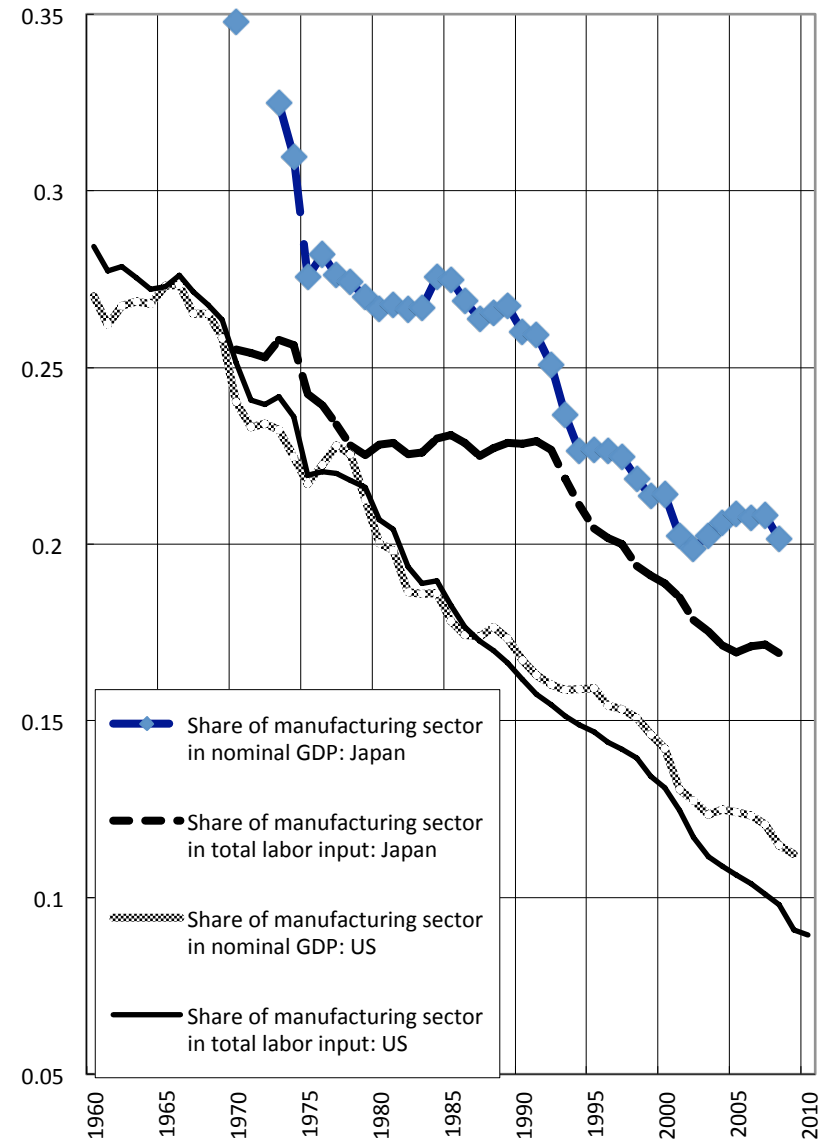# Deindustrialization in Japan and Its Impact on Growth

**Prepared for the Workshop, "Is deindustrialization inevitable?
The future of manufacturing in Japan, Korea, Germany, and France,"
organized by the Fondation France-Japon de l'EHESS, Paris, 20-21 March, 2012**

Kyoji FUKAO

(Hitotsubashi University)

Introduction

- **Like in the US, deindustrialization continues in Japan.**

- **Using industry, regional, and factory-level data, I will examine how Japan's industrial structure has changed and how deindustrialization affects Japan's economic growth.**

Legend:
- Share of manufacturing sector in nominal GDP: Japan
- Share of manufacturing sector in total labor input: Japan
- Share of manufacturing sector in nominal GDP: US
- Share of manufacturing sector in total labor input: US

Sources: JIP Database 2011, The Council of Economic Advisers, *Economic Report of the President 2005* and *2011*.

2

Introduction (contd.)

Structure of today's presentation:

1. **The Baumol effect and the effect on capital deepening**

2. **The regional impact of deindustrialization**

3. **The relocation of factories abroad and the decline in spillover effects**

In what way did the share of the manufacturing sector in nominal GDP decline?

The 40 percent decline in the B. Share of the manufacturing sector in nominal GDP in the last 40 years masks a 35 percent increase in A. Real gross value added of the manufacturing sector/Real GDP.

Thus, the decline in C. Value added deflator of the manufacturing sector/GDP deflator has exceeded the increase in real gross value added.

Figure 2. Real Output and Prices

B=A×C

A: Real gross value added of manufacturing sector/Real GDP (1970=100)

B: Share of manufacturing sector in nominal GDP (1970=100)

