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Employment and Productivity Dynamics in Korea: An Analysis of Establishment-Level Micro Data

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16 June, 2012

Korea's Leading Think Tank 



C O N T E N T S

Historical Overview

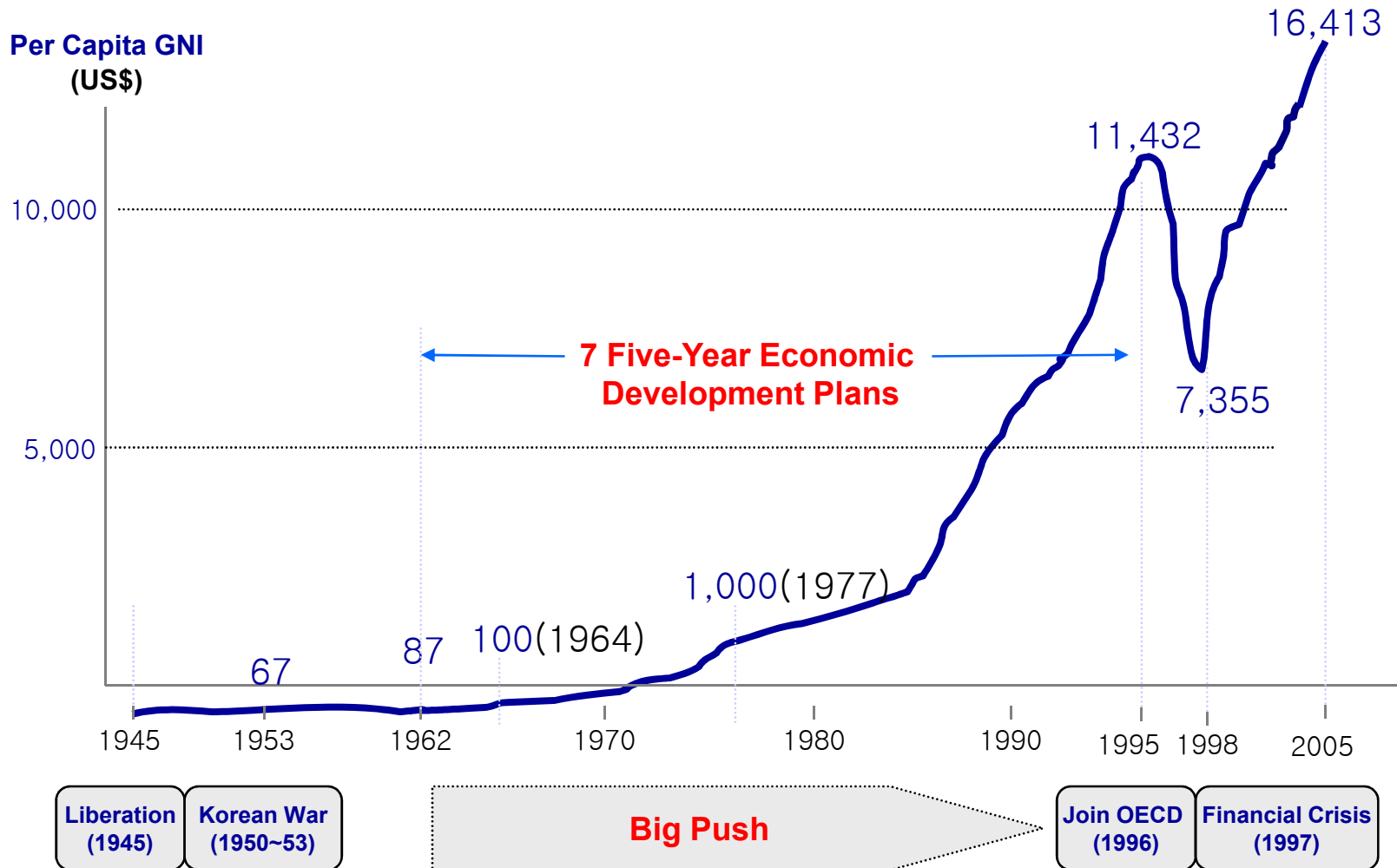
Impacts of Globalization

Productivity Dynamics

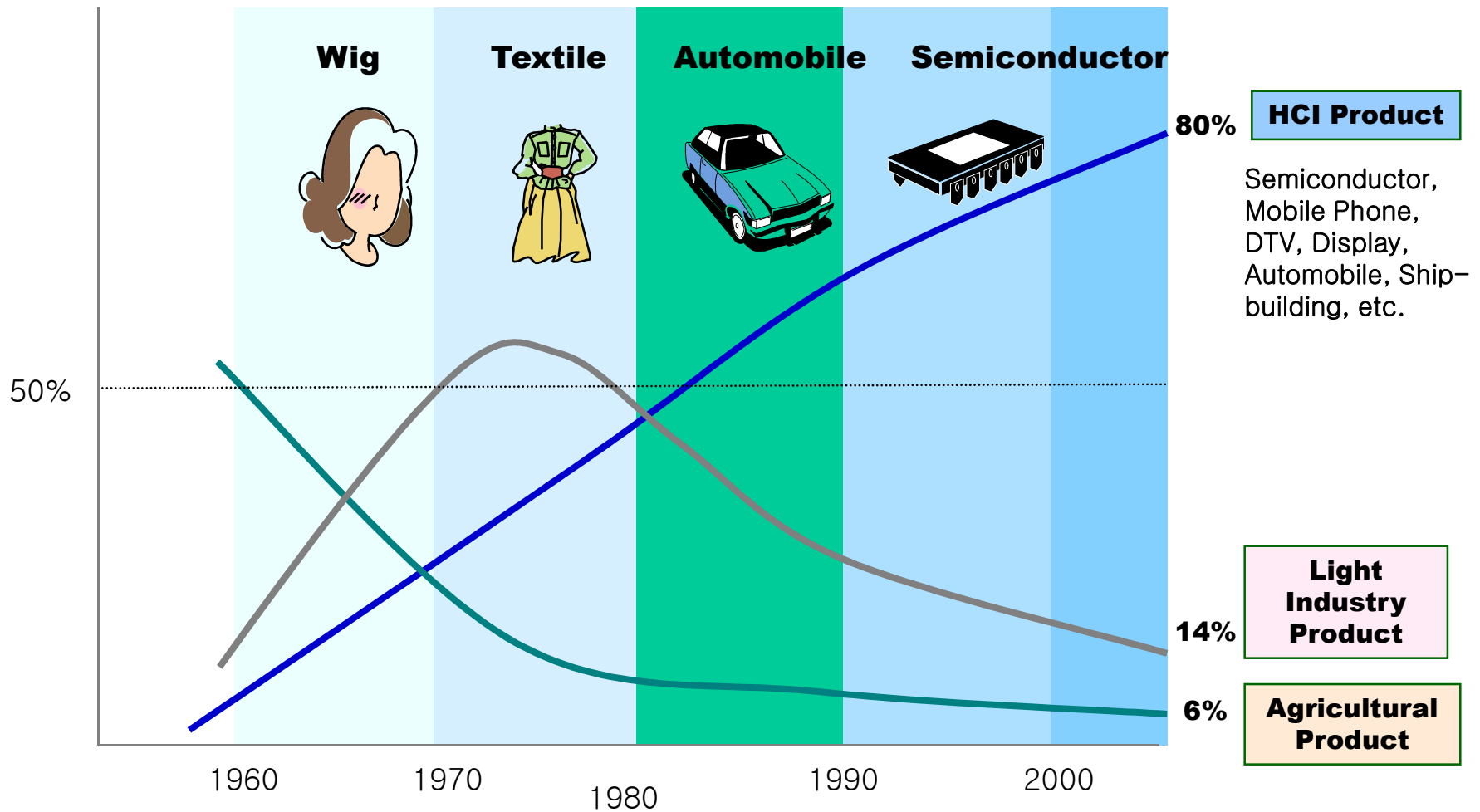
Policy Implications

Part-01 | Historical Overview

KDI

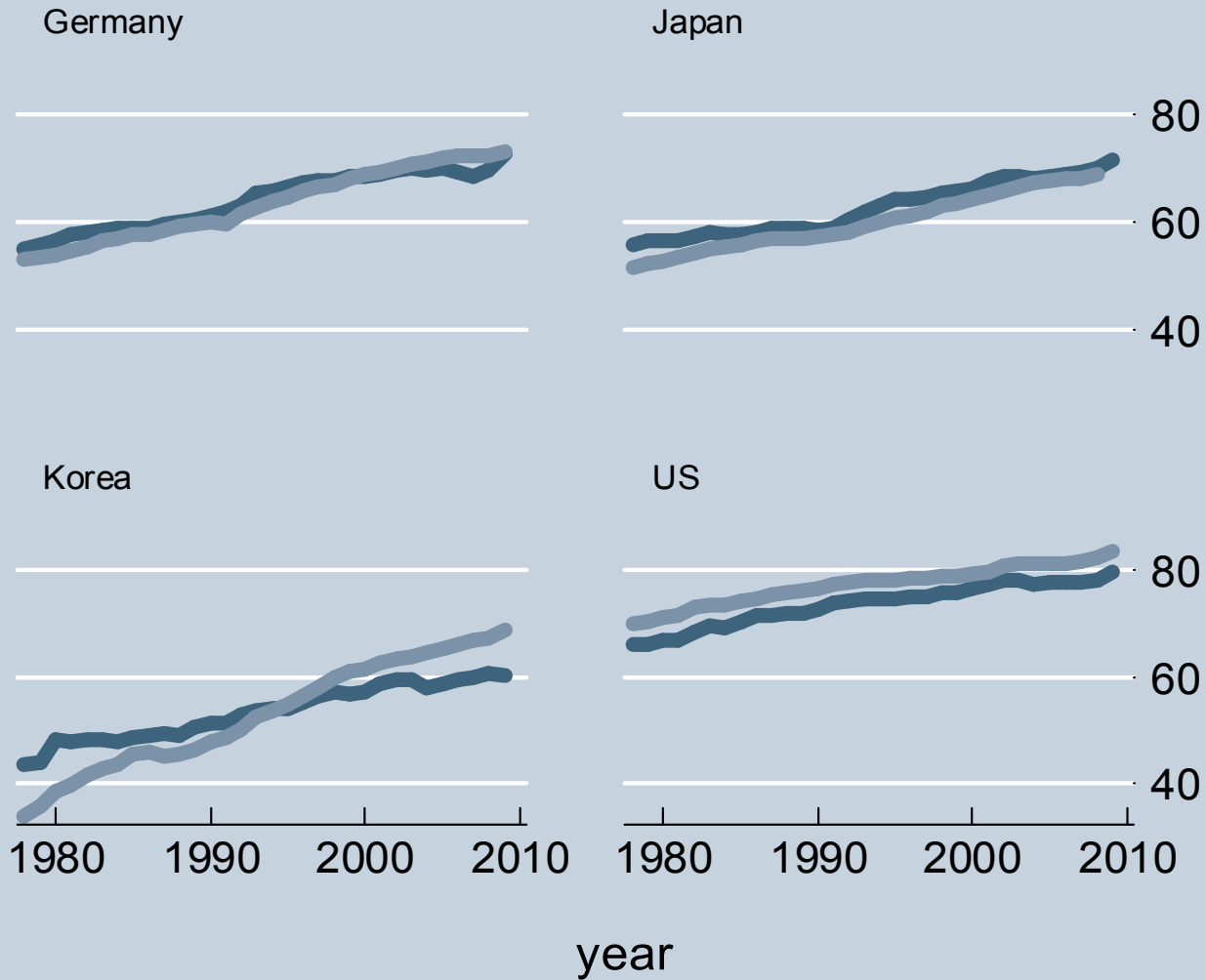


Changes in Export Commodity Profile



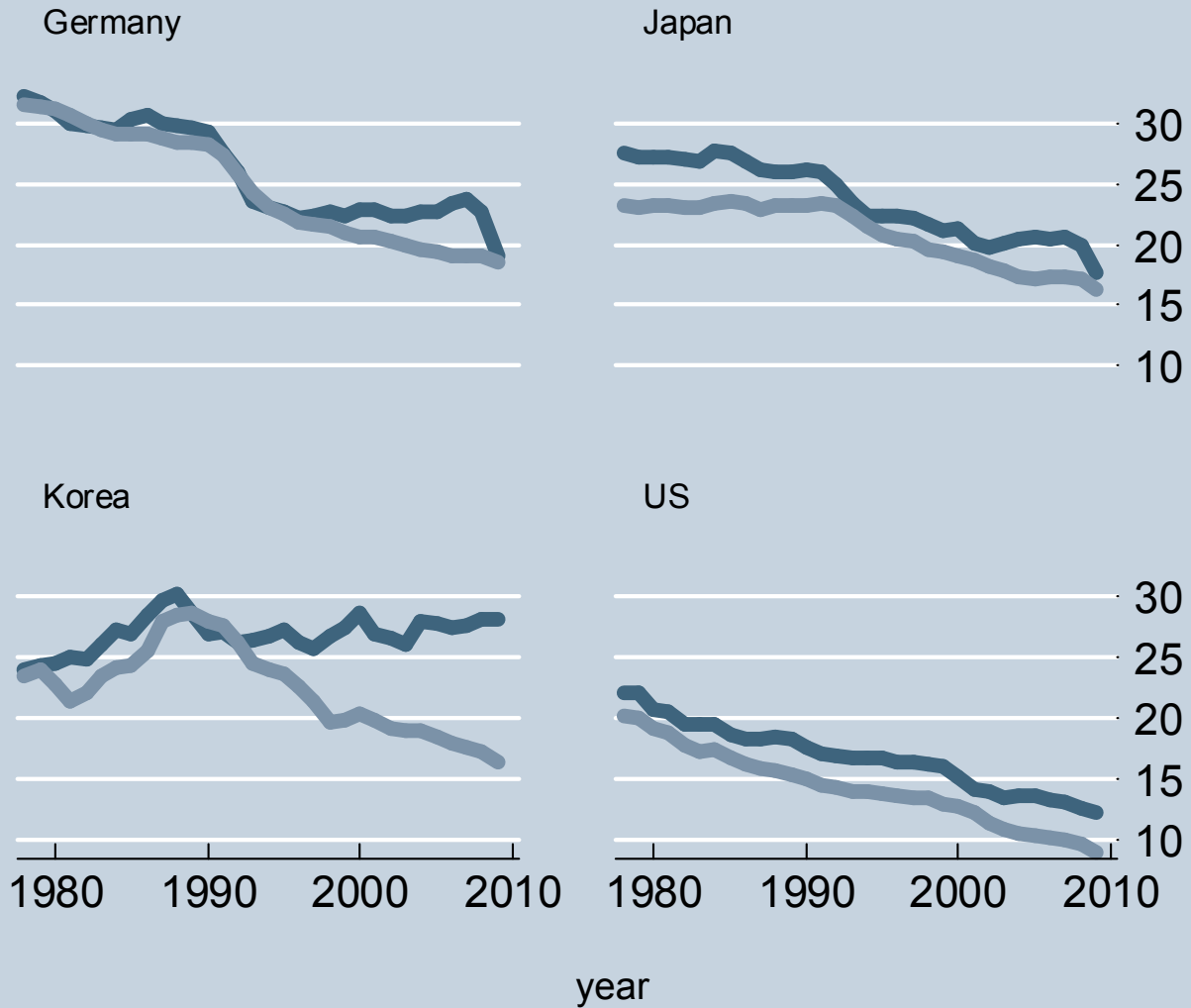
Service Sector relative to Total Economy

Value added Employment

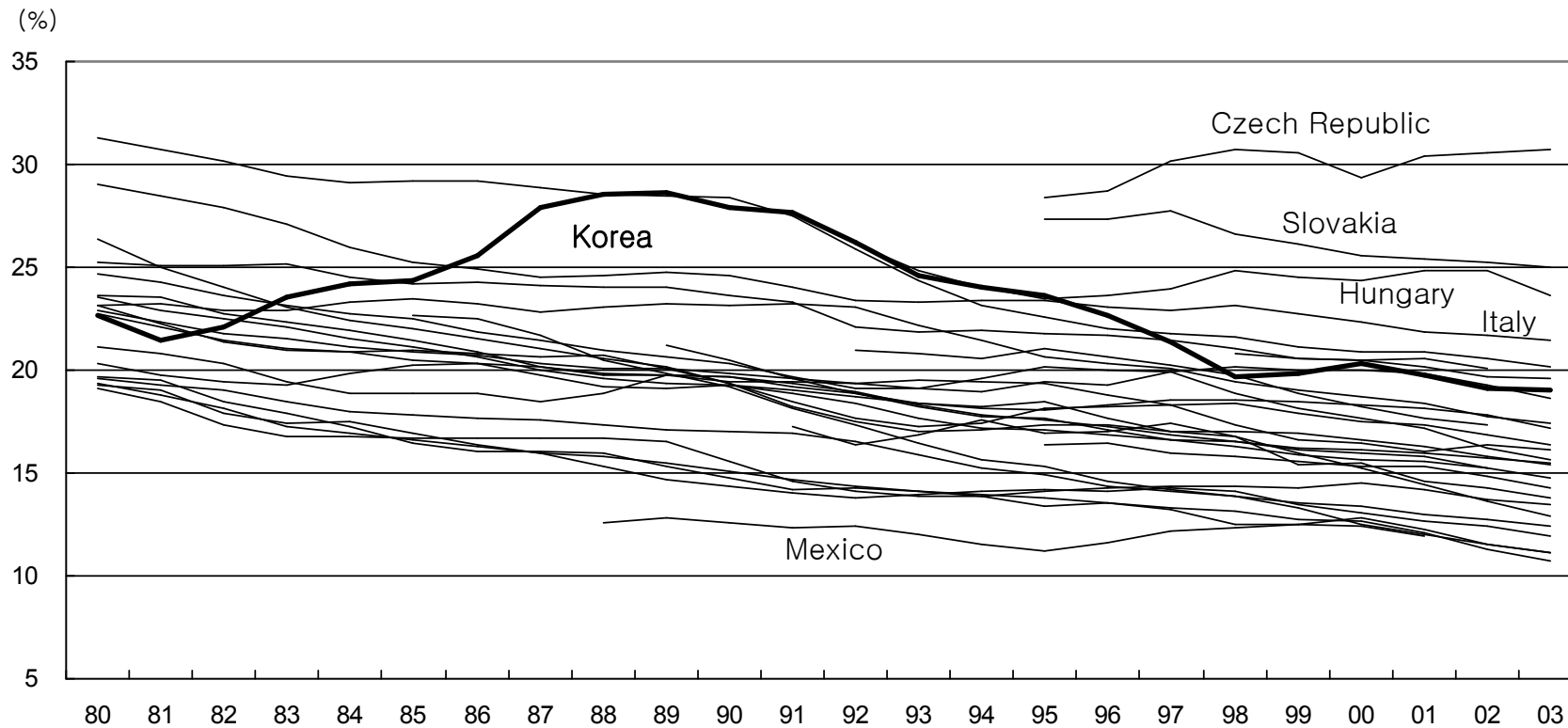


Manufacturing Share relative to Total Economy

Value added Employment

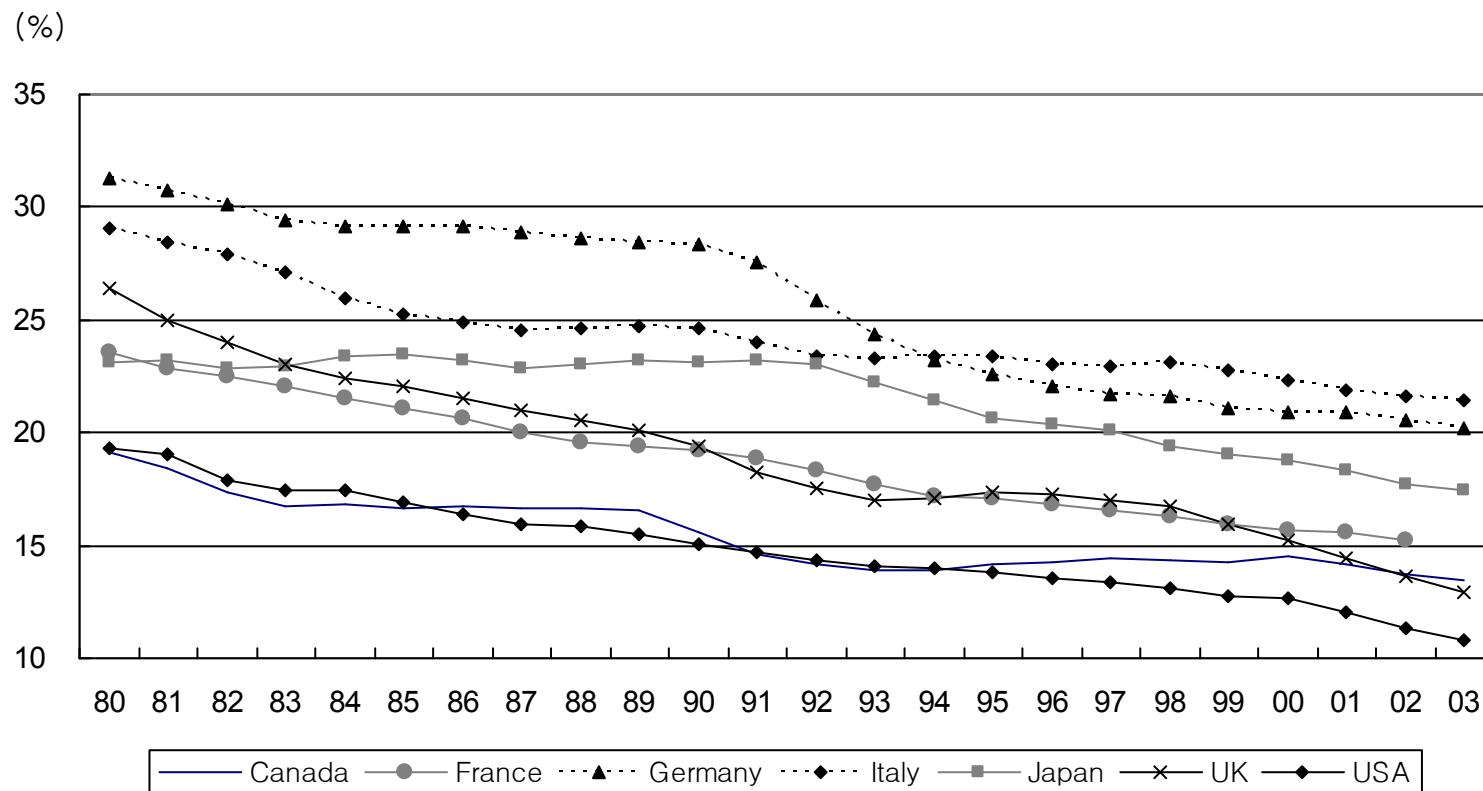


Trend of manufacturing employment share in OECD countries



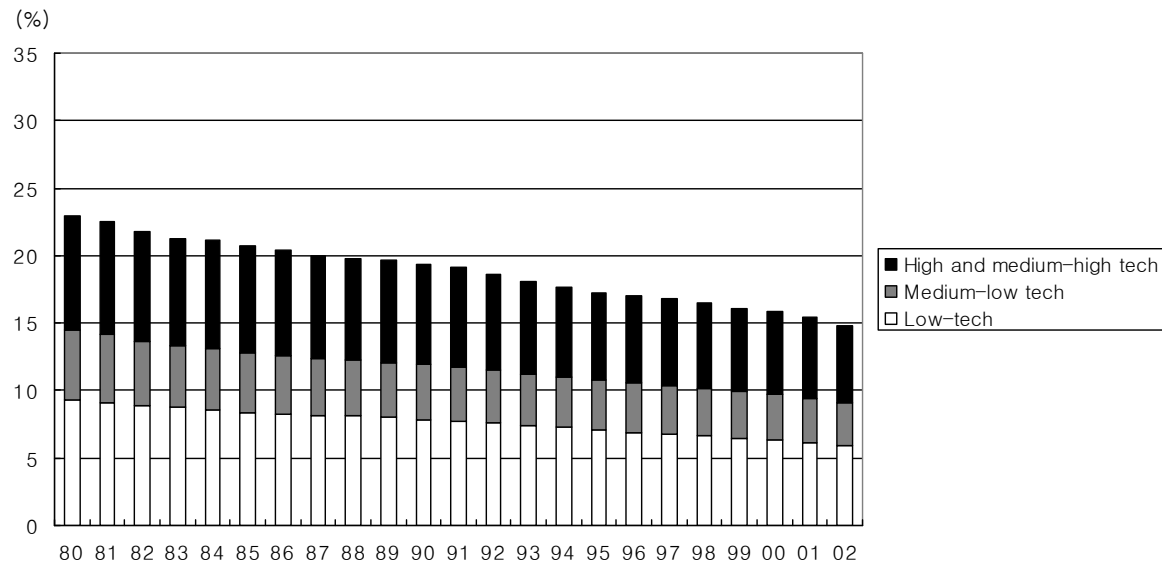
Source: OECD STAN indicators database, 2005

