Entry and Growth of SMEs in Korean Manufacturing:

An Empirical Analysis based on Micro Data

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Korea's Leading Think Tank KDI

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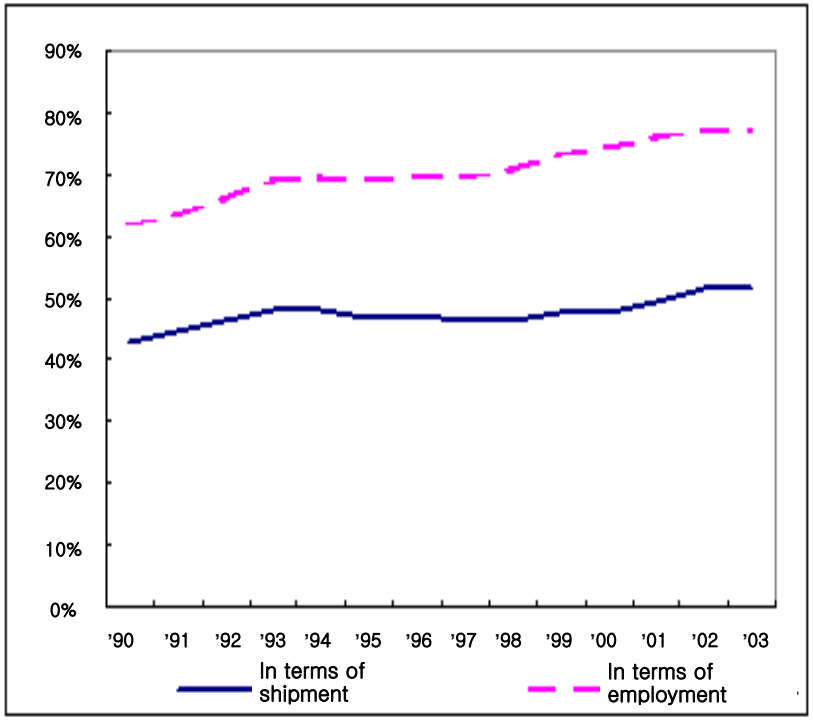
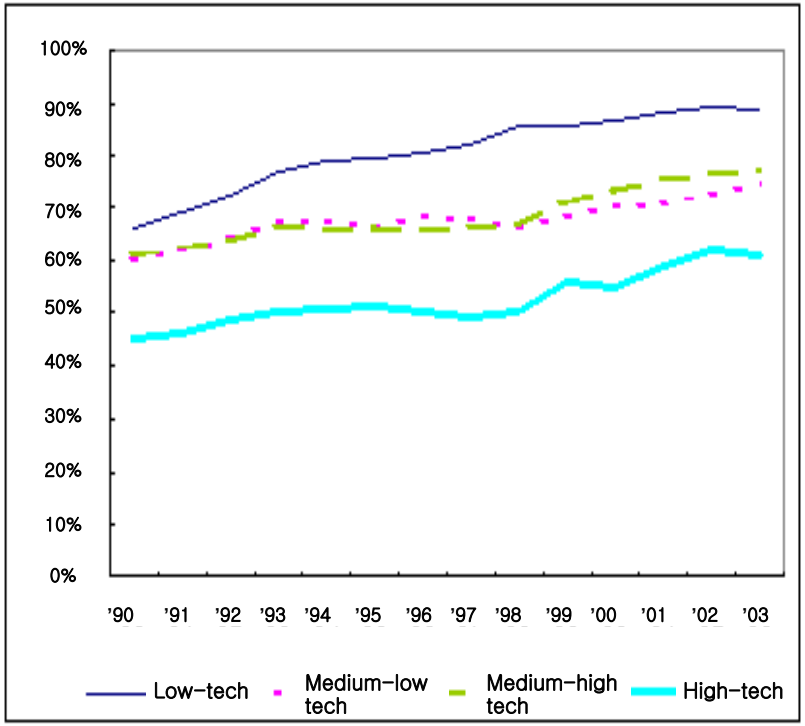
Part-01 | Introduction

Share of SMEs in Manufacturing





Source: ***Report on Mining and Manufacturing Survey.***

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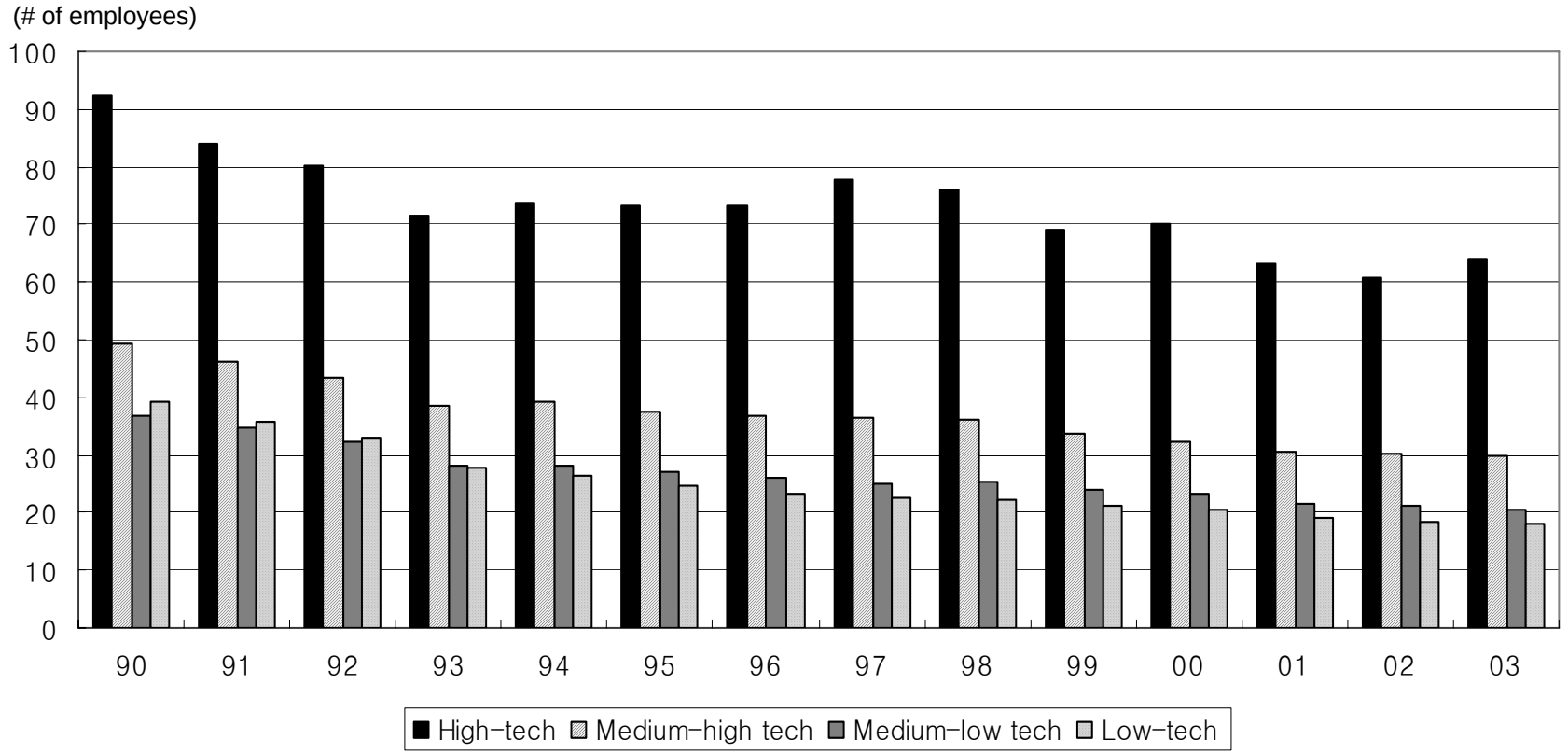
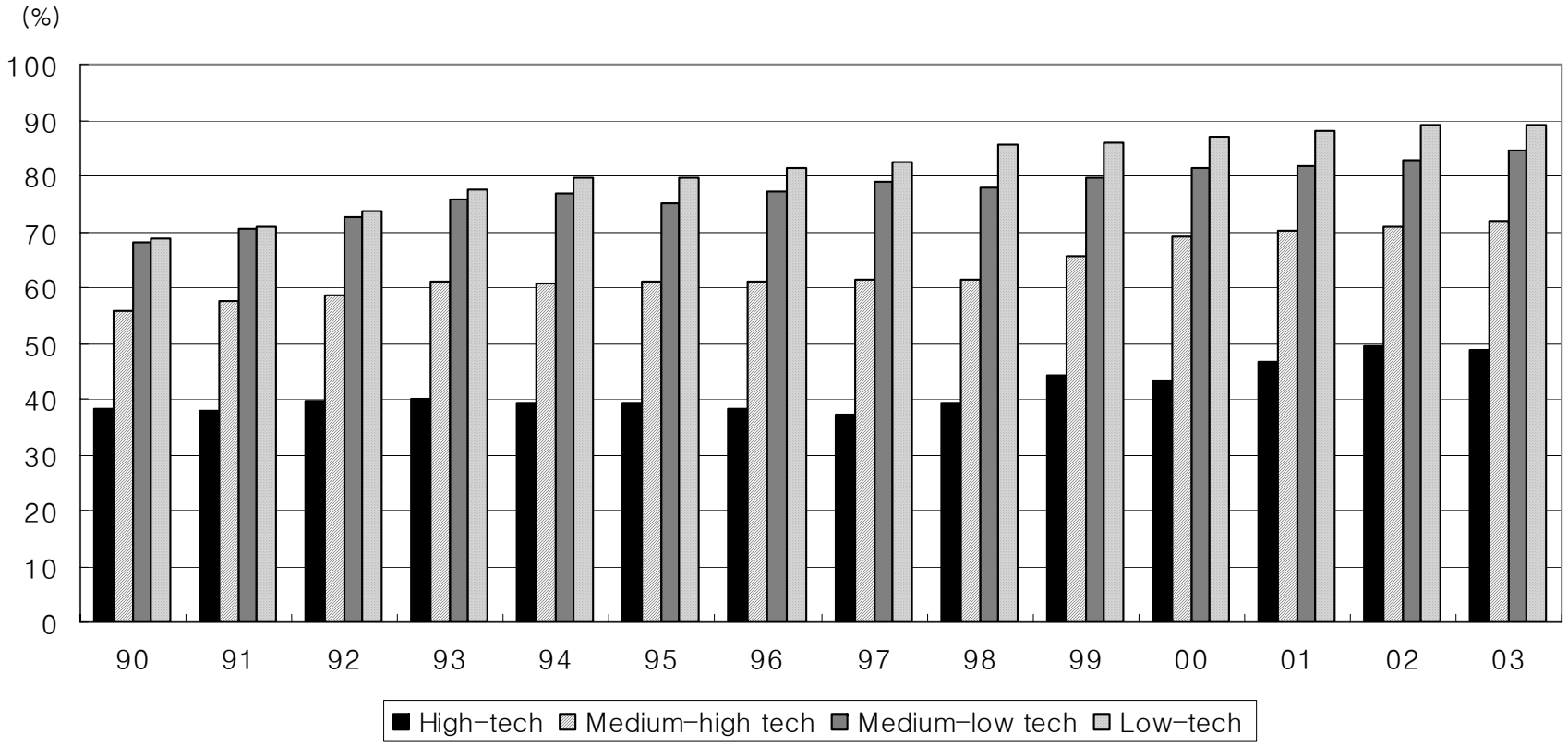
Trend in average number of employees of firms (by technology level)



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

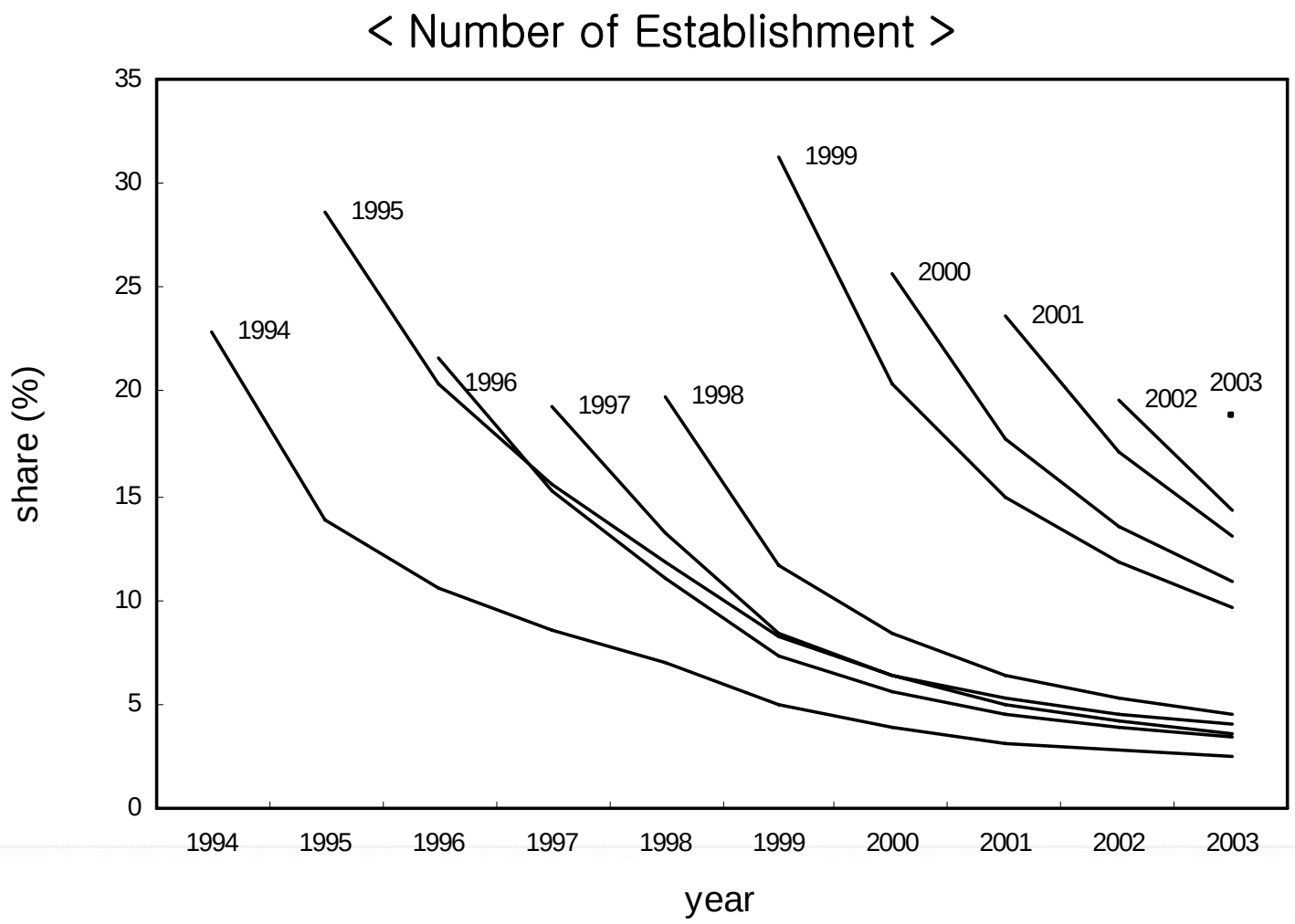
Trend in employment share of SMEs (by technology level)