C: Value added deflator of manufacturing sector/GDP deflator (1970=100)
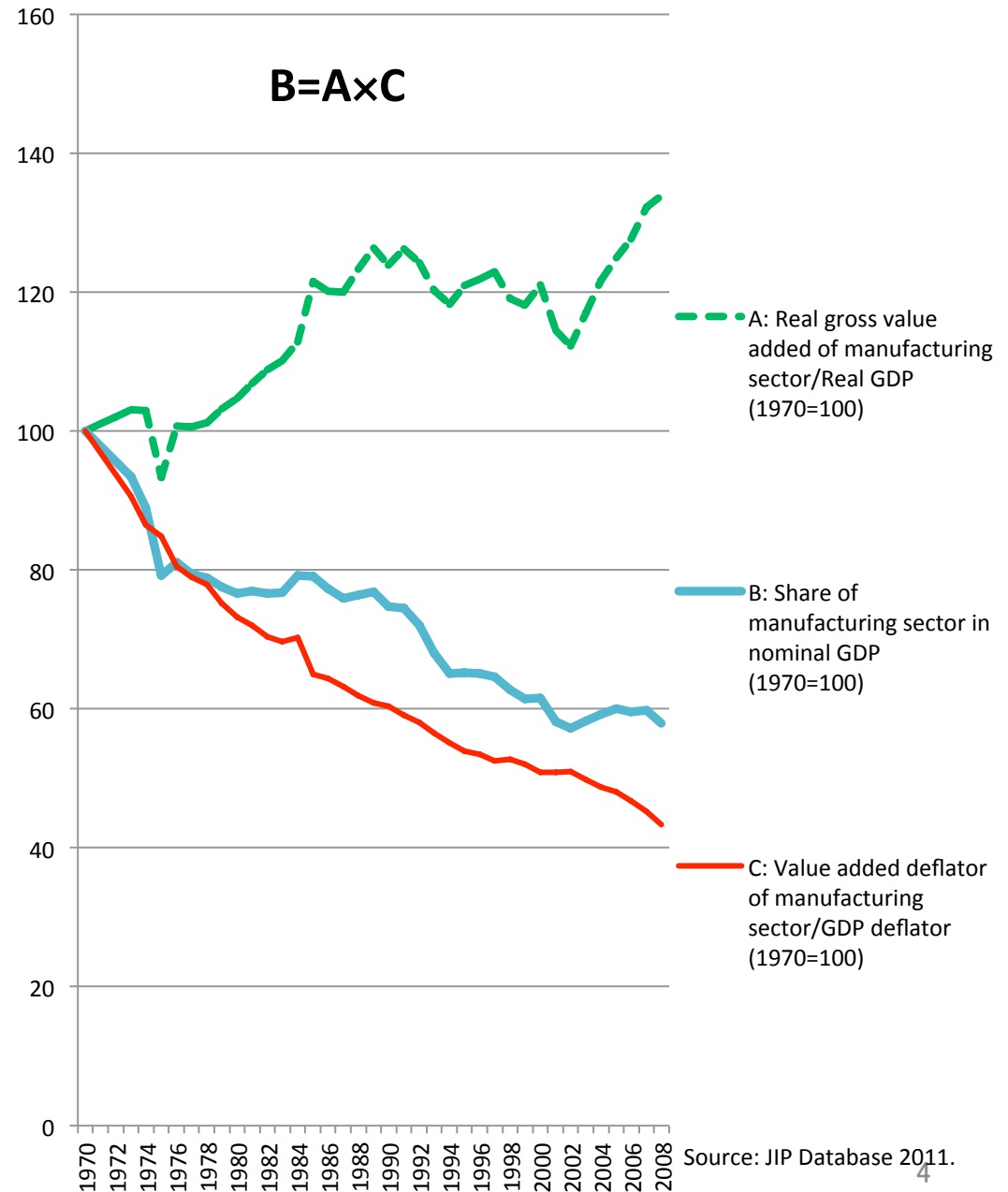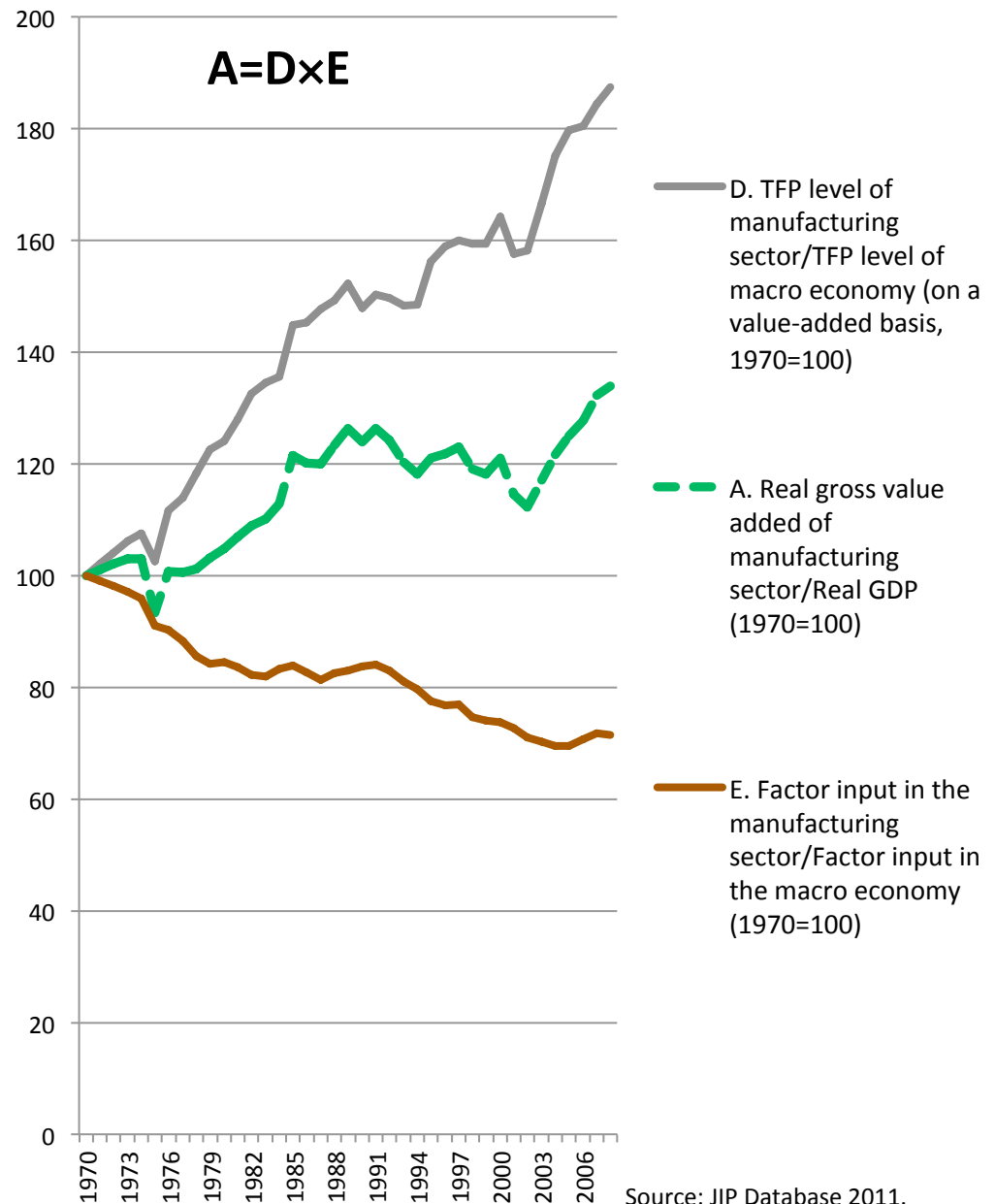
Source: JIP Database 2011.

4

Figure 3. TFP and Factor Input

Given the sharp decline in C. Value added deflator of the manufacturing sector/GDP deflator (in Figure 2), how were production costs covered in the manufacturing sector?

This was made possible by a rapid increase in D. TFP level of manufacturing sector/TFP level of macro economy.

It seems that the price elasticity of demand was not sufficiently large to make output growth greater than TFP growth. And this resulted in a decline in E. Factor input into the manufacturing sector/factor input of the macro economy

A=D×E

D. TFP level of manufacturing sector/TFP level of macro economy (on a value-added basis, 1970=100)

A. Real gross value added of manufacturing sector/Real GDP (1970=100)

E. Factor input in the manufacturing sector/Factor input in the macro economy (1970=100)

Source: JIP Database 2011.

