Session 2: South Korea, Intangible Investments and the Knowledge Economy Agenda

Intangible Investments and Productivity Dynamics in Korea

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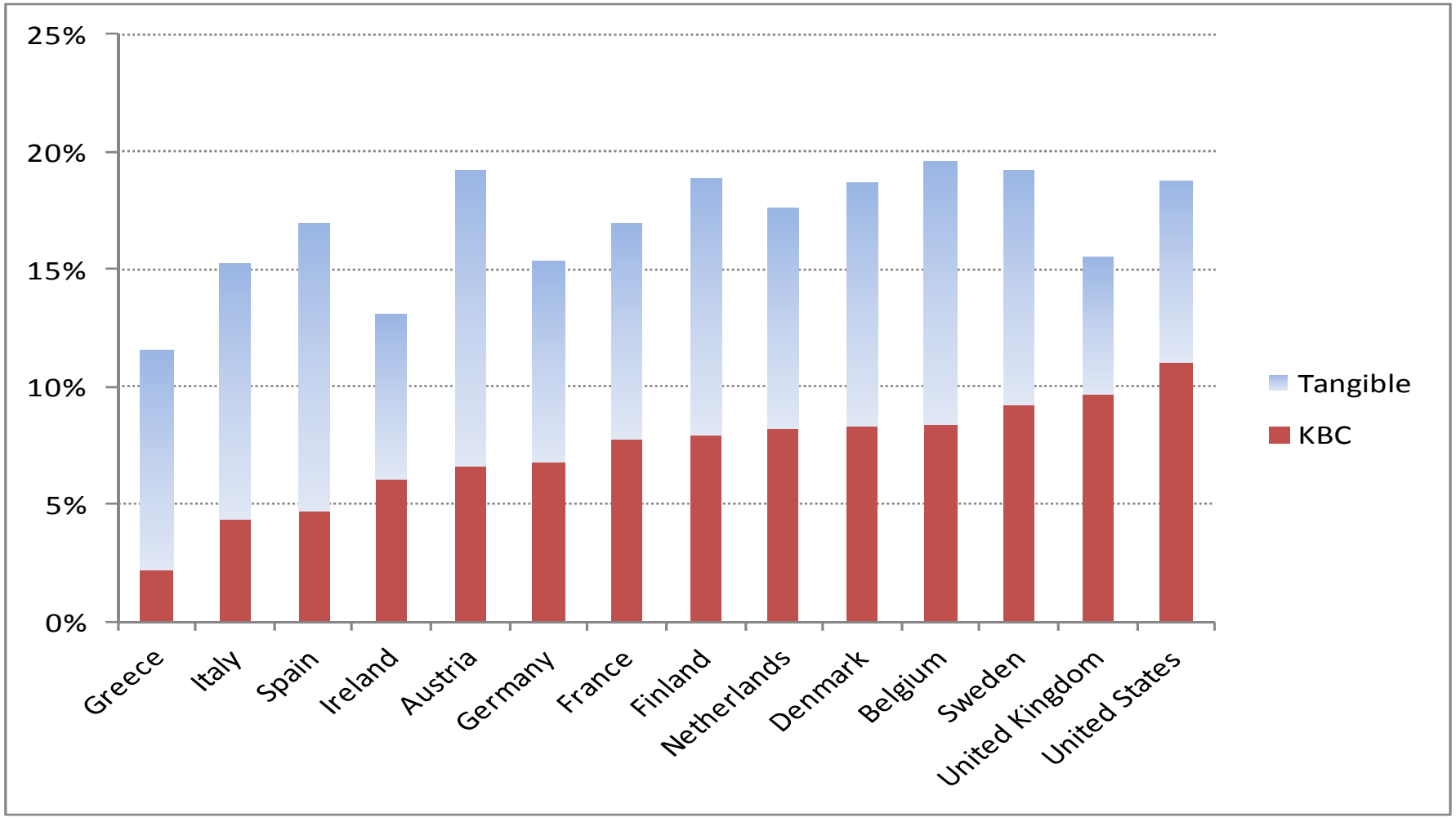
Part 1 | Motivation: Why Intangibles Matter?

Intangibles account for over half of all investment in several countries …

Why intangibles matter

Investment in fixed and intangible assets as a share of GDP, 2009

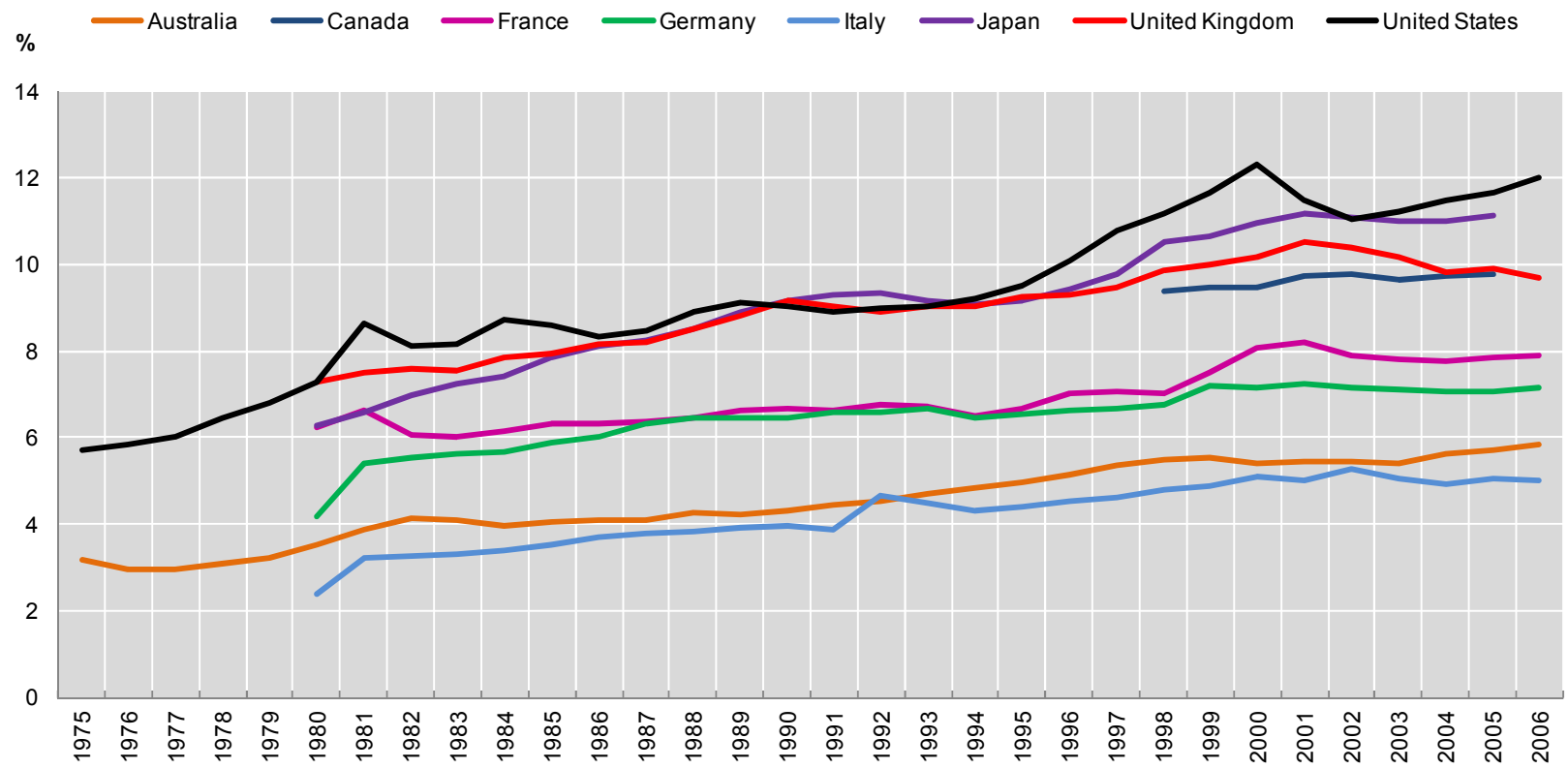


Source: Corrado et al (2012, forthcoming)

…with increasing importance...