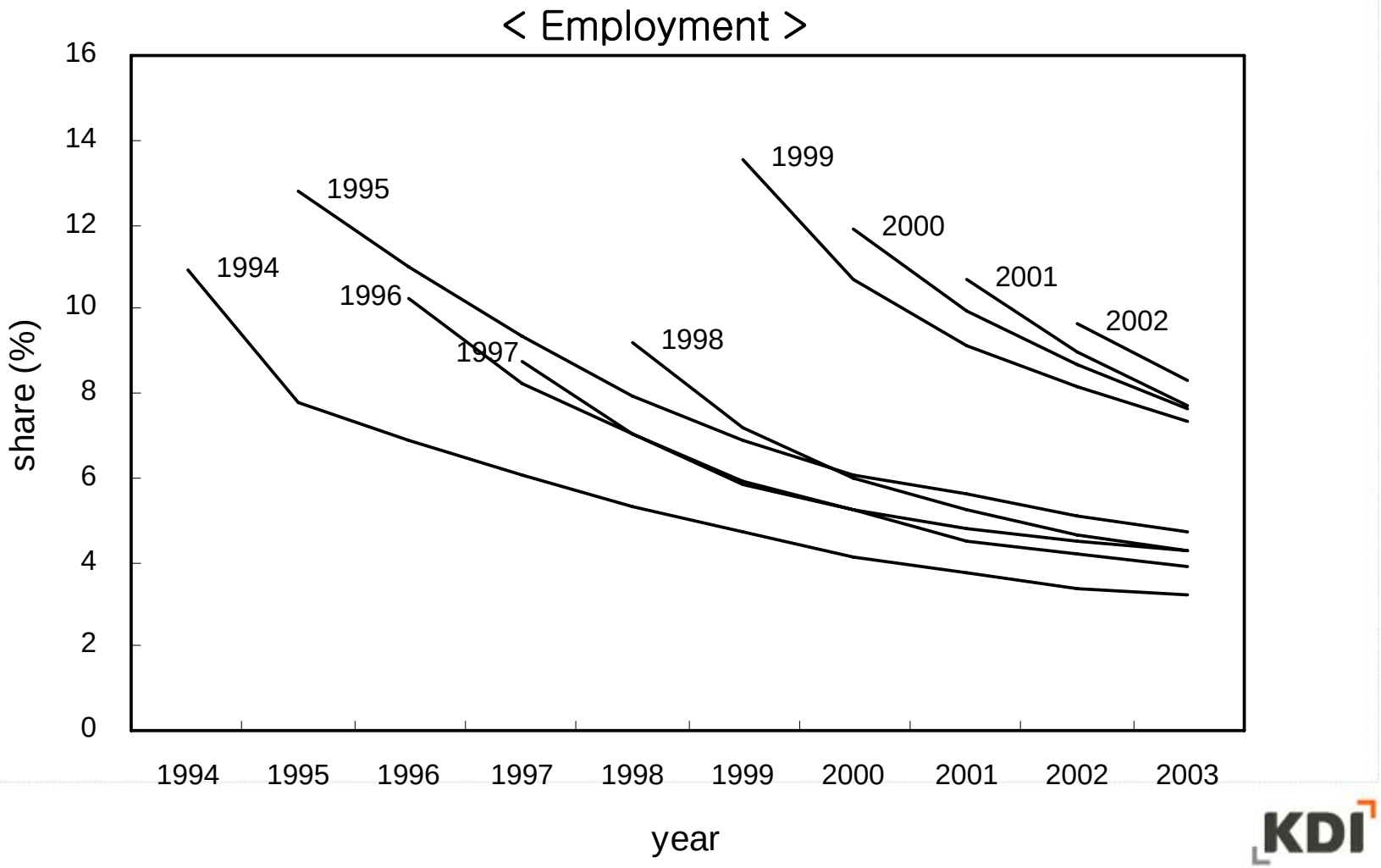
Author's calculation based on the micro-data of
Report on Mining and Manufacturing Survey, National Statistics Office

Part-02 | Entry and Growth of New Plants

Share of Entry Cohorts



Share of Entry Cohorts



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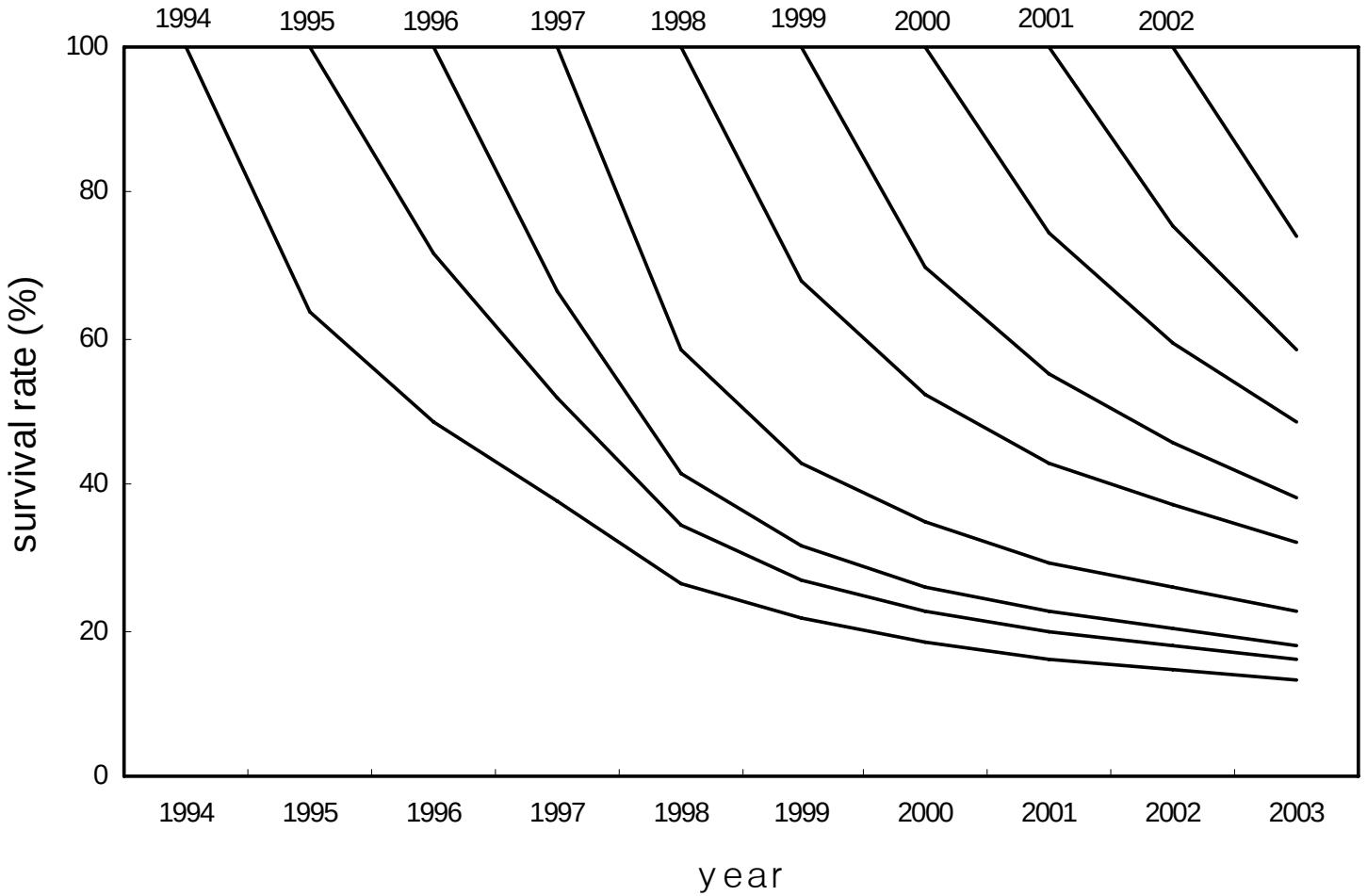
Survival Rate of Entry Cohorts



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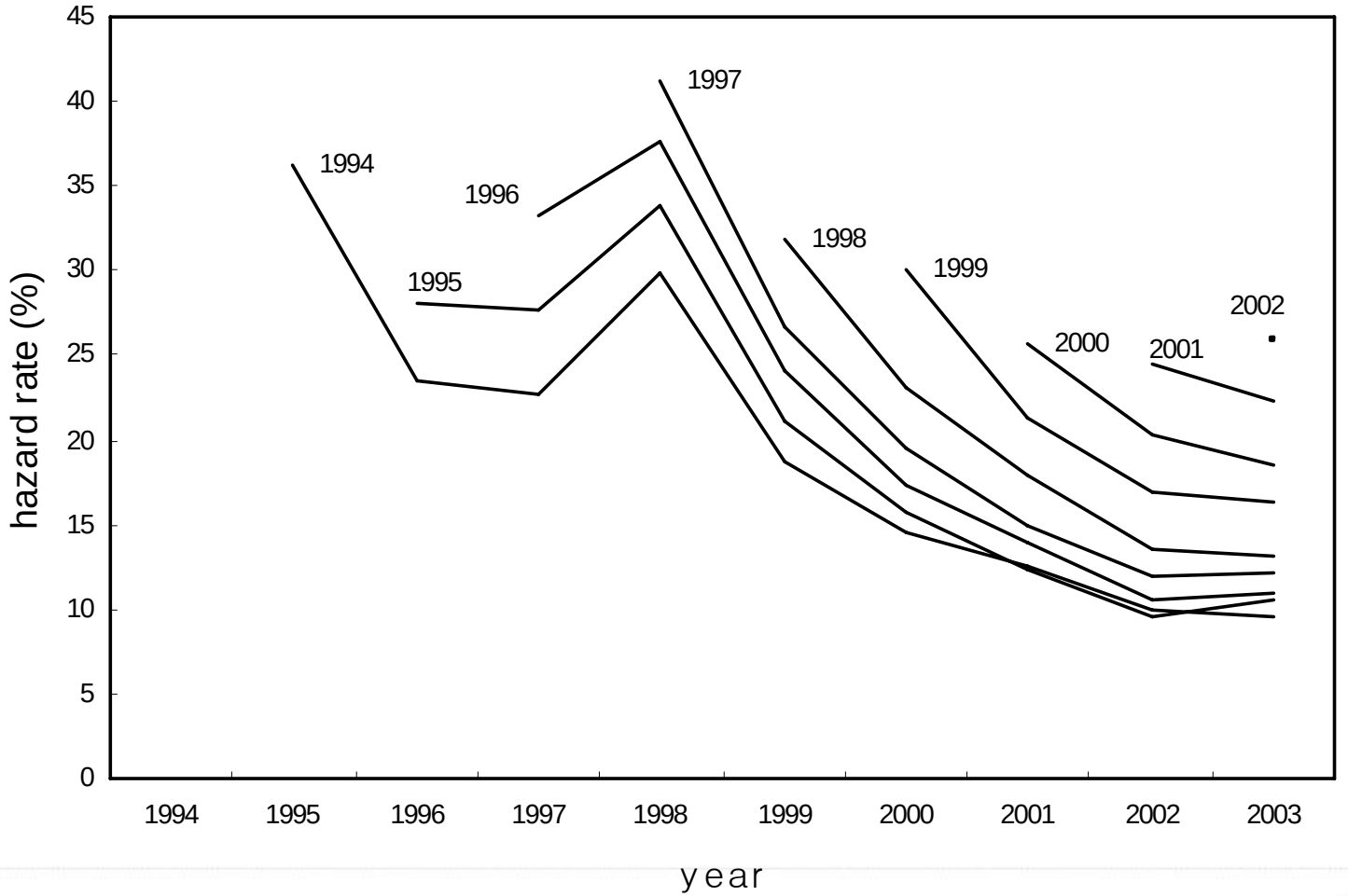
Hazard Rate of Entry Cohorts



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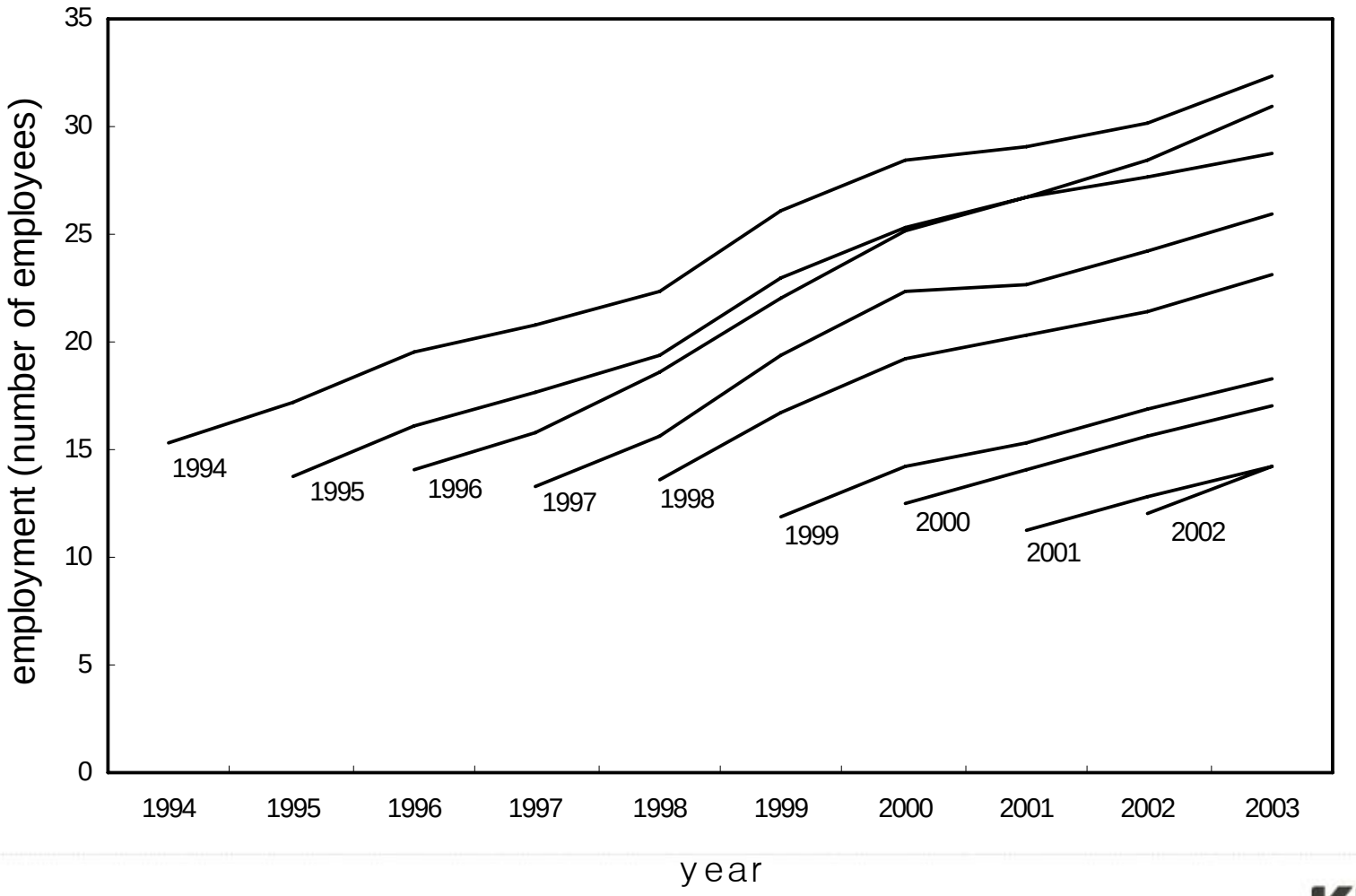
Average Size by Entry Cohort 1