Trend of manufacturing employment share in G7 countries

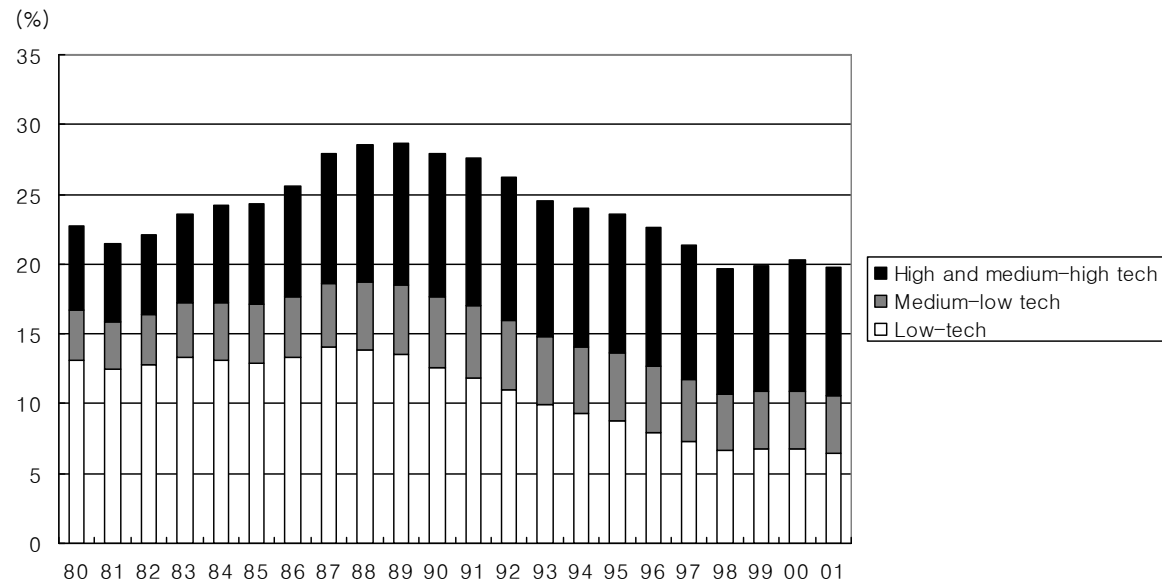


Source: OECD STAN indicators database, 2005

Trend in employment share of manufacturing industry (by technology level)



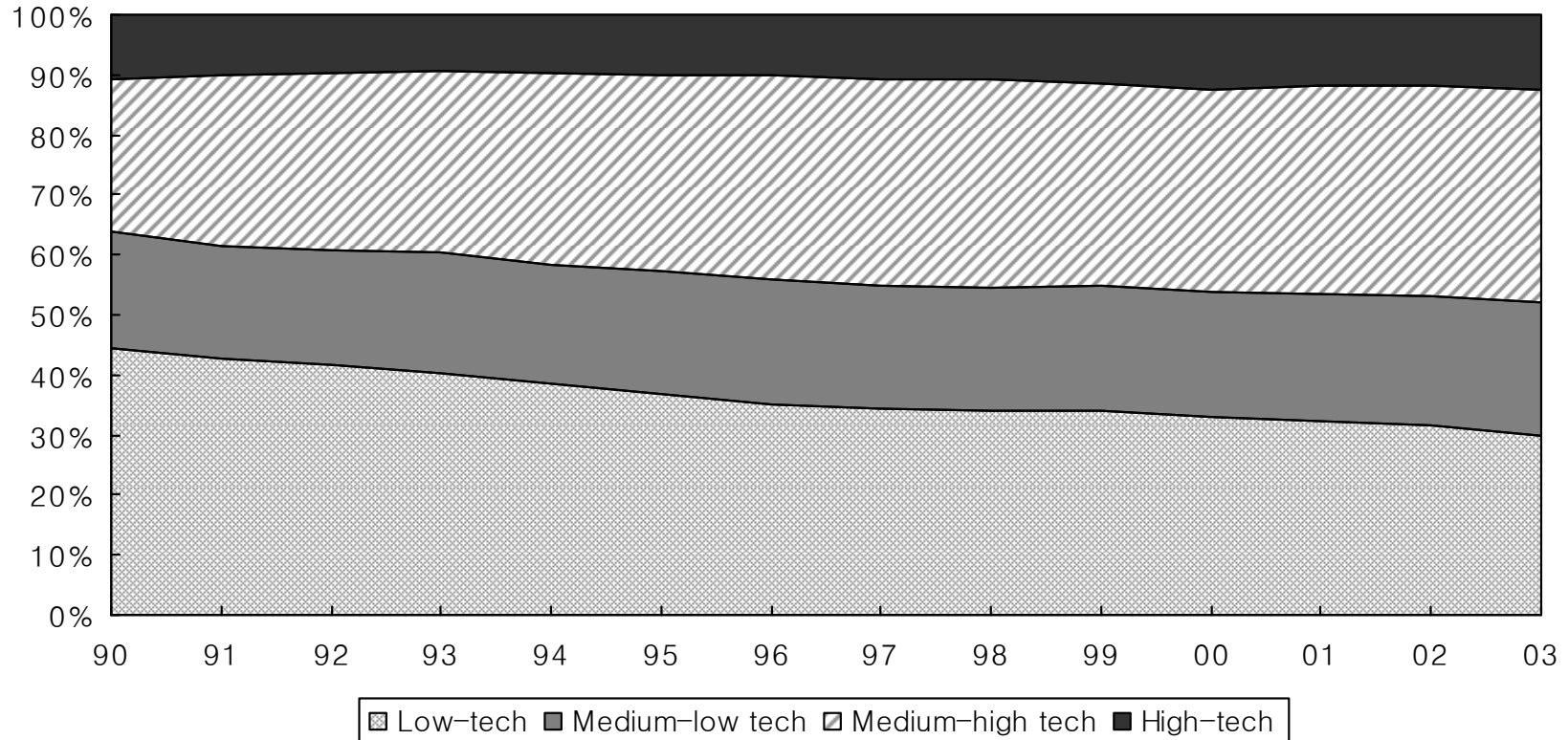
G7



Korea

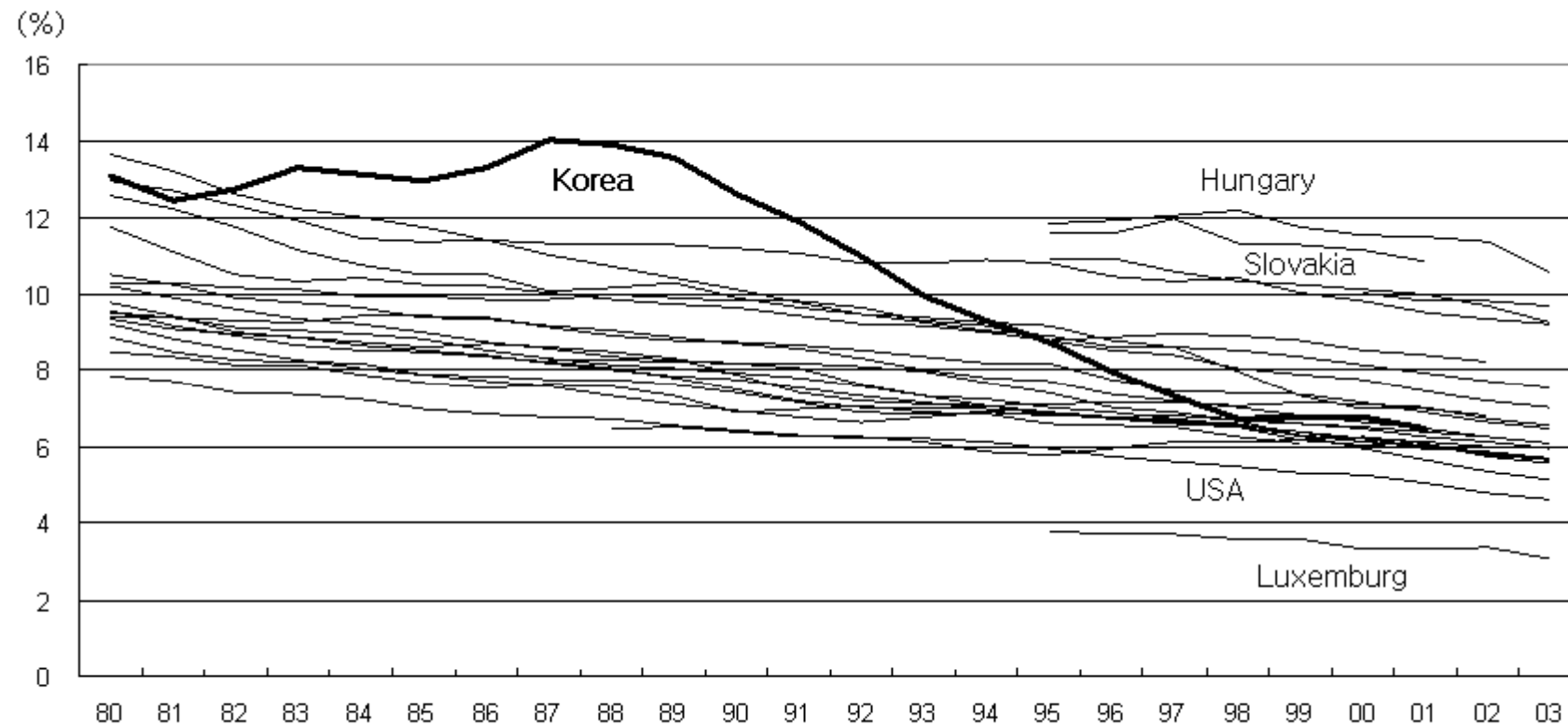
Source: *OECD STAN Indicators database, 2005*

Employment share of industries within manufacturing industry (by technology level)



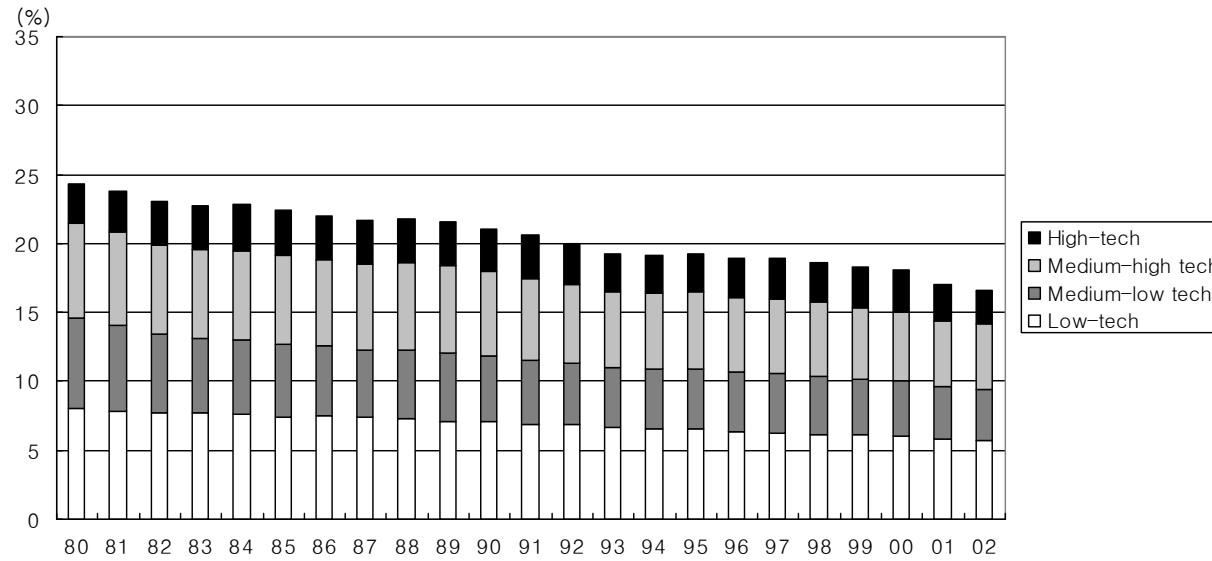
Author's calculation based on the micro-data of
Annual Survey on Mining and Manufacturing, National Statistics Office

Trend of employment share in OECD countries by sector: Low-tech. manufacturing

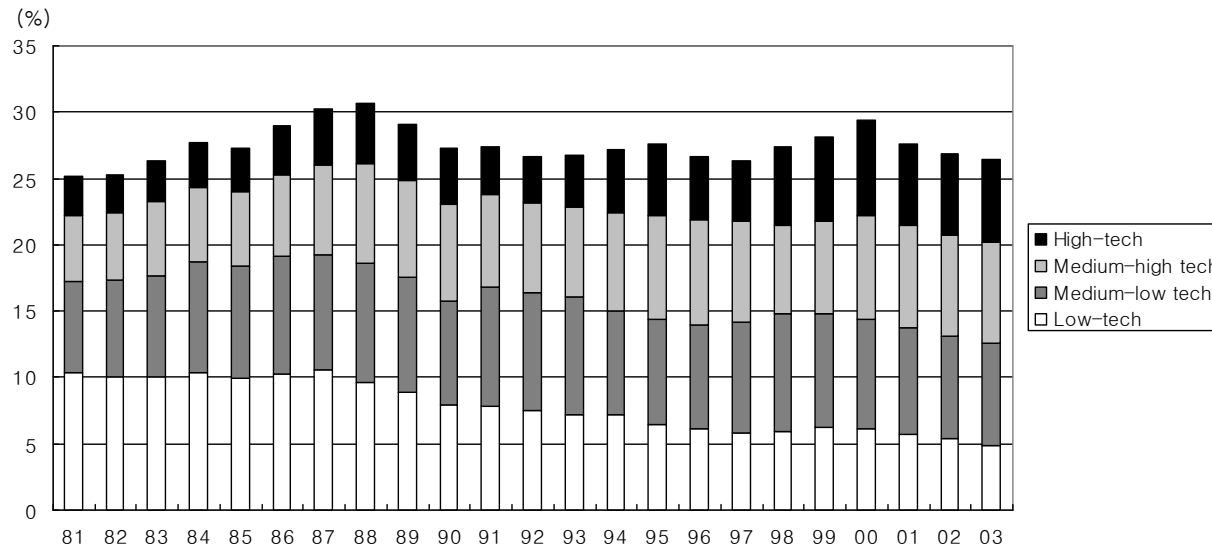


Source: OECD STAN indicators database, 2005

Trend in value-added share of manufacturing industry (by technology level)



G7



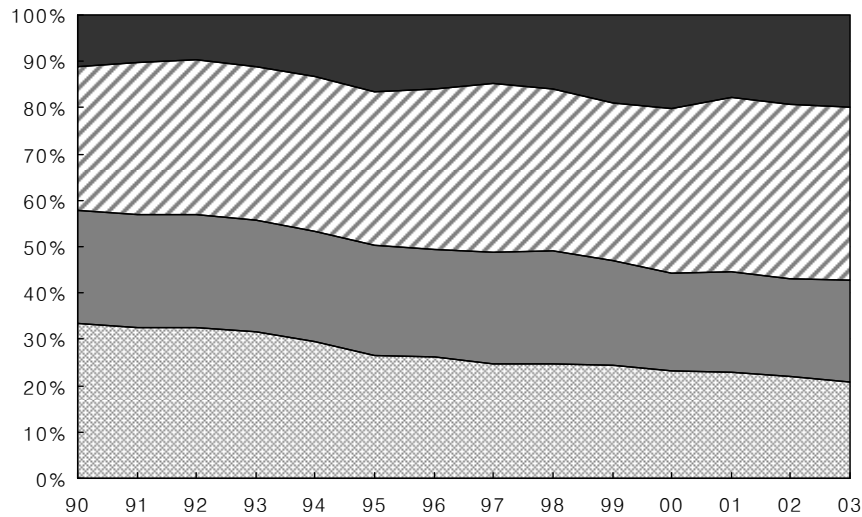
Korea

Source: *OECD STAN Indicators database, 2005*

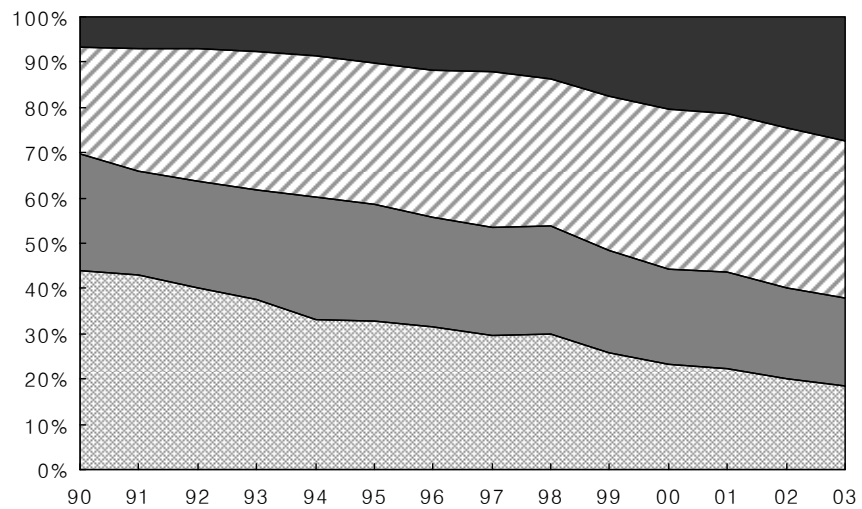
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Value-added share of industries within manufacturing industry (by technology level)



**Nominal
Value-added**



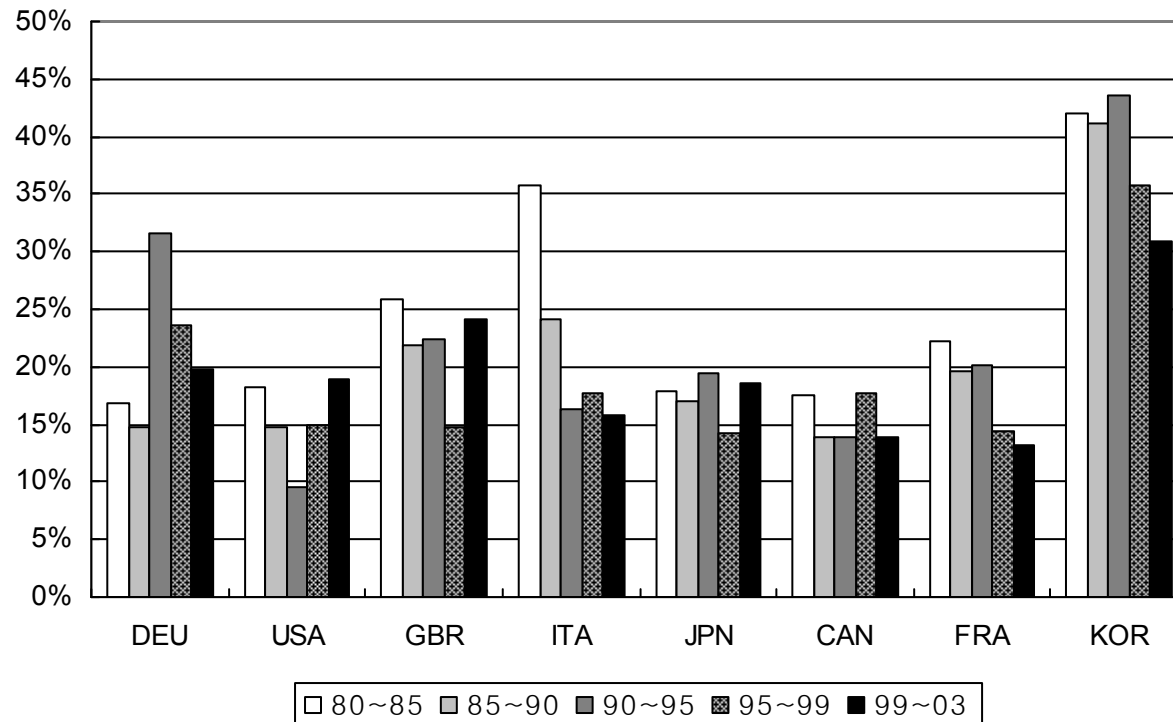
**Real
Value-added**

Author's calculation based on the micro-data of
Annual Survey on Mining and Manufacturing, National Statistics Office