Why intangibles matter

Investment in intangible assets as a percentage of GDP

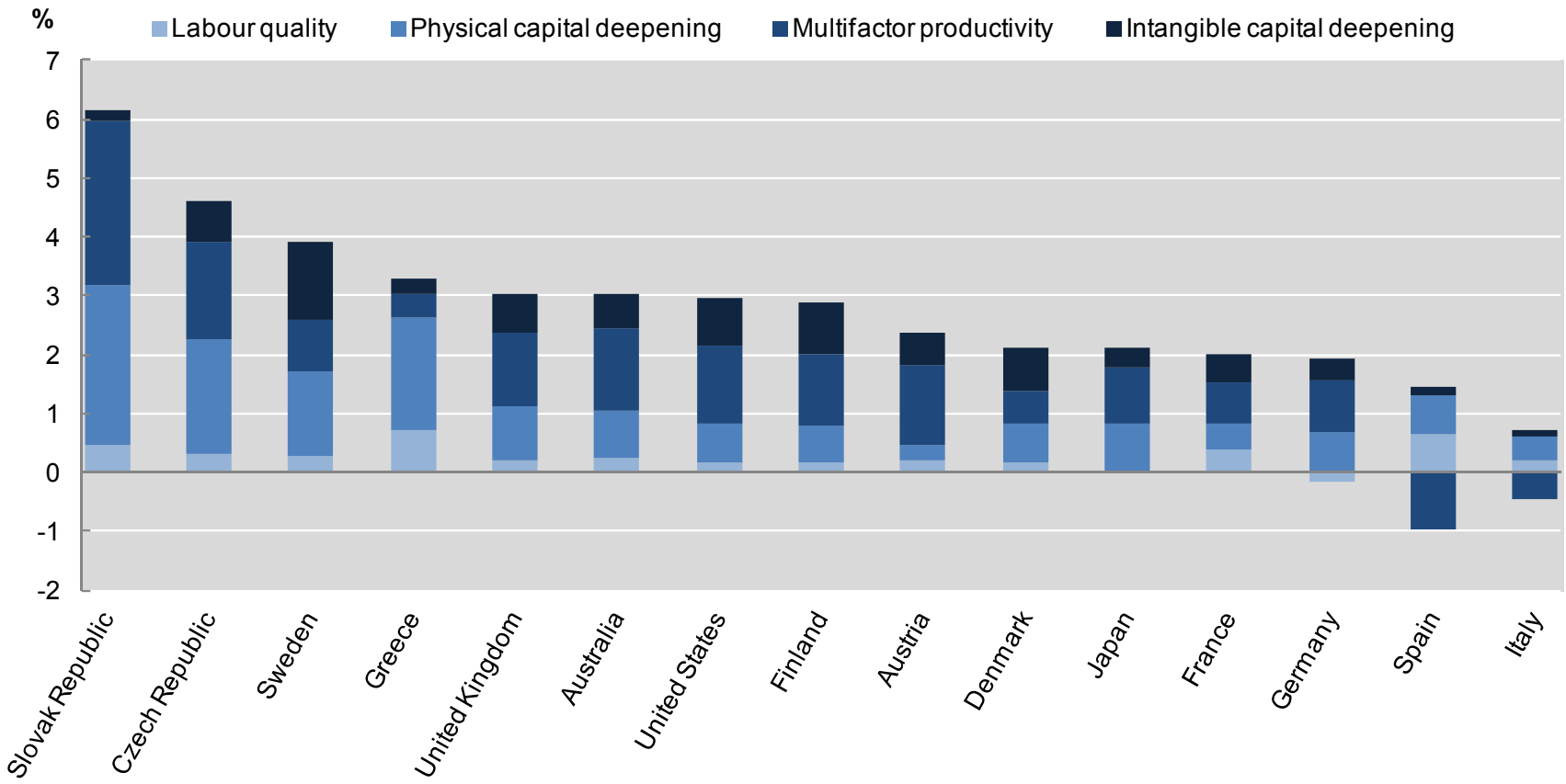


Source: COINVEST [www.coinvest.org.uk] and research papers, 2009.

