

Toward Asian KLEMS

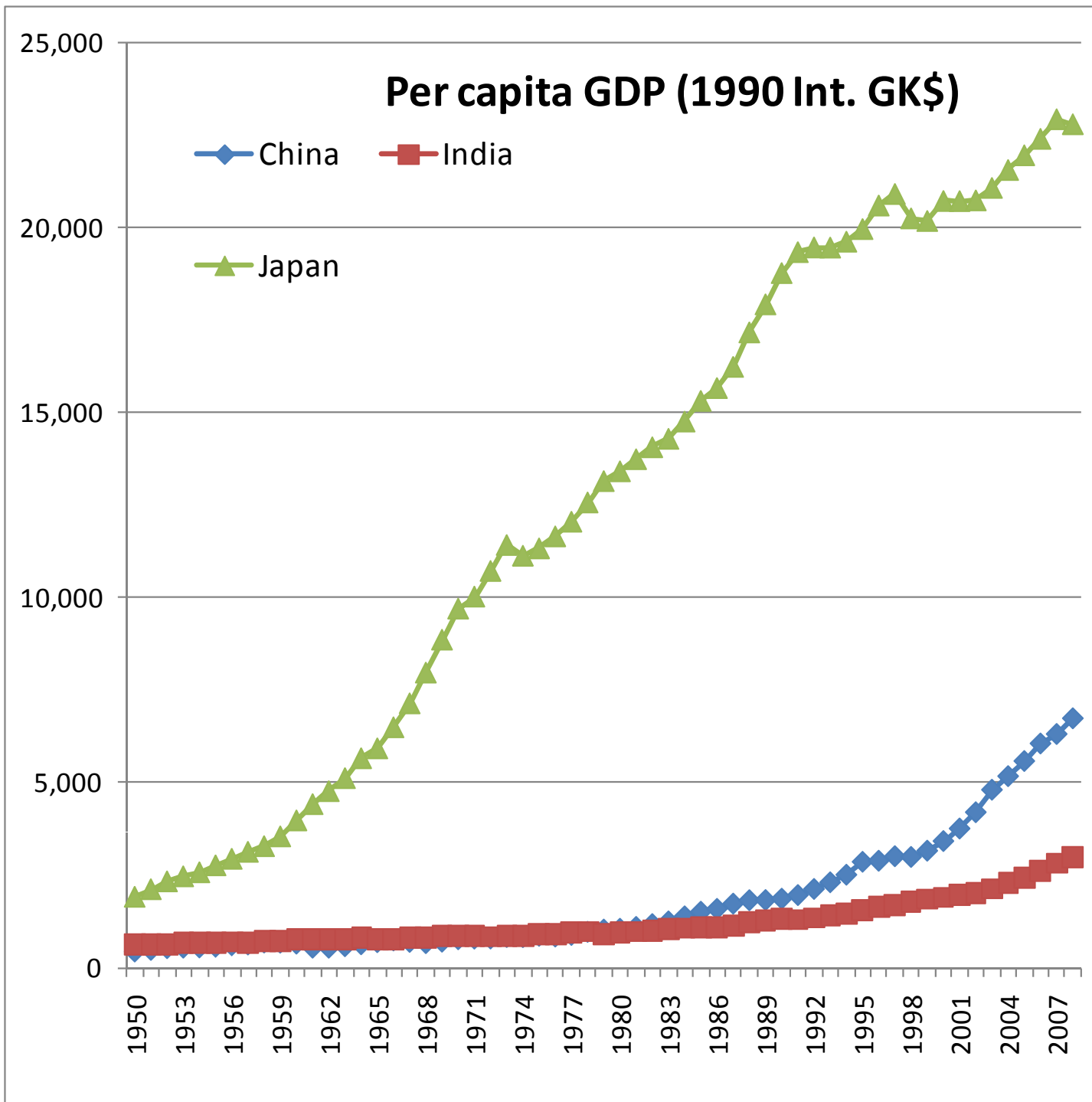
Kyoji Fukao

Hitotsubashi University and RIETI

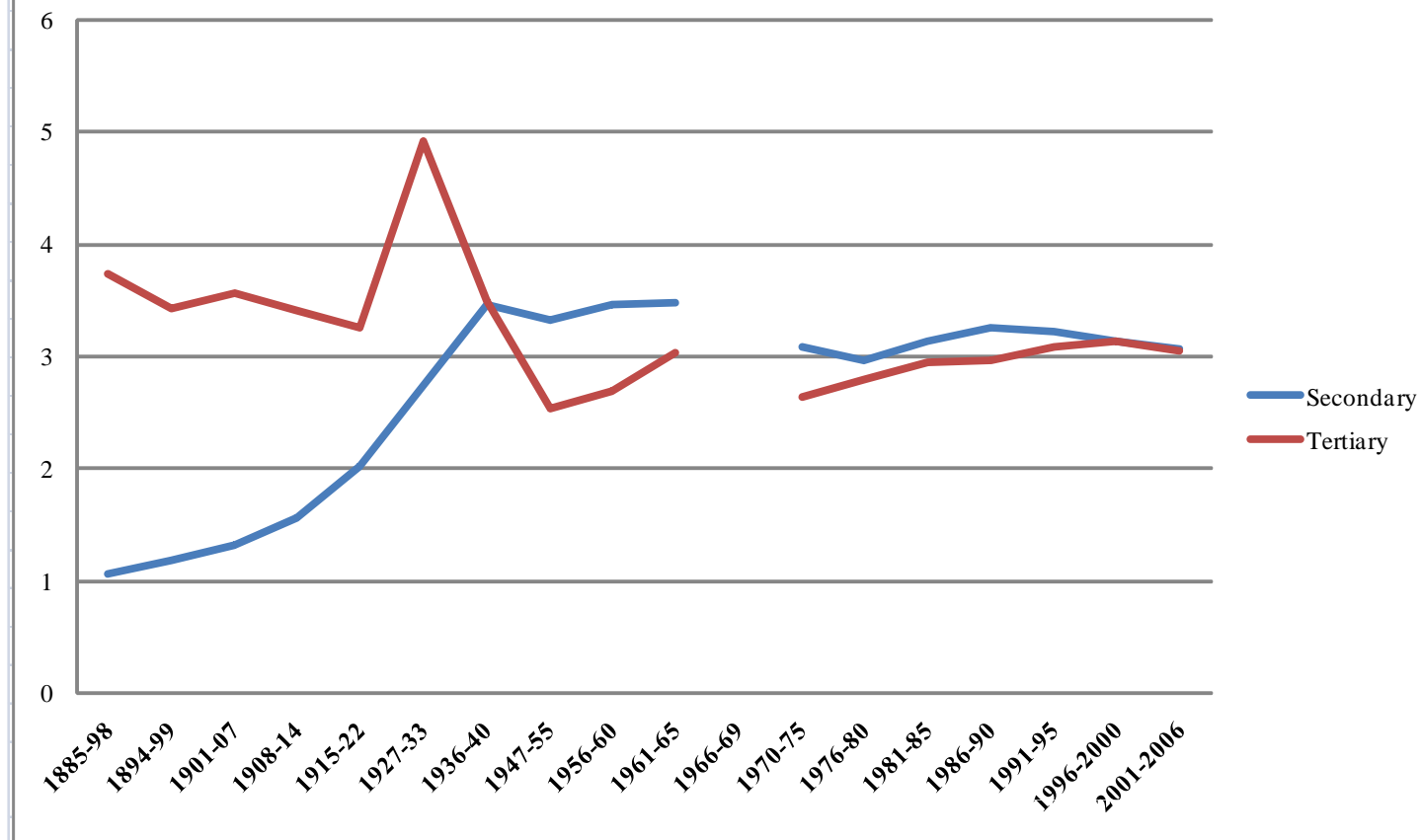
Ideas about analytical use of the Asian KLEMS data

Since many Asian countries are under dynamic development process, it is interesting to analyze changes of industrial structure and capital deepening.

- For example, labor productivity growth might be mainly caused by change of industrial structure (Of course, usually capital deepening occurs behind this change.) .**
- Does capital deepening occur within each industry or through expansion of capital intensive sectors?**



Comparison of sectoral labor productivity (primary=1)



Notes:

Subsidiary occupations are taken account of for periods before the Second World War.

Data before 1965 are on a per worker basis. Data from 1973 are on a man-hour basis.

The primary sector consists of agriculture, fishery and forestry. The secondary sector consists of mining, manufacturing and construction. The tertiary sector consists of all other sectors except imputed rent.

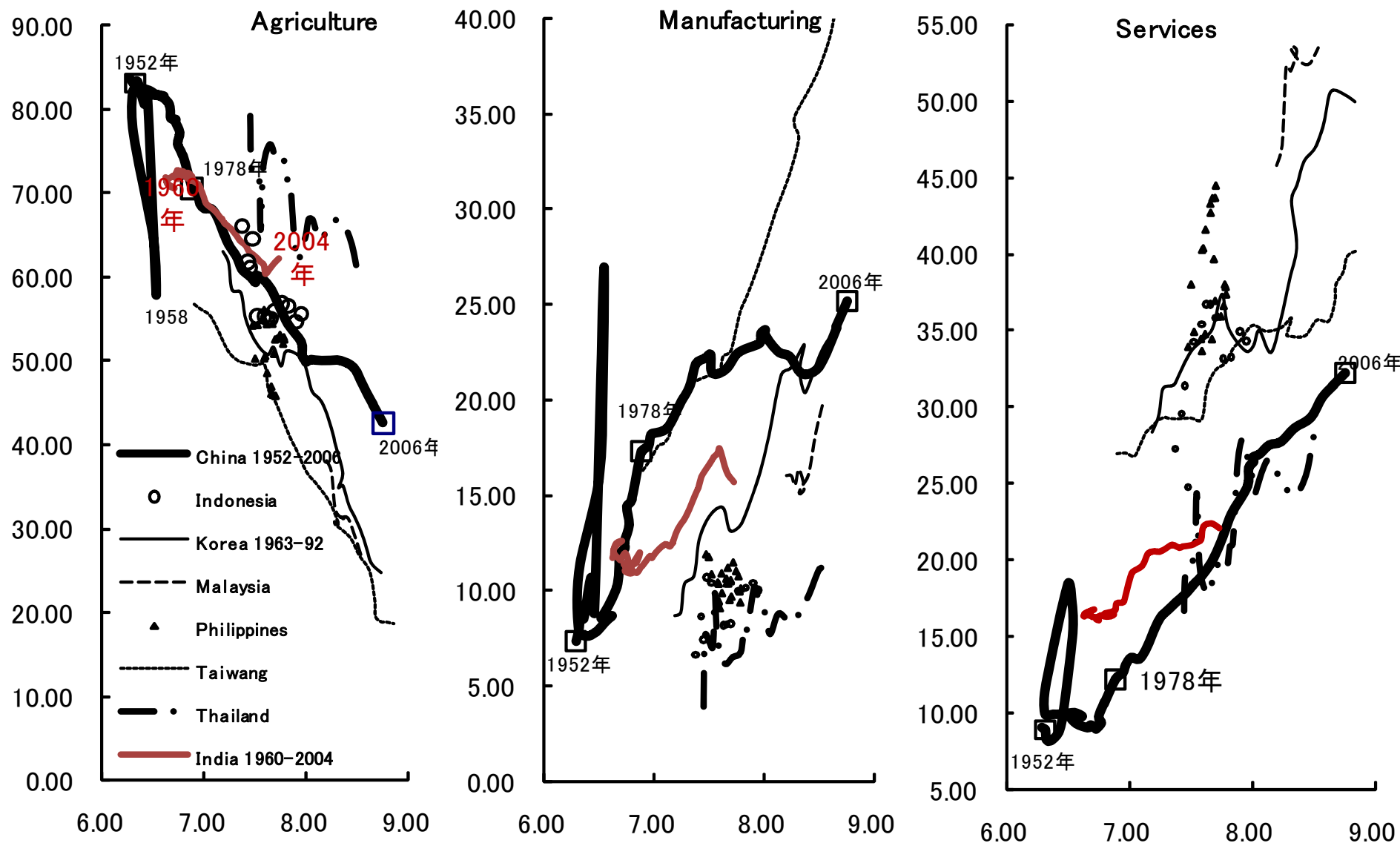
Sources:

Data for periods between 1885-1940 are from Osamu Saito and Tokihiko Settsu (2009), "Unveiling historical occupational structures and its implications for sectoral labour productivity analysis in Japan's economic growth," paper presented at INCHOS 2009, 28-30 July 2009, King's College, Cambridge, p. 31, table 11.

Data for periods between 1947-65 are from Ohkawa, K. and M. Shinohara, eds., (1979), *Patterns of Japanese Economic Development: A Quantitative Appraisal* (New Haven: Yale University Press), p. 41, Table 2.12.

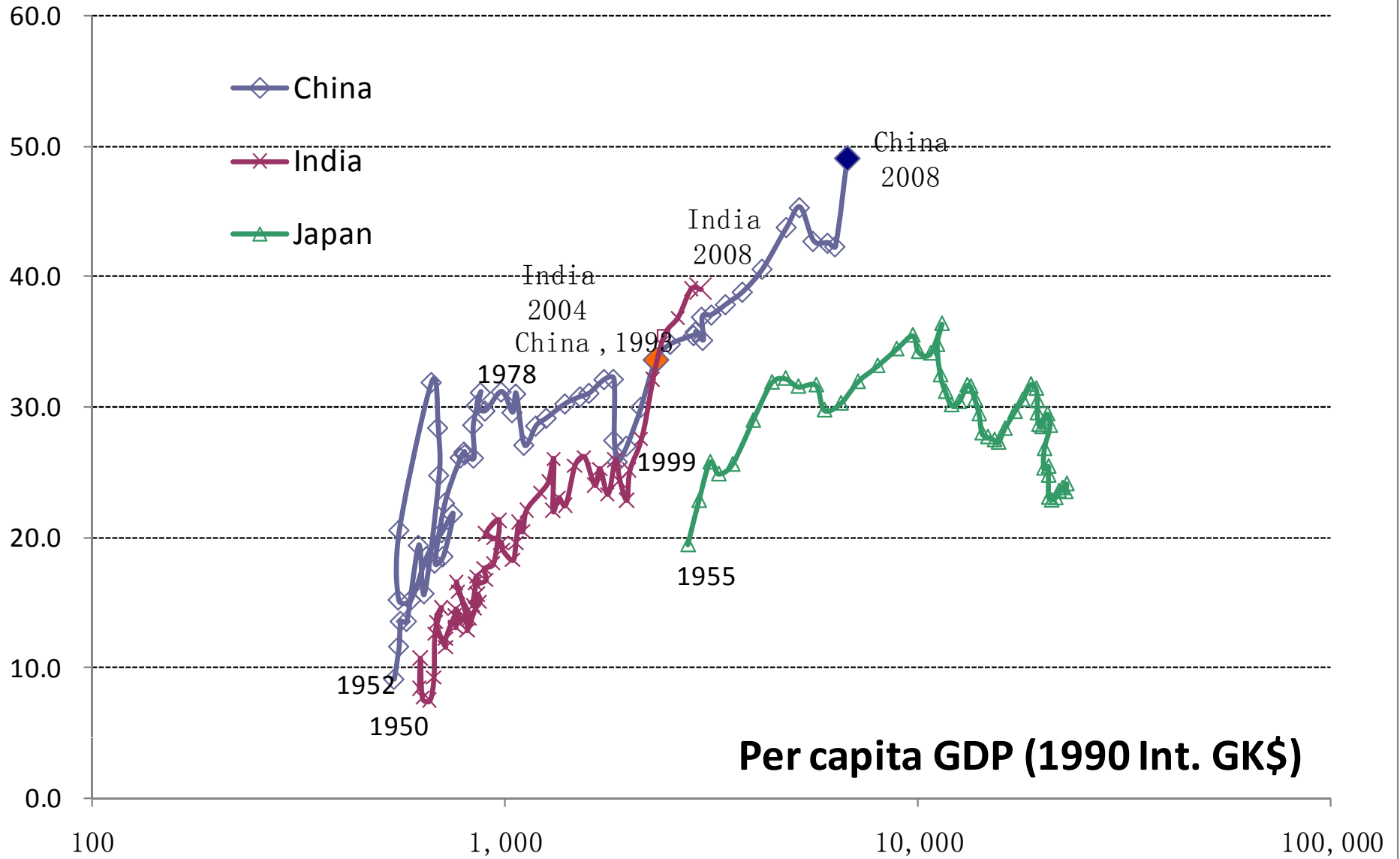
Data for periods after 1970 are from the JIP Database 2009.

Distribution of Workers Across Sectors in Asian Countries

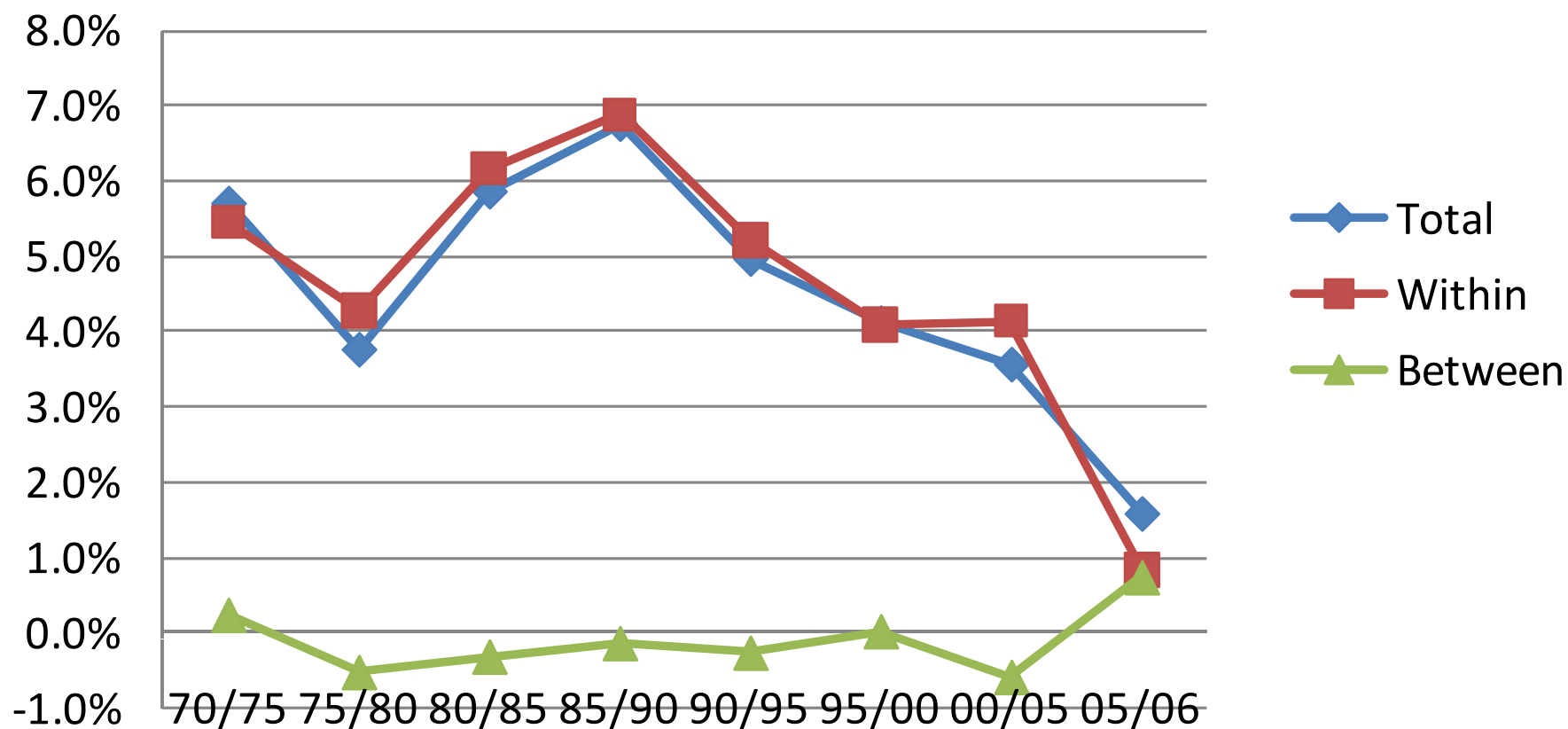


Source: The Conference Board and Groningen Growth and Development Centre, Total Economy Database, <http://www.conference-board.org/economic> and World Bank World Development Indicators (2007).