Modified Lilien Indicator of Structural Change

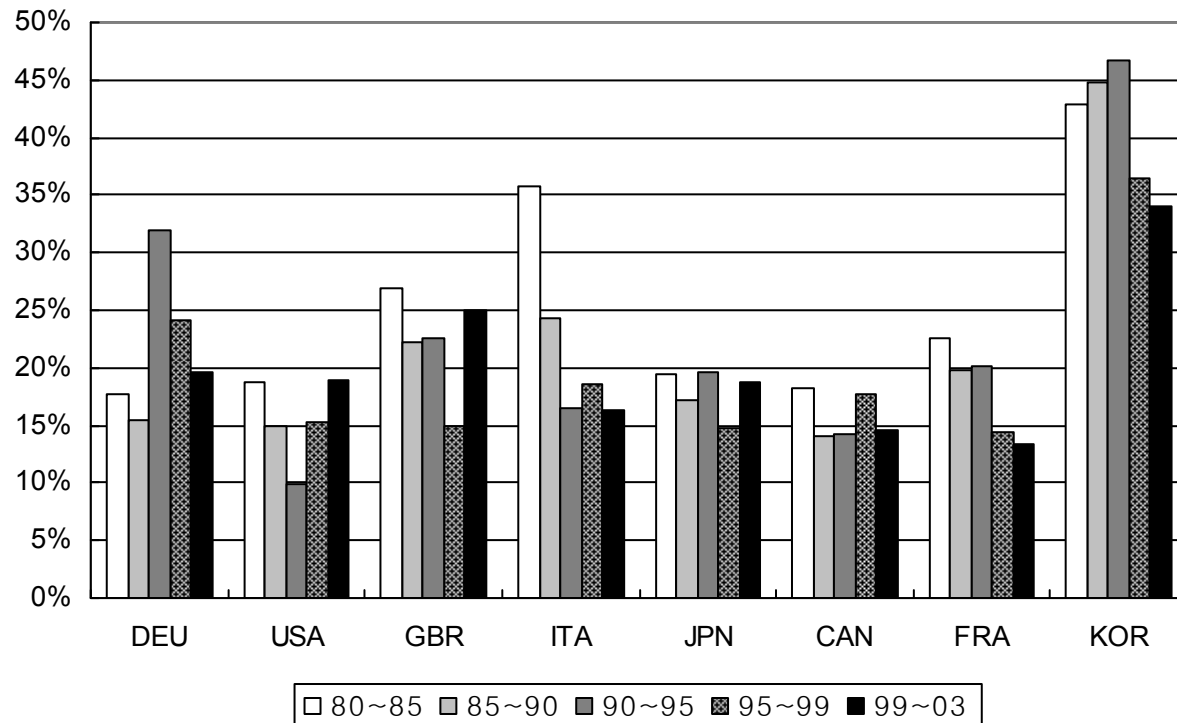
$$SC_t = \sqrt{\sum_{i=1}^n \frac{S_i^t + S_i^{t-1}}{2} \cdot \left(\ln \frac{S_i^t}{S_i^{t-1}} \right)^2}$$

International comparison of rate of industrial structural change: All industries (9 sectors)



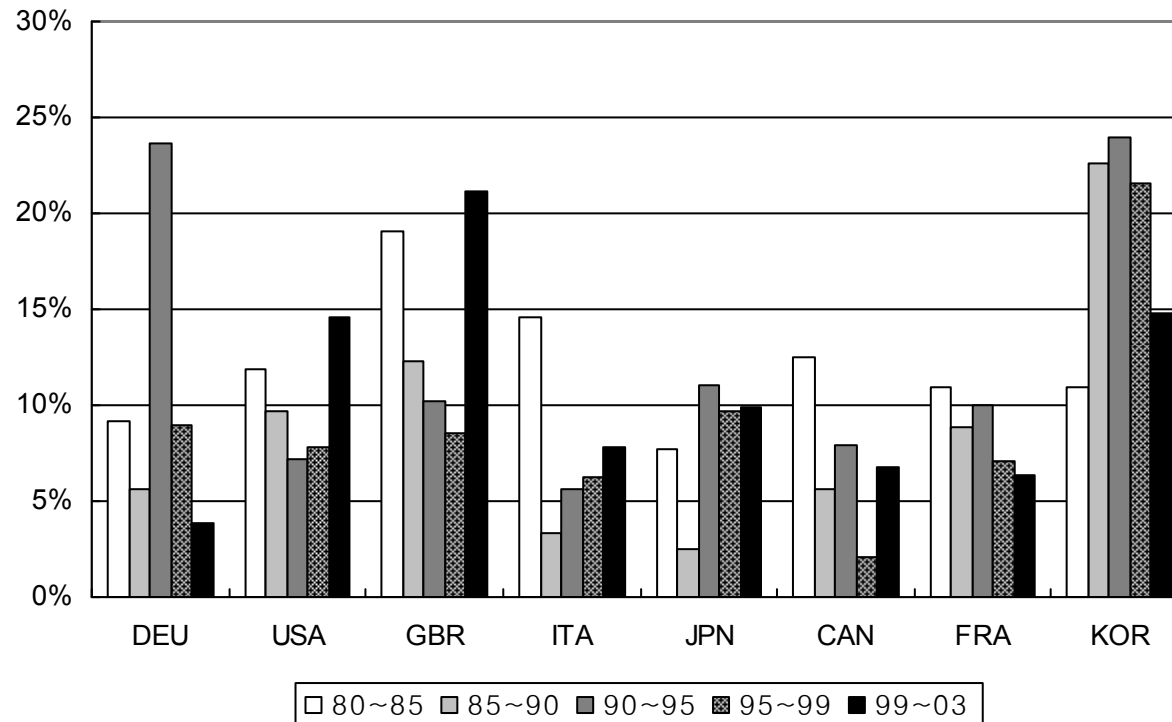
Source: Author's calculation based on OECD STAN indicators database, 2005

International comparison of rate of industrial structural change: All industries (11 sectors)



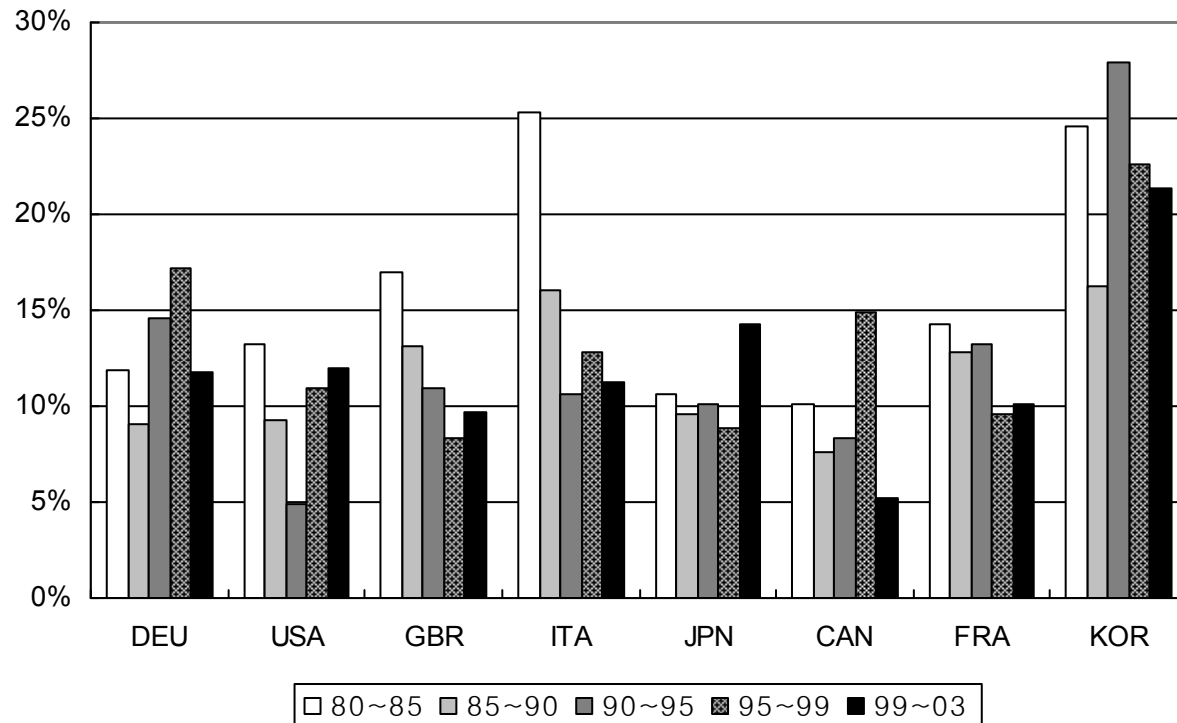
Source: Author's calculation based on OECD STAN indicators database, 2005

International comparison of rate of industrial structural change: Manufacturing industry (3 sectors)



Source: Author's calculation based on OECD STAN indicators database, 2005

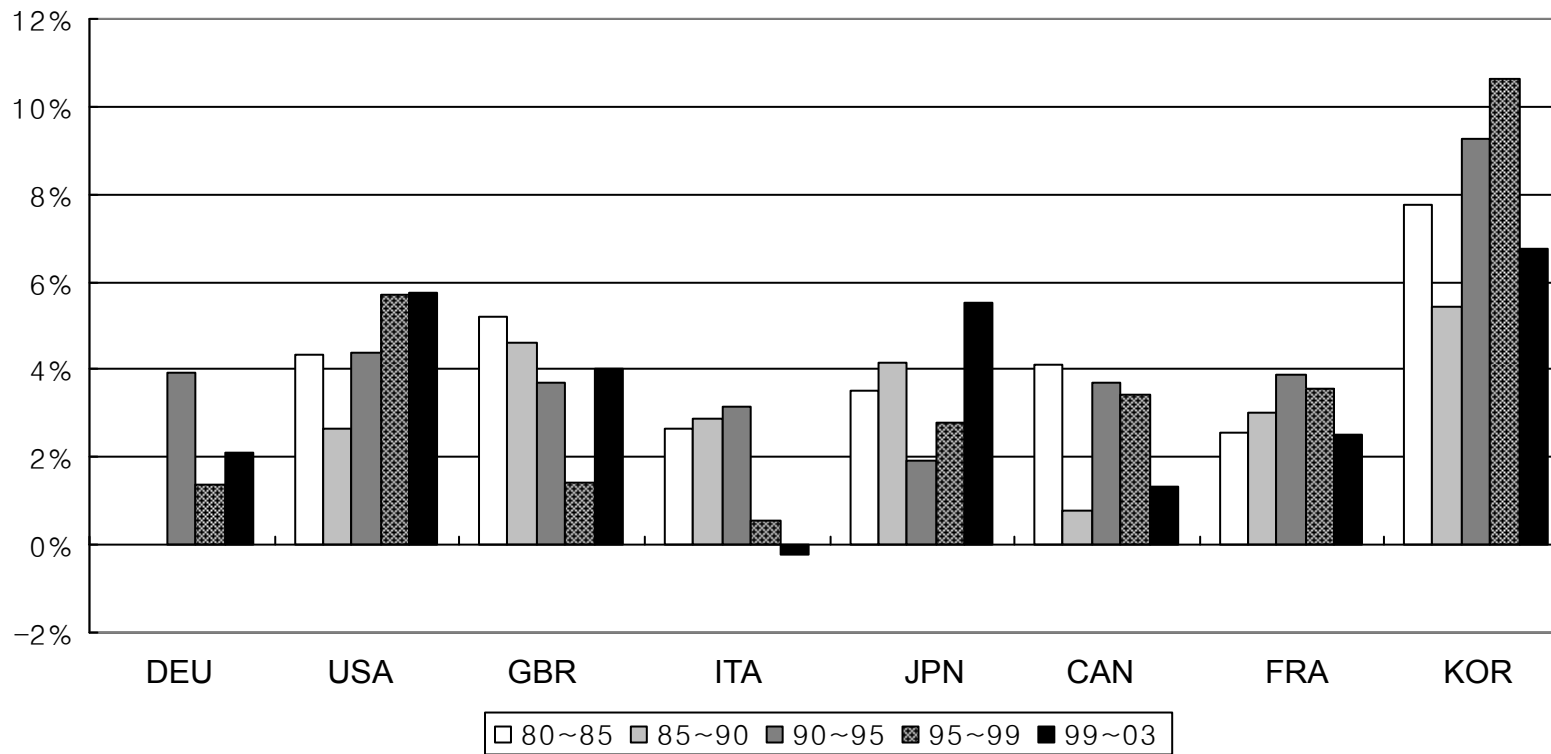
International comparison of rate of industrial structural change: Service industry (4 sectors)



Source: Author's calculation based on OECD STAN indicators database, 2005

International comparison of the trend in yearly average growth rate of labor productivity

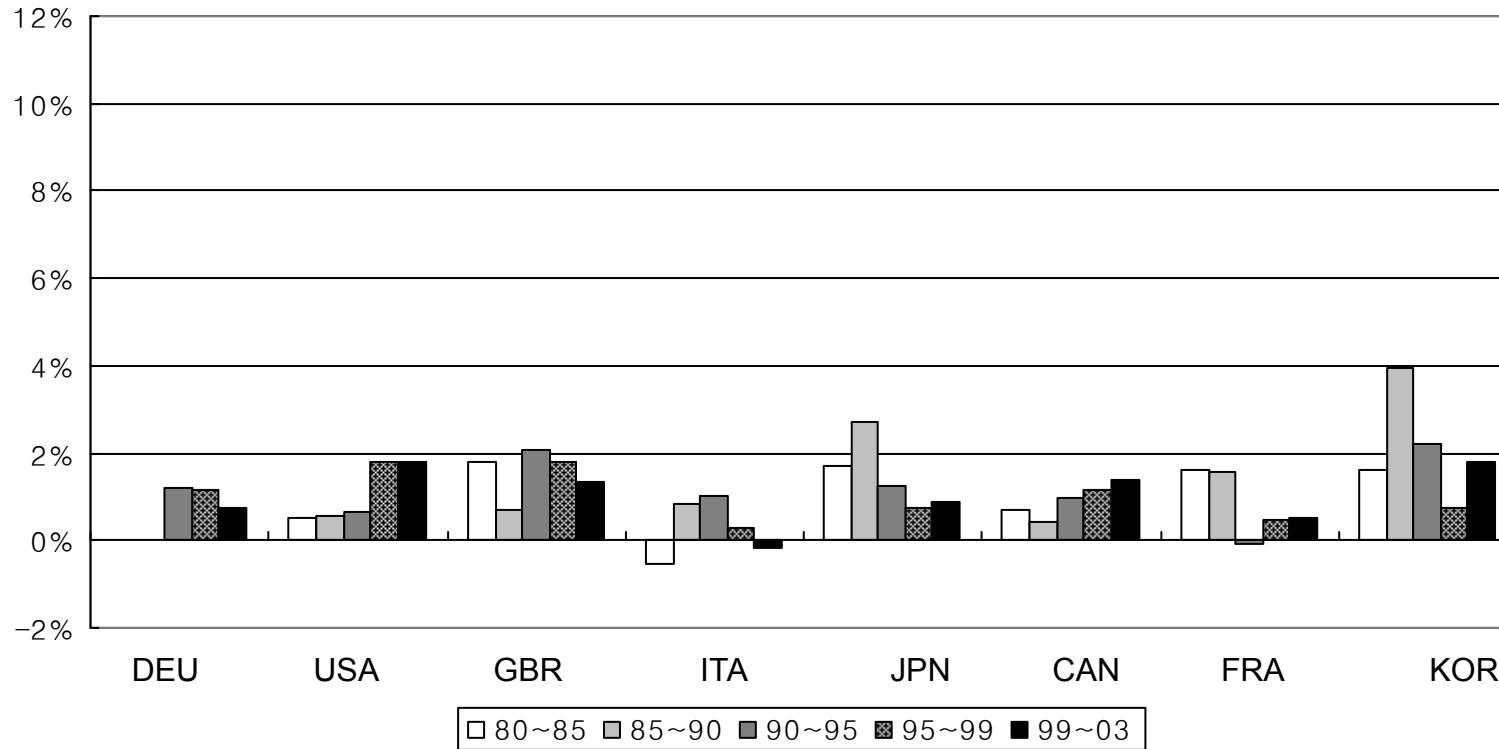
Whole manufacturing industry



Author's calculation based on *OECD Stan Indicators*

International comparison of the trend in yearly average growth rate of labor productivity

Whole service industry



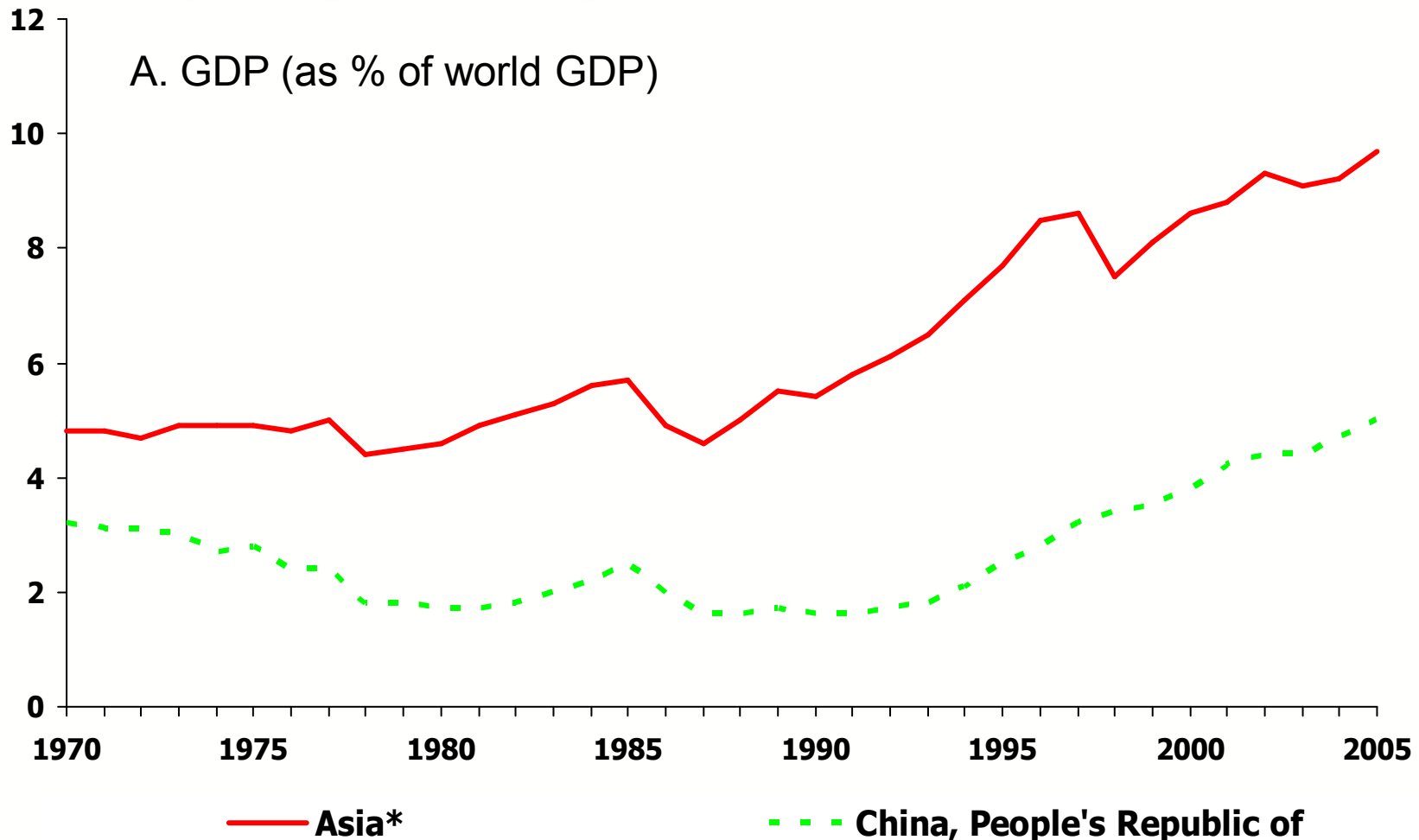
Author's calculation based on *OECD Stan Indicators*

Part-02

Impacts of Globalization

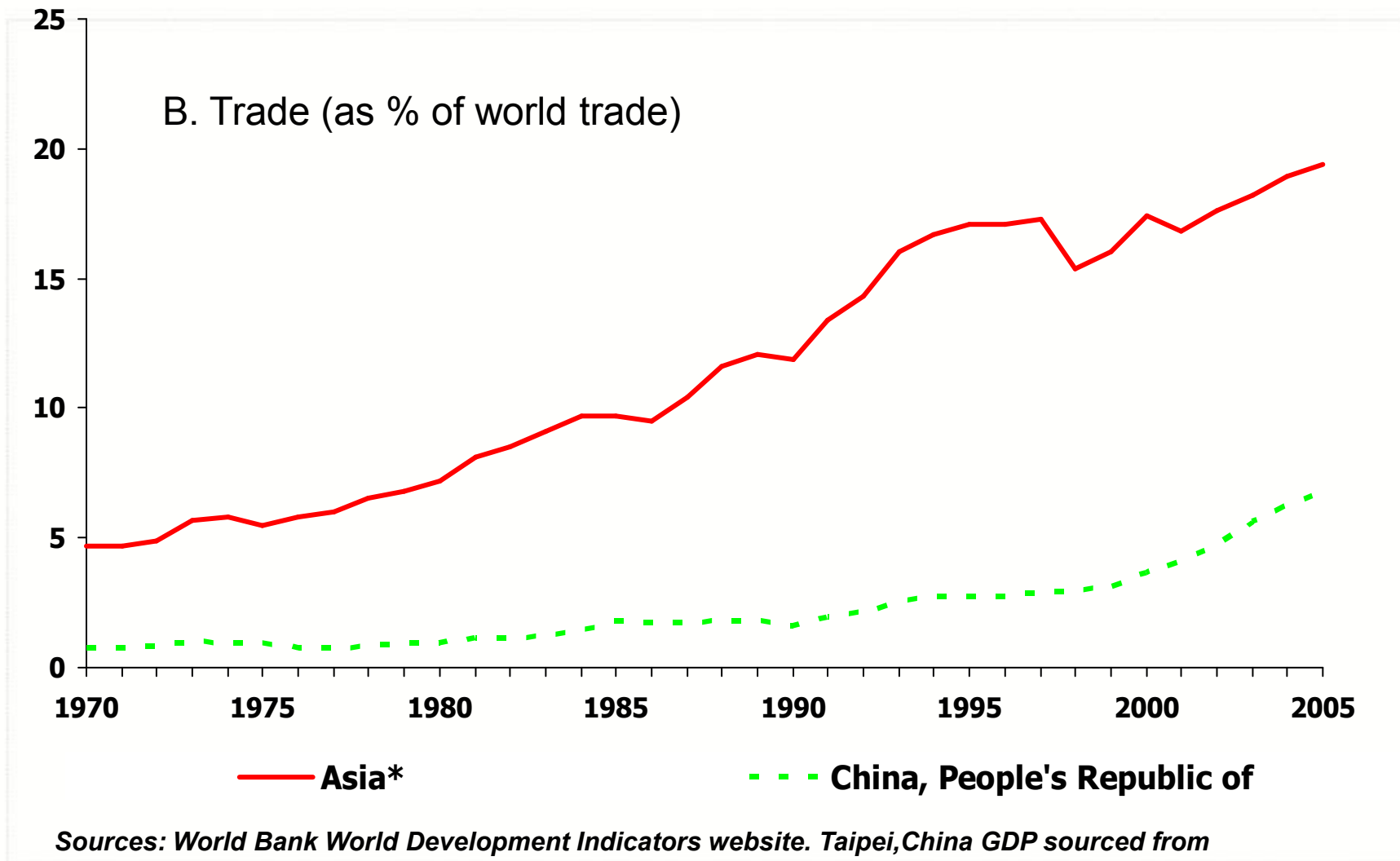
KDI

The Emergence of East Asia (Ahn and Lee, 2007)



