

Future of the World Trading System: Asian Perspectives

11-12 March, 2013

Evolution of Industrial Policy and Green Growth in Korea

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Korea's Leading Think Tank



Part-01

Industrial Policy in East Asia

KDI

Industrial Policy: Literature Review

Schools	Insights on sector identification and promotion
Developmental state (Johnson 1982; Amsden 1989; Wade 1990)	Government picks winners (in consultation with business).
Rent-seeking (Krueger 1974)	Government can't and shouldn't pick winners. (Self-fulfilling incompetence and corruption?)
Self-discovery (Rodrik 2007)	Winners pick themselves, with help from search and problem-solving networks.
New structural economics (Lin and Monga 2010)	Latecomers can pick winners in <u>mature</u> industries by benchmarking early movers (based on CA).
Product space (Hidalgo et al. 2007)	Winners are readily identifiable, but how do we go from the periphery to the core?
Strategic risk-taking	Winners are readily identifiable, but the key is to take strategic risks, weighing the challenges of skill accumulation, scale economies, and complementary investments against the possibility of capacity underutilization and financial distress.

Trade and productivity growth in East Asia

- Lucas (1993), “Making a Miracle”, *Econometrica*
 - Focusing on East Asian miracle economies as “large scale exporters of manufactured goods of increasing sophistication”
 - (1) The main engine of growth is the accumulation human capital, especially in the form of learning-by-doing on the job;
 - (2) For such learning to persist, workers and managers should continue to take on new tasks;
 - (3) For such learning to continue on a large scale, the economy must be a large scale exporter.



Industrial Policy in Korea

- IP for **Export Promotion**
- IP with Effective **Monitoring and Evaluation**
- IP as a **Public-Private Partnership**
- IP in a Rapid **Evolution**

◆ **Outward-Oriented, Bottom-up, Integrated Industrial Policy**

- Discover latent and potential comparative advantage through experimentation and international benchmarking.
- Positively reinforce successful experiments and phase out unsuccessful experiments by providing performance-based rewards.
- Systematically study what has to be done to fill the missing links in the domestic value chain and move up the quality ladder, and make concerted efforts to aim for international competitiveness from the outset.
- Take strategic risks, weighing the challenges of skill accumulation, scale economies, and complementary investments against the possibility of capacity underutilization and financial distress.

◆ **Inward-Oriented, Top-down, Ad Hoc Industrial Policy**

- Promote upstream industries with large spillovers (“Big Push” through coordinated domestic industrialization).
- Go top-down. Disregard feedback.
- Problem: Insufficient Demand, Suboptimal-Scale Plants, Higher Costs, Monumental Projects

Korea retained the ownership of its export-oriented industrialization and progressively developed its own capabilities to add value and manage risks even as it actively learned from, and engaged with, the outside world.

Korea's Big-Push Partnership: Government and Business Groups

- ◆ **Two-Tier Approach to Coordination and Innovation**
 - Government: National-Level Coordination and Innovation
 - Chaebol: Group-Level Coordination and Innovation
 - Big-Push Partnership: Information and Risk Sharing

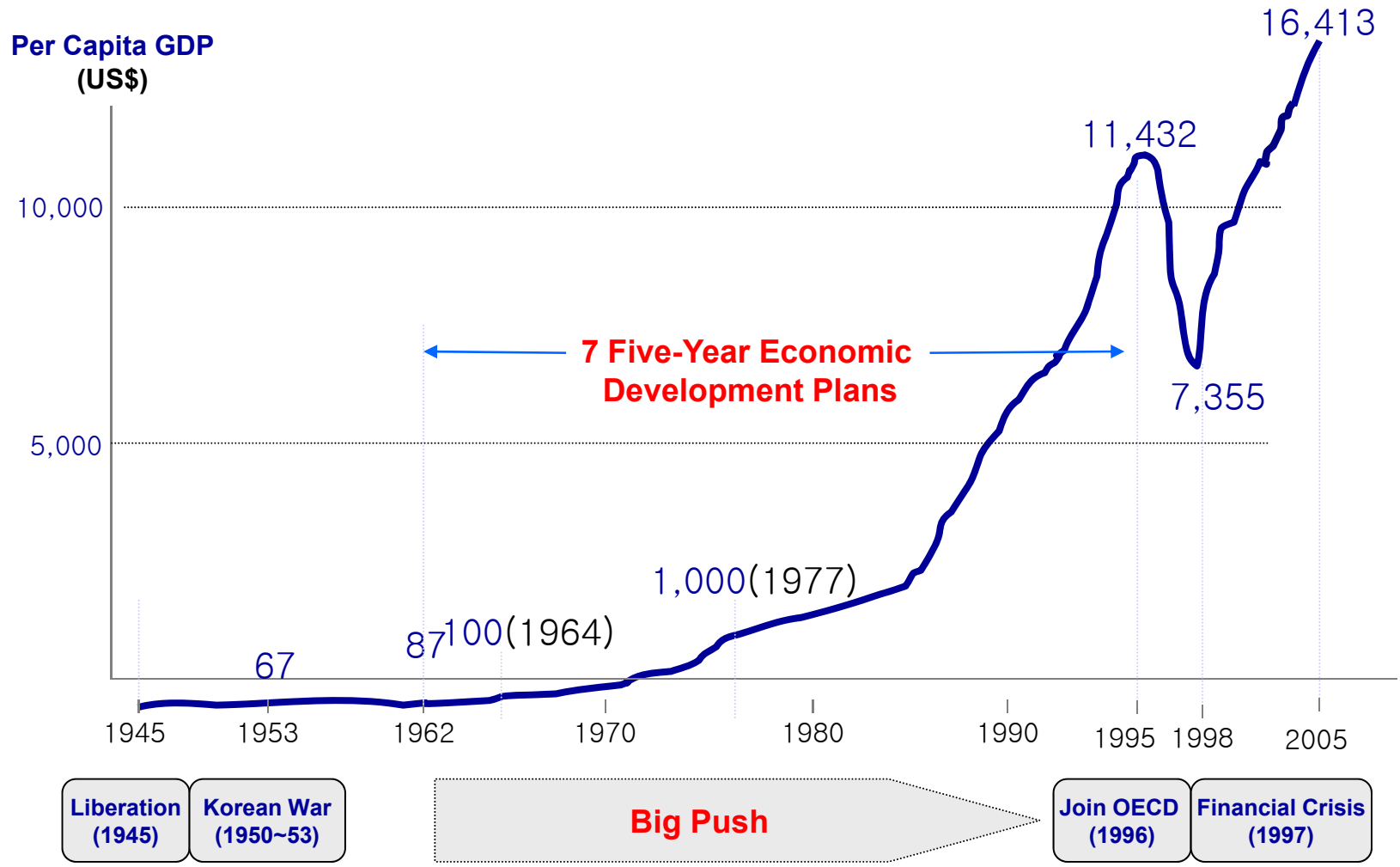
- ◆ **International Trade as an Essential Component**
 - Coordination
 - Scale Economies: Overcoming the Limits of Domestic Market
 - Market Test and Reward Based on Performance in a Competitive Setting: Less Prone to Political Influence and Manipulation
 - Learning by Exporting: Upgrading Mechanism

