Estimates of Total Factor Productivity, ICT Contributions and Resource Reallocation Effects in Japan and Korea

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Structure of the Paper

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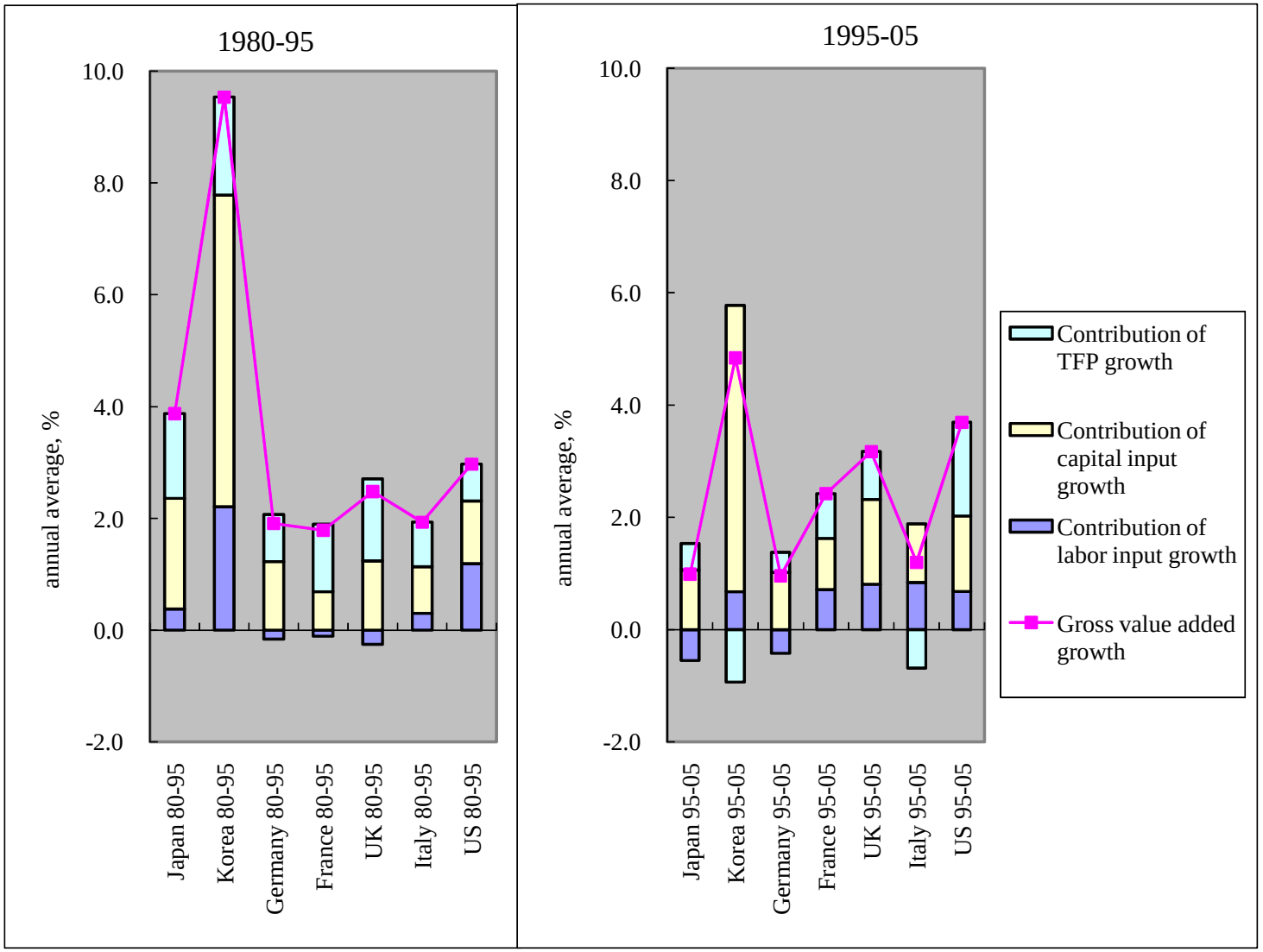
3. Has ICT Investment Contributed to Economic Growth in Japan and Korea?
4. Resource Reallocation Effects in Japan and Korea
5. Conclusion

2. Growth Accounting and TFP Growth

2.1 Overview of Growth Accounting for Japan and Korea in Comparison with the Major EU Economies and the US

Figure 2-1 Growth Accounting for the Market Sector in Japan, the US, and the Major EU Economies