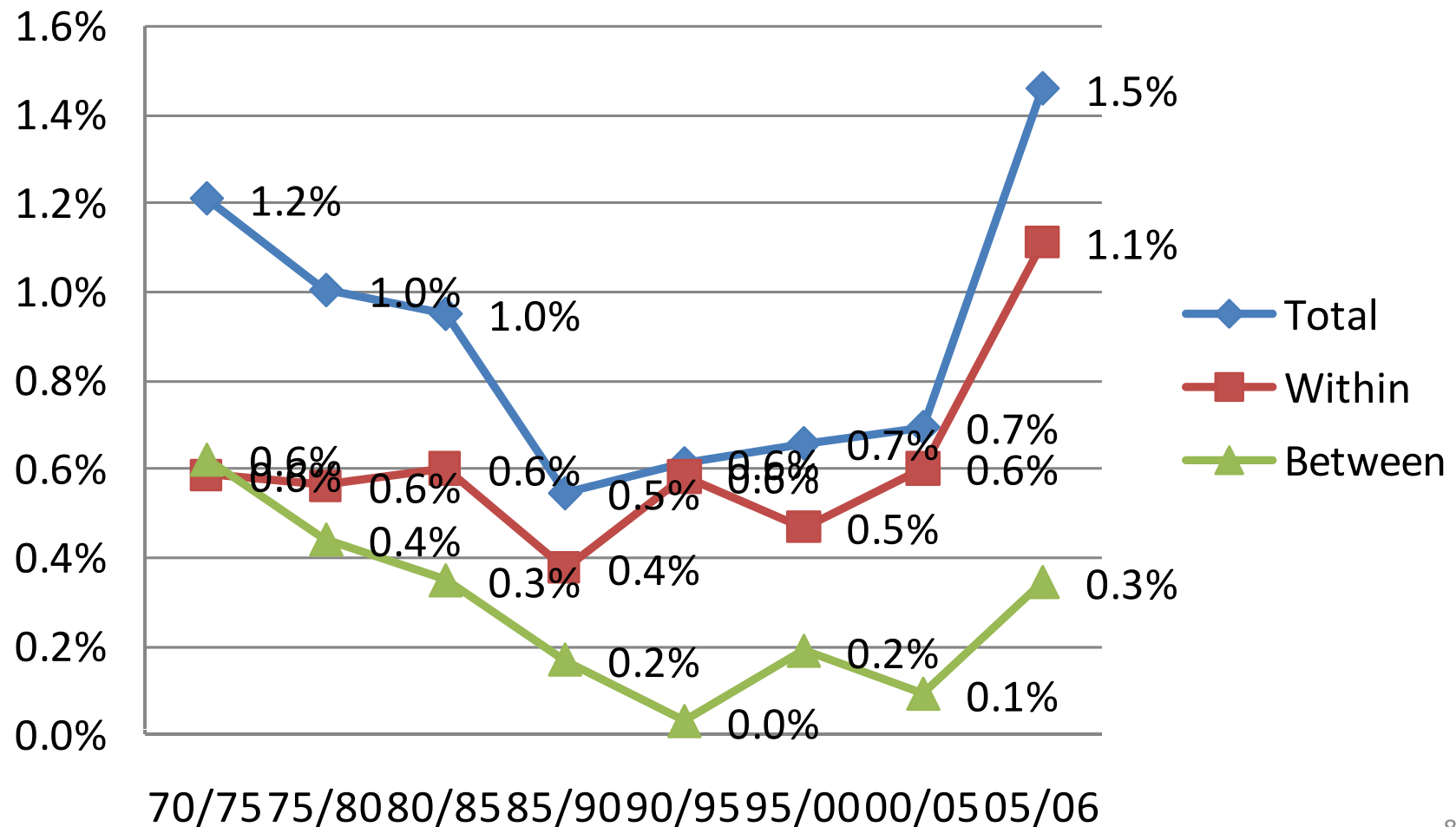
Gross Investment-GDP Ratio



Decomposition of Increase of Capital Service-Labor Service Ratio in Japan (annual average growth rate)

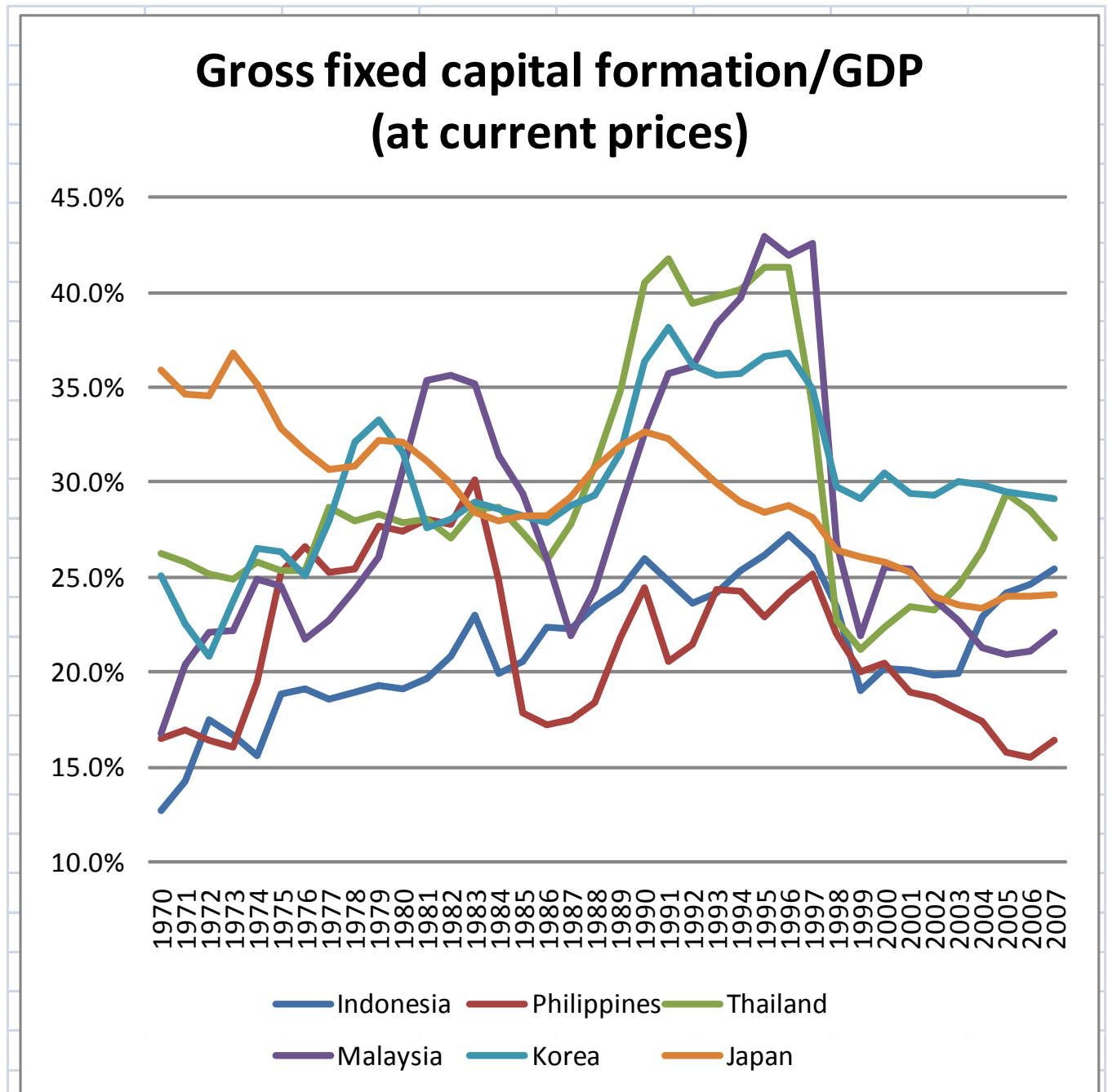


Decomposition of Human Capital Accumulation in Japan (annual average growth rate)



Analysis on impact of economic crisis

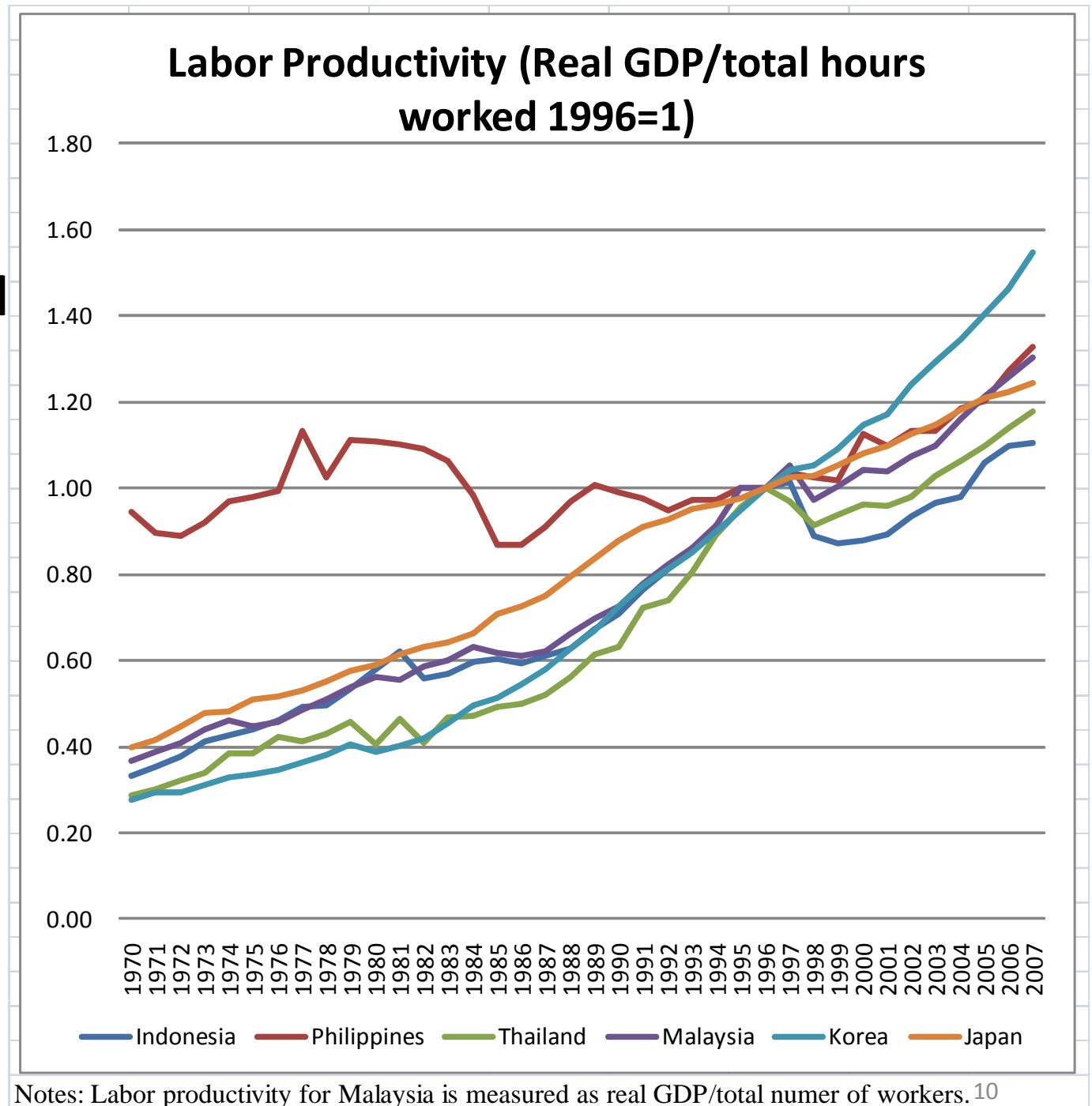
Capital accumulation slowed down sharply in crisis-hit Asian developing economies



Source: Asian Productivity Organization, APO Productivity Database.

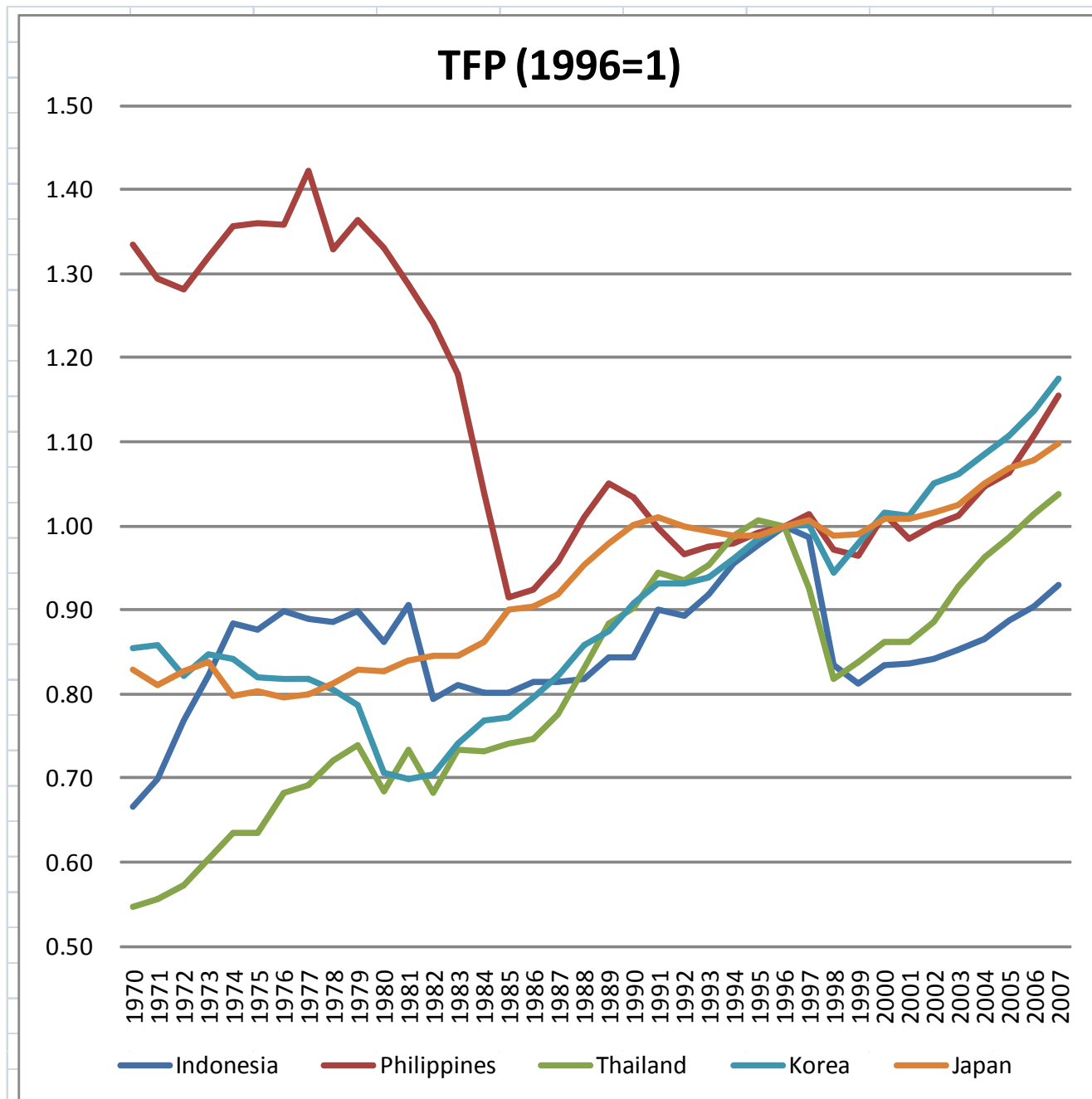
A Large Drop and Slow Recovery in Productivity

In Thailand and Indonesia, it took ten years for labor productivity to recover to pre-crisis levels.



A Large Drop and Slow Recovery in Productivity

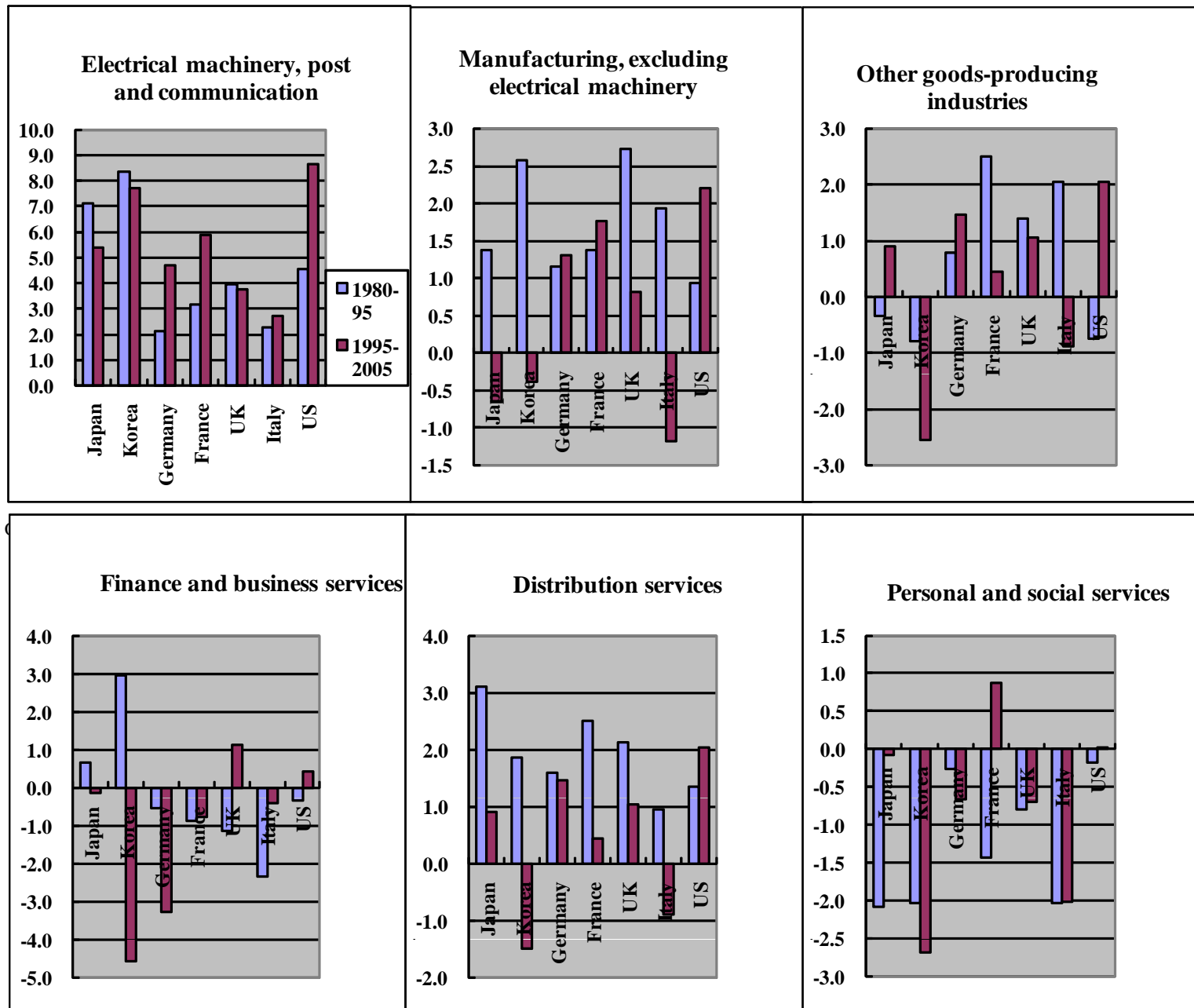
With regard to TFP, the recovery to pre-crisis levels in Thailand and Indonesia took even longer.



Notes: TFP data for Malaysia are not available.

Source: APO Database 2010.

TFP Growth in the Market Sector: by Sector and by Country

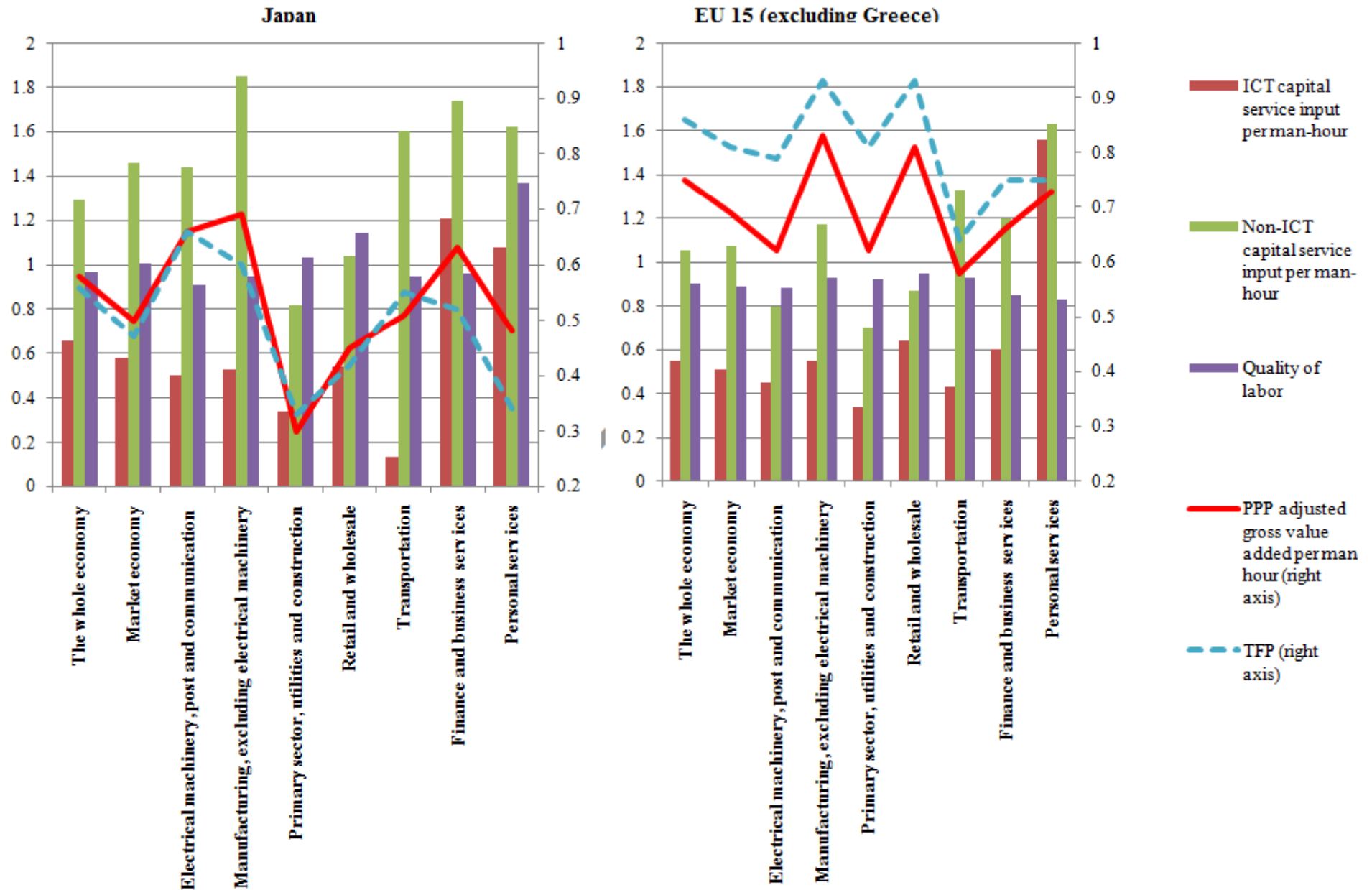


Source: Kyoji Fukao, Tsutomu Miyagawa, Hak K. Pyo and Keun Hee Rhee (2009), "Estimates of Total Factor Productivity, ICT Contributions and Resource Reallocation Effects in Japan and Korea."

For this type of analysis, we need to harmonize our data.

- **Will EU KLEMS continue their service and expand their coverage of countries?**
- **Industry classification? Don't we need to take account of special characteristics of Asian countries?**
- **Shall we use labor categories (age, education, etc.) of EU KLEMS?**
- **Shall we use capital depreciation rates of EU KLEMS?**

Figure 4. PPP adjusted labor productivity, factor inputs, and TFP: Japan, EU and US comparison (2005, US=1)



For international comparison of labor productivity and TFP, we need PPP for output, intermediate input and investment goods. Will Groningen University provide us?

The Results of International
Comparison of TFP between
Japanese, Korean and Chinese firms

EALC Database

- **The Japan Center for Economic Research has been pursuing the revision and updating of the East Asian Listed Companies Database (EALC) compiled in a collaborative effort with the Center for Corporate Competitiveness at Seoul National University (Prof. Keun Lee), Hitotsubashi University, and Nihon University.**
- **The most recent version, EALC 2009, is composed of the necessary data for estimating the total factor productivity (TFP) of all companies listed on the stock exchanges in Japan, China, South Korea, and Taiwan as well as the TFP of each company adjusted for purchasing power parity.**

Source of Data (China)

- **Output and Material Deflator**
 - **Output:** From *NBS*(the National Bureau of Statistics), except output deflator for agriculture and service sectors, which are from *China Statistical Yearbook*
 - **Material:** Estimated based on data form *NBS* and *Input-Output Table 2002*
- **Labor hours**
 - **The numbers of employee;** from CSMAR
 - **Industry average labor hour:** Estimated based on the data from *Population Survey 1995* and Yang(2003)
- **Capital cost**
 - **Interest rate:** from *PBC* (The People's Bank of China)
 - **Corporate tax rate** from CSMAR
 - **Deflator:** Estimated based on data from *NBS* and *Input-Output Table 2002*. We use the average price of capital goods, and they are machinery, tools, vehicle, and building and structure.
 - **Depreciation rate:** from Harry Wu (2002)

Labor Cost Share in the manufacturing industry

	1985	1990	1995	2000	2004/5
Japan	0.153	0.145	0.169	0.164	0.158
Korea	0.133	0.148	0.132	0.118	0.087
China				0.062	0.053

Capital Cost Share in the manufacturing industry

	1985	1990	1995	2000	2004/5
Japan	0.058	0.061	0.046	0.038	0.034
Korea	0.058	0.069	0.054	0.042	0.022
China				0.092	0.087

Intermediate input Cost Share in the manufacturing industry

	1985	1990	1995	2000	2004/5
Japan	0.789	0.794	0.785	0.798	0.807
Korea	0.808	0.783	0.814	0.840	0.891
China				0.846	0.860

Labor Cost Share in the non-manufacturing industry

	1985	1990	1995	2000	2004/5
Japan	0.183	0.173	0.176	0.165	0.162
Korea	0.156	0.156	0.144	0.119	0.072
China				0.075	0.056

Capital Cost Share in the non-manufacturing industry

	1985	1990	1995	2000	2004/5
Japan	0.114	0.111	0.079	0.055	0.047
Korea	0.138	0.155	0.112	0.085	0.026
China				0.152	0.121

Intermediate input Cost Share in the non-manufacturing industry

	1985	1990	1995	2000	2004/5
Japan	0.703	0.716	0.745	0.780	0.791
Korea	0.605	0.589	0.644	0.795	0.802
China				0.773	0.823

TFP Growth Rate in Manufacturing Industry (% per annum, Japan, Korea and China)

	1985- 1990	1990- 1995	1995- 2000	2000- 2004
Japan	1.07%	0.59%	1.58%	1.77%
Korea	4.04%	5.62%	-0.75%	2.73%
China				7.19%

TFP Growth Rate in non-manufacturing Industry (% per annum, Japan, Korea and China)

	1985- 1990	1990- 1995	1995- 2000	2000- 2004
Japan	1.97%	-1.25%	0.92%	2.14%
Korea	-0.04%	1.23%	0.93%	3.31%
China*				8.14%

*except for Oil and Gas Extraction Industry

TFP Growth Rate by Industry (Manufacturing Industry, China)

p.a.