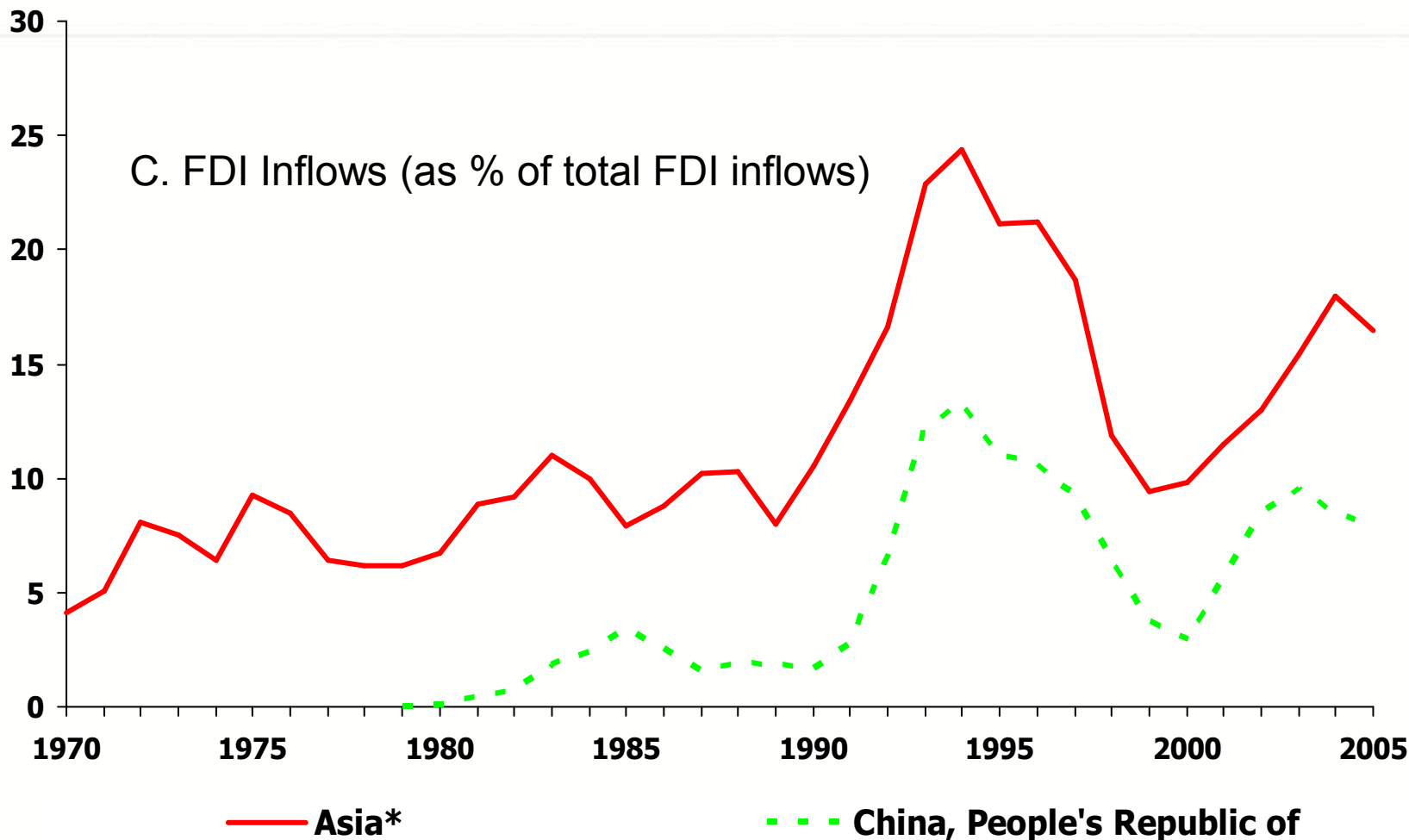
Sources: World Bank World Development Indicators website. Taipei, China GDP sourced from Directorate General of Budget, Accounting and Statistics 93SNA basis.

The Emergence of East Asia



Sources: World Bank World Development Indicators website. Taipei, China GDP sourced from Directorate General of Budget, Accounting and Statistics 93SNA basis.

The Emergence of East Asia



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Inward FDI into The People's Republic of China, by source economy (Ahn and Ito, 2007)



(a) Number of Inward FDI Projects and Amount of Investment

	No. of projects				Amount of investments fulfilled			
	2003		2004		2003		2004	
World Total	41,081	(100.0)	43,664	(100.0)	5,350,467	(100.0)	6,062,998	(100.0)
Hong Kong, China	13,633	(33.2)	14,719	(33.7)	1,770,010	(33.1)	1,899,830	(31.3)
Japan	3,254	(7.9)	3,454	(7.9)	505,419	(9.4)	545,157	(9.0)
Taipei, China	4,495	(10.9)	4,002	(9.2)	337,724	(6.3)	311,749	(5.1)
Macau	580	(1.4)	715	(1.6)	41,660	(0.8)	54,639	(0.9)
Korea, Rep. of	4,920	(12.0)	5,625	(12.9)	448,854	(8.4)	624,786	(10.3)
US	4,060	(9.9)	3,925	(9.0)	419,851	(7.8)	394,095	(6.5)
Canada	901	(2.2)	995	(2.3)	56,351	(1.1)	61,387	(1.0)
Europe	2,074	(5.0)	2,423	(5.5)	393,031	(7.3)	423,904	(7.0)
Germany	451	(1.1)	608	(1.4)	85,697	(1.6)	105,848	(1.7)
France	269	(0.7)	289	(0.7)	60,431	(1.1)	65,674	(1.1)
Italy	297	(0.7)	358	(0.8)	31,670	(0.6)	28,082	(0.5)
Netherland	189	(0.5)	199	(0.5)	72,549	(1.4)	81,056	(1.3)
UK	438	(1.1)	488	(1.1)	74,247	(1.4)	79,282	(1.3)
ASEAN-5	2,128	(5.2)	2,156	(4.9)	285,309	(5.3)	290,962	(4.8)
Singapore	1,144	(2.8)	1,279	(2.9)	205,840	(3.8)	200,814	(3.3)
Indonesia	143	(0.3)	122	(0.3)	15,013	(0.3)	10,452	(0.2)
Malaysia	350	(0.9)	352	(0.8)	25,103	(0.5)	38,504	(0.6)
Philippines	297	(0.7)	241	(0.6)	22,001	(0.4)	23,324	(0.4)
Thailand	194	(0.5)	162	(0.4)	17,352	(0.3)	17,868	(0.3)
Others	5,036	(12.3)	5,650	(12.9)	1,092,258	(20.4)	1,456,489	(24.0)
Br. Virgin Iss.	2,218	(5.4)	2,641	(6.0)	577,696	(10.8)	673,030	(11.1)

Note: In US\$ 10,000's. Figures in parenthesis indicate shares in World Total in percent.

Source: Ministry of Commerce, People's Republic of China (2004, 2005)

Inward FDI in China (by home country)

(a) Number of inward FDI projects and amount of investment					
(Unit: US\$10,000)					
	No. of projects			Amount of investment	
	2004			2004	
World Total	43,664	(100.0)		6,062,998	(100.0)
Hong Kong	14,719	(33.7)		1,899,830	(31.3)
Japan	3,454	(7.9)		545,157	(9.0)
Taiwan	4,002	(9.2)		311,749	(5.1)
Macau	715	(1.6)		54,639	(0.9)
Korea	5,625	(12.9)		624,786	(10.3)
USA	3,925	(9.0)		394,095	(6.5)
Canada	995	(2.3)		61,387	(1.0)
Europe	2,423	(5.5)		423,904	(7.0)
ASEAN-5	2,156	(4.9)		290,962	(4.8)

FDI Position of OECD Countries

Figure B.3.3. Outward FDI position of OECD countries as a percentage of GDP

2002

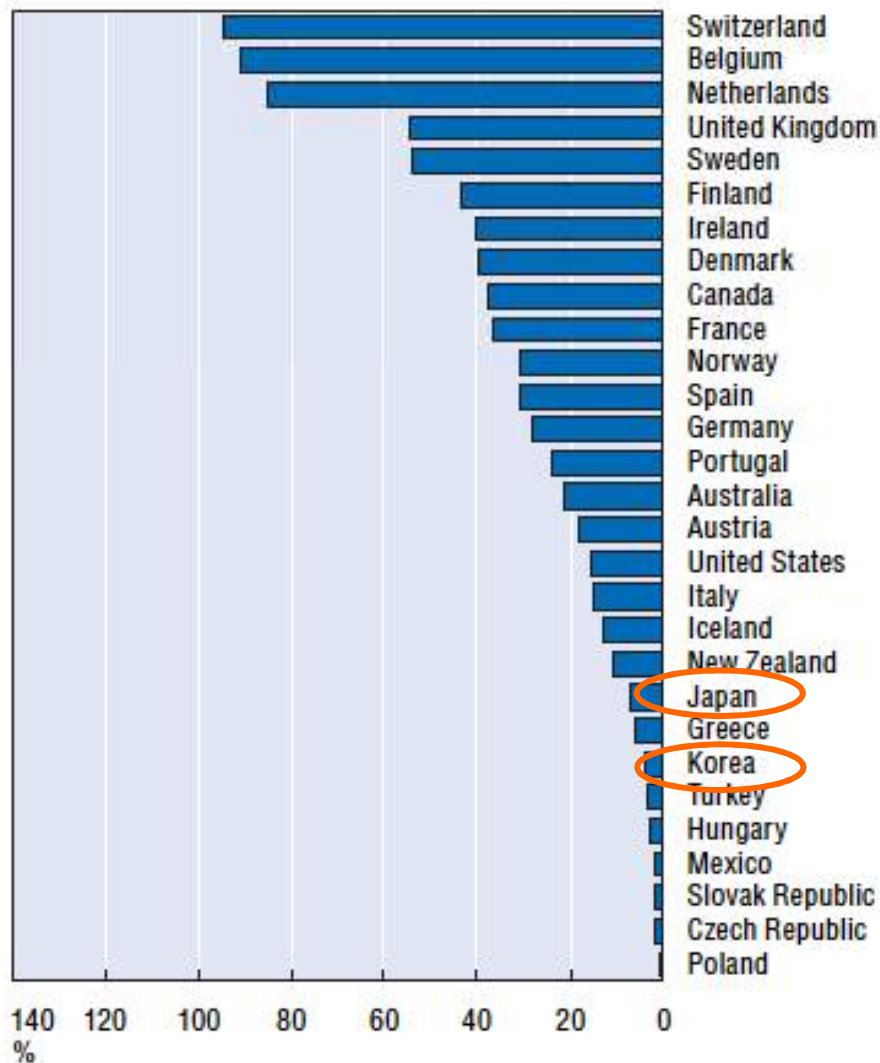
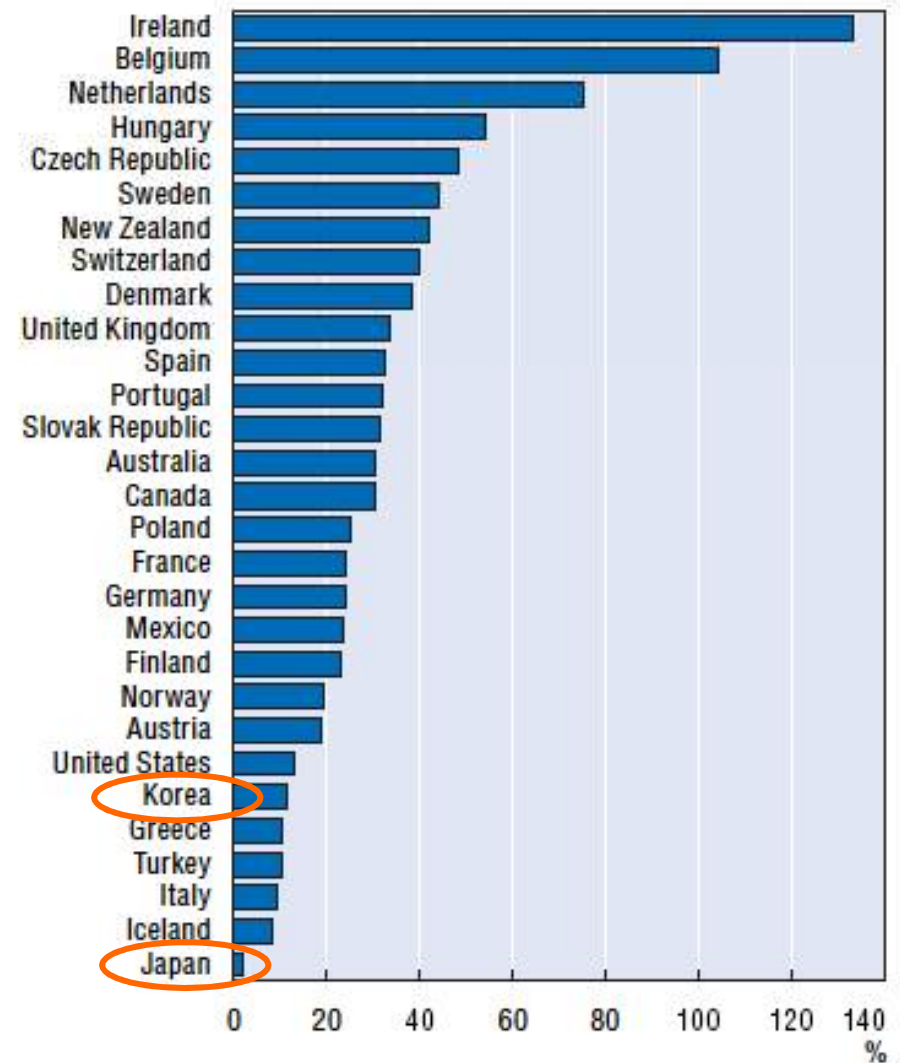


Figure B.3.4. Inward FDI position of OECD countries as a percentage of GDP

2002



FDI to non-OECD countries

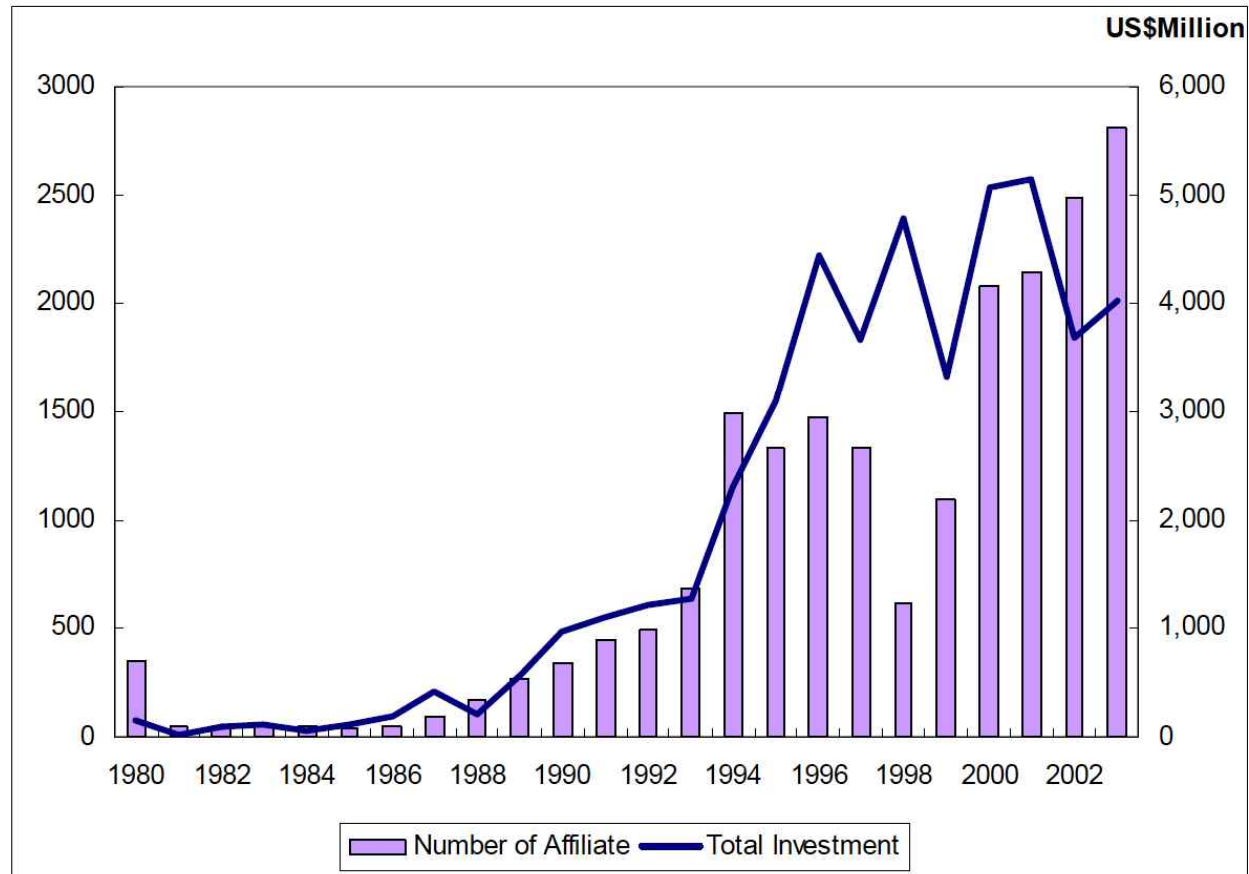
Figure B.8.4. OECD¹ outward investment to non-OECD countries as a percentage of total outward FDI stocks

2002²



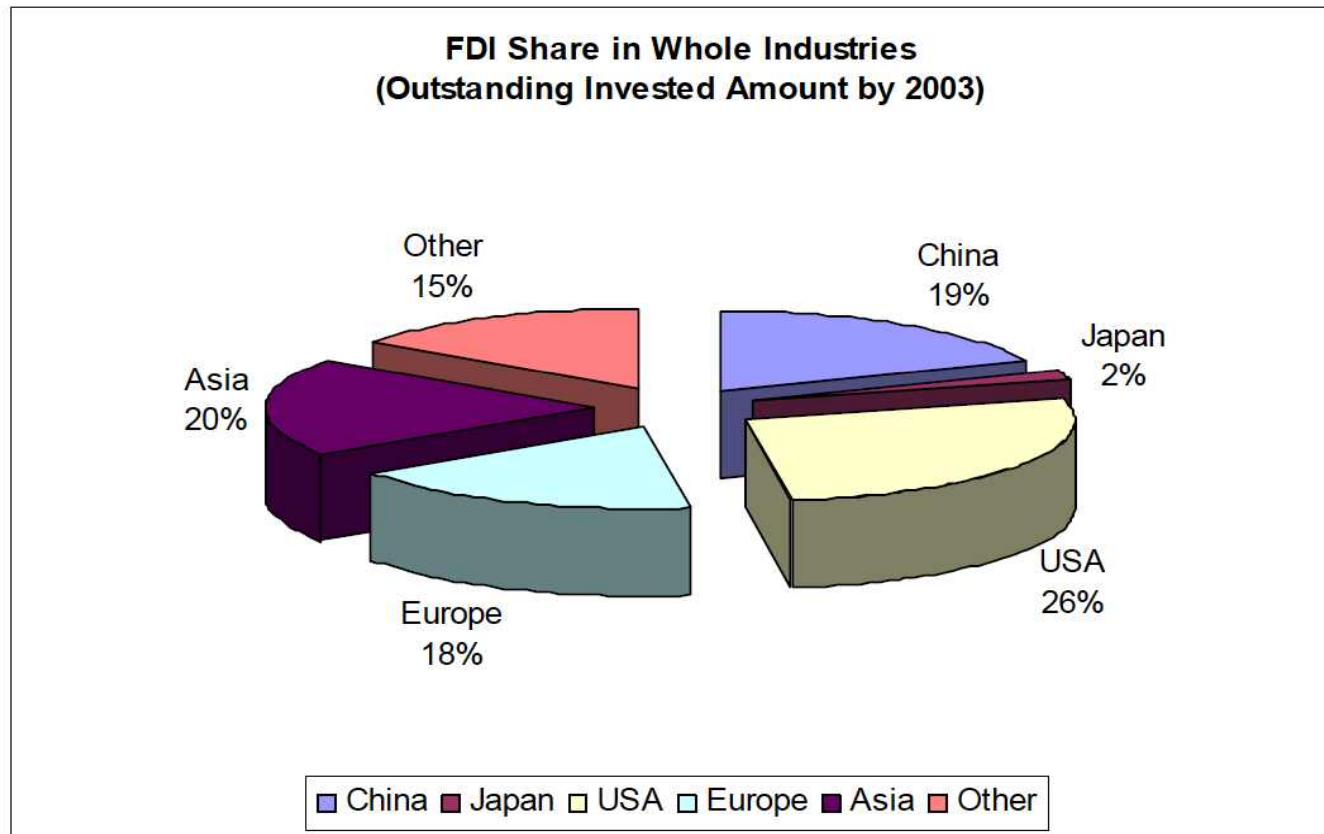
Recent Surge in Outbound FDI

<Figure 3.1> Outbound FDI for Korea



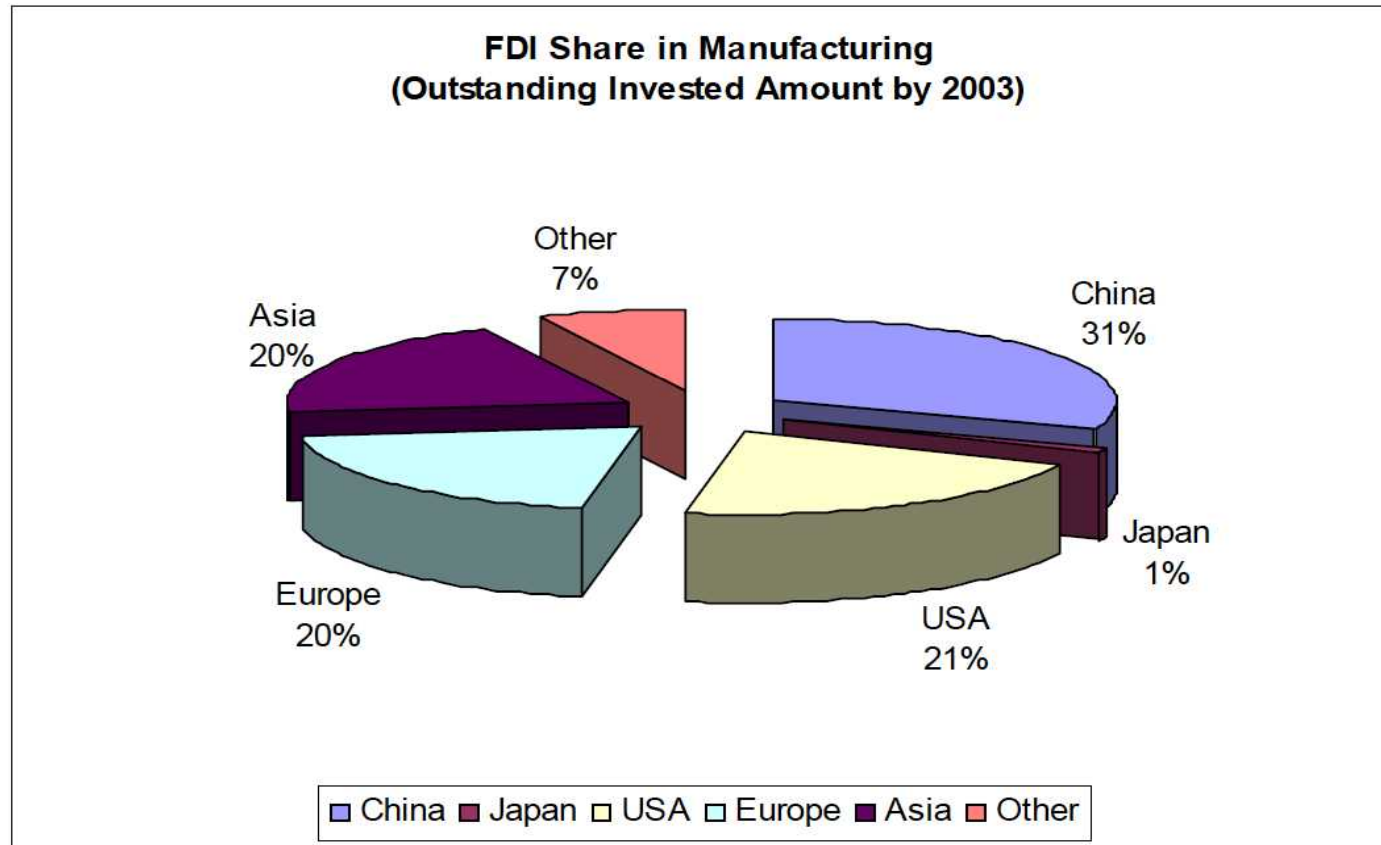
Composition of Outbound FDI (by Destination)