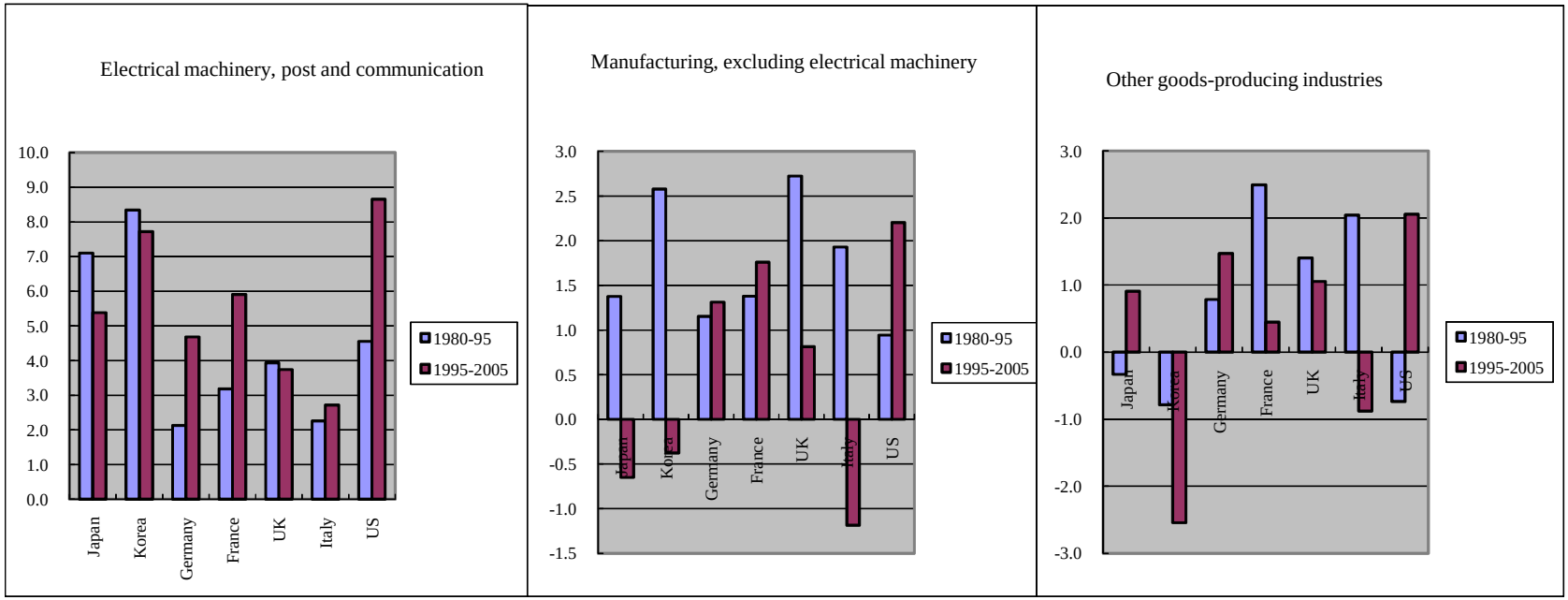


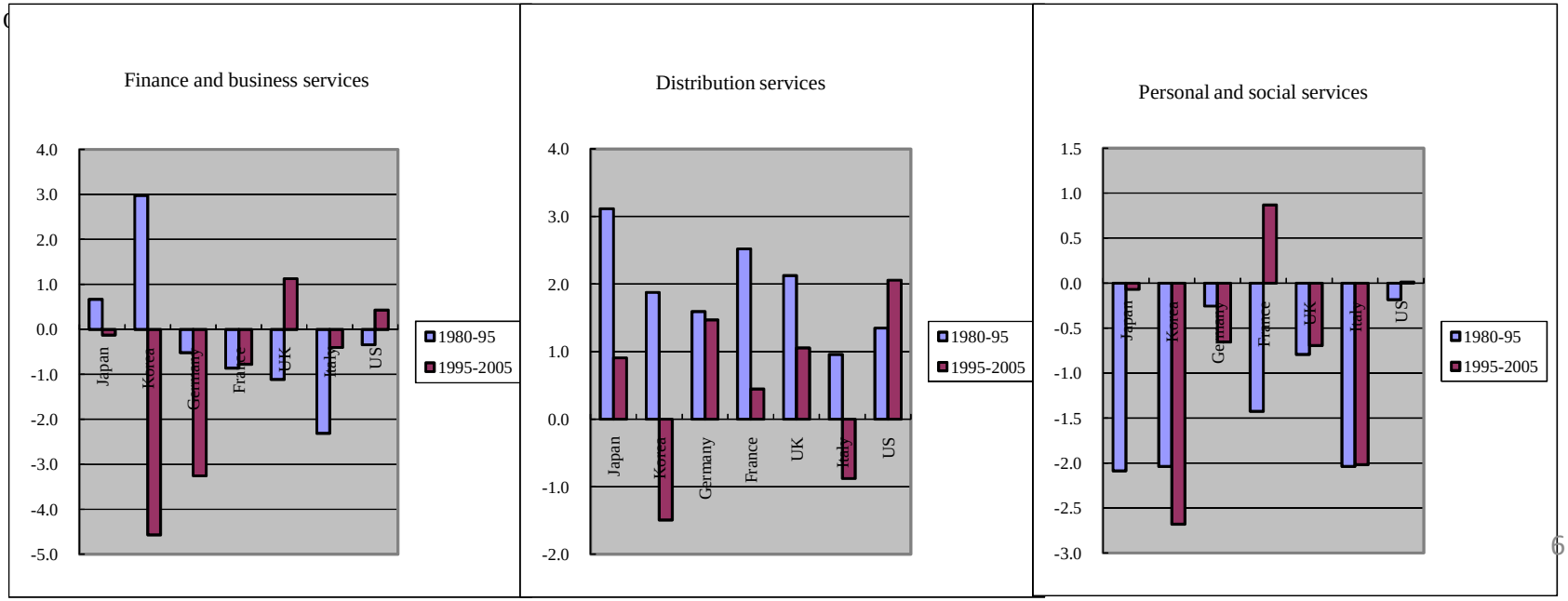
Source: EU KLEMS Database, March 2008.

- **Looking at the factors contributing to the slowdown in growth in the market sector of Korea's economy, the most important is the decline in the contribution of TFP growth. Of the 4.7 percentage-point decline in the growth rate of Korea's market sector from the earlier to the latter period, 57% was accounted for by the deceleration in TFP growth. The slowdown of the contribution of labor input growth accounted for 32% of the decline of Korea's growth rate. The contribution of capital input growth did not decline substantially.**
- **In Japan, all the three factors contributed to the slowdown in growth in the market sector: the deceleration in TFP was responsible for 36% of the slowdown, while the negative contribution of capital accumulation and the decline in the contribution of labor input growth each accounted for 32% of the slowdown.**

- **It is not the gap in TFP growth but differences in factor input growth that caused the large difference between the economic growth performance of France, the UK and Italy on the one hand and Japan on the other in the period after 1995.**
- **The four major EU economies (Germany, France, the UK and Italy) and Japan experienced a slowdown in TFP growth of a similar magnitude after 1995, while Korea suffered a much larger decline. Thus, the US is the exception in experiencing an acceleration in TFP growth.**

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





- **Korea and Japan experienced relatively higher TFP growth in the ICT producing sector.**
- **However, the problem for the two countries is that TFP growth in ICT-using sectors, such as distribution services (retail, wholesale and transportation) and in the rest of the manufacturing sector (i.e., excluding electrical machinery), declined substantially after 1995.**
- **And these ICT-using sectors have larger shares in the economy than the ICT-producing sector.**

Figure 2-5 Cumulative Contribution of Industries to TFP Growth: Japan, 1973-2005, Economy-wide

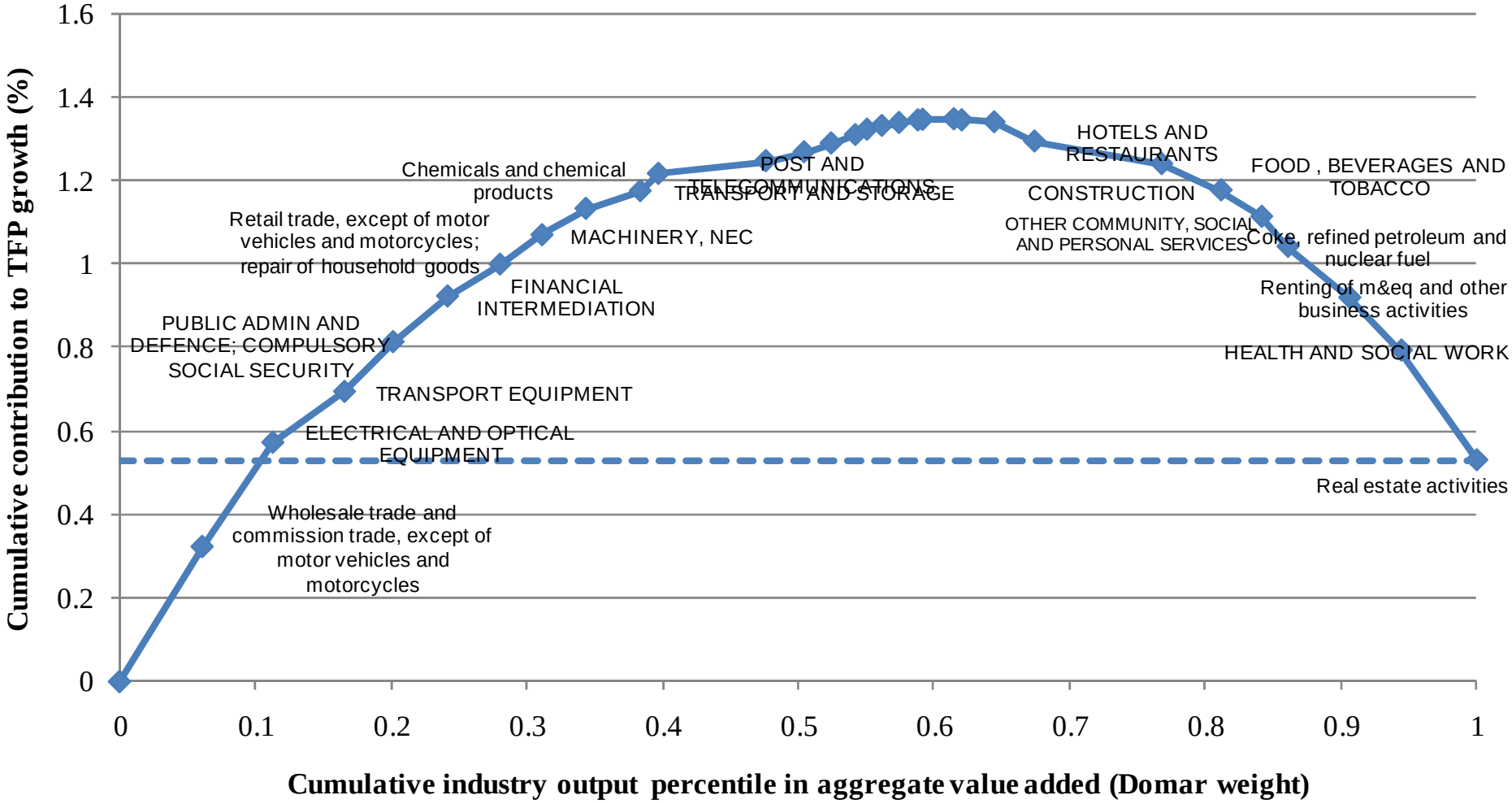


Figure 2-6 Cumulative Contribution of Industries to TFP Growth: Japan, 1973-2005, Manufacturing