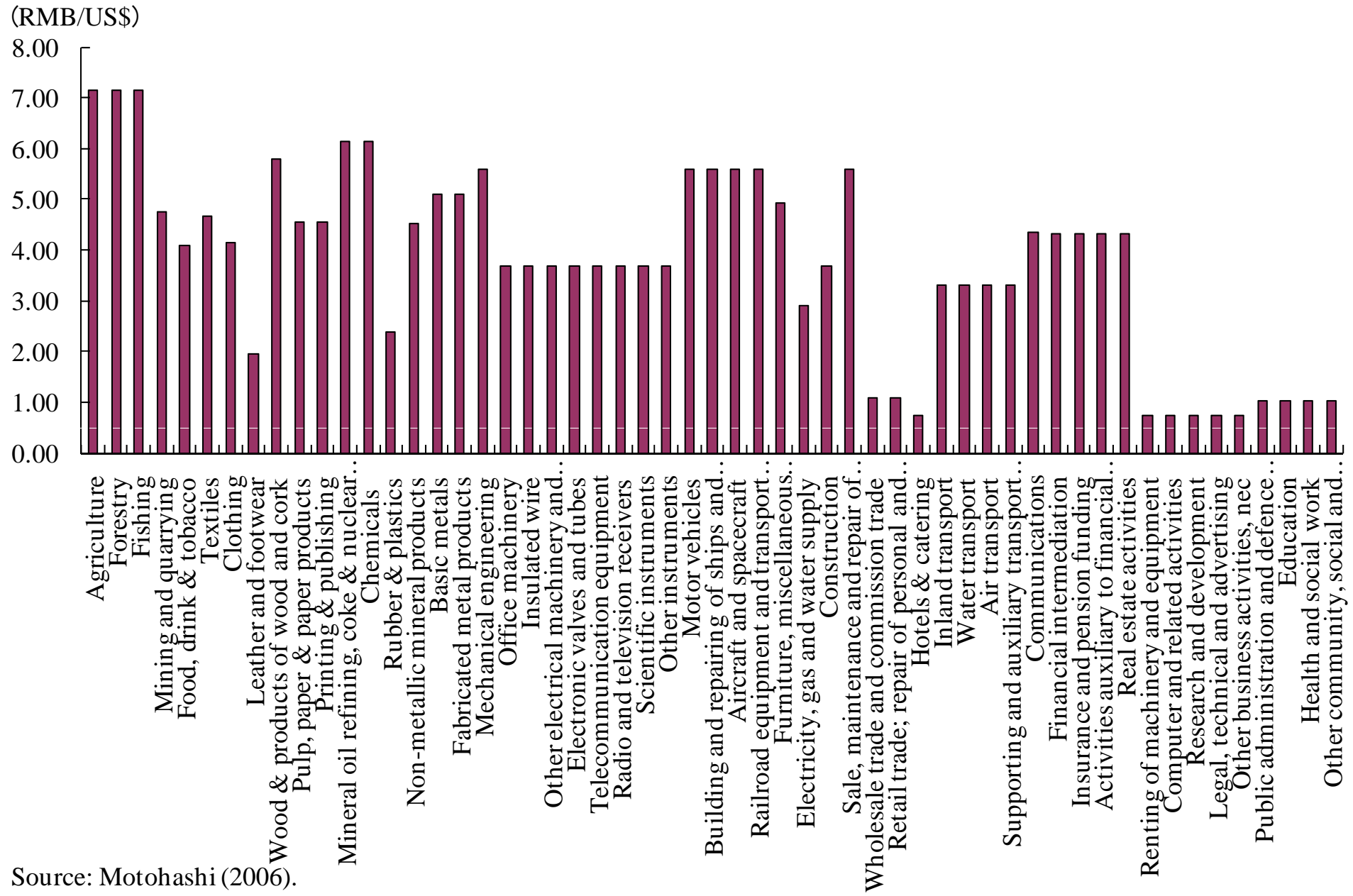
	Industrial Name	1999	2000	2001	2002	2003	2004	1999– 2004
6	Food and kindred products	0.02	0.05	0.00	0.05	0.13	0.08	0.05
7	Textile mill products	0.02	0.02	-0.01	0.03	0.02	0.02	0.02
8	Apparel	0.02	0.07	0.00	0.02	0.05	0.06	0.04
9	Lumber and wood							
10	Furniture and fixtures	0.00	0.13	0.12	-0.11	-0.13	-0.07	-0.01
11	Paper and allied	0.02	0.05	-0.03	0.02	0.05	0.08	0.03
12	Printing, publishing and allied	0.01	0.00	0.01	0.02	-0.10	-0.01	-0.01
13	Chemicals	0.03	0.03	0.04	0.13	0.11	0.08	0.07
14	Petroleum and coal products	0.00	0.10	-0.03	-0.01	0.02	0.11	0.03
15	Leather	0.00	-0.04	-0.02	-0.01	0.01	0.00	-0.01
16	Stone,clay,glass	0.04	0.15	0.15	0.12	0.19	0.20	0.14
17	Primary metal	0.01	0.03	0.05	0.08	0.11	-0.01	0.05
18	Fabricated metal	0.16	0.23	0.25	0.22	0.09	0.30	0.21
19	Machinery,non-elect	0.04	0.04	0.06	0.07	0.11	0.16	0.08
20	Electrical machinery	0.02	0.04	0.05	0.09	0.14	0.16	0.08
21	Motor vehicles	0.01	-0.01	-0.01	0.03	0.08	0.14	0.04
22	Transportation equipment & ordnance	0.02	0.01	0.07	0.11	0.14	0.18	0.09
23	Instruments	0.07	0.13	0.12	0.08	0.13	0.19	0.12
24	Rubber and misc plastics	0.01	0.02	-0.02	0.06	0.06	0.07	0.03
25	Misc. manufacturing	0.08	0.11	0.04	-0.03	-0.02	0.03	0.04

TFP Growth Rate by Industry (Non-manufacturing Industry, China)

p.a.

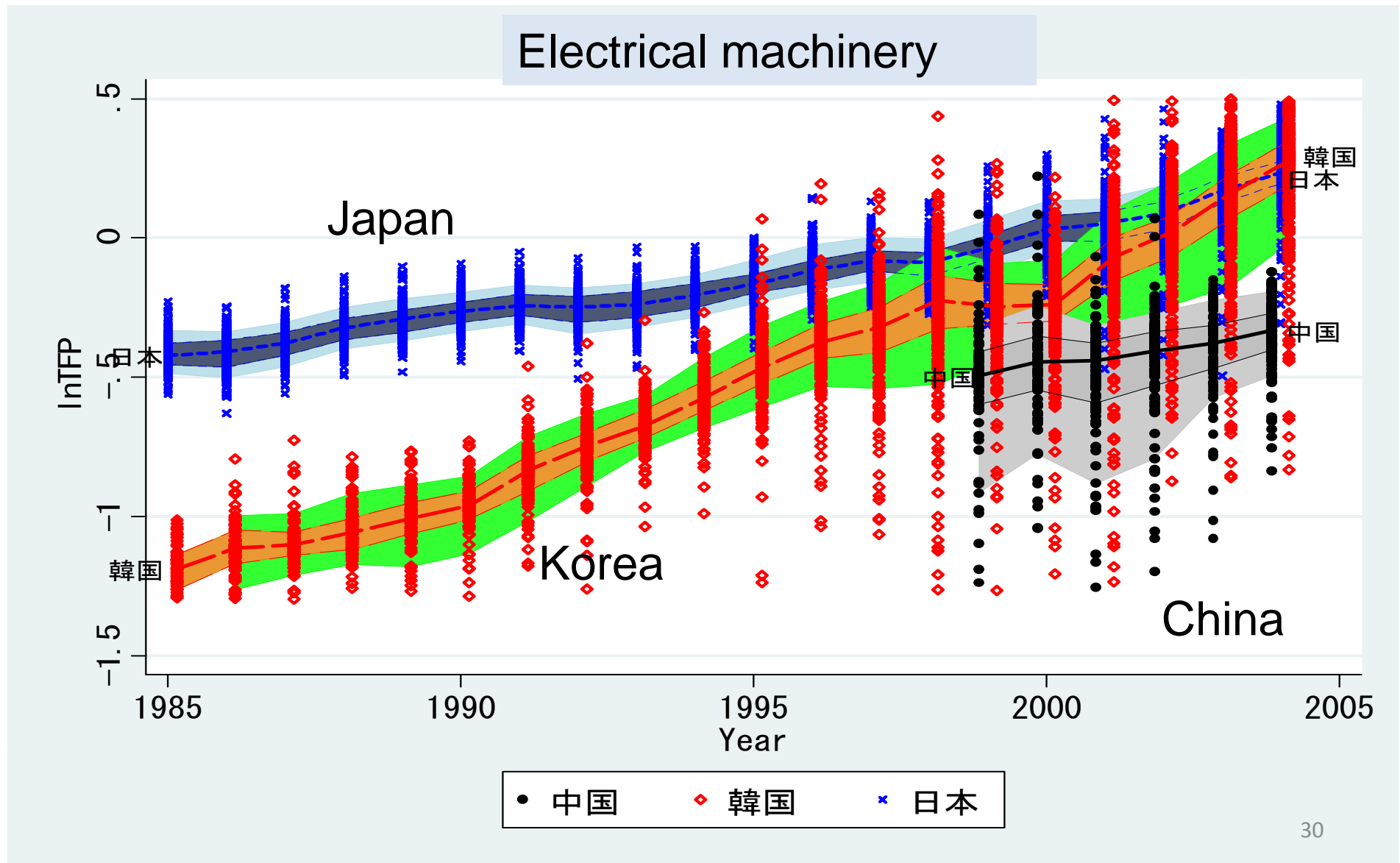
	Industrial Name	1999	2000	2001	2002	2003	2004	1999– 2004
1	Agriculture	0.05	0.11	-0.04	-0.05	-0.04	-0.09	-0.01
2	Coal mining	0.03	0.03	-0.07	-0.18	-0.20	-0.32	-0.12
3	Metal and non-metallic mining	0.02	-0.06	-0.11	-0.23	-0.19	-0.12	-0.12
4	Oil and gas extraction	0.05	-0.20	-0.31	-0.57	-0.21	-0.78	-0.34
5	Construction	0.03	-0.01	-0.05	-0.01	-0.04	-0.05	-0.02
26	Transportation	0.04	0.09	0.18	0.20	0.19	0.29	0.16
27	Communication	0.04	0.08	0.10	0.08	0.17	0.29	0.13
28	Electric utilities	0.03	-0.05	-0.04	-0.04	-0.01	0.00	-0.02
29	Gas utilities	0.01	0.06	0.08	0.03	0.06	0.12	0.06
30	Trade	0.04	0.06	0.11	0.10	0.14	0.12	0.09
31	Finance Insurance and Real Estate	0.07	0.09	0.10	0.14	0.14	0.15	0.11
32	Other private service	0.06	0.22	0.16	0.09	0.08	0.15	0.13
33	Public service							

Fig.3 Estimation of China's Purchasing Power Parity on a Production

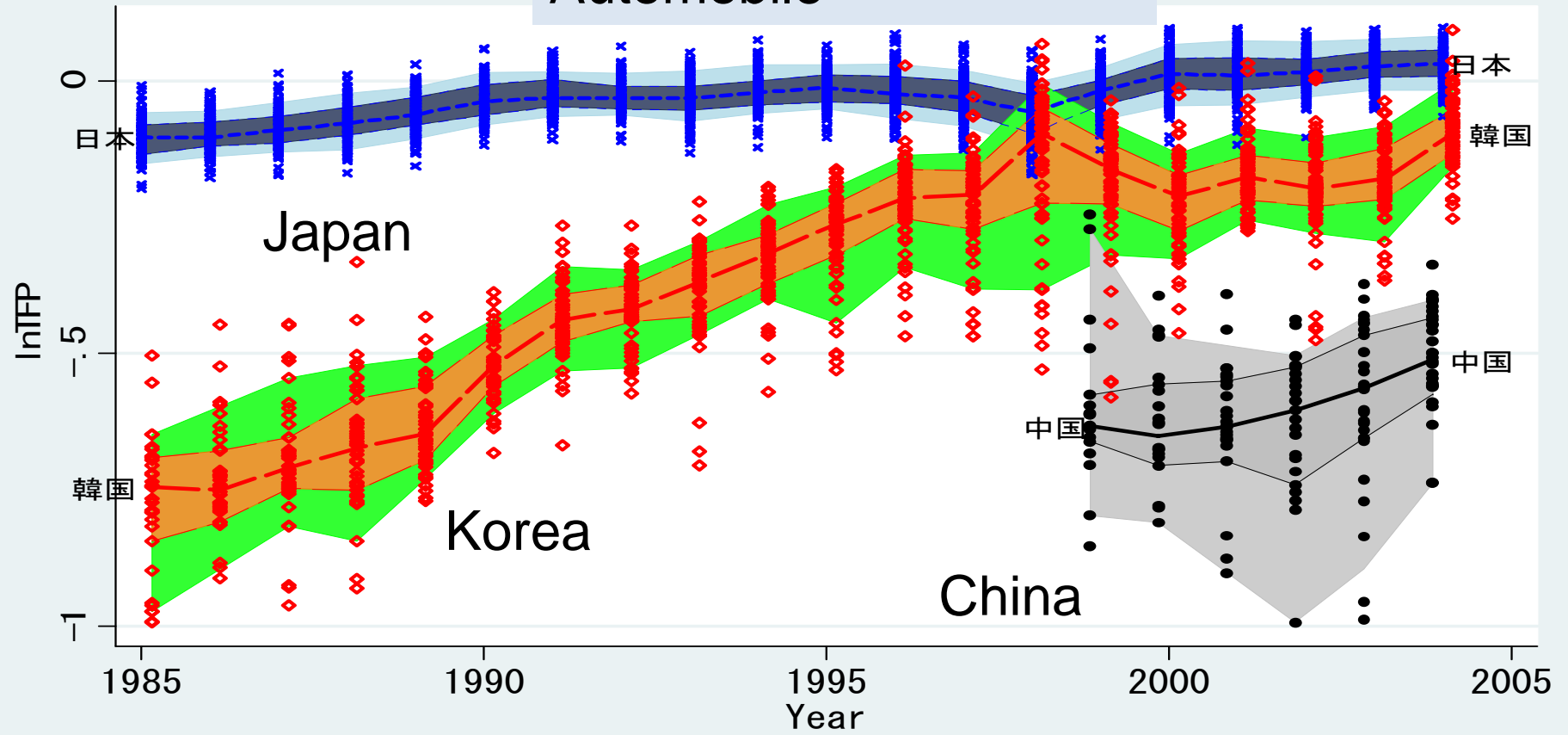


Source: Motohashi (2006).

- **EALC 2009** shows that South Korean firms are catching up with Japanese firms in machinery.

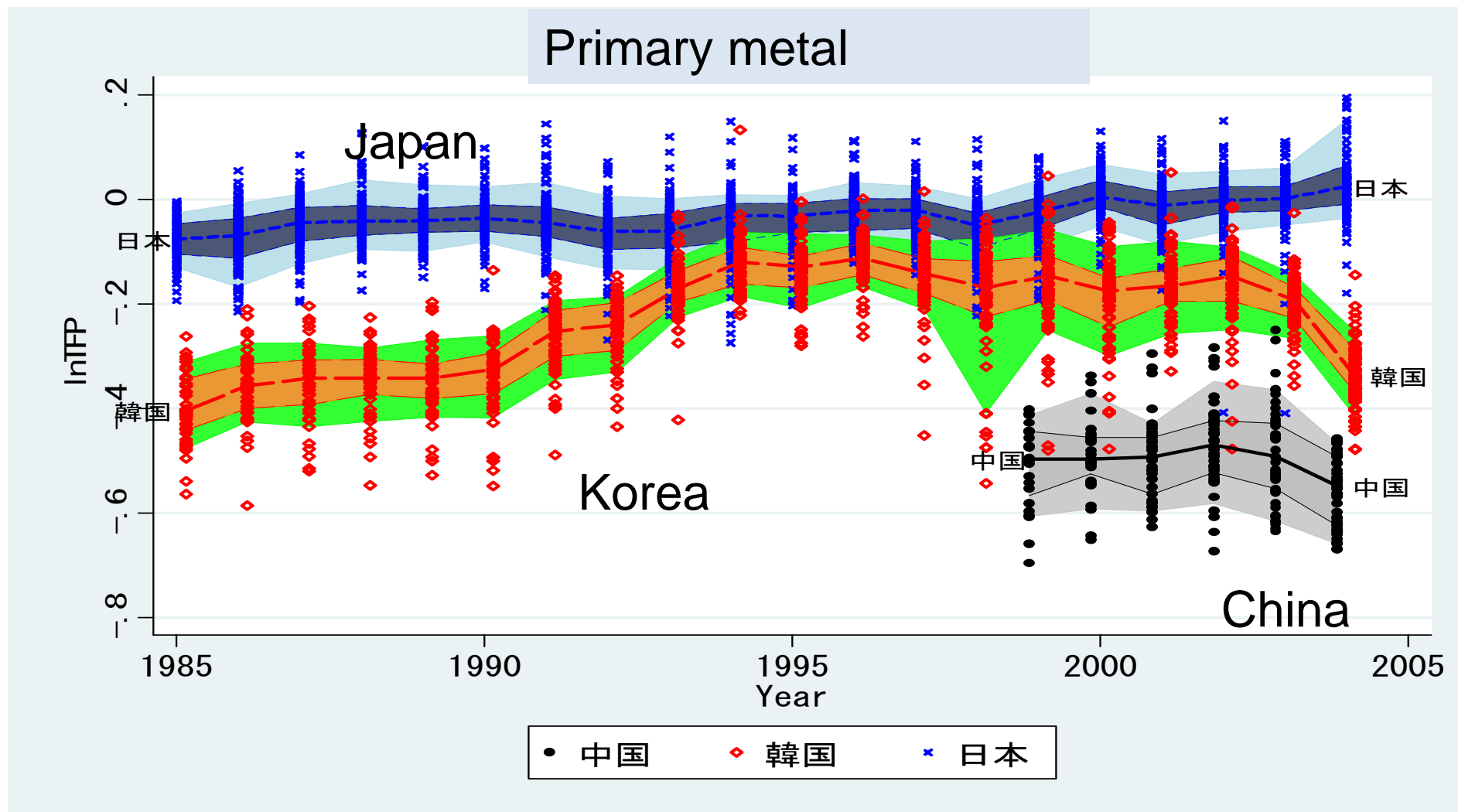


Automobile

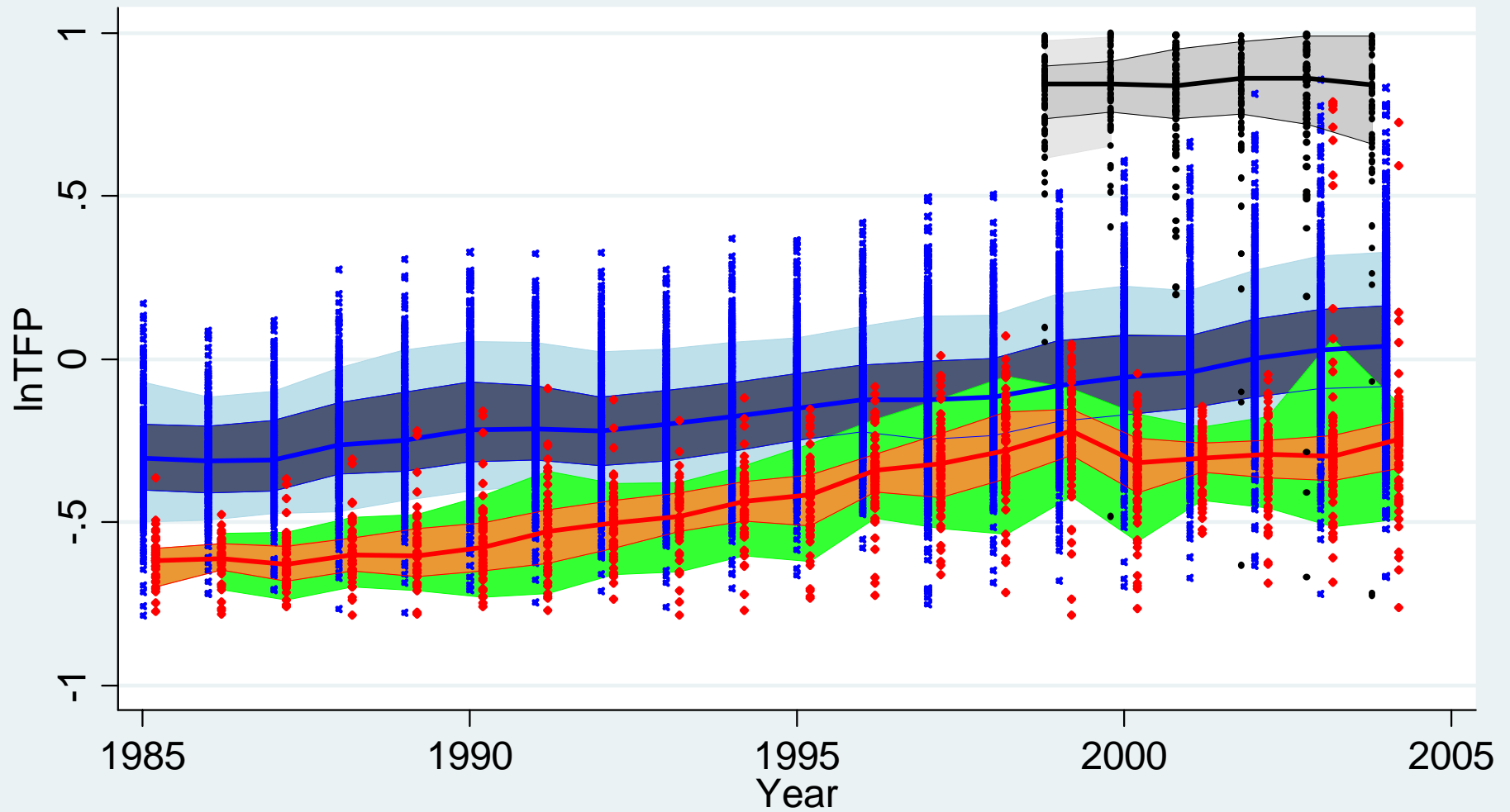


● 中国 ◆ 韩国 × 日本

- But the catching-up process is slow in some other industries, such as primary metal.