… and a driver of productivity growth

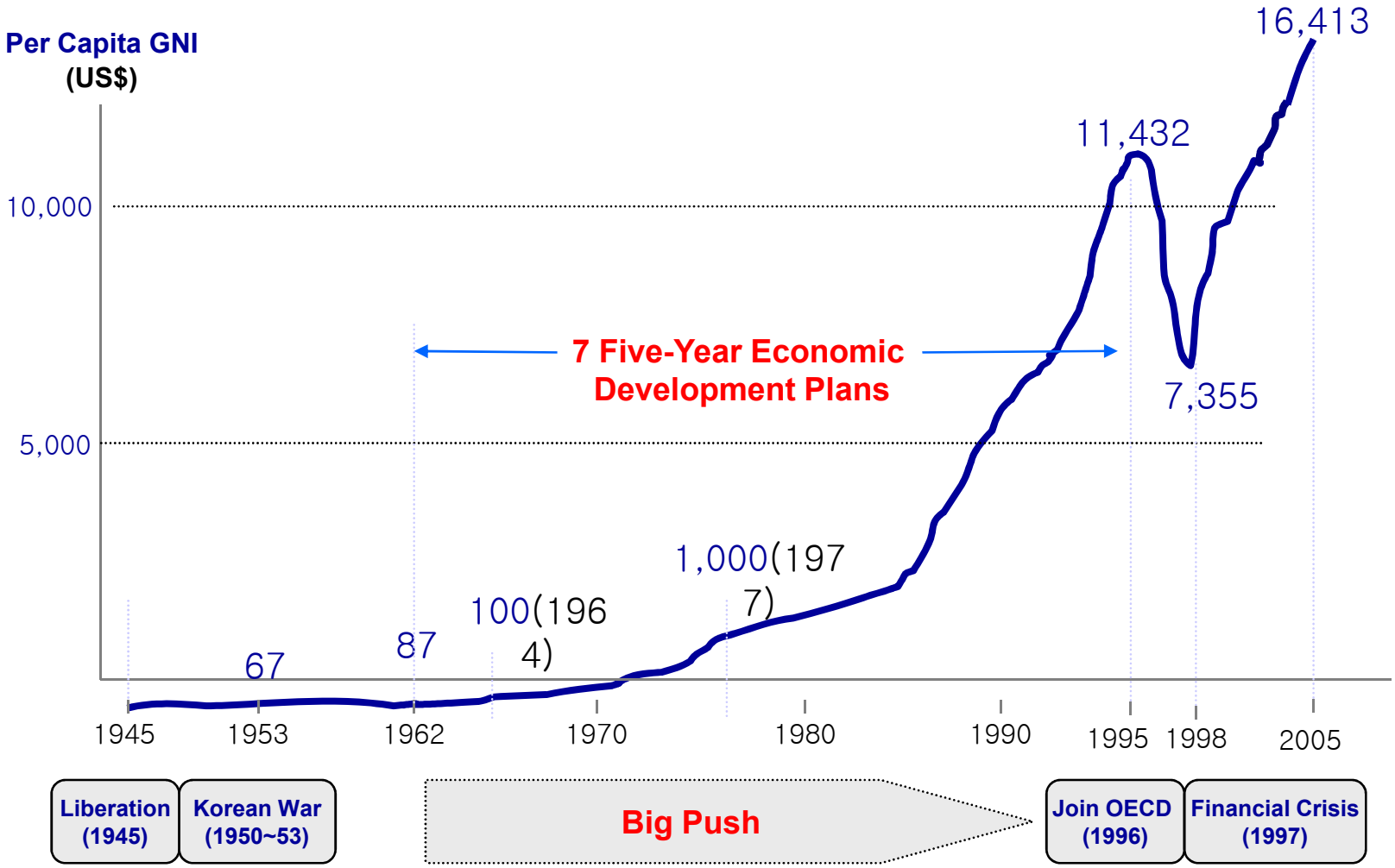
Why intangibles matter

Contributions to labour productivity growth, 1995-2006, in %

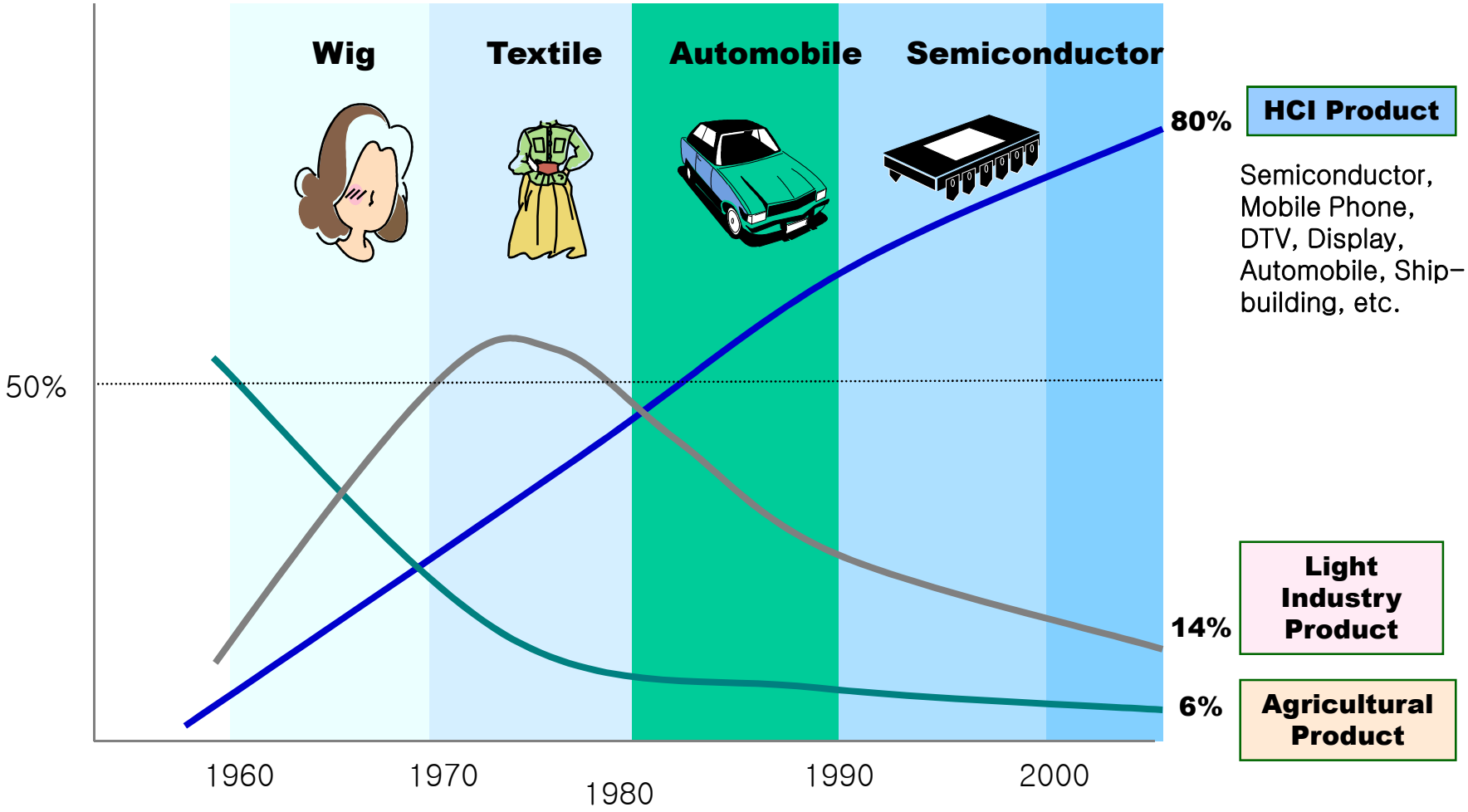


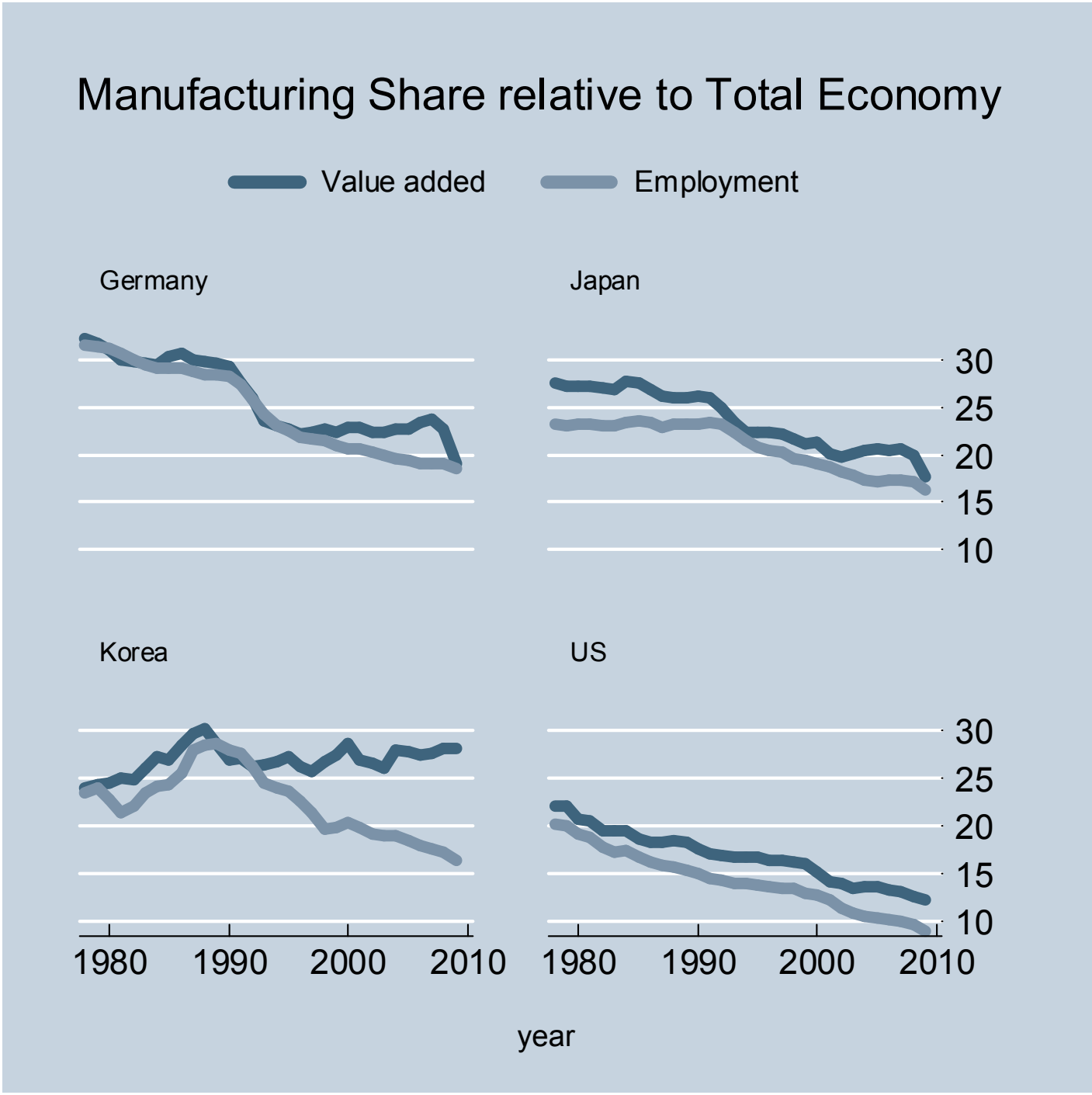
Source: Data on intangible investment are based on COINVEST [www.coinvest.org.uk] and research papers, 2009.

Part 2 | Long-term Trends and Structural Changes


Per Capita GNI
(US$)
16,413
11,432
10,000
7 Five-Year Economic
Development Plans
7,355
5,000
1,000(197
7)
100(196
4)
87
67
1945
1953
1962
1970
1980
1990
1995
1998
2005
Liberation
(1945)
Korean War
(1950~53)
Big Push
Join OECD
(1996)
Financial Crisis
(1997)

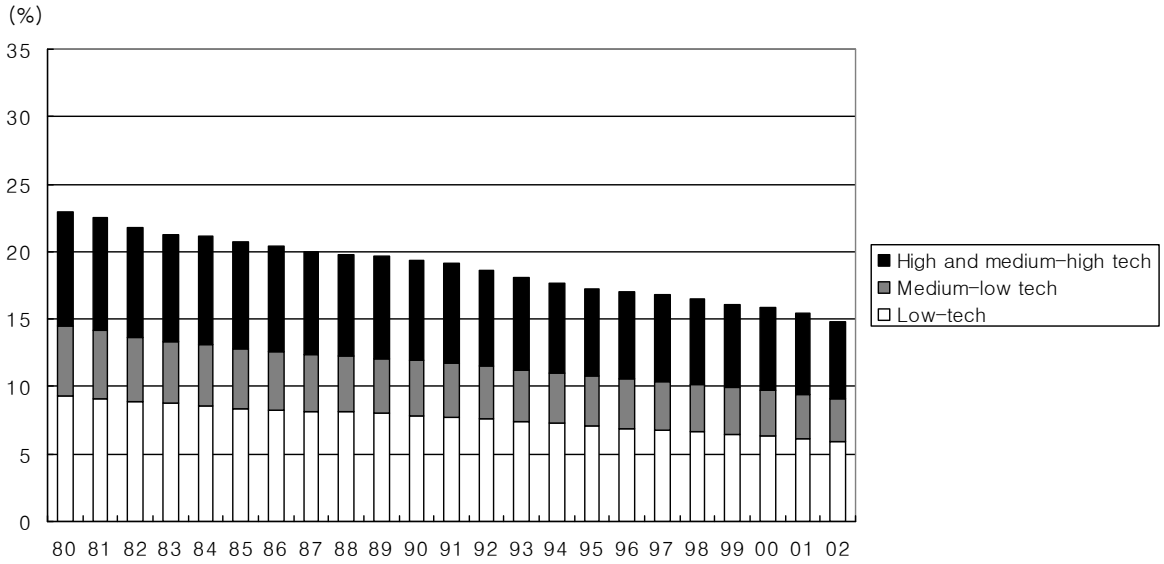
Changes in Export Commodity Profile



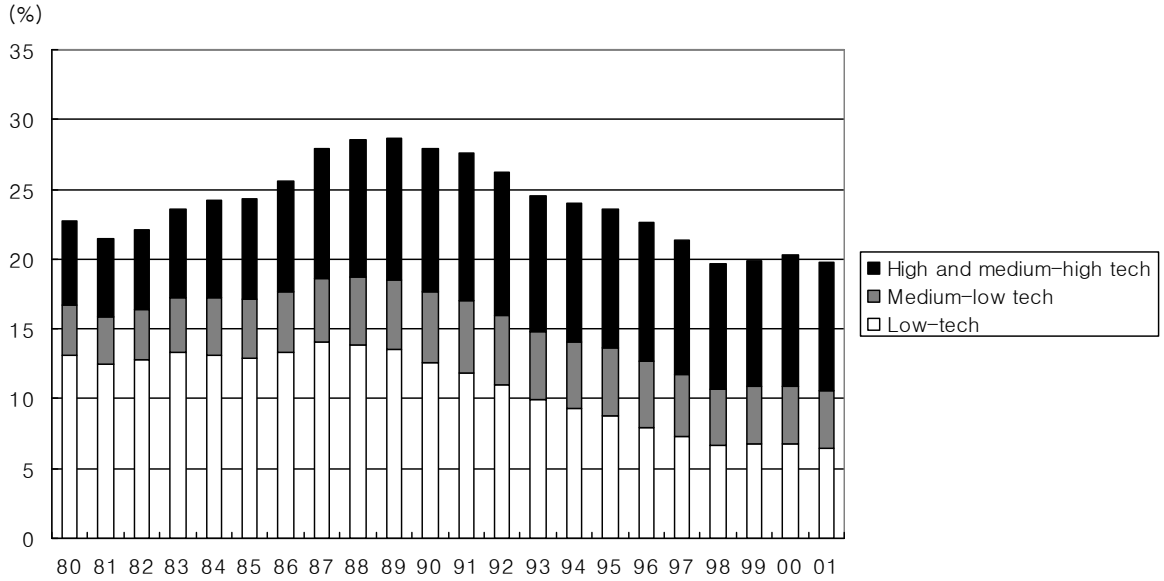

Manufacturing Share relative to Total Economy
Value added
Employment
Germany
Japan
Korea
US
30
25
20
15
10
1980
1990
2000
2010
year