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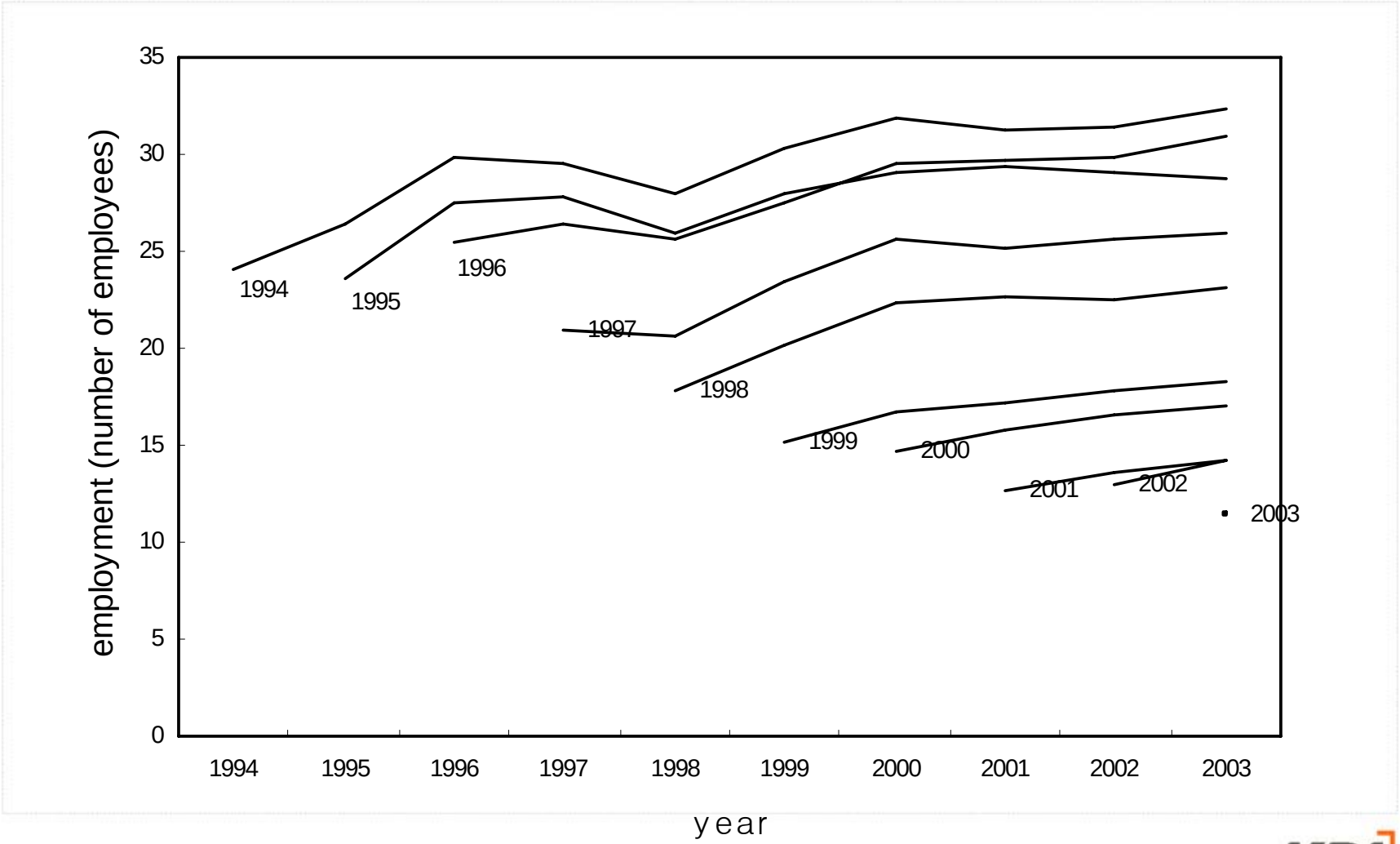
Average Size by Entry Cohort 2



Part-03

Characteristics of High-growth SMEs

Defining High-growth SMEs

- To identify high-growth SMEs with top 10% growth rate
  - ✓ 4,444 plants in the period of 1994~1997 (top 9.90%)
  - ✓ 4,355 plants in the period of 1997~2000 (top 9.99%)
  - ✓ 5,864 plants in the period of 2000~03 (top 9.98%)

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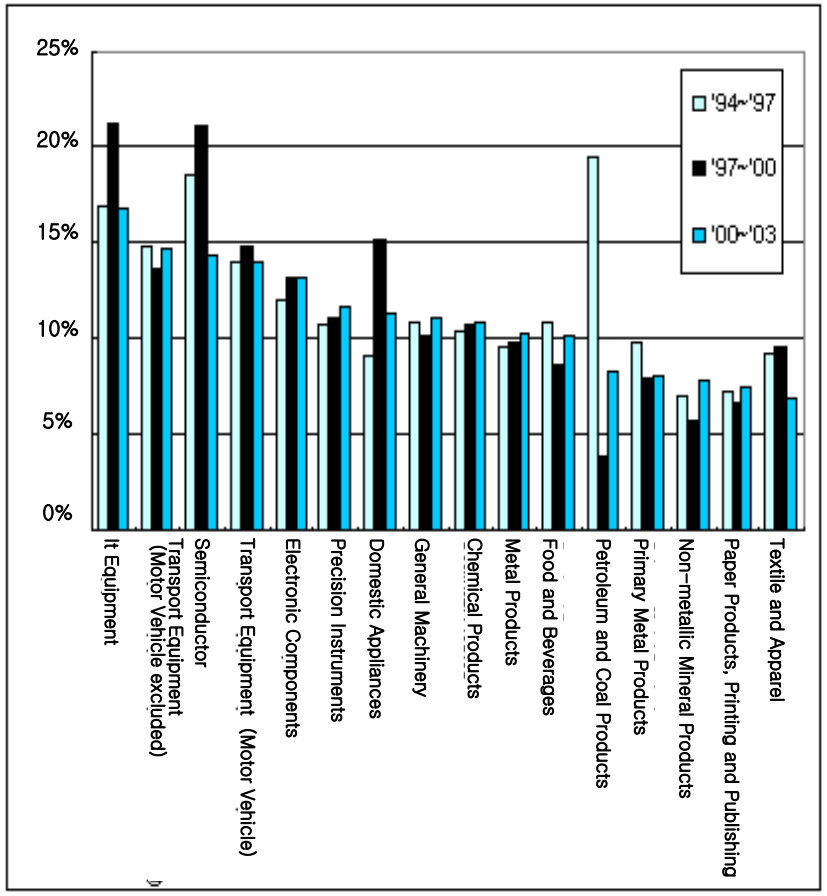
High-growth SMEs by Industry

< Number of Establishment >



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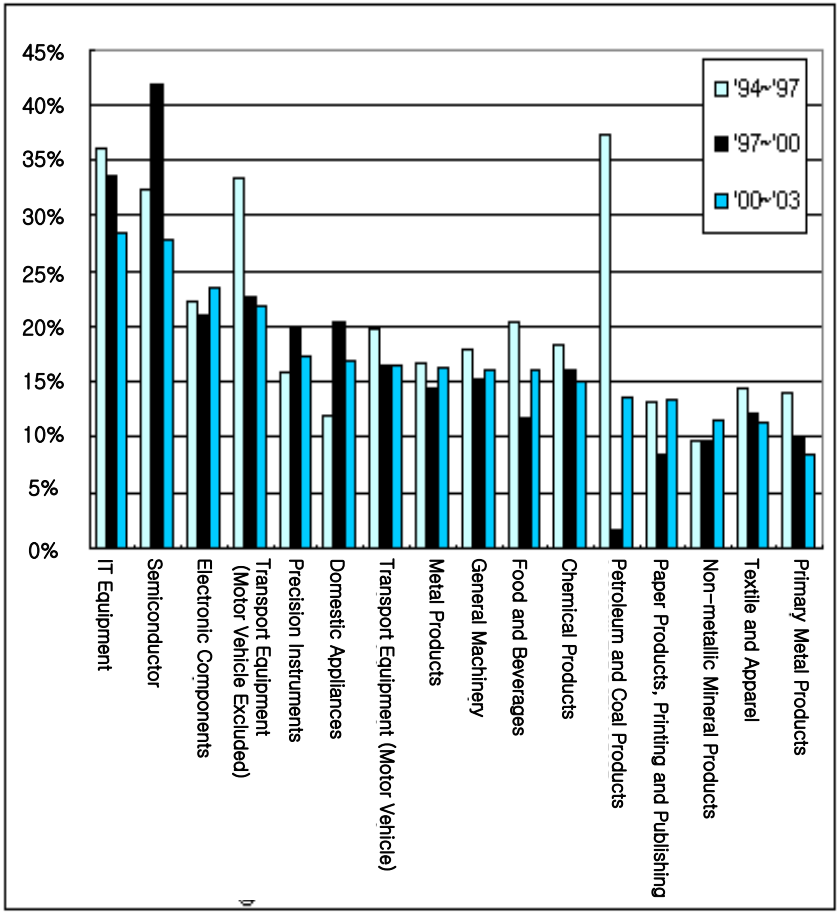

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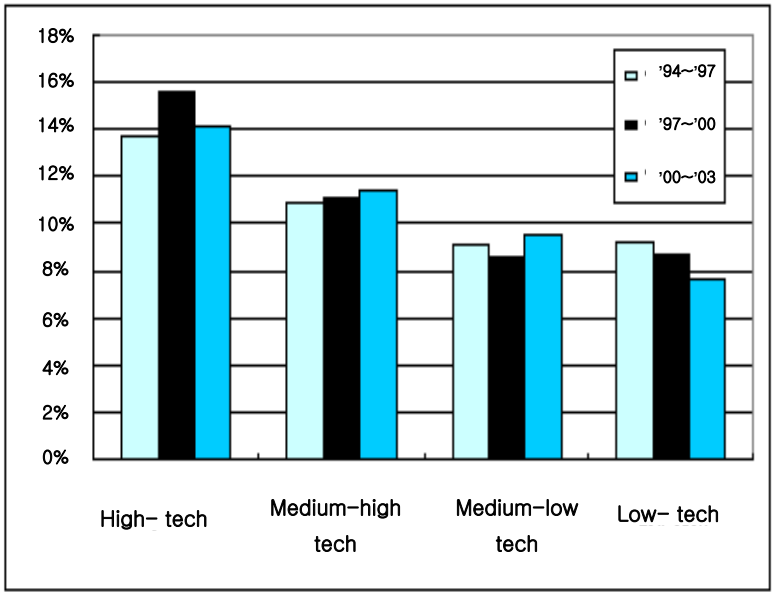
High-growth SMEs by Technology Level

< Number of Establishment >



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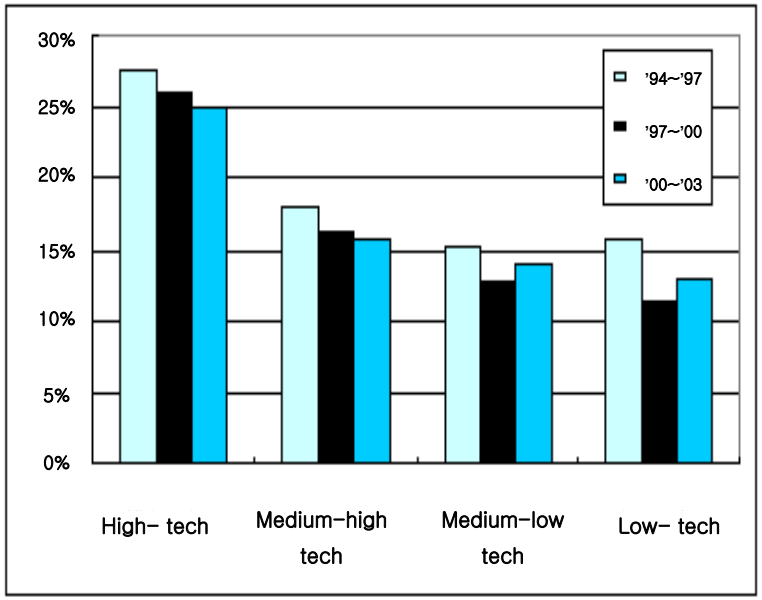

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Characteristics of High-growth SMEs

Dependent Variables / Explanatory Variables	Total Factor Productivity (TFP)	Proportion of Non-production workers	R&D Intensity	Export Intensity
High-growth dummy	0.02153* (6.61)	0.05728* (6.30)	0.00230* (4.40)	0.00572* (3.06)
Constant term	0.55193* (20.33)	0.34352* (25.38)	0.00154 (1.57)	0.03564* (11.49)
Industry dummy	included	included	included	included
Year dummy	included	included	included	included
number of observations	104,966	146,167	147,238	88,465
Adj. R^2	0.06581	0.01843	0.00422	0.03993

Note: Inside of ( ) are t-ratios corrected for heteroskedasticily

***: significant in the level of significance 1%**

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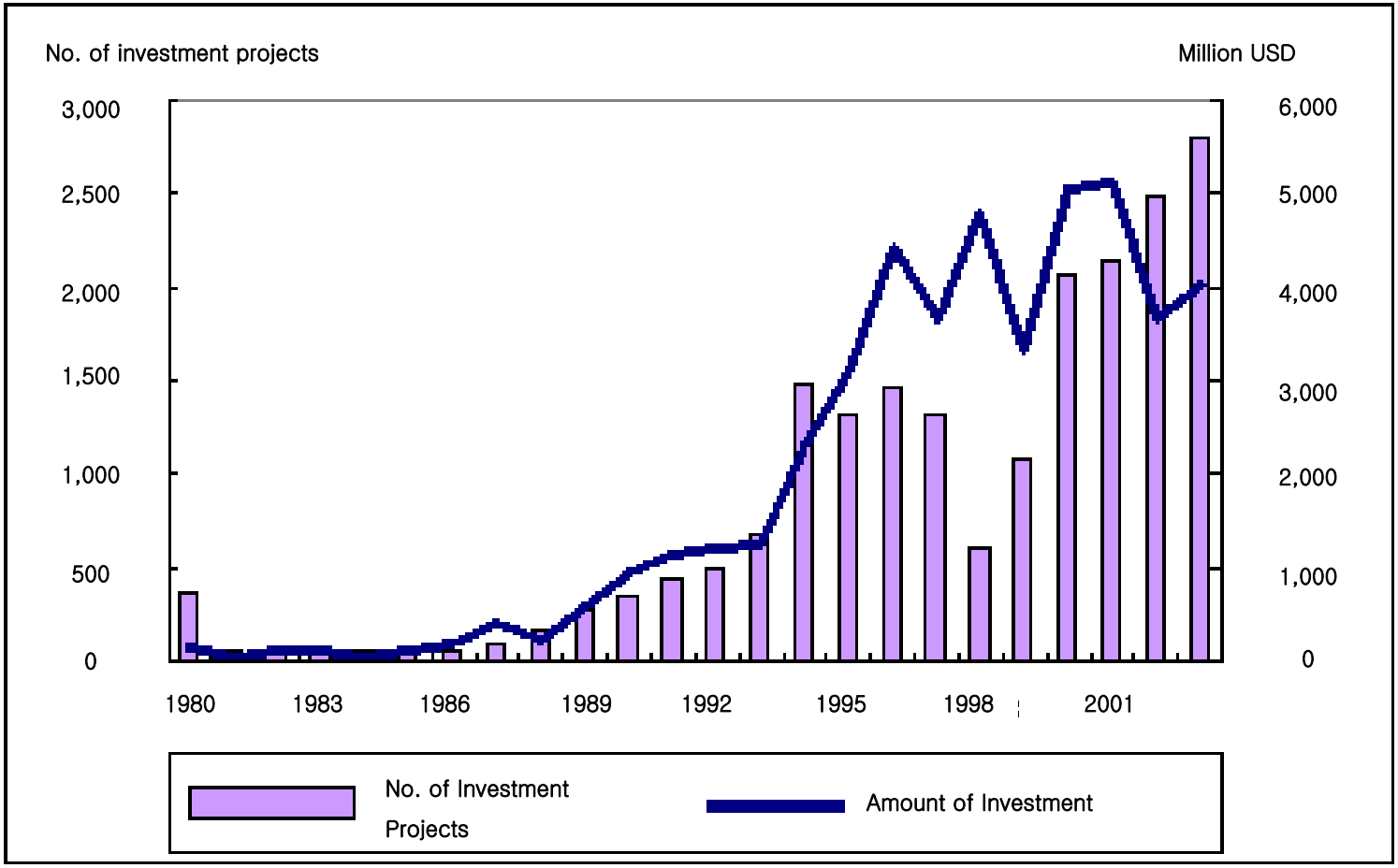
Part-04 | Determining of SMEs' Growth