# 1. The Baumol effect and the effect on capital deepening

- **Since TFP growth in the manufacturing sector is much higher than in the non-manufacturing sector, deindustrialization may reduce macro TFP growth (Baumol effect).**

- **If the activities disappearing in the manufacturing sector are physical and human capital intensive, deindustrialization will also reduce the rate of return to physical and human capital. This might hamper Japan's economic growth.**

- **In order to test this hypothesis, we need to investigate what kind of manufacturing activities are disappearing.**

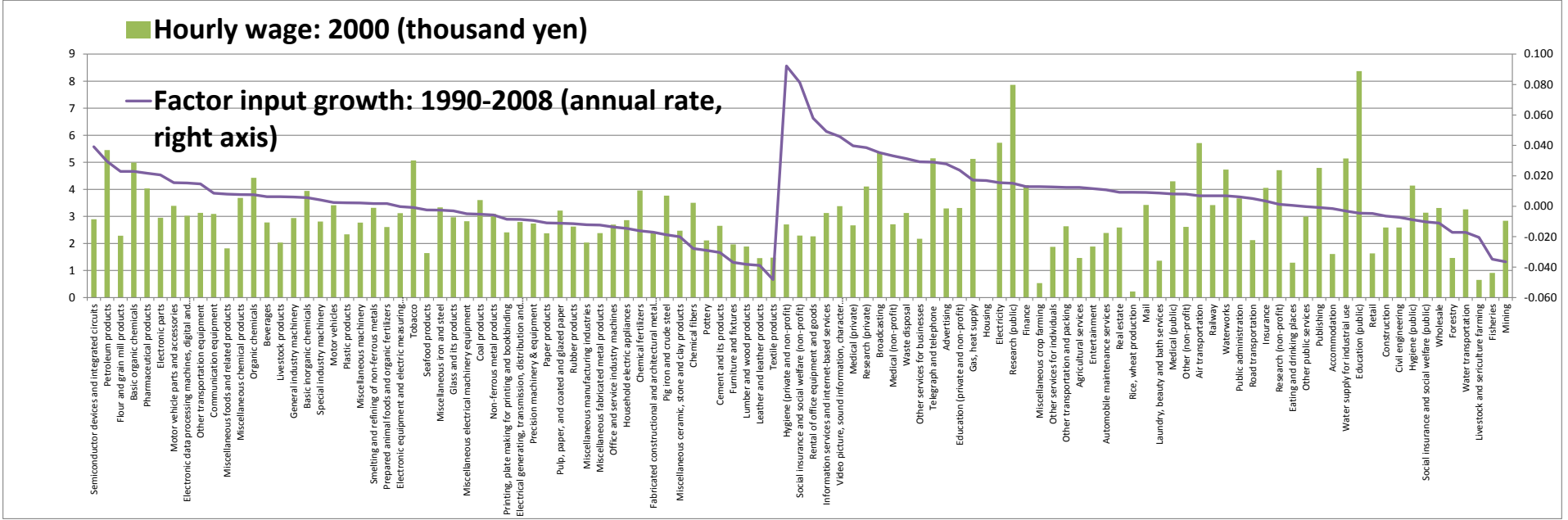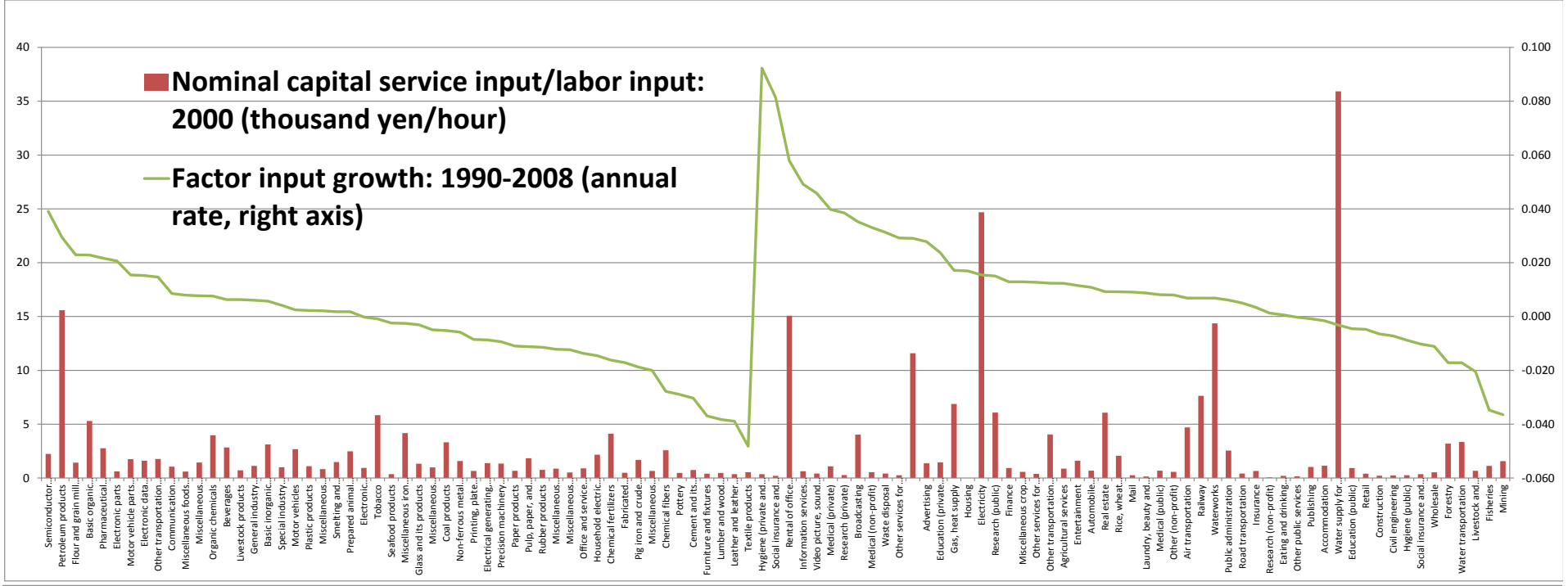|	Nominal capital service input/Labor input: 2000 (thousand yen/hour)	Hourly wage: 2000 (thousand yen)
Macro economy	0.96	2.57
Manufacturing	0.82	2.60

Source: JIP Database 2011.

The Baumol effect

- The figure below shows the relationships between TFP growth and factor input growth at the disaggregated industry level for 1990-2008.