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

G7



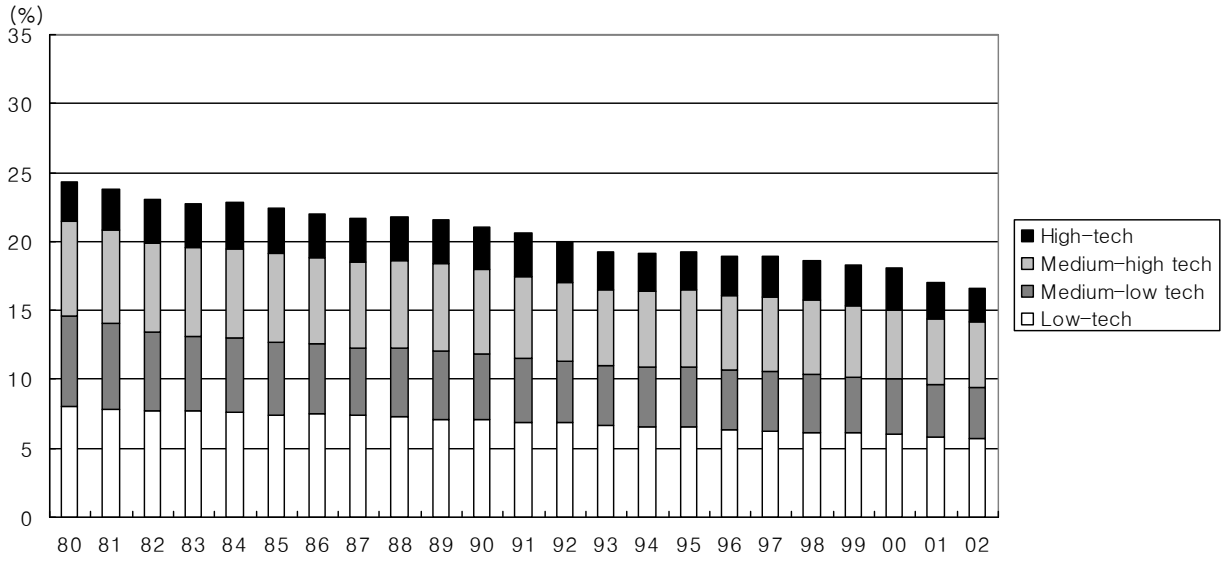
Korea



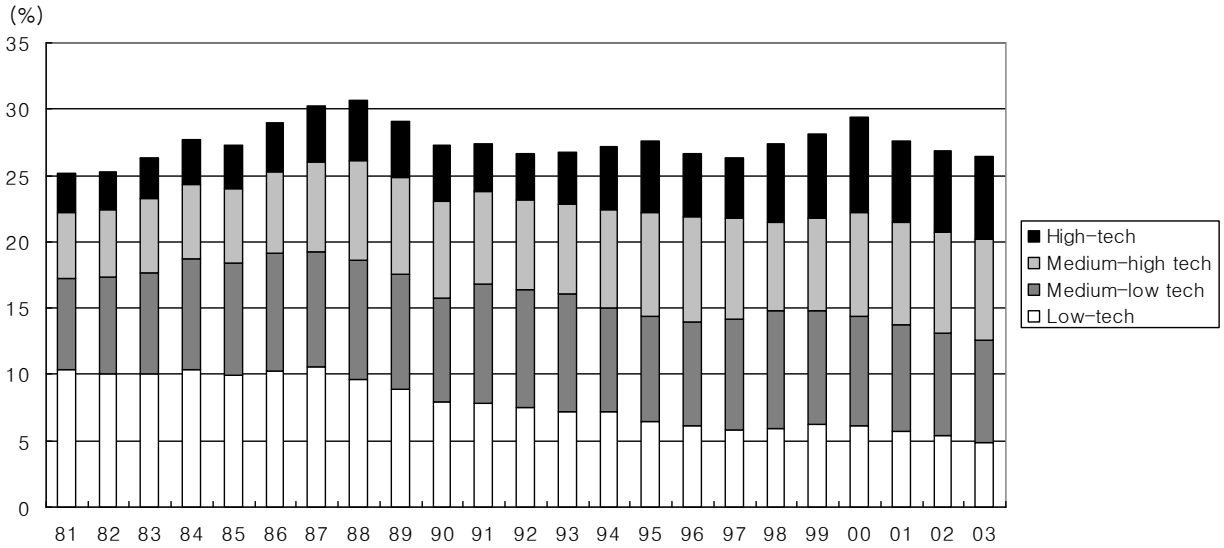
Source: *OECD STAN Indicators database, 2005*

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

G7

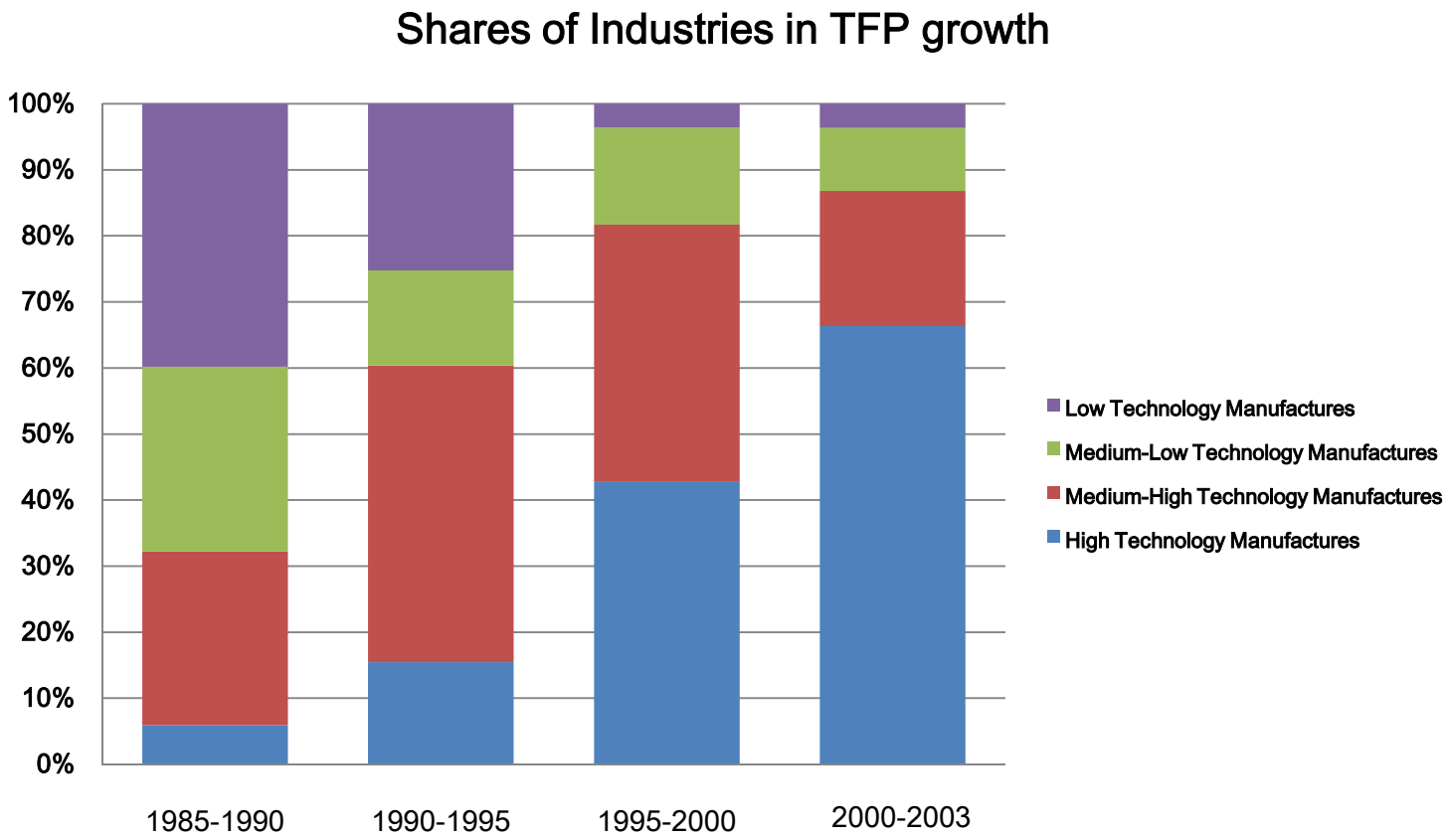


Korea



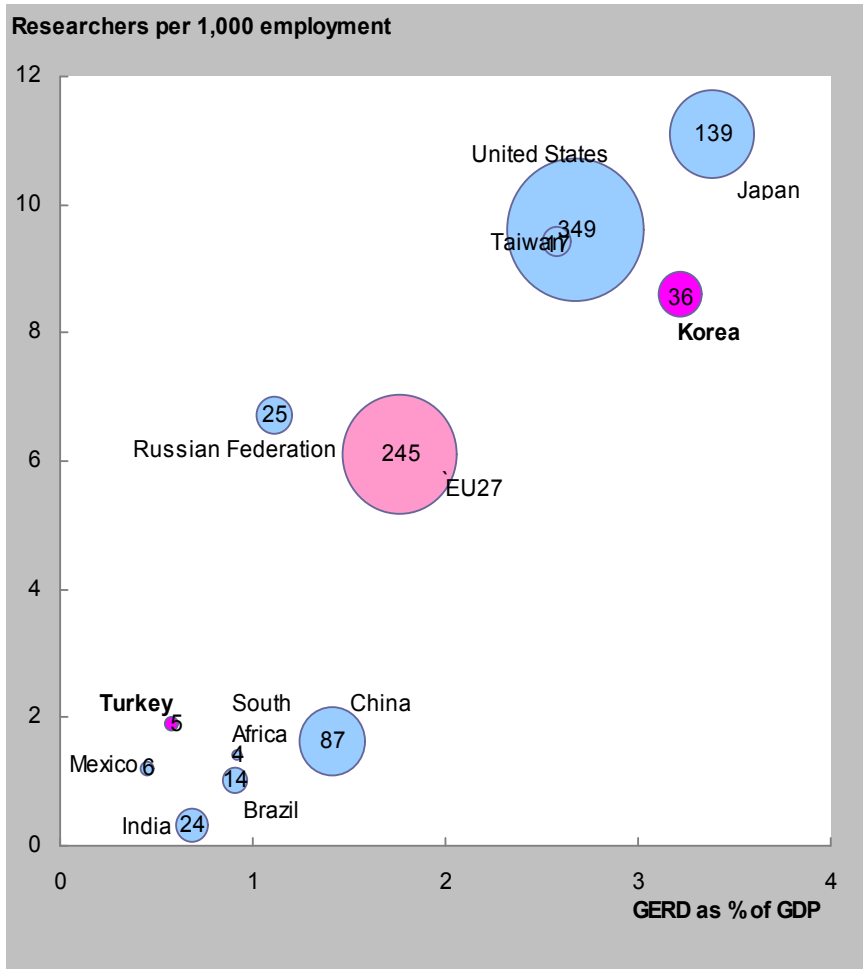
Source: *OECD STAN Indicators database, 2005*

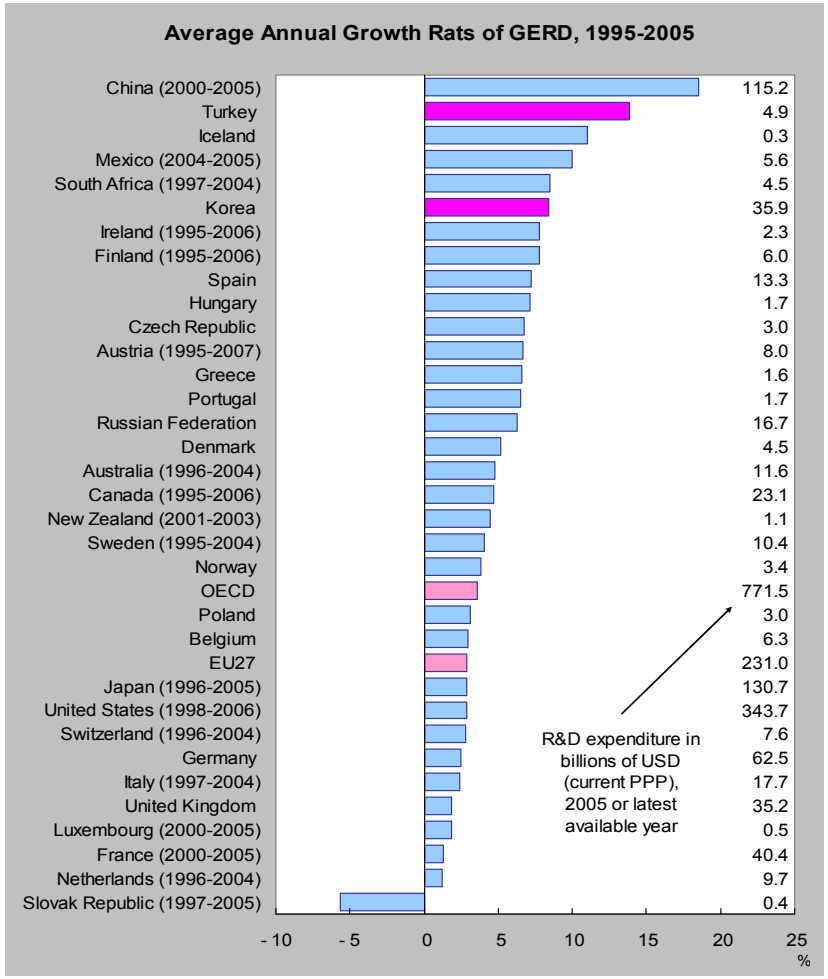
Technology and Productivity Dynamics: Korea