Trend in FDI (gross investment)



Source: Export-Import Bank of Korea, quoted again from Ahn et al. (2005)

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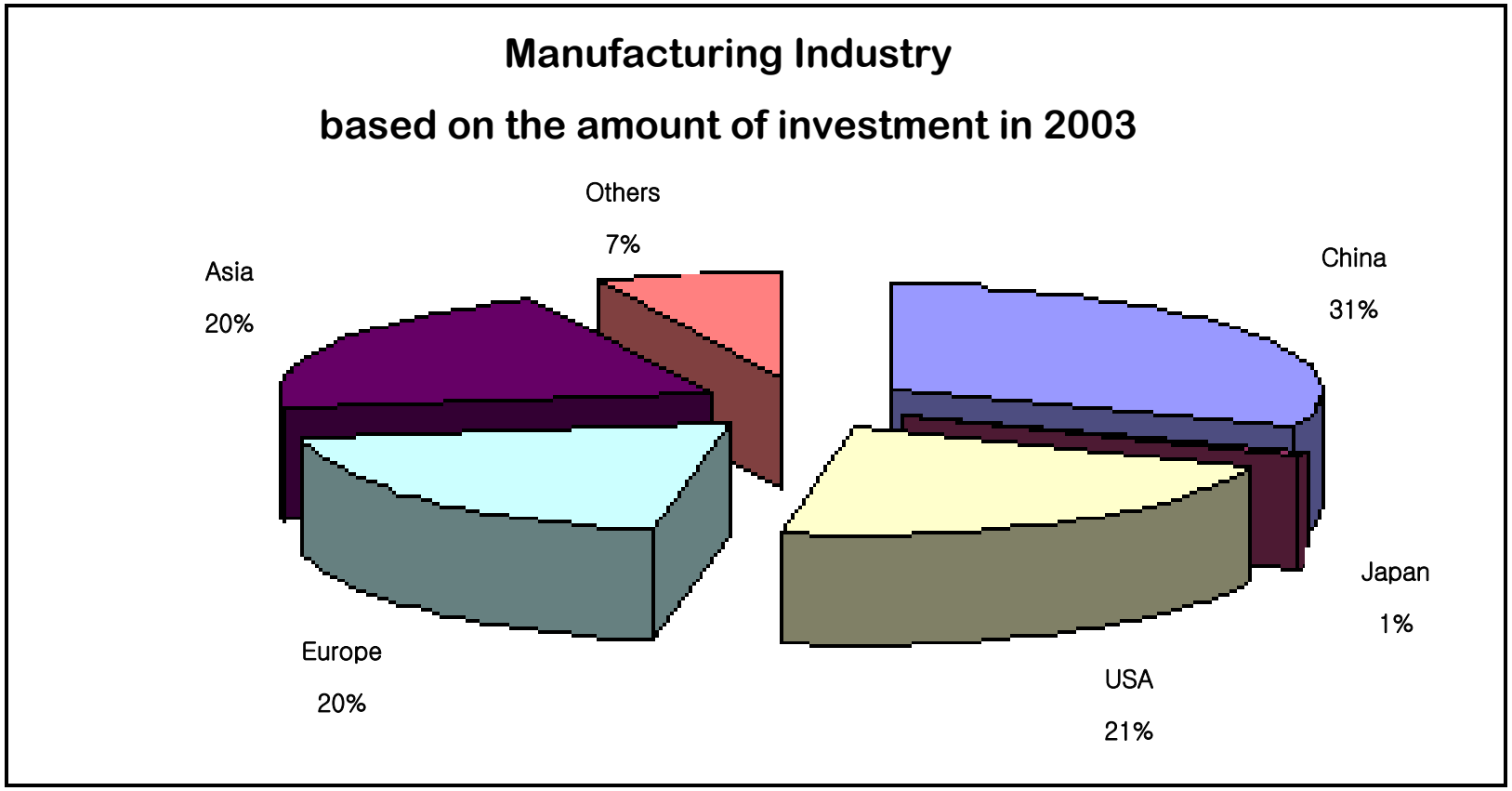
Regional Distribution of FDI



Source: Export-Import Bank of Korea, quoted again from Ahn et al. (2005)

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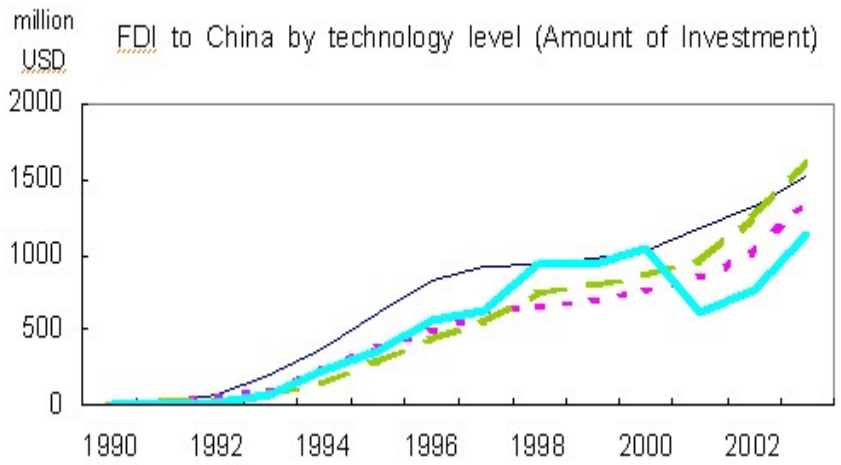
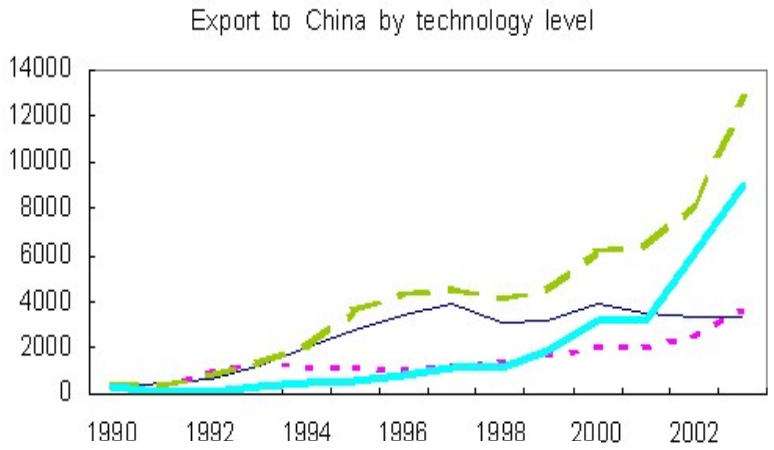
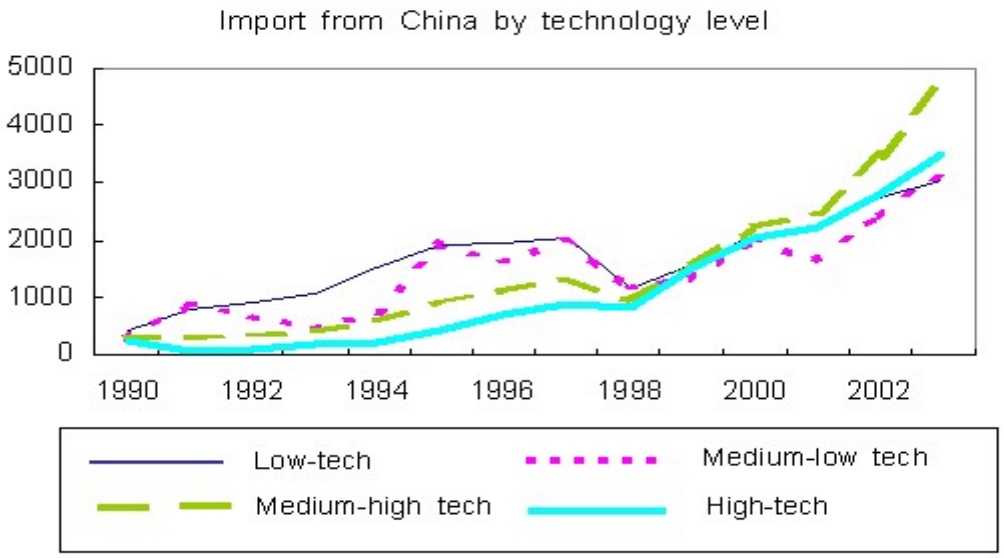
Trend of FDI, export, and import by technology level (to and from China)







Source: Export-Import Bank of Korea, quoted again from Ahn et al. (2005)

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Regression Equation and Main Variables

- $$\frac{L_{i,t+1} - L_{i,t}}{L_{i,t}} = \alpha_0 + \alpha_p \bullet X_{i,t} + \alpha_I \bullet X_{j,t} + \alpha_D \bullet D_t + \varepsilon_{i,t\,I}$$

- $$InTFP_{i,t+1} - InTFP_{i,t} = \beta_0 + \beta_P \bullet X_{i,t} + \beta_I \bullet Y_{j,t} + \beta_D \bullet D_t + \varepsilon_{i,t\,I}$$

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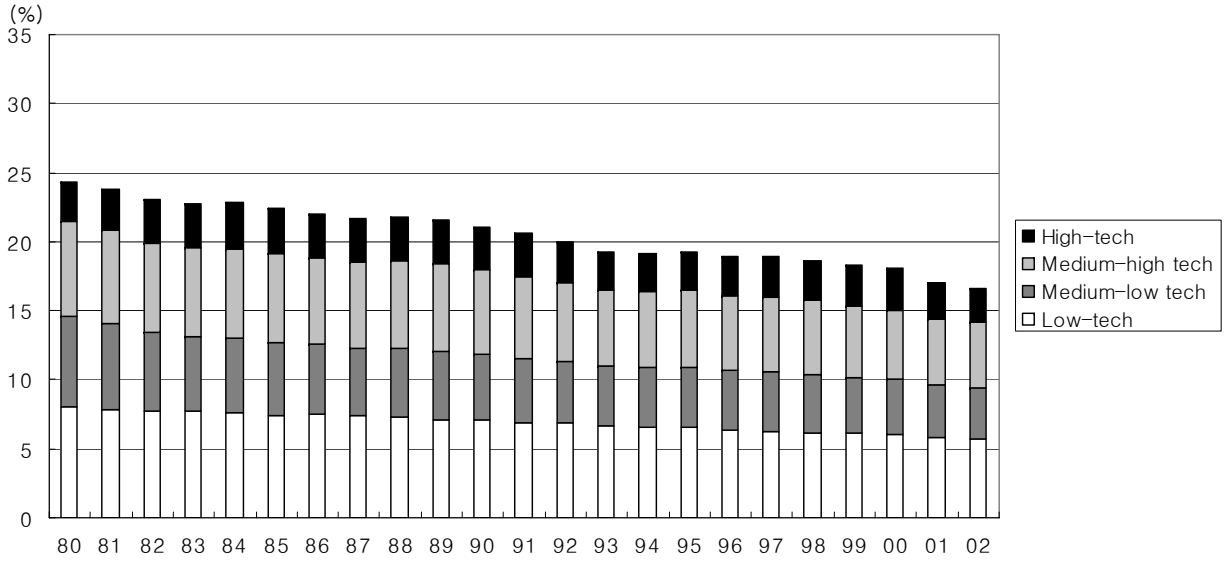
Part-05