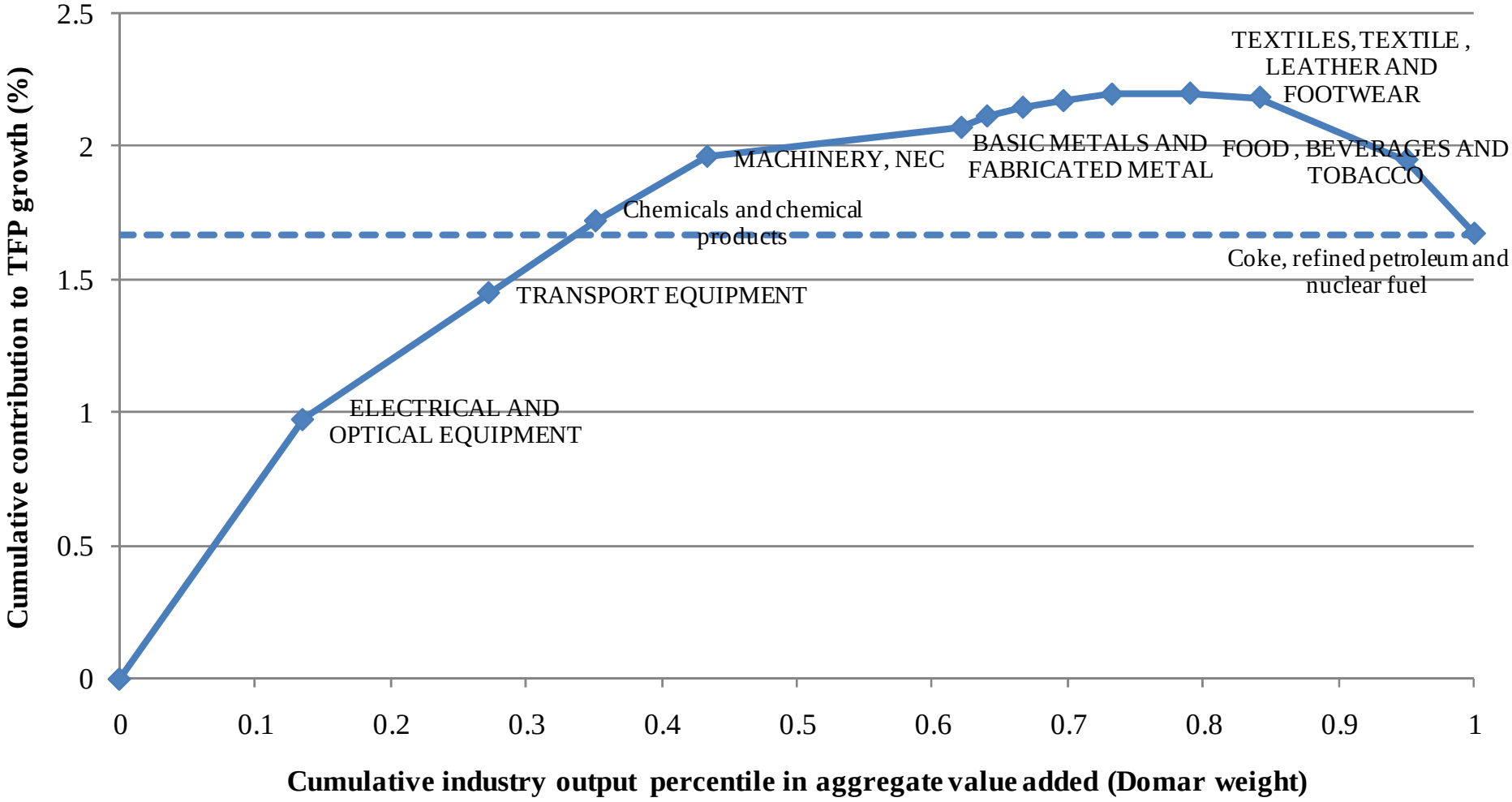


Figure 2-7 Cumulative Contribution of Industries to TFP Growth: Japan, 1973-2005, Services

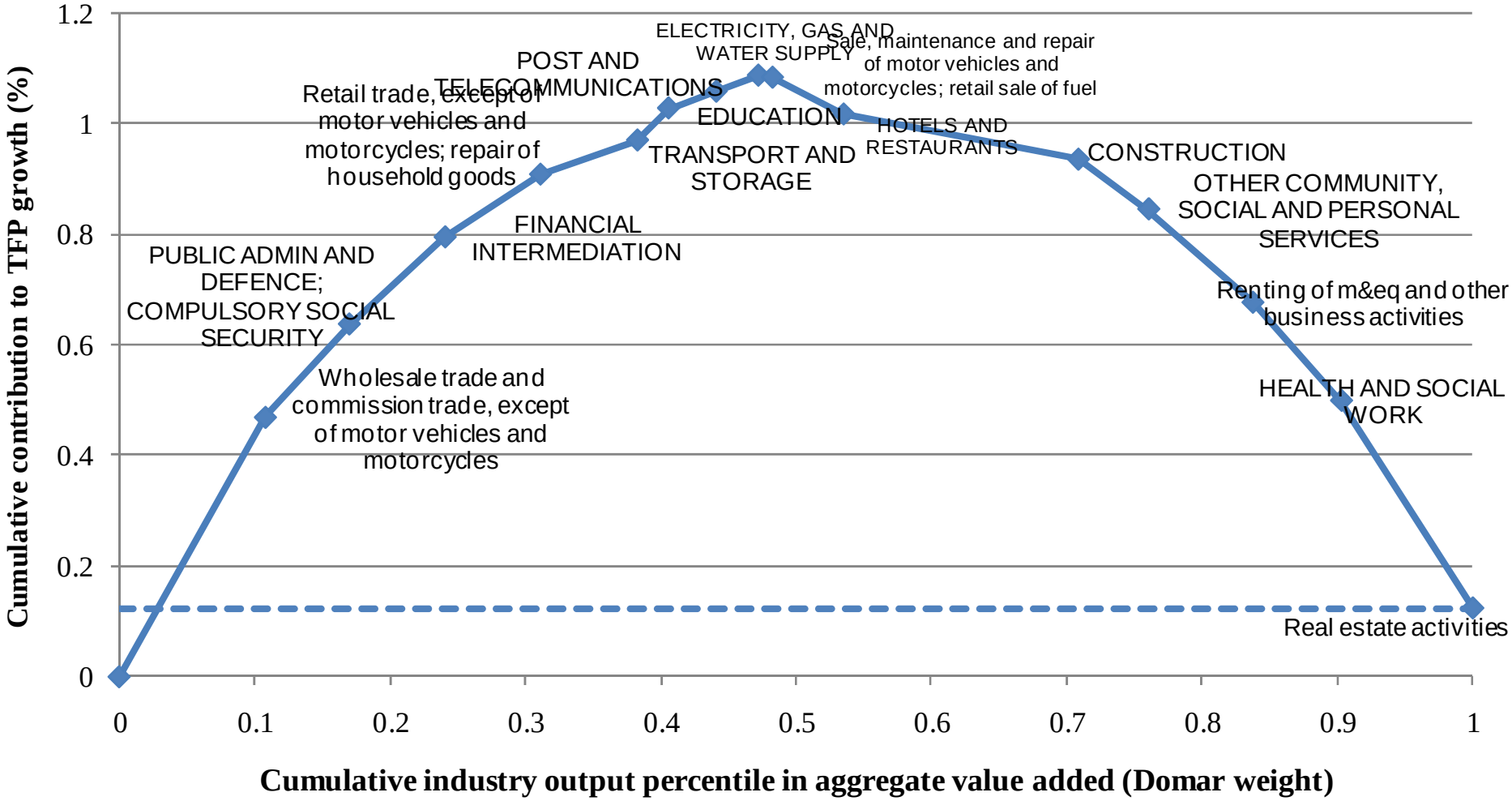


Figure 2-8 Cumulative Contribution of Industries to TFP Growth: Korea, 1972-2005, Economy--wide