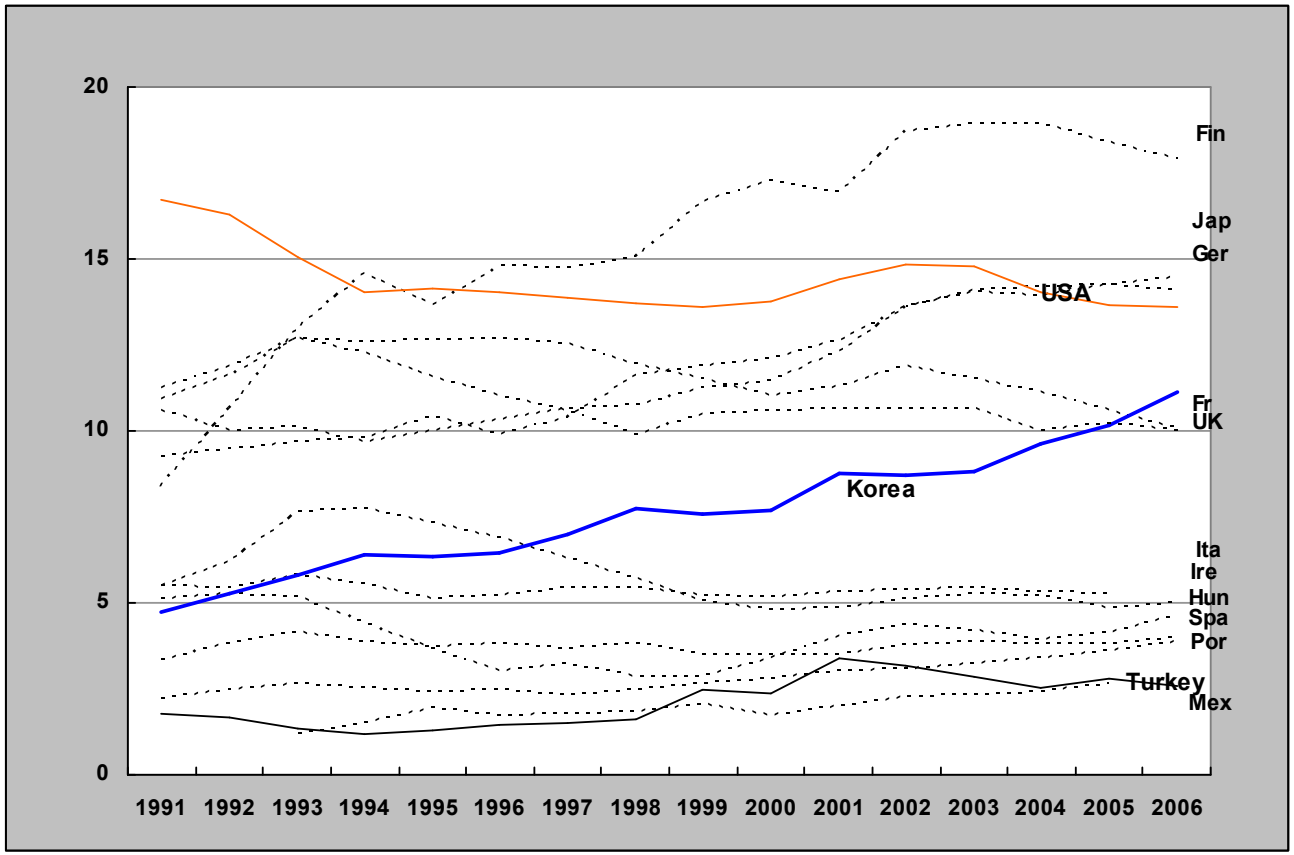
Part 3 | Intangible Investments in Korea

R&D investment in international comparison





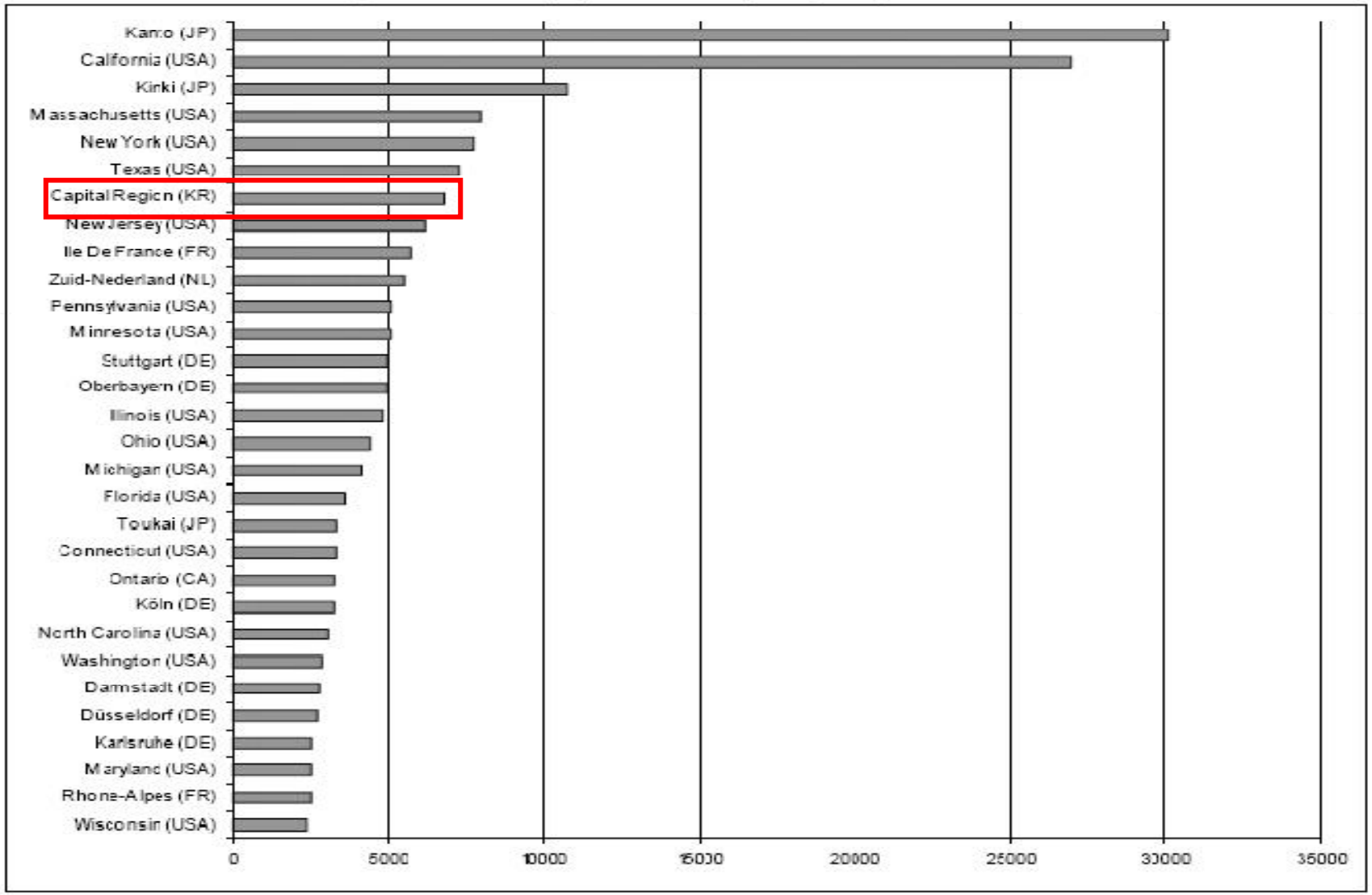
R&D / Physical investment (%)