Trade

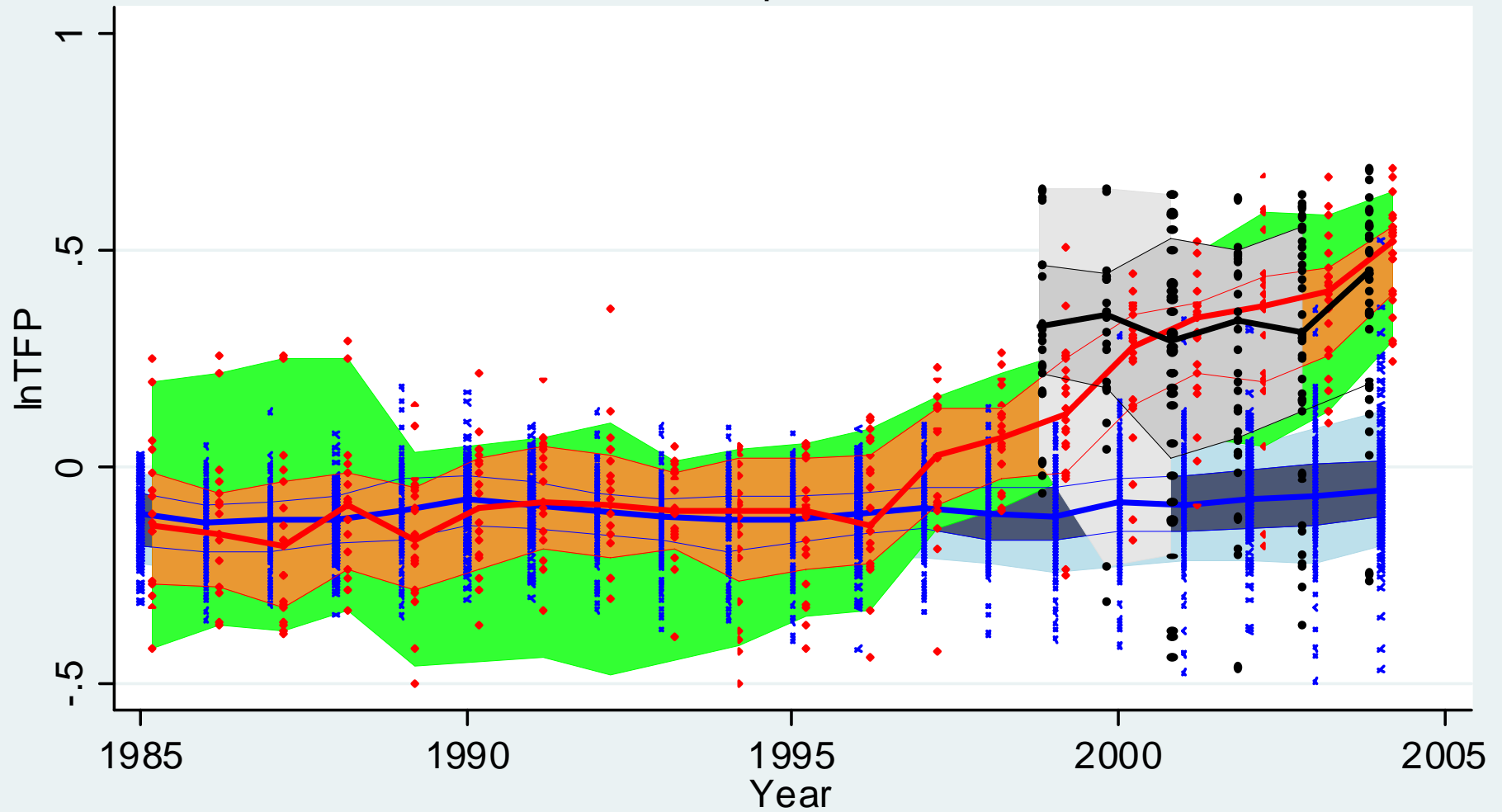


• China • Korea • Japan

Note: The shaded areas show the 10-90 and 25-75 percentile bands.

The thicker lines represent the median values.

Transportation

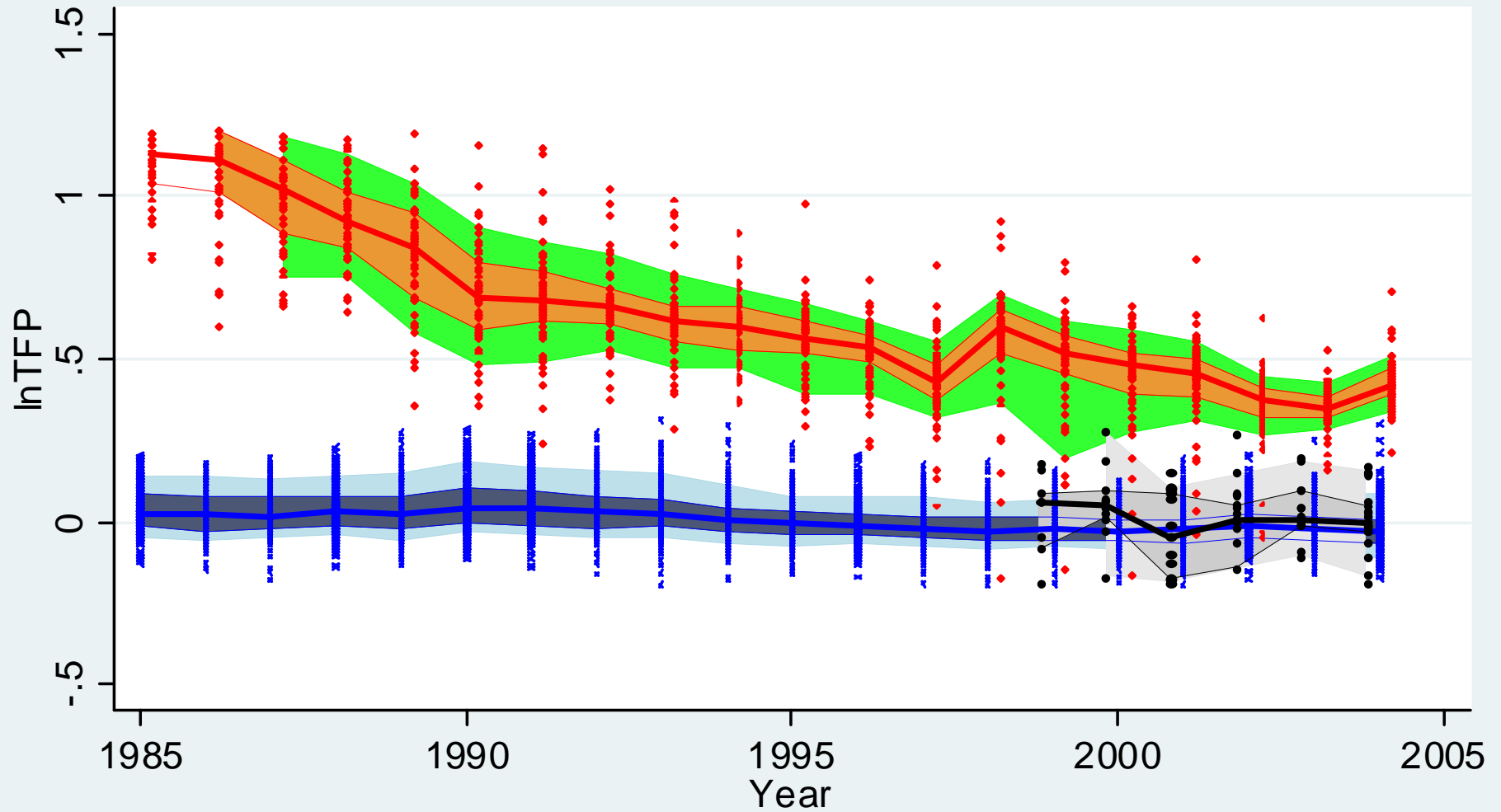


• China ♦ Korea ▪ Japan

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Construction

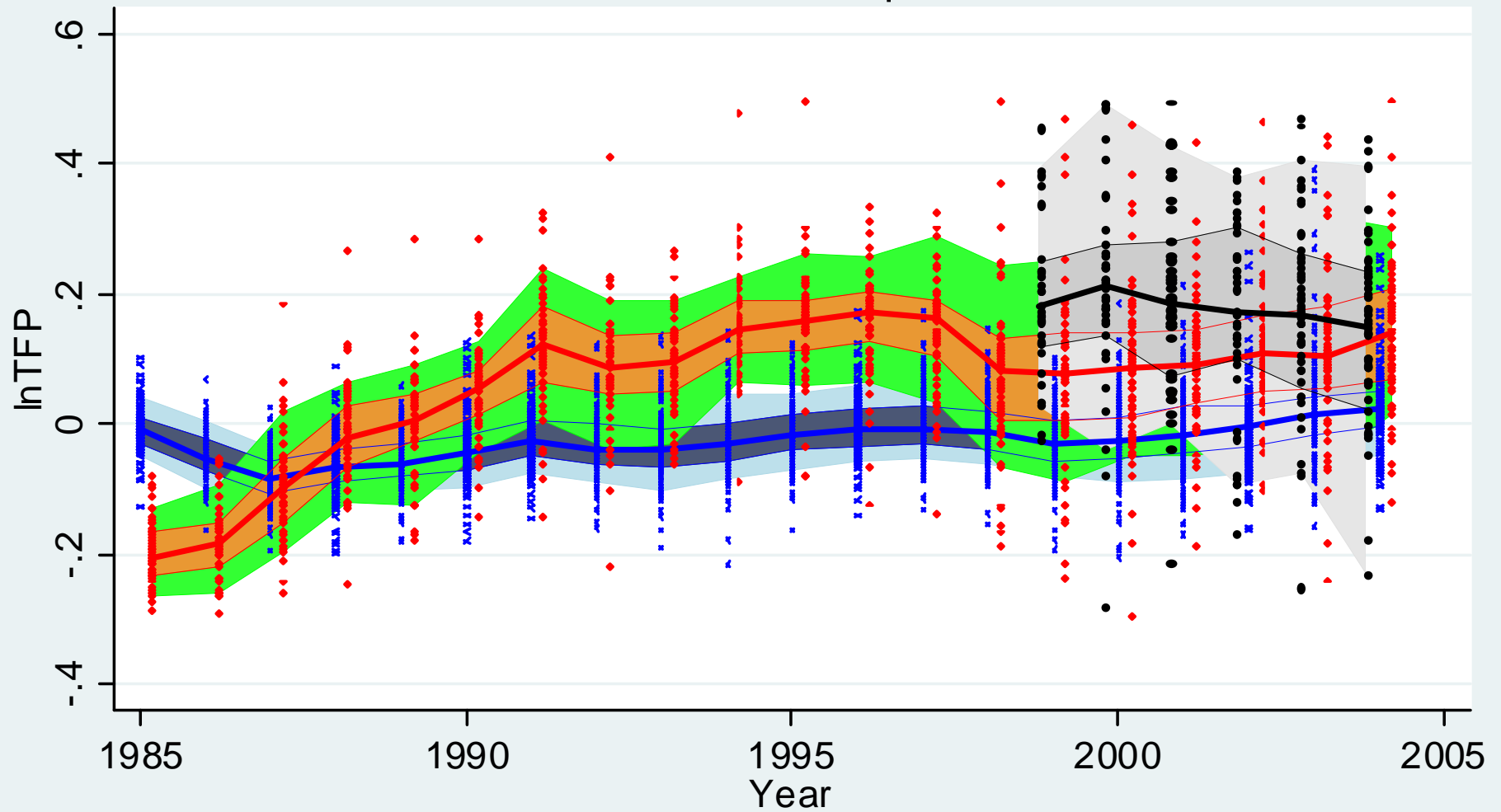


• China • Korea • Japan

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Food and kindred products

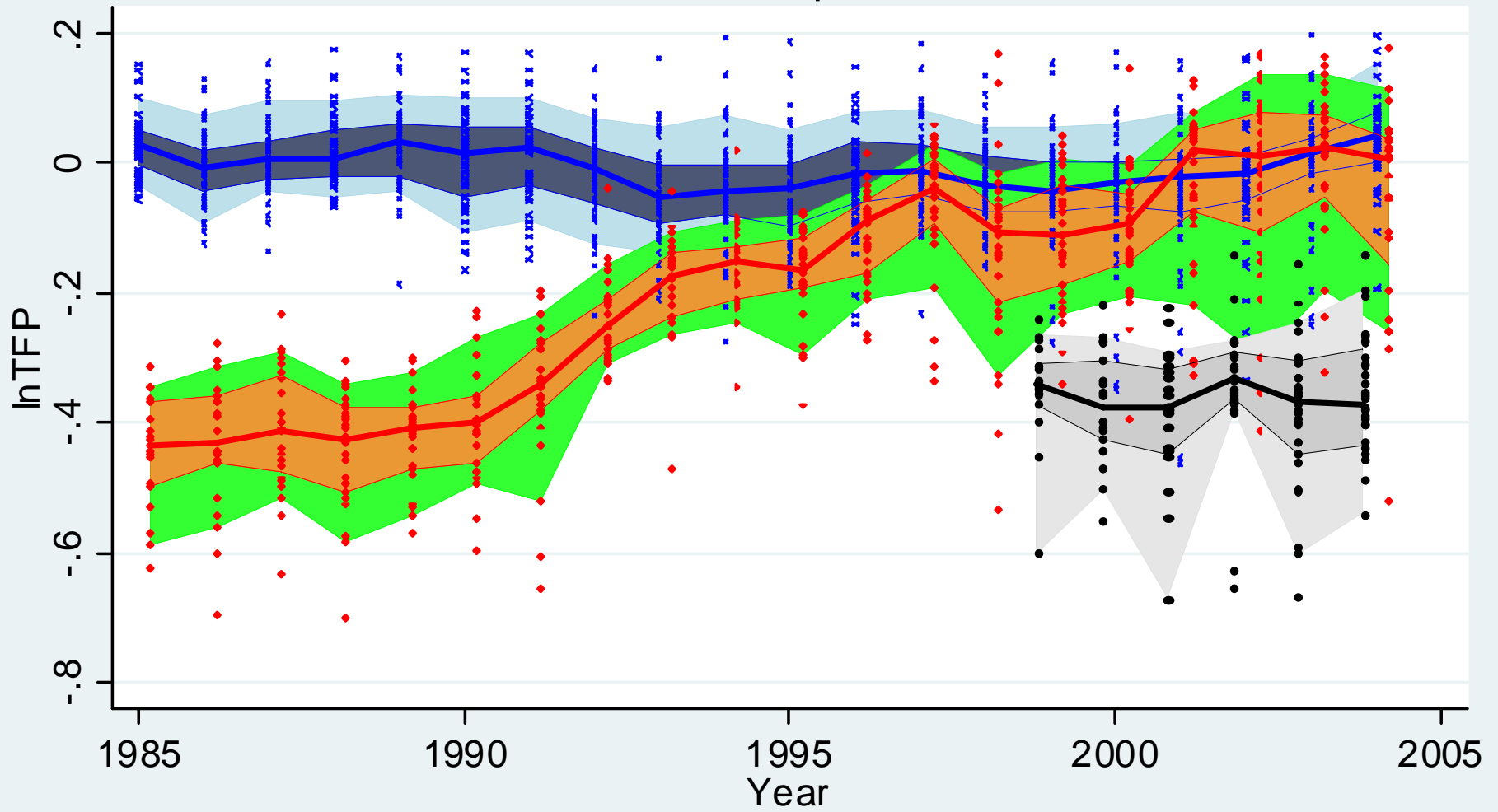


• China • Korea • Japan

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Textile mill products

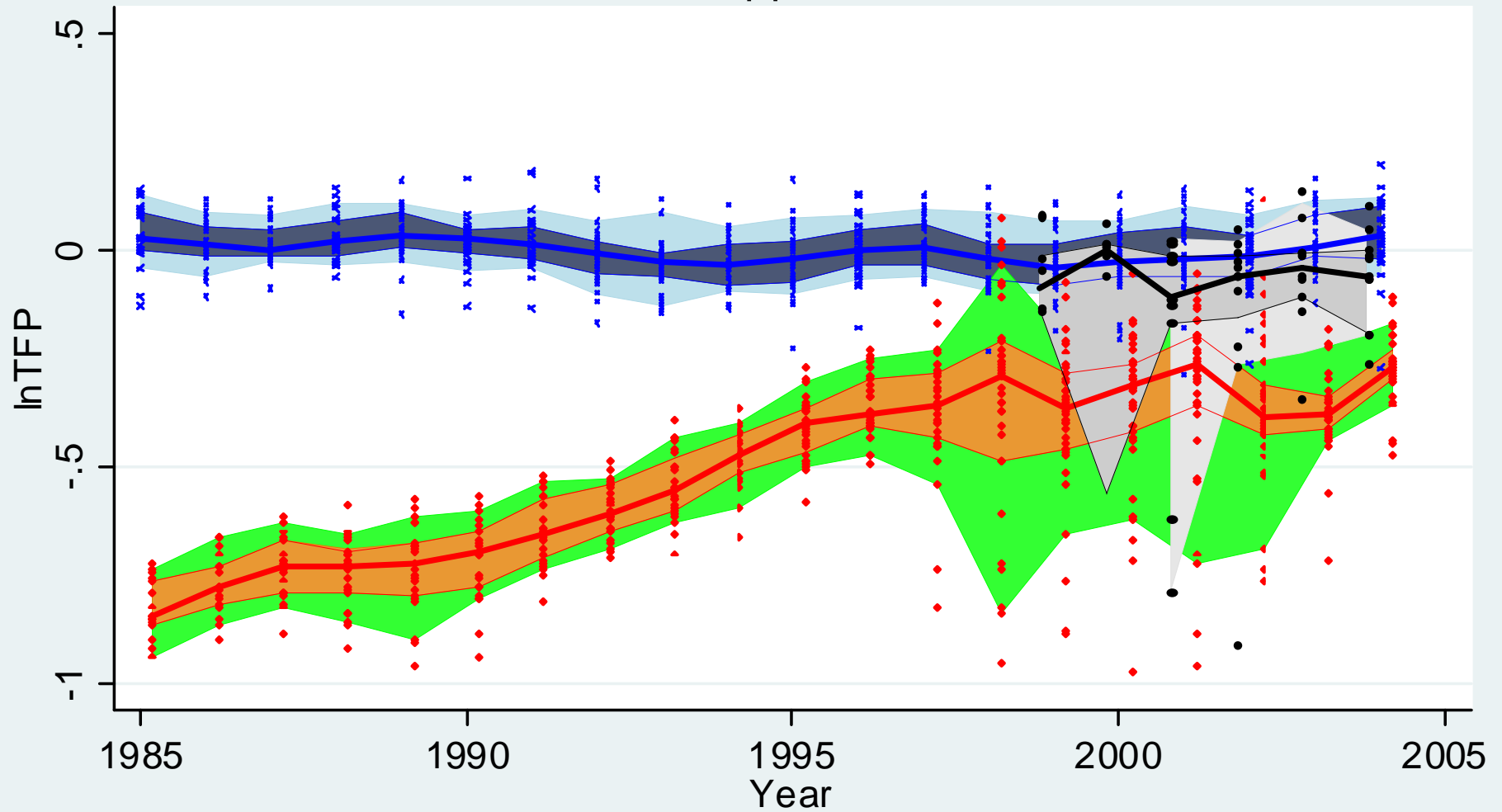


• China ♦ Korea ▣ Japan

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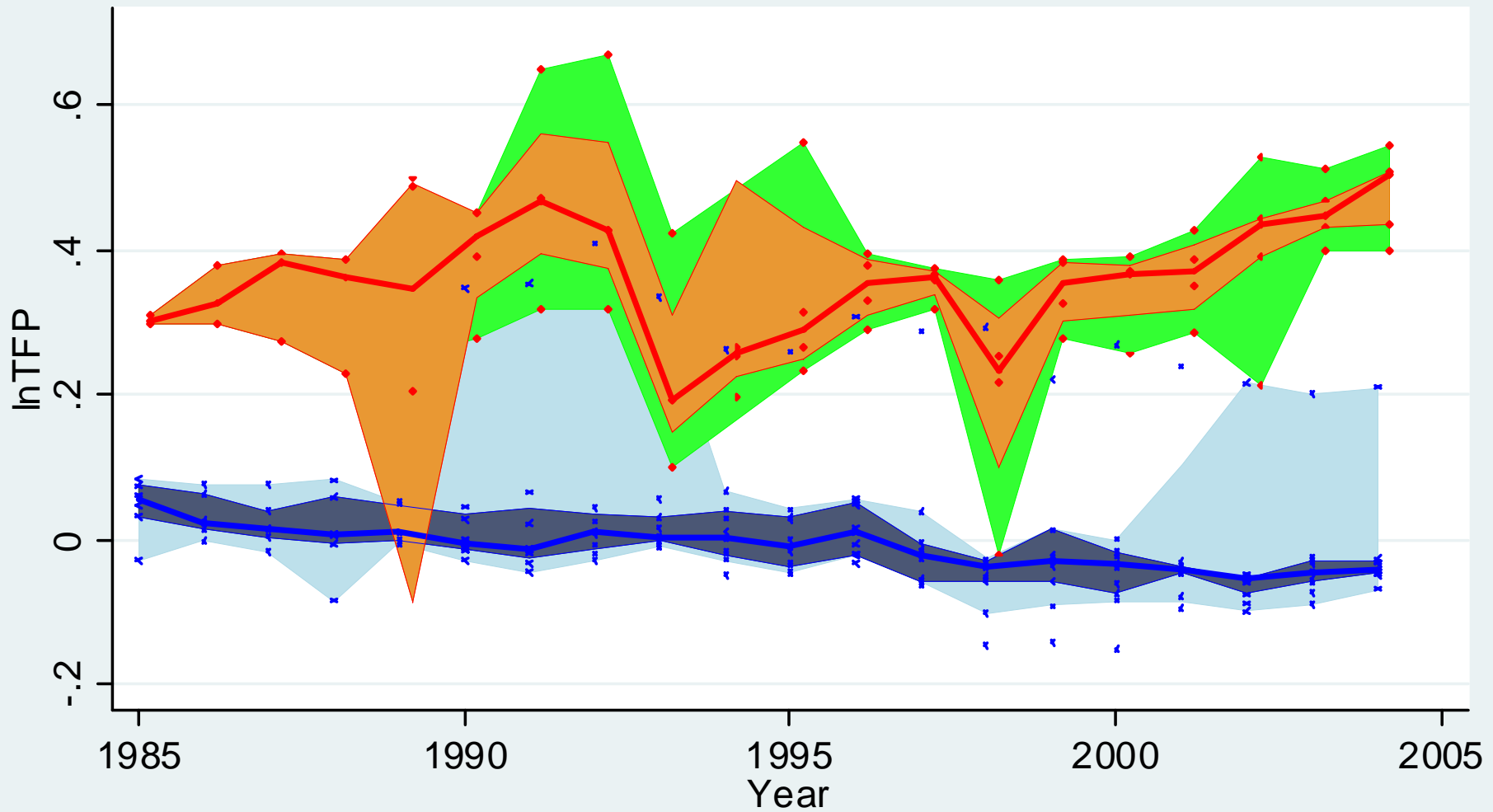
Apparel