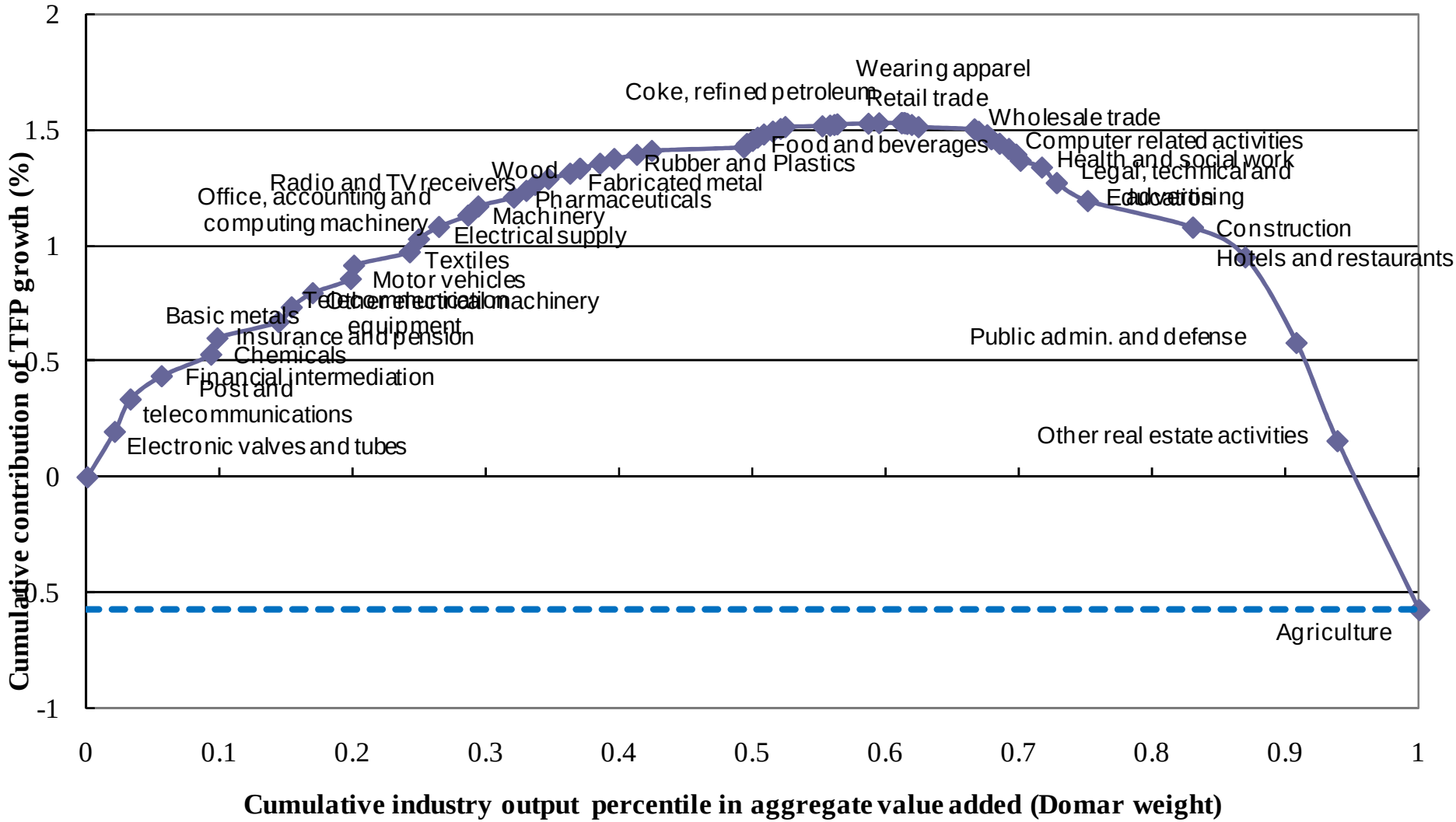


Figure 2-9 Cumulative Contribution of Industries to TFP Growth: Korea, 1972-2005, Manufacturing

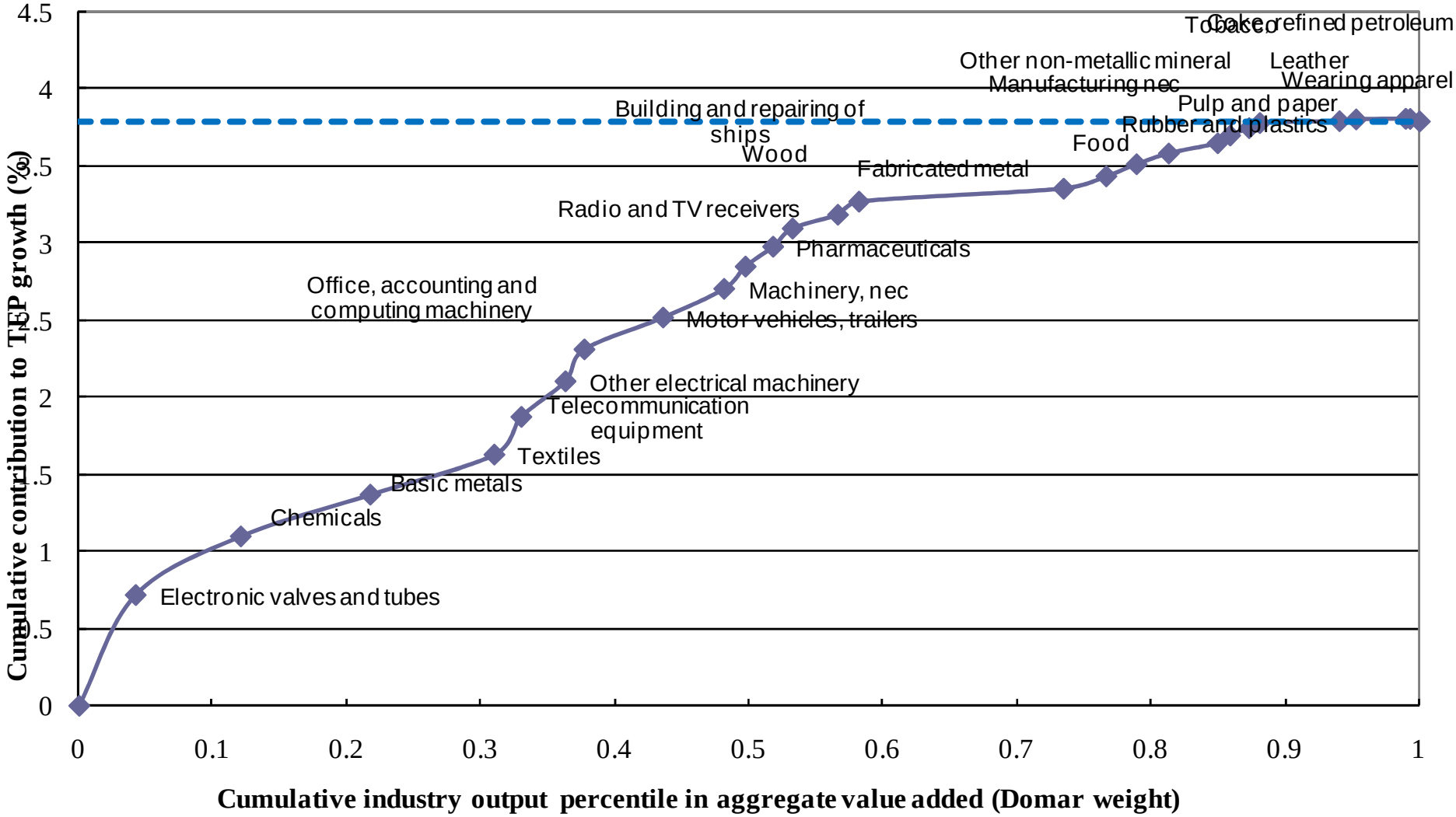
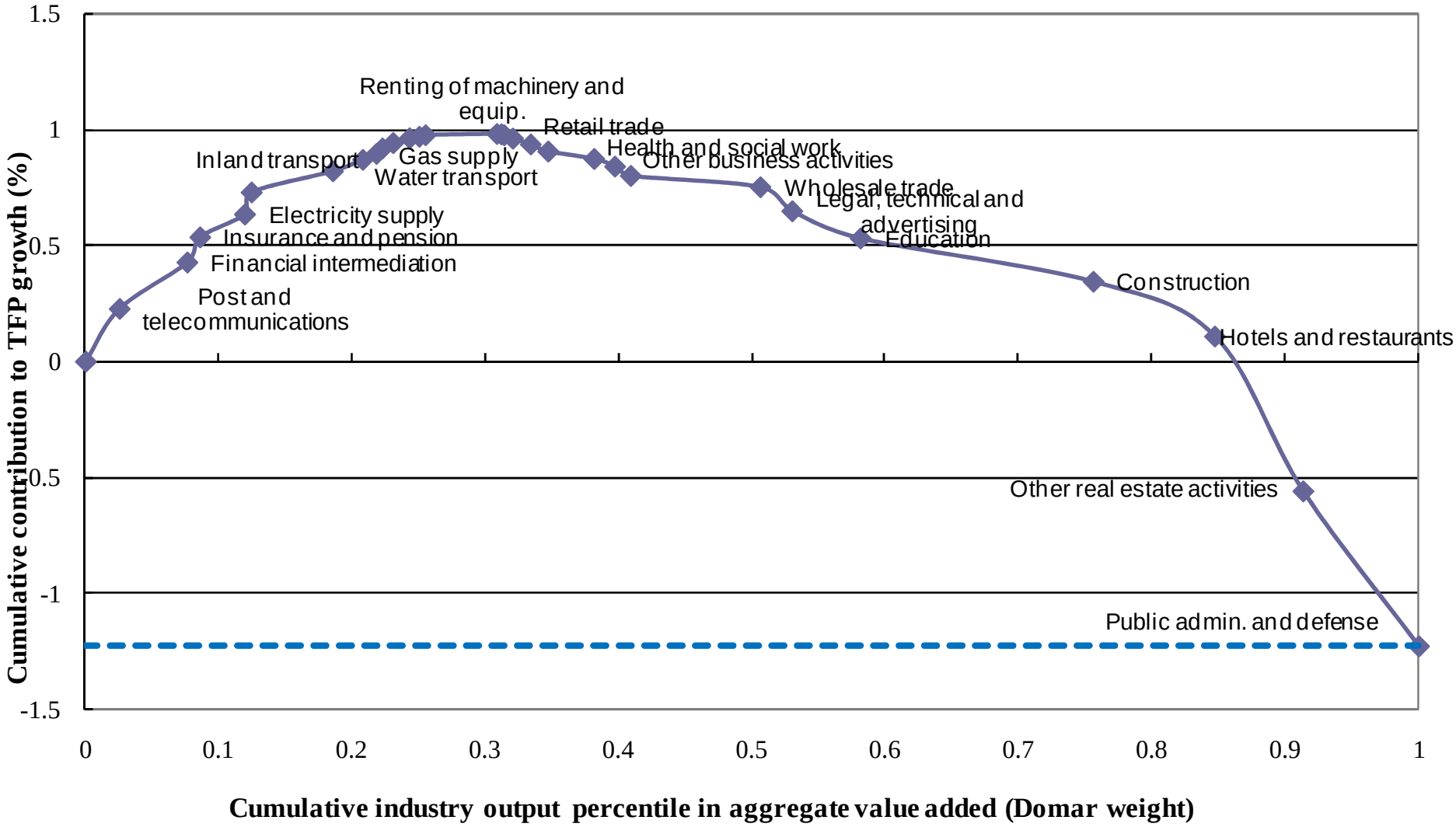