<Figure 3.2> Outbound FDI for Korea, by Destination



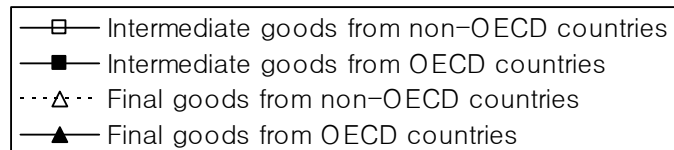
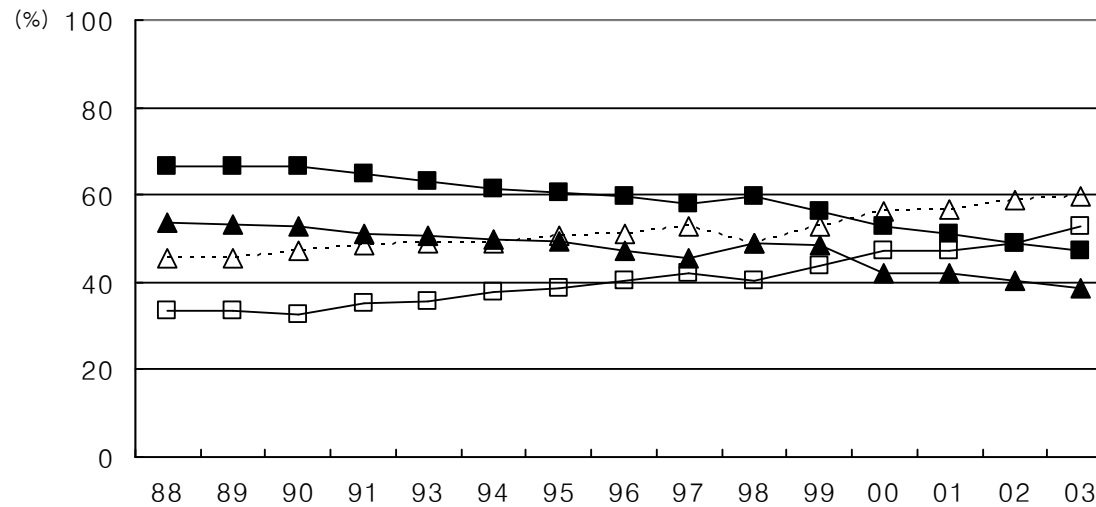
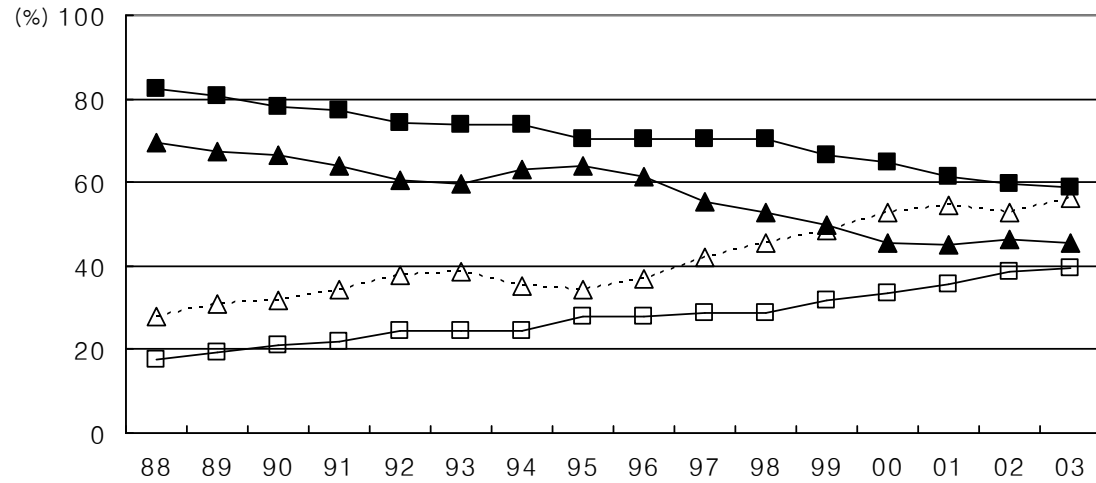
Composition of Outbound FDI (by Destination)

<Figure 3.3> Korea Outbound FDI in Manufacturing, by Destination



- Links between integration and productivity growth:
 - Plants in an industry with a **higher growth rate of FDI inflows** over the previous 3 years tend to have **faster productivity growth** over the following 3 years.
 - Industry-level **trade** and **FDI outflows** also have positive spillover effects on individual plants' productivity growth.
- The nature of international integration matters:
 - Integration with more advanced economies could have larger benefits.

Trend in import share of final and intermediate goods by region



Source: Pain (2006)

- **Intra-regional trade in East Asia** grew remarkably during the period 1990-2003. While overall trade with the rest of the world roughly doubled in this period, intra-regional trade in East Asia more than tripled.
- The main factor behind increased intra-regional trade in East Asia was the **trade in intermediate goods through outsourcing** and the international fragmentation of production.
- Reflecting the fact that **outsourcing to Asia (particularly to China)** has a negative impact on the demand for workers with lower education and a positive impact on the demand for workers with higher education, relative wage shares of workers by educational attainment have changed substantially both in Japan and Korea.
- Although the overall effects of outsourcing have been insignificant in Korea partly because a substantial part of Korean outsourcing remained directed towards Japan, **labor demand in Korea would shift away from less-skilled workers towards more-skilled workers if outsourcing to China increased and outsourcing to Japan decreased in the future.**

Part-03

Productivity Dynamics

(Ahn, Fukao, Kim, and Kwon, 2012)

KDI

Japan and Korea

- **Similarities**
 - Export-oriented growth
 - Strong manufacturing (but weak tertiary sector?)
 - Aging population
 - Increasing competition from emerging economies (especially from China)
- **Differences**
 - Different size
 - Distance to frontier
 - Latecomer's advantage
 - Speed of recovery
 - Different challenges

Micro Data: Japan

- **Main Data Source: *Census of Manufactures***
 - **Coverage: All plants in the manufacturing sector (with 4 or more employees)**
 - **Information: Shipments, number of employees, book value of tangible fixed assets, wage bill, intermediate materials, etc.**
 - **Plant-level, not firm-level**
- **Additional Data Sources**
 - ***Establishment and Enterprise Census*: Larger coverage of establishments, but fewer items covered**
 - ***Basic Survey of Japanese Business Structure and Activities* : Firm-level data since 1991**

Micro Data: Korea

- **Main Data Source: *Mining and Manufacturing Survey***
 - **Coverage**: All plants with five or more employees in the mining and manufacturing industries
 - **Information**: Plant-level information on output, inputs, and a variety of additional items, including the plant ID, the regional code, and the industry code assigned to each plant based on its major product. Similar to *Census of Manufactures* of Japan
 - Plant-level, not firm level
- **Additional Data Sources**
 - ***Census on Establishments***: Larger coverage of establishments, but fewer items covered
 - ***Survey of Business Activities***: Firm-level data since 2005

Analysis of Productivity Dynamics

- Panel data based on *Census of Manufactures* (Japan, 1985-2005) and *Mining and Manufacturing Survey* (Korea, 1985-2003).

- Calculation of TFP at the plant level

- Following Good, Nadiri and Sickles (1997) and Aw, Chen and Roberts (2001), we measured each plant's TFP level in comparison with the industry average TFP level.
- Aggregation at industry level (54 manufacturing sectors in Japan; 34 manufacturing sectors in Korea)

$$\ln TFP_{f,t} = (\ln Q_{f,t} - \overline{\ln Q_t}) - \sum_{i=1}^n \frac{1}{2} (S_{i,f,t} + \overline{S_{i,t}}) (\ln X_{i,f,t} - \overline{\ln X_{i,t}}) \text{ for } t = 0,$$

and

$$\ln TFP_{f,t} = (\ln Q_{f,t} - \overline{\ln Q_t}) - \sum_{i=1}^n \frac{1}{2} (S_{i,f,t} + \overline{S_{i,t}}) (\ln X_{i,f,t} - \overline{\ln X_{i,t}})$$

$$+ \sum_{s=1}^t (\overline{\ln Q_s} - \overline{\ln Q_{s-1}}) - \sum_{s=1}^t \sum_{i=1}^n \frac{1}{2} (\overline{S_{i,s}} + \overline{S_{i,s-1}}) (\overline{\ln X_{i,s}} - \overline{\ln X_{i,s-1}})] \text{ for } t \geq 1.$$

Productivity Dynamics Decomposition

- We define the industry TFP level in year t as:

$$\ln TFP_t = \sum_{f=1}^n \theta_{f,t} \ln TFP_{f,t}$$

- We can decompose changes in industry average TFP levels into the sum of the following four factors (Foster, Haltiwanger and Krizan, 2001):

➤ Within effect:

$$\sum_{f \in S} \theta_{f,t-\tau} \Delta \ln TFP_{f,t}$$

➤ Between effect:

$$\sum_{f \in S} \Delta \theta_{f,t} (\ln TFP_{f,t-\tau} - \overline{\ln TFP_{t-\tau}})$$

➤ Covariance effect:

$$\sum_{f \in S} \Delta \theta_{f,t} \Delta \ln TFP_{f,t}$$

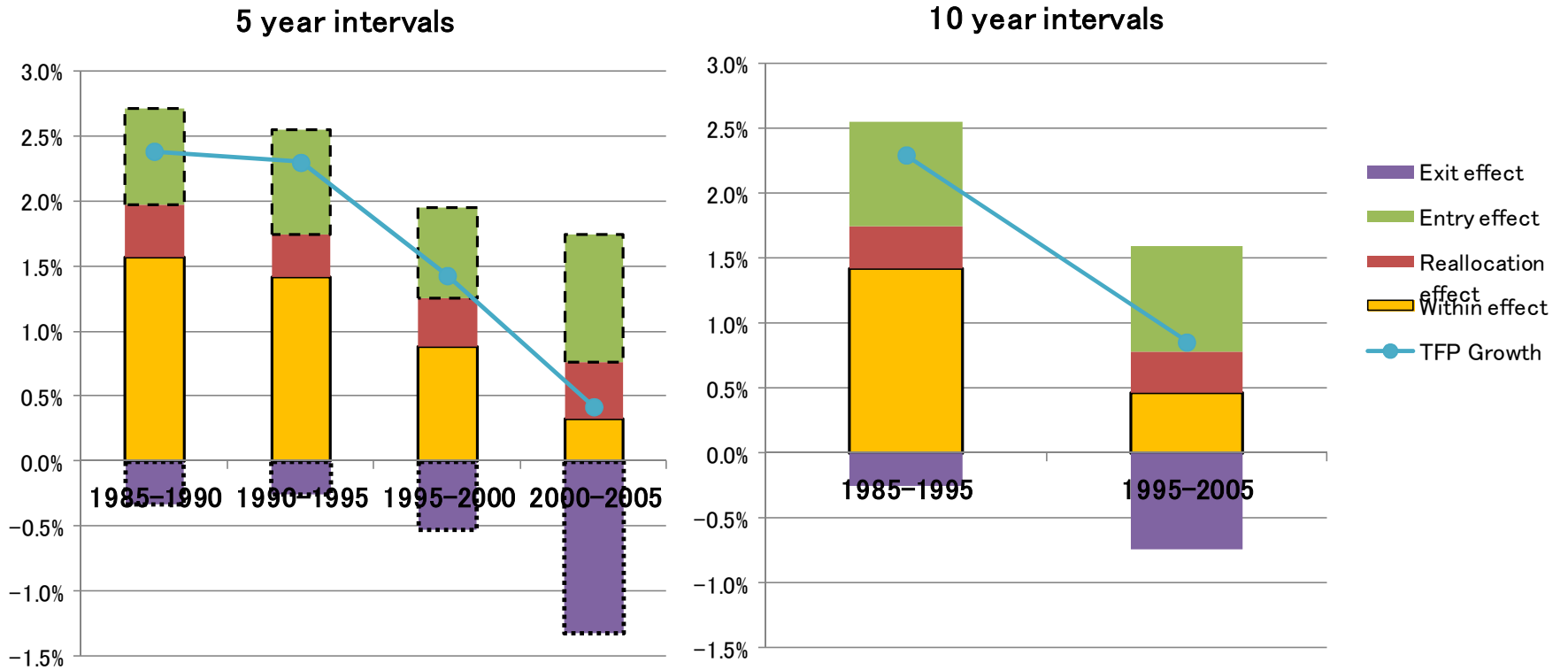
➤ Entry effect:

$$\sum_{f \in N} \theta_{f,t} (\ln TFP_{f,t} - \overline{\ln TFP_{t-\tau}})$$

➤ Exit effect:

$$\sum_{f \in X} \theta_{f,t-\tau} (\overline{\ln TFP_{t-\tau}} - \ln TFP_{f,t-\tau})$$

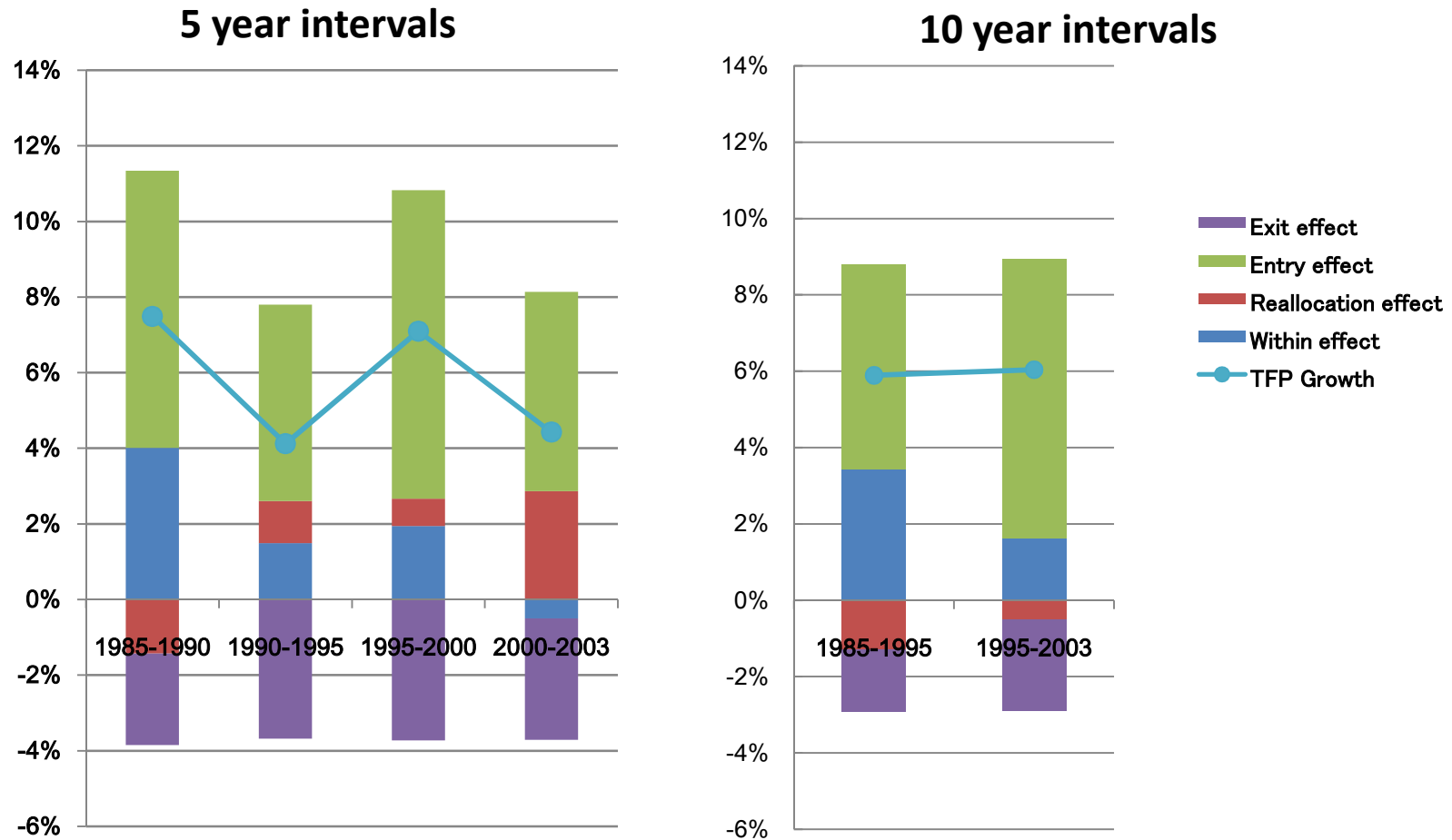
Productivity Dynamics: Japan



Productivity Dynamics: Japan

- **TFP growth has been declining since 1990.**
- **Most of the productivity decline occurred within plants.**
- **Plants with higher productivity tend to increase their market share and Entering plants tend to have above-average productivity levels.**
- **Exiting firms also tend to have above-average productivity levels, lowering aggregate productivity level. Such negative exit effects have been sizable.** (In fact, most of the decrease in TFP growth during 2000-2005 can be explained by negative exit effects.)