Geography of Inventive Activities in OECD Regions

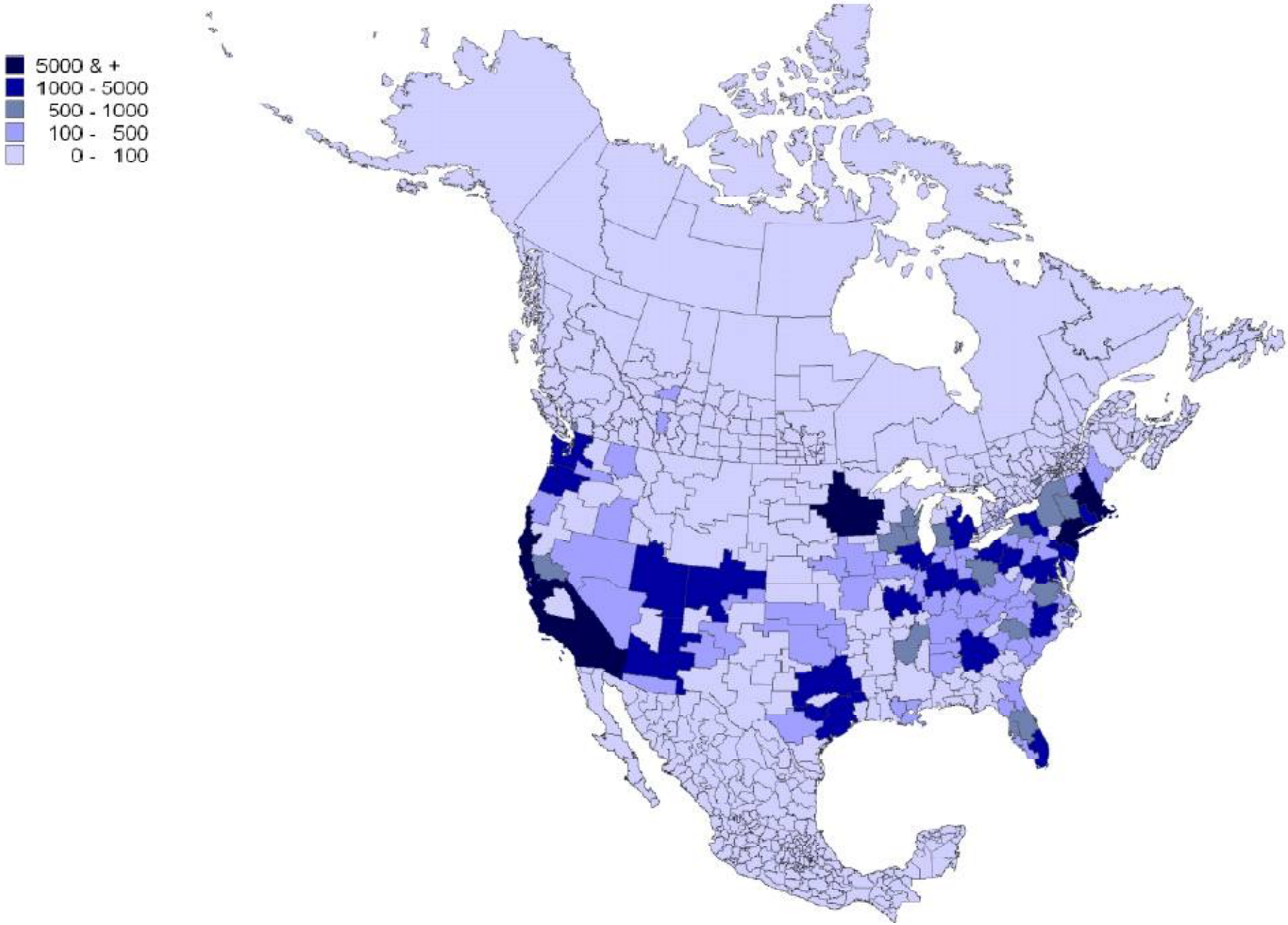
(*Stefano Usai, OECD STI WORKING PAPER 2008*)

Figure 5. PCT, Top performance (30 regions), 2002-2004



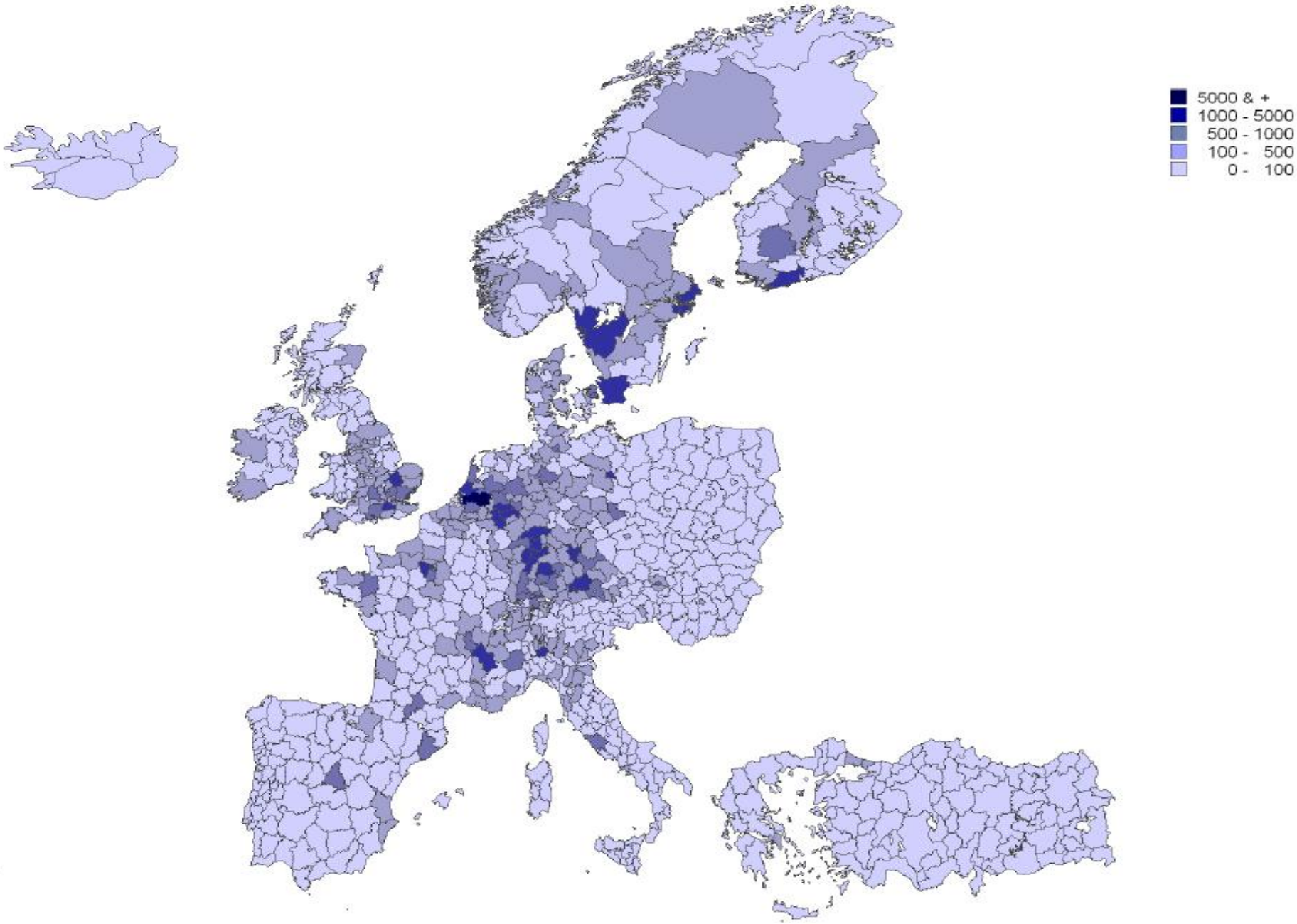
Number of patent applications filed under the PCT, 2003-2005

North America



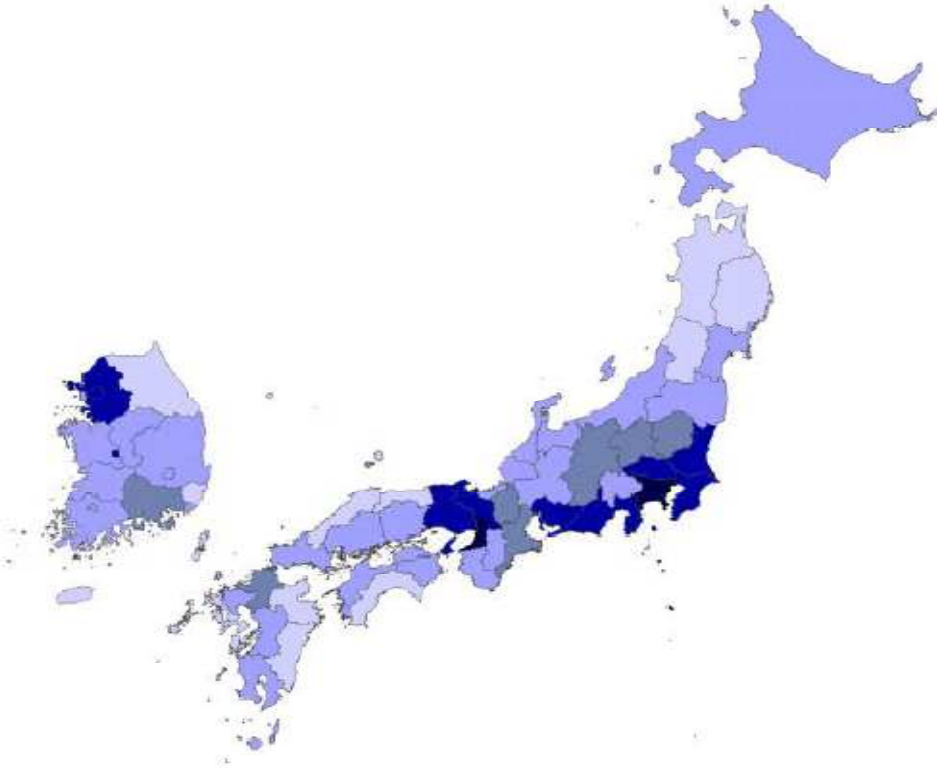
Number of patent applications filed under the PCT, 2003-2005