- Within the manufacturing sector (left-hand side of the figure), factor inputs have increased in industries with high TFP growth.
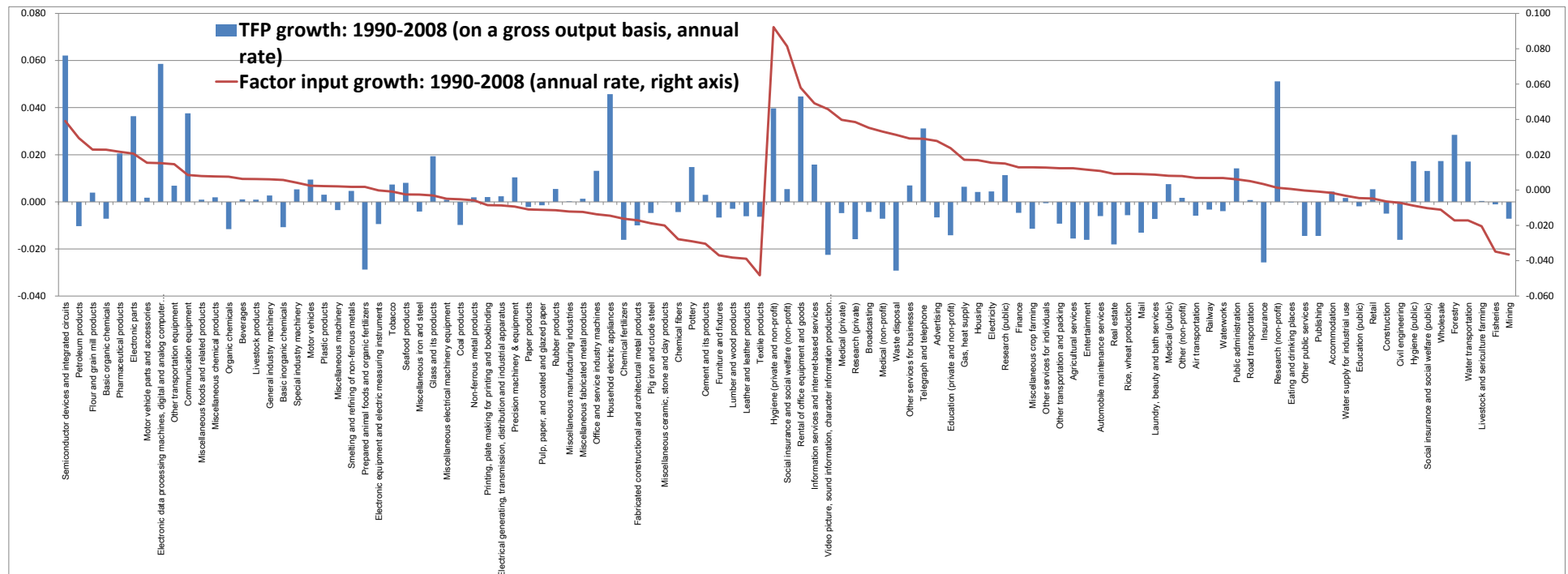
Effect on capital deepening

- **From the viewpoint of factor intensity, activities disappearing in the manufacturing sector tend to be less physical and human capital intensive.**

- **It seems that deindustrialization will not necessarily reduce the rate of return to physical and human capital.**

- **We should also note that vertical intra-industry trade with Asian countries seems to have caused capital deepening within each sector (Fukao, Ishido and Ito 2003).**

Nominal capital service input/labor input: 2000 (thousand yen/hour)

Factor input growth: 1990-2008 (annual rate, right axis)

Hourly wage: 2000 (thousand yen)

Factor input growth: 1990-2008 (annual rate, right axis)

The Baumol effect

- **Using the following framework, we can decompose the slowdown of Japan's TFP growth into two factors: the effect of the slowdown of TFP growth within each sector (within effect) and effect of the contraction of industries with high TFP growth (between effect).**

$$\sum_i w_{90,02,i} \Delta A_{90,02,i} - \sum_i w_{80,90,i} \Delta A_{80,90,i} = \frac{1}{2} \sum_i \left(w_{80,90,i} + w_{90,02,i} \right)\left(\Delta A_{90,02,i} - \Delta A_{80,90,i} \right)$$

$$+ \frac{1}{2} \sum_i \left(\Delta A_{90,02,i} + \Delta A_{80,90,i} \right)\left(w_{90,02,i} - w_{80,90,i} \right)$$

where w_i denotes the Domar weight for industry i and A_i denotes TFP growth on a gross output basis in industry i.

|	TFP growth 1990-2002 minus TFP growth 1980-90	Within effect	Between effect
Market economy	-1.14%	-1.13%	-0.01%

Effect on physical capital deepening

- **Using a similar framework, we can decompose capital deepening (growth of capital service input/man hours in the macro economy and in the manufacturing sector) into the within effect and the between effect.**

- **We do not observe large negative between effects.**

Decomposition of physical capital deepening in the macro economy
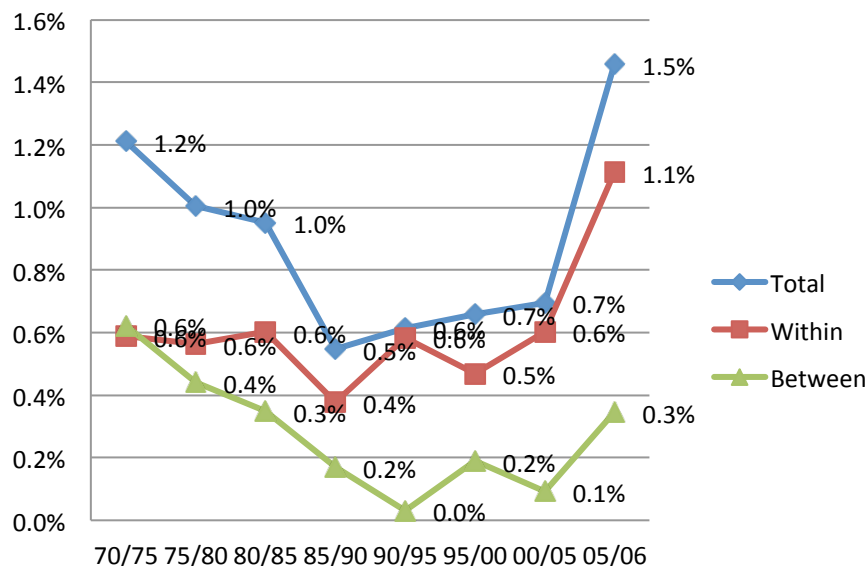

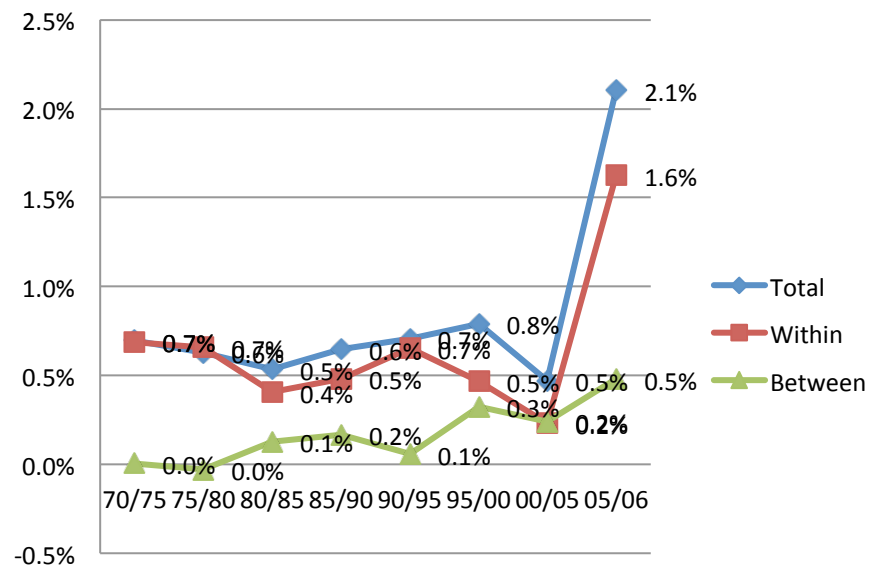Decomposition of physical capital deepening in the manufacturing sector

