor vehicles	0.65	0.60	0.46	0.49	0.96	0.91	0.83	0.97	0.59	0.48
22 Transportation equipment & ordnance	0.31	0.25	0.12	0.12	0.15	0.13	0.18	0.21	0.21	0.21
23 Instruments	0.30	0.33	0.33	0.36	0.80	0.82	0.82	0.78	0.68	0.71
24 Rubber and misc plastics	1.02	1.04	1.02	1.04	1.68	1.26	0.97	1.03	0.95	0.79
25 Misc. manufacturing	0.47	0.46	0.34	0.28	0.44	0.53	0.71	0.80	0.81	0.98
26 Transportation	0.06	0.02	(0.01)	(0.02)	0.10	0.04	0.09	0.10	0.15	0.10
27 Communications	0.17	0.13	0.09	0.05	(0.11)	(0.17)	(0.14)	(0.12)	(0.08)	(0.11)
28 Electric utilities	0.05	0.03	0.02	0.01	0.04	(0.03)	0.02	0.04	0.08	0.03
29 Gas utilities	0.01	(0.01)	(0.02)	(0.02)	(0.06)	(0.11)	(0.04)	0.02	0.05	(0.02)
30 Trade	1.47	1.58	1.71	1.70	2.36	2.85	2.96	3.64	3.26	3.15
31 Finance Insurance and Real Estate	0.19	0.20	0.20	0.21	0.25	0.24	0.39	0.38	0.25	0.14
32 Other private service	0.14	0.14	0.12	0.10	0.41	0.41	0.49	0.49	0.57	0.50
33 Public service	0.02	(0.00)	(0.02)	(0.03)	0.13	0.10	0.16	0.17	0.19	0.13

4. MEASURING LABOR INPUT

In this section, we will first introduce the detailed materials and methodology used to measure labor inputs for 1981-2005, then will also briefly introduce an updated approach to decompose employment into 5-dimension cross-sectional breakdown for 2000-2011 updates.

4.1. *Measure labor inputs for 1981-2005*

In order to consider the labor quality change as well as quantity change, we build up a four-dimension cross-sectional breakdown for total employment as shown in Table 4.1:

Table 4.1 Employment cross-sectional breakdown

Industry	
Code	Name
1	01 Agriculture
2	02 Coal mining
3	03 Metal and non-metallic mining
4	04 Oil and gas extraction
5	05 Construction
6	06 Food and kindred products
7	07 Textile mill products
8	08 Apparel
9	09 Lumber and wood
10	10 Furniture and fixtures
11	11 Paper and allied
12	12 Printing, publishing and allied
13	13 Chemicals
14	14 Petroleum and coal products
15	15 Leather
16	16 Stone, clay, glass
17	17 Primary metal
18	18 Fabricated metal
19	19 Machinery, non-elect
20	20 Electrical machinery
21	21 Motor vehicles
22	22 Transportation equipment & ordnance
23	23 Instruments
24	24 Rubber and misc plastics
25	25 Misc. manufacturing
26	26 Transportation
27	27 Communications
28	28 Electric utilities

Gender	
Code	Name
1	Male
2	Female

Age group	
Code	Name
1	15-19
2	20-24
3	25-29
4	30-39
5	40-49
6	50-54
7	55+

Educational attainment	
Code	Name
1	illiterate
2	elementary school
3	junior high school
4	senior high school
5	college

29	29 Gas utilities
30	30 Trade
31	31 Finance Insurance and Real Estate
32	32 Other private service
33	33 Public service

The materials and statistics used are Population surveys, “Three-in-one” statistics and other labor statistics, including: Industrial census, Service census, Economic census, Agricultural census, Statistics on TVEs by Ministry of Agriculture, and Labor force survey.

We build up the benchmark for number of employment mainly based on surveys, including: Population census for every 10 years (1982, 1990, and 2000), 1% population sample survey at middle of any two successive population years (1987, 1995, 2005), and Annual 1‰ population movement sample survey.

Meanwhile, we also need the “Three-in-one” statistics to provide additional information for cross-sectional breakdowns. The components of “Three-in-one” are: 1) Labor statistics of urban units; 2) Administrative registration of private enterprises and “Getihu” (self-employed or Small-Medium size family business); 3) Rural employment statistics.

The numbers of employment based on the population surveys are bigger than “Three-in-one”, except for 2005 in rural, because the definition of “the employed” are different and poorer coverage of “Three-in-one” statistics. Thus, it needs further investigation into why “Three-in-one” gives more number of rural workers in 2005 than does the population surveys.

For some sectors, especially agricultural sector, population surveys give more workers than does “Three-in-one”, while for other sectors, especially construction sector, the numbers of workers based on “Three-in-one” are bigger, because of the definitional difference of “the employed”. Mistreatment of sectoral status of rural workers in population surveys also is taken into account when we estimate the breakdowns for employment.

Based on the census benchmarks and adjustments from “Three-in-one” statistics, we set up control totals for all the 4 dimensions of total employment. Then we apply Iterative Proportional Fitting (IPF) approach to estimate the cross-sectional decomposition for total employment.

Then in order to aggregate the different breakdowns of employment to estimate the labor inputs, we need estimate the corresponding labor compensation matrix for different employment breakdowns.

Considering the difficulties to build up the labor compensation matrix for all the different employment breakdowns, relative wage could work as a proxy for estimation. The information to estimate relative wage is from Chinese Household Income Project (CHIP) Surveys, Economic Census, and Total Labor Compensation from Input-Output Table as the control total. Table 4.2-5 shows different relative wages for different dimensions.

Table 4.2 Sectoral structure of employment and relative wages

Sector	Shares (%)					Relative Wage（Avg. Wage=100）				
	1982	1987	1990	1995	2000	1982	1987	1990	1995	2000
Agriculture	73.8	71.0	72.3	69.7	64.4	72.9	66.7	67.6	52.9	41.6
Mining	1.4	1.4	1.3	0.9	1.0	249.6	176.3	212.4	365.5	363.9
Manufacturing	11.8	13.6	11.5	11.6	12.5	127.9	123.5	166.3	206.4	226.6
Utility	0.3	0.3	0.4	0.5	0.6	199.4	147.5	138.4	161.1	266.9
Construction	2.1	2.2	1.8	1.9	2.7	297.9	363.3	318.6	366.8	343.4
Geological Prospecting & Water Conservancy	0.2	0.2	0.2	0.1	0.1	229.4	302.5	448.4	366.6	194.4
Traffic, Transport, Storage & Post	1.8	2.0	1.9	2.3	2.6	156.1	161.8	246.6	234.3	165.1
Wholesale & Retail Trade, Accommodations	2.9	3.4	3.9	5.3	6.7	89.9	215.3	121.0	112.3	123.3
Finance	0.2	0.2	0.3	0.5	0.6	574.8	149.7	121.1	410.5	348.8
Real Estate	0.1	0.1	0.1	0.1	0.2	730.9	182.6	398.0	370.8	230.6
Social, Residential & Commercial Services	0.4	0.9	0.9	1.3	2.2	594.9	361.5	175.8	186.2	194.3
Sanitation, Social Security & Social Welfare	0.8	0.7	0.8	0.9	1.1	130.1	179.9	196.4	169.2	135.3
Culture, Sports & Entertainment	2.4	2.0	2.3	2.3	2.6	106.2	160.5	150.3	152.6	164.6
Scientific Research & Technical Service	0.2	0.2	0.2	0.2	0.2	584.8	831.8	594.0	529.9	431.9
Public & Social Organization	1.3	1.3	1.7	2.0	2.4	401.1	257.2	202.5	233.4	171.9
Others	0.3	0.4	0.3	0.2	0.2	241.1	100.0	100.0	100.0	101.4

Table 4.3 Gender structure of employment and relative wages

Gender	Shares (%)					Relative Wage（Avg. Wage=100）				
	1982	1987	1990	1995	2000	1982	1987	1990	1995	2000
Male	56.3	55.5	55.0	54.3	54.7	117.1	116.8	115.0	117.6	120.5
Female	43.7	44.5	45.0	45.7	45.3	78.0	79.1	81.7	79.1	75.2

Table 4.4 Age structure of employment and relative wages

Industry	Shares (%)					Relative Wage（Avg. Wage=100）				
	1982	1987	1990	1995	2000	1982	1987	1990	1995	2000
15-19	17.8	14.0	12.0	7.0	6.3	49.9	49.7	48.4	41.0	34.1
20-24	13.3	19.1	17.7	13.8	10.1	79.9	73.6	69.0	63.4	91.4
25-29	16.7	11.9	15.2	16.8	14.1	89.0	95.9	91.6	86.9	101.8
30-39	22.9	25.9	25.0	26.2	30.1	111.0	113.6	115.8	120.0	111.7
40-49	16.1	15.2	16.0	21.1	21.3	137.1	130.3	130.5	135.7	120.9
50-54	5.6	5.9	5.5	6.0	7.3	151.8	145.9	142.9	94.2	114.5
55+	7.6	8.1	8.5	9.1	10.9	126.6	121.8	121.0	88.2	60.7

Table 4.5 Educational structure of employment and relative wages

Industry	Shares (%)					Relative Wage（Avg. Wage=100）				
	1982	1987	1990	1995	2000	1982	1987	1990	1995	2000
illiterate	28.2	22.9	16.9	12.7	8.1	90.8	85.6	72.7	48.6	26.7
elementary school	34.4	36.3	37.8	37.2	32.8	93.0	86.7	80.6	77.8	60.8
junior high school	26.0	29.5	32.3	36.2	41.7	101.3	104.6	111.2	104.5	98.6
senior high school	10.5	10.1	11.1	11.1	12.7	131.9	148.3	155.4	176.3	188.3
college	0.9	1.2	1.9	2.9	4.7	249.5	255.7	217.9	261.8	276.9

Table 4.6 Aggregate labor inputs and contributions (*: calculated based on hours worked)

Annual Avg. Growth (%)	1982-2000	1982-1987	1987-1990	1990-1995	1995-2000	1995-2000*
Number of employment	1.8	2.3	3.4	1.0	1.2	1.8
Labor inputs	3.2	2.9	4.1	2.2	3.6	4.1
Labor quality changes	1.4	0.6	0.7	1.2	2.5	2.3
Contribution to labor inputs from labor quality changes	44.3	20.9	17.6	53.5	68.1	55.9

Table 4.7 Decomposition of labor quality changes (*: calculated based on hours worked)

Annual Avg. Growth (%)	**1982-2000**	1982-1987	1987-1990	1990-1995	1995-2000	1995-2000*
s	0.8	0.7	-0.2	0.5	1.5	1.3
g	0.0	-0.1	-0.1	-0.1	0.0	-0.1
a	0.5	0.2	0.4	1.2	0.4	0.4
e	0.8	0.2	0.9	0.7	1.7	1.7
sg	0.0	0.0	0.0	0.0	0.0	0.0
sa	-0.1	-0.1	-0.1	-0.2	0.0	0.0
se	-0.7	-0.4	-1.0	-0.6	-1.3	-1.3
ga	-0.1	0.0	0.0	-0.1	-0.1	-0.1
ge	-0.1	-0.1	-0.2	-0.1	-0.1	-0.1
ae	0.5	0.4	0.7	-0.4	0.3	0.3
sga	0.0	0.0	0.0	0.0	0.0	0.0
sge	0.1	0.1	0.1	0.0	0.1	0.1
sae	-0.2	-0.2	-0.3	0.1	-0.1	-0.1
gae	0.0	0.0	0.1	0.0	0.0	0.0
sgae	0.0	-0.1	0.2	-0.1	0.0	0.0

Notes: g (gender), a (age), e (education), s (sector), ga (gender*age), and so on.

Based on the decomposition of total employment, and relative wage for all the four dimensions, we compute the aggregate labor inputs based on equation (4.1), and decompose into contributions from labor quality changes shown in Table 4.6 and 4.7.

(4.1) $$\ln L = \alpha_0 + \sum_{i=1}^{n} \alpha_i \ln L_i + \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} \beta_{ij} \ln L_i * \ln L_j$$

4.2. *Updates for 2000-2011*

Since the more recent statistical materials provide us more information about labor inputs, we are now running an updated framework to estimate labor inputs staring 2000 till 2011. The updated breakdowns are shown in Table 4.8 as follows. We add in one more dimension to represent non-market and market sides of China's labor market, in which "inside system" represent the persons employed in the stated-owned and collective-owned enterprises, while "outside system" represent the ones employed in private enterprises.

Table 4.8 Updated employment cross-sectional breakdown for 2000-2011

Industry	
Code	Name
1	Agriculture
2	Mining
3	Manufacturing
4	Utility
5	Construction
6	Traffic, Transport, Storage & Post
7	Wholesale & Retail Trade, Accommodations
8	Finance
9	Real Estate
10	Social, Residential & Commercial Services
11	Sanitation, Social Security & Social Welfare
12	Culture, Sports & Entertainment
13	Scientific Research & Technical Service
14	Public & Social Organization

Ownership	
Code	Name
1	Inside System
2	Outside System

Gender	
Code	Name
1	Male

Age group	
Code	Name
1	16-19
2	20-24
3	25-29
4	30-34
5	35-39
6	40-44
7	45-49
8	50-54
9	55-59
10	60-64
11	65+

Educational attainment	
Code	Name
1	illiterate
2	primary school
3	junior school
4	senior school
5	college
6	university
7	graduate
2	primary school
3	junior school

2	Female	4	senior school
		5	college
		6	university
		7	graduate

Meanwhile, there are additional cross-sectional percentages figures newly release in China Labor Statistical Yearbook. We gather the tables which can provide any cross-sectional information among sectors, genders, age groups, ownership types, and educational levels. We again first estimate control totals for all the 5 dimensions, then apply the IPF to estimate the decompositions for total employment based on different cross-sectional figures. In the end, we compare which cross-sectional figures provides us the least residuals and keep it as our final results for decomposition.

Table 4.9-12 shows an example for the estimated residual of 2011 employment decomposition using cross-sectional table I & II. In this case, Approach II shows much better quality of estimation.