Europe



Number of patents filed under the PCT, 2003-2005

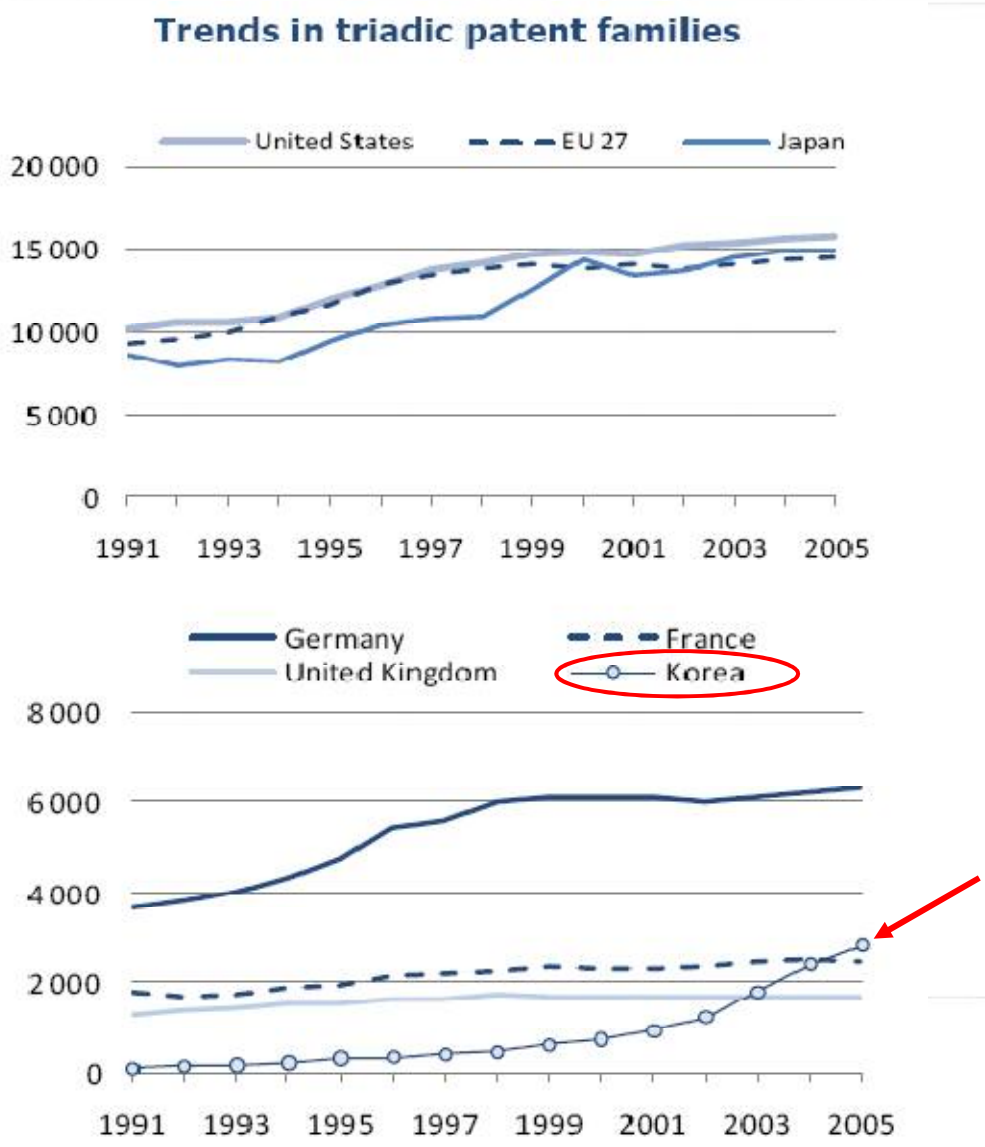
Japan and Korea



Australia

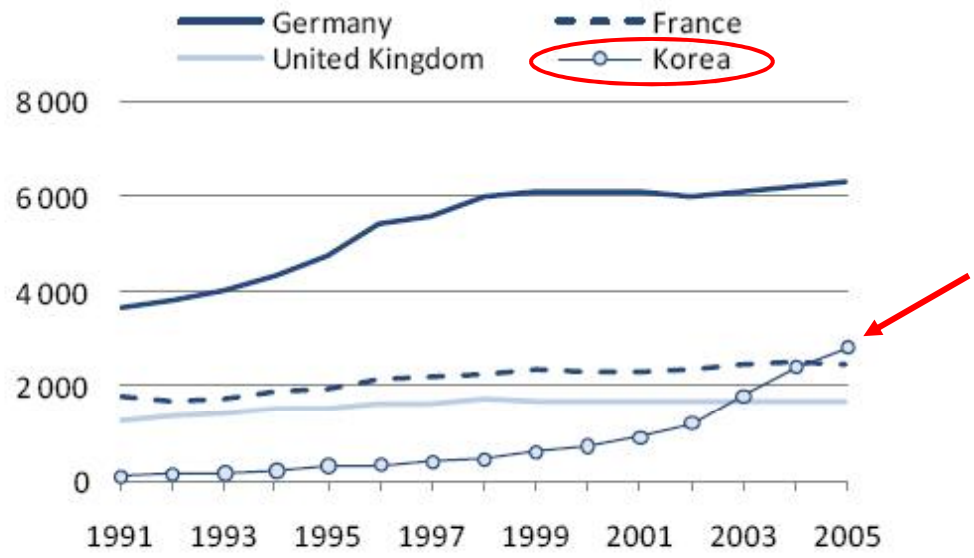
Related findings from OECD

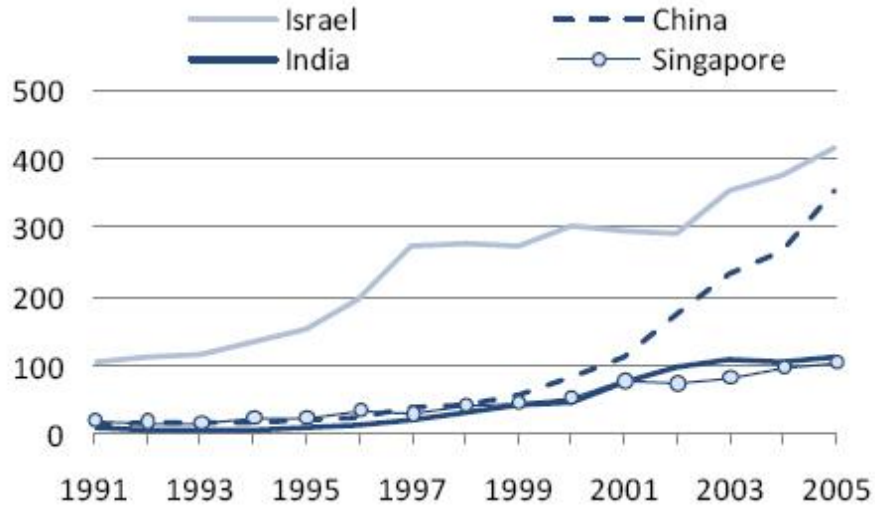
(*2008 Compendium of Patent Statistics*)



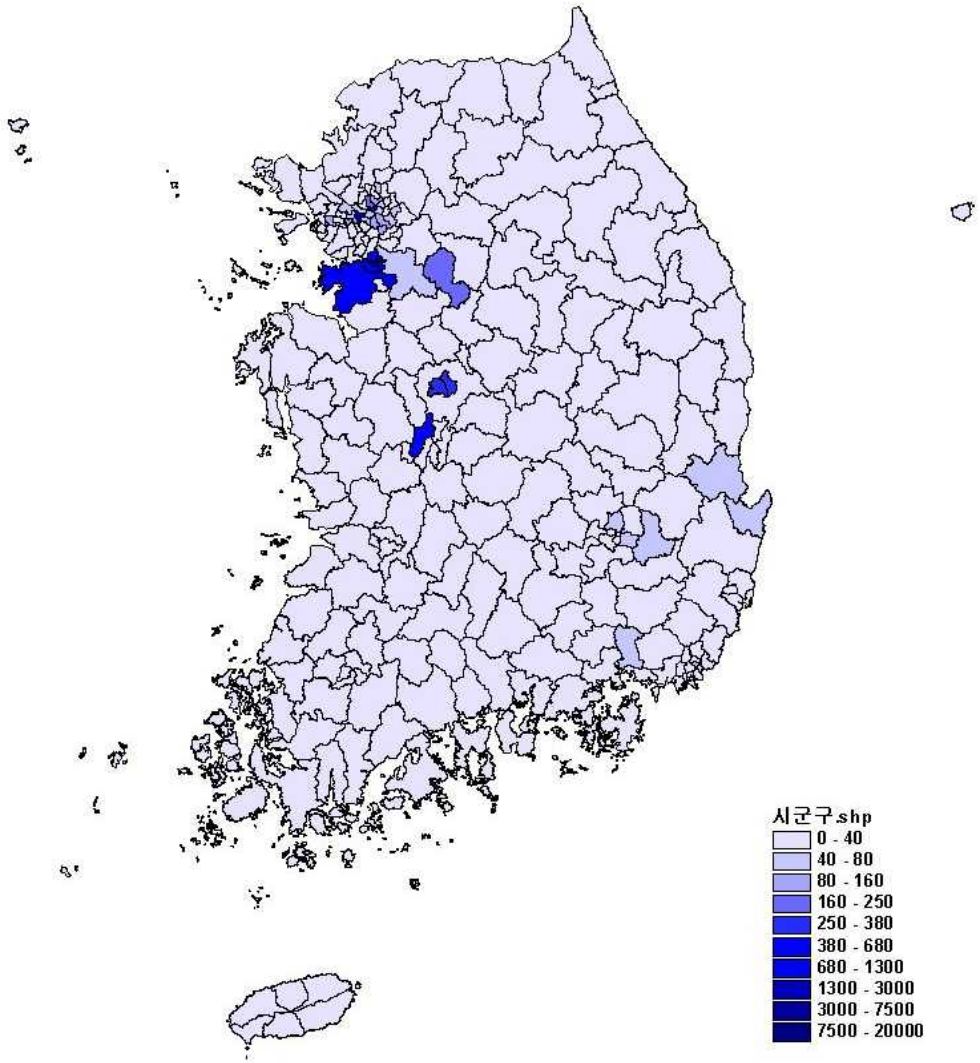
Related findings from OECD

(*2008 Compendium of Patent Statistics*)