• China ♦ Korea ▣ Japan

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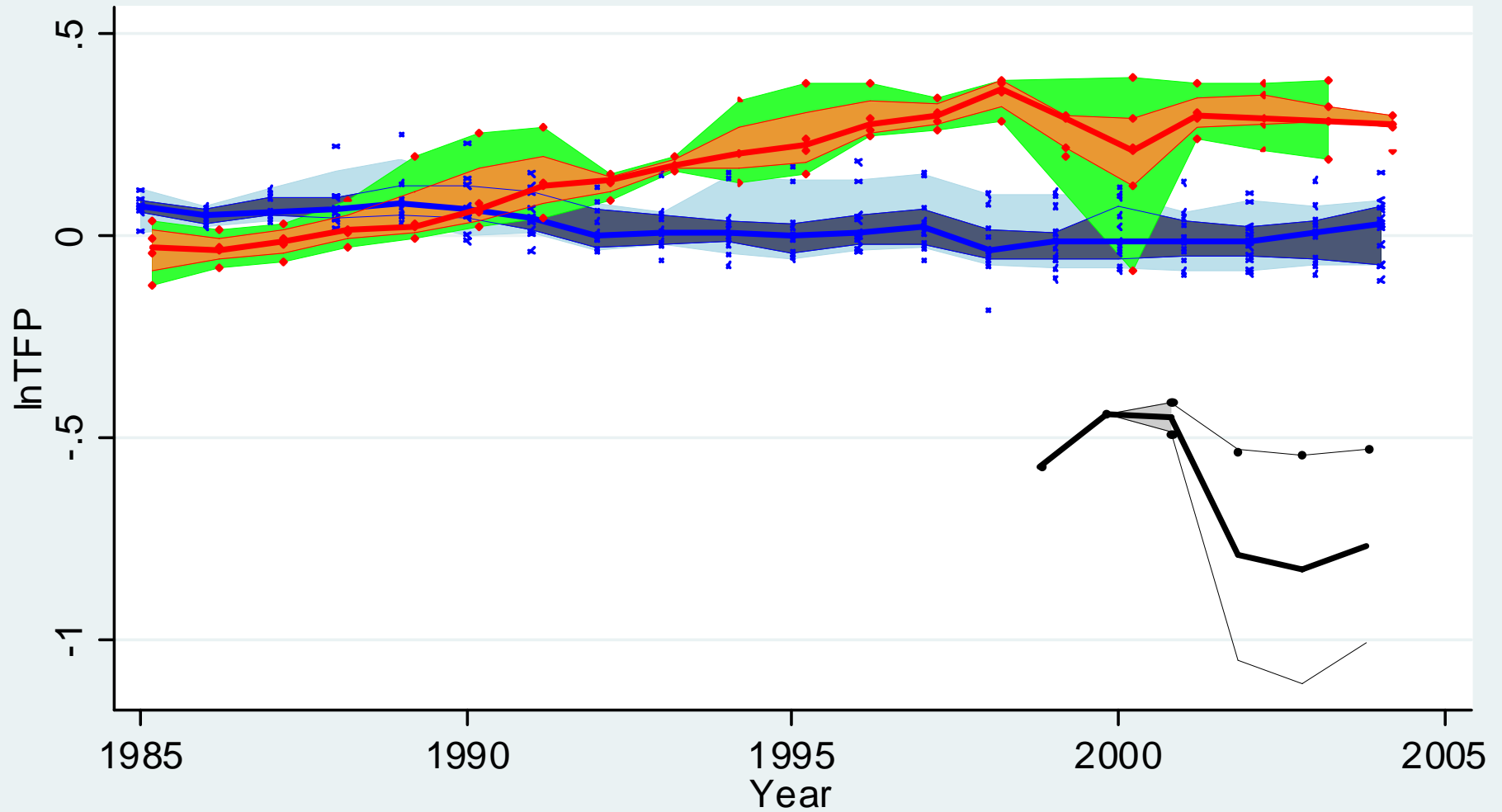
Lumber and wood



• China • Korea • Japan

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Furniture and fixtures

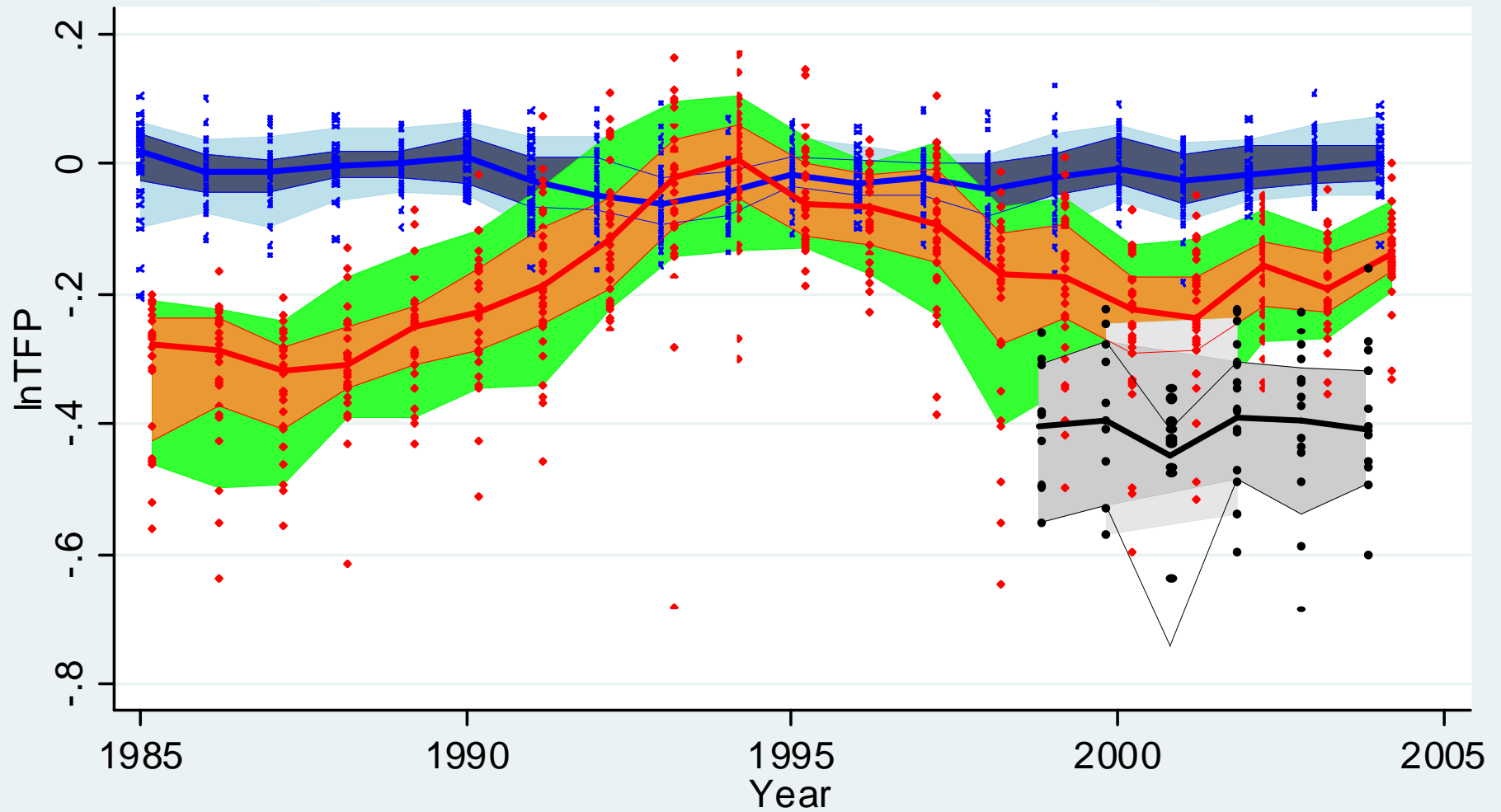


• China • Korea • Japan

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Paper and allied industries

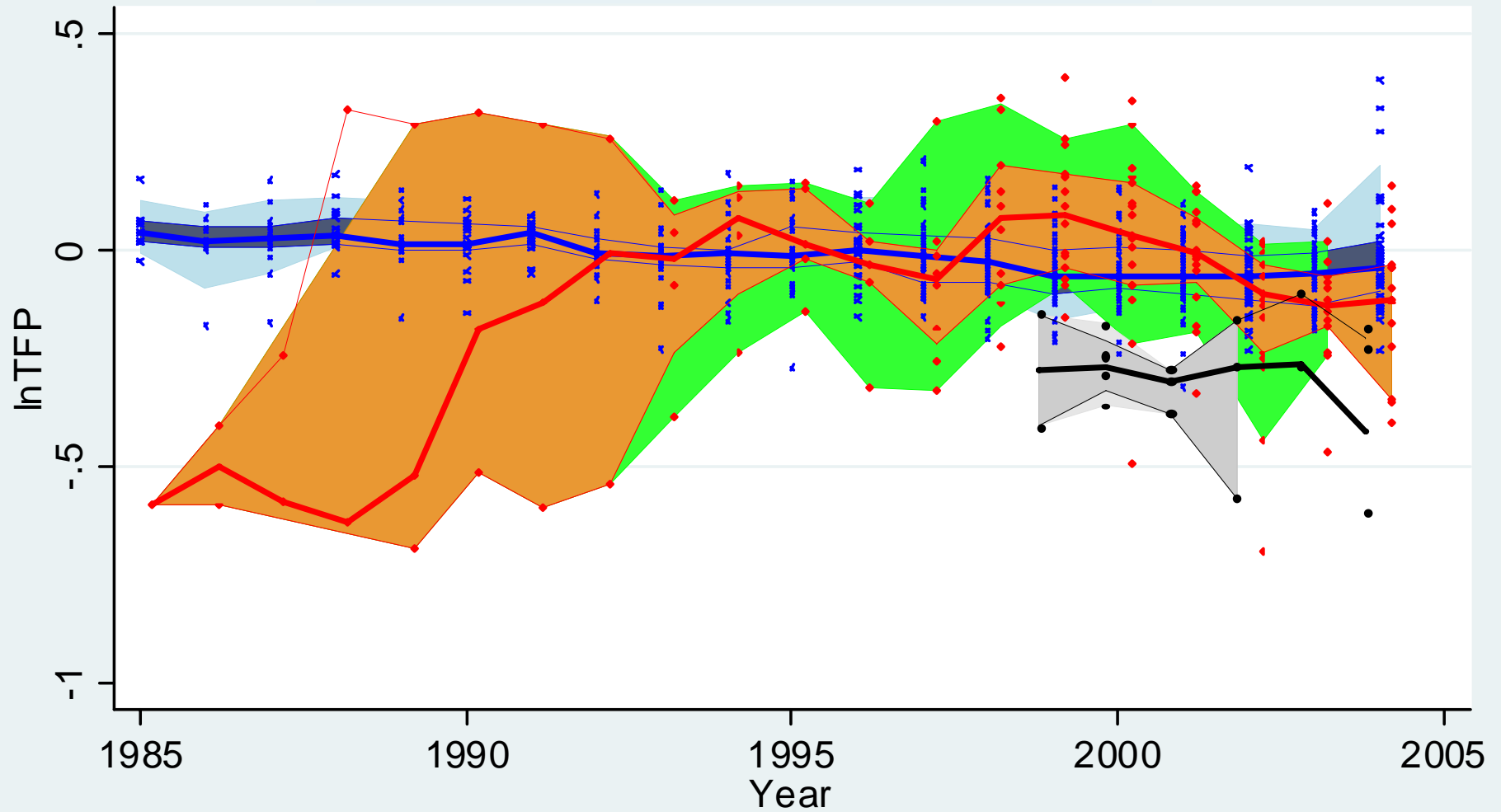


• China • Korea • Japan

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Printing, publishing and allied industries

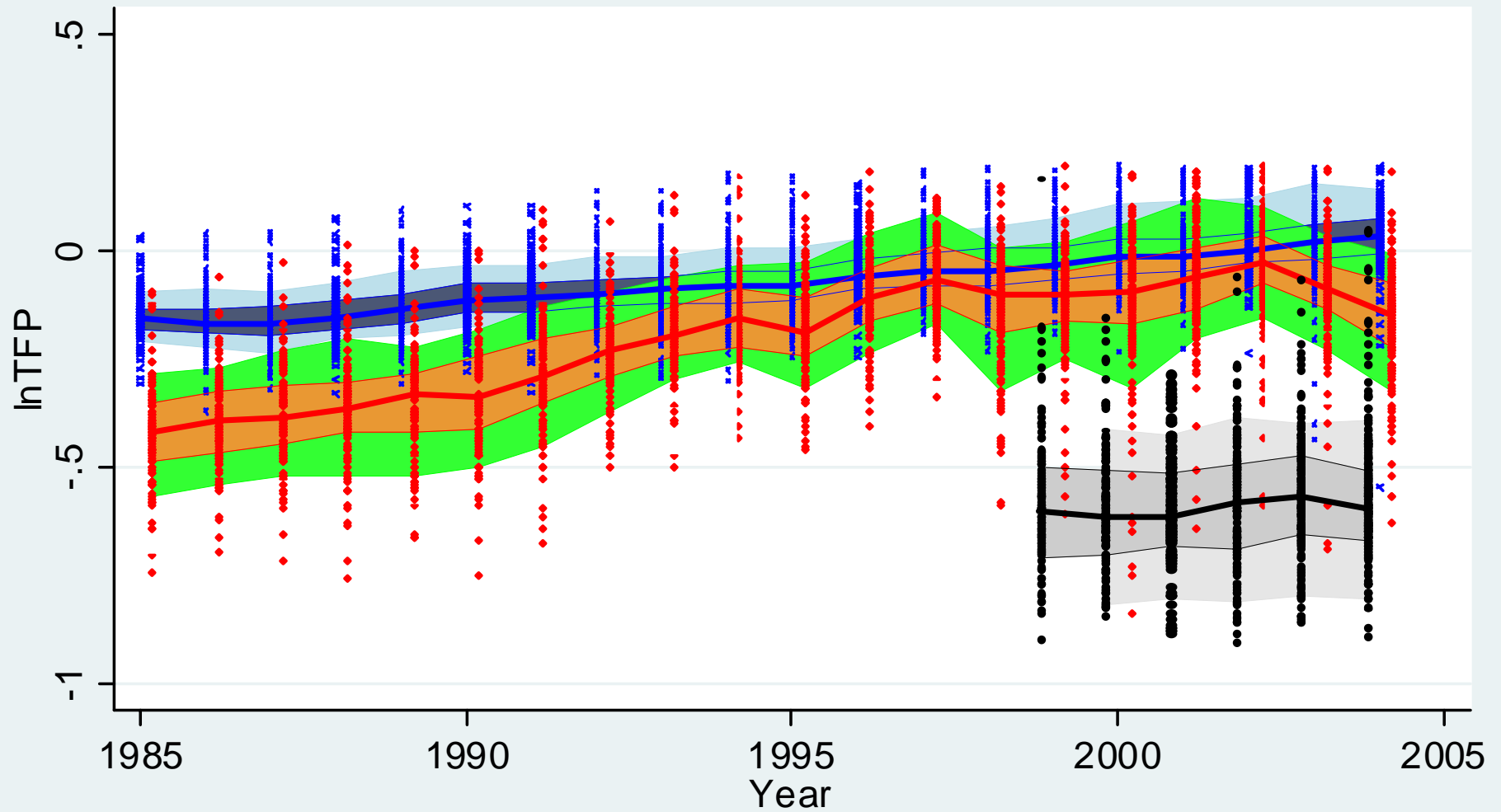


• China • Korea • Japan

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Chemicals

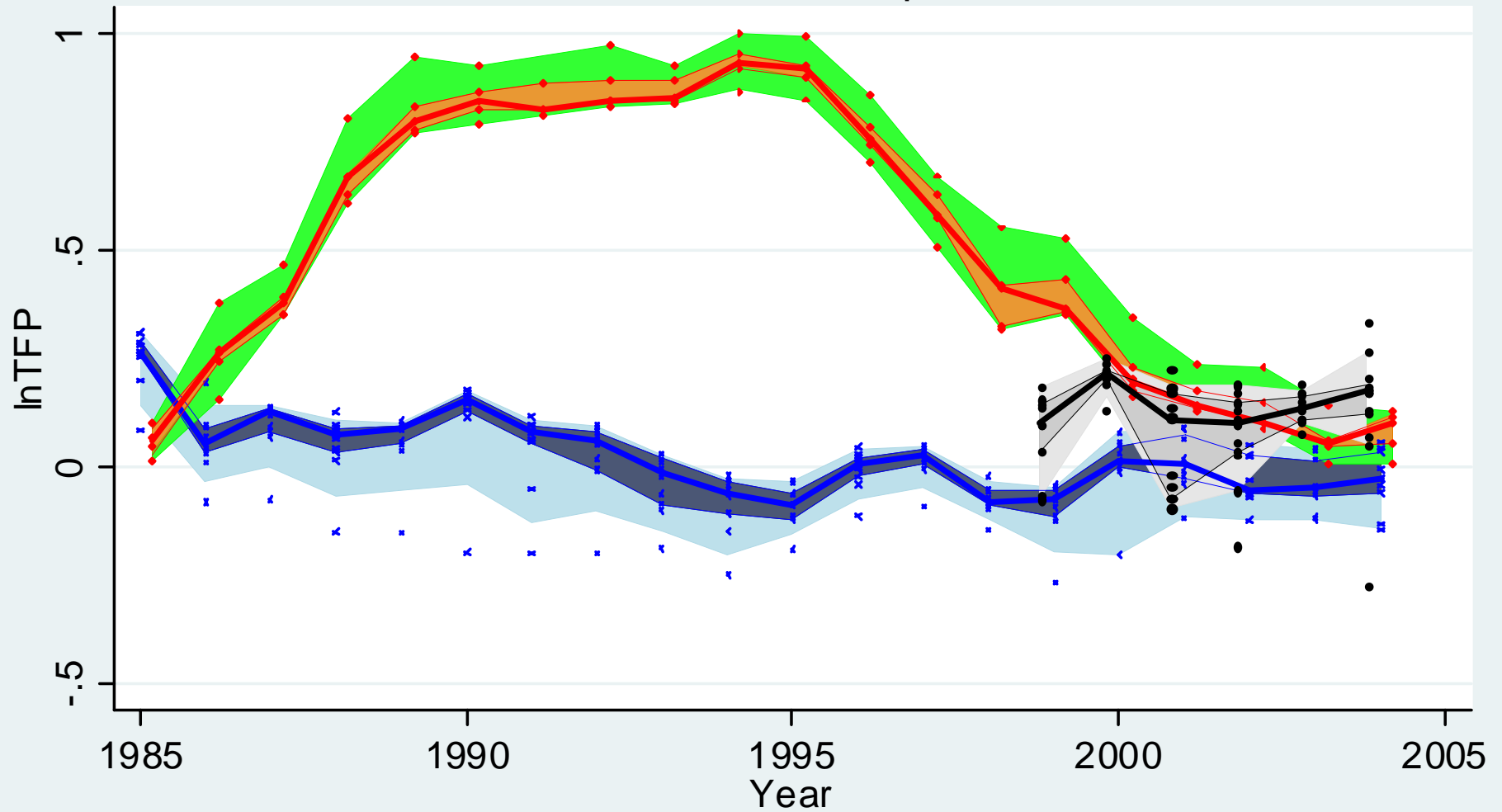


• China • Korea • Japan

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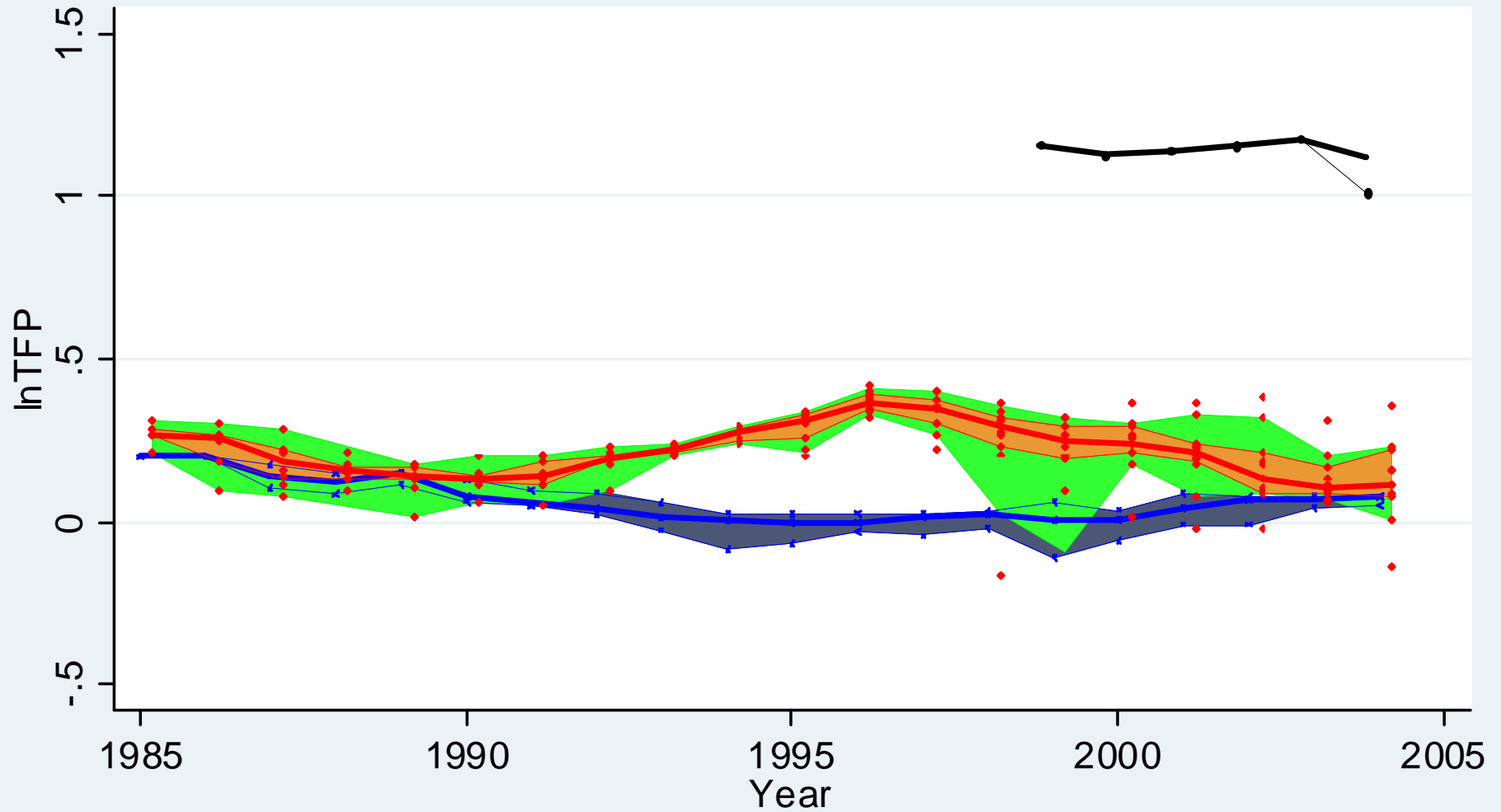
Petroleum and coal products