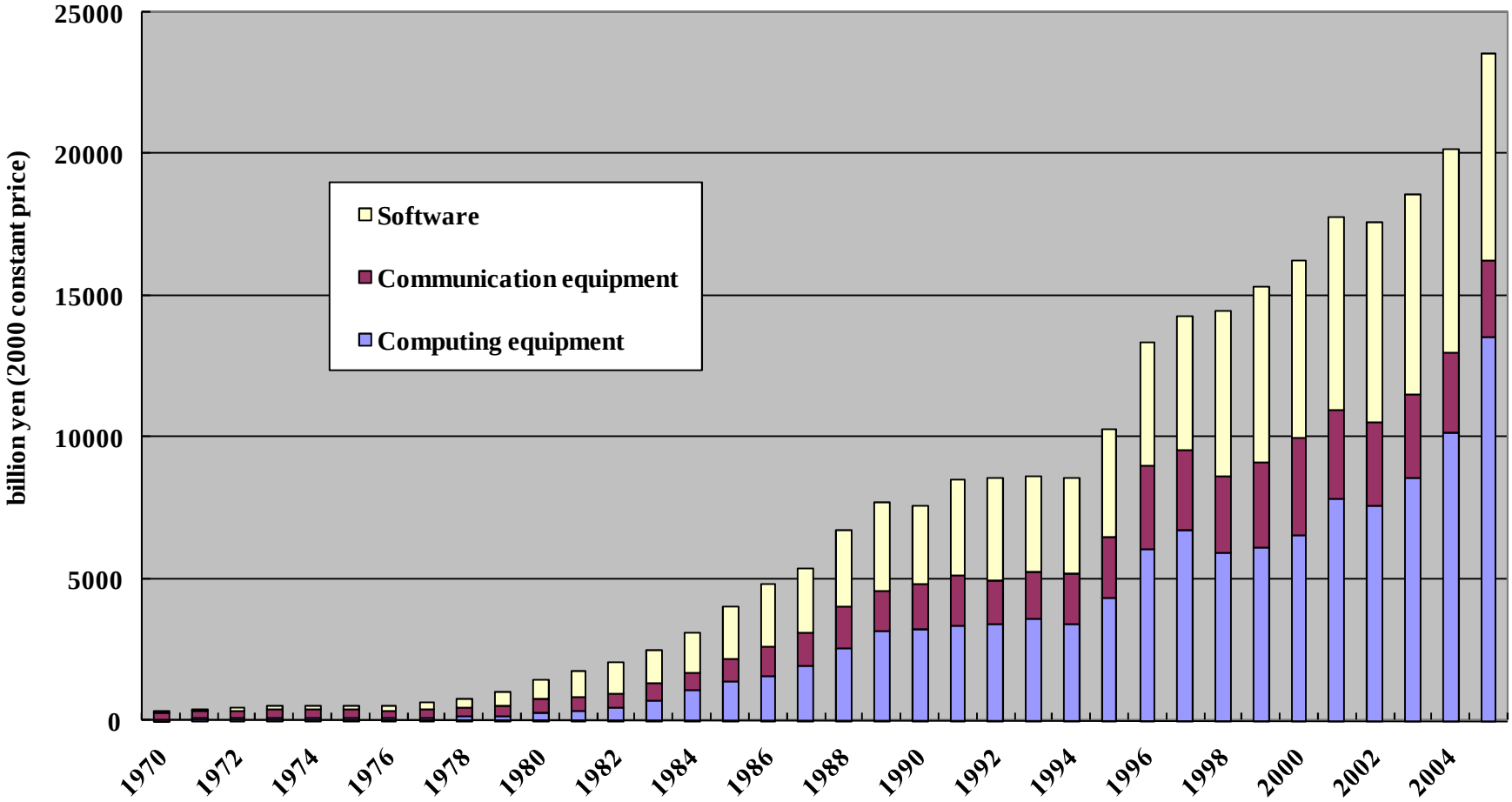
Figure 2-10 Cumulative Contribution of Industries ot TFP Growth: Korea, 1972-2005, Services