Table 4.9 sector-gender-education (I)

		illiterate	primary school	junior school	senior school	college	university	graduate
Agriculture	Male	0.307	0.307	0.307	0.307	0.307	0.307	0.307
	Female	0.435	0.435	0.435	0.435	0.435	0.435	0.435
Mining	Male	1.276	1.276	1.276	1.275	1.274	1.275	1.275
	Female	1.213	1.213	1.213	1.212	1.212	1.212	1.213
Manufacturing	Male	1.416	1.416	1.416	1.416	1.414	1.416	1.416
	Female	1.692	1.692	1.692	1.692	1.692	1.692	1.692
Utility	Male	1.325	1.325	1.325	1.325	1.323	1.324	1.325
	Female	1.202	1.202	1.202	1.202	1.202	1.202	1.202
Construction	Male	1.645	1.645	1.645	1.645	1.643	1.645	1.645
	Female	2.220	2.220	2.220	2.220	2.220	2.220	2.220
Traffic, Transport, Storage & Post	Male	1.621	1.621	1.621	1.621	1.619	1.621	1.621
	Female	0.904	0.904	0.904	0.904	0.904	0.904	0.904
Wholesale & Retail Trade, Accommodations	Male	1.834	1.833	1.833	1.833	1.831	1.833	1.833
	Female	2.079	2.079	2.079	2.079	2.079	2.079	2.079
Finance	Male	2.570	2.569	2.569	2.569	2.566	2.568	2.569
	Female	2.513	2.513	2.513	2.513	2.512	2.513	2.513
Real Estate	Male	2.492	2.491	2.491	2.491	2.488	2.490	2.491
	Female	2.879	2.879	2.879	2.878	2.878	2.878	2.879
Social, Residential & Commercial Services	Male	2.338	2.337	2.338	2.337	2.334	2.336	2.337
	Female	4.261	4.261	4.261	4.260	4.260	4.260	4.261
Sanitation, Social Security & Social Welfare	Male	1.906	1.906	1.906	1.906	1.903	1.905	1.906
	Female	1.641	1.641	1.641	1.640	1.640	1.640	1.641
Culture, Sports & Entertainment	Male	1.124	1.124	1.124	1.124	1.123	1.124	1.124
	Female	1.342	1.342	1.342	1.342	1.342	1.342	1.342
Scientific Research & Technical Service	Male	1.748	1.748	1.748	1.747	1.745	1.747	1.748
	Female	2.135	2.135	2.135	2.134	2.134	2.134	2.135
Public & Social Organization	Male	1.372	1.372	1.372	1.371	1.370	1.371	1.372
	Female	1.394	1.394	1.394	1.393	1.393	1.393	1.394

Table 4.10 sector-gender-education (II)

		illiterate	primary school	junior school	senior school	college	university	graduate
Agriculture	Male	1.237	1.141	0.962	0.813	0.744	0.712	0.676
	Female	1.131	1.081	0.954	0.801	0.780	0.766	0.750
Mining	Male	1.365	1.259	1.062	0.897	0.821	0.786	0.745
	Female	1.302	1.244	1.098	0.922	0.898	0.881	0.863
Manufacturing	Male	1.380	1.273	1.074	0.907	0.830	0.795	0.754
	Female	1.237	1.182	1.043	0.876	0.853	0.837	0.820
Utility	Male	1.490	1.374	1.159	0.980	0.896	0.858	0.814
	Female	1.376	1.315	1.160	0.975	0.949	0.932	0.912
Construction	Male	1.309	1.207	1.018	0.860	0.787	0.753	0.715
	Female	1.222	1.168	1.030	0.866	0.843	0.827	0.810
Traffic, Transport, Storage & Post	Male	1.374	1.267	1.069	0.903	0.826	0.791	0.750
	Female	1.333	1.274	1.124	0.944	0.919	0.902	0.883
Wholesale & Retail Trade, Accommodations	Male	1.371	1.264	1.066	0.901	0.824	0.789	0.749
	Female	1.254	1.198	1.057	0.888	0.864	0.849	0.831
Finance	Male	1.554	1.434	1.209	1.022	0.934	0.895	0.849
	Female	1.373	1.312	1.157	0.972	0.946	0.929	0.909
Real Estate	Male	1.488	1.372	1.158	0.978	0.895	0.857	0.813
	Female	1.345	1.285	1.134	0.953	0.927	0.911	0.891
Social, Residential & Commercial Services	Male	1.426	1.316	1.110	0.938	0.857	0.821	0.779
	Female	1.293	1.236	1.090	0.916	0.891	0.875	0.857
Sanitation, Social Security & Social Welfare	Male	1.544	1.424	1.202	1.015	0.928	0.889	0.844
	Female	1.405	1.343	1.184	0.995	0.969	0.951	0.931
Culture, Sports & Entertainment	Male	1.565	1.443	1.218	1.029	0.941	0.901	0.855
	Female	1.391	1.330	1.173	0.986	0.959	0.942	0.922
Scientific Research & Technical Service	Male	1.513	1.396	1.177	0.995	0.910	0.871	0.827
	Female	1.338	1.278	1.128	0.947	0.922	0.905	0.886
Public & Social Organization	Male	1.591	1.467	1.238	1.046	0.956	0.916	0.869
	Female	1.411	1.349	1.190	1.000	0.973	0.955	0.935

Table 4.11 gender-age-education (I)

		illiterate	primary school	junior school	senior school	college	university	graduate
Male	16-19	0.462	0.669	0.557	1.629	1.466	1.448	0.000
	20-24	0.391	0.475	1.086	1.369	1.561	1.413	1.468
	25-29	0.611	0.657	1.157	1.220	1.432	1.503	1.629
	30-34	0.459	0.785	1.564	1.174	1.356	1.474	1.478
	35-39	0.484	0.479	1.641	1.381	1.569	1.531	1.617
	40-44	0.451	0.476	0.969	1.306	1.533	1.548	1.554
	45-49	0.618	0.393	0.638	1.362	1.493	1.511	1.493
	50-54	0.442	1.391	1.075	1.330	1.467	1.479	1.433
	55-59	0.712	1.163	0.568	1.285	1.469	1.555	1.595
	60-64	0.703	1.212	0.613	1.511	1.563	1.639	1.606
	65+	0.452	0.500	0.623	1.589	1.505	1.564	1.496
Female	16-19	0.532	0.585	0.791	1.706	1.631	1.698	0.000
	20-24	0.526	1.004	1.083	1.645	1.691	1.559	1.630
	25-29	0.492	0.709	1.753	1.553	1.680	1.688	1.562
	30-34	0.504	0.633	1.217	1.667	1.602	1.592	1.665
	35-39	0.510	0.921	1.055	1.585	1.609	1.735	1.663
	40-44	0.879	0.622	1.045	1.511	1.695	1.531	1.489

	45-49	0.479	1.136	1.065	1.581	1.629	1.732	1.587
	50-54	1.420	1.286	1.069	1.693	1.873	1.612	1.622
	55-59	0.519	0.627	1.079	1.688	1.703	1.610	1.659
	60-64	1.089	0.751	1.031	1.635	1.731	1.649	1.515
	65+	0.528	0.538	1.130	1.770	1.640	1.659	1.531

Table 4.12 gender-age-education (II)

		illiterate	primary school	junior school	senior school	college	university	graduate
Male	16-19	0.948	0.928	0.908	1.032	1.059	1.048	0.000
	20-24	0.897	0.904	0.933	0.985	1.034	1.046	1.094
	25-29	0.900	0.908	0.918	0.989	1.041	1.074	1.068
	30-34	0.899	0.899	0.921	0.988	1.027	1.090	1.088
	35-39	0.908	0.899	0.922	0.963	1.046	1.055	1.083
	40-44	0.903	0.950	0.986	0.971	1.061	1.067	1.076
	45-49	0.932	0.902	0.949	0.979	1.026	1.056	1.091
	50-54	0.902	0.904	0.929	0.987	1.063	1.058	1.088
	55-59	0.906	0.907	0.914	0.974	1.066	1.078	1.091
	60-64	0.920	0.939	0.919	0.959	1.039	1.064	1.066
	65+	0.906	0.897	0.985	0.993	1.042	1.054	1.093
Female	16-19	1.020	1.019	1.039	1.094	1.184	1.197	0.000
	20-24	1.008	1.015	1.054	1.115	1.168	1.209	1.203
	25-29	1.007	1.037	1.034	1.094	1.163	1.195	1.210
	30-34	1.010	1.027	1.053	1.131	1.186	1.175	1.204
	35-39	1.021	1.016	1.056	1.124	1.164	1.201	1.204
	40-44	1.027	1.013	1.035	1.096	1.157	1.208	1.207
	45-49	1.006	1.011	1.056	1.098	1.186	1.185	1.194
	50-54	1.009	1.046	1.043	1.122	1.169	1.192	1.212
	55-59	1.013	1.017	1.040	1.090	1.197	1.197	1.202
	60-64	1.009	1.013	1.028	1.097	1.183	1.192	1.220
	65+	1.011	1.033	1.035	1.132	1.181	1.210	1.198

5. TFP ESTIMATION AND COMPARISON

In this section, we will compute industry TFP based on the estimation of output, capital input, labor input and intermediate input index, then quantify input and TFP contributions to output growth for each industry. We will also highlight data and conceptual issues with industry data.

The method used in this study is described in detail in many book and papers (see Jorgenson, Gollop and Fraumeni (1987), Jorgenson and Stiroh (2000), Gu and Ho (2000), Jorgenson et al. (2005), and Cao, J., M. Ho, D. Jorgenson, R. Ren, L. Sun, X. Yue (2009)). Gross output of sector j is assumed to be produced with a Hicks-neutral production function:

$$Y_{jt} = A_{jt} f(K_{1jt},....K_{kjt}, L_{1jt},....L_{ljt}, Z_{1jt},....Z_{njt}) \qquad j = 1\ldots 33 \ \textit{industries} \tag{5.1}$$

Then Productivity growth could be defined as:

$$d\ln Y_{jt} = \bar{v}_{Kjt}\, d\ln K_{jt} + \bar{v}_{Ljt}\, d\ln L_{jt} + \bar{v}_{Zjt}\, d\ln Z_{jt} + d\ln A_{jt} \tag{5.2}$$

The real value added of sector j is defined as output less an index of intermediate inputs:

$$d\ln Y_{jt} = \bar{v}_{Vjt} d\ln V_{jt} + \bar{v}_{Zjt} d\ln Z_{jt} \tag{5.3}$$

The following identity is implied:

$$\bar{v}_{Vjt} d\ln V_{jt} = \bar{v}_{Kjt} d\ln K_{jt} + \bar{v}_{Ljt} d\ln L_{jt} + d\ln A_{jt} \tag{5.4}$$

$$v_{Vjt} = \frac{P_{Kjt}K_{jt} + P_{Ljt}L_{jt}}{P_{Yjt}Y_{jt}} \tag{5.5}$$

Express the growth rate of each input as the weighted average of the growth rates of individual components:

$$\ln X^{t} - \ln X^{t-1} = \sum_{i} \bar{v}_{i}^{t} (\ln X_{i}^{t} - \ln X_{i}^{t-1}) \qquad \text{X=\{K, L, Z\}} \tag{5.6}$$

Weights are given by the average shares of each component.

Industry Output Index result shows in the following Figure 5.1 and details in Table 5.1, in which wide range of industry output growth rates varies from -0.176%(oil and gas extraction) to 22.10% (electrical machinery). We also compare two sub-period, 1982-1994, and 1994-2005. Some industry output growth decelerate: Food and kindred products (11% to 7%); Apparel (19% to 7%); Paper and allied (19% to 11%); Leather (19% to 9%）； Communication (17% to 0%); Finance (15% to 2%). While some industry output growth accelerate: Petroleum and coal products (4% to 11%); Primary metal (9% to 14%); Transportation (9% to 14%); Electric utilities (9% to 14%)

Industry Intermediate Input Index and Industry Energy Input Index result shows in the following Figure 5.2 & 5.3 and details in Table 5.2 (together with capital and labor input), in which wide range of industry intermediate input growth rates varies from 7.93% (textile) to 18.08% (electrical machinery), while energy input growth rates varies from -0.52% (public service) to 14.16% (electrical machinery). In general, intermediate input experienced stronger growth than capital input and labor input.

As we introduced in the earlier section, based on our labor inputs estimation, Labor input index is defined as a divisia aggregate over workers distinguished by sex, age and education attainment using wages as weights. The breakdowns are as follows: Gender (male, female), Educational attainment (college, high school, junior high school, elementary school, no schooling), Age (16-34, 35-54, 55+)

The result for labor input index shows in Figure 5.4 and details in Table 5.2, in which wide range of industry labor input growth rates varies from 1.18% (metal and nonmetallic mining) to 13.16% (gas utilities). Larger labor growth shows in labor intensive manufacturing (such as apparel, leather, lumber and wood), as well as energy sectors (gas, electrical), some service (communication, finance). We also compare two sub-period, 1982-1994, and 1994-2005. Labor input increase for all service industry. Labor input falls in agriculture, mining sectors, and some manufacturing (chemical, machinery).

As we mentioned, we estimate the capital stock under the Perpetual Inventory Method with the geometrically declining pattern, classified by asset type – structure, equipment and auto. We also estimate the capital rental price with the help of the property compensation from the input-output series, then aggregate capital services over different asset types with the weight of capital rental price. The result for capital input index shows in Figure 5.5 and details in Table 5.2, in which wide range of industry capital input growth rates varies from 1.02% (machinery) to 15.91% (communication), and service sector shows a high capital accumulation speed. We also compare two sub-periods: 1982-1994, and 1994-2005. Most manufacturing experience higher capital input. (apparel, lumber, furniture, paper, instrument, etc.) Only few industries experience lower capital input. (metal and nonmetallic mining, oil and gas extraction, finance insurance and real estate, other private services).

Figure 5.1 Industry Output Index (%)

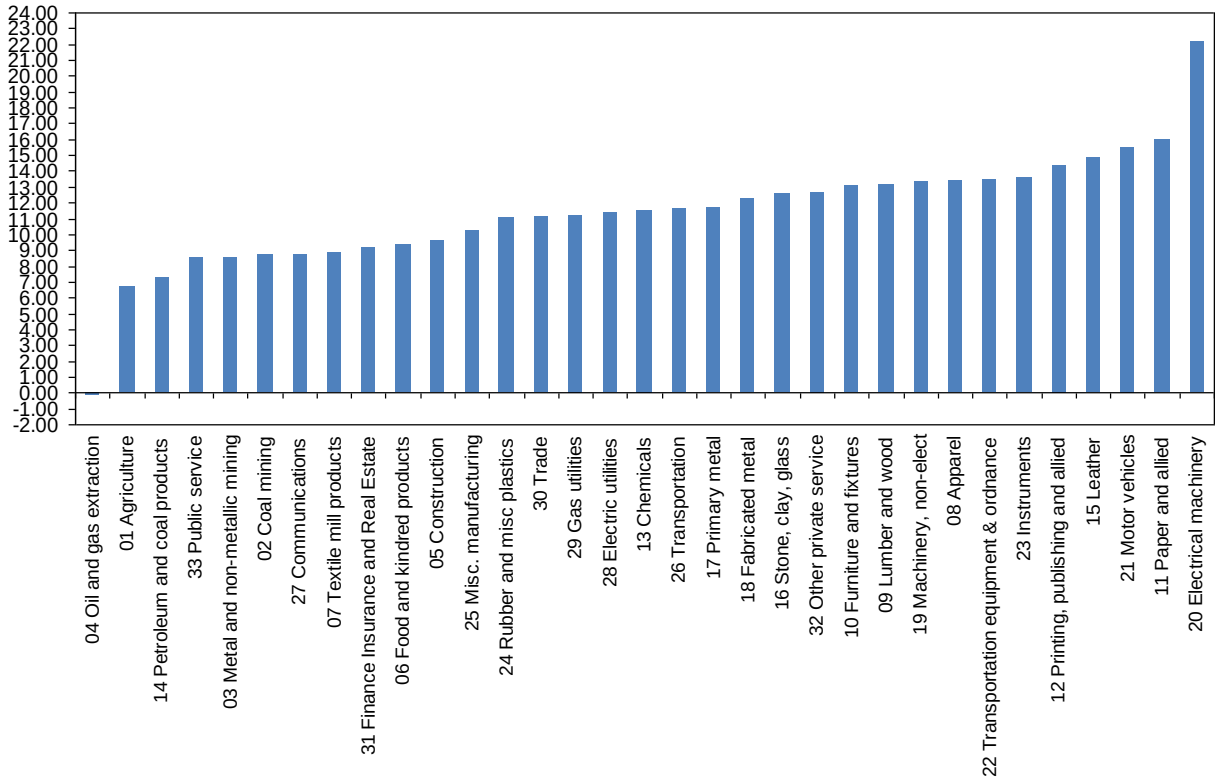


Figure 5.2 Industry Intermediate Input Index (%)