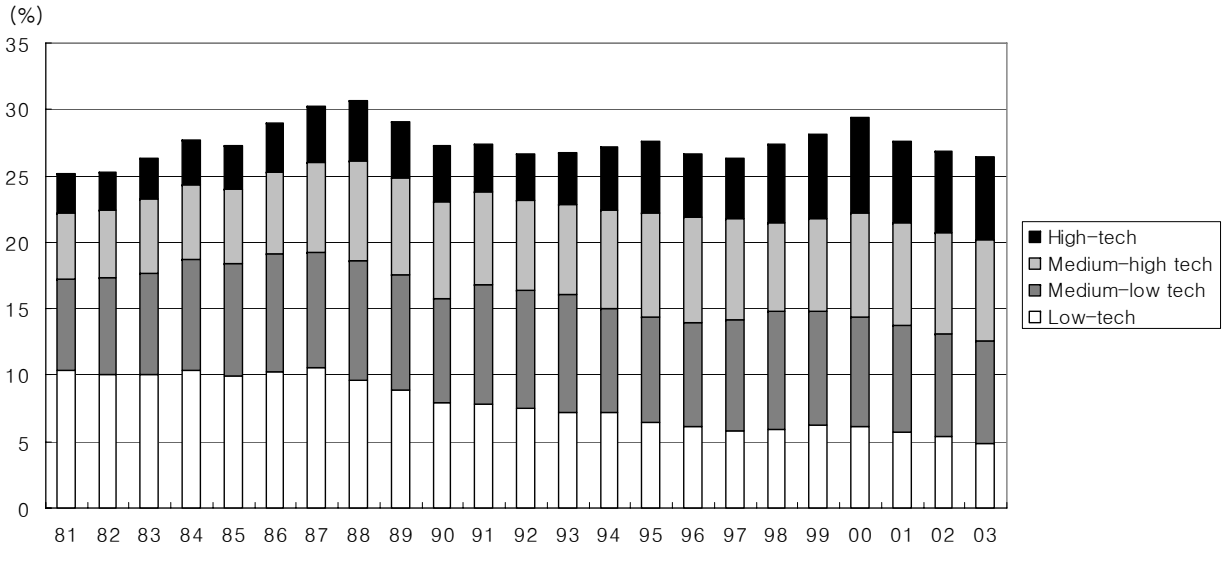
New Trends in Korean Manufacturing

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

G7



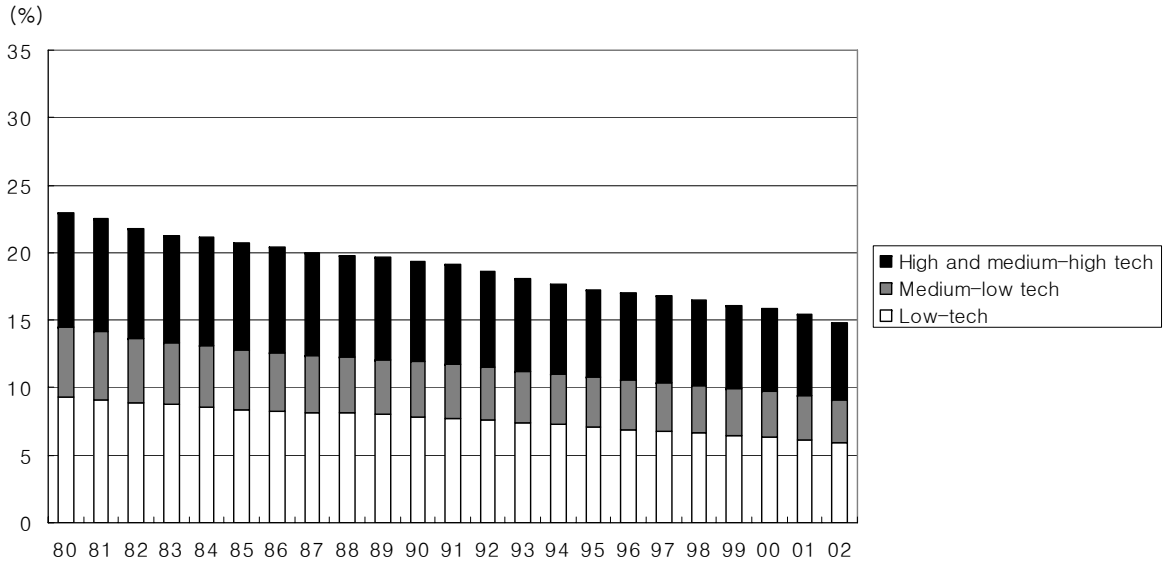
Korea



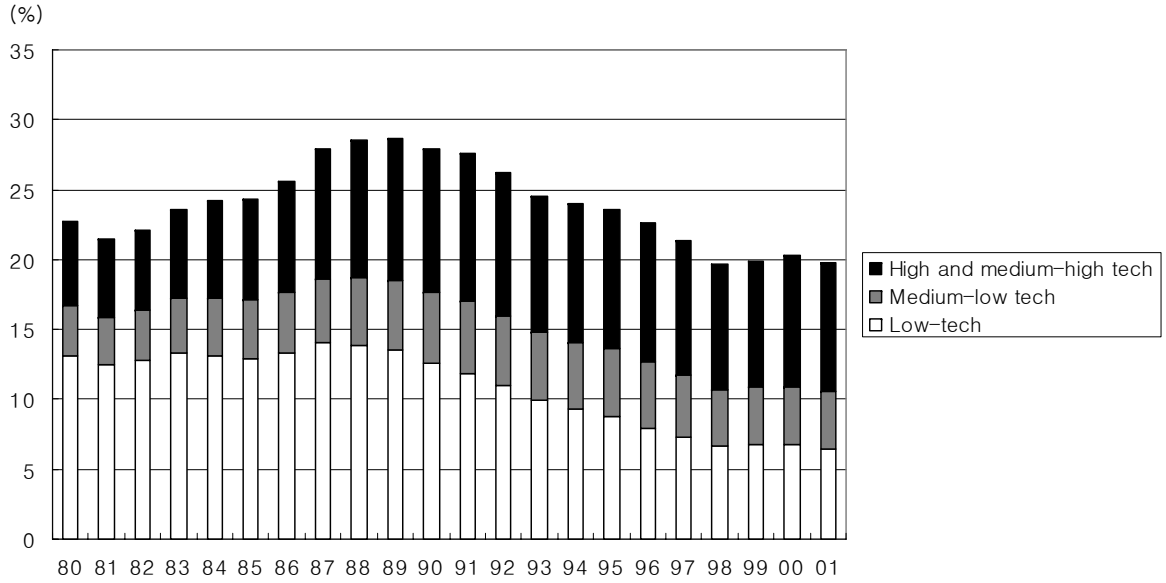
Source: *OECD STAN Indicators database, 2005*

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

G7

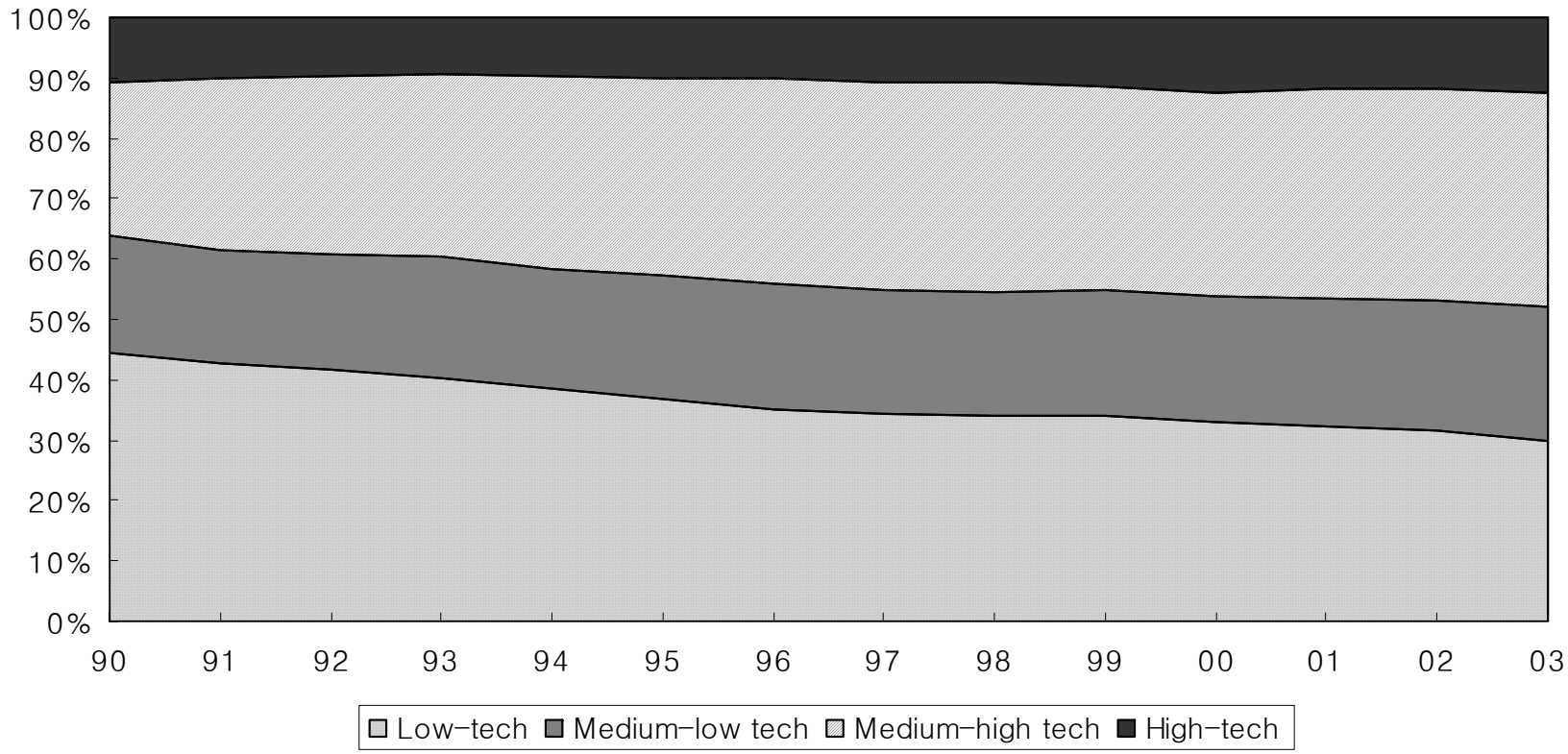


Korea



Source: *OECD STAN Indicators database, 2005*

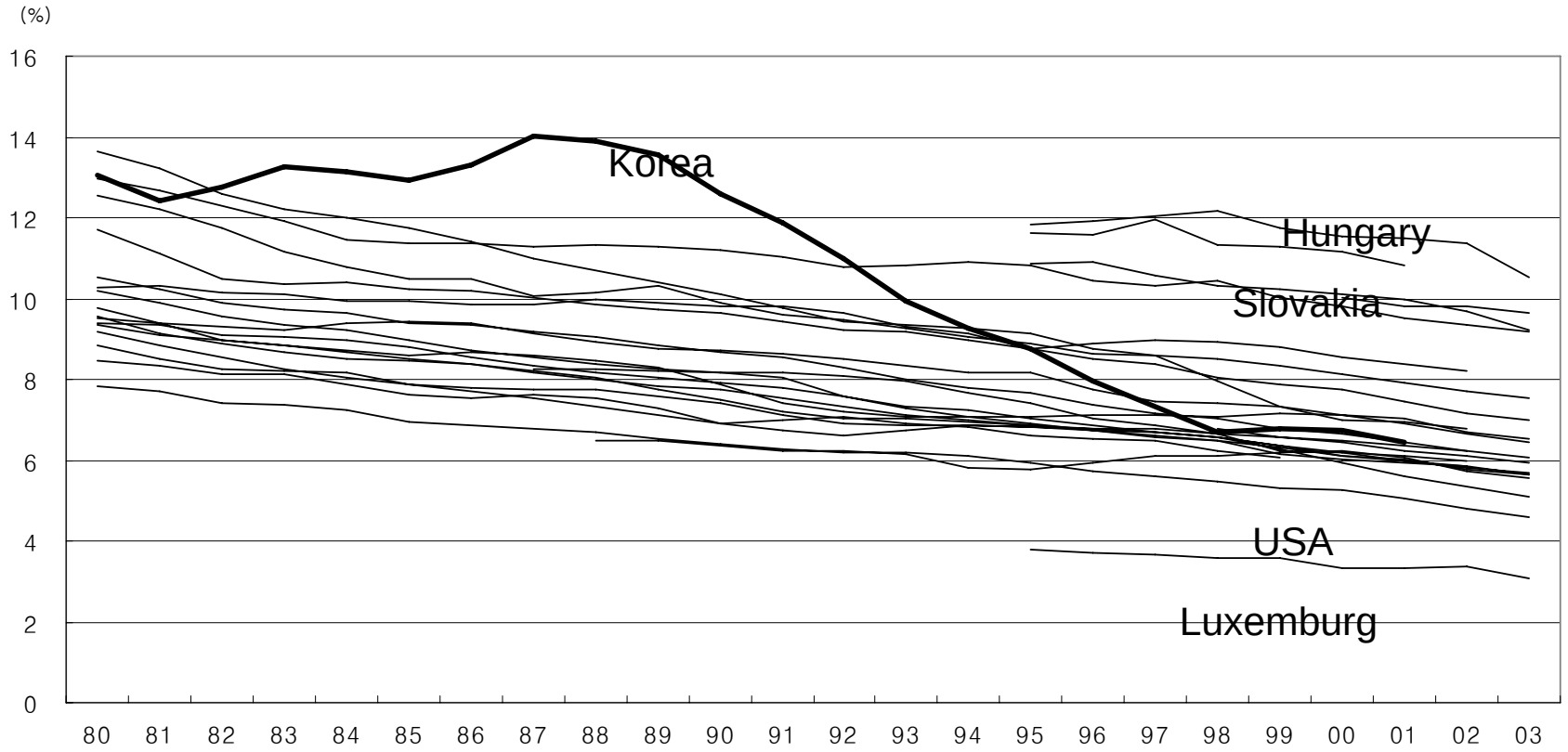
Employment share of industries within manufacturing industry (by technology level)



Author's calculation based on the micro-data of

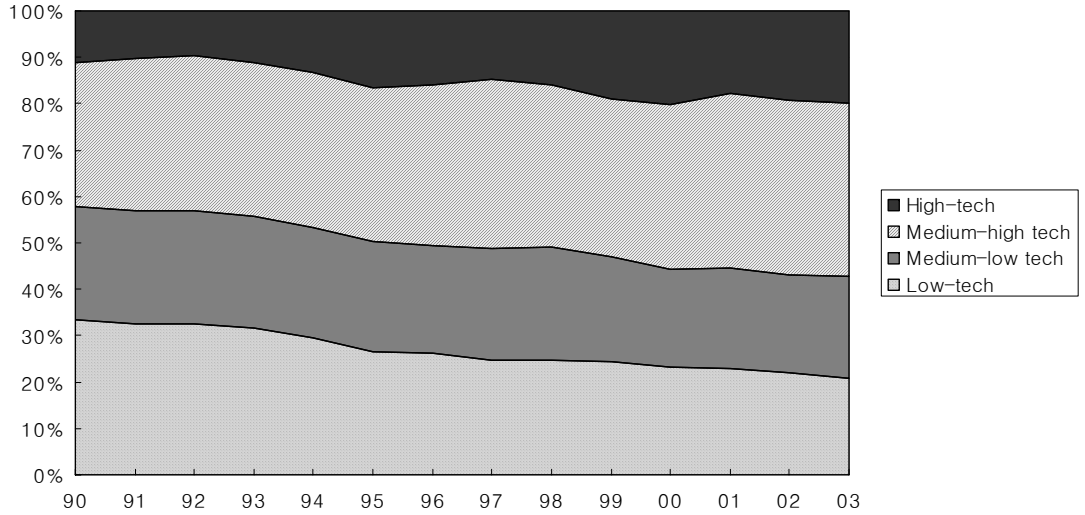
Report on Mining and Manufacturing Survey, National Statistics Office