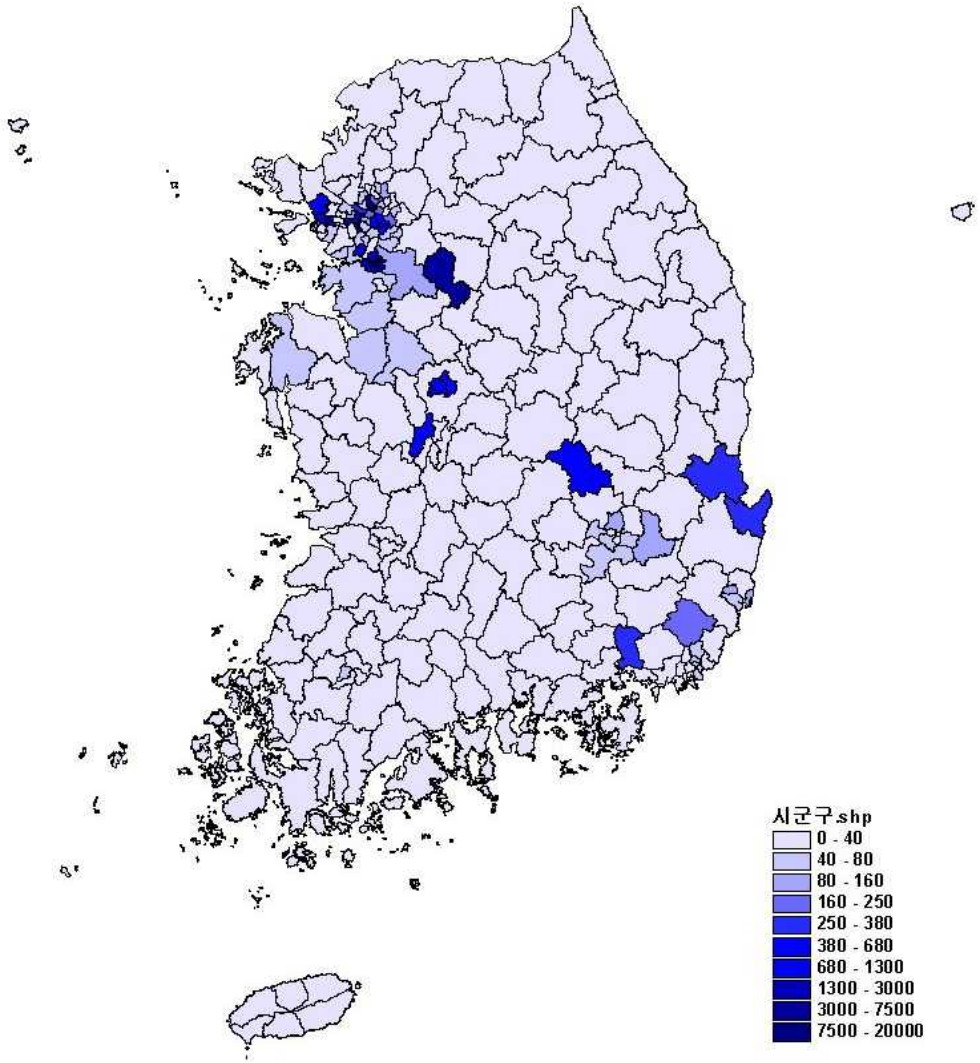




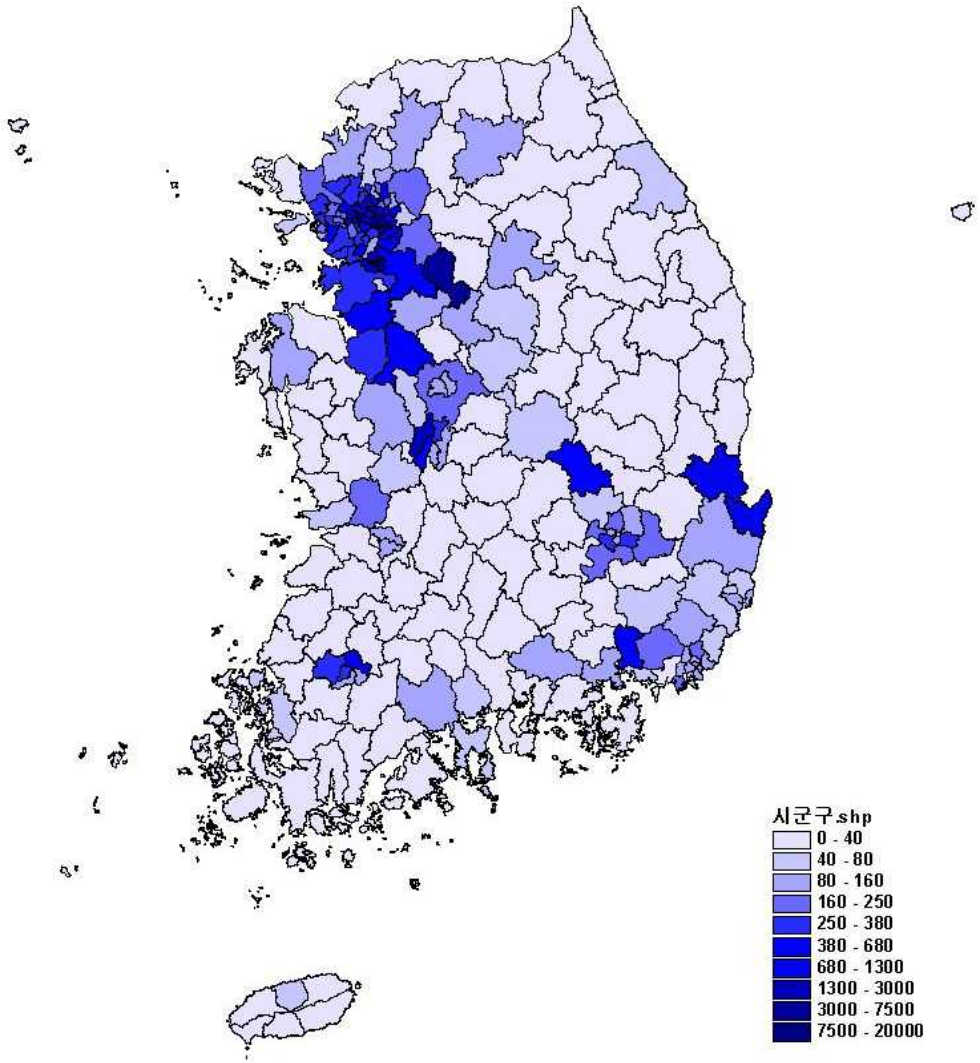
내국거주출원인_분율가산
(1990)



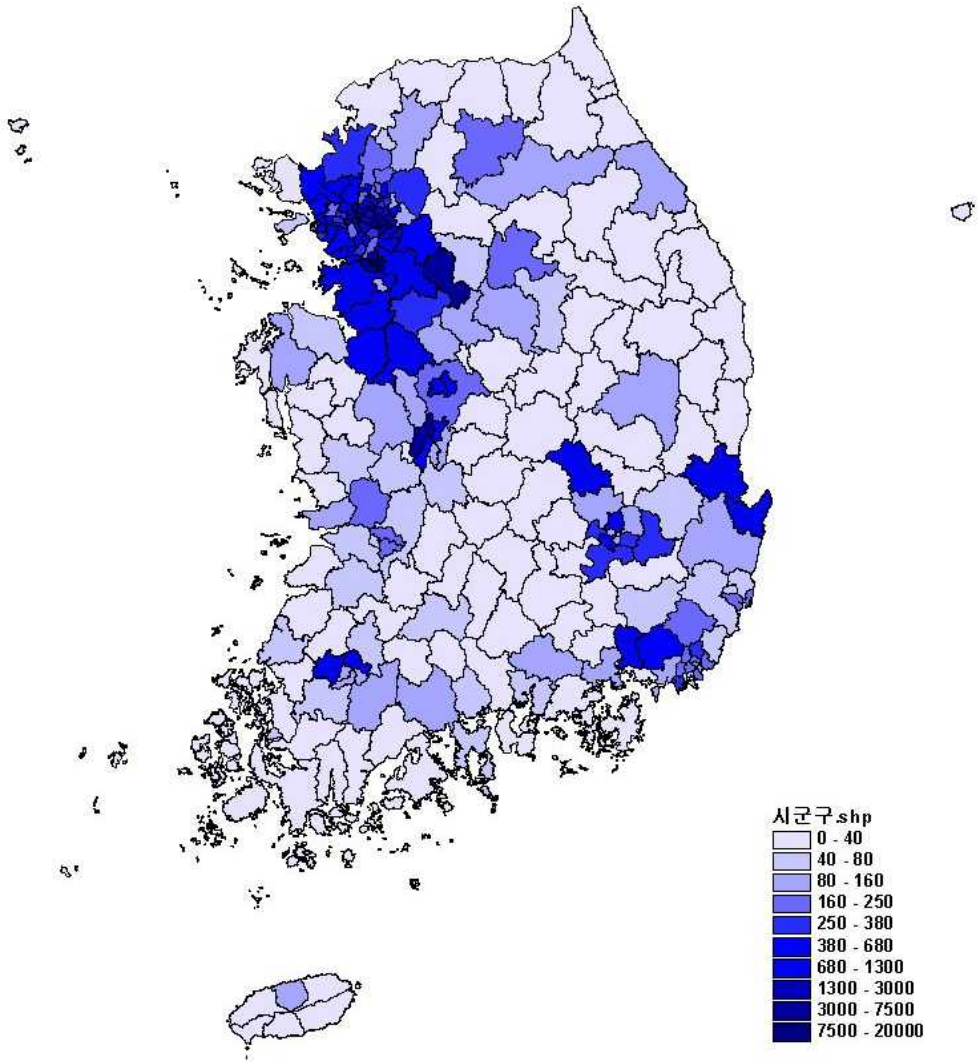
내국거주출원인_분율가산
(1995)



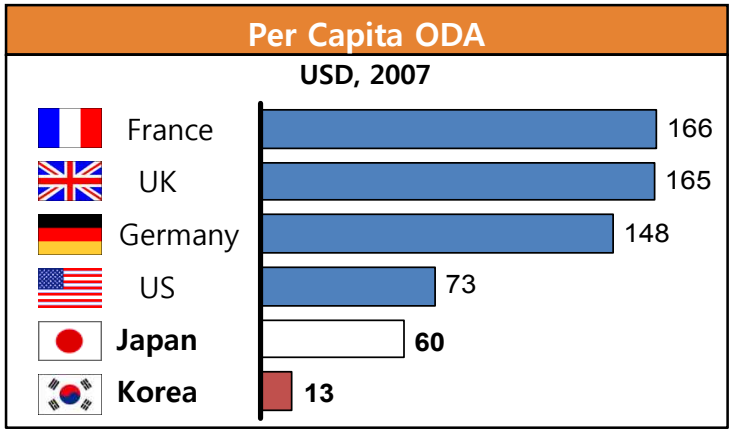
내국거주출원인_분율가산
(2000)



내국거주출원인_분율가산
(2005)



National Brand



Source: KOTRA; Anholt Nation Brand; IMF; Anderson Analytics; OECD; IMD; WEF; Future Vision Team Analysis

- Korea's national image has made little contribution to corporate competitiveness.
- Weak contribution to the international community
- Korea hosted only one international organization (International Vaccine Institute)
- Globalization of Korean culture is far from being satisfactory.
  - The number of overseas cultural centers is less than a fifth of Japan.

Part 4 | Intangibles and Productivity

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)**

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

$$and$$

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

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

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

Regression for Plant-Level TFP Growth

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

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Findings from Korea

$\{\ln(TFP)_{i,t+3} - \ln(TFP)_{i,t}\}/3$	I	II	III	IV
ln(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)**

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Findings from Korea (continued)

$\{\ln(TFP)_{i,t+3} - \ln(TFP)_{i,t}\}/3$	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)
ln (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.

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Thank you !

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