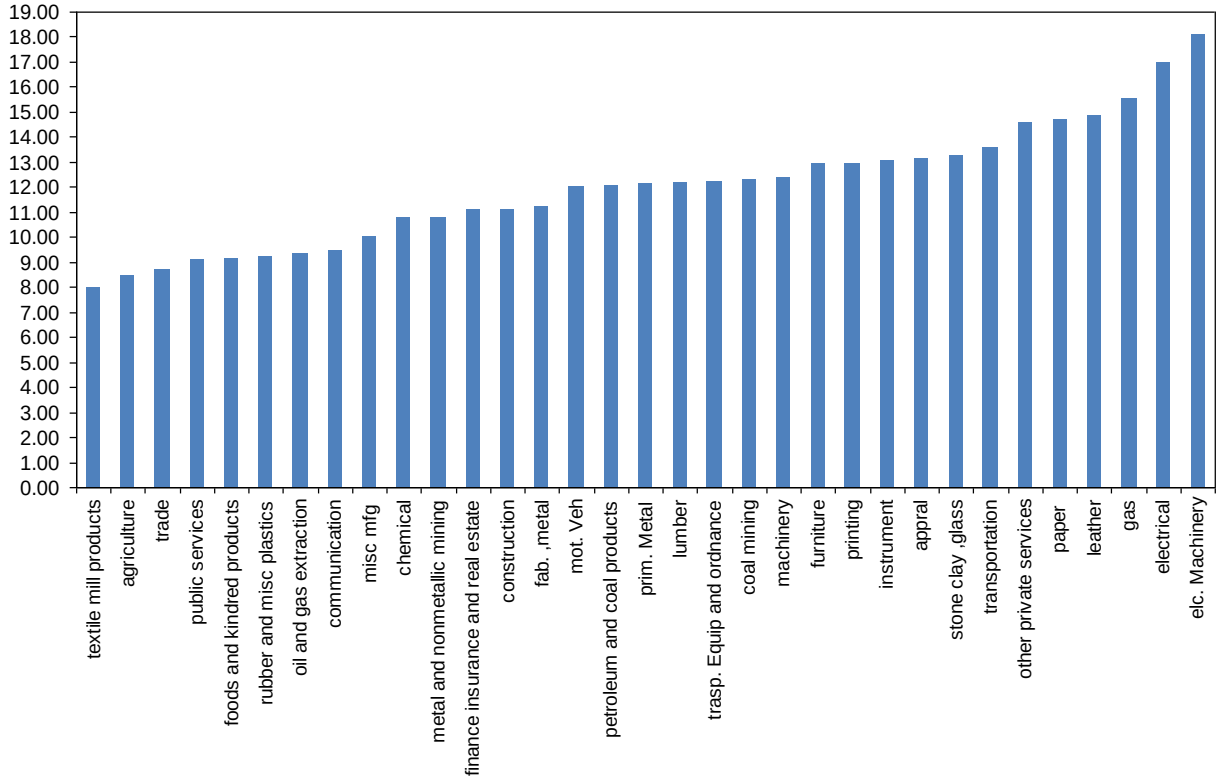


Figure 5.3 Industry Energy Input Index (%)

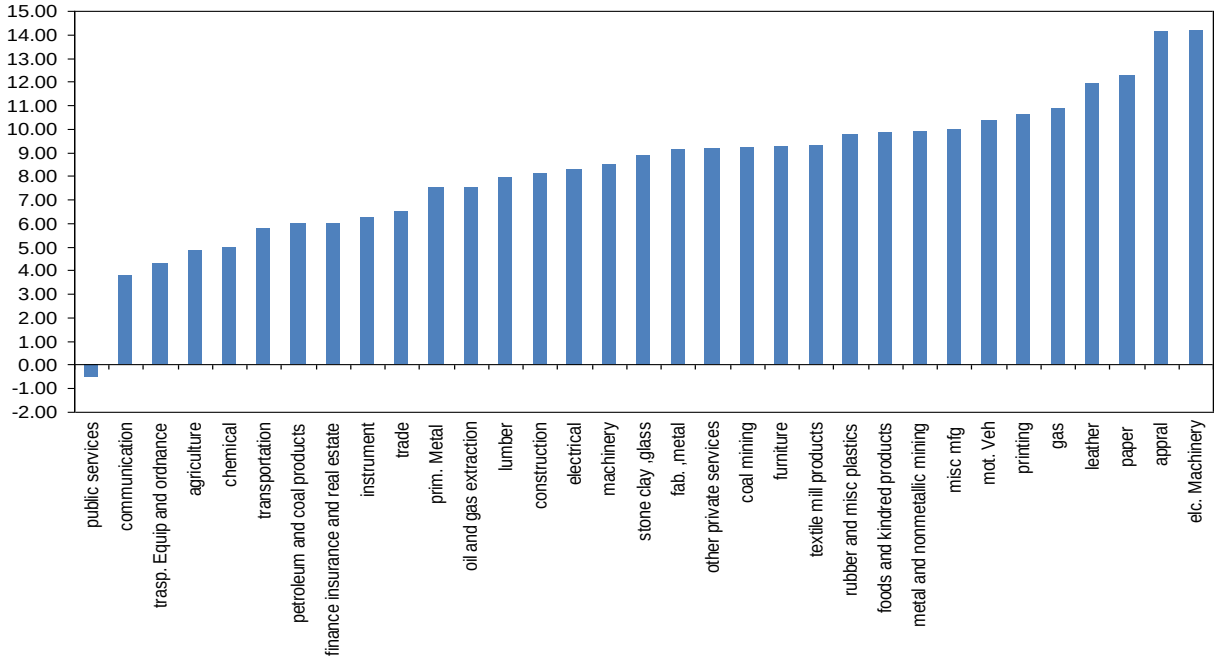


Figure 5.4 Industry Labor Input Index, 1981-2005 (%)

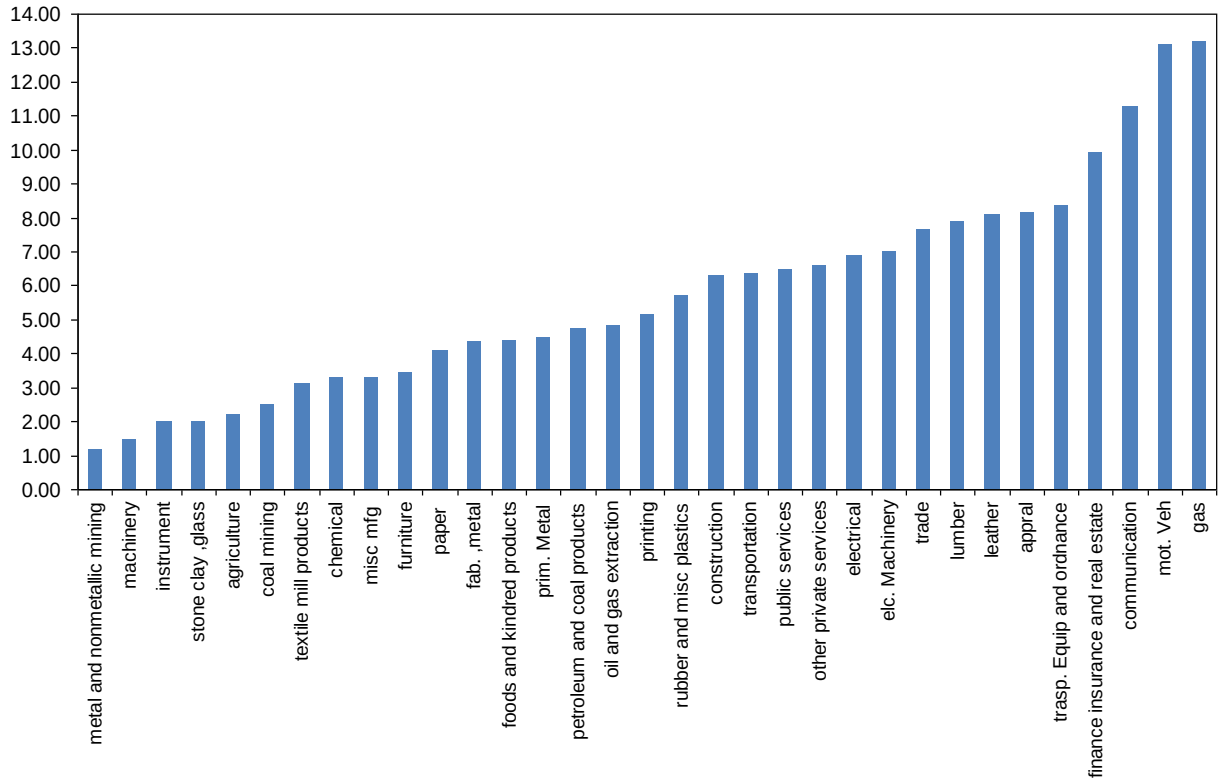


Figure 5.5 Industry Capital Input Index, 1981-2005 (%)

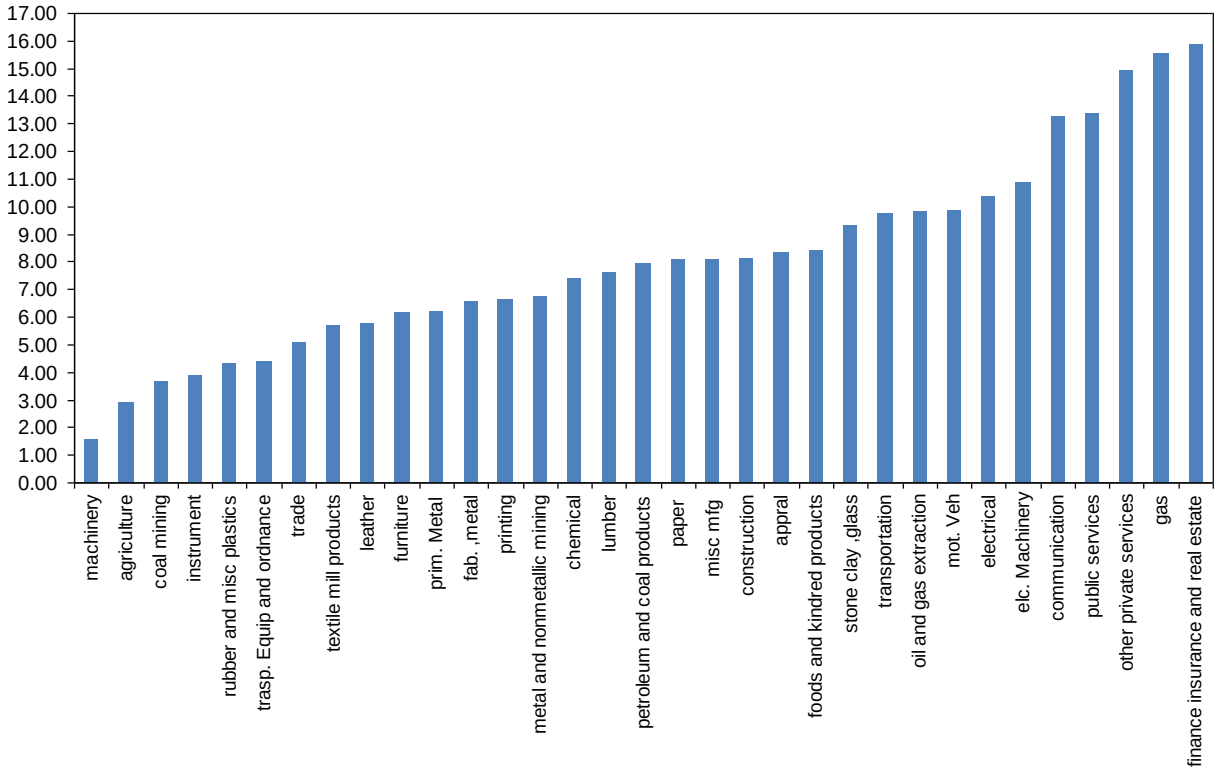


Table 5.1 (1) Industry Output Index (%)

	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94
01 Agriculture	0.108	0.059	0.117	0.036	0.041	0.040	0.020	-0.032	0.185	0.083	0.074	0.065	0.024
02 Coal mining	0.162	0.075	0.107	-0.023	0.123	0.060	0.207	0.149	0.059	0.010	0.032	0.004	0.081
03 Metal and non-metallic mining	0.034	0.018	0.140	-0.008	0.078	0.313	0.263	-0.057	0.004	-0.027	0.154	0.213	0.269
04 Oil and gas extraction	-0.010	-0.006	0.197	-0.299	0.006	0.030	-0.010	0.063	0.044	0.022	0.131	-0.193	-0.114
05 Construction	0.129	0.153	0.130	0.183	0.131	0.109	0.112	-0.108	-0.199	-0.002	0.224	0.302	0.082
06 Food and kindred products	0.095	0.048	0.115	0.053	0.134	0.225	0.099	-0.039	0.115	0.151	0.181	0.059	0.196
07 Textile mill products	0.096	0.084	-0.001	0.400	0.106	0.122	0.052	-0.028	0.029	0.066	0.192	0.172	-0.002
08 Apparel	0.105	0.190	0.196	0.281	0.077	0.206	0.189	-0.018	0.157	0.147	0.230	0.360	0.340
09 Lumber and wood	-0.461	-0.035	0.072	0.638	0.000	0.328	0.263	-0.031	-0.023	0.079	-0.013	0.477	0.488
10 Furniture and fixtures	-0.436	0.000	0.125	0.607	0.046	0.145	0.188	-0.176	0.058	0.048	0.331	0.256	0.554
11 Paper and allied	-0.202	0.167	0.246	0.733	0.254	0.241	0.297	0.016	-0.036	0.063	0.115	0.280	0.344
12 Printing, publishing and allied	-0.139	0.135	0.237	0.532	0.157	0.144	0.203	-0.076	0.059	0.017	0.034	0.360	0.272
13 Chemicals	0.058	0.094	0.158	0.196	0.138	0.163	0.131	0.001	0.110	0.096	0.180	-0.382	0.710
14 Petroleum and coal products	0.305	0.062	0.175	-0.286	-0.234	-0.046	0.061	0.025	0.037	0.221	0.064	-0.010	0.162
15 Leather	0.085	0.211	0.322	0.110	0.195	0.331	0.158	0.003	0.105	0.165	0.217	0.307	0.317
16 Stone, clay, glass	0.016	0.081	0.195	0.302	0.104	0.417	0.238	-0.105	0.021	0.029	0.275	0.171	0.245
17 Primary metal	0.215	0.098	0.147	-0.064	0.154	-0.008	0.087	0.026	0.024	0.036	0.211	0.139	0.154
18 Fabricated metal	0.030	0.131	0.159	0.014	0.087	0.352	0.210	-0.071	0.059	0.119	0.217	0.270	0.253
19 Machinery, non-elect	-0.019	0.193	0.233	0.413	0.162	0.043	0.236	-0.082	-0.051	0.153	0.369	0.100	0.033
20 Electrical machinery	0.199	0.096	0.297	0.762	0.118	0.200	0.213	-0.039	0.010	0.211	0.260	0.316	0.238
21 Motor vehicles	0.020	0.084	0.245	0.235	0.011	0.138	0.157	-0.051	-0.004	0.257	0.345	0.249	0.209
22 Transportation equipment & ordnance	0.145	0.126	0.122	0.178	-0.015	0.208	0.261	0.015	0.041	0.235	0.331	0.212	0.271
23 Instruments	0.020	0.076	0.119	0.580	-0.395	0.288	0.129	-0.110	-0.036	0.168	0.319	0.244	0.190
24 Rubber and misc plastics	0.107	0.162	0.173	0.044	0.100	0.034	0.203	-0.051	-0.021	0.196	0.217	-0.304	0.628
25 Misc. manufacturing	-0.011	0.112	0.118	0.061	0.113	0.109	0.091	0.028	0.158	0.204	0.194	0.076	0.055
26 Transportation	0.104	0.103	0.104	0.160	0.108	-0.015	0.163	0.088	0.097	0.091	0.081	0.061	0.071
27 Communications	-0.129	0.082	0.128	0.102	0.182	0.421	-0.047	0.153	0.127	0.197	0.278	0.443	0.195
28 Electric utilities	0.053	0.026	0.056	0.136	0.062	0.083	0.138	0.183	0.133	0.044	0.206	-0.046	0.107
29 Gas utilities	0.043	0.044	0.095	0.421	0.074	0.119	0.334	0.186	0.212	0.158	0.124	0.001	-0.089
30 Trade	-0.369	0.113	0.419	0.401	0.083	0.289	0.101	-0.026	-0.118	0.307	0.299	0.004	0.085
31 Finance Insurance and Real Estate	0.207	0.155	0.270	0.086	0.249	0.154	0.074	0.198	0.063	0.038	0.263	0.087	0.112
32 Other private service	0.126	0.102	0.202	0.262	0.014	0.075	0.065	0.017	0.034	0.155	0.158	0.227	0.206
33 Public service	0.022	0.072	0.143	0.120	0.042	0.100	0.018	0.024	0.011	0.136	0.078	0.101	0.107