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

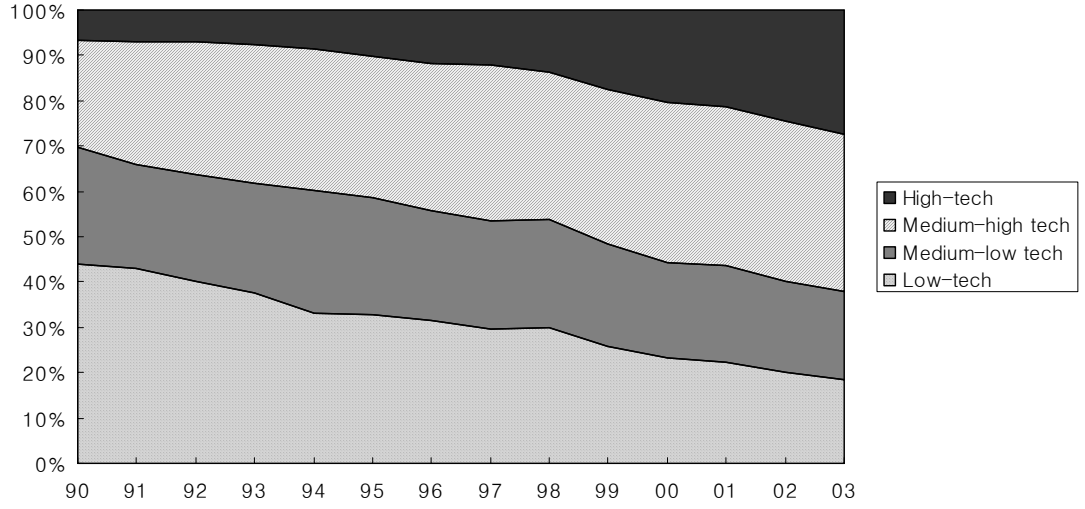


Source: *OECD STAN Indicators database, 2005*

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



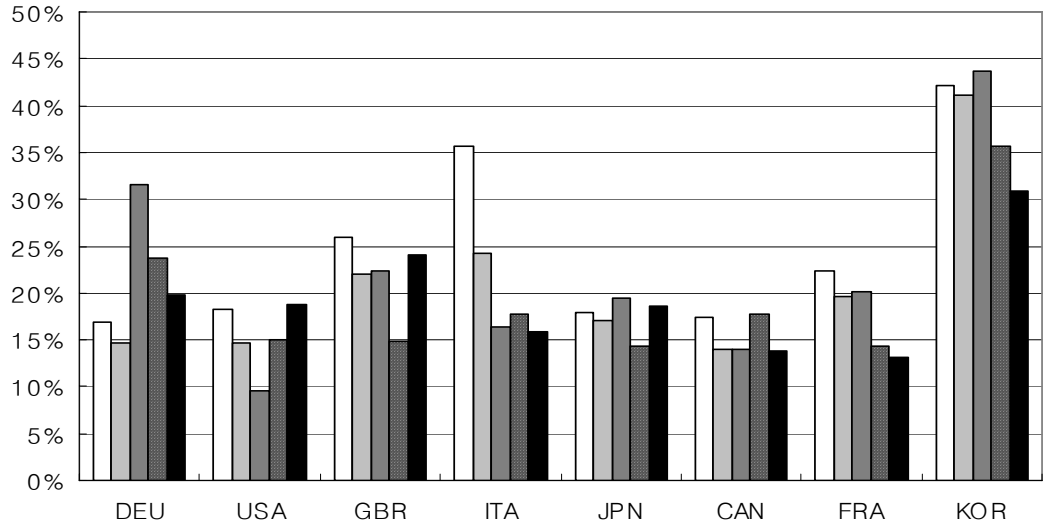
Nominal Value-added



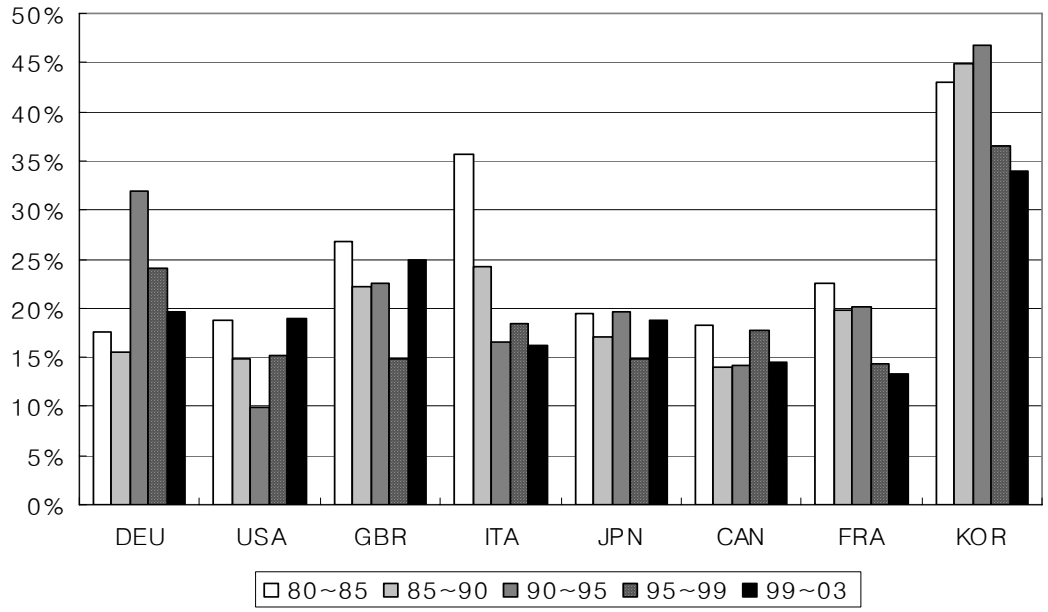
Real Value-added

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

International comparison of the rate of structural change



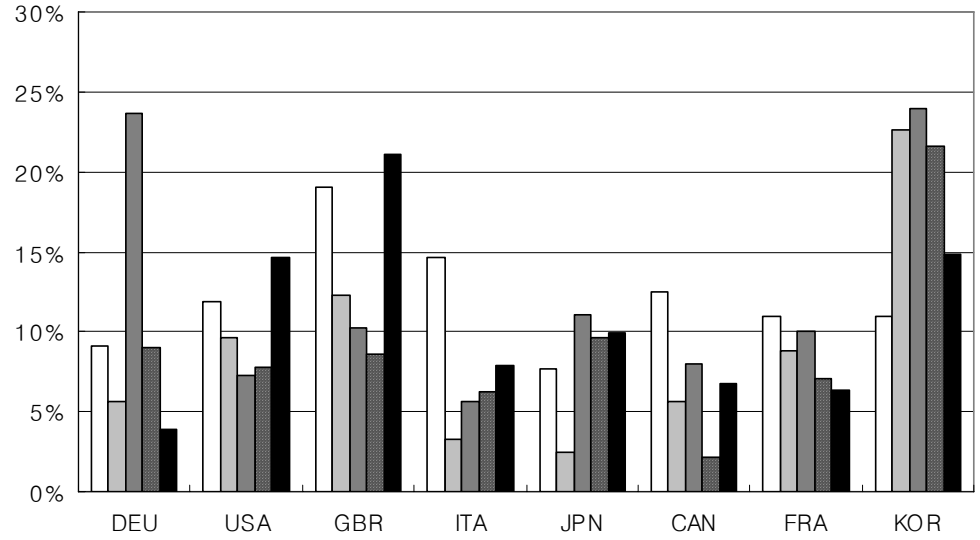
All industries: 9 sectors



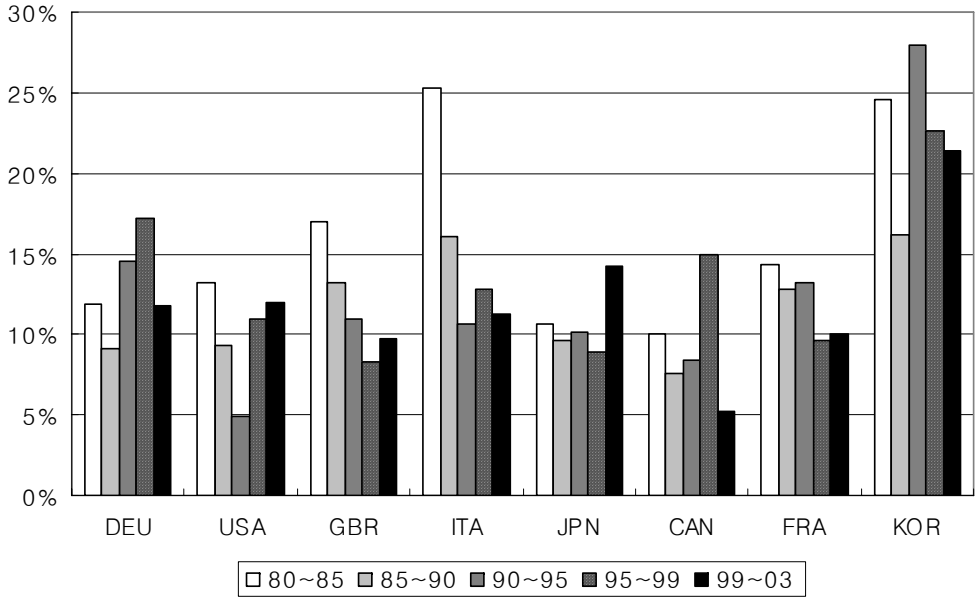
All industries: 11 sectors

Author's calculation based on *OECD Stan Indicators*

International comparison of the rate of structural change



3 sectors in manufacturing

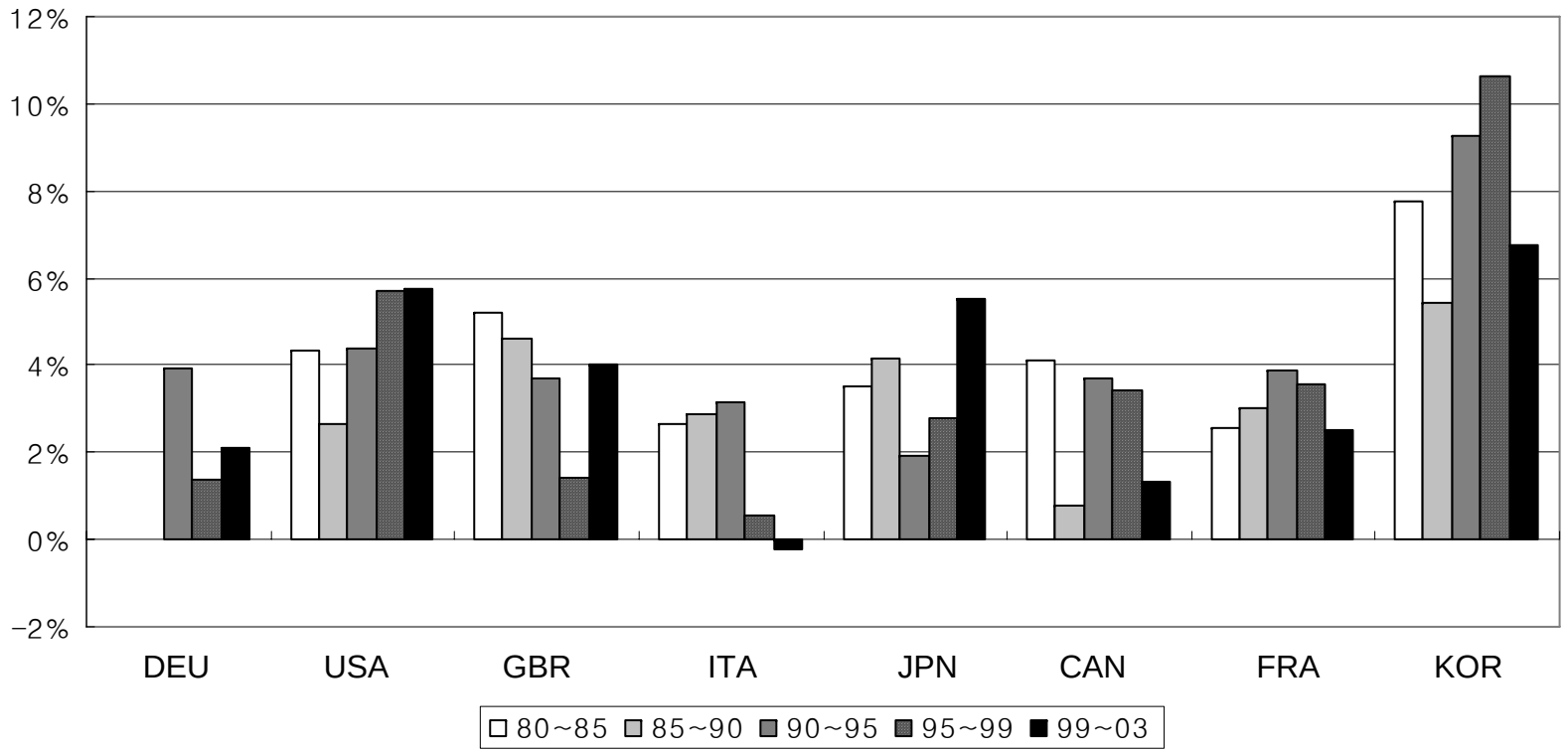


4 sectors In service

Author's calculation based on *OECD Stan Indicators*

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

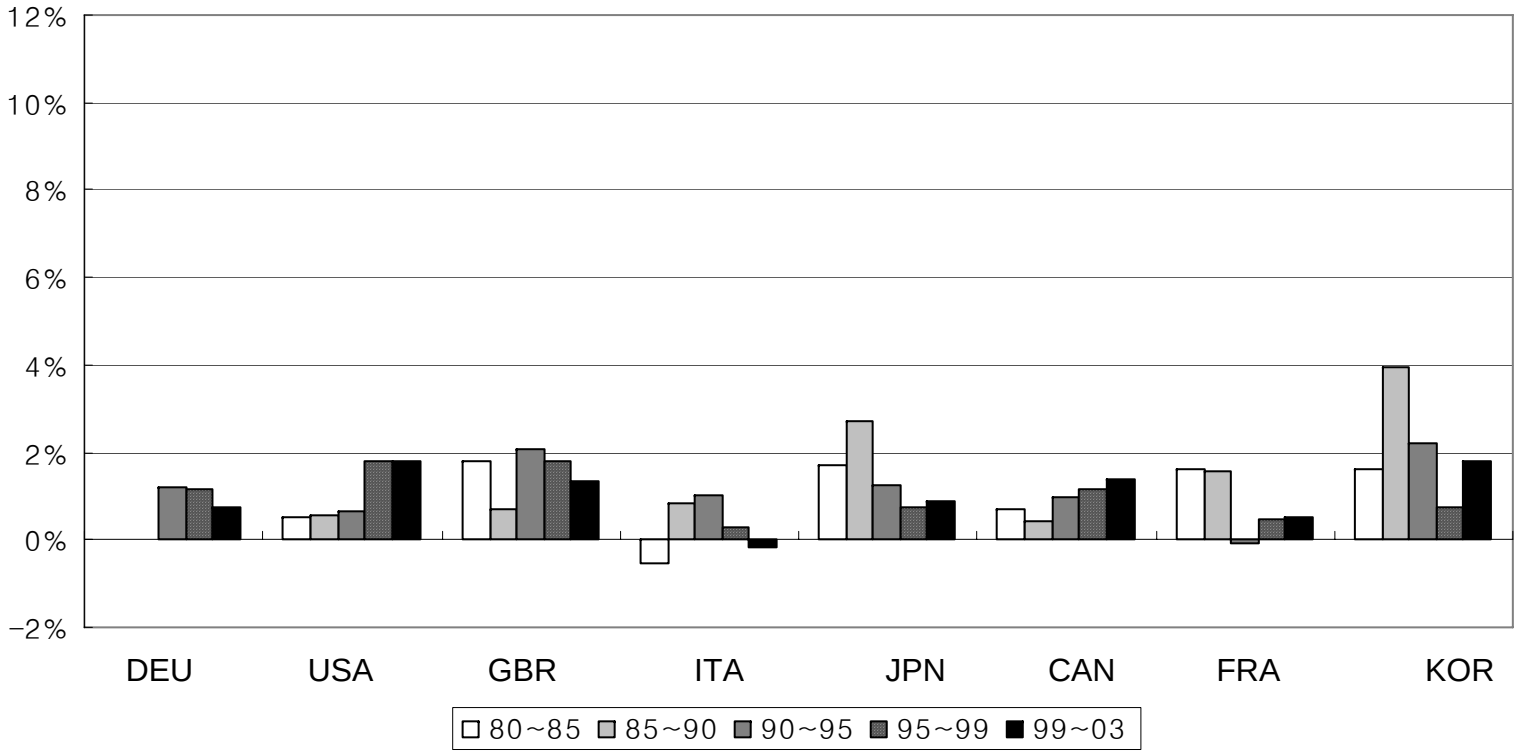
Whole manufacturing industry



Author's calculation based on *OECD Stan Indicators*

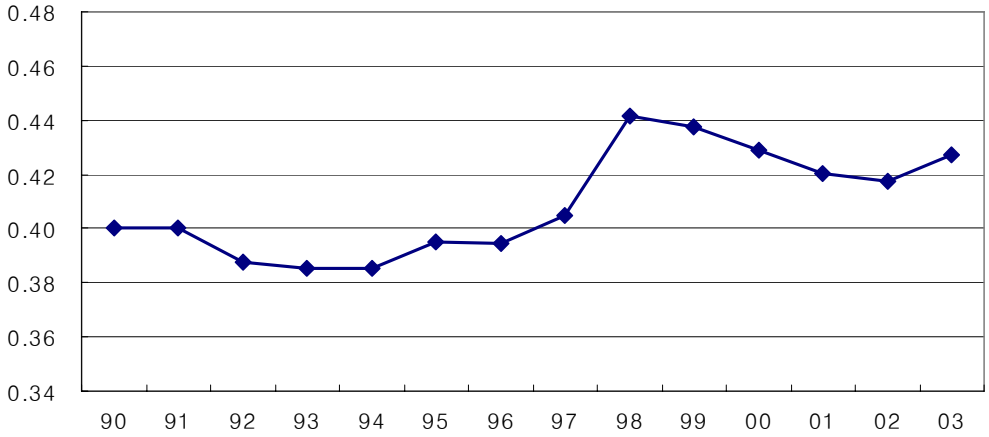
International comparison of the trend in yearly average growth rate of labor productivity