• China • Korea • Japan

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Leather

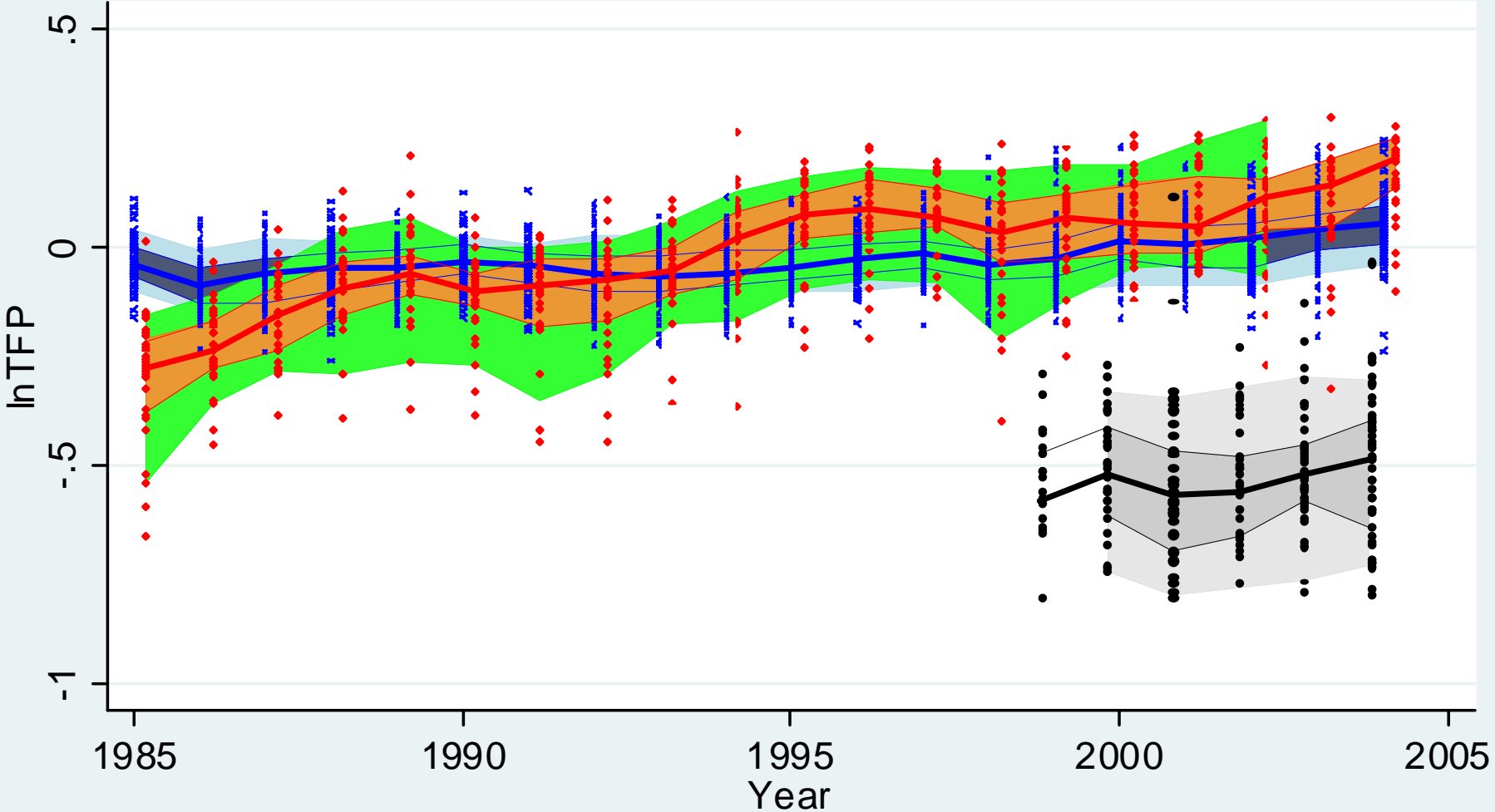


• China • Korea • Japan

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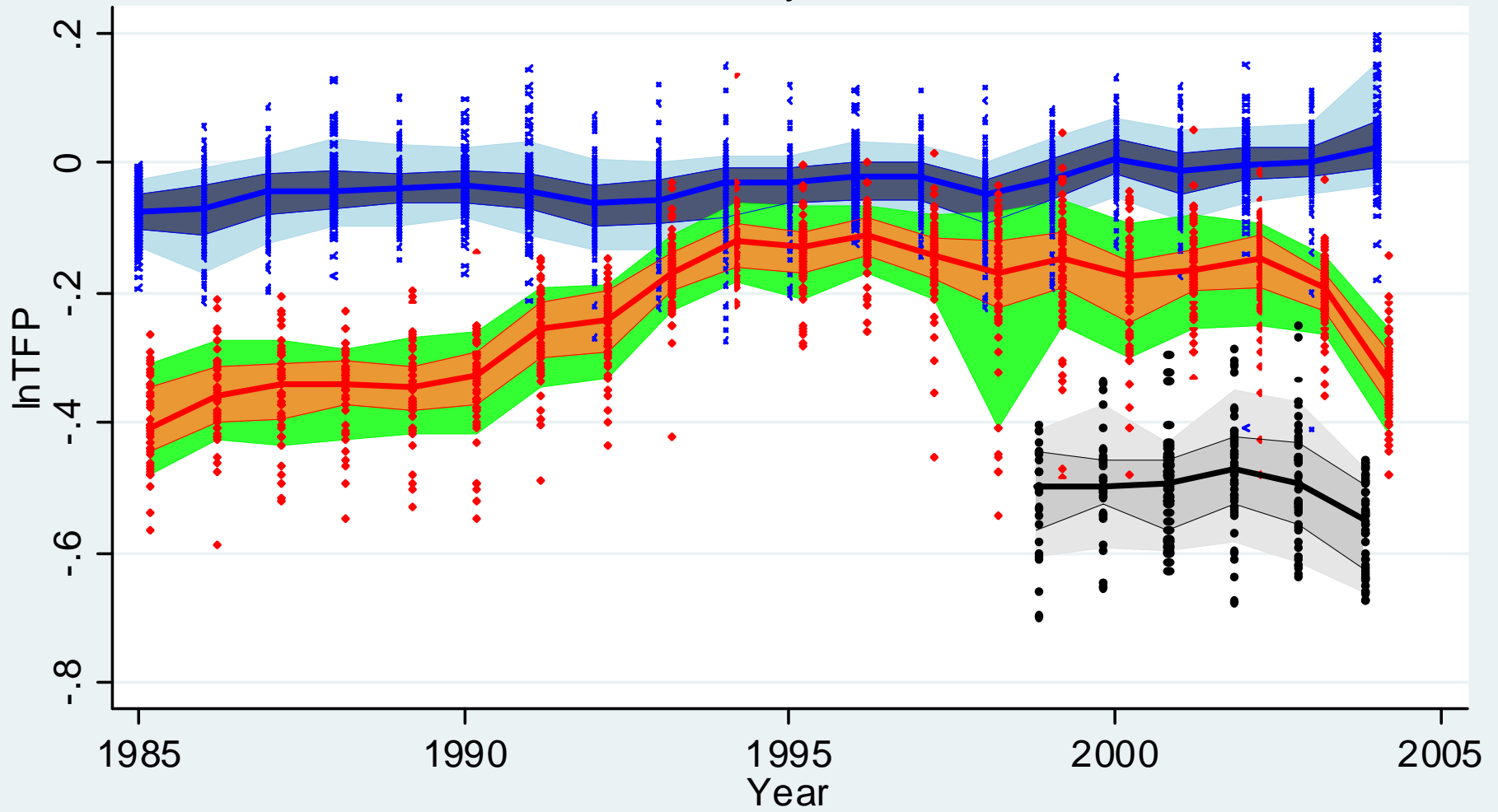
Stone, clay, glass



• China • Korea • Japan

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Primary metal

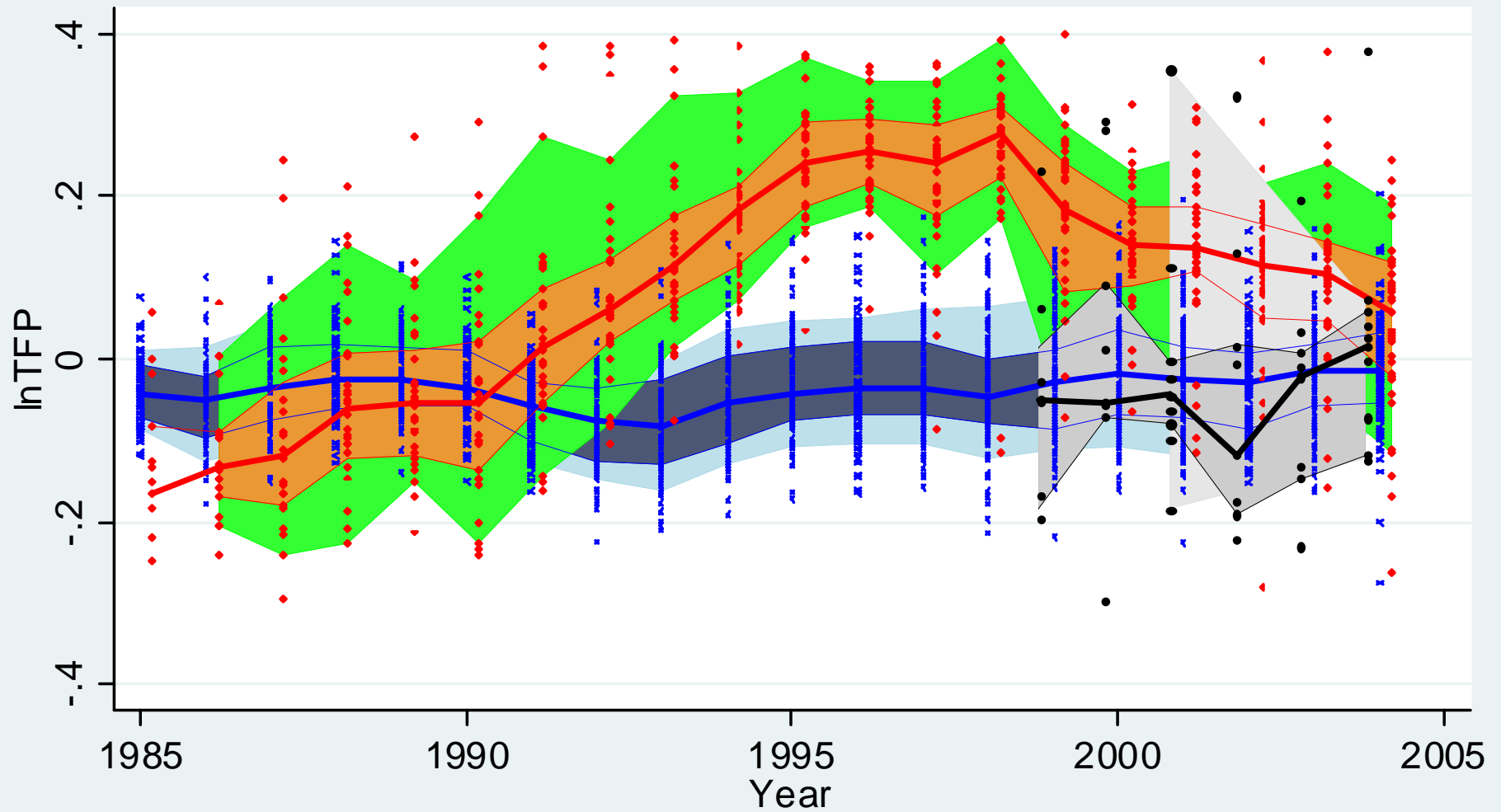


• China • Korea • Japan

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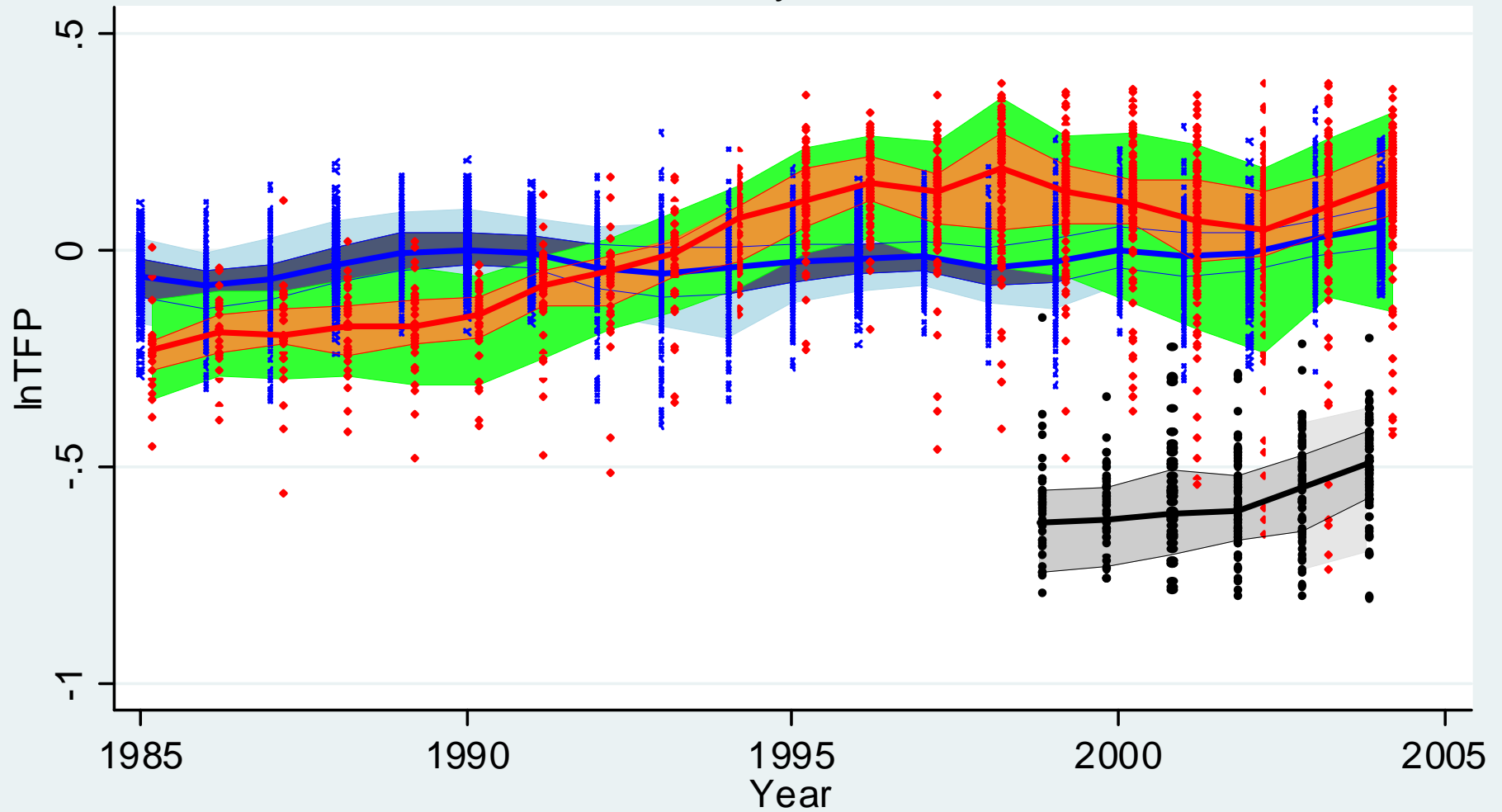
Fabricated metal



• China • Korea • Japan

Note: The shaded areas show the 10-90 and 25-75 percentile bands.
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Machinery (non-electrical)

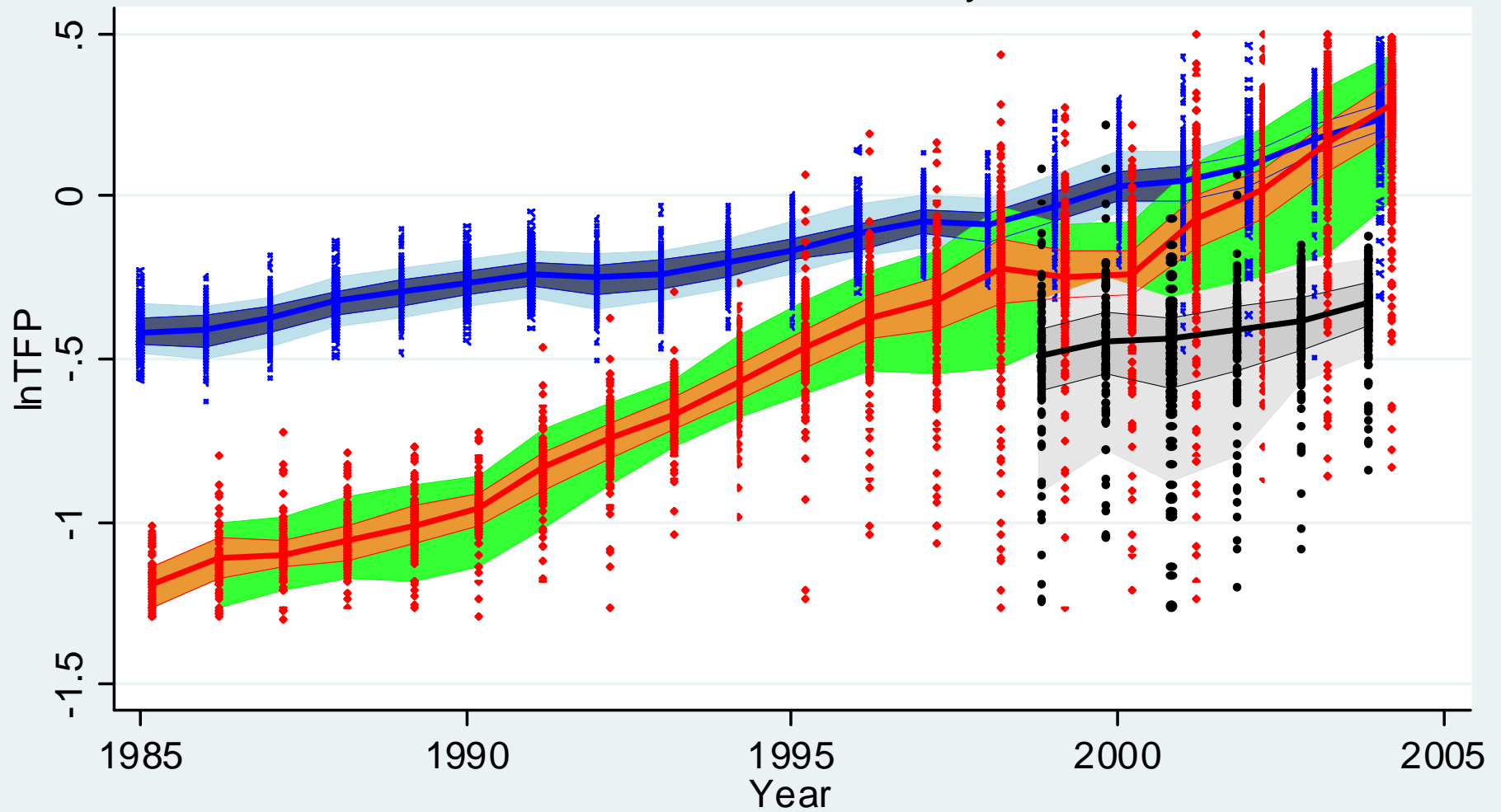


• China • Korea • Japan

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Electrical machinery

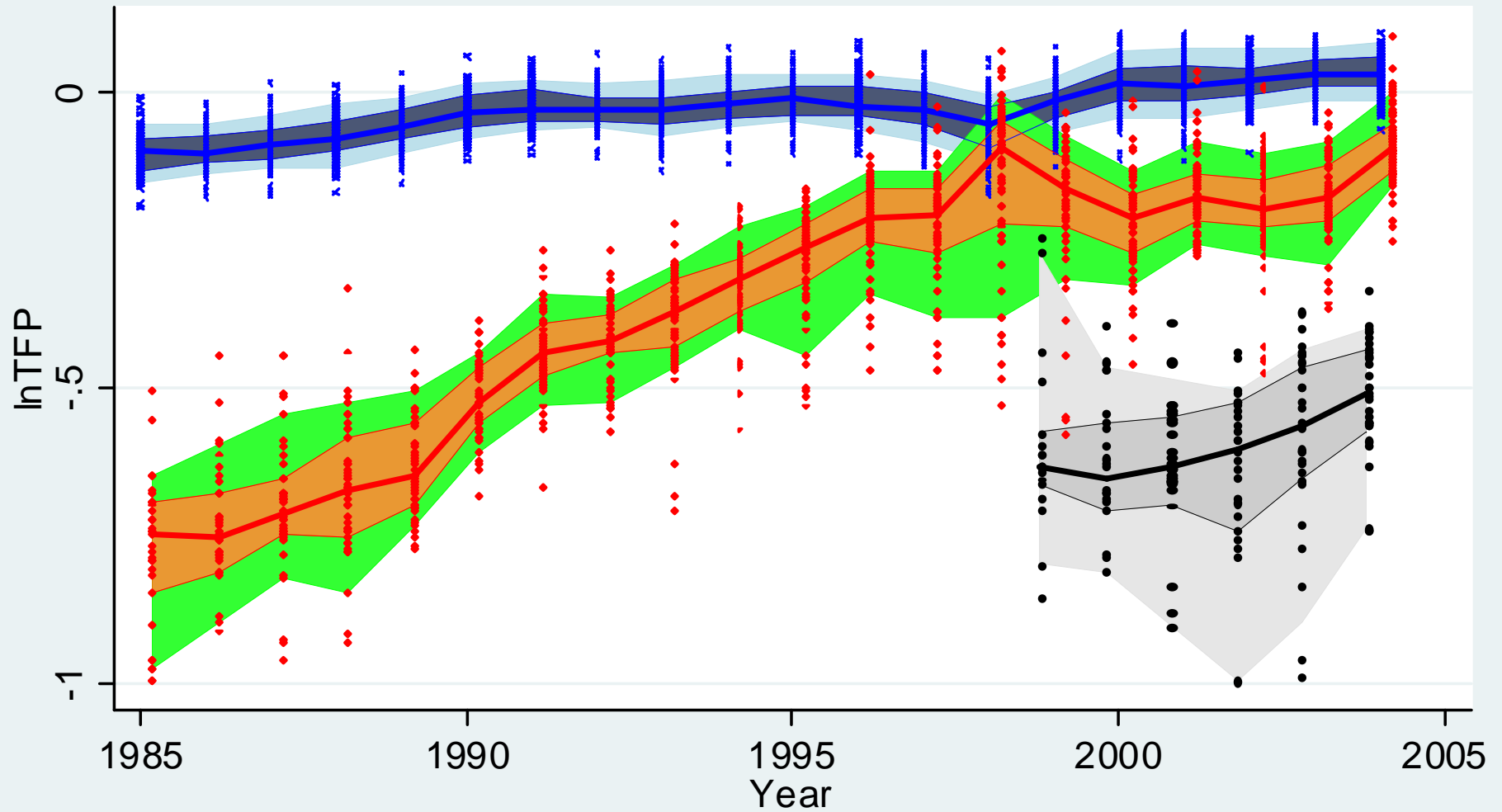


• China • Korea • Japan

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Motor vehicles

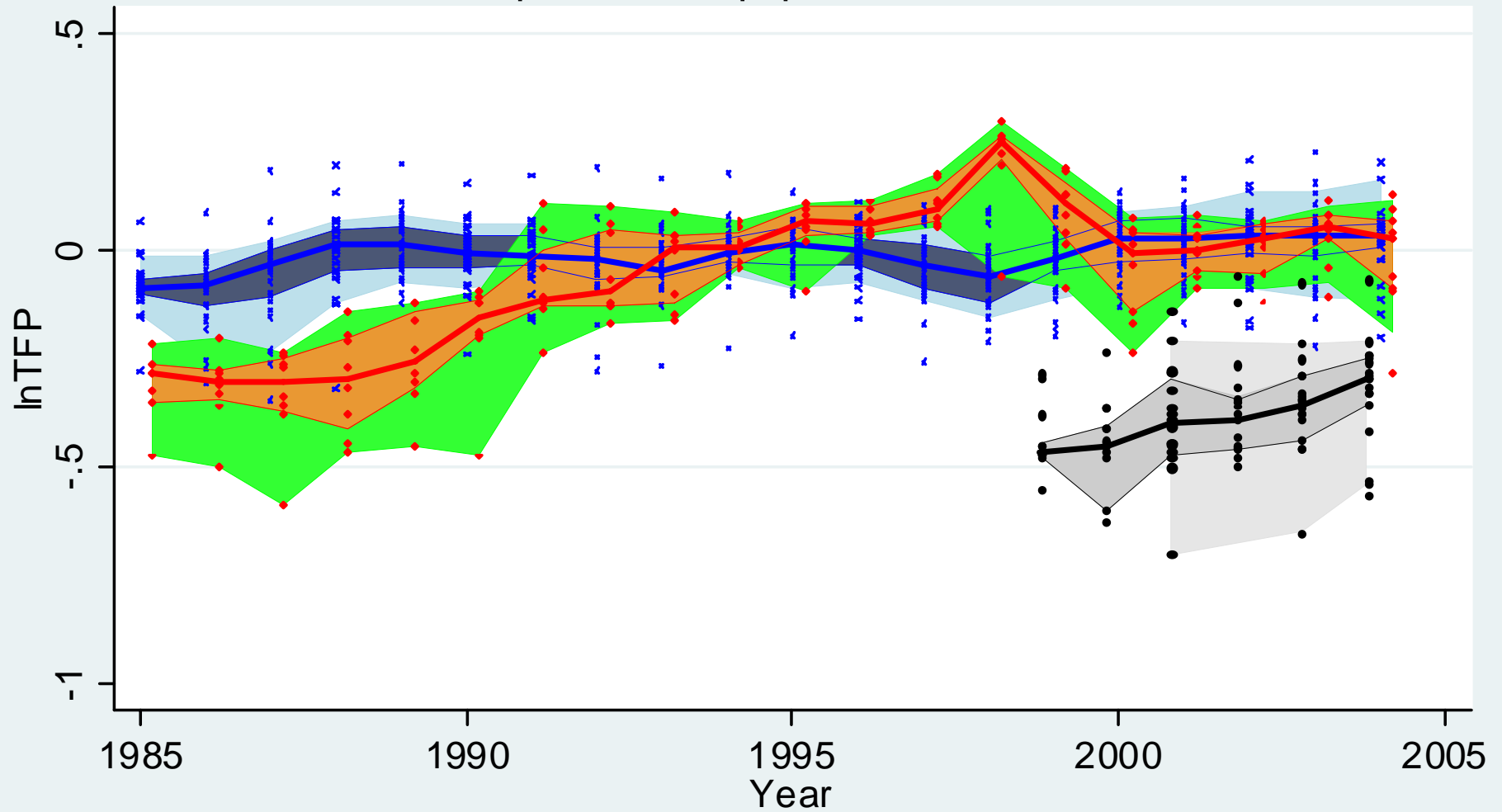


• China • Korea • Japan

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Transportation equipment and ordnance