3. Has ICT Investment Contributed to Economic Growth in Japan and Korea?

3.1 Accumulation of ICT assets in Japan and Korea

Figure 3-1-1 ICT Investment in Japan

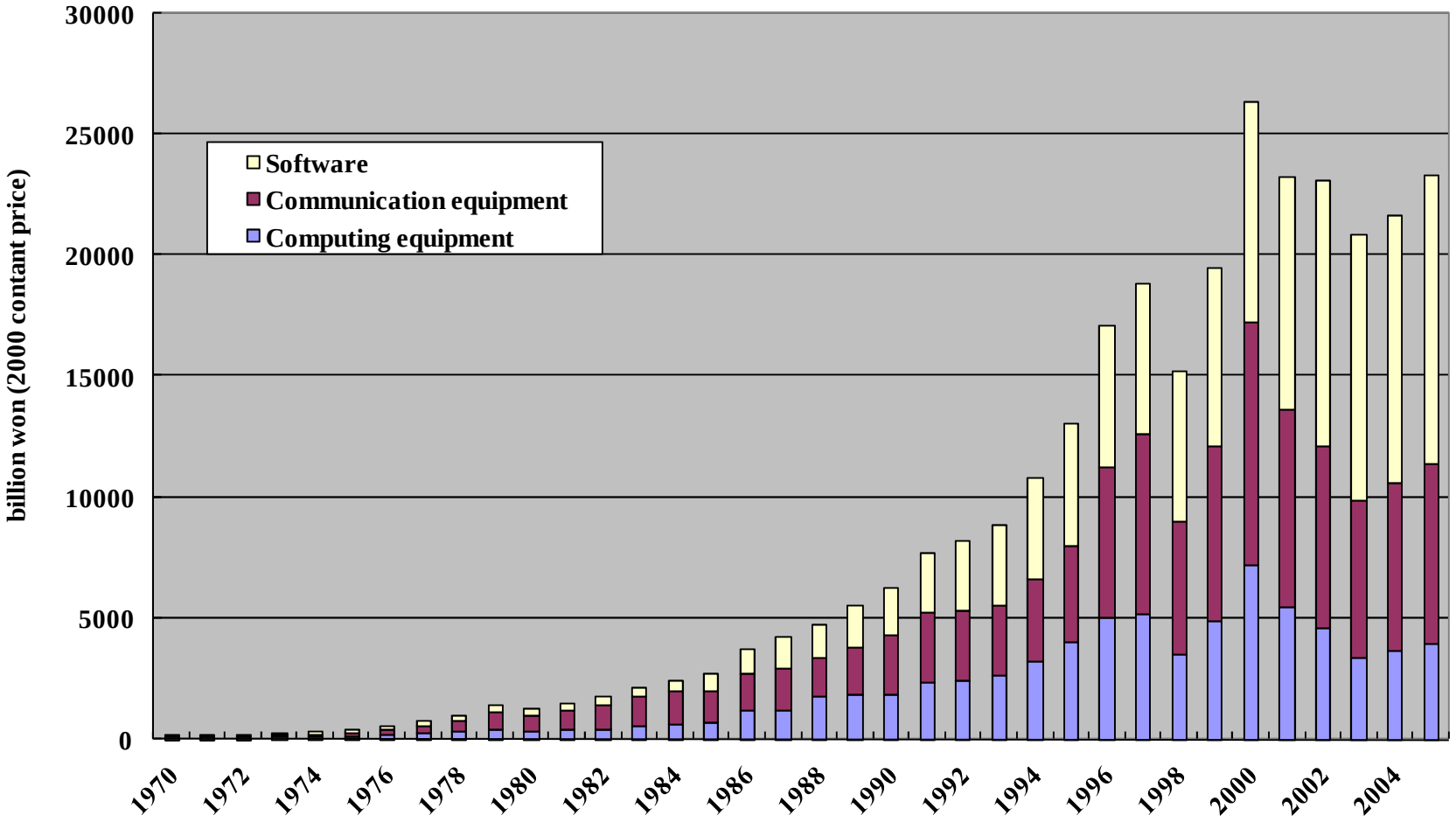


Source: JIP 2008 Database

3. Has ICT Investment Contributed to Economic Growth in Japan and Korea?

3.1 Accumulation of ICT assets in Japan and Korea

Figure 3-1-2 ICT Investment in Korea

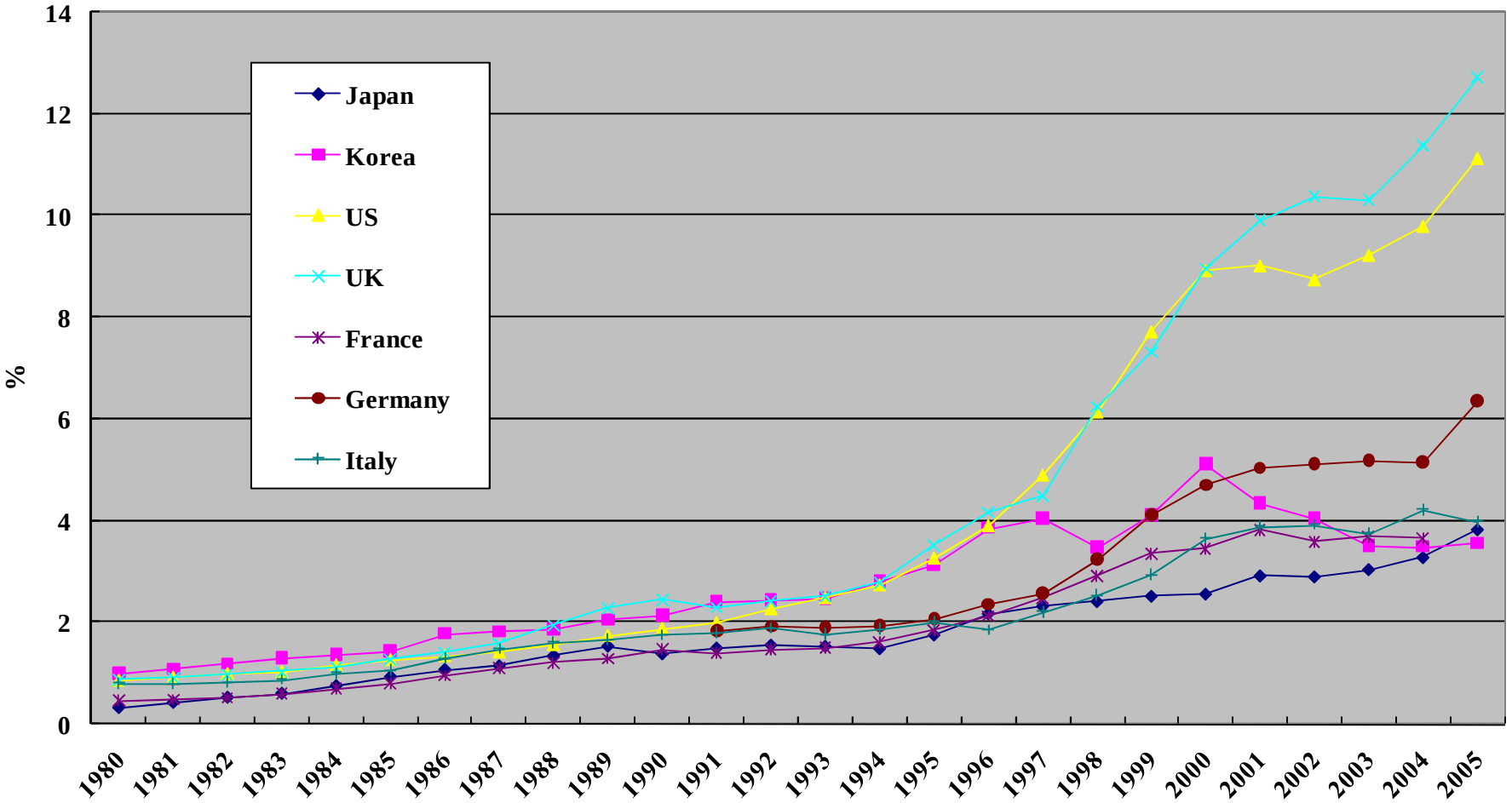


Source: KIP Database

3. Has ICT Investment Contributed to Economic Growth in Japan and Korea?

3.1 Accumulation of ICT assets in Japan and Korea

Figure 3-2 ICT Investment/GDP Ratio in the Major Developed Countries

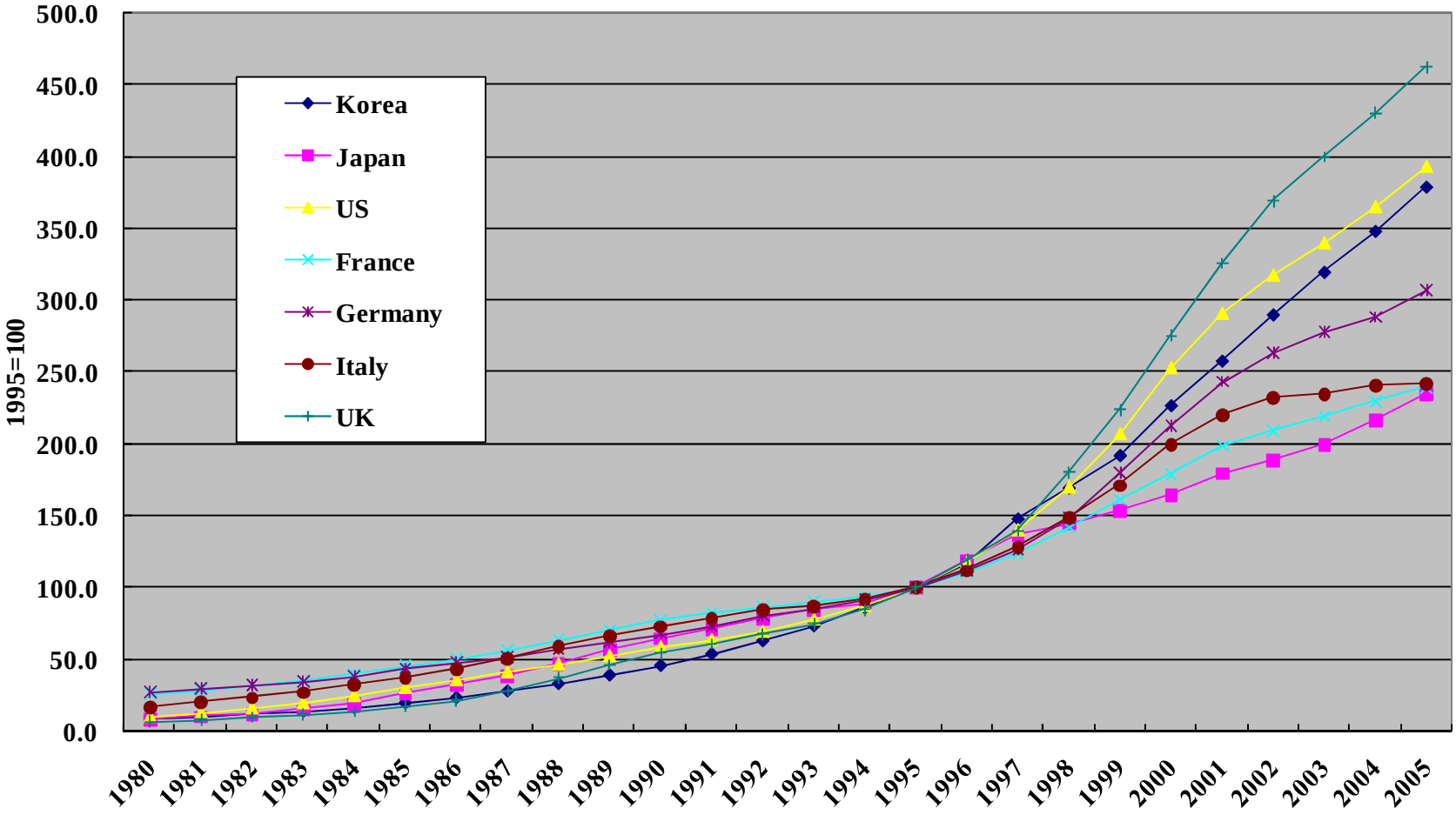


Source: EU KLEMS Database March 2008, JIP Database 2008, KIP Database

3. Has ICT Investment Contributed to Economic Growth in Japan and Korea?

3.1 Accumulation of ICT assets in Japan and Korea

Figure 3-3 Growth in ICT Capital Service in the Major Developed Countries (Market economy)



Source: EUKLEMS Database March 2008

3.2 The Contribution of ICT Capital Services to Economic Growth in Korea and Japan

Table 3-1 Growth accounting including ICT capital service (Market economy)(%)

	1980-1995		1995-2000		2000-2005	
	Korea	Japan	Korea	Japan	Korea	Japan
Value added	9.54	3.87	5.01	1.01	4.68	0.96
Labor	2.20	0.38	0.24	-0.43	1.12	-0.66
Man-hour	1.91	0.11	-0.20	-0.86	0.62	-1.03
Labor quality	0.29	0.27	0.44	0.42	0.50	0.37
Capital	5.58	1.98	5.91	1.07	4.28	1.06
ICT capital	0.50	0.46	0.91	0.50	0.75	0.41
Non-ICT capital	5.00	1.52	4.94	0.57	3.54	0.65
MFP	1.76	1.52	-1.14	0.38	-0.73	0.57

Source: EU KLEMS Database March 2008 and KIP Database.