Whole service industry

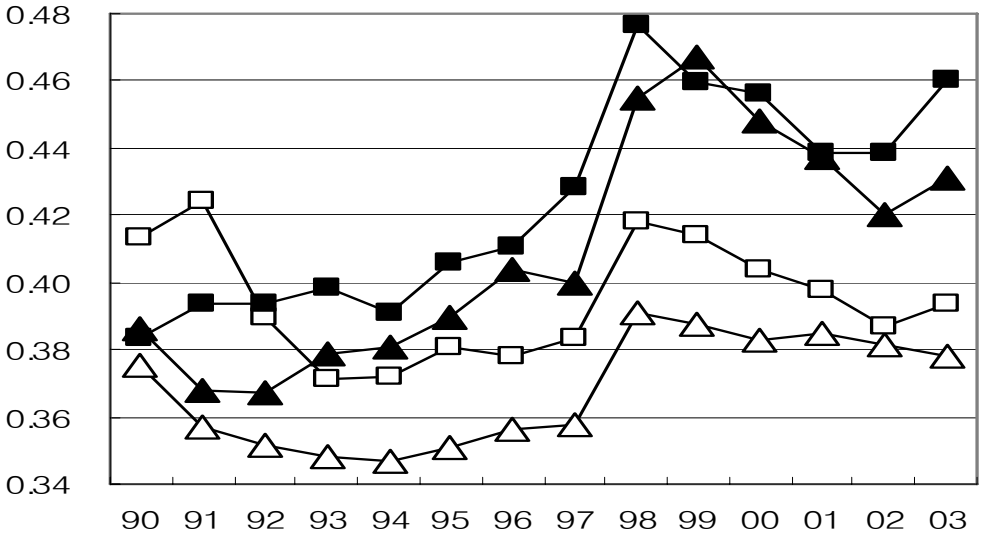


Author's calculation based on *OECD Stan Indicators*

Trend in inequality of labor productivity (Gini Coefficient) by firm



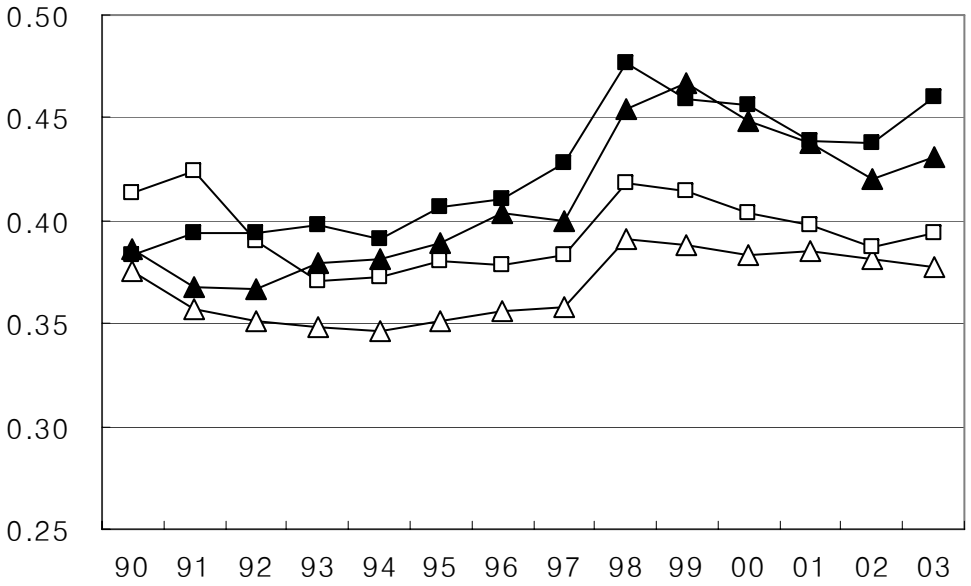
Manufacturing industry



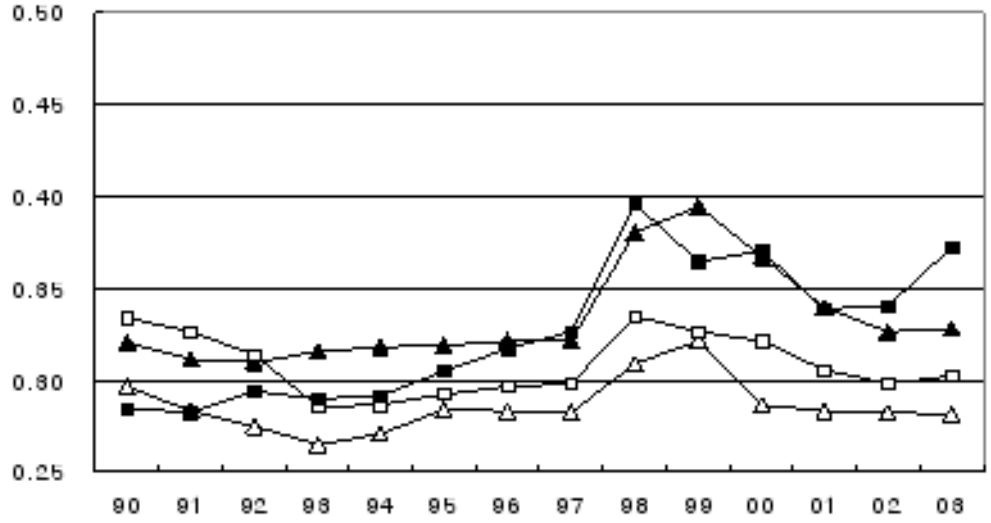
by technology level

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

Comparison of inequality index and bipolarization index (manufacturing industry)



Inequality index (Gini Coefficient)



Bipolarization index (Wolfson Index)

Author's calculation based on the micro-data of
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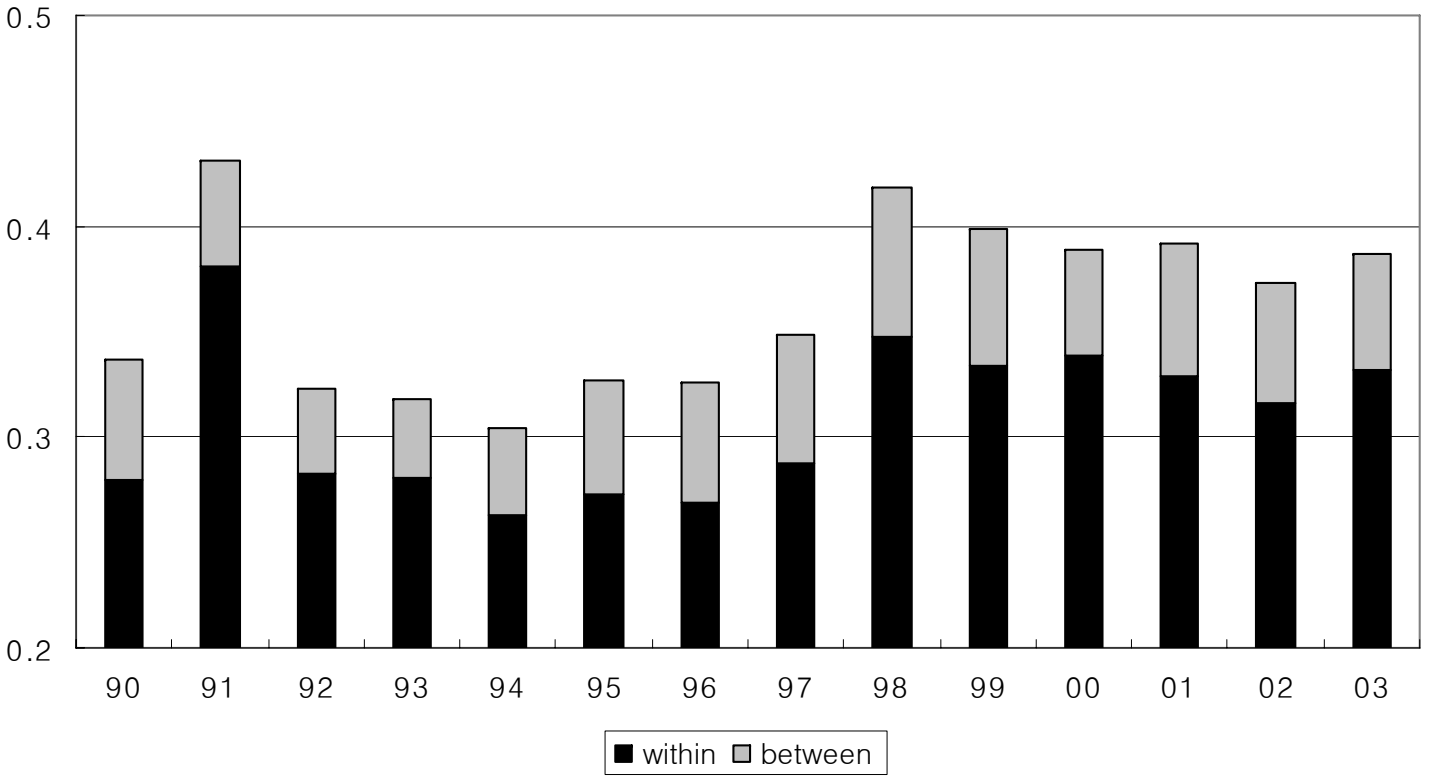
Trend in inequality of labor productivity (Theil Index) within and between industries



author's calculation based on the micro-data of

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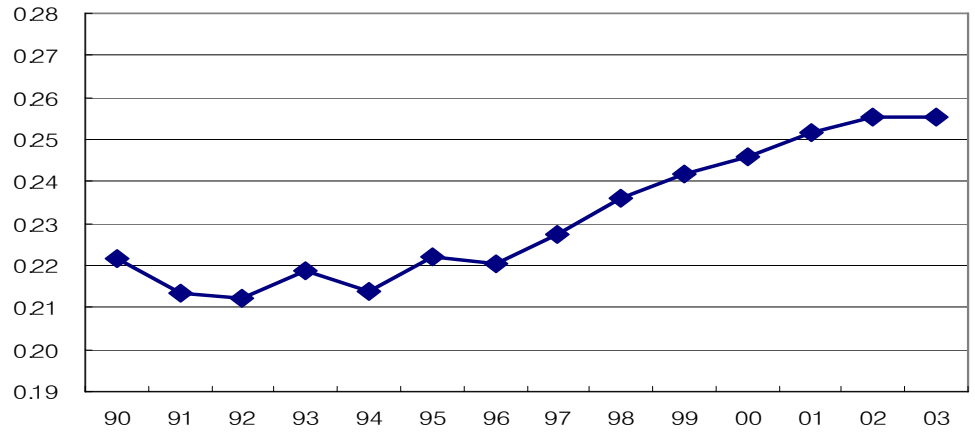
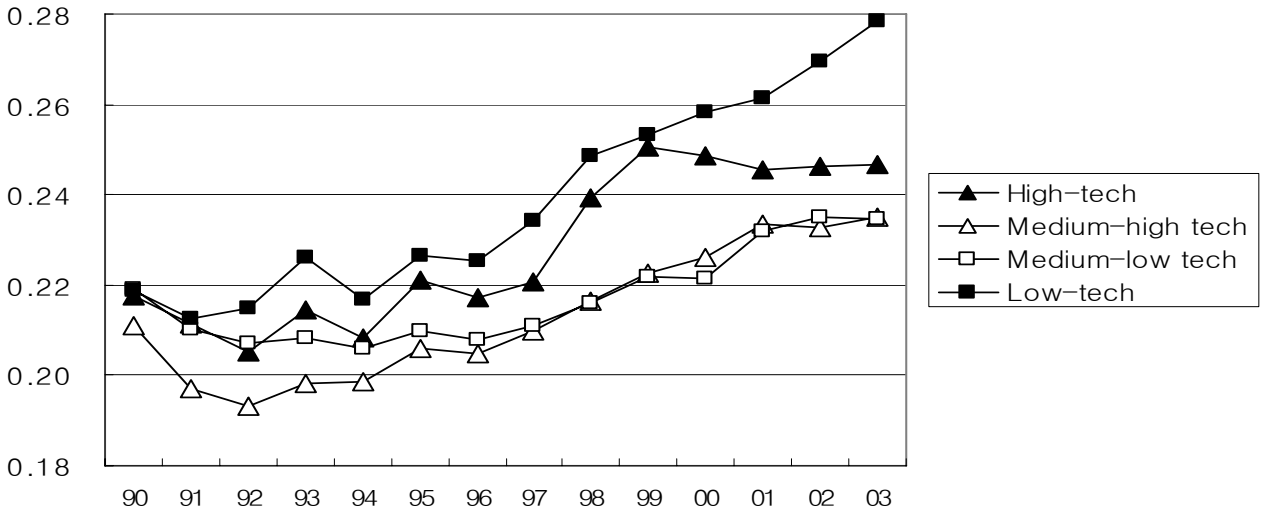
Trend in inequality of average wage (Gini Coefficient) by firm