Table 5.1 (2) Industry Output Index, annual growth (%)

	94-95	95-96	96-97	97-98	98-99	99-00	00-01	01-02	02-03	03-04	04-05
01 Agriculture	0.074	0.053	0.108	0.115	0.129	0.100	0.020	0.050	-0.003	0.071	0.071
02 Coal mining	0.116	0.135	-0.026	0.093	0.034	0.401	-0.002	-0.035	0.169	0.101	0.055
03 Metal and non-metallic mining	0.029	0.119	0.179	0.047	0.053	-0.215	0.086	0.115	0.141	0.054	0.052
04 Oil and gas extraction	-0.223	0.032	0.064	0.587	-0.017	-0.538	0.033	0.047	0.001	0.022	0.088
05 Construction	0.182	0.070	0.068	0.121	0.031	0.096	0.106	0.107	0.137	0.034	0.105
06 Food and kindred products	-0.039	0.113	0.097	0.121	0.059	-0.282	0.106	0.147	0.169	0.142	0.182
07 Textile mill products	-0.078	0.085	0.089	0.106	0.153	-0.302	0.101	0.175	0.173	0.174	0.155
08 Apparel	-0.119	0.192	0.021	0.070	0.030	-0.273	0.135	0.125	0.164	0.180	0.228
09 Lumber and wood	0.053	0.199	0.097	-0.010	0.154	0.177	0.147	0.158	0.099	0.101	0.195
10 Furniture and fixtures	0.020	0.163	0.100	0.145	0.098	0.171	0.138	0.158	0.099	0.101	0.195
11 Paper and allied	0.159	0.125	0.077	0.110	0.078	-0.004	0.129	0.141	0.181	0.180	0.136
12 Printing, publishing and allied	-0.165	0.227	0.091	0.001	0.070	0.606	0.173	0.159	0.081	0.100	0.159
13 Chemicals	-0.197	0.203	0.151	0.207	0.148	-0.223	0.138	0.164	0.187	0.172	0.168
14 Petroleum and coal products	0.018	0.036	0.036	0.458	0.121	-0.093	0.034	0.116	0.126	0.176	0.173
15 Leather	0.021	0.173	0.079	-0.017	0.048	-0.185	0.148	0.144	0.173	0.186	0.257
16 Stone, clay, glass	0.221	0.129	0.044	0.071	0.060	-0.679	0.093	0.155	0.418	0.383	0.130
17 Primary metal	0.220	0.160	0.095	0.215	0.172	-0.001	0.163	0.150	0.156	0.090	0.164
18 Fabricated metal	0.057	0.150	0.112	0.069	0.063	0.051	0.090	0.085	0.143	0.099	0.184
19 Machinery, non-elect	0.131	0.158	0.076	0.096	0.053	-0.002	0.138	0.166	0.211	0.210	0.165
20 Electrical machinery	0.210	0.173	0.248	0.414	0.183	-0.096	0.204	0.194	0.339	0.342	0.214
21 Motor vehicles	0.088	0.028	0.084	0.117	0.126	0.267	0.201	0.204	0.283	0.313	0.108
22 Transportation equipment & ordnance	0.125	0.189	0.129	0.073	0.016	-0.298	0.129	0.140	0.187	0.193	0.227
23 Instruments	0.023	0.236	0.140	0.200	0.187	-0.124	0.114	0.136	0.229	0.239	0.280
24 Rubber and misc plastics	-0.003	0.044	0.143	0.200	0.135	-0.003	0.126	0.193	0.133	0.108	0.095
25 Misc. manufacturing	0.022	0.112	0.125	0.123	0.076	-0.161	0.142	0.183	0.141	0.143	0.248
26 Transportation	0.054	0.058	0.084	0.082	0.101	0.529	0.046	0.126	0.165	0.190	0.129
27 Communications	0.346	0.333	0.363	0.354	0.199	-1.987	0.052	0.033	0.042	0.142	0.077
28 Electric utilities	0.105	0.037	0.015	0.262	0.070	0.170	0.060	0.069	0.350	0.359	0.052
29 Gas utilities	0.033	-0.005	0.030	0.202	0.181	-0.260	0.037	0.181	0.211	0.243	0.123
30 Trade	0.064	0.078	0.087	0.104	0.081	0.267	0.063	0.047	0.135	0.108	0.050
31 Finance Insurance and Real Estate	0.015	-0.026	-0.052	0.005	-0.020	-0.013	0.084	0.042	0.073	0.041	0.097
32 Other private service	0.083	0.112	0.122	0.117	0.114	0.284	0.060	0.085	0.155	0.139	0.118
33 Public service	0.077	0.082	0.097	0.050	0.088	-0.003	0.133	0.098	0.163	0.161	0.122

Table 5.2 (1) Intermediate, Energy, Labor & Capital Input Index (%)

	1982				1983				1984			
	Capital	**Labor**	**Energy**	**Inter-mediate**	**Capital**	**Labor**	**Energy**	**Inter-mediate**	**Capital**	**Labor**	**Energy**	**Inter-mediate**
01 Agriculture	0.003	0.024	0.219	0.108	0.004	0.024	0.006	0.059	0.005	0.023	0.095	0.111
02 Coal mining	-0.087	-0.005	0.321	0.149	-0.019	-0.005	0.037	0.103	0.038	-0.008	0.060	0.151
03 Metal and non-metallic mining	0.088	0.045	0.119	0.032	0.109	0.045	0.028	0.072	0.127	0.038	0.129	0.169
04 Oil and gas extraction	0.165	0.122	-0.008	0.026	0.186	0.122	-0.016	0.082	0.182	0.086	0.311	0.276
05 Construction	0.021	0.056	0.408	0.199	0.050	0.056	0.189	0.181	0.058	0.051	0.220	0.160
06 Food and kindred products	0.017	0.087	0.155	0.120	0.086	0.087	0.033	0.039	0.072	0.079	0.095	0.103
07 Textile mill products	0.028	0.079	0.109	0.074	0.099	0.079	-0.002	0.047	0.092	0.072	-0.034	-0.021
08 Apparel	-0.103	0.116	0.152	0.112	-0.099	0.116	0.135	0.218	-0.064	0.103	0.166	0.213
09 Lumber and wood	-0.045	0.278	-0.309	-0.437	-0.023	0.278	-0.064	-0.022	0.002	0.204	0.064	0.106
10 Furniture and fixtures	-0.092	0.247	-0.223	-0.376	-0.072	0.247	-0.041	0.003	-0.039	0.193	0.087	0.128
11 Paper and allied	-0.033	0.072	-0.079	-0.173	-0.084	0.072	0.098	0.162	-0.054	0.067	0.183	0.230
12 Printing, publishing and allied	-0.072	0.097	-0.038	-0.165	-0.031	0.097	0.093	0.151	0.003	0.081	0.188	0.245
13 Chemicals	-0.023	0.032	-0.465	0.122	-0.064	0.032	-0.150	0.131	0.022	0.030	0.271	0.167
14 Petroleum and coal products	-0.022	0.138	0.329	0.196	-0.047	0.138	0.046	0.117	0.018	0.114	0.149	0.159
15 Leather	-0.073	0.093	0.108	0.063	-0.054	0.093	0.108	0.187	-0.077	0.084	0.268	0.340
16 Stone, clay, glass	0.046	0.053	0.110	0.030	0.076	0.053	0.058	0.133	0.115	0.049	0.164	0.222
17 Primary metal	-0.073	0.059	0.265	0.213	-0.022	0.059	0.099	0.109	-0.001	0.053	0.143	0.168
18 Fabricated metal	-0.081	0.006	0.110	0.025	0.020	0.006	0.093	0.133	0.034	0.005	0.135	0.163
19 Machinery, non-elect	-0.125	0.045	0.097	-0.003	-0.062	0.045	0.133	0.191	-0.030	0.042	0.199	0.238
20 Electrical machinery	0.014	0.082	0.244	0.171	-0.058	0.082	0.108	0.116	-0.035	0.074	0.262	0.299
21 Motor vehicles	-0.031	0.013	0.099	0.016	-0.081	0.013	0.018	0.019	-0.047	0.011	0.273	0.249
22 Transportation equipment & ordnance	-0.065	0.017	0.187	0.159	-0.108	0.017	0.008	0.068	-0.069	0.016	0.026	0.087
23 Instruments	-0.053	-0.034	0.047	-0.012	-0.022	-0.034	0.069	0.124	-0.006	-0.035	0.099	0.124
24 Rubber and misc plastics	-0.170	0.100	0.100	0.108	-0.175	0.100	0.050	0.155	-0.149	0.089	0.124	0.223
25 Misc. manufacturing	0.350	-0.040	0.131	-0.003	0.251	-0.040	0.095	0.122	-0.007	-0.041	0.137	0.137
26 Transportation	-0.067	0.045	0.270	-0.015	-0.016	0.045	0.103	0.134	0.030	0.042	0.089	0.096
27 Communications	-0.195	0.006	-0.019	-0.096	-0.154	0.006	0.043	0.111	-0.088	0.005	0.095	0.158
28 Electric utilities	-0.055	0.031	-0.112	0.021	-0.029	0.031	0.006	0.091	0.015	0.029	0.028	0.111
29 Gas utilities	0.011	0.203	-0.058	0.039	0.021	0.203	0.015	0.109	0.063	0.165	0.079	0.174
30 Trade	-0.035	0.066	-0.357	-0.224	0.002	0.066	-0.003	0.138	0.012	0.061	0.303	0.342
31 Finance Insurance and Real Estate	0.579	0.054	0.125	0.291	0.248	0.054	0.008	0.179	0.255	0.048	0.168	0.269
32 Other private service	0.445	0.026	0.268	0.111	0.267	0.026	-0.022	0.089	0.230	0.026	0.239	0.175
33 Public service	0.378	0.020	0.289	0.052	0.349	0.020	-0.145	0.064	0.273	0.018	0.138	0.115

Notes: There's no data available for Labor Input in 1982, so we assume it remains the same as 1983.

Table 5.2 (2) Intermediate, Energy, Labor & Capital Input Index (%)

	1985				1986				1987			
	Capital	**Labor**	**Energy**	**Inter-mediate**	**Capital**	**Labor**	**Energy**	**Inter-mediate**	**Capital**	**Labor**	**Energy**	**Inter-mediate**
01 Agriculture	0.004	0.023	-0.255	0.116	0.007	0.023	-0.152	0.115	0.007	0.023	-0.037	0.087
02 Coal mining	0.077	-0.009	-0.156	0.085	0.080	-0.009	-0.060	0.051	0.075	-0.009	-0.024	0.065
03 Metal and non-metallic mining	0.136	0.036	-0.137	0.051	0.105	0.034	-0.028	0.143	0.108	0.033	0.366	0.391
04 Oil and gas extraction	0.183	0.078	-0.450	-0.012	0.188	0.072	-0.063	0.048	0.148	0.067	-0.007	-0.019
05 Construction	0.063	0.048	-0.322	0.157	0.126	0.046	-0.143	0.123	0.078	0.044	0.099	0.092
06 Food and kindred products	0.058	0.073	-0.037	0.038	0.131	0.068	0.030	0.116	0.155	0.064	0.205	0.252
07 Textile mill products	0.054	0.066	0.129	0.335	0.065	0.062	0.008	0.103	0.104	0.059	0.103	0.129
08 Apparel	-0.049	0.093	0.084	0.301	-0.045	0.085	0.002	0.071	-0.017	0.079	0.190	0.188
09 Lumber and wood	0.095	0.168	0.510	0.651	0.012	0.144	-0.069	0.051	0.059	0.125	0.381	0.449
10 Furniture and fixtures	0.049	0.160	0.443	0.662	0.063	0.138	-0.120	0.091	0.039	0.121	0.174	0.205
11 Paper and allied	-0.037	0.062	0.502	0.706	0.065	0.059	0.153	0.206	0.132	0.056	0.295	0.301
12 Printing, publishing and allied	0.024	0.073	0.244	0.459	0.131	0.068	-0.004	0.154	0.116	0.065	0.199	0.212
13 Chemicals	0.025	0.029	0.070	0.161	0.066	0.028	-0.082	0.136	0.108	0.027	0.291	0.208
14 Petroleum and coal products	0.057	0.101	-0.439	0.045	0.032	0.091	0.111	0.151	0.061	0.083	-0.005	-0.011
15 Leather	-0.047	0.077	-0.008	0.101	0.059	0.072	0.025	0.181	0.076	0.067	0.320	0.363
16 Stone, clay, glass	0.106	0.046	0.143	0.401	0.168	0.044	0.052	0.188	0.197	0.042	0.369	0.470
17 Primary metal	0.015	0.050	-0.312	-0.003	0.033	0.047	-0.017	0.174	0.067	0.045	-0.027	0.017
18 Fabricated metal	0.036	0.005	-0.104	-0.016	0.024	0.005	-0.007	0.142	0.047	0.006	0.294	0.392
19 Machinery, non-elect	-0.006	0.040	0.087	0.370	-0.012	0.038	-0.001	0.189	0.005	0.037	0.085	0.049
20 Electrical machinery	0.000	0.068	0.380	0.558	0.306	0.064	0.004	0.084	0.248	0.060	0.225	0.202
21 Motor vehicles	-0.033	0.011	0.069	0.230	0.025	0.011	-0.167	-0.120	0.000	0.011	0.225	0.186
22 Transportation equipment & ordnance	-0.051	0.016	-0.132	0.179	0.022	0.016	-0.345	-0.091	0.048	0.015	0.006	0.270
23 Instruments	0.026	-0.037	0.174	0.489	0.014	-0.038	-0.288	-0.362	0.015	-0.039	0.369	0.458
24 Rubber and misc plastics	-0.107	0.082	-0.090	0.057	0.016	0.075	-0.039	0.114	0.036	0.070	0.038	0.030
25 Misc. manufacturing	-0.051	-0.042	-0.021	0.090	0.053	-0.043	0.001	0.130	0.114	-0.043	0.119	0.098
26 Transportation	0.070	0.040	-0.160	0.338	0.098	0.039	-0.265	0.099	0.070	0.038	-0.348	-0.044
27 Communications	-0.038	0.005	-0.143	0.040	0.005	0.005	-0.047	0.173	-0.023	0.005	0.631	0.670
28 Electric utilities	0.044	0.028	-0.022	0.239	0.086	0.027	-0.092	0.039	0.136	0.026	0.248	0.229
29 Gas utilities	0.082	0.140	0.382	0.601	0.541	0.123	0.103	0.194	0.390	0.109	0.264	0.242
30 Trade	0.045	0.057	-0.211	0.033	0.049	0.054	-0.198	0.097	0.035	0.052	0.372	0.364
31 Finance Insurance and Real Estate	0.178	0.045	0.014	0.112	0.123	0.042	0.071	0.272	0.136	0.041	0.049	0.103
32 Other private service	0.225	0.025	0.133	0.326	0.244	0.025	-0.211	0.095	0.162	0.024	-0.126	0.046
33 Public service	0.251	0.018	-0.730	0.134	0.140	0.018	-0.116	0.116	0.039	0.018	0.102	0.032

Table 5.2 (3) Intermediate, Energy, Labor & Capital Input Index (%)