11
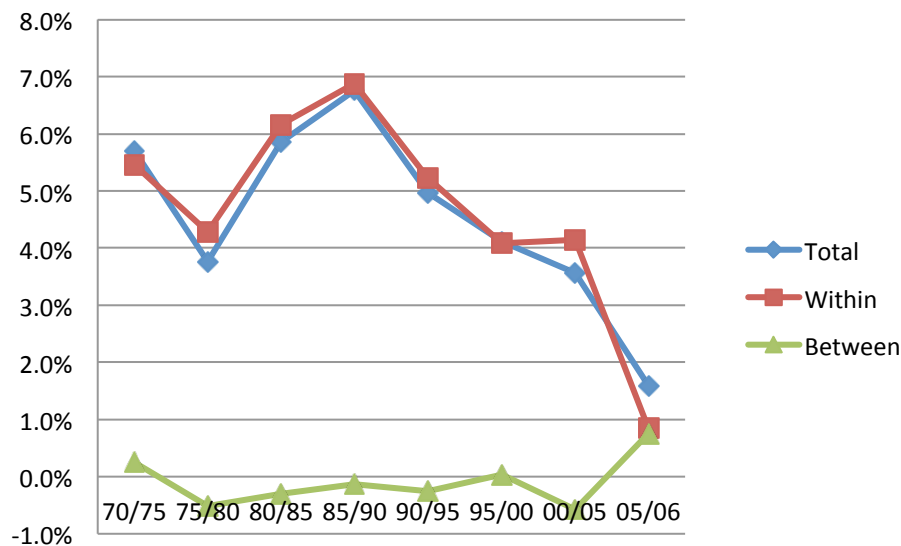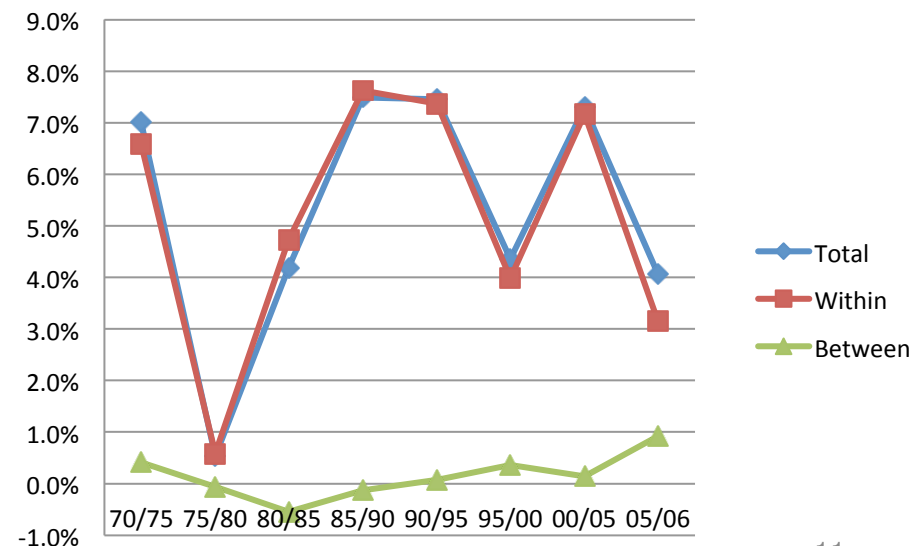
Effect on human capital deepening

- **In the case of human capital deepening, we also do not observe large negative between effects.**