Manufacturing industry



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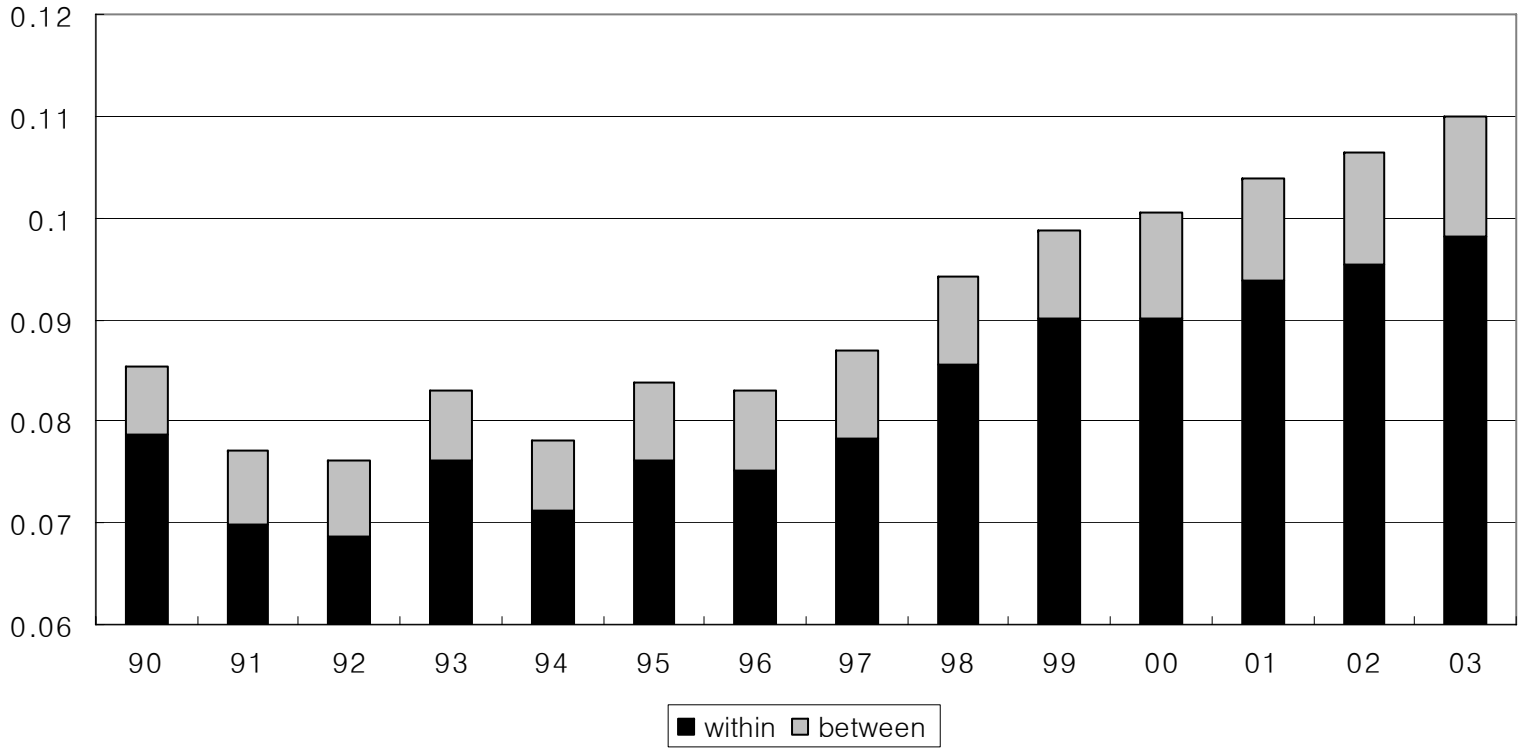
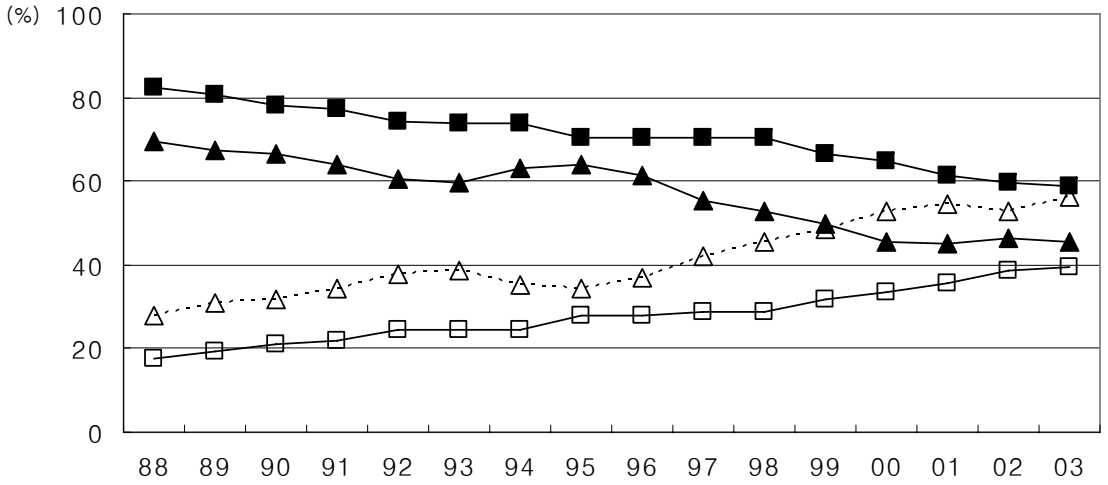
Trend in inequality of average wage (Theil Index) within and between industries



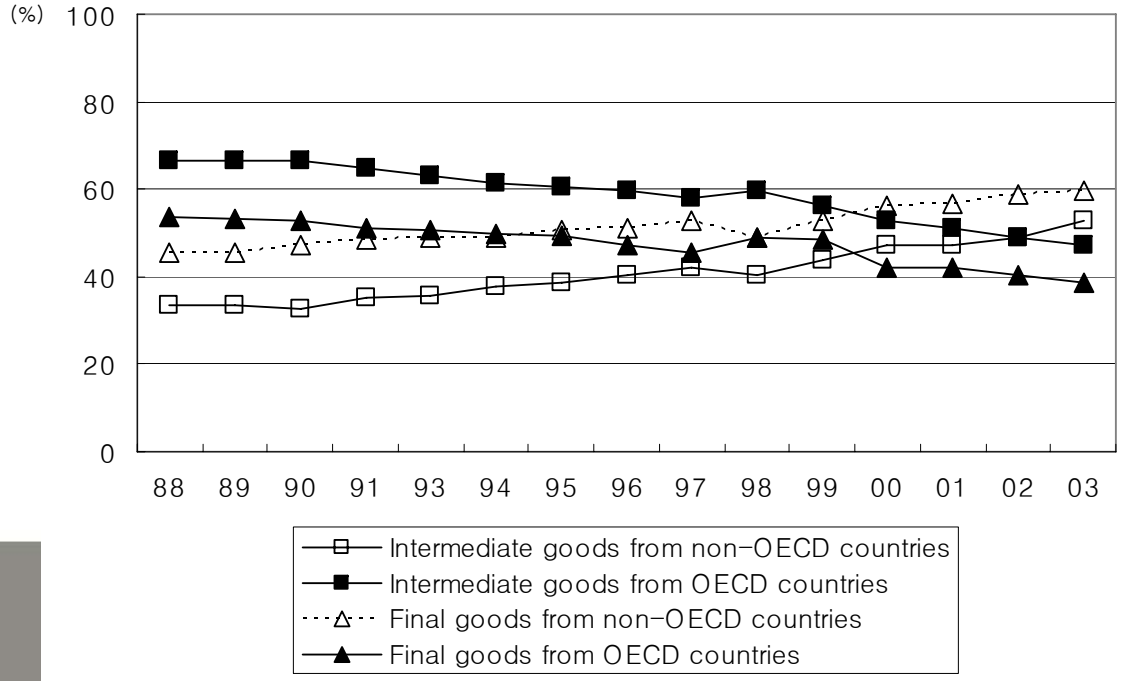
author's calculation based on the micro-data of

Report on Mining and Manufacturing Survey, National Statistics Office

Trend in import share of final and intermediate goods by region



Korea



Japan

Source: Pain (2006)

Part-06 | Conclusion

Main Findings

- This paper analyzed entry and growth of Korea SMEs using raw data behind the *Annual Report on Mining and Manufacturing Survey* by Korean National Statistical Office (1994-2003). Main findings from the analysis are summarized as follows.
- First, basic indicators related to 'firm dynamics' (such as entry, exit, survival, and growth of establishments) were calculated. The entry rates (based on the number of entrants) used to be above 20% most of the time except during the financial crisis. But the entry rates peaked at 31.1% in 1999 falling below 20% since 2002.
- Second, it is found that the 'infant mortality rate' of new entrants is very high, which is consistent with earlier findings from earlier studies in other countries. Tracking entry cohorts each year revealed that survival rates of entrants 2 years after the entry ranged from 42% to 59%. Once overcoming barriers-to-survival, however, surviving entrants usually showed faster growth than mature establishments.

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Main Findings

- Third, this study identified highest 10% establishments in terms of 3-year average employment growth rates as 'high-growth SMEs' and looked into their industrial distribution and their characteristics. High-growth SMEs are observed in high-tech industries more frequently, but they are observed in other industries too. High-growth SMEs tend to be more productive, more human-capital intensive, and more active in R&D and exporting.
- Fourth, according to the results of regression analyses on individual establishments' growth rates, factors contributing to establishment growth include: non-production to production workers ratio (establishment-level), R&D intensity (industry-level), captal-labor ratio (establishment-level), outbound FDI growth rate (industry-level), and export intensity (establishment-level and industry-level).
- It is also found that overall outbound FDI has positive effects on employment growth and productivity growth, while outbound FDI to China tends to have negative effects on both.

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Some Policy Implications

- First, improving the composition of human resources at the individual establishment level turns out to be very important for future growth.
- Second, R&D expenditures at the individual plant level do not show direct positive effects on the plant's performance, while industry-level R&D expenditures show strong positive effects on the average growth of plants belonging to the industry. This finding underlines the importance of collective efforts in R&D as well as the high risks accompanying innovation at the individual level.
- Third, capital-labor ratio at the plant-level turns out to be important for growth, confirming that well-functioning financial markets are crucial for healthy growth of promising SMEs.

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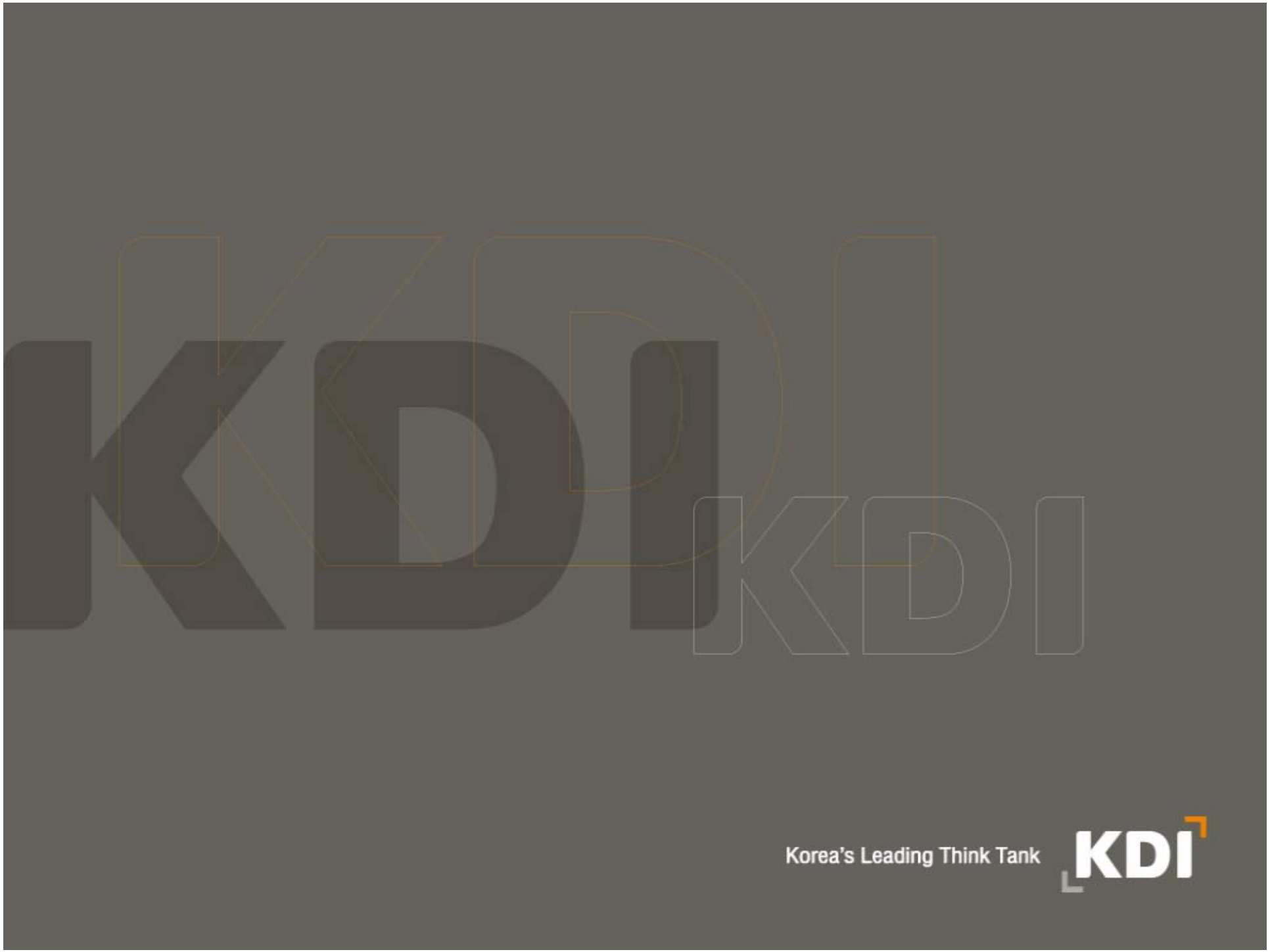
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Multilateral Index Approach

$$\ln TFP_{it} = (\ln Y_{it} - \overline{\ln Y_t}) + \sum_{\tau=2}^{t}(\overline{\ln Y_\tau} - \overline{\ln Y_{\tau-1}})$$

$$- \left\{ \sum_{n=1}^{N}\frac{1}{2}(S_{nit} + \overline{S_{nt}})(\ln X_{nit} - \overline{\ln X_{nt}}) + \sum_{\tau=2}^{t}\sum_{n=1}^{N}\frac{1}{2}(\overline{S_{n\tau}} + \overline{S_{n\tau-1}})(\overline{\ln X_{n\tau}} - \overline{\ln X_{n\tau-1}}) \right\}$$

where Y, X, S, and TFP denote output, input, input share, TFP level, respectively and symbols with upper bar are corresponding measures for hypothetical firms. The subscripts τ and n are indices for time and inputs, respectively. Here, capital, labor, energy and real intermediate inputs were considered as factor inputs.

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

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TFP Growth Decomposition

- **TFP Growth** $lnTFP_t - lnTFP_{t-\tau}$
- **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** $\sum_{f \in X} \theta_{f,t-\tau} (\overline{\ln TFP_{t-\tau}} - \ln TFP_{f,t-\tau})$

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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%**		

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TFP Growth Decomposition: '90-'95

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	**0.37%**	-0.12%	0.41%	**0.66%**	0.20%	-0.08%	0.05%	-0.05%	**0.12%**	**0.79%**	8.82%	4.21%
Medium-High	**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	**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%
Total Manufacturing	**0.94%**	-1.42%	2.41%	**1.93%**	1.77%	-1.60%	0.58%	-0.44%	**0.31%**	**2.25%**		
Contribution of Each Effect	**42.00%**	-63.10%	107.12%	**86.02%**	78.67%	-70.99%	25.72%	-19.42%	**13.98%**	**100.00%**		

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TFP Growth Decomposition: '95-'99

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	**0.14%**	-0.35%	0.59%	**0.38%**	0.36%	-0.05%	0.81%	-0.12%	**1.01%**	**1.39%**	14.29%	6.72%
Medium-High	**-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	**-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%
Total Manufacturing	**-1.88%**	-1.23%	3.65%	**0.54%**	1.23%	-1.15%	1.35%	-0.32%	**1.12%**	**1.66%**		
Contribution of Each Effect	**-112.98%**	-74.22%	219.93%	**32.72%**	73.86%	-69.04%	81.46%	-19.00%	**67.28%**	**100.00%**		

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TFP Growth Decomposition: '99-'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	**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	**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	**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%
Total Manufacturing	**3.25%**	-1.77%	3.04%	**4.52%**	1.77%	-0.71%	0.56%	-0.35%	**1.27%**	**5.78%**		
Contribution of Each Effect	**56.25%**	-30.68%	52.55%	**78.12%**	30.53%	-12.28%	9.63%	-6.01%	**21.88%**	**100.00%**		

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