3.2 The Contribution of ICT Capital Services to Economic Growth in Korea and Japan

Table 3-2 Contributions of ICT Capital Service Input Growth to the Economic Growth (%)

	1995-2000							2000-2005						
	Korea	Japan	US	France	Germany	Italy	UK	Korea	Japan	US	France	Germany	Italy	UK
Market economy total	0.91	0.50	0.57	0.54	0.68	0.43	0.95	0.75	0.41	0.85	0.50	0.34	0.13	1.23
.Electrical machinery, post and communication	1.49	1.50	0.82	0.16	0.18	0.80	2.46	1.18	0.47	1.59	0.03	0.25	0.15	3.78
.Manufacturing, excluding electrical	0.83	0.15	0.24	0.33	0.20	0.28	0.46	0.36	0.22	0.65	0.19	0.12	0.06	0.59
.Other goods producing industries	0.34	0.11	0.64	0.28	0.09	0.15	0.20	0.07	0.03	0.69	0.37	0.03	0.06	0.22
.Distribution services	0.44	0.15	0.53	0.54	0.49	0.46	0.81	0.28	0.10	0.83	0.63	0.21	0.07	0.90
.Finance and business services	2.07	1.61	0.75	1.00	2.13	0.76	1.73	2.44	1.50	0.89	0.79	0.99	0.34	2.33
.Personal and social services	0.64	0.20	0.57	0.48	0.27	0.38	0.49	0.26	0.07	0.74	0.45	0.10	0.12	0.60

Source: EU KLEMS Database March 2008 and KIP Database.

4. Resource Reallocation Effects in Japan and Korea

4.1 Measurement Methodology and Results for the Market Economy as a Whole

$$\nu_T = \nu_T{}^D + \left(\sum_j \left(\overline{w}_j \frac{\overline{\nu}_{K,j}}{\overline{\nu}_{V,j}} \Delta \ln K_j \right) - \overline{\nu}_K \Delta \ln K \right) + \left(\sum_j \left(\overline{w}_j \frac{\overline{\nu}_{L,j}}{\overline{\nu}_{V,j}} \Delta \ln L_j \right) - \overline{\nu}_L \Delta \ln L \right)$$

ν^T: the macro TFP growth derived from the production possibility frontier approach

$\nu^T{}_D$: the macro TFP growth derived from the direct aggregation across industries approach

$\nu_{K,j}$ and $\nu_{L,j}$ are the share of capital and of labor income in industry *j*'s gross output, and $\nu_{V,j}$ stands for industry *j*'s value added-gross output ratio.

$$\sum_j \left(\overline{w}_j \frac{\overline{\nu}_{K,j}}{\overline{\nu}_{V,j}} \Delta \ln K_j \right) - \overline{\nu}_K \Delta \ln K = \sum_j \left(\overline{w}_j \frac{\overline{\nu}_{K,j}}{\overline{\nu}_{V,j}} \Delta \ln K_j - \overline{w}_{K,j} \overline{\nu}_K \Delta \ln K \right)$$

$$= \sum_j \left(\overline{w}_j \frac{\overline{\nu}_{K,j}}{\overline{\nu}_{V,j}} - \overline{w}_{K,j} \overline{\nu}_K \right) \Delta \ln K_j + \overline{\nu}_K \left(\sum_j \overline{w}_{K,j} \Delta \ln K_j - \Delta \ln K \right)$$

The first term on the right-hand side of the equation denotes the inter-industry reallocation effect of aggregated capital.

The second term on the right-hand side of the equation denotes the reallocation effect of changes in the capital composition within each industry.

Table 4-1 Aggregate Reallocation Effects in Japan and Korea

(Average annual growth rates: %)

Japan		1975-80	1980-90	1990-2000	2000-05		
(1) Growth rate of aggregated TFP, v_T	a=b+c+d	2.59	1.89	0.51	0.98		
(2) Domar weighted TFP growth, v_T^D	b	2.19	1.64	0.10	0.92		
(3) Reallocation effects of capital input	c	0.47	0.28	0.18	0.07		
(4) Reallocation effects of labor input	d	-0.07	-0.03	0.23	-0.02		

*These estimates for Japan are from Fukao, Miyagawa and Takizawa (2007).

Korea		1972-80	1980-90	1990-2000	2000-05	1990-97	1999-2005
(1) Growth rate of aggregated TFP, v_T	a=b+c+d	-0.35	1.29	-1.06	-1.04	-0.79	-0.26
(2) Domar weighted TFP growth, v_T^D	b	-2.34	0.88	-1.02	-1.63	-0.36	-0.87
(3) Reallocation effects of capital input	c	1.06	-0.76	-0.52	0.19	-0.95	0.21
(4) Reallocation effects of labor input	d	0.93	1.16	0.47	0.40	0.52	0.40

Analysis on the market economy?

Based on disaggregated data?

Figure 4-1-1 Industry-Level Reallocation Effect of Capital Input in Japan: 1975-2005

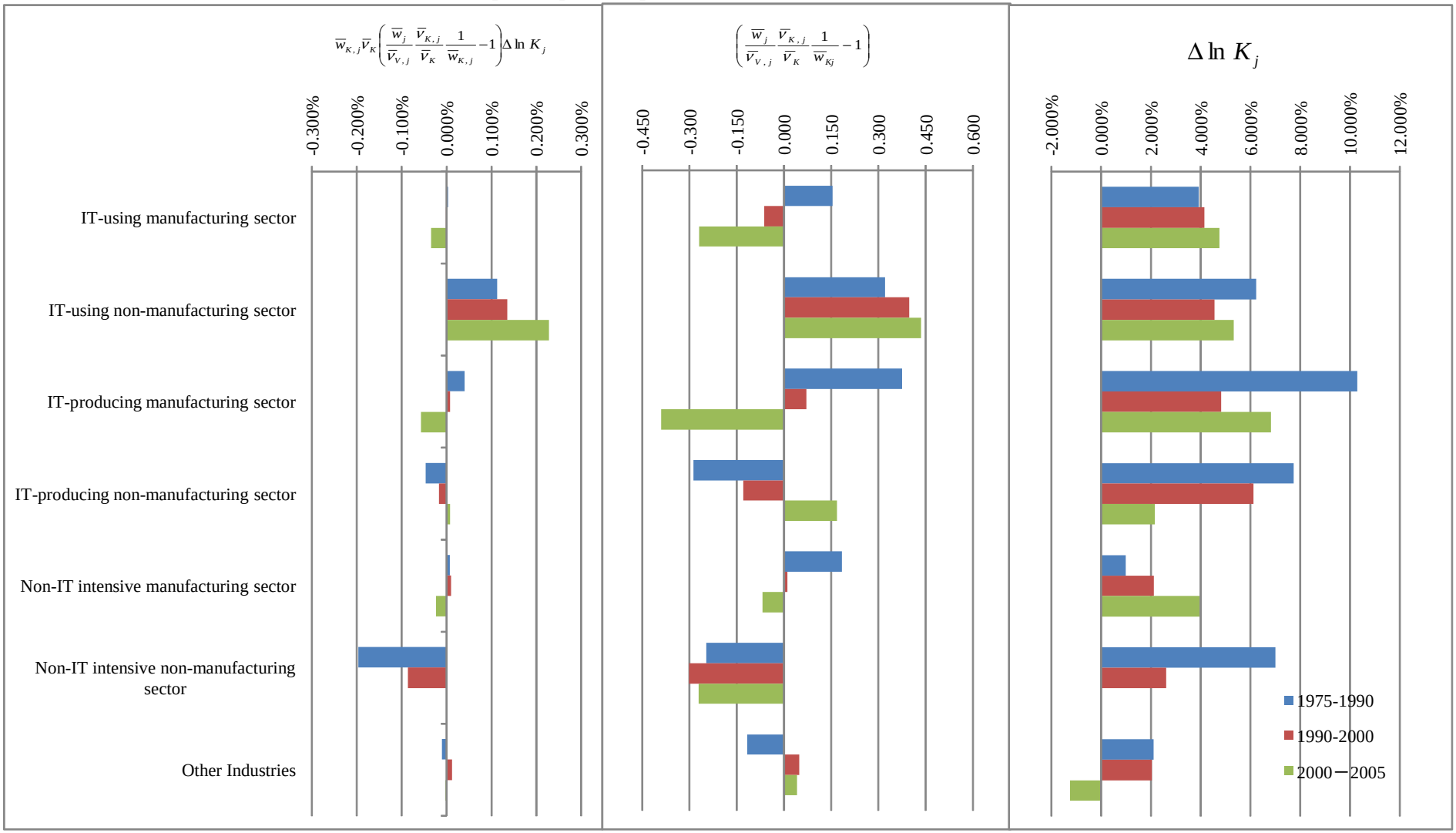


Figure 4-1-2 Industry-Level Reallocation Effect of Labor Input in Japan: 1975-2005