Decomposition of human capital deepening in the macro economy
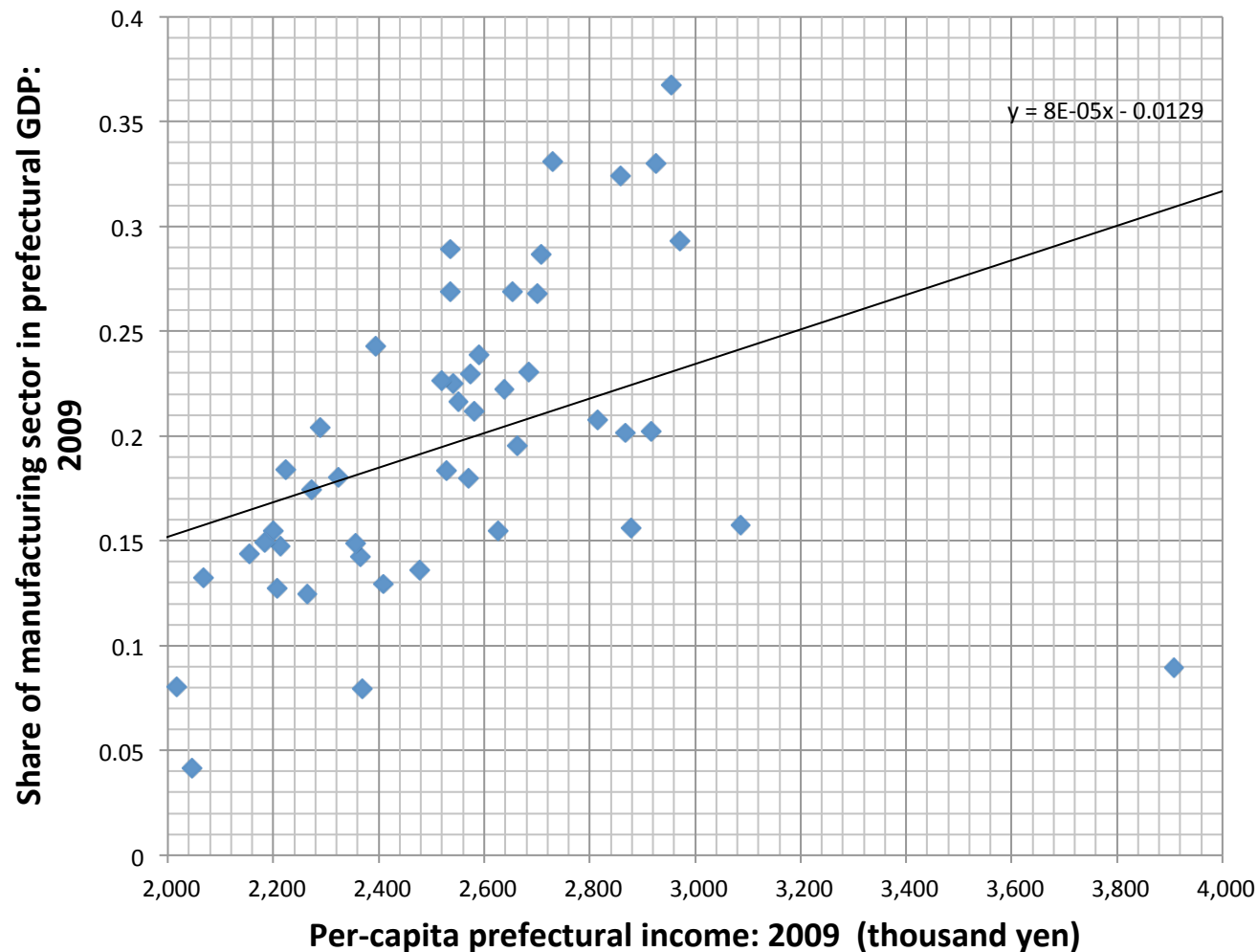
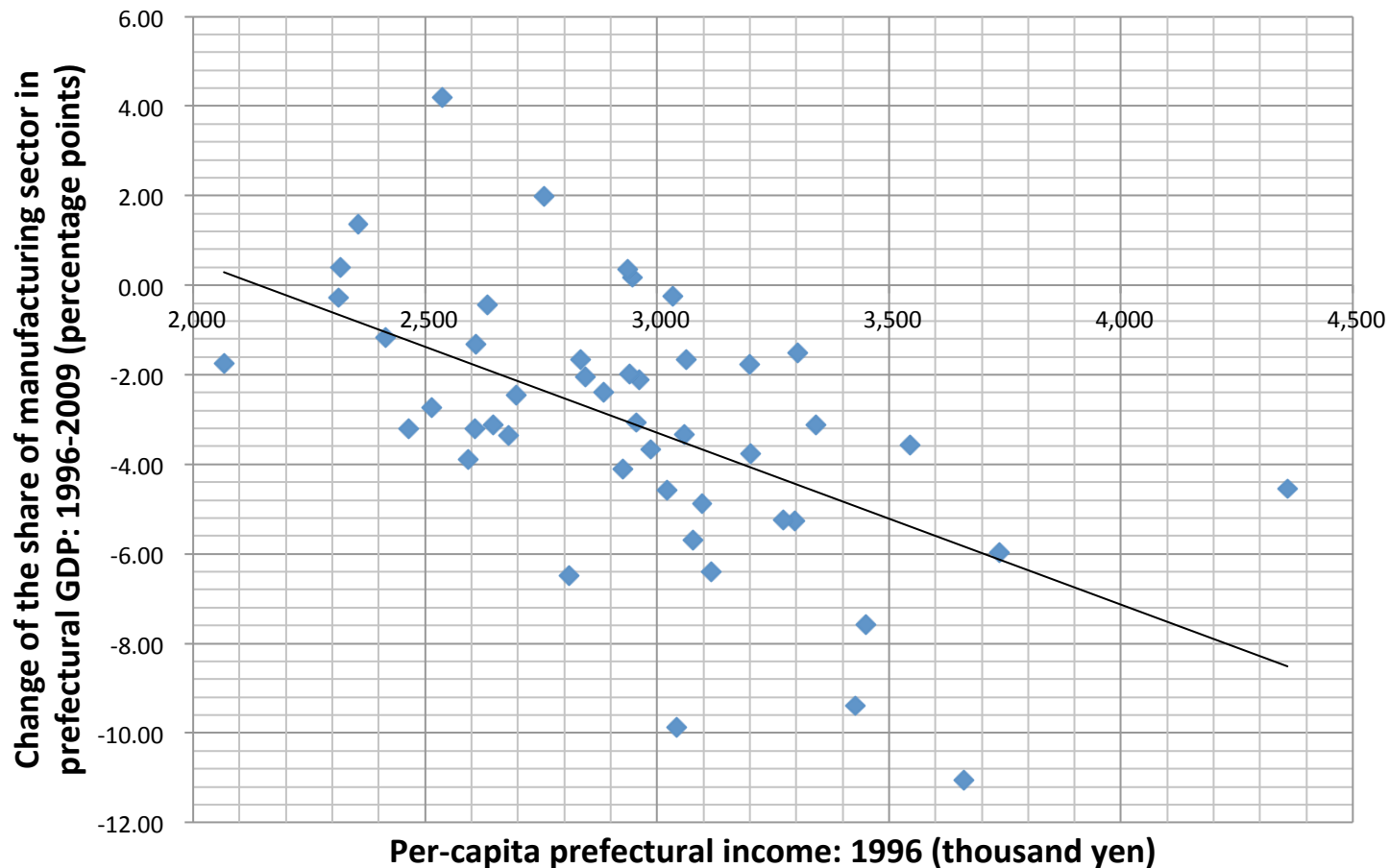Decomposition of human capital deepening in the manufacturing sector

2. The regional impact of deindustrialization

- **The next issue I would like to examine is how deindustrialization affects the spatial distribution of industries.**

- **In Japan, manufacturing activities are mainly concentrated in relatively rich prefectures, except in Tokyo.**

2. The regional impact of the deindustrialization

- **And these relatively rich prefectures have experienced rapid deindustrialization.**

Per-capita prefectural income: 1996 (thousand yen)

(Y-axis) Change of the share of manufacturing sector in prefectural GDP: 1996-2009 (percentage points)

14

3. The relocation of factories abroad and the decline in spillover effects

Studies on productivity dynamics similar to Foster, Haltiwanger and Krizan (2001) for Japan show that the "exit effect" is <u>negative</u>. The market selection process is not working.

→ It is the <u>productive</u> factories that are being shut down. Less productive factories remain.