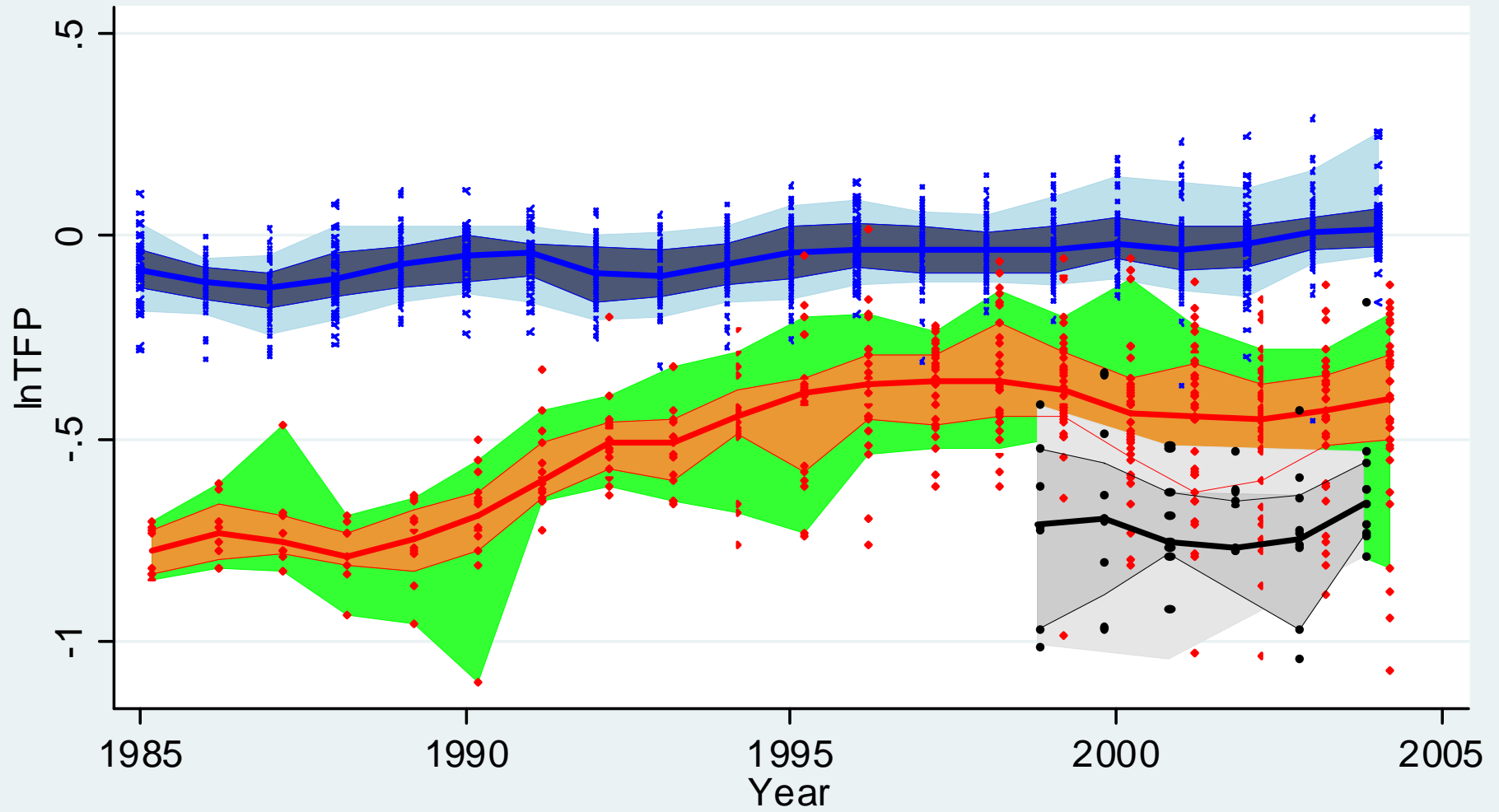


• China ♦ Korea ✕ Japan

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Instruments

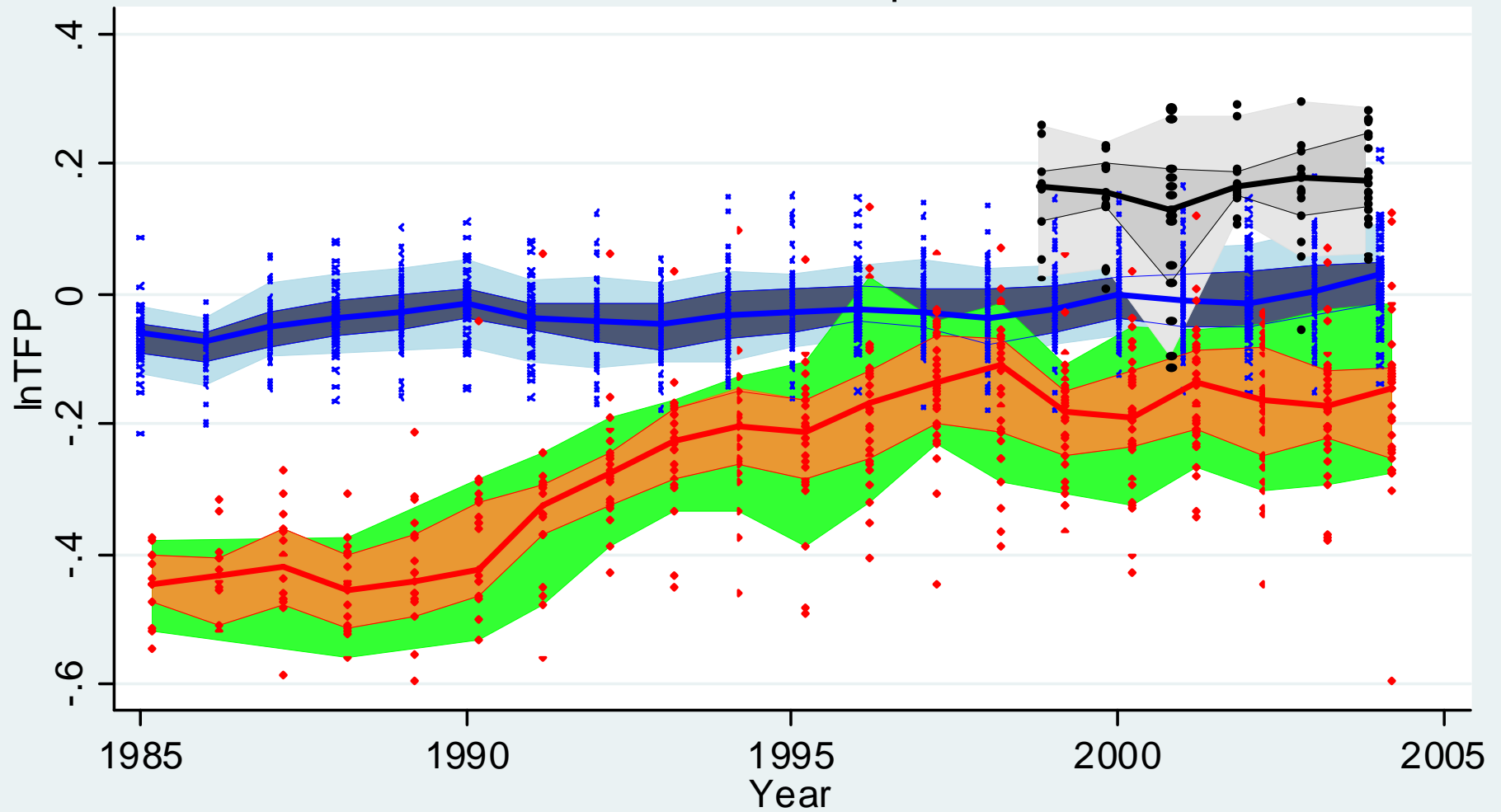


• China • Korea • Japan

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Rubber and miscellaneous plastics

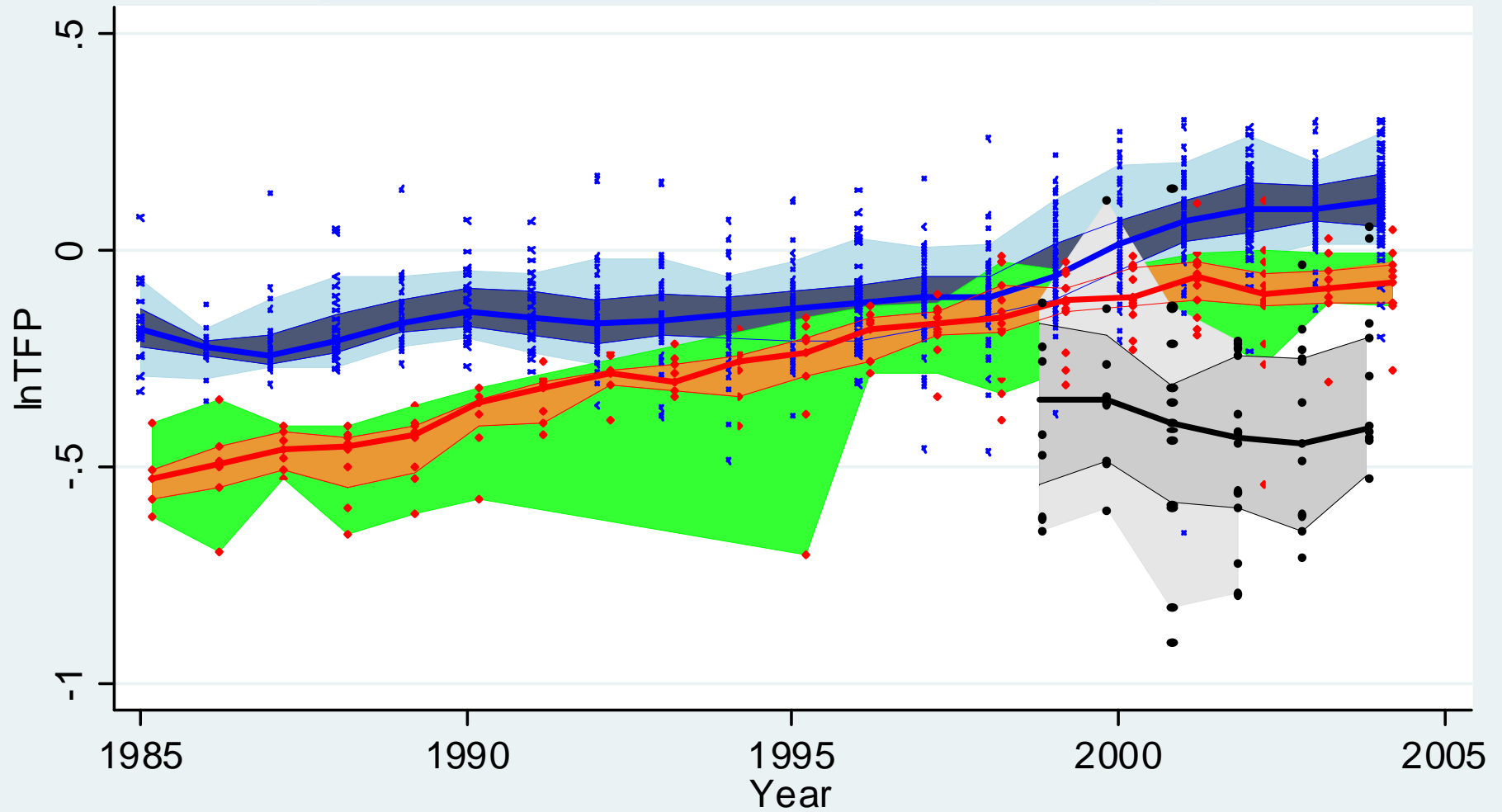


• China ♦ Korea ✱ Japan

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Miscellaneous manufacturing

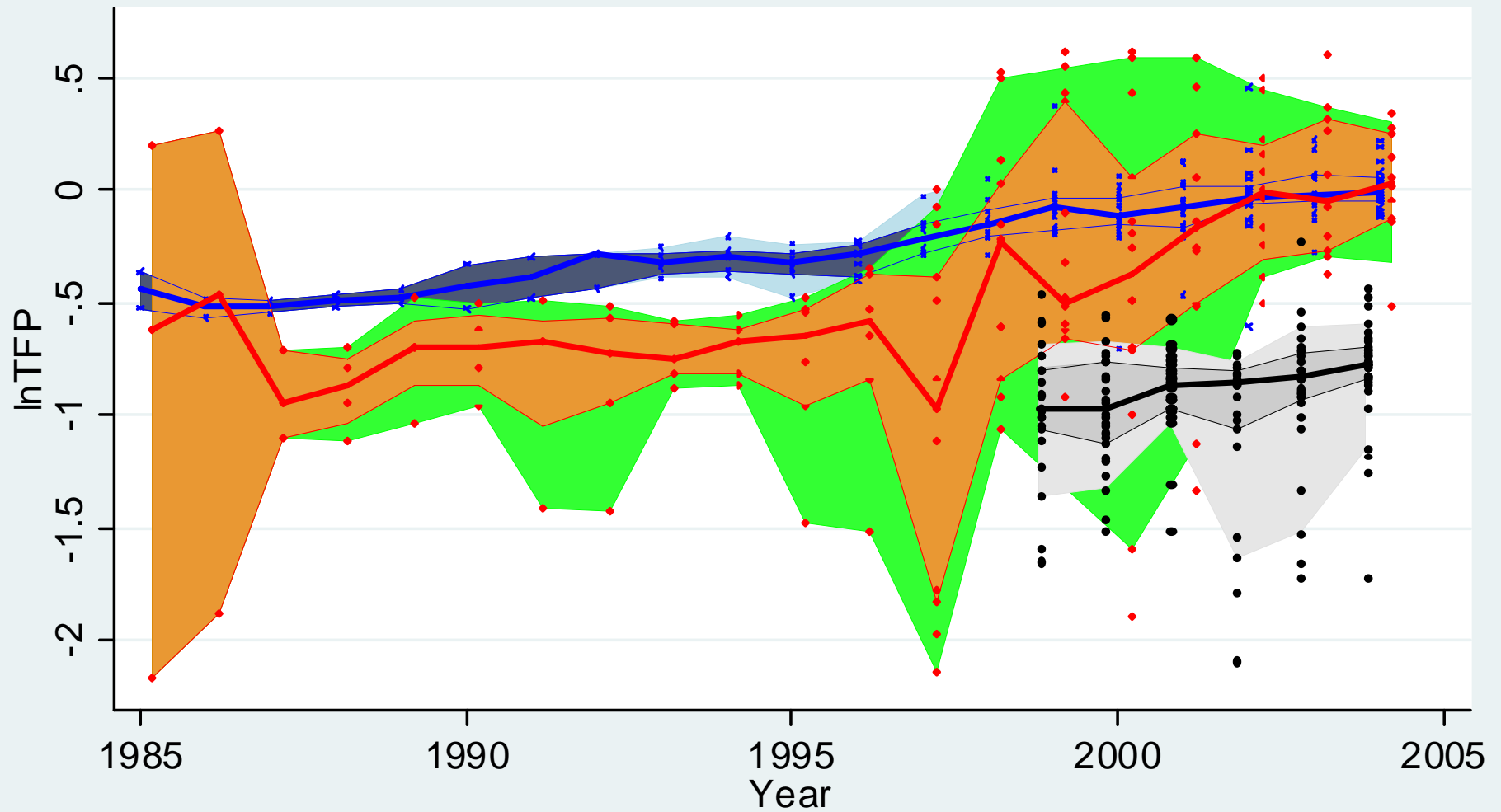


• China ♦ Korea * Japan

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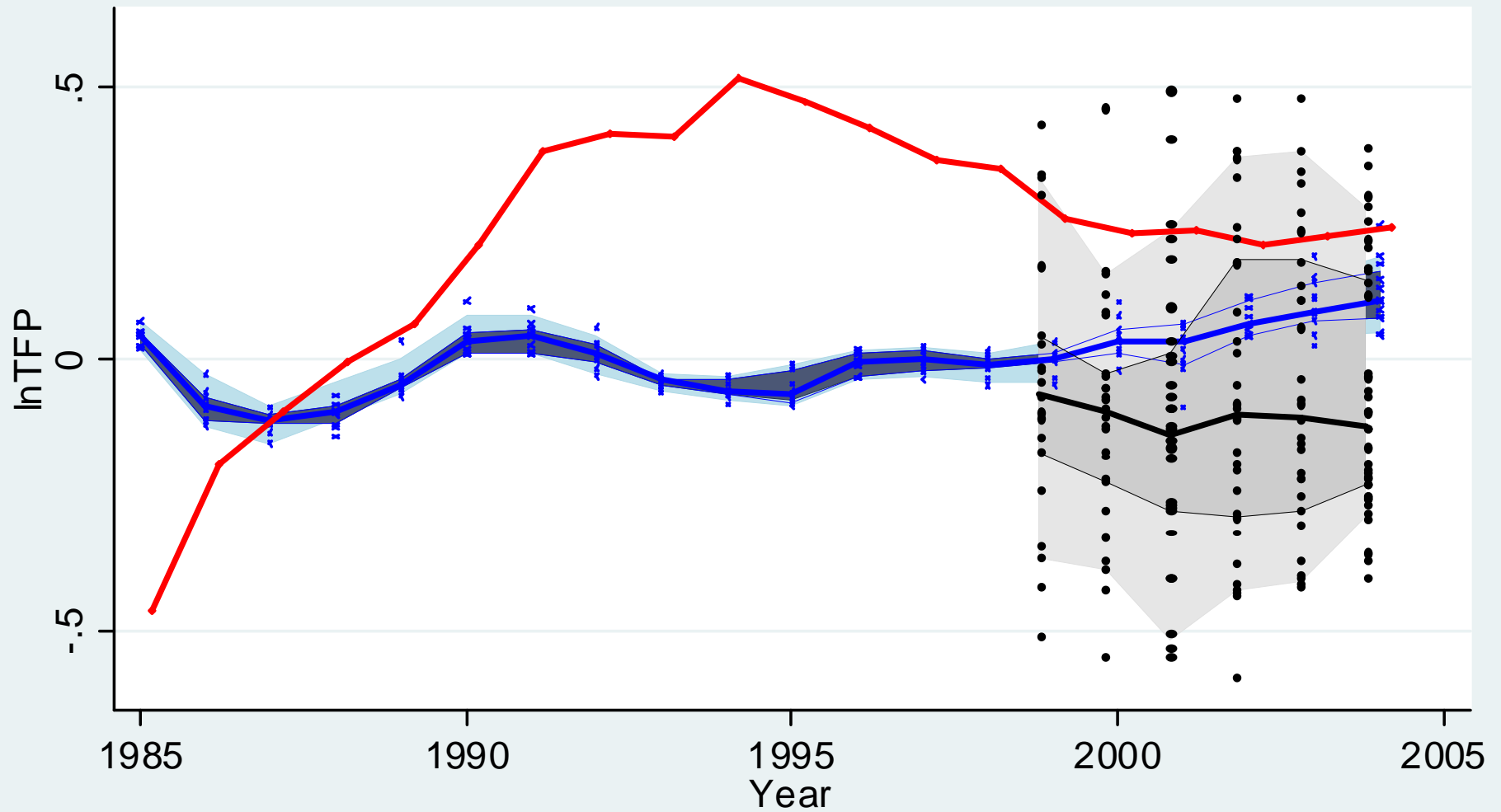
Communication



• China • Korea • Japan

Note: The shaded areas show the 10-90 and 25-75 percentile bands.
The thicker lines represent the median values.