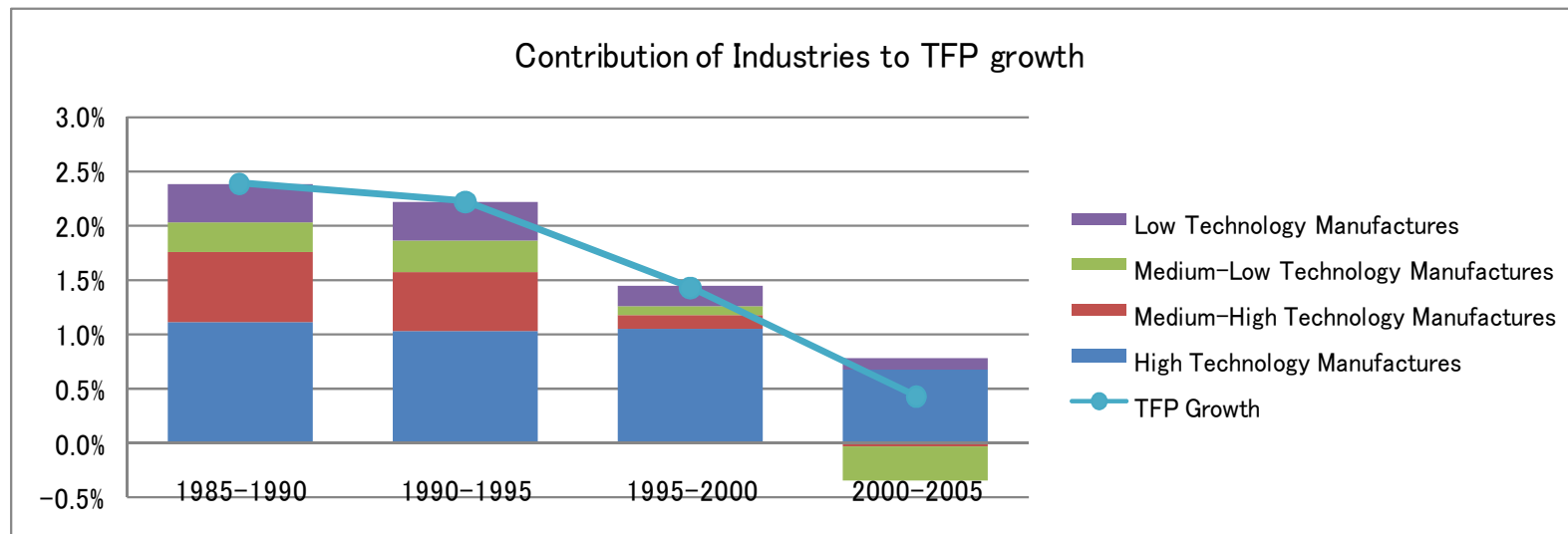
Productivity Dynamics: Korea



Productivity Dynamics: Korea

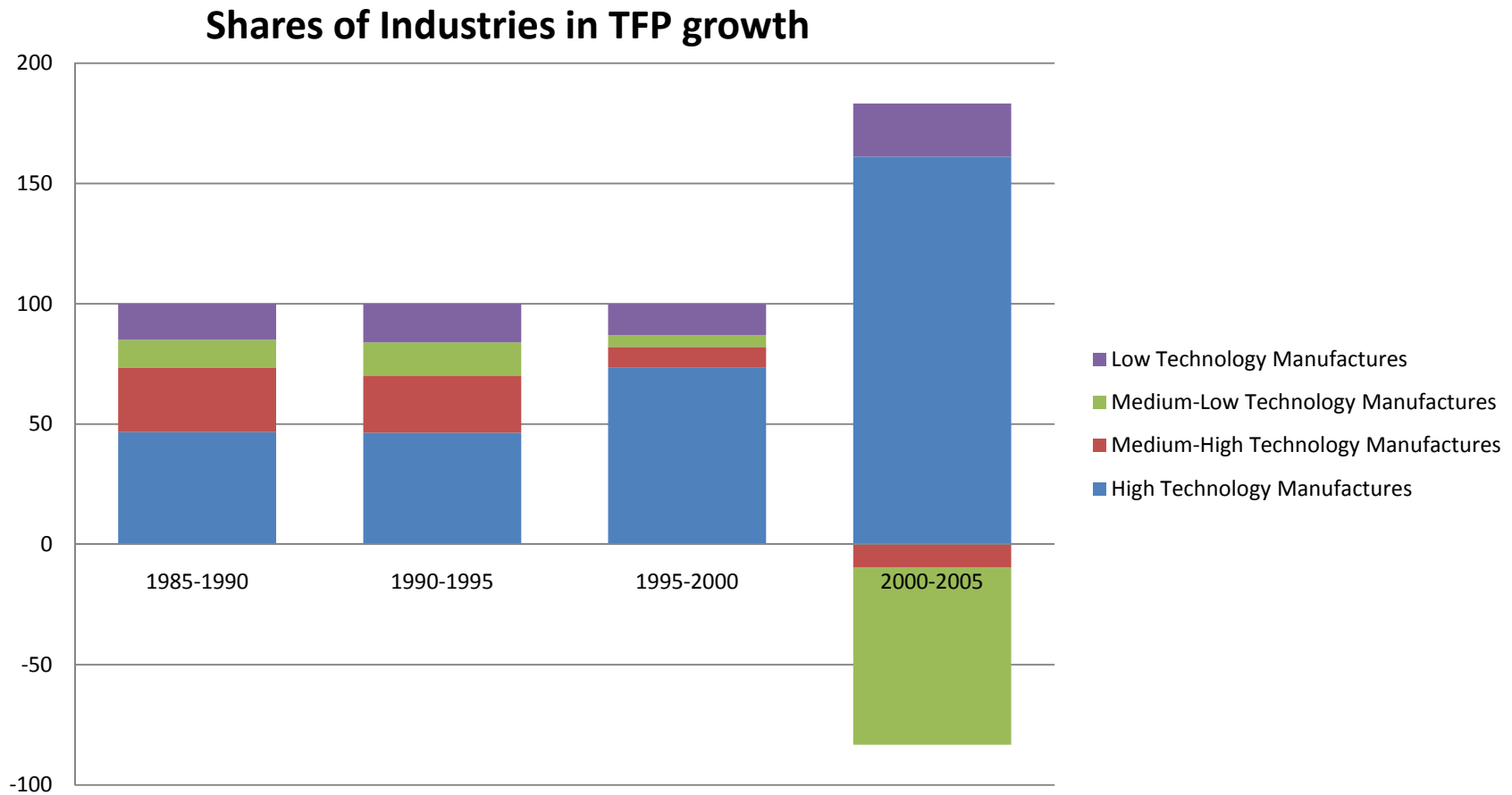
- **TFP growth rate still remains high.**
- **Within plant productivity growth has been declining, while plant entry continues to have positive effects.**
- **Similar to Japan, many exiting plants have above-average productivity.**
- **The negative exit effect was not only sizable but also persistent.**

Technology and Productivity Dynamics: Japan



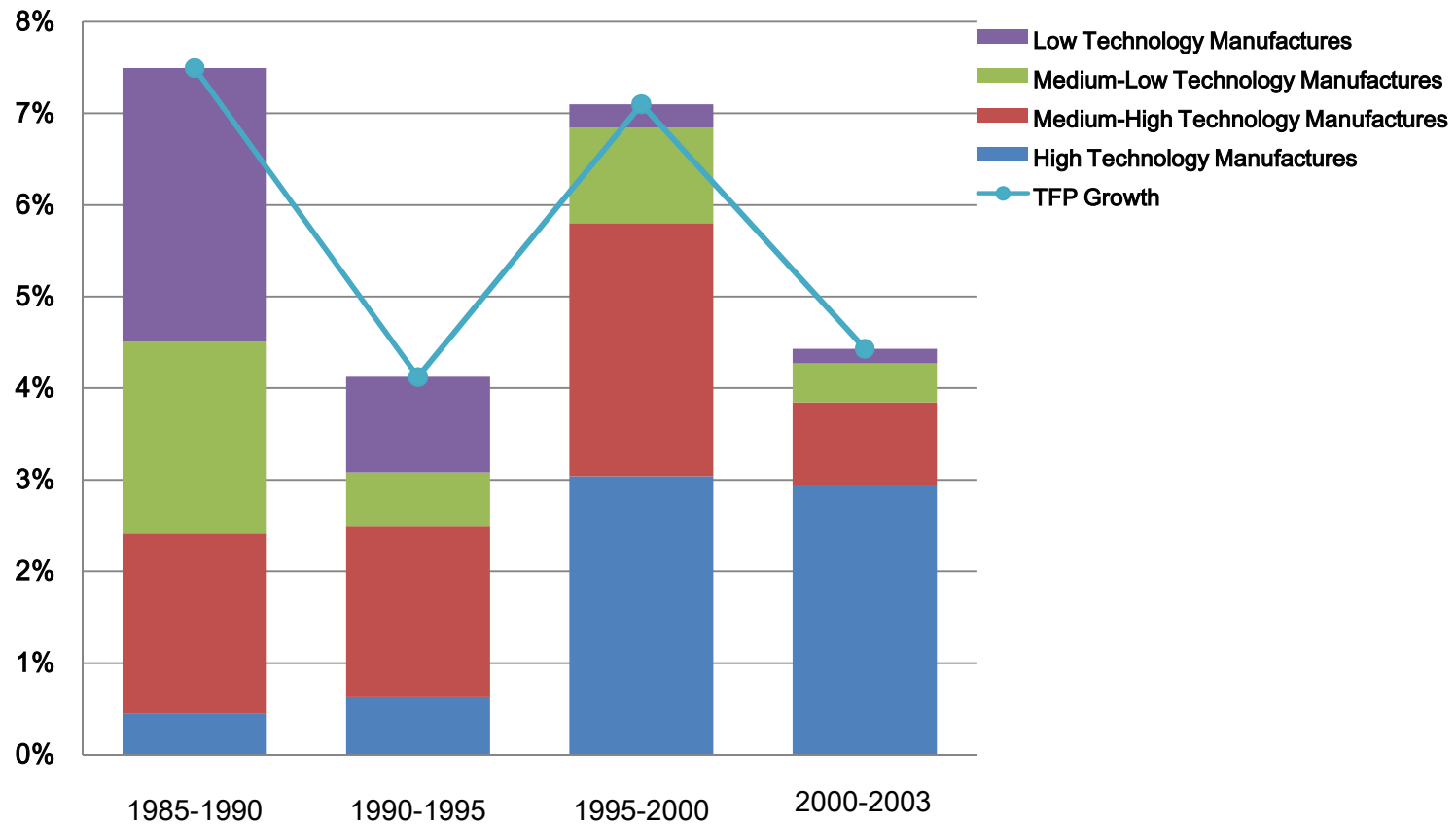
- **High technology industries, such as electronics and pharmaceutical industry account for most of the productivity growth in the manufacturing sector.**
- **The contribution of medium-high and medium low technology industries (such as chemicals, motor vehicles, iron and steel) has sharply declined since 1995.**

Technology and Productivity Dynamics: Japan



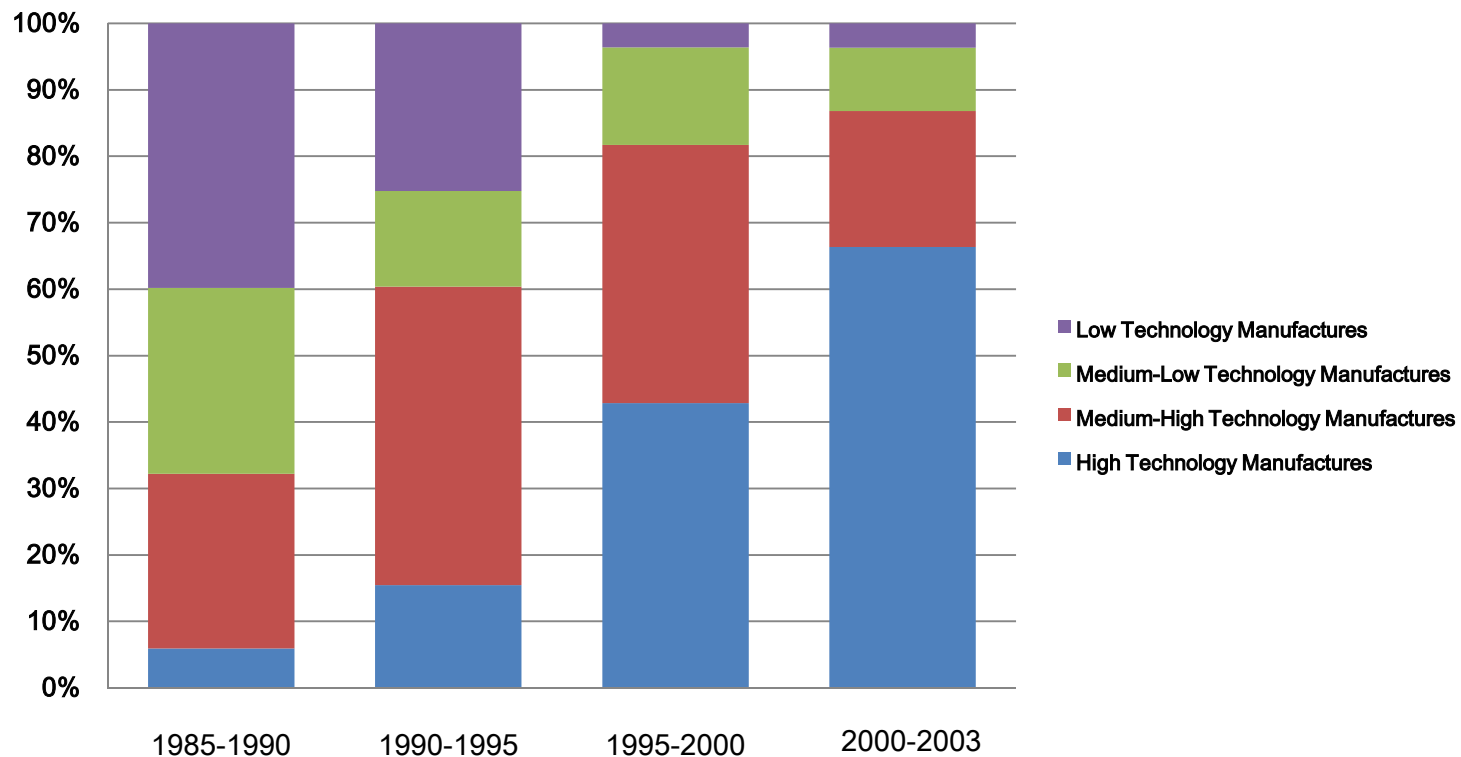
Technology and Productivity Dynamics: Korea

Contribution of Industries to TFP growth



Technology and Productivity Dynamics: Korea

Shares of Industries in TFP growth



TFP Growth Decomposition: '90-'03

Industry	Within Effect	Between Effect	Co-variance	Stayers' Total Effect	Entry Effect	Exit Effect	Switch-In	Switch-Out	Net Entry Effect	Industry Total	Average Share	Share Change
	a	b	c	d=a+b+c	e	f	g	h	i=e+f+g+h	j=d+i		
High-Tech	0.81%	-0.04%	-0.07%	0.70%	1.31%	-0.17%	0.33%	-0.11%	1.37%	2.07%	17.35%	21.28%
Medium-High	0.74%	-0.12%	-0.05%	0.58%	0.88%	-0.13%	0.13%	-0.11%	0.77%	1.35%	29.41%	11.34%
Medium-Low	0.09%	-0.15%	0.15%	0.09%	0.27%	-0.11%	0.03%	-0.08%	0.11%	0.19%	22.63%	-6.24%
Low Tech	-0.21%	-0.18%	0.25%	-0.14%	0.49%	-0.40%	0.05%	-0.11%	0.03%	-0.10%	30.60%	-26.38%
Total Manufacturing	1.43%	-0.48%	0.28%	1.23%	2.96%	-0.81%	0.54%	-0.41%	2.27%	3.51%		
Contribution of Each Effect	40.84%	-13.77%	8.06%	35.14%	84.40%	-23.24%	15.34%	-11.64%	64.86%	100.00%		

Decomposition of TFP growth rate of manufacturing industry

Period before the Financial Crisis: 1990-1995 (annual average growth rate)

Industry	Within effect	Between effect	Covariance effect	Total effect among stayers	Entry effect	Exit effect	Switch-in effect	Switch-out effect	Net-entry effect	Industry total	Average share	Change in share
	a	b	c	d=a+b+c	e	f	g	h	i=e+f+g+h	j=d+i		
High-tech	0.37%	-0.12%	0.41%	0.66%	0.20%	-0.08%	0.05%	-0.05%	0.12%	0.79%	8.82%	4.21%
Medium-high tech	0.69%	-0.32%	0.30%	0.67%	0.44%	-0.22%	0.36%	-0.13%	0.46%	1.13%	27.31%	7.13%
Medium-low tech	0.22%	-0.48%	0.58%	0.32%	0.19%	-0.22%	0.11%	-0.17%	-0.08%	0.23%	25.82%	0.14%
Low-tech	-0.34%	-0.50%	1.12%	0.28%	0.93%	-1.08%	0.05%	-0.09%	-0.18%	0.10%	38.05%	-11.48%
Weighted average of all industries	0.94%	-1.42%	2.41%	1.93%	1.77%	-1.60%	0.58%	-0.44%	0.31%	2.25%		
Share of each effect in industry's TFP growth	42.00%	-63.10%	107.12%	86.02%	78.67%	-70.99%	25.72%	-19.42%	13.98%	100.0%		

Decomposition of TFP growth rate of manufacturing industry

Period including the Financial Crisis: 1995-1999 (annual average growth rate)

Industry	Within effect	Between effect	Covariance effect	Total effect among stayers	Entry effect	Exit effect	Switch-in effect	Switch-out effect	Net-entry effect	Industry total	Average share	Change in share
	a	b	c	d=a+b+c	e	f	g	h	i=e+f+g+h	j=d+i		
High-tech	0.14%	-0.35%	0.59%	0.38%	0.36%	-0.05%	0.81%	-0.12%	1.01%	1.39%	14.29%	6.72%
Medium-high tech	-0.02%	-0.33%	0.93%	0.59%	0.38%	-0.22%	0.24%	-0.05%	0.35%	0.94%	32.74%	3.73%
Medium-low tech	-0.98%	-0.19%	0.78%	-0.39%	0.13%	-0.26%	0.18%	-0.08%	-0.03%	-0.41%	24.39%	-3.00%
Low-tech	-1.03%	-0.37%	1.35%	-0.04%	0.35%	-0.61%	0.12%	-0.07%	-0.21%	-0.25%	28.58%	-7.46%
Weighted average of all industries	-1.88%	-1.23%	3.65%	0.54%	1.23%	-1.15%	1.35%	-0.32%	1.12%	1.66%		
Share of each effect in industry's TFP growth	112.98%	-74.22%	219.93%	32.72%	73.86%	-69.04%	81.46%	-19.00%	67.28%	100.0%		

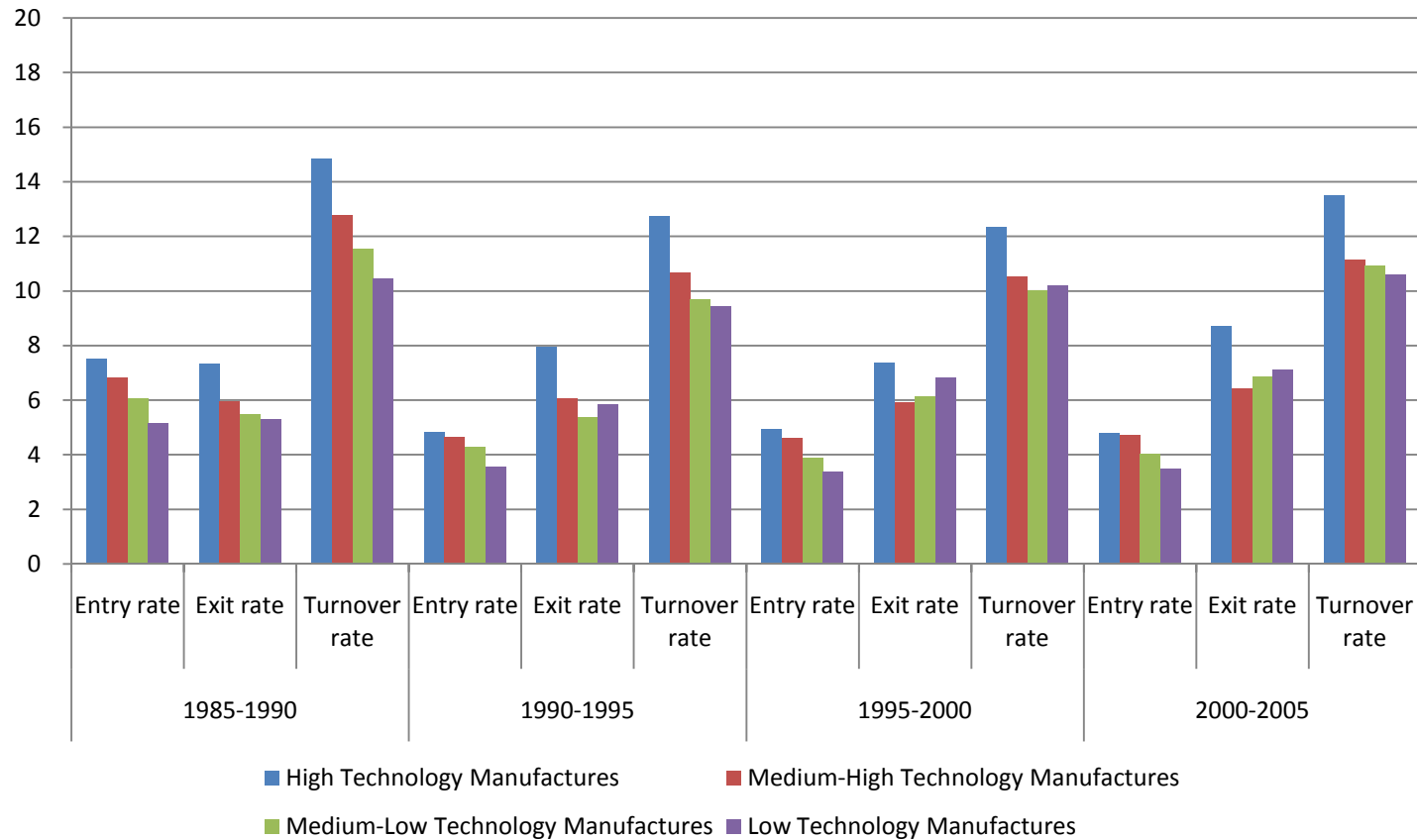
Decomposition of TFP growth rate of manufacturing industry

Period after the Financial Crisis: 1999-2003 (annual average growth rate)

Industry	Within effect	Between effect	Covariance effect	Total effect among stayers	Entry effect	Exit effect	Switch-in effect	Switch-out effect	Net-entry effect	Industry total	Average share	Change in share
	a	b	c	d=a+b+c	e	f	g	h	i=e+f+g+h	j=d+i		
High-tech	2.48%	0.07%	0.17%	2.71%	0.61%	-0.14%	0.19%	-0.07%	0.59%	3.29%	22.82%	10.34%
Medium-high tech	1.42%	-0.75%	1.16%	1.83%	0.40%	-0.15%	0.17%	-0.06%	0.35%	2.18%	34.84%	0.48%
Medium-low tech	0.32%	-0.43%	0.59%	0.48%	0.27%	-0.11%	0.10%	-0.10%	0.16%	0.64%	21.20%	-3.38%
Low-tech	-0.96%	-0.65%	1.12%	-0.50%	0.49%	-0.30%	0.09%	-0.11%	0.17%	-0.33%	21.13%	-7.44%
Weighted average of all industries	3.25%	-1.77%	3.04%	4.52%	1.77%	-0.71%	0.56%	-0.35%	1.27%	5.78%		
Share of each effect in industry's TFP growth	56.25%	-30.68%	52.55%	78.12%	30.53%	-12.28%	9.63%	-6.01%	21.88%	100.0%		

Firm Dynamics: Japan

Entry, Exit, and Turnover Rates (%, annualized, 1985-2005)



Firm Dynamics: Japan

Entry, Exit, and Turnover Rates

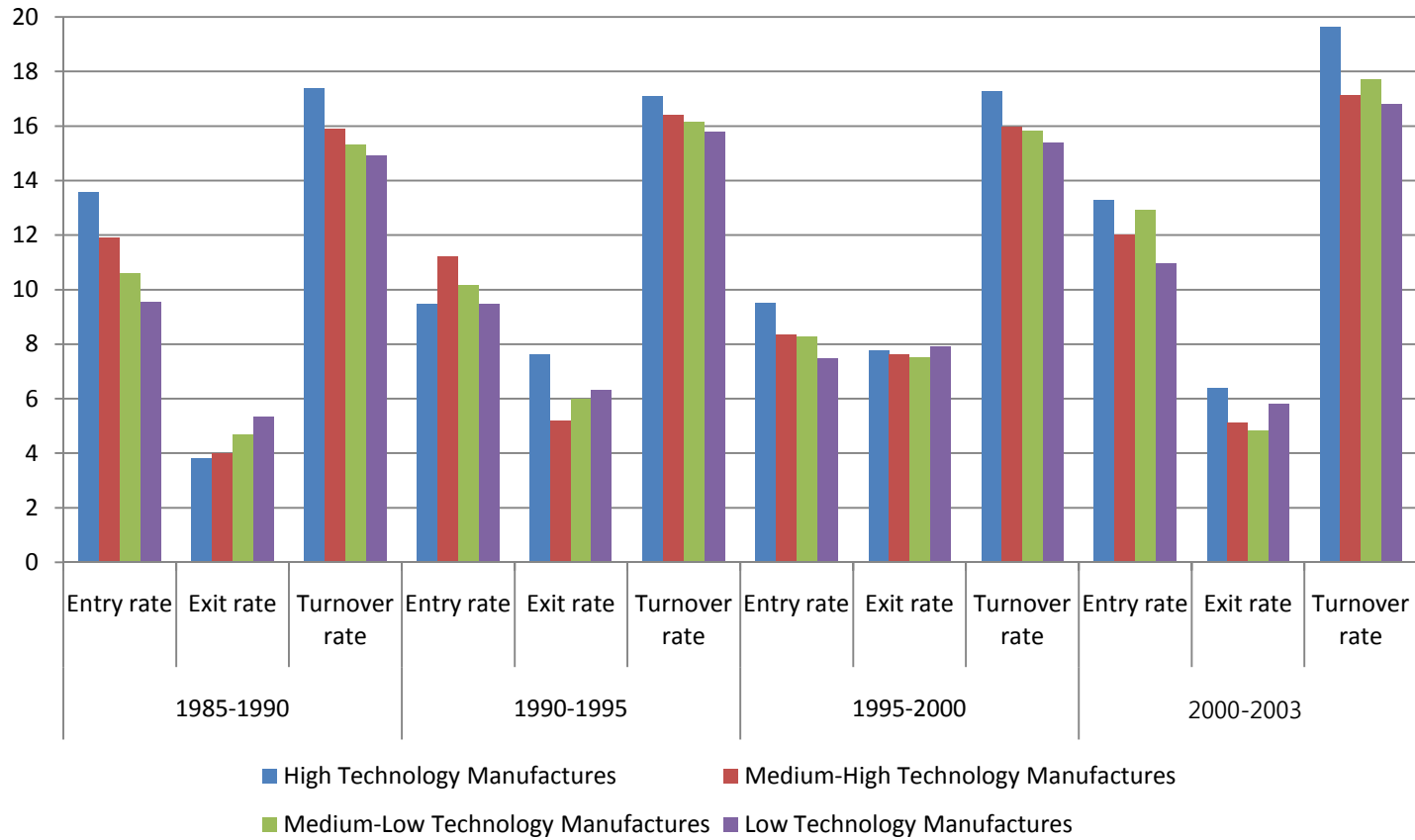
(%, annualized, 1985-2005)

		High Technology Manufacturing	Medium-High Technology Manufacturing	Medium-Low Technology Manufacturing	Low Technology Manufacturing
1985-1990	Entry rate	7.5	6.8	6.1	5.1
	Exit rate	7.3	6.0	5.5	5.3
	Turnover rate	14.9	12.8	11.5	10.5
1990-1995	Entry rate	4.8	4.6	4.3	3.6
	Exit rate	7.9	6.0	5.4	5.9
	Turnover rate	12.8	10.7	9.7	9.4
1995-2000	Entry rate	4.9	4.6	3.9	3.4
	Exit rate	7.4	5.9	6.2	6.8
	Turnover rate	12.3	10.5	10.0	10.2
2000-2005	Entry rate	4.8	4.7	4.0	3.5
	Exit rate	8.7	6.4	6.9	7.1
	Turnover rate	13.5	11.2	10.9	10.6

Source: Author's calculations based on *Census of Manufactures*.