	1988				1989				1990			
	Capital	**Labor**	**Energy**	**Inter-mediate**	**Capital**	**Labor**	**Energy**	**Inter-mediate**	**Capital**	**Labor**	**Energy**	**Inter-mediate**
01 Agriculture	0.013	0.070	0.159	0.146	0.021	0.050	0.024	-0.017	0.011	0.047	-0.097	0.123
02 Coal mining	0.054	0.143	0.283	0.257	0.032	0.102	0.267	0.088	0.022	0.089	0.237	0.135
03 Metal and non-metallic mining	0.123	0.008	0.337	0.368	0.095	-0.008	0.113	-0.011	0.052	-0.009	0.183	0.151
04 Oil and gas extraction	0.143	0.047	0.140	0.116	0.126	0.026	0.250	0.177	0.119	0.023	0.248	0.145
05 Construction	0.052	-0.006	-0.005	0.125	0.044	-0.018	-0.241	-0.224	0.005	-0.020	-0.341	-0.063
06 Food and kindred products	0.141	0.056	0.371	0.071	0.115	0.031	0.224	-0.082	0.016	0.027	0.210	0.131
07 Textile mill products	0.107	0.121	0.289	0.061	0.159	0.071	0.250	0.007	0.027	0.062	0.180	0.073
08 Apparel	0.017	-0.001	0.293	0.157	0.043	-0.027	0.188	0.012	0.004	-0.030	0.177	0.148
09 Lumber and wood	0.022	-0.093	0.253	0.350	0.065	-0.113	0.018	-0.109	0.049	-0.125	-0.024	-0.057
10 Furniture and fixtures	0.059	-0.206	0.209	0.285	0.078	-0.260	0.016	-0.088	-0.008	-0.341	0.003	0.011
11 Paper and allied	0.124	0.048	0.333	0.311	0.137	0.024	0.207	0.008	0.035	0.021	0.121	-0.005
12 Printing, publishing and allied	0.047	0.108	0.109	0.249	0.003	0.066	-0.032	-0.012	-0.058	0.058	-0.089	0.052
13 Chemicals	0.124	0.149	0.063	0.203	0.141	0.103	-0.045	0.062	0.067	0.089	0.054	0.075
14 Petroleum and coal products	0.114	-0.001	0.080	0.171	0.146	-0.013	0.125	0.175	0.036	-0.015	0.028	0.097
15 Leather	0.129	0.025	0.292	0.188	0.149	-0.001	0.156	0.007	0.002	-0.004	0.151	0.130
16 Stone, clay, glass	0.137	-0.019	0.252	0.330	0.090	-0.033	0.079	-0.029	-0.001	-0.035	-0.055	-0.015
17 Primary metal	0.085	0.100	0.094	0.128	0.091	0.070	0.073	0.077	0.025	0.062	0.011	0.073
18 Fabricated metal	0.078	0.009	0.137	0.222	0.063	-0.008	0.028	-0.031	0.001	-0.011	-0.007	0.024
19 Machinery, non-elect	0.009	0.034	0.159	0.235	0.010	0.014	0.031	-0.075	-0.034	0.012	-0.037	-0.056
20 Electrical machinery	0.120	0.059	0.166	0.217	0.119	0.032	0.088	0.022	0.044	0.028	-0.021	-0.041
21 Motor vehicles	0.030	0.136	0.067	0.152	0.032	0.094	-0.035	-0.056	-0.002	0.083	-0.107	-0.036
22 Transportation equipment & ordnance	0.070	0.210	0.200	0.191	0.055	0.145	0.118	0.039	0.010	0.123	0.058	0.064
23 Instruments	0.007	0.040	0.057	0.127	0.034	0.017	-0.057	-0.078	-0.021	0.014	-0.137	-0.040
24 Rubber and misc plastics	-0.010	0.031	0.265	0.227	0.016	0.007	0.146	-0.030	-0.036	0.004	0.078	0.020
25 Misc. manufacturing	0.070	-0.003	0.143	0.121	0.091	-0.024	0.093	0.062	0.025	-0.027	0.073	0.178
26 Transportation	0.087	0.073	0.109	0.169	0.077	0.052	0.168	0.111	0.037	0.047	0.235	0.270
27 Communications	0.030	0.163	-0.040	-0.098	0.011	0.111	0.266	0.209	0.043	0.096	0.042	0.044
28 Electric utilities	0.142	0.219	0.048	0.162	0.119	0.150	0.107	0.141	0.083	0.126	0.165	0.240
29 Gas utilities	0.189	0.267	0.285	0.337	0.143	0.179	0.211	0.200	0.085	0.148	0.213	0.257
30 Trade	0.060	0.152	-0.006	-0.017	0.062	0.104	0.104	0.150	0.012	0.091	-0.143	-0.090
31 Finance Insurance and Real Estate	0.127	0.309	0.208	0.085	0.152	0.201	0.240	0.214	0.110	0.163	0.134	-0.001
32 Other private service	0.127	0.135	0.125	0.035	0.119	0.097	0.094	-0.041	0.102	0.085	0.106	0.057
33 Public service	0.059	0.230	-0.178	0.031	0.052	0.164	0.032	-0.084	0.010	0.137	0.071	0.182

Table 5.2 (4) Intermediate, Energy, Labor & Capital Input Index (%)

	1991				1992				1993			
	Capital	**Labor**	**Energy**	**Inter-mediate**	**Capital**	**Labor**	**Energy**	**Inter-mediate**	**Capital**	**Labor**	**Energy**	**Inter-mediate**
01 Agriculture	0.005	0.016	0.104	0.067	0.003	0.016	0.026	0.090	-0.004	0.017	0.062	-0.034
02 Coal mining	0.031	0.014	-0.020	0.082	0.031	0.016	-0.025	0.101	0.001	0.018	0.063	0.195
03 Metal and non-metallic mining	0.030	0.016	-0.081	-0.022	0.036	0.018	0.126	0.184	0.042	0.019	0.169	0.258
04 Oil and gas extraction	0.064	0.022	-0.057	0.066	0.067	0.024	0.202	0.160	0.045	0.025	-0.005	0.090
05 Construction	-0.021	0.020	-0.024	-0.009	-0.013	0.017	0.157	0.320	0.011	0.016	0.560	0.314
06 Food and kindred products	0.003	0.021	0.222	0.177	0.014	0.022	0.234	0.194	0.014	0.022	-0.106	0.064
07 Textile mill products	-0.017	0.025	0.153	0.092	-0.019	0.025	0.207	0.195	-0.008	0.025	-0.167	0.053
08 Apparel	-0.009	0.025	0.149	0.181	0.004	0.026	0.250	0.310	0.025	0.026	0.296	0.344
09 Lumber and wood	0.045	0.019	0.067	0.140	0.004	0.021	-0.023	-0.017	-0.039	0.021	0.199	0.544
10 Furniture and fixtures	-0.044	0.017	0.008	0.060	-0.040	0.018	0.198	0.308	0.010	0.018	0.114	0.278
11 Paper and allied	0.042	0.022	0.071	0.046	0.037	0.023	0.162	0.120	0.062	0.023	0.071	0.234
12 Printing, publishing and allied	-0.026	0.024	-0.149	0.047	0.038	0.024	-0.155	0.038	0.079	0.024	0.451	0.270
13 Chemicals	0.048	0.025	-0.011	0.077	0.056	0.025	0.277	0.189	0.036	0.025	-0.261	-0.098
14 Petroleum and coal products	0.067	0.027	0.110	0.343	0.073	0.028	0.114	0.112	0.023	0.028	-0.057	0.125
15 Leather	-0.069	0.024	0.176	0.155	0.004	0.024	0.278	0.303	0.066	0.024	0.112	0.256
16 Stone, clay, glass	-0.017	0.019	-0.003	-0.002	0.005	0.020	0.292	0.314	0.047	0.020	0.165	0.337
17 Primary metal	-0.004	0.024	0.065	0.051	0.015	0.025	0.296	0.259	0.010	0.025	0.078	0.300
18 Fabricated metal	-0.005	0.021	-0.003	0.095	0.017	0.022	0.167	0.254	0.036	0.022	0.226	0.262
19 Machinery, non-elect	-0.030	0.025	0.055	0.119	-0.016	0.025	0.319	0.426	0.001	0.025	-0.011	0.101
20 Electrical machinery	0.053	0.029	0.021	0.118	0.027	0.029	0.195	0.273	0.051	0.029	0.077	0.165
21 Motor vehicles	0.089	0.027	0.068	0.302	0.103	0.028	0.148	0.377	0.107	0.027	0.187	0.194
22 Transportation equipment & ordnance	-0.044	0.025	0.093	0.246	-0.010	0.026	0.175	0.324	0.011	0.026	0.006	0.164
23 Instruments	-0.018	0.030	-0.098	0.132	-0.020	0.031	0.135	0.403	-0.009	0.031	0.048	0.127
24 Rubber and misc plastics	-0.018	0.023	0.134	0.207	0.005	0.024	0.204	0.228	0.036	0.024	0.017	-0.108
25 Misc. manufacturing	0.021	0.023	0.071	0.234	0.051	0.024	0.121	0.228	0.084	0.024	0.221	0.085
26 Transportation	0.030	0.016	0.094	0.150	0.069	0.018	-0.046	0.154	0.064	0.019	-0.168	-0.049
27 Communications	0.073	0.023	-0.093	-0.015	0.070	0.024	0.267	0.343	0.111	0.024	0.071	0.277
28 Electric utilities	0.078	0.023	-0.004	0.256	0.064	0.024	0.099	0.273	0.053	0.024	-0.142	0.148
29 Gas utilities	0.170	0.027	0.139	0.331	0.162	0.027	0.022	0.226	0.114	0.027	-0.033	0.077
30 Trade	-0.008	0.022	0.121	0.176	0.018	0.023	0.195	0.329	0.076	0.023	-0.071	-0.051
31 Finance Insurance and Real Estate	0.054	0.030	0.025	-0.039	0.076	0.029	0.338	0.351	0.138	0.028	-0.239	0.058
32 Other private service	0.060	0.040	0.163	0.127	0.054	0.040	0.205	0.219	0.080	0.039	0.118	0.211
33 Public service	0.005	0.034	0.119	0.099	0.041	0.035	0.130	0.106	0.074	0.035	-0.263	0.120

Table 5.2 (5) Intermediate, Energy, Labor & Capital Input Index (%)

	1994				1995				1996			
	Capital	**Labor**	**Energy**	**Inter-mediate**	**Capital**	**Labor**	**Energy**	**Inter-mediate**	**Capital**	**Labor**	**Energy**	**Inter-mediate**
01 Agriculture	0.002	0.018	0.243	0.297	0.012	0.019	0.235	0.028	0.061	0.003	-0.005	-0.031
02 Coal mining	0.002	0.018	-0.033	0.152	0.023	0.019	0.022	0.038	0.154	-0.054	0.094	0.174
03 Metal and non-metallic mining	0.017	0.020	0.086	0.296	0.038	0.020	0.029	-0.032	0.139	-0.043	0.046	0.113
04 Oil and gas extraction	0.038	0.025	0.092	0.190	0.056	0.025	-0.334	-0.173	0.176	-0.014	0.072	0.057
05 Construction	0.190	0.015	0.181	0.064	0.126	0.015	0.402	0.202	0.249	0.129	0.190	0.122
06 Food and kindred products	0.028	0.022	0.095	0.159	0.024	0.022	0.113	0.016	0.169	0.037	0.030	0.110
07 Textile mill products	-0.008	0.026	0.002	0.101	-0.008	0.026	-0.044	-0.141	0.114	-0.049	-0.065	0.014
08 Apparel	0.208	0.026	0.315	0.277	0.114	0.026	0.142	-0.220	0.176	0.150	0.241	0.249
09 Lumber and wood	0.009	0.021	0.065	0.443	0.040	0.021	-0.032	-0.050	0.197	0.170	-0.044	0.148
10 Furniture and fixtures	-0.022	0.018	0.163	0.490	-0.005	0.018	0.040	-0.070	0.110	0.096	0.065	0.154
11 Paper and allied	0.034	0.023	0.068	0.264	0.014	0.023	0.160	0.146	0.164	-0.010	0.082	0.174
12 Printing, publishing and allied	0.049	0.024	0.258	0.212	0.051	0.024	0.272	-0.025	0.136	-0.002	0.222	0.090
13 Chemicals	0.032	0.025	0.117	0.418	0.061	0.026	-0.008	-0.092	0.225	-0.027	0.021	0.181
14 Petroleum and coal products	0.037	0.028	-0.171	0.212	0.092	0.027	-0.190	-0.010	0.198	-0.001	-0.015	0.123
15 Leather	0.026	0.024	0.183	0.367	-0.002	0.024	0.122	-0.060	0.067	0.220	0.149	0.193
16 Stone, clay, glass	0.089	0.020	-0.027	0.252	0.081	0.021	0.048	0.047	0.178	-0.019	0.010	0.127
17 Primary metal	0.042	0.025	-0.057	0.132	0.076	0.025	-0.038	-0.030	0.210	-0.025	0.062	0.140
18 Fabricated metal	0.044	0.022	0.148	0.260	0.037	0.023	0.143	0.102	0.144	0.046	0.141	0.126
19 Machinery, non-elect	-0.006	0.025	-0.075	0.027	0.002	0.026	0.099	0.112	0.111	-0.056	0.078	0.141
20 Electrical machinery	0.026	0.029	0.052	0.273	0.006	0.029	0.187	0.184	0.121	0.079	0.119	0.172
21 Motor vehicles	0.146	0.027	0.172	0.237	0.110	0.027	0.182	0.030	0.192	0.064	0.148	0.024
22 Transportation equipment & ordnance	0.029	0.026	0.042	0.293	0.028	0.026	0.069	0.119	0.184	0.038	0.061	0.166
23 Instruments	0.012	0.031	0.074	0.232	0.006	0.030	0.073	-0.022	0.101	-0.038	0.185	0.233
24 Rubber and misc plastics	0.025	0.024	0.103	0.397	0.015	0.025	0.234	0.026	0.114	0.034	0.088	0.083
25 Misc. manufacturing	0.078	0.025	0.165	0.041	0.084	0.025	0.220	-0.036	0.216	0.121	0.202	0.086
26 Transportation	0.114	0.020	-0.118	0.113	0.192	0.021	-0.038	-0.046	0.263	0.080	-0.005	0.096
27 Communications	0.241	0.024	0.151	0.364	0.151	0.025	0.228	0.204	0.493	0.145	0.189	0.308
28 Electric utilities	0.062	0.024	0.135	0.299	0.091	0.024	0.030	0.079	0.218	0.142	0.098	0.164
29 Gas utilities	0.084	0.027	-0.146	0.048	0.062	0.027	-0.023	-0.054	0.167	0.222	0.045	0.034
30 Trade	0.072	0.023	0.075	0.104	0.061	0.023	0.166	-0.006	0.167	0.161	0.082	0.016
31 Finance Insurance and Real Estate	0.190	0.027	-0.108	0.189	0.180	0.027	-0.027	0.055	0.280	0.235	-0.089	0.059
32 Other private service	0.075	0.038	0.164	0.371	0.079	0.037	-0.013	0.033	0.227	0.056	-0.048	0.130
33 Public service	0.129	0.034	-0.102	0.163	0.109	0.034	0.007	0.028	0.239	0.087	0.007	0.093

Table 5.2 (6) Intermediate, Energy, Labor & Capital Input Index (%)