Electrical utilities

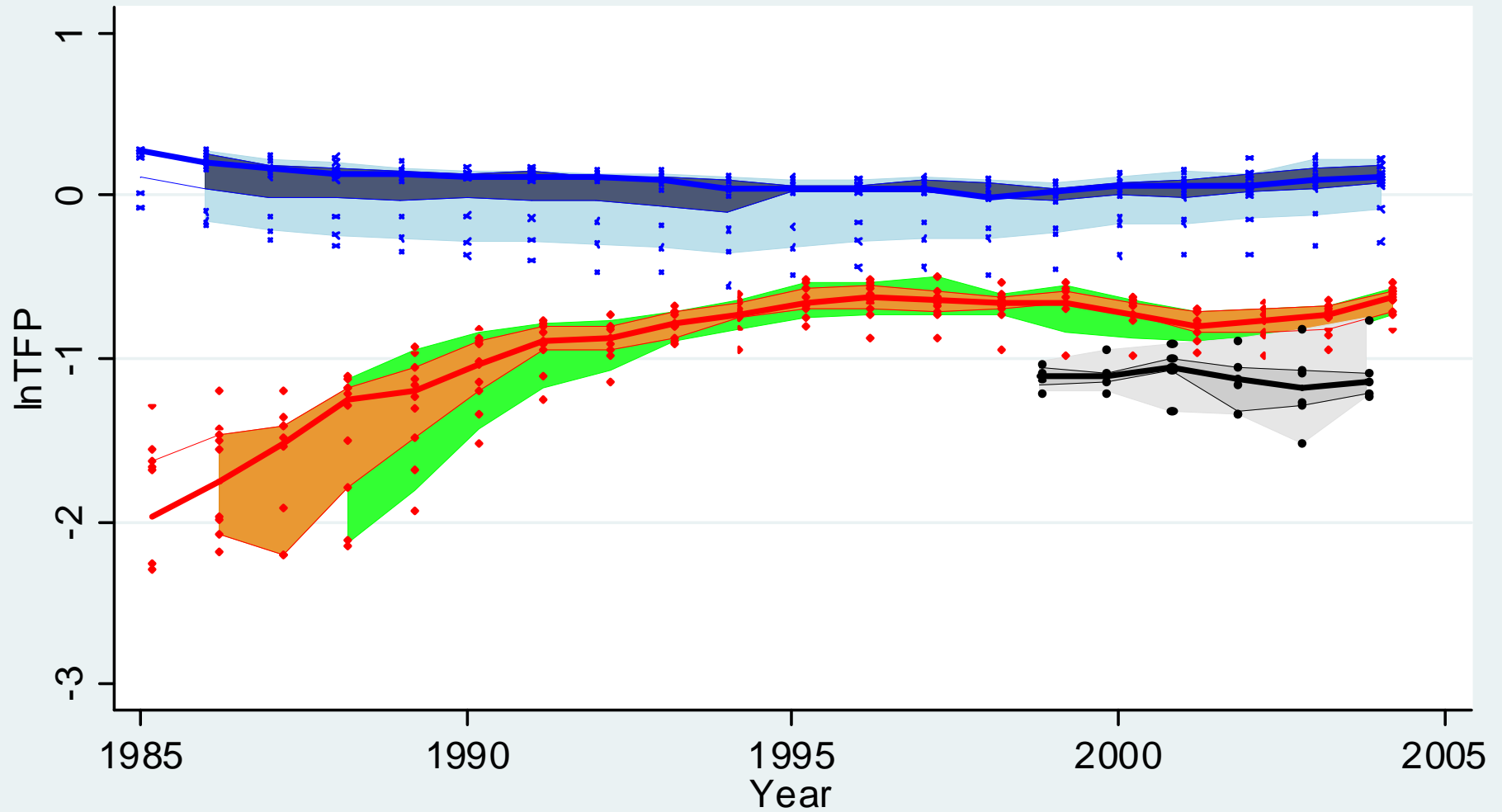


• China • Korea • Japan

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Gas utilities

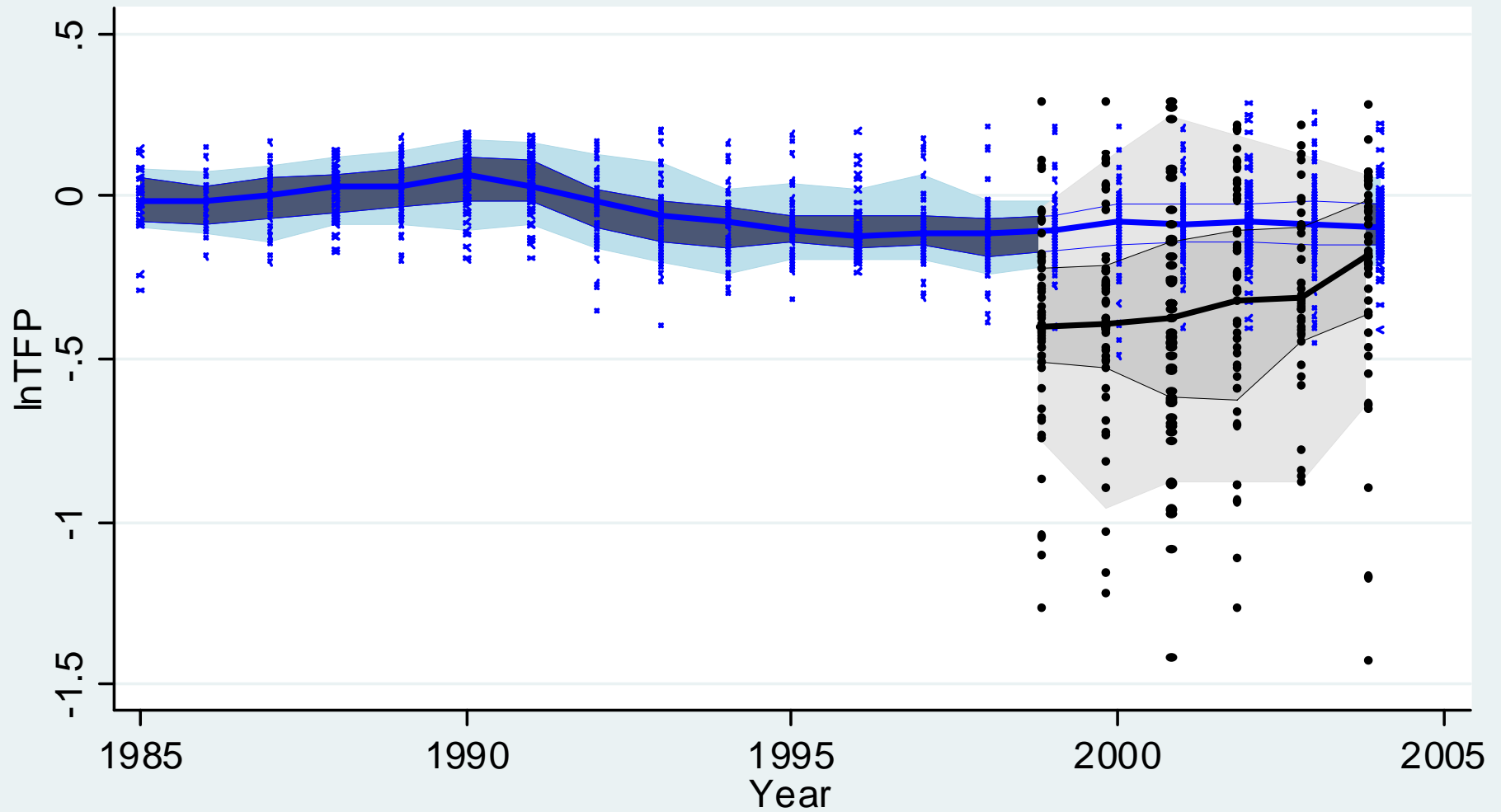


• China • Korea • Japan

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Finance, insurance and real estate

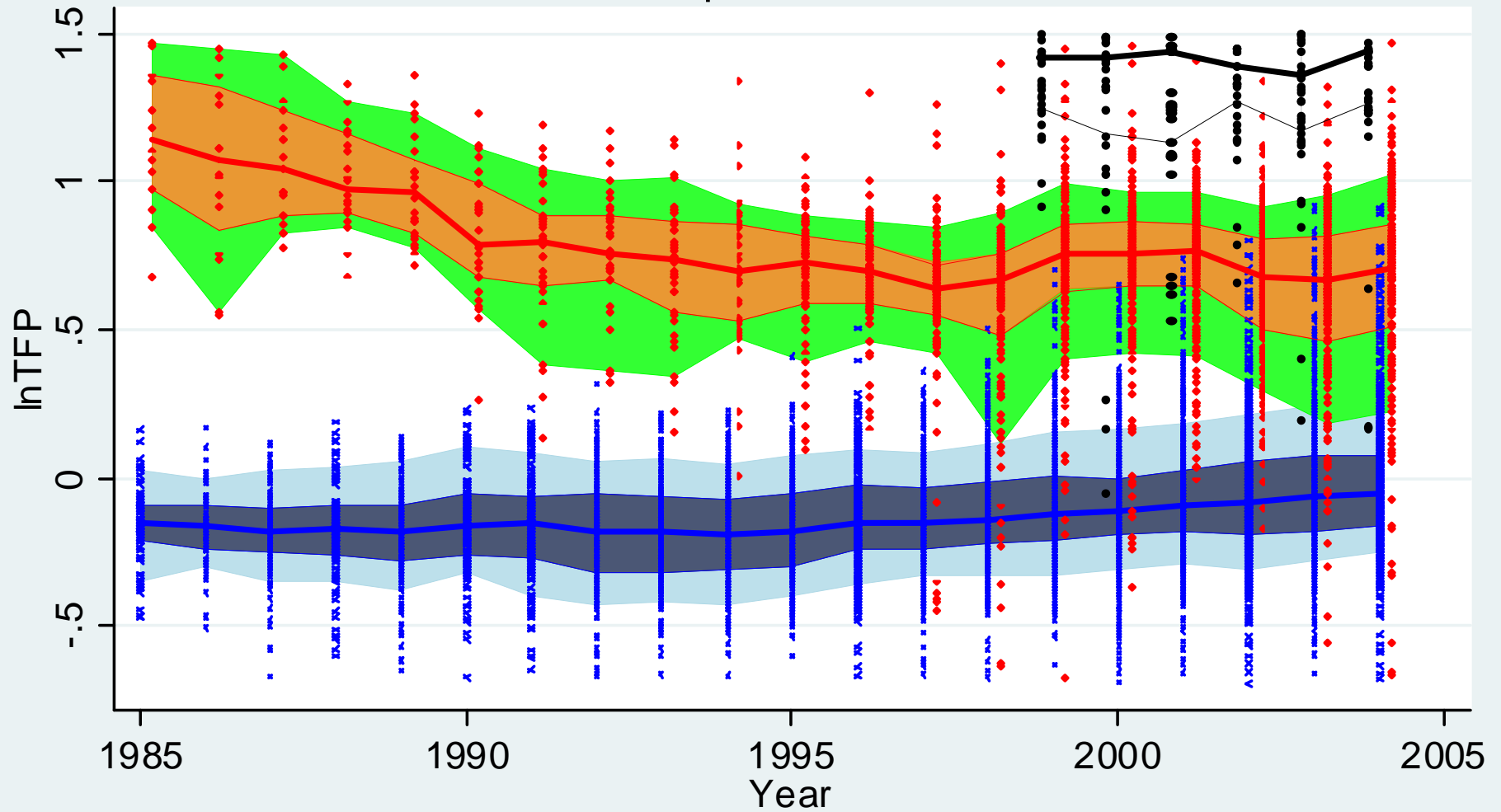


• China • Korea • Japan

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The thicker lines represent the median values.

Other private services

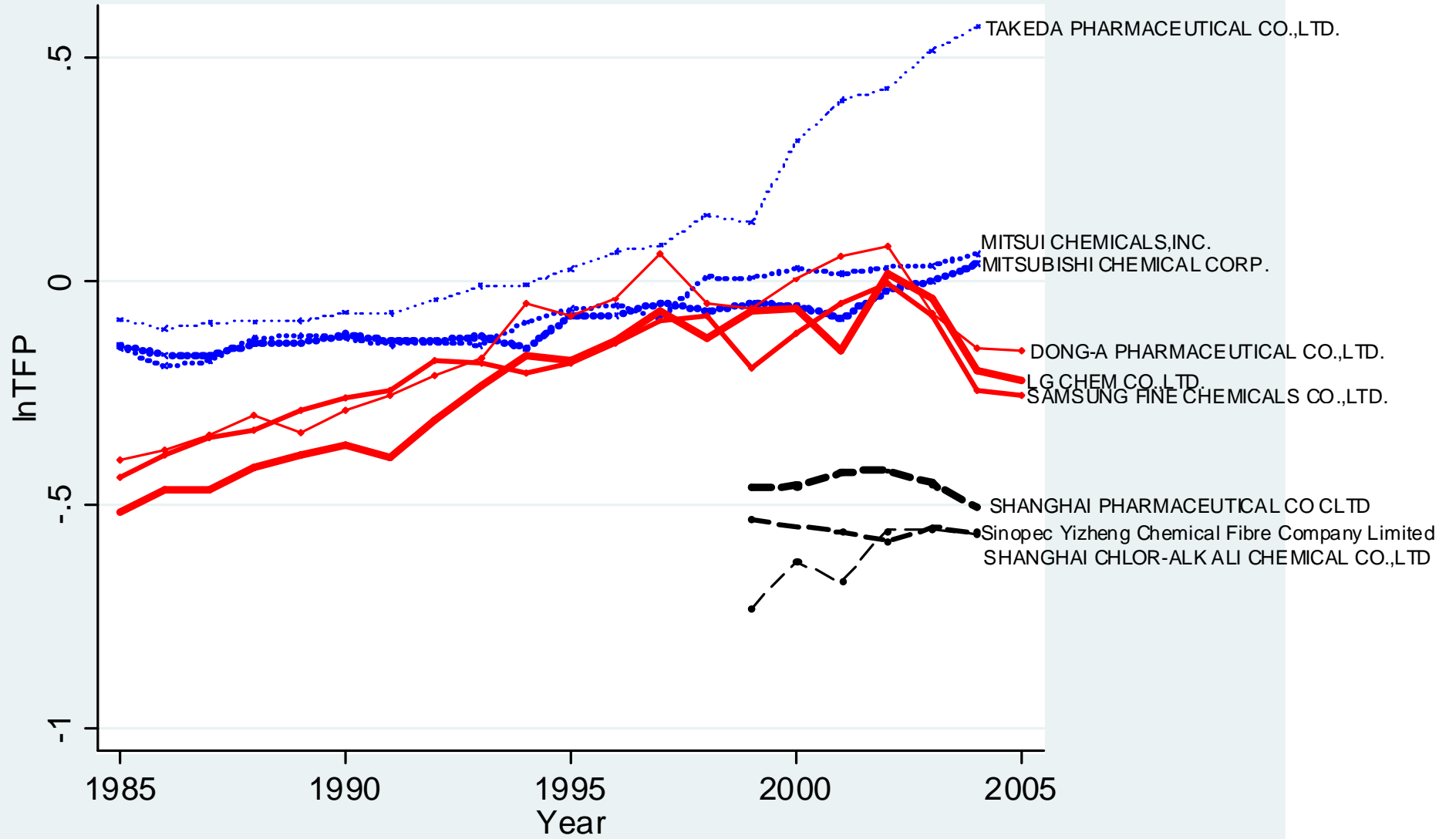


• China • Korea • Japan

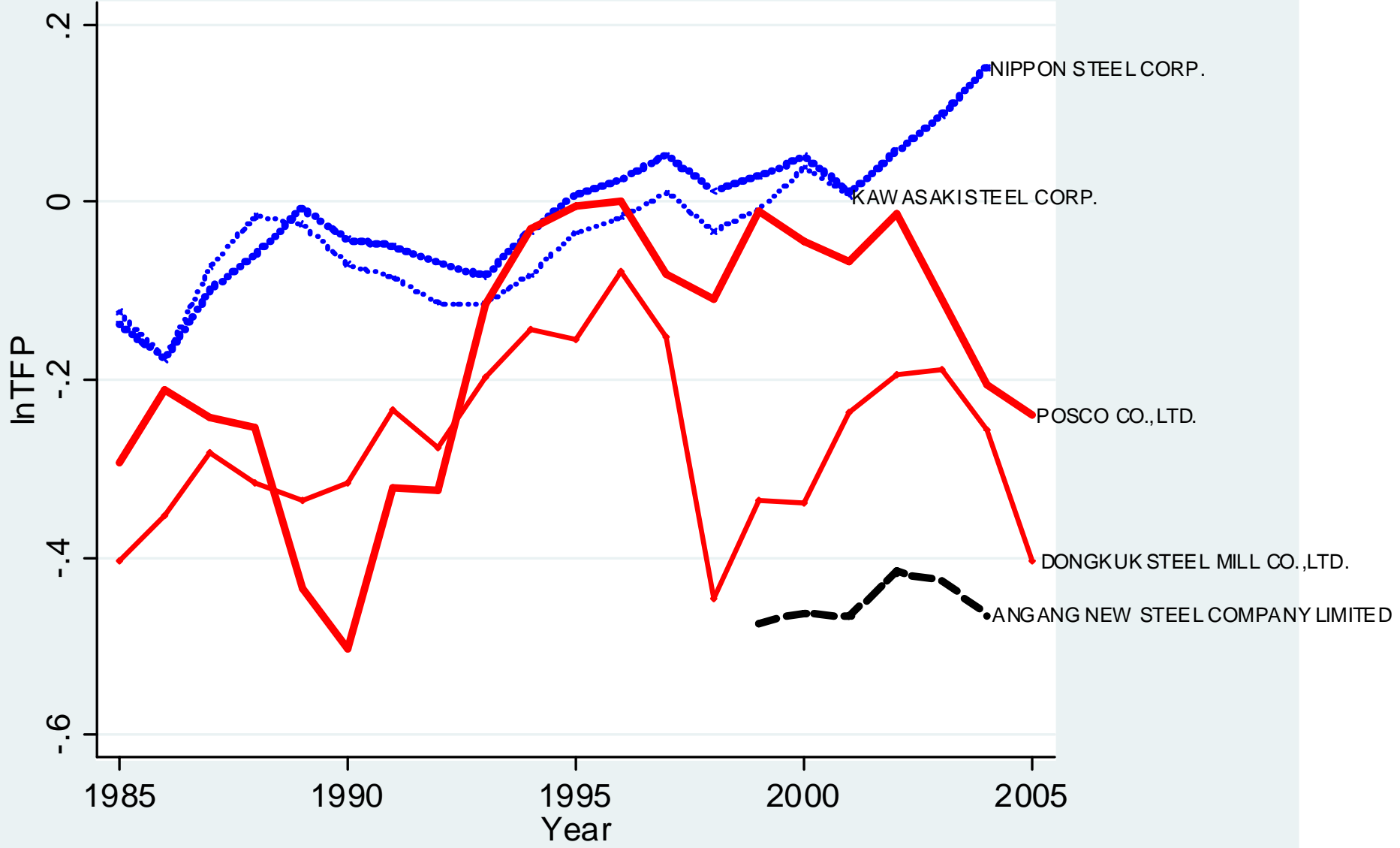
Note: The shaded areas show the 10-90 and 25-75 percentile bands.

The thicker lines represent the median values.

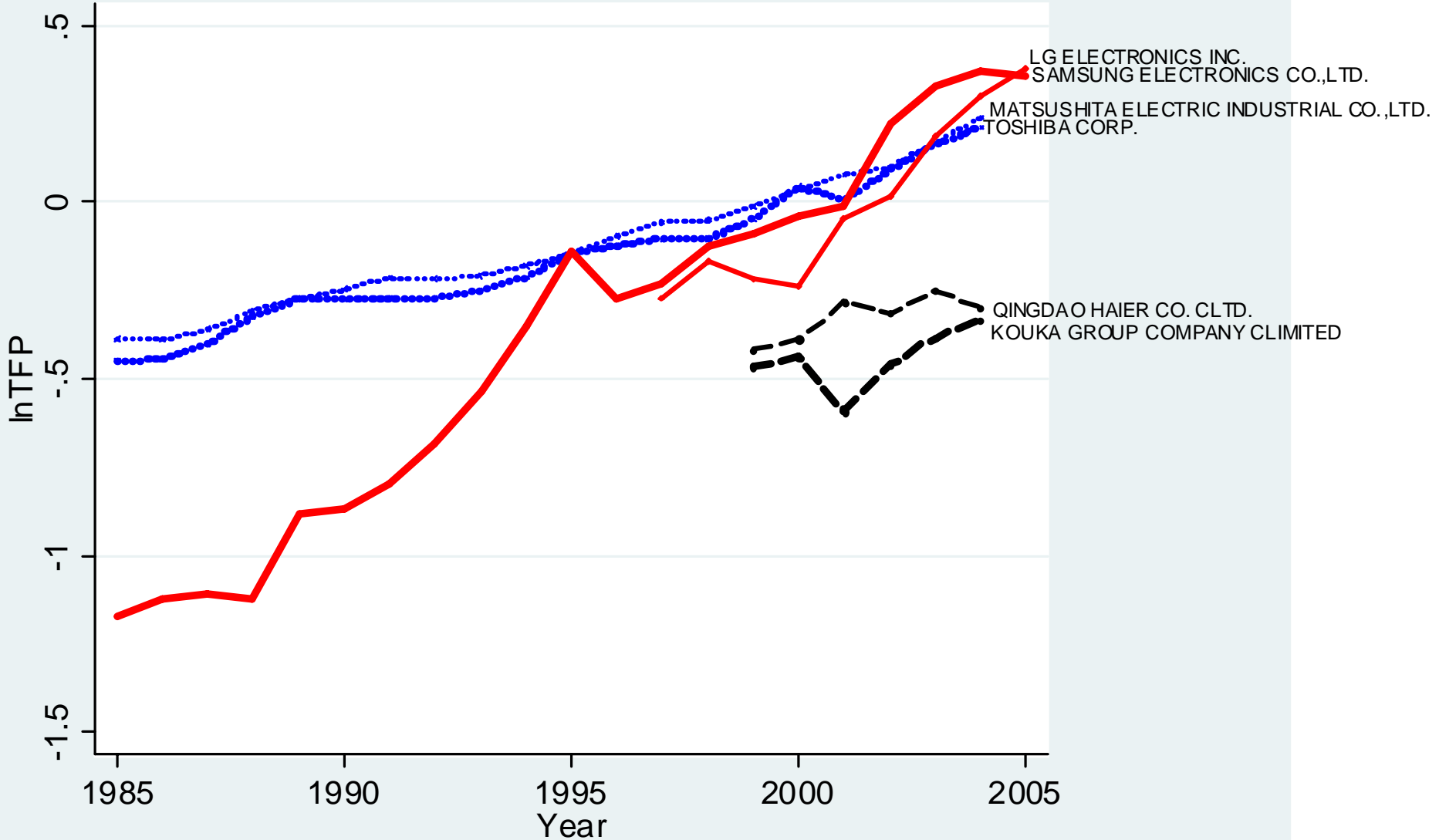
Chemicals



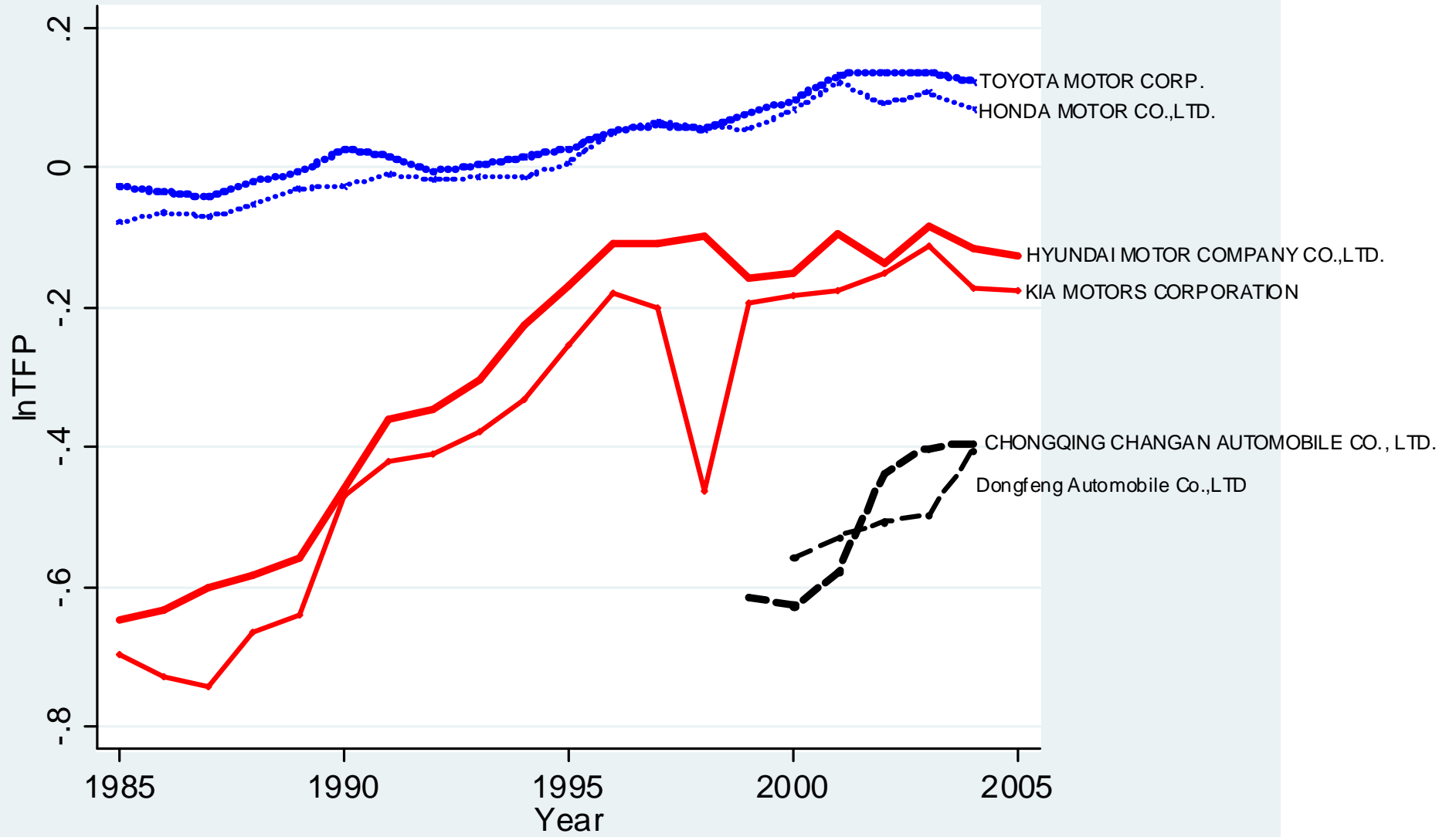
Primary metal



Electrical machinery



Motor Vehicles



Issues in our comparison calculation

- Problems in estimation for relative intermediate price should be fixed, especially industry use imported intermediate goods heavily.
- Since a firm usually produces heterogeneous goods, its deflated sales by a common industry price index can be a misleading proxy for output.