Decomposition of TFP Growth in the Manufacturing Sector (Annual Growth Rate)
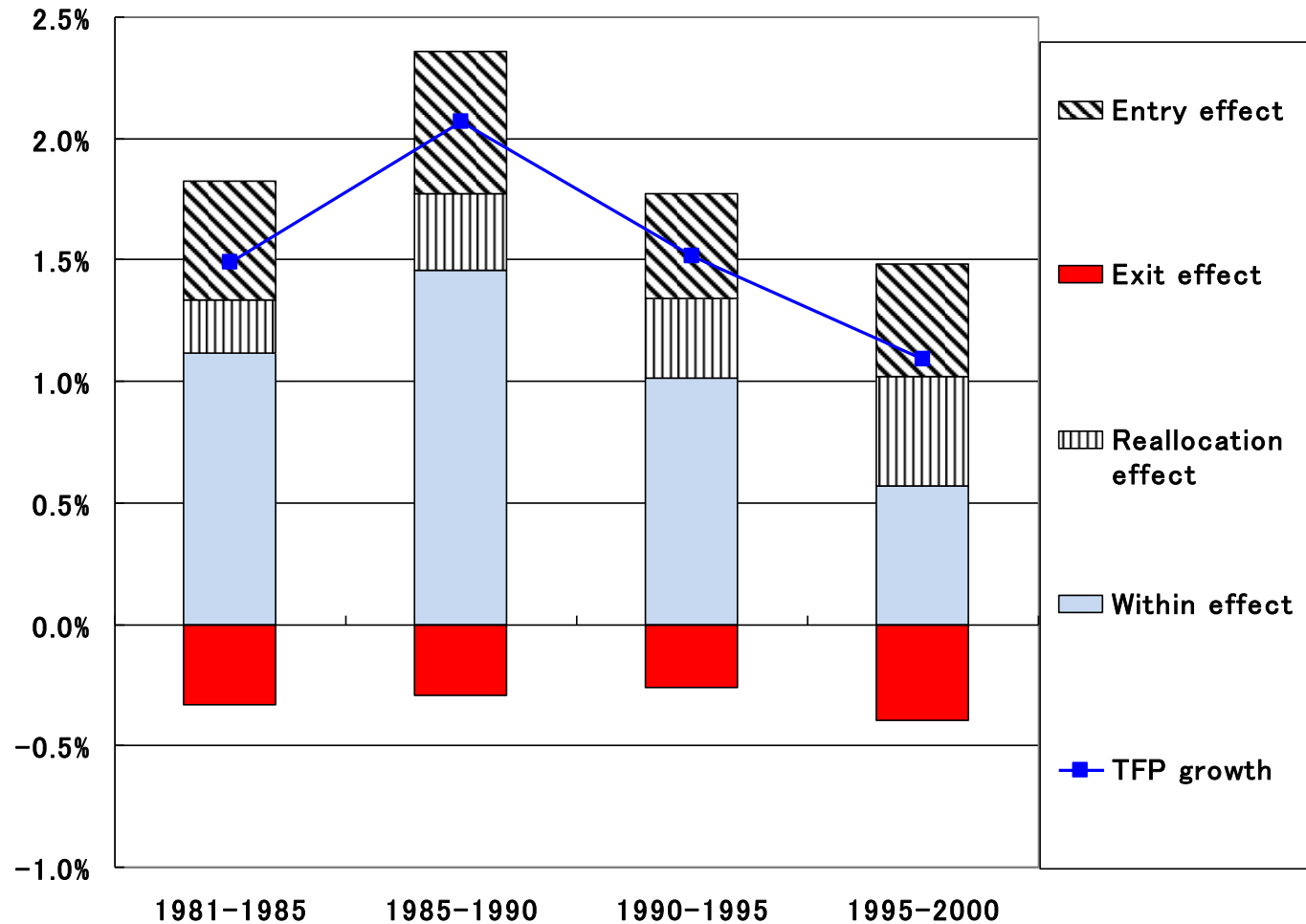
3. The relocation of factories abroad and the decline in spillover effects

Factories with the lowest labor productivity in their industry are more likely to be shut down than productive factories. However, many factories in the top group are also closed, and they are much larger than less productive factories. This is what causes the negative exit effects.

Transition matrix for factories' labor productivity rank

		2003										Closed factories	Whole sample	
		Top group	Top 20% group	Top 30% group	Top 40% group	Top 50% group	Top 60% group	Top 70% group	Top 80% group	Top 90% group	Bottom group			
1990	Top group	8,137	4,472	2,887	1,915	1,399	1,064	852	648	544	511	20,007	42,436	
	Top 20% group	3,583	4,508	3,877	3,044	2,317	1,671	1,337	984	691	582	19,854	42,448	
	Top 30% group	2,028	3,325	3,571	3,259	2,804	2,256	1,678	1,226	924	708	20,678	42,457	
	Top 40% group	1,323	2,250	2,808	3,047	2,915	2,515	2,107	1,659	1,256	839	21,735	42,454	
	Top 50% group	952	1,603	2,097	2,598	2,801	2,683	2,505	1,949	1,491	1,024	22,757	42,460	424,535
	Top 60% group	737	1,062	1,612	1,986	2,332	2,732	2,684	2,387	1,881	1,201	23,834	42,448	
	Top 70% group	534	786	1,097	1,534	1,954	2,348	2,629	2,636	2,279	1,590	25,063	42,450	
	Top 80% group	400	608	787	1,040	1,393	1,913	2,367	2,718	2,793	2,080	26,360	42,459	
	Top 90% group	333	399	576	729	949	1,242	1,701	2,484	3,034	2,824	28,177	42,448	
	Bottom group	319	348	409	518	588	799	1,028	1,469	2,354	3,626	31,017	42,475	
Newly opened factories		10,255	9,263	8,897	8,953	9,174	9,392	9,728	10,466	11,370	13,654		101,152	
Whole sample		28,601	28,624	28,618	28,623	28,626	28,615	28,616	28,626	28,617	28,639	239,482		
		286,205												

3. The relocation of factories abroad and the decline in spillover effects

It seems that an important factor behind the negative exit effects is hollowing out of Japan's manufacturing sector through outward FDI. The exit effect takes large negative value in industries where Japanese firms expanded their production in Asia.