	1997				1998				1999			
	Capital	**Labor**	**Energy**	**Inter-mediate**	**Capital**	**Labor**	**Energy**	**Inter-mediate**	**Capital**	**Labor**	**Energy**	**Inter-mediate**
01 Agriculture	0.025	0.003	0.098	0.127	0.042	0.003	0.239	0.093	0.054	0.003	0.060	0.073
02 Coal mining	0.075	-0.057	-0.118	0.008	0.072	-0.060	0.247	0.199	0.031	-0.062	-0.037	0.031
03 Metal and non-metallic mining	0.015	-0.045	0.096	0.193	0.022	-0.046	0.139	0.058	0.032	-0.047	0.006	0.050
04 Oil and gas extraction	0.054	-0.014	0.160	0.069	0.093	-0.014	1.097	0.469	0.100	-0.014	0.083	0.148
05 Construction	0.138	0.114	0.281	0.114	0.118	0.102	0.481	0.151	0.092	0.092	0.078	0.057
06 Food and kindred products	0.036	0.037	0.001	0.117	0.052	0.036	0.182	0.168	0.047	0.035	0.051	0.121
07 Textile mill products	-0.016	-0.051	-0.058	0.071	-0.016	-0.053	0.198	0.182	-0.023	-0.056	0.097	0.185
08 Apparel	0.029	0.130	0.099	0.010	0.079	0.115	0.195	0.172	0.093	0.104	0.024	0.042
09 Lumber and wood	0.077	0.145	-0.119	0.091	0.079	0.127	0.053	0.004	0.472	0.113	0.114	0.180
10 Furniture and fixtures	-0.014	0.088	0.015	0.098	0.015	0.081	0.198	0.169	0.068	0.075	0.068	0.118
11 Paper and allied	0.081	-0.010	-0.049	0.091	0.098	-0.009	0.207	0.152	0.062	-0.008	0.019	0.057
12 Printing, publishing and allied	-0.002	-0.001	0.120	0.045	0.037	-0.001	0.144	0.075	0.082	0.000	0.011	0.042
13 Chemicals	0.127	-0.028	0.109	0.117	0.089	-0.028	0.230	0.203	0.060	-0.028	0.068	0.175
14 Petroleum and coal products	0.120	0.000	0.088	0.102	0.197	0.001	0.518	0.334	0.092	0.001	-0.015	0.135
15 Leather	-0.036	0.180	0.062	0.109	-0.026	0.153	0.121	0.034	0.056	0.133	0.018	0.051
16 Stone, clay, glass	0.033	-0.019	-0.070	0.043	0.033	-0.019	0.195	0.118	0.020	-0.019	0.019	0.075
17 Primary metal	0.070	-0.025	0.036	0.081	0.051	-0.025	0.317	0.180	0.031	-0.025	0.069	0.186
18 Fabricated metal	-0.012	0.045	0.122	0.125	0.014	0.043	0.171	0.084	0.022	0.042	-0.010	0.034
19 Machinery, non-elect	-0.019	-0.059	0.016	0.041	0.010	-0.062	0.256	0.184	0.007	-0.066	0.013	0.058
20 Electrical machinery	0.039	0.074	0.129	0.224	0.059	0.069	0.333	0.429	0.092	0.065	0.074	0.173
21 Motor vehicles	0.084	0.061	0.117	0.060	0.108	0.058	0.234	0.181	0.061	0.055	0.086	0.142
22 Transportation equipment & ordnance	0.150	0.037	0.004	0.129	0.114	0.036	0.203	0.135	0.104	0.036	0.003	0.053
23 Instruments	-0.005	-0.039	0.080	0.120	0.005	-0.040	0.257	0.260	0.010	-0.041	0.129	0.224
24 Rubber and misc plastics	0.035	0.033	0.079	0.131	0.051	0.033	0.246	0.229	0.021	0.033	0.082	0.157
25 Misc. manufacturing	0.111	0.108	0.162	0.110	0.122	0.097	0.205	0.180	0.140	0.089	0.047	0.094
26 Transportation	0.110	0.074	-0.034	0.085	0.166	0.069	0.322	0.110	0.218	0.065	0.141	0.096
27 Communications	0.313	0.125	0.415	0.632	0.276	0.110	0.338	0.326	0.344	0.099	0.087	0.135
28 Electric utilities	0.140	0.124	0.011	0.120	0.155	0.110	0.403	0.342	0.145	0.099	0.075	0.111
29 Gas utilities	0.109	0.181	0.111	0.069	0.126	0.153	0.272	0.239	0.151	0.132	0.225	0.161
30 Trade	0.019	0.138	0.051	0.019	0.030	0.121	0.205	0.046	0.049	0.108	0.070	0.050
31 Finance Insurance and Real Estate	-0.028	0.186	-0.140	0.010	0.000	0.157	0.199	0.086	0.006	0.137	0.113	0.119
32 Other private service	0.085	0.053	-0.021	0.201	0.115	0.050	0.266	0.183	0.155	0.048	0.153	0.162
33 Public service	0.142	0.079	-0.014	0.059	0.117	0.073	0.114	0.012	0.156	0.068	0.077	0.078

Table 5.2 (7) Intermediate, Energy, Labor & Capital Input Index (%)

	2000				2001				2002			
	Capital	**Labor**	**Energy**	**Inter-mediate**	**Capital**	**Labor**	**Energy**	**Inter-mediate**	**Capital**	**Labor**	**Energy**	**Inter-mediate**
01 Agriculture	0.055	0.006	0.124	0.147	0.048	0.028	-0.017	0.035	0.095	0.026	0.028	0.054
02 Coal mining	0.090	-0.065	-0.060	-0.285	-0.073	0.124	0.118	0.127	-0.031	0.107	0.130	0.216
03 Metal and non-metallic mining	0.099	-0.048	-0.087	-0.507	-0.042	0.054	0.043	0.046	-0.004	0.049	0.101	0.096
04 Oil and gas extraction	0.101	-0.014	-1.238	-0.406	-0.019	0.129	0.184	0.173	0.040	0.115	0.021	0.101
05 Construction	0.197	0.084	-0.351	0.118	0.024	0.175	0.100	0.107	0.040	0.143	0.166	0.117
06 Food and kindred products	0.203	0.035	-0.374	-0.391	0.033	0.053	0.047	0.078	0.104	0.049	0.083	0.160
07 Textile mill products	0.098	-0.058	0.239	-0.399	-0.019	0.058	0.042	0.087	0.055	0.054	0.102	0.168
08 Apparel	0.275	0.095	-0.296	-0.313	0.169	0.195	0.081	0.108	0.152	0.163	0.063	0.130
09 Lumber and wood	0.113	0.102	0.373	-0.091	-0.036	0.119	0.080	0.091	0.020	0.102	0.072	0.146
10 Furniture and fixtures	0.226	0.071	0.363	0.038	0.100	0.055	0.061	0.084	0.088	0.050	0.101	0.142
11 Paper and allied	0.327	-0.008	-0.407	-0.203	0.089	0.114	0.139	0.144	0.106	0.101	0.089	0.154
12 Printing, publishing and allied	0.268	0.000	0.195	0.400	0.057	0.105	0.097	0.105	0.072	0.095	0.062	0.112
13 Chemicals	0.162	-0.028	-0.195	-0.338	-0.019	0.062	0.126	0.000	0.049	0.059	0.129	0.102
14 Petroleum and coal products	0.142	0.002	-0.195	-0.172	-0.030	0.105	0.129	-0.017	0.091	0.096	0.123	0.017
15 Leather	0.163	0.118	-0.337	-0.111	0.074	0.132	0.098	0.119	0.160	0.114	0.080	0.120
16 Stone, clay, glass	0.169	-0.018	-0.530	-0.691	-0.007	0.073	-0.026	-0.028	0.067	0.066	-0.031	0.049
17 Primary metal	0.127	-0.025	-0.175	-0.073	-0.025	0.136	0.130	0.143	0.075	0.118	0.105	0.129
18 Fabricated metal	0.192	0.041	-0.068	-0.042	0.013	0.172	0.031	0.048	0.083	0.145	0.017	0.059
19 Machinery, non-elect	0.123	-0.069	-0.270	-0.117	-0.048	0.060	0.124	0.120	0.017	0.055	0.126	0.175
20 Electrical machinery	0.351	0.062	-0.198	-0.167	0.205	0.173	0.110	0.118	0.225	0.145	0.045	0.098
21 Motor vehicles	0.245	0.053	-0.174	-0.012	0.121	0.956	0.153	0.155	0.138	0.485	0.112	0.168
22 Transportation equipment & ordnance	0.231	0.035	-0.575	-0.427	-0.022	0.321	0.091	0.098	0.060	0.240	0.063	0.137
23 Instruments	0.107	-0.042	-0.521	-0.294	0.013	0.162	0.085	0.099	0.096	0.137	0.092	0.158
24 Rubber and misc plastics	0.257	0.032	-0.033	-0.231	0.303	0.143	0.100	0.020	0.289	0.124	0.177	0.132
25 Misc. manufacturing	0.073	0.083	-0.448	-0.155	-0.071	0.097	0.091	0.079	-0.029	0.087	0.071	0.133
26 Transportation	0.242	0.063	0.383	0.695	0.045	0.170	0.025	0.004	0.082	0.143	0.187	0.216
27 Communications	0.619	0.089	-1.432	-1.553	0.284	0.590	-0.026	0.003	0.366	0.309	-0.048	-0.010
28 Electric utilities	0.317	0.090	-0.008	-0.121	0.130	0.058	0.030	0.109	0.093	0.055	-0.033	0.152
29 Gas utilities	0.283	0.117	-0.129	-0.018	0.011	0.206	0.019	-0.012	0.054	0.168	0.090	0.169
30 Trade	0.138	0.097	0.552	0.394	-0.019	0.090	-0.066	-0.018	0.031	0.082	-0.071	-0.029
31 Finance Insurance and Real Estate	0.105	0.122	0.370	0.083	-0.058	0.093	0.027	0.053	-0.013	0.085	-0.097	-0.027
32 Other private service	0.255	0.045	0.177	0.397	0.079	0.166	0.008	0.045	0.113	0.139	0.013	0.051
33 Public service	0.221	0.066	-0.289	-0.006	0.011	0.070	0.140	0.160	0.065	0.067	0.041	0.067

Table 5.2 (8) Intermediate, Energy, Labor & Capital Input Index (%)

	2003				2004				2005			
	Capital	**Labor**	**Energy**	**Inter-mediate**	**Capital**	**Labor**	**Energy**	**Inter-mediate**	**Capital**	**Labor**	**Energy**	**Inter-mediate**
01 Agriculture	0.115	0.024	-0.043	0.015	0.050	0.022	0.074	0.117	0.050	0.018	-0.029	0.105
02 Coal mining	0.036	0.095	0.384	0.311	0.056	0.085	0.363	0.290	0.106	0.078	0.115	0.216
03 Metal and non-metallic mining	0.031	0.046	0.254	0.230	0.071	0.042	0.292	0.169	0.147	0.040	0.049	0.096
04 Oil and gas extraction	-0.034	0.105	0.234	0.016	0.078	0.097	0.215	0.010	0.052	0.090	0.673	0.428
05 Construction	0.093	0.122	0.021	0.153	0.132	0.106	-0.052	0.031	0.069	0.095	-0.107	0.058
06 Food and kindred products	0.014	0.046	0.201	0.152	0.246	0.044	0.192	0.121	0.229	0.041	0.104	0.164
07 Textile mill products	0.018	0.052	0.223	0.172	0.230	0.049	0.220	0.163	0.251	0.047	0.051	0.154
08 Apparel	-0.010	0.140	0.162	0.122	0.620	0.122	0.156	0.122	0.392	0.109	0.123	0.197
09 Lumber and wood	-0.040	0.090	0.119	0.068	0.290	0.081	0.104	0.048	0.357	0.074	0.114	0.192
10 Furniture and fixtures	-0.011	0.047	0.094	0.072	0.538	0.045	0.107	0.053	0.379	0.042	0.086	0.190
11 Paper and allied	0.005	0.092	0.239	0.162	0.221	0.084	0.217	0.142	0.309	0.077	0.062	0.102
12 Printing, publishing and allied	0.029	0.088	0.165	0.133	0.268	0.081	0.133	0.102	0.299	0.076	0.050	0.117
13 Chemicals	-0.015	0.057	0.219	0.117	0.174	0.054	0.218	0.115	0.218	0.052	0.149	0.160
14 Petroleum and coal products	-0.008	0.089	0.172	0.197	0.134	0.082	0.236	0.140	0.280	0.076	0.168	0.153
15 Leather	-0.036	0.101	0.119	0.125	0.484	0.091	0.119	0.125	0.286	0.083	0.141	0.213
16 Stone, clay, glass	-0.005	0.060	0.456	0.393	0.295	0.056	0.406	0.329	0.304	0.052	0.063	0.094
17 Primary metal	0.100	0.104	0.213	0.176	0.246	0.094	0.194	0.119	0.242	0.085	0.179	0.164
18 Fabricated metal	0.001	0.126	0.146	0.067	0.392	0.112	0.160	0.016	0.376	0.100	0.113	0.149
19 Machinery, non-elect	0.000	0.052	0.237	0.169	0.222	0.049	0.239	0.142	0.249	0.046	0.077	0.128
20 Electrical machinery	-0.030	0.125	0.342	0.257	0.285	0.110	0.351	0.254	0.340	0.099	0.105	0.136
21 Motor vehicles	0.085	0.326	0.306	0.208	0.633	0.246	0.297	0.191	0.243	0.197	0.007	-0.014
22 Transportation equipment & ordnance	0.043	0.193	0.227	0.164	0.207	0.161	0.219	0.155	0.058	0.138	0.221	0.214
23 Instruments	0.144	0.119	0.261	0.217	0.251	0.105	0.223	0.203	0.246	0.094	0.139	0.214
24 Rubber and misc plastics	0.061	0.110	0.111	0.021	0.184	0.099	0.117	-0.005	0.237	0.090	0.007	0.021
25 Misc. manufacturing	0.015	0.079	0.164	0.108	0.083	0.073	0.145	0.092	0.065	0.068	0.193	0.191
26 Transportation	0.144	0.123	0.177	0.215	0.127	0.109	0.118	0.146	0.093	0.098	0.145	0.113
27 Communications	0.225	0.238	-0.026	-0.013	-0.075	0.197	0.008	0.015	0.096	0.170	-0.047	0.038
28 Electric utilities	0.116	0.052	0.523	0.470	0.113	0.050	0.416	0.426	0.165	0.047	-0.017	-0.040
29 Gas utilities	0.053	0.143	0.168	0.087	0.557	0.124	0.113	0.051	0.095	0.110	0.237	0.169
30 Trade	0.012	0.075	0.178	0.145	0.171	0.070	0.189	0.120	0.159	0.065	0.022	0.001
31 Finance Insurance and Real Estate	0.122	0.079	0.053	0.049	0.511	0.073	-0.019	-0.012	0.336	0.068	0.018	0.101
32 Other private service	0.151	0.120	0.185	0.187	0.012	0.106	0.227	0.156	0.120	0.095	-0.006	0.139
33 Public service	0.146	0.064	0.195	0.218	0.119	0.061	0.260	0.195	0.088	0.058	-0.007	0.151