Firm Dynamics: Korea

Entry, Exit, and Turnover Rates (%, annualized, 1985-2003)



Firm Dynamics: Korea

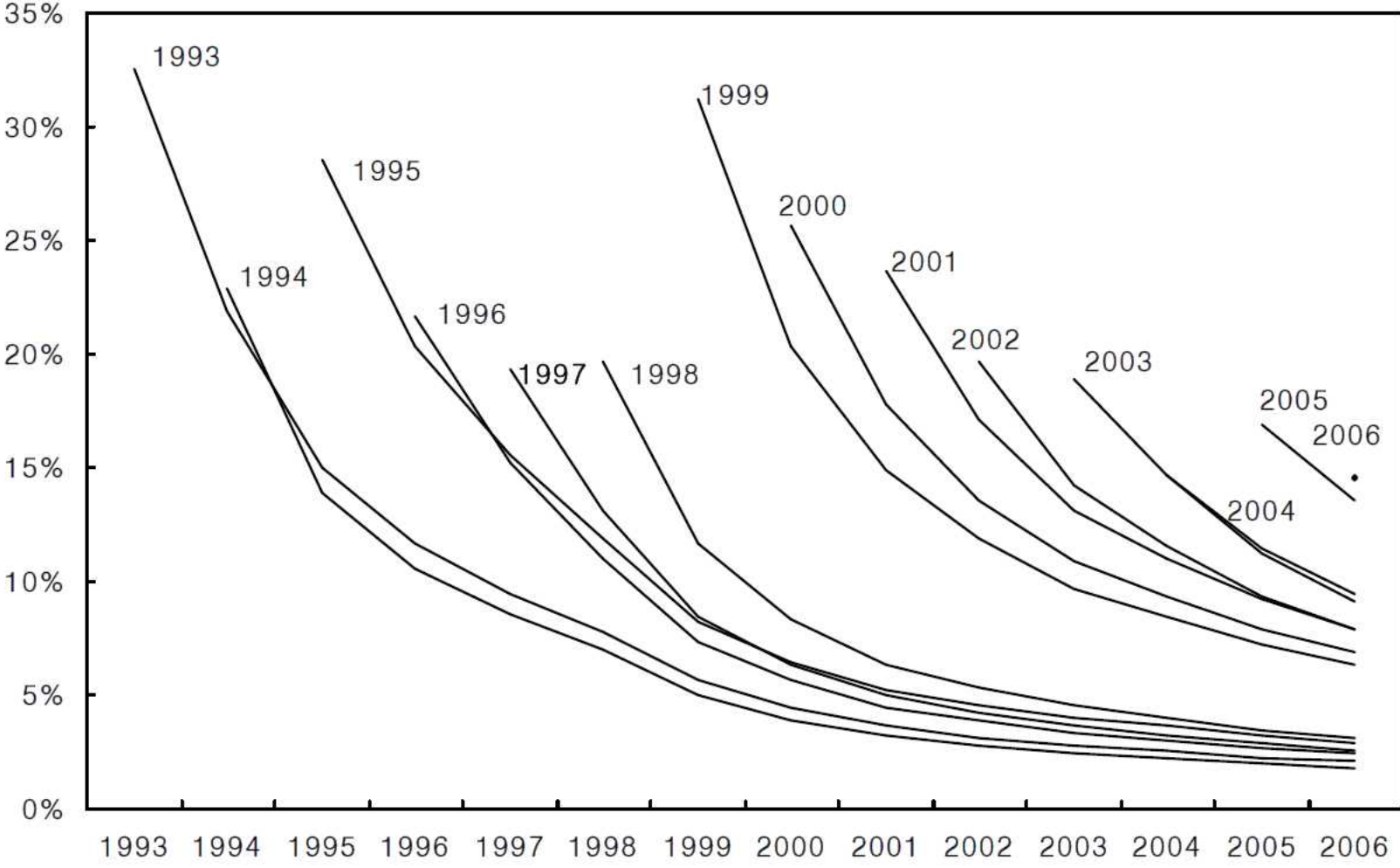
Entry, Exit, and Turnover Rates

(%, annualized, 1985-2003)

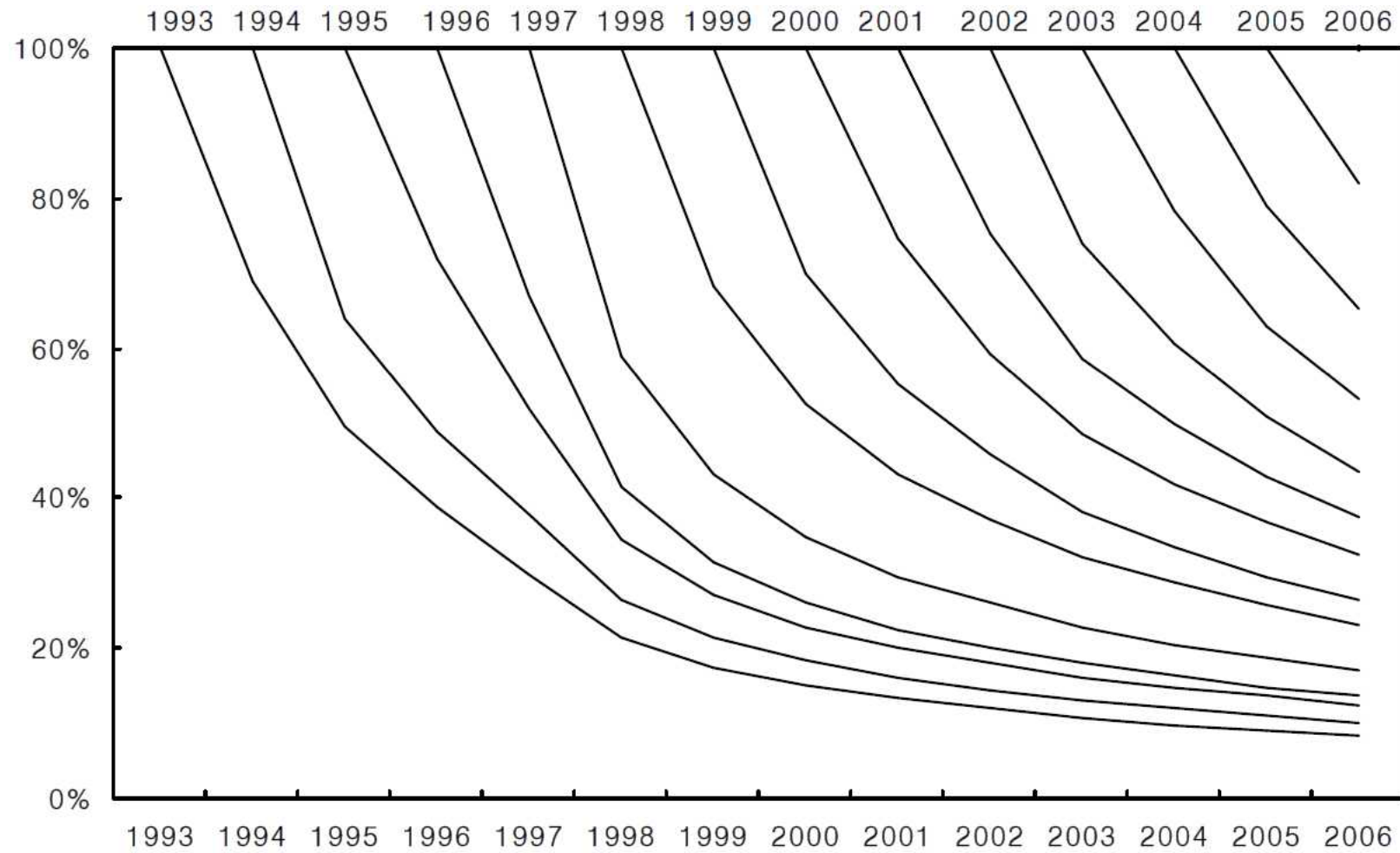
	High Technology Manufacturing	Medium-High Technology Manufacturing	Medium-Low Technology Manufacturing	Low Technology Manufacturing
1985-1990				
Entry rate	13.6	11.9	10.6	9.6
Exit rate	3.8	4.0	4.7	5.4
Turnover rate	17.4	15.9	15.3	14.9
1990-1995				
Entry rate	9.5	11.2	10.2	9.5
Exit rate	7.6	5.2	6.0	6.3
Turnover rate	17.1	16.4	16.2	15.8
1995-2000				
Entry rate	9.5	8.3	8.3	7.5
Exit rate	7.8	7.6	7.5	7.9
Turnover rate	17.3	16.0	15.8	15.4
2000-2003				
Entry rate	13.3	12.0	12.9	11.0
Exit rate	6.4	5.1	4.8	5.8
Turnover rate	19.7	17.1	17.7	16.8

Source: Author's calculations based on *Mining and Manufacturing Survey*.

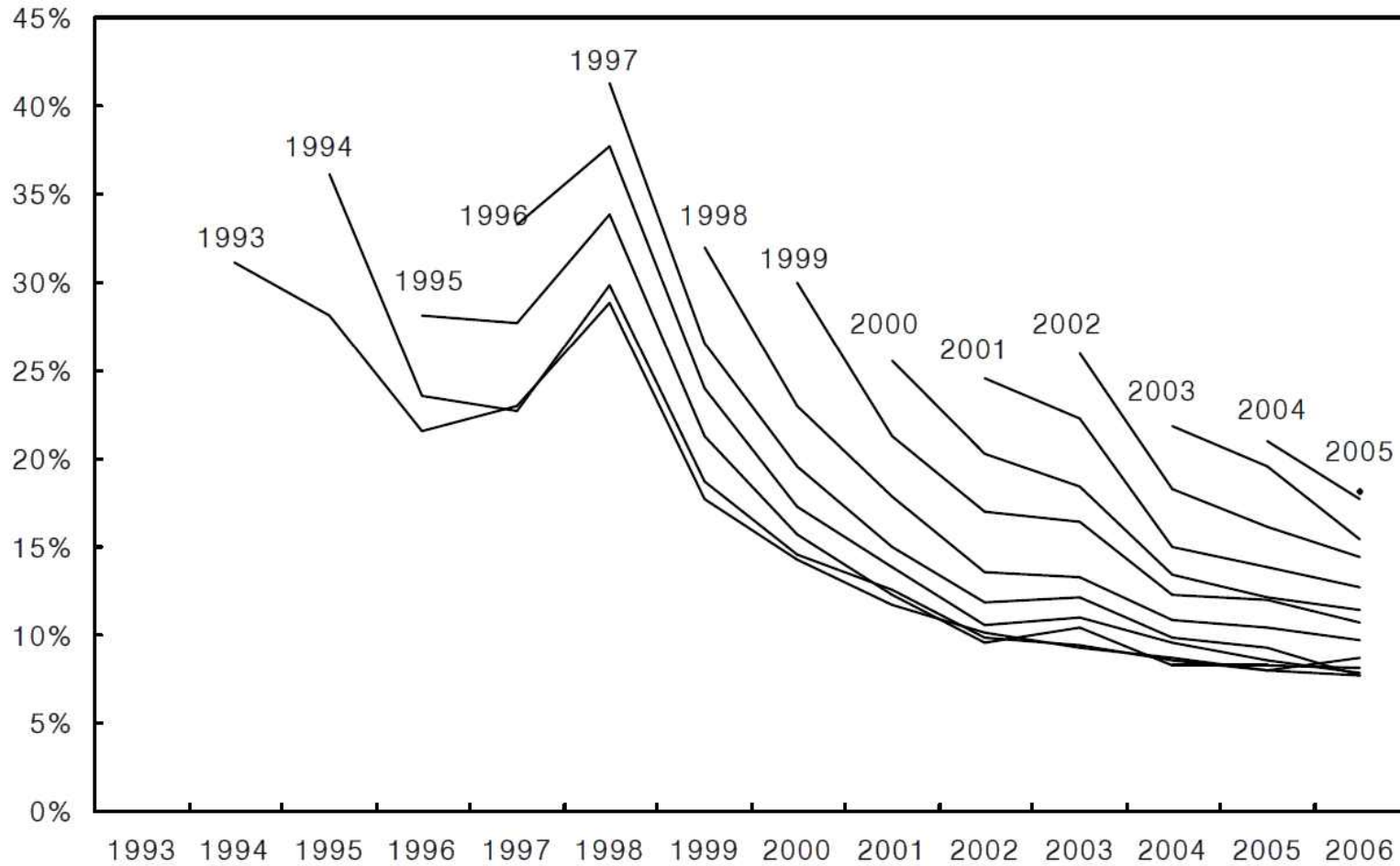
Evolution of Each Entry Cohort's Share: Korea



Evolution of Each Entry Cohort's Survival Rate



Evolution of Each Entry Cohort's Hazard Rate





Entry Regulation and Productivity Dynamics

- **Entry Regulation and Firm Dynamics**
 - Entry regulation reduces entry rate
 - Entry regulation reduces exit rate
- **Firm Dynamics and Economic Performance**
 - Entry raises employment and TFP growth
 - Exit raises (output and) TFP growth

(Ahn, 2006)

$$\ln TFP_{i,t+1} - \ln TFP_{i,t} = \beta_0 + \beta_{Plant} \cdot X_{i,t} + \beta_{Industry} \cdot Y_{j,t} + \beta_D \cdot D_t + \varepsilon_{i,t}$$

$\{\ln(\text{TFP})_{i,t+3} - \ln(\text{TFP})_{i,t}\}/3$	I	II	III	IV
$\ln(\text{TFP})_{i,t}$	-0.23483*** (-268.95)	-0.23537*** (-267.35)	-0.23475*** (-268.80)	-0.23582*** (-267.31)
Non-production to production worker ratio (by plant)	0.00540*** (10.57)	0.00543*** (10.55)	0.00543*** (10.58)	0.00552*** (10.54)
Capital Labor Ratio (by plant)	-0.00005*** (-8.60)	-0.00005*** (-8.58)	-0.00005*** (-8.57)	-0.00005*** (-8.48)
R&D Intensity (by plant)	0.00014 (0.31)	0.00013 (0.27)	0.00016 (0.34)	0.00015 (0.32)
Export Intensity (by plant)	-0.00137 (-1.08)	-0.00137 (-1.08)	-0.00148 (-1.17)	-0.00162 (-1.28)
\ln (Number of workers)	0.00613*** (25.57)	0.00625*** (26.02)	0.00617*** (25.73)	0.00648*** (27.00)
Non-production to production worker ratio (by industry)	0.01426*** (8.84)	0.01470*** (9.08)	0.01460*** (9.05)	0.01607*** (9.87)
Capital Labor Ratio (by industry)	0.00005*** (12.40)	0.00006*** (14.01)	0.00006*** (13.85)	0.00008*** (18.74)
R&D Intensity (by industry)	0.20076*** (7.36)	0.16367*** (5.89)	0.22754*** (8.26)	0.18268*** (6.59)
Export Intensity (by industry)	0.01547*** (8.80)	0.01592*** (9.05)	0.01429*** (8.11)	0.01364*** (7.75)

$\{\ln(\text{TFP})_{i,t+3} - \ln(\text{TFP})_{i,t}\}/3$	I	II	III	IV
Import penetration (by industry)	0.02200*** (11.97)	0.02364*** (12.77)	0.02071*** (11.19)	0.02255*** (12.17)
Entry rate (by industry)		0.03158*** (7.27)		0.06999*** (12.90)
Exit rate (by industry)			0.03209*** (6.72)	0.07683*** (12.87)
In (Road Stock) (by region)	0.01971*** (55.12)	0.01981*** (55.41)	0.01980*** (55.21)	0.02013*** (55.96)
Number of observation	204,040	204,040	204,040	204,040
R-sq	0.40243	0.40260	0.40257	0.40314

Hetero-scadasticity robust t -ratios are in parentheses. ***,**,* significant at 1%, 5%, 10% level, respectively.

<i>TFP growth rate for subsequent three years</i>	I	II	III
$\ln(TFP)_{i,t}$	-0.24542 *** (-110.31)	-0.24604 *** (-110.39)	-0.24708 *** (-110.56)
Non-production to production worker ratio (plant-level)	0.00465 *** (5.11)	0.00482 *** (4.96)	0.00486 *** (4.97)
Capital Labor Ratio (plant-level)	-0.00004 *** (-5.46)	-0.00004 *** (-5.36)	-0.00004 *** (-5.24)
R&D Intensity (plant-level)	-0.00184 (-0.86)	-0.00197 (-0.87)	-0.00179 (-0.81)
Export Intensity (plant-level)	0.00871 (1.19)	0.00647 (0.89)	0.00654 (0.90)
$\ln(\text{Number of workers})$	0.00938 *** (16.96)	0.01014 *** (18.30)	0.01017 *** (18.30)
Non-production to production worker ratio (industry-level)	0.01248 *** (4.08)	0.00679 ** (2.30)	0.01527 *** (4.89)
Capital Labor Ratio (industry-level)	0.00002 ** (2.05)	0.00010 *** (8.92)	0.00011 *** (9.69)
R&D Intensity (industry-level)	0.75621 *** (9.70)	0.79440 *** (8.74)	0.75078 *** (8.27)
Export intensity (industry-level)	0.05482 *** (7.50)	0.03776 *** (4.83)	0.02668 *** (3.40)
Import penetration rate (industry-level)	0.04214 *** (8.76)	0.04995 *** (10.07)	0.04833 *** (9.80)
Entry rate (industry-level)		0.15204 *** (7.92)	0.13458 *** (7.03)
Exit rate (industry-level)		0.25960 *** (6.79)	0.24569 *** (6.41)
Entry regulation rate (industry-level)	-0.03249 *** (-11.20)		-0.02799 *** (-9.65)
Number of observations	33402	33402	33402
Adjusted R ²	0.43095	0.4322	0.43390
R ²	0.43115	0.4324	0.43414

<i>TFP growth rate for subsequent three years</i>	I (L < 20)	II (20 ≤ L < 50)	III (50 ≤ L < 150)	IV (150 ≤ L < 300)	V (300 ≤ L)
ln(TFP) _{i,t}	-0.26038 *** (-90.43)	-0.23971 *** (-51.25)	-0.22422 *** (-25.01)	-0.18807 *** (-11.10)	-0.16302 *** (-7.06)
Non-production to production worker ratio (plant-level)	0.01049 *** (7.02)	0.00402 ** (2.30)	0.00383 *** (3.39)	0.00427 (1.44)	0.00062 (0.99)
Capital Labor Ratio (plant-level)	-0.00011 (-2.91)	-0.00002 (-1.00)	-0.00002 (-0.82)	-0.00001 (-1.00)	-0.00002 ** (-2.30)
R&D intensity (plant-level)	-0.00220 (-0.86)	0.00200 (0.21)	-0.01992 (-1.56)	0.00506 (0.10)	-0.01689 (-0.11)
Export intensity (plant-level)	-0.00104 (-0.07)	0.02833 * (1.89)	0.00538 (0.36)	-0.02715 (-1.38)	0.00847 (0.43)
ln(Number of workers)	0.00570 *** (4.11)	0.00359 * (1.70)	0.01273 *** (4.11)	0.00402 (0.64)	0.00868 * (1.74)
Non-production to production worker ratio (industry-level)	0.00714 * (1.79)	0.02587 *** (4.19)	0.01190 (1.15)	0.00727 (0.66)	-0.02214 (-1.42)
R&D Intensity (industry-level)	0.00013 *** (8.29)	0.00012 *** (6.26)	0.00003 (0.98)	-0.00001 (-0.13)	-0.00001 (-0.12)
R&D Intensity (industry-level)	0.18521 (1.52)	1.16846 *** (6.60)	1.86405 *** (7.07)	2.49020 *** (4.42)	2.22933 *** (3.77)
Export intensity (industry-level)	0.03281 *** (3.08)	0.01230 (0.90)	0.04596 * (1.76)	0.04899 (0.91)	0.00132 (0.03)
Import penetration rate (industry-level)	0.07664 *** (11.55)	0.02092 ** (2.14)	0.00464 (0.34)	-0.01365 (-0.57)	-0.00865 (-0.29)
Entry rate (industry-level)	0.21120 *** (8.50)	0.14750 *** (4.07)	-0.01786 (-0.31)	-0.34436 ** (-2.12)	-0.05689 (-0.43)
Exit rate (industry-level)	0.27865 *** (5.80)	0.19765 ** (2.51)	-0.03044 (-0.27)	0.06738 (0.22)	0.06292 (0.25)
Entry regulation rate (industry-level)	-0.04880 *** (-13.18)	-0.01790 *** (-3.11)	0.02298 ** (2.54)	0.02538 * (1.71)	0.04526 ** (2.44)
Number of observations	21708	7522	3131	671	370
Adjusted R ²	0.4477	0.4334	0.4286	0.4061	0.3645
R ²	0.4481	0.4345	0.4311	0.4185	0.3886