- ◆ **Containment of Corruption and Rent-Seeking**
 - Changes in Political Economy (1960-61)
 - Meritocracy, Monitoring, and Incentives

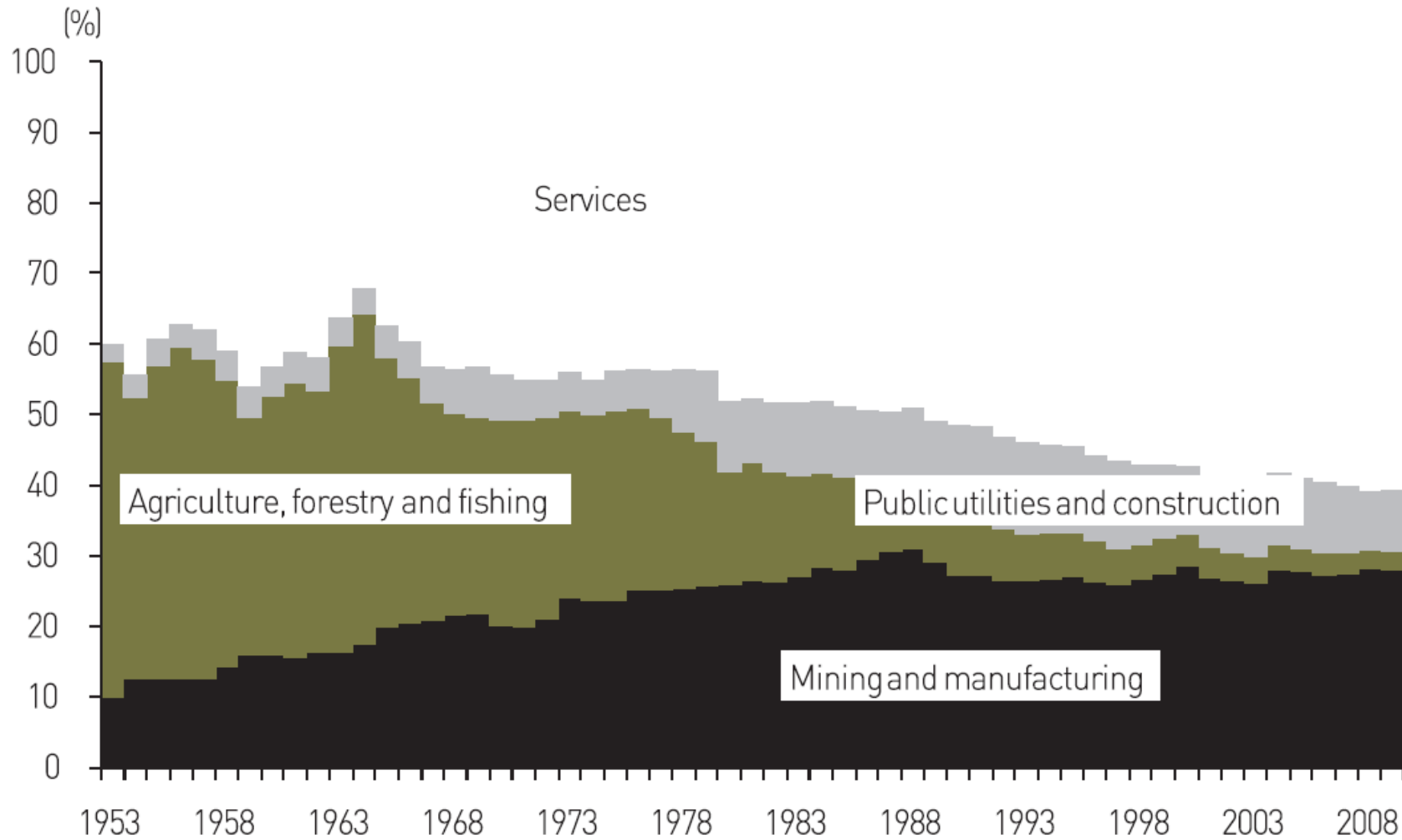
Part-02

Trade and Industrialization in Korea

KDI