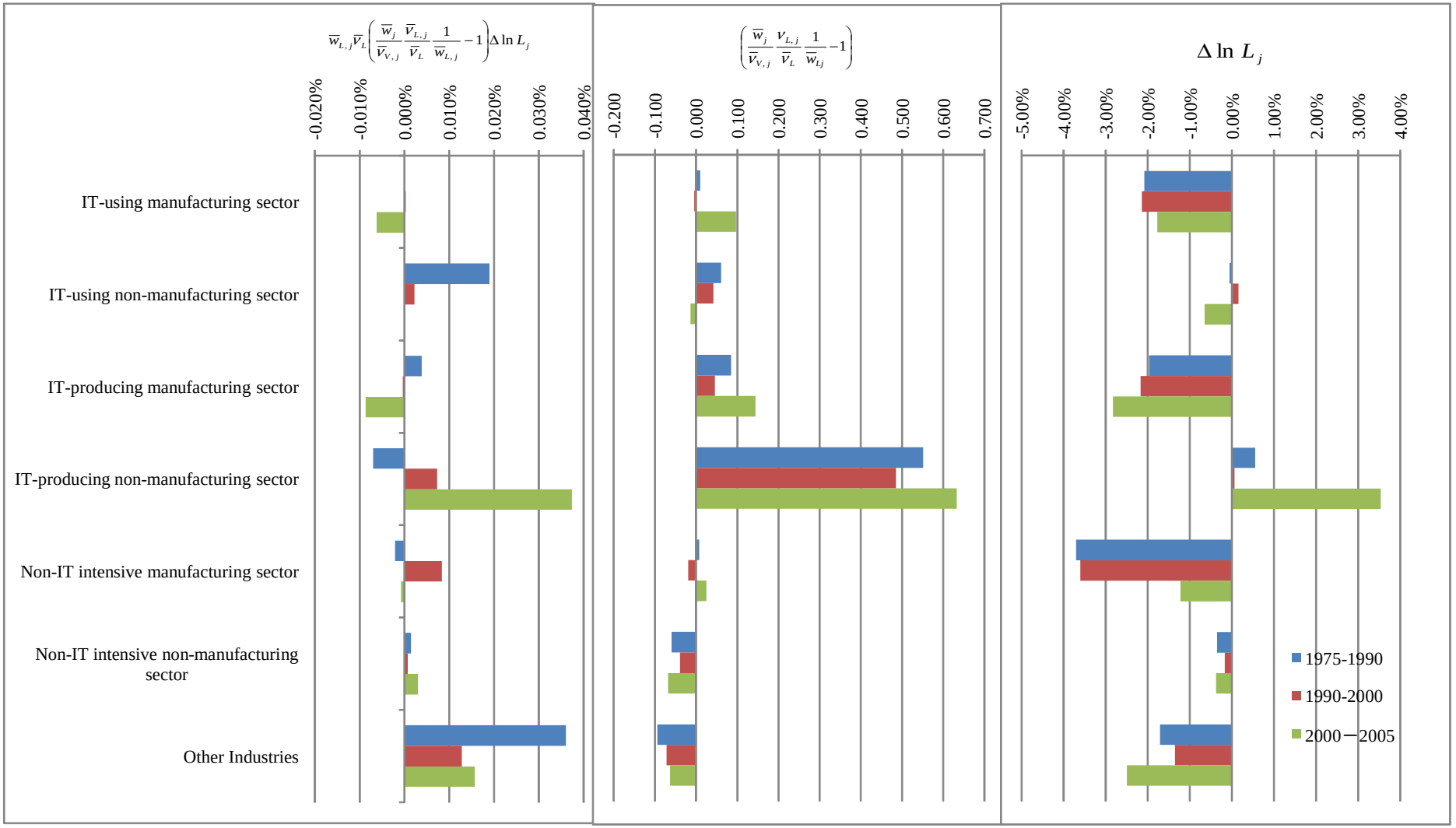


Figure 4-2-1 Industry-Level Reallocation Effect of Capital Input in Korea: 1975-2005

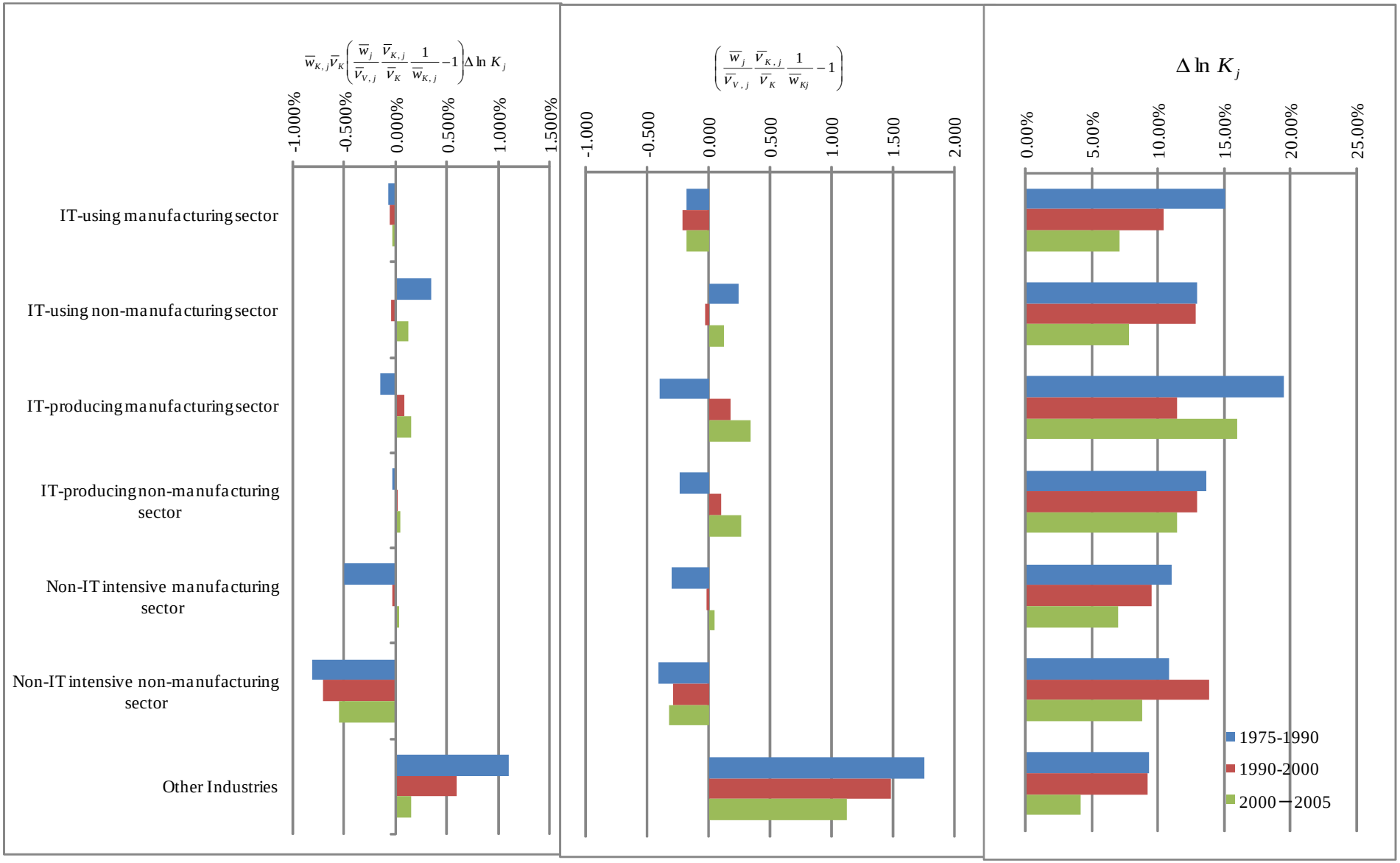


Figure 4-2-2 Industry-Level Reallocation Effect of Labor Input in Korea: 1975-2005