<i>TFP growth rate for subsequent three years</i>	I (L < 20)	II (20 ≤ L < 50)	III (50 ≤ L < 150)	IV (150 ≤ L < 300)	V (300 ≤ L)
$\ln(\text{TFP})_{i,t}$	-0.26038 *** (-90.43)	-0.23971 *** (-51.25)	-0.22422 *** (-25.01)	-0.18807 *** (-11.10)	-0.16302 *** (-7.06)
Non-production to production worker ratio (plant-level)	0.01049 *** (7.02)	0.00402 ** (2.30)	0.00383 *** (3.39)	0.00427 (1.44)	0.00062 (0.99)
Capital Labor Ratio (plant-level)	-0.00011 (-2.91)	-0.00002 (-1.00)	-0.00002 (-0.82)	-0.00001 (-1.00)	-0.00002 ** (-2.30)
R&D intensity (plant-level)	-0.00220 (-0.86)	0.00200 (0.21)	-0.01992 (-1.56)	0.00506 (0.10)	-0.01689 (-0.11)
Export intensity (plant-level)	-0.00104 (-0.07)	0.02833 * (1.89)	0.00538 (0.36)	-0.02715 (-1.38)	0.00847 (0.43)
$\ln(\text{Number of workers})$	0.00570 *** (4.11)	0.00359 * (1.70)	0.01273 *** (4.11)	0.00402 (0.64)	0.00868 * (1.74)
Non-production to production worker ratio (industry-level)	0.00714 * (1.79)	0.02587 *** (4.19)	0.01190 (1.15)	0.00727 (0.66)	-0.02214 (-1.42)
R&D Intensity (industry-level)	0.00013 *** (8.29)	0.00012 *** (6.26)	0.00003 (0.98)	-0.00001 (-0.13)	-0.00001 (-0.12)
R&D Intensity (industry-level)	0.18521 (1.52)	1.16846 *** (6.60)	1.86405 *** (7.07)	2.49020 *** (4.42)	2.22933 *** (3.77)
Export intensity (industry-level)	0.03281 *** (3.08)	0.01230 (0.90)	0.04596 * (1.76)	0.04899 (0.91)	0.00132 (0.03)

Export intensity (plant-level)	-0.00104 (-0.07)	0.02833 * (1.89)	0.00538 (0.36)	-0.02715 (-1.38)	0.00847 (0.43)
ln(Number of workers)	0.00570 *** (4.11)	0.00359 * (1.70)	0.01273 *** (4.11)	0.00402 (0.64)	0.00868 * (1.74)
Non-production to production worker ratio (industry-level)	0.00714 * (1.79)	0.02587 *** (4.19)	0.01190 (1.15)	0.00727 (0.66)	-0.02214 (-1.42)
R&D Intensity (industry-level)	0.00013 *** (8.29)	0.00012 *** (6.26)	0.00003 (0.98)	-0.00001 (-0.13)	-0.00001 (-0.12)
R&D Intensity (industry-level)	0.18521 (1.52)	1.16846 *** (6.60)	1.86405 *** (7.07)	2.49020 *** (4.42)	2.22933 *** (3.77)
Export intensity (industry-level)	0.03281 *** (3.08)	0.01230 (0.90)	0.04596 * (1.76)	0.04899 (0.91)	0.00132 (0.03)
Import penetration rate (industry-level)	0.07664 *** (11.55)	0.02092 ** (2.14)	0.00464 (0.34)	-0.01365 (-0.57)	-0.00865 (-0.29)
Entry rate (industry-level)	0.21120 *** (8.50)	0.14750 *** (4.07)	-0.01786 (-0.31)	-0.34436 ** (-2.12)	-0.05689 (-0.43)
Exit rate (industry-level)	0.27865 *** (5.80)	0.19765 ** (2.51)	-0.03044 (-0.27)	0.06738 (0.22)	0.06292 (0.25)
Entry regulation rate (industry-level)	-0.04880 *** (-13.18)	-0.01790 *** (-3.11)	0.02298 ** (2.54)	0.02538 * (1.71)	0.04526 ** (2.44)
Number of observations	21708	7522	3131	671	370
Adjusted R ²	0.4477	0.4334	0.4286	0.4061	0.3645
R ²	0.4481	0.4345	0.4311	0.4185	0.3886

Part-04

Policy Implications: Old View?

KDI

Major Problems in Productivity Dynamics

- ***Creative destruction*** plays a very important role for productivity growth and innovation by enhancing:
 - The expansion or entry of high productivity firms
 - The contraction or exit by low productivity firms
- Productivity growth driven by ***creative destruction*** is impeded due to:
 - High entry costs
 - High levels of taxation
 - Labor market rigidity
 - ...

Regulatory Costs of Entry are Sizable

Japan-Korea-USA Comparison (1999)

Number of procedures that a start-up has to comply with in order to obtain legal status	Japan	Korea	USA	Average of 85 countries
Safety and health	0	0	0	0.34
Environment	0	0	0	0.14
Taxes	2	2	1	2.04
Employment	2	4	1	1.94
Screening	7	7	2	6.04
Time (business days; a week has 5 business days and a month has 22.)	26	27	4	47.4
Cost (share of per capita GDP 1999)	11.6%	16.3%	0.5%	47.1%
Time + Cost (share of per capita GDP 1999)	22.0%	27.1%	1.7%	66.0%
Dollar Amount of Time + Cost	\$ 7,094	\$ 2,298	\$ 517	\$ 5,428
Per capita GDP 1999	\$ 32,230	\$ 8,490	\$ 30,600	\$ 8,226

Source: Djankov, et al. (2002), "The Regulation of Entry", Quarterly Journal of Economics, 117: 1-37

Barriers to Economic Activity

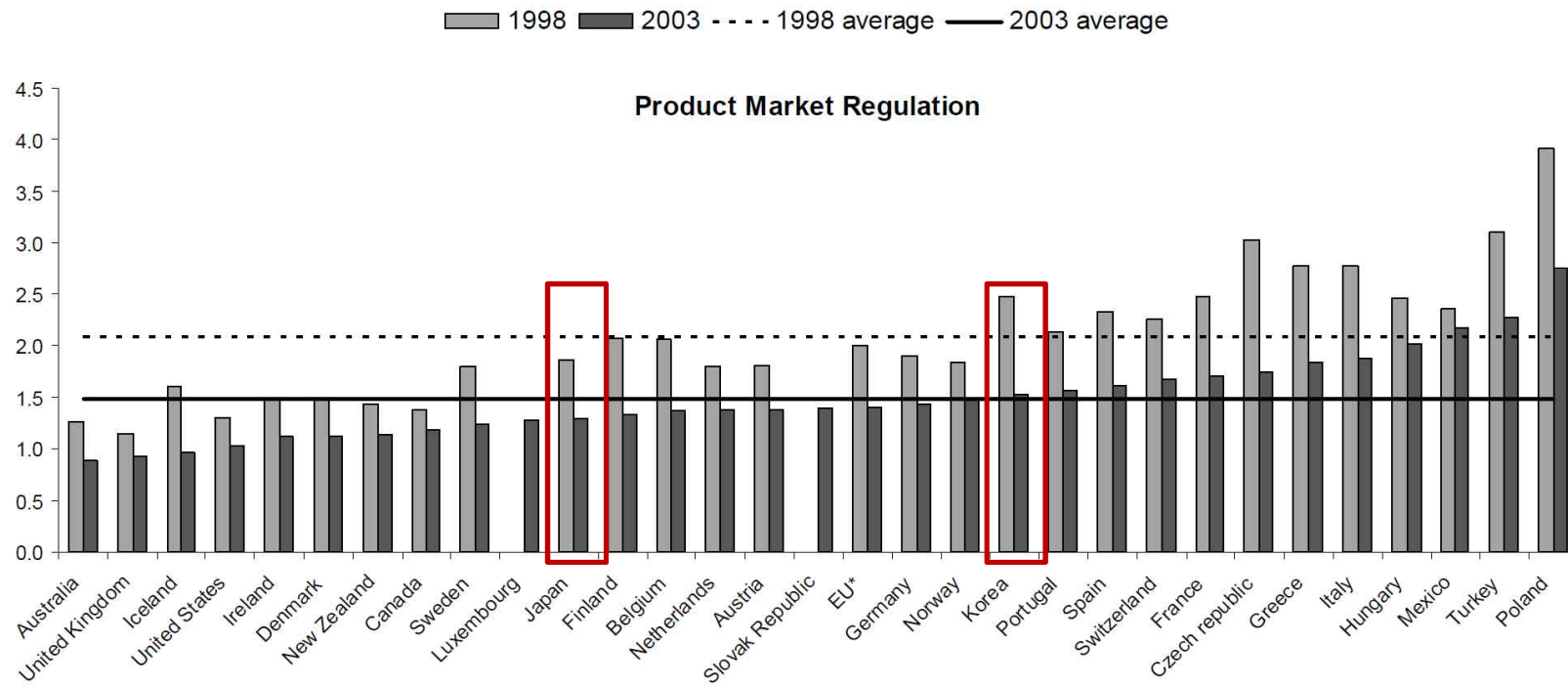
Japan-Korea-USA Comparison (2005 and 2010)

	Japan		Korea		USA	
	2005	2010	2005	2010	2005	2010
Ease of doing business index (1=most business-friendly regulations)	-	20	-	15	-	4
Start-up procedures to register a business (number)	11	8	10	8	6	6
Time required to start a business (days)	31	23	17	13	6	6
Time to resolve insolvency (years)	0.6	0.6	1.5	1.5	1.5	1.5
Total tax rate (%)	53.1	48.6	36.4	29.8	46.0	46.8

Source: World Bank, Doing Business (2011)

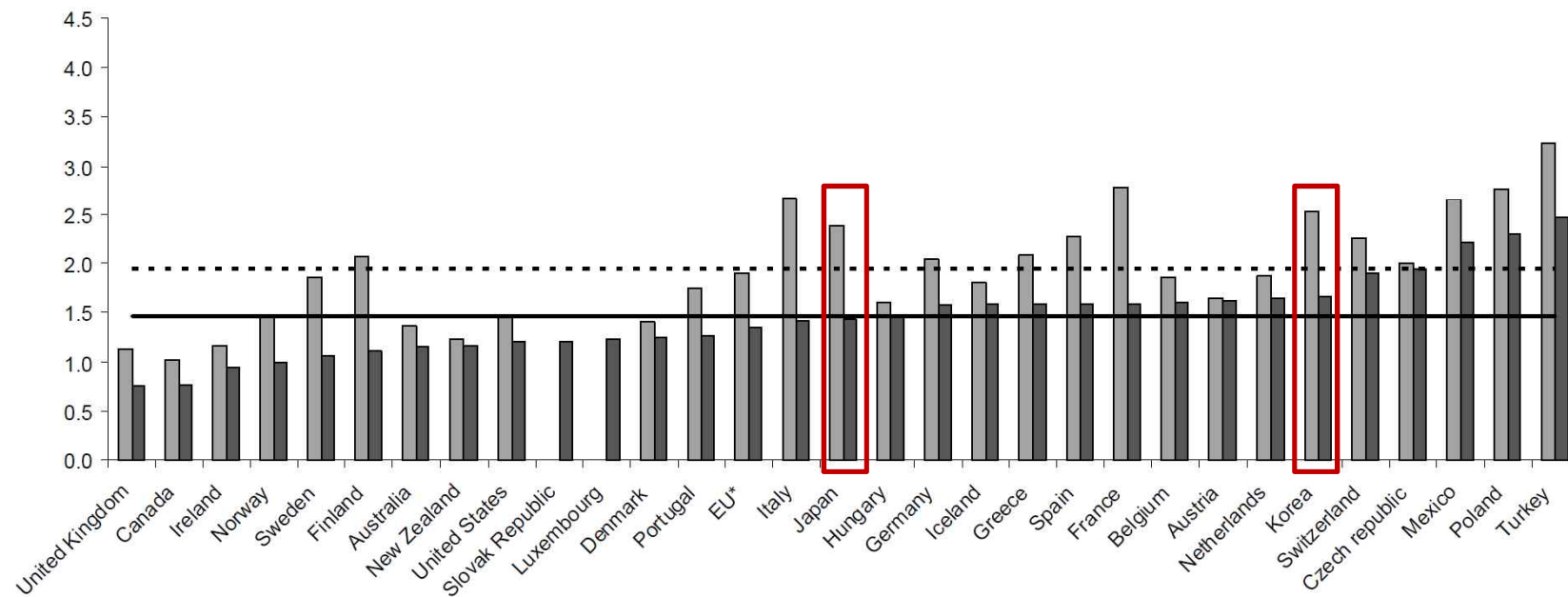
OECD *Product Market Regulation* Indicator

1998 and 2003



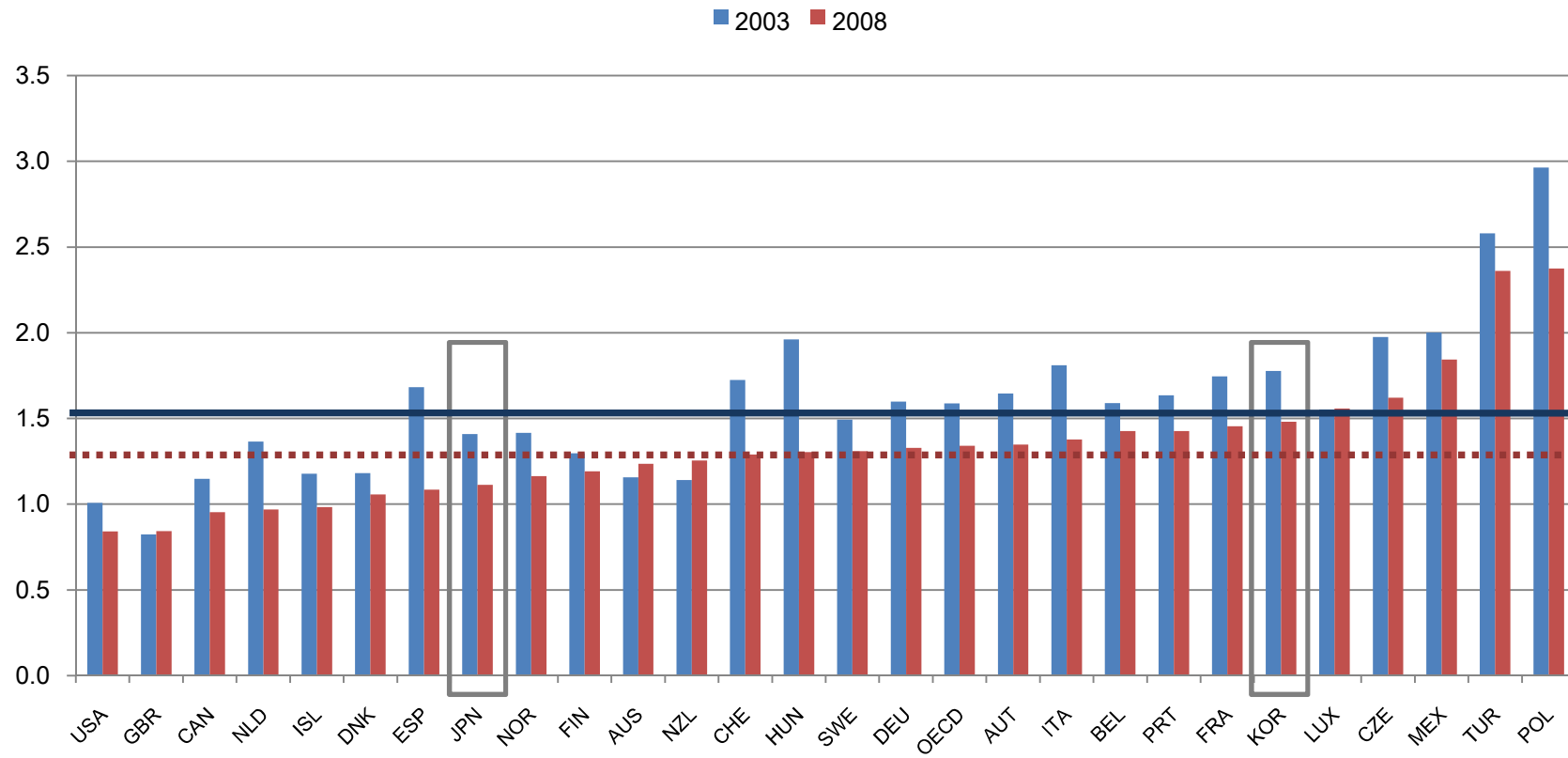
OECD *Product Market Regulation* Indicator

Barriers to Entrepreneurship (1998 and 2003)



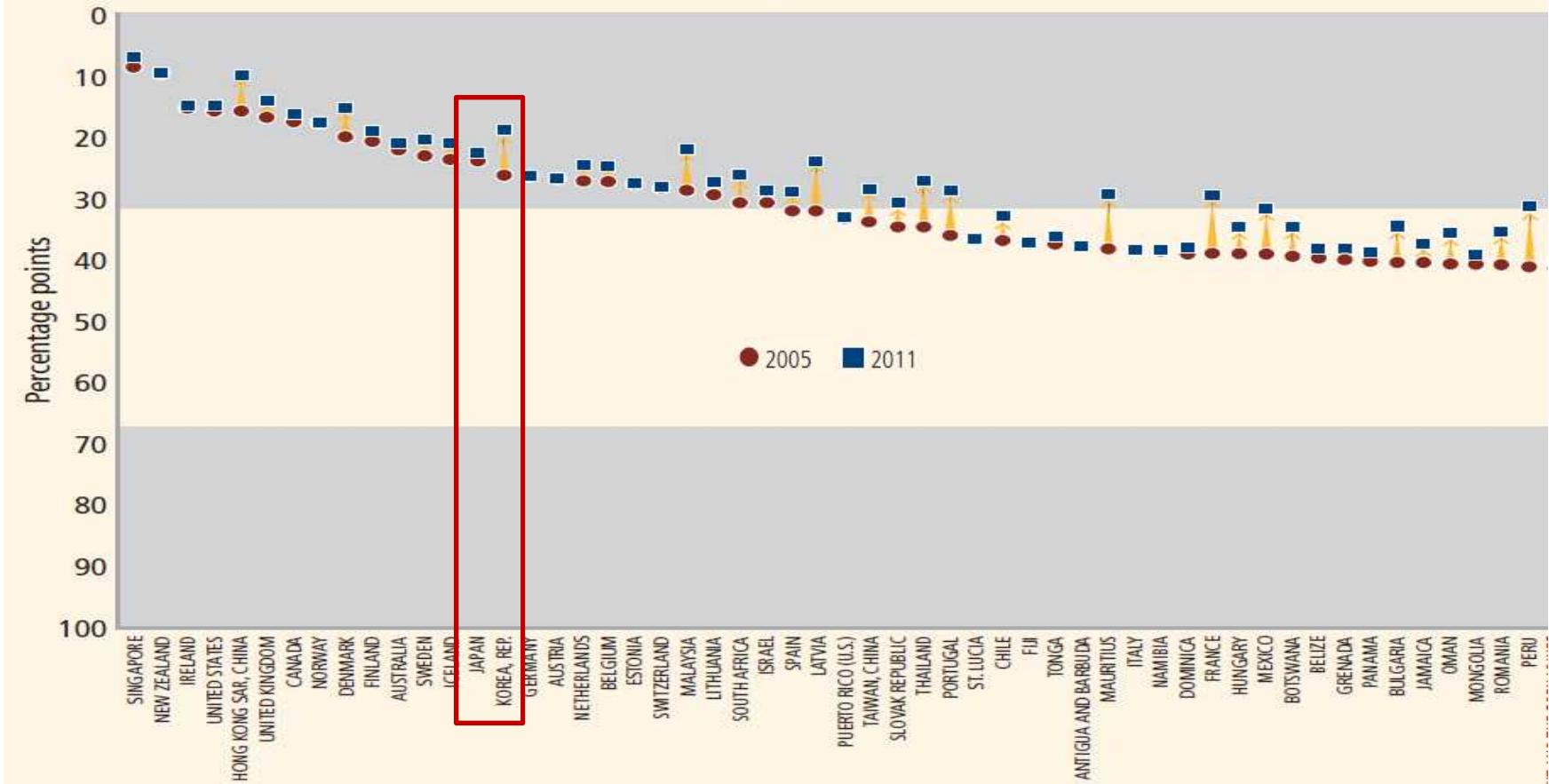
OECD *Product Market Regulation* Indicator

2003 and 2008



World Bank *Doing Business* Indicator

FIGURE 1.8 In the past 6 years 163 economies moved closer to the frontier in regulatory practice
Distance to frontier, 2005 and 2011



Manufacturing to Services

- Services account for **over 60% of total economic activity** in most OECD countries.
 - Service sector growth has outpaced overall economic growth in the OECD area, a trend which is expected to continue.
- Services are **a growing source of employment** in the OECD area
 - Demand for highly skilled white-collar workers is rising, although services are also an important source of low-skilled jobs.
- Increased **trade and investment in services** is an important vehicle for growth and competition.
 - Technological advances are increasing the tradability of services.
 - Liberalization of markets is providing an environment more conducive to international competition.

(OECD, 2000)

Policy Issues for Services

- The role of services in economic growth and job creation calls for greater government attention to improving services' performance.
 - This implies [reforms to domestic regulation, liberalization of international trade and investment](#), and [a reorientation of relevant government programs](#) to meet the needs of service industries more effectively.
- Many of the barriers to service sector development are not found at the border between countries, but are rather of a domestic nature.
 - Domestic [regulation](#) is one of the principal factors [limiting growth and competition in services](#).
- Services continue to be poorly covered in most basic statistics.
 - To improve understanding of service processes and performance, and to design policies that are better suited to the characteristics of the service sector, [better and more comprehensive data](#) are needed.

(OECD, 2000)

Thank you !