Production increase in Asia by affiliates of Japanese firms and net exit effect derived from analysis of labor productivity dynamics (1990-2003)
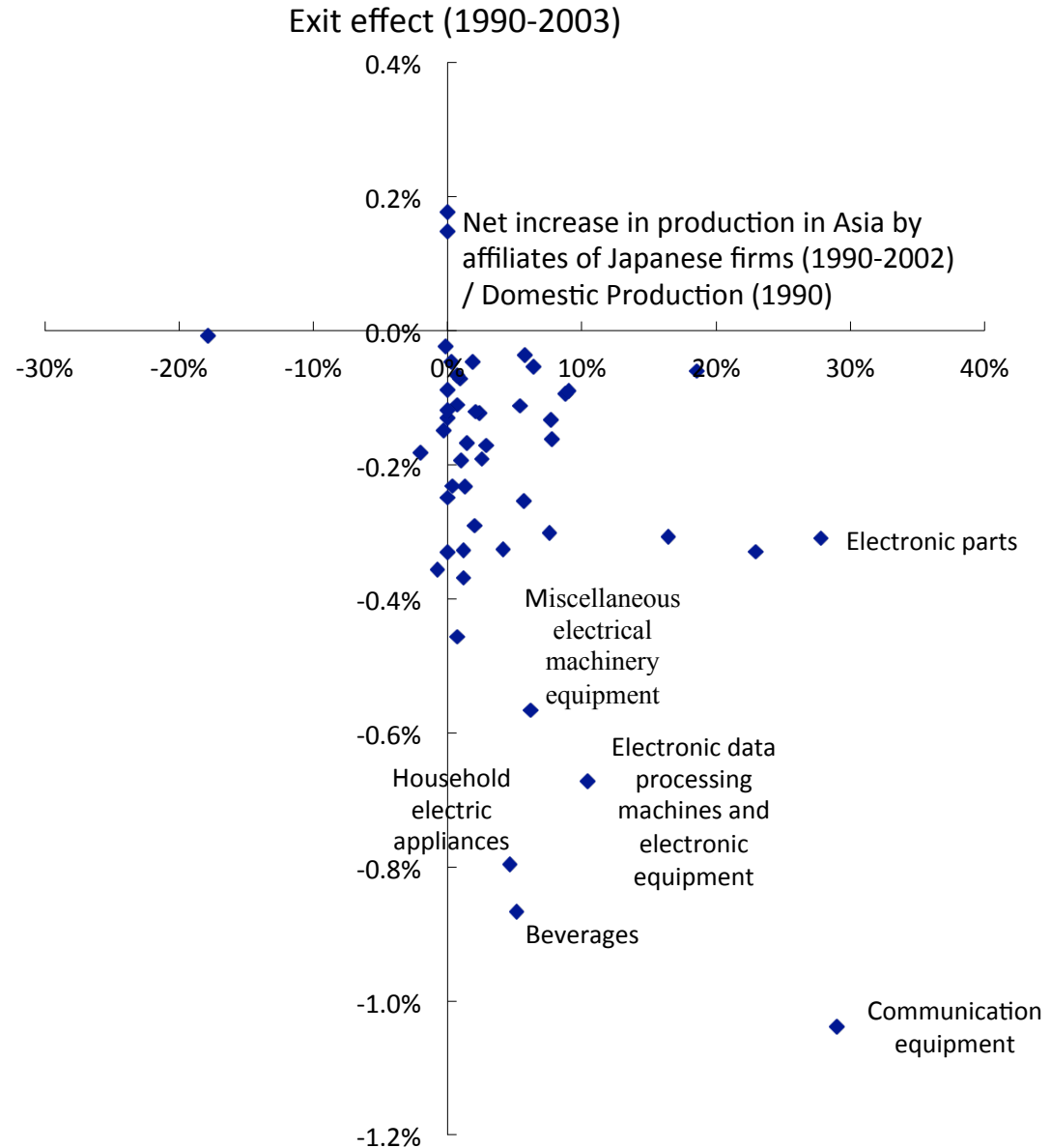
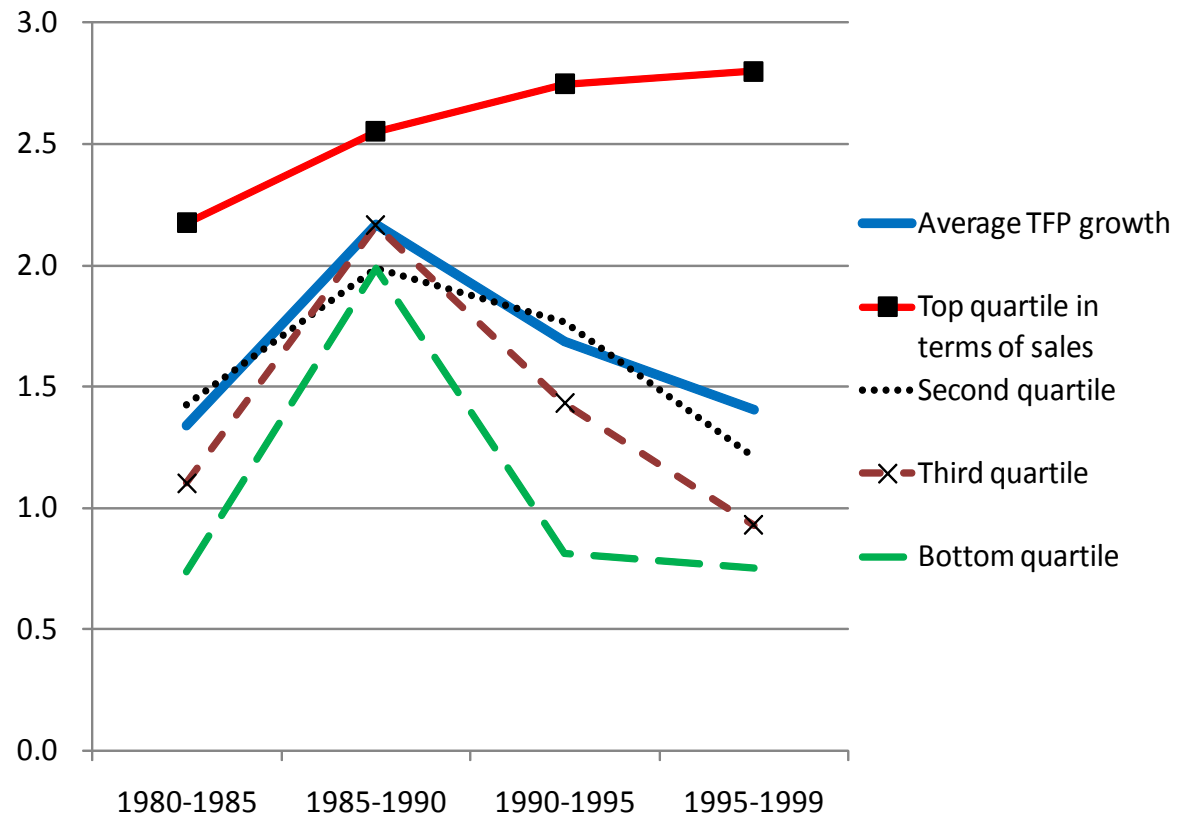# 3. The relocation of factories abroad and the decline in spillover effects

In the manufacturing sector, the TFP growth of large firms has actually accelerated. Small and medium-sized firms (SMEs) have been left behind.

→ **Possible reasons:**

(a) SMEs left behind in R&D and internationalization (in Japan, most R&D is conducted by large firms).

(b) decrease in technology spillovers from large firms (supplier relationships in Japan seem to be weakened by outward FDI and deindustrialization).

TFP Growth by Factory Size (Annual Growth Rate)

Legend:
- Average TFP growth
- Top quartile in terms of sales
- Second quartile
- Third quartile
- Bottom quartile

X-axis: 1980-1985, 1985-1990, 1990-1995, 1995-1999

Main findings

1. Within the manufacturing sector, relatively labor intensive industries with low TFP growth have shrunk. Because of this, we observe neither large negative Baumol effects nor a decline in capital intensity through "between" effects.

2. In Japan, manufacturing activities are mainly concentrated in relatively rich prefectures (except in Tokyo). These rich prefectures have experienced rapid deindustrialization. Deindustrialization in Japan will not increase the income gaps between regions.

3. Because of the shutdown of large productive factories, which seems to have been partly caused by the relocation of factories abroad, Japan has experienced negative "exit" effects. Outward FDI and deindustrialization have weakened Japan's supplier relationships and this may have decreased technology spillovers from large firms to small firms.