Table 5.3 (1) Industry TFP (%)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
01 Agriculture	0.066	0.031	0.074	-0.005	-0.003	0.002	-0.060	-0.052	0.123	0.052	0.036	0.070	-0.093
02 Coal mining	0.099	0.045	0.047	-0.049	0.094	0.027	0.019	0.046	-0.058	-0.032	-0.020	-0.101	0.005
03 Metal and non-metallic mining	-0.028	-0.059	0.017	-0.077	-0.020	0.096	0.045	-0.084	-0.096	-0.019	0.039	0.051	0.096
04 Oil and gas extraction	-0.131	-0.151	-0.011	-0.385	-0.125	-0.064	-0.141	-0.084	-0.092	-0.028	0.024	-0.245	-0.200
05 Construction	-0.033	0.004	-0.005	0.062	0.028	0.027	0.019	0.057	-0.146	0.003	-0.001	0.069	0.015
06 Food and kindred products	0.004	-0.005	0.021	0.009	0.016	0.004	0.010	-0.012	0.016	0.021	0.035	0.010	0.072
07 Textile mill products	0.030	0.024	-0.009	0.144	0.015	0.005	-0.025	-0.068	-0.037	-0.005	0.040	0.133	-0.080
08 Apparel	0.032	0.045	0.050	0.074	0.028	0.069	0.075	-0.030	0.051	0.011	-0.009	0.090	0.100
09 Lumber and wood	-0.215	-0.047	-0.020	0.176	-0.044	0.000	0.032	0.043	0.024	-0.028	-0.003	0.096	0.174
10 Furniture and fixtures	-0.205	-0.010	0.032	0.148	-0.037	-0.013	0.000	-0.105	0.082	0.011	0.111	0.047	0.192
11 Paper and allied	-0.094	0.079	0.104	0.278	0.098	0.000	0.044	-0.026	-0.046	0.018	0.014	0.101	0.153
12 Printing, publishing and allied	-0.035	0.036	0.073	0.229	0.020	-0.028	0.013	-0.076	0.027	-0.014	-0.001	0.142	0.105
13 Chemicals	0.066	0.059	0.028	0.091	0.052	-0.014	-0.035	-0.074	0.037	0.037	0.025	-0.306	0.427
14 Petroleum and coal products	0.145	0.039	0.078	-0.133	-0.322	-0.068	-0.046	-0.113	-0.009	0.064	-0.036	-0.023	0.187
15 Leather	0.038	0.075	0.083	0.036	0.049	0.052	0.001	-0.022	0.007	0.054	-0.019	0.101	0.031
16 Stone, clay, glass	-0.035	-0.011	0.038	0.075	-0.041	0.095	0.013	-0.113	0.040	0.031	0.069	-0.049	0.083
17 Primary metal	0.079	0.027	0.032	-0.028	0.045	-0.035	-0.025	-0.053	-0.032	-0.002	0.019	-0.062	0.063
18 Fabricated metal	0.030	0.042	0.047	0.018	-0.006	0.083	0.045	-0.061	0.045	0.052	0.028	0.064	0.047
19 Machinery, non-elect	0.005	0.089	0.090	0.187	0.046	0.004	0.077	-0.039	-0.009	0.076	0.075	0.026	0.014
20 Electrical machinery	0.073	0.026	0.100	0.383	-0.020	-0.001	0.031	-0.081	0.028	0.115	0.055	0.183	0.027
21 Motor vehicles	0.016	0.095	0.099	0.098	0.081	0.014	0.040	-0.024	0.019	0.025	0.051	0.083	0.004
22 Transportation equipment & ordnance	0.048	0.107	0.084	0.084	0.046	0.017	0.096	-0.037	-0.016	0.062	0.098	0.093	0.053
23 Instruments	0.048	0.025	0.060	0.317	-0.197	0.024	0.043	-0.073	-0.008	0.089	0.059	0.156	0.025
24 Rubber and misc plastics	0.068	0.097	0.055	0.029	0.015	-0.001	0.046	-0.037	-0.029	0.050	0.049	-0.235	0.328
25 Misc. manufacturing	-0.084	-0.018	0.037	0.021	0.022	0.025	-0.003	-0.027	0.031	0.027	0.015	-0.003	0.010
26 Transportation	0.069	0.046	0.043	0.075	0.091	0.022	0.054	-0.006	-0.041	0.019	0.013	0.074	0.012
27 Communications	-0.014	0.096	0.096	0.109	0.122	0.140	-0.045	0.039	0.074	0.165	0.135	0.301	-0.038
28 Electric utilities	0.108	0.026	0.024	0.085	0.036	-0.091	0.013	0.061	-0.011	-0.049	0.082	-0.074	-0.039
29 Gas utilities	0.032	-0.007	-0.003	0.122	-0.180	-0.150	0.057	-0.005	0.019	-0.028	0.011	-0.036	-0.071
30 Trade	-0.222	0.021	0.200	0.366	0.019	0.109	0.054	-0.134	-0.096	0.217	0.126	0.005	0.010
31 Finance Insurance and Real Estate	-0.176	-0.035	0.043	-0.049	0.093	0.043	-0.073	0.017	-0.025	0.016	0.109	0.000	-0.044
32 Other private service	-0.028	0.000	0.058	0.061	-0.084	0.015	-0.024	-0.023	-0.043	0.069	0.033	0.100	0.001
33 Public service	-0.134	-0.028	-0.045	-0.001	-0.021	0.070	-0.089	-0.012	-0.134	0.071	0.006	0.033	0.008

Table 5.3 (2) Industry TFP (%)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
01 Agriculture	0.051	0.049	0.055	0.065	0.087	0.017	-0.021	-0.026	-0.073	-0.006	0.002
02 Coal mining	0.088	0.042	-0.012	-0.015	0.036	0.491	-0.012	-0.101	-0.011	-0.100	-0.099
03 Metal and non-metallic mining	0.032	0.036	0.078	0.009	0.030	0.010	0.072	0.059	-0.011	-0.099	-0.045
04 Oil and gas extraction	-0.170	-0.084	0.001	0.248	-0.109	-0.304	-0.021	-0.011	-0.027	-0.067	-0.153
05 Construction	0.020	-0.067	-0.054	-0.032	-0.036	-0.008	0.017	0.006	0.003	-0.016	0.049
06 Food and kindred products	-0.058	-0.002	0.005	-0.014	-0.040	-0.050	0.041	0.013	0.054	0.006	0.020
07 Textile mill products	0.028	0.064	0.049	-0.021	0.019	-0.030	0.040	0.039	0.035	0.001	-0.008
08 Apparel	0.024	-0.031	-0.012	-0.080	-0.026	-0.105	0.009	-0.011	0.071	-0.056	-0.007
09 Lumber and wood	0.080	0.049	0.010	-0.043	-0.057	0.186	0.091	0.053	0.055	-0.009	-0.025
10 Furniture and fixtures	0.068	0.025	0.022	0.007	-0.007	0.092	0.053	0.032	0.044	-0.045	-0.020
11 Paper and allied	0.049	-0.016	0.011	-0.014	0.033	0.077	0.003	0.006	0.052	0.022	0.000
12 Printing, publishing and allied	-0.163	0.140	0.059	-0.059	0.028	0.281	0.084	0.063	-0.016	-0.046	0.002
13 Chemicals	-0.153	0.050	0.047	0.042	0.023	-0.018	0.118	0.072	0.085	0.032	0.005
14 Petroleum and coal products	0.096	-0.027	-0.056	0.067	0.084	0.044	-0.049	0.019	-0.025	-0.019	0.001
15 Leather	0.062	-0.007	-0.022	-0.061	-0.015	-0.128	0.037	0.018	0.079	-0.008	0.035
16 Stone, clay, glass	0.172	0.027	0.024	-0.024	0.011	-0.202	0.111	0.111	0.138	0.069	-0.006
17 Primary metal	0.228	0.036	0.032	0.055	0.039	0.051	0.054	0.035	-0.006	-0.059	-0.011
18 Fabricated metal	-0.030	0.031	0.015	-0.006	0.032	0.051	0.044	0.020	0.081	-0.001	-0.003
19 Machinery, non-elect	0.048	0.050	0.060	-0.031	0.019	0.070	0.064	0.037	0.082	0.051	0.018
20 Electrical machinery	0.067	0.018	0.065	0.066	0.031	-0.021	0.067	0.071	0.135	0.085	0.048
21 Motor vehicles	0.042	-0.032	0.019	-0.043	0.005	0.229	-0.007	0.019	0.086	0.039	0.066
22 Transportation equipment & ordnance	0.029	0.035	0.010	-0.048	-0.040	-0.013	0.047	0.016	0.044	0.026	0.043
23 Instruments	0.031	0.065	0.064	0.021	0.030	0.059	0.040	-0.002	0.035	0.029	0.064
24 Rubber and misc plastics	-0.032	-0.039	0.038	0.015	0.009	0.111	0.027	0.025	0.096	0.067	0.032
25 Misc. manufacturing	0.028	-0.003	0.014	-0.038	-0.023	-0.060	0.097	0.091	0.052	0.052	0.087
26 Transportation	0.008	-0.074	0.010	-0.063	-0.027	0.140	0.013	-0.021	-0.010	0.058	0.018
27 Communications	0.200	-0.042	-0.038	0.075	-0.019	-1.368	-0.062	-0.099	-0.042	0.154	0.012
28 Electric utilities	0.040	-0.124	-0.080	-0.013	-0.040	0.084	-0.031	-0.003	0.030	0.054	0.025
29 Gas utilities	0.044	-0.095	-0.079	-0.017	0.000	-0.238	0.025	0.069	0.090	0.037	-0.057
30 Trade	0.041	-0.020	0.035	0.037	0.014	0.012	0.068	0.036	0.048	-0.024	-0.021
31 Finance Insurance and Real Estate	-0.097	-0.228	-0.071	-0.049	-0.084	-0.117	0.087	0.052	-0.024	-0.276	-0.145
32 Other private service	0.042	-0.009	-0.005	-0.017	-0.011	-0.001	-0.002	0.003	-0.012	0.049	-0.005
33 Public service	0.040	-0.019	0.025	0.000	0.008	-0.062	0.033	0.032	-0.023	-0.007	-0.002

Table 5.4 Industry TFP comparison: China vs. South Korea (Year2005=100, South Korea=100)

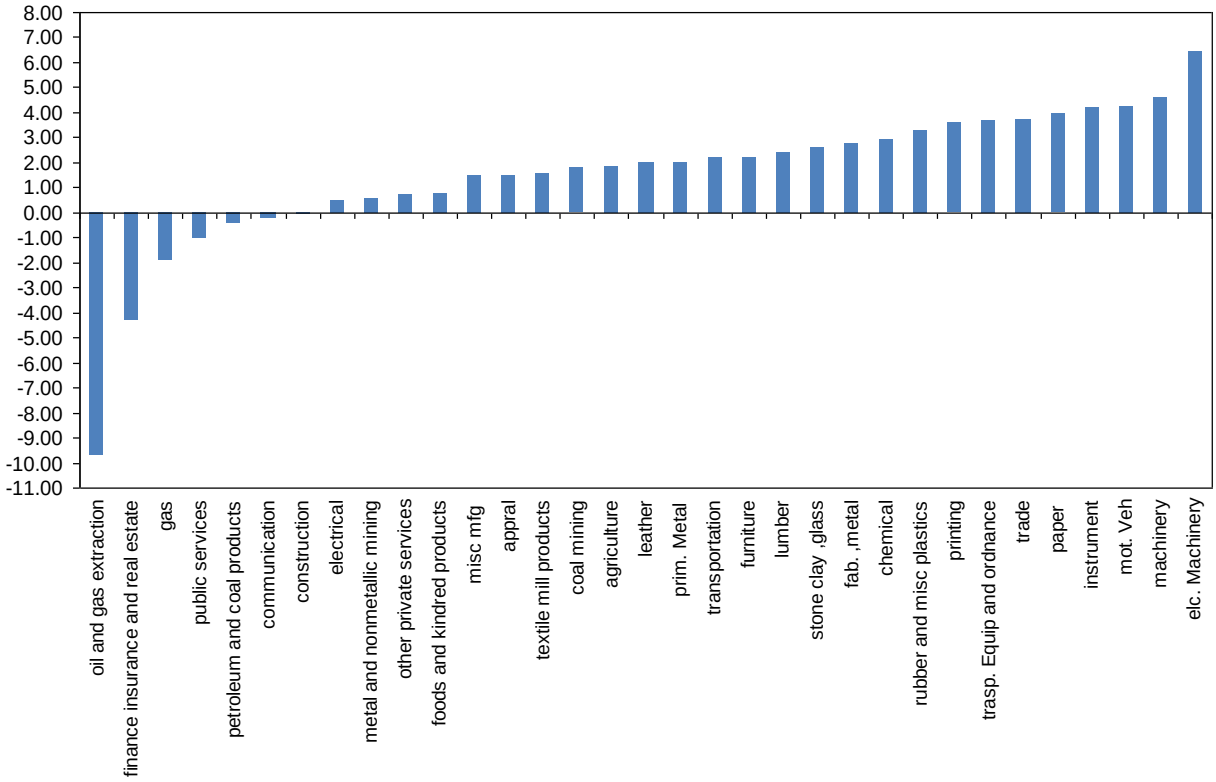
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
01 Agriculture	149.4	137.0	131.9	128.8	127.8	136.4	147.1	157.1	148.0	132.2	122.5	121.4
05 Construction	77.6	73.9	77.6	73.8	73.7	71.5	71.1	65.6	74.9	75.0	78.9	72.7
06 Food and kindred products	107.4	108.9	104.5	104.1	102.7	103.9	102.7	103.5	103.6	101.5	98.7	98.6
07 Textile mill products	131.2	128.4	129.8	117.1	113.9	114.3	117.1	125.6	128.7	129.3	125.4	112.8
13 Chemicals	178.9	170.6	172.3	161.9	157.2	159.1	161.4	172.0	166.1	156.3	153.6	182.9
14 Petroleum and coal products	85.0	80.8	71.8	87.4	125.8	136.0	143.3	158.7	160.1	155.9	157.2	161.7
16 Stone, clay, glass	176.8	174.9	166.6	162.0	163.6	152.6	149.0	163.0	159.2	153.1	148.6	158.5
19 Machinery, non-elect	274.1	251.2	243.2	222.8	208.6	206.9	196.0	202.7	197.8	180.3	173.0	179.3
20 Electrical machinery	437.9	428.4	397.2	341.0	328.6	325.7	310.9	327.5	313.1	292.9	280.5	241.0
24 Rubber and misc plastics	192.8	182.5	165.4	160.4	153.4	149.0	141.2	144.9	147.5	152.7	147.1	173.1
33 Public service	48.6	53.9	59.3	64.4	71.3	69.3	79.7	81.8	94.1	89.9	91.5	92.4

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
01 Agriculture	132.2	123.5	117.2	110.0	110.8	96.8	93.9	96.1	99.0	110.2	104.7
05 Construction	72.6	70.9	76.6	82.0	85.3	92.4	97.6	95.9	97.7	96.3	99.5
06 Food and kindred products	90.8	96.7	96.8	96.4	98.3	103.3	107.7	102.5	103.2	98.8	99.3
07 Textile mill products	120.6	118.7	110.6	104.1	108.4	103.9	107.2	104.2	100.5	99.6	99.9
13 Chemicals	139.9	160.1	154.4	147.3	143.0	138.6	136.1	121.0	112.3	103.9	100.7
14 Petroleum and coal products	136.1	104.3	108.3	113.3	107.8	99.1	95.3	98.8	97.3	98.6	98.8
16 Stone, clay, glass	149.1	129.1	128.7	127.2	134.4	128.8	149.0	134.0	124.0	107.2	101.2
19 Machinery, non-elect	169.7	149.0	141.5	133.4	151.5	144.5	133.4	128.4	122.5	112.0	102.7
20 Electrical machinery	226.6	207.1	200.5	190.1	174.2	158.8	149.7	143.2	131.0	113.6	102.5
24 Rubber and misc plastics	138.5	136.0	142.7	140.2	139.0	130.1	120.5	118.5	115.4	107.3	103.4
33 Public service	94.7	92.5	92.1	91.5	99.4	105.0	104.5	97.1	92.7	98.4	101.8

Based on the above inputs, we estimate the Industry TFP as showed in the following Figure 5.6 and details in Table 5.3, in which wide range of industry TFP growth rates varies from -9.71% (oil and gas extraction) to 6.46% (electrical machinery). And many energy industries (oil and gas extraction, gas, petroleum and coal products), and some service (finance, public service, communication) shows negative TFP growth rate. Meanwhile, some of manufacturing industries, such as electrical manufacturing, machinery, motor vehicle, instrument, paper, show high TFP rates, especially ICT manufacturing.

We also compare 2 sub-periods: 1982-1994, and 1994-2000, and find out some industries TFP slowdown: apparel, paper, leather, transportation equipment, transportation, communication. while few industries TFP accelerate: coal mining, Primary metal, metal and nonmetallic mining.

Figure 5.6 Industry TFP growth, 1981-2005 (%)



We also calculate the Domar-weighted TFP, shown in Figure 5.7 & 5.8. The result shows China has a moderate productivity growth, since Domar-weighted TFP growth is estimated at 3.89%. 1987-90, 1995-96 and 1999-2000 experienced negative Domar-weighted TFP. TFP acceleration is obvious during the beginning of revolution, 1982-1985. And Agriculture, electrical machinery contributes the biggest to aggregate TFP among 33 industries, while Agriculture is the largest average share of gross output to total value-added over 1981-2005, and Electrical machinery is the fastest TFP growth rate over 1981-2005.

In Figure 5.9, we identify the input growth is the predominant source of output growth in most industries. In details, intermediate input growth is the primary source of output growth in most industries over 1984-88, 1988-94 and 1994-2000, 2000-2005. And TFP growth is the primary source of output in most industries over 1981-84. Capital input growth is becoming a more important source of output growth over the four periods. While, only few industries relied on labor input as primary source of expansion.

Figure 5.7 Domar-Weighted TFP

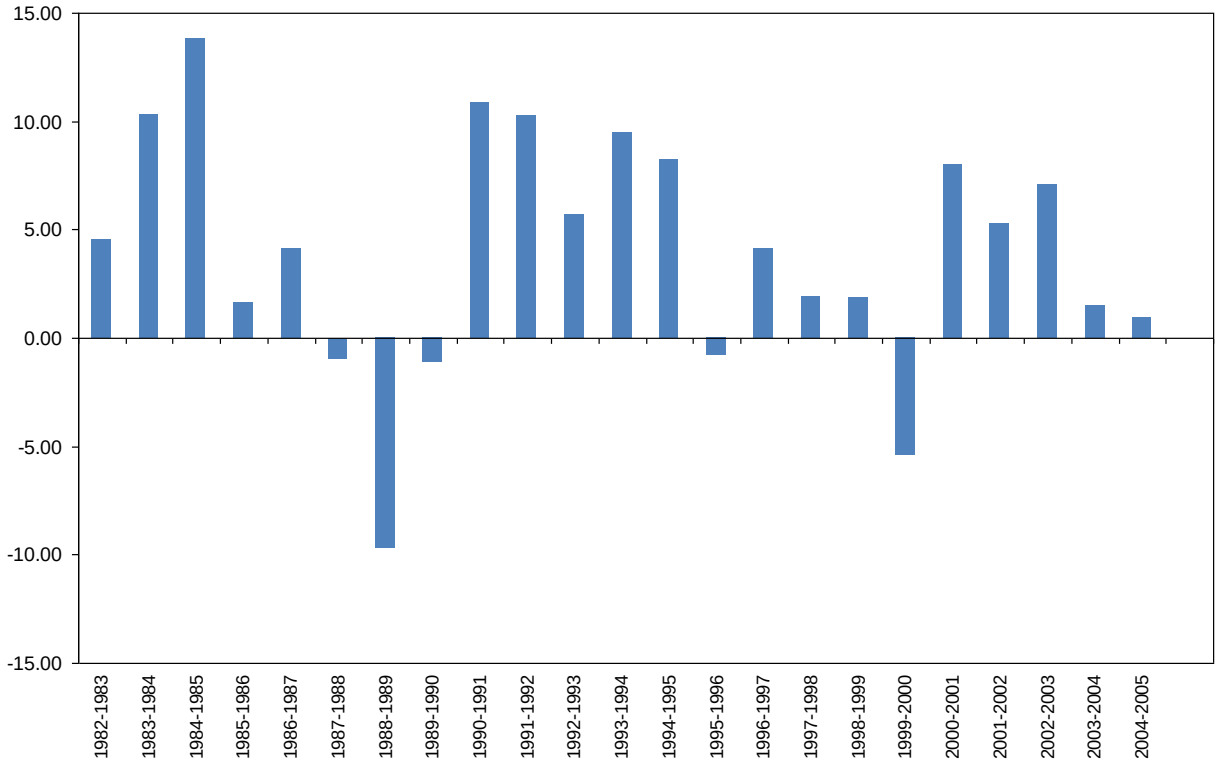


Figure 5.8 Domar-Wtd Productivity Contributions, 1981-2005

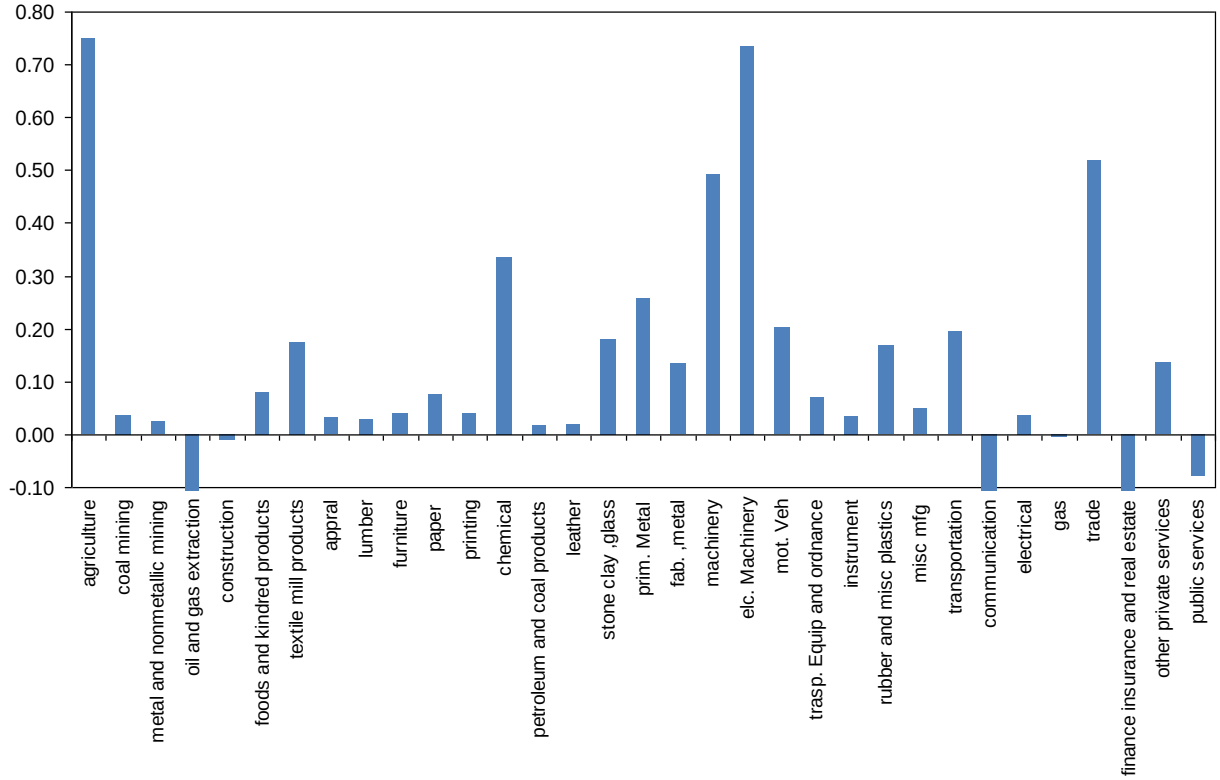
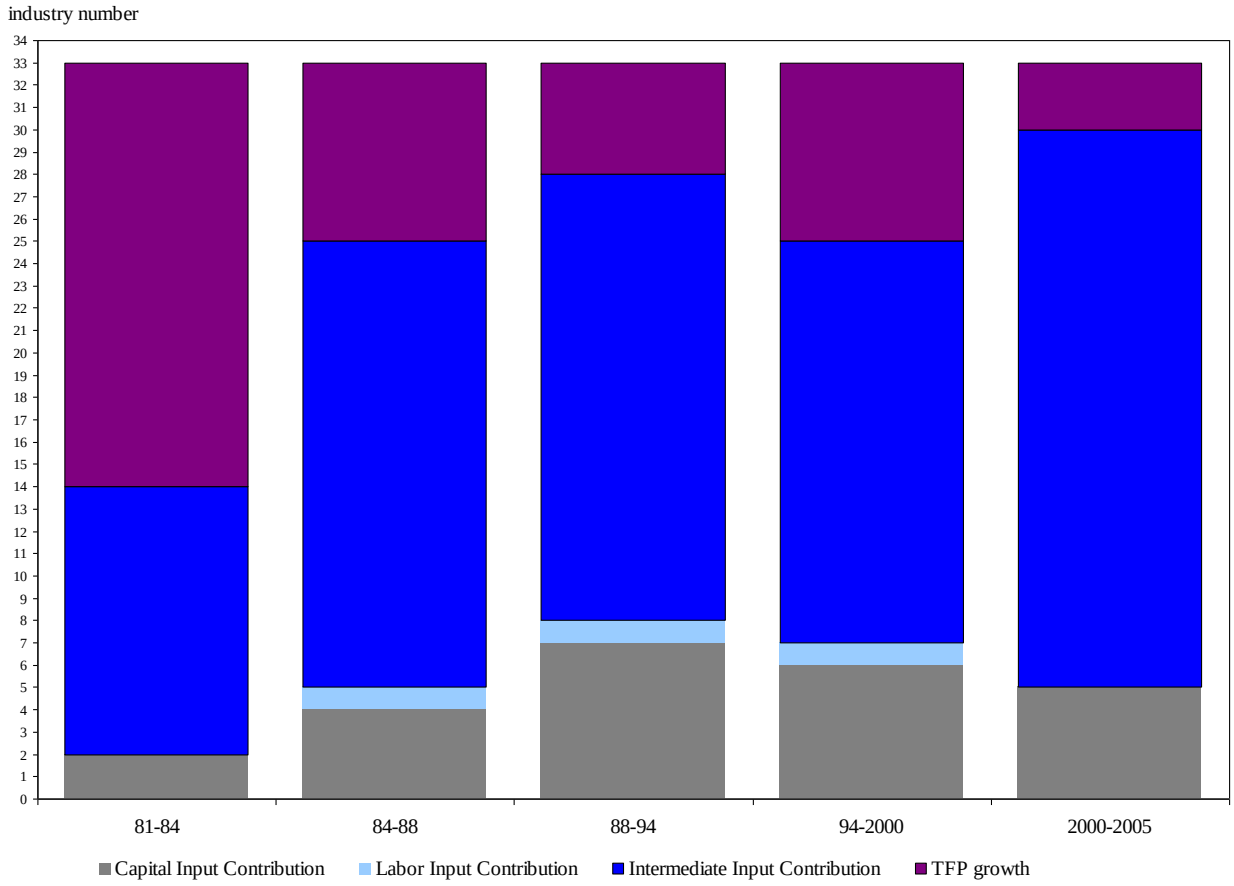


Figure 5.9 Predominant Source of Output Growth



In the last, we also run an international comparison between our China KLEMS results and other Asia countries from newly released Asia KLEMS dataset[3], to identify China's performance benchmarking with other advanced and emerging economies in the same region. Because of the data availability, here we only provide a preliminary result for some of the industries between China and South Korea in Table 5.4.

6. CLOSING REMARKS

In this research, Domar-weighted TFP growth for the period of 1981-2005 is estimated at 3.89%. TFP acceleration is obvious during the beginning of revolution, 1982-1985. Agriculture and electrical machinery are the biggest contributions to aggregate TFP among 33 industries. Intermediate input growth is the most important source of growth.

Our China KLEMS database is based the Input-Output table time series of 1981-2011. Before 1987, China's statistical system is under Material Product System (MPS), and after 1987, China gradually adopted System of National Accounts (SNA), which leads to a huge challenge to compile a consistent and comparable Input-Output table series. We set up a joint-project with China's National Bureau of Statistics (NBS) to make all the necessary adjustments for the definition and coverage issues along the transformation, as well as the gap between China' s National Accounts and IO Accounts. The underlying

[3] Professors Hak K. Pyo, Kyoji Fukao and Tsutomu Miyagawa (2010 &2012), http://www.asiaklems.net

statistical materials we depend on are: 1) China's official Benchmark IO tables: 1987, 1992, 1997, 2002, and 2007; 2) China's official Extended IO tables: 1990, 1995, 2000, 2005 and 2010 (upcoming); 3) National Accounts aggregate statistics; 4) Gross Output, Value-added, and other information from Industrial statistics; 5) detailed information for China's Final Use, such as customs trade volumes by commodities; 6) Price indices and related information, especially from the State Planning Commission in earlier stage of China's Reform. We use a 3-dimension Cross-checking Approach (Consistency, Comparability, IO-Balancing) to construct the IO series, and for the period after 2007, we will use 2012 benchmark IOT and collaborate with World Input-Output Database[4] to get the estimation for the recent years in our next stage.

Our Capital Input Index is based on a cross-classified the capital of each sector by 2 types of assets: structure and equipment. We estimate the capital stock under the Perpetual Inventory Method (PIM). We use the property compensation from the input-output series to estimate the capital rental price. Then we aggregate of capital services over different asset types with the weights of capital rental price. Since the deflator for investment in fixed asset is only available since 1992, the structure investment deflator for 1980-1991 was construction ex-factory price index, which is from the IO time series price index. The equipment investment deflator for 1980-1991 was from the NBS. We adjust the "fixed asset investment" to "gross capital formation" of each industry; estimate the land capital stock for agriculture. Furthermore, we consider the self-employed compensation problem during the internal rate of return estimation.

Our Labor Input Index is a Divisia aggregate over workers distinguished by sex, age and education attainment using wages as weights, with the following breakdowns: 1) Sex: male, female; 2) Educational attainment: college, high school, junior high school, elementary school, no schooling; 3) Age: 16-34, 35-54, 55+. The underlying statistical materials are: 1) Population surveys, including Population census for every 10 years (1982, 1990, 2000, 2010), 1% population sample survey at middle of any two successive population years (1987, 1995, 2005), and annual 1‰ population movement sample survey; 2) "Three-in-one" statistics, including Labor statistics of urban units, Administrative registration of private enterprises and "Getihu" (an unique business unit during China's Reform), and Rural employment statistics; 3) Other labor statistics, including Industrial census, Service census, Economic census, Agricultural census, Statistics on Township and Village Enterprises (TVEs) by Ministry of Agriculture, and Labor force survey.

Our Energy, Materials and Services inputs are calculated by applying shares of E, M and S from the IO-tables. Then we build up a Domar-Weighted approach to measure the aggregate TFP, industrial contributions and source of growth to Gross Output growth. This analysis will help us to understand the drivers for China's thirty-year economic growth "miracle".

In the future stage of our research, we are keen to compare China's TFP performance with other advanced and emerging countries based on EU-KLEMS and a newly built-up Asia KLEMS database, which is an Asian regional research consortium to promote building database and conduct international productivity comparison among Asian countries based on KLEMS methodology adopted by EU KLEMS project. Since our China KLEMS dataset is a part of the Asia KLEMS database, the consistency of the measurements will be able to make sure the international comparisons within the database build up on a

[4] Marcel Timmer (2012), The World Input-Output Database (WIOD): Contents, Sources and Methods, http://www.wiod.org/database/index.htm

comparable basis. With the current progress, the comparisons with the following Asia countries: Japan, South Korea, Taiwan, India, Indonesia, Malaysia, Vietnam, Philippines will be possible for the next stage. The results will be helpful to benchmark China's performance in Asia for the last 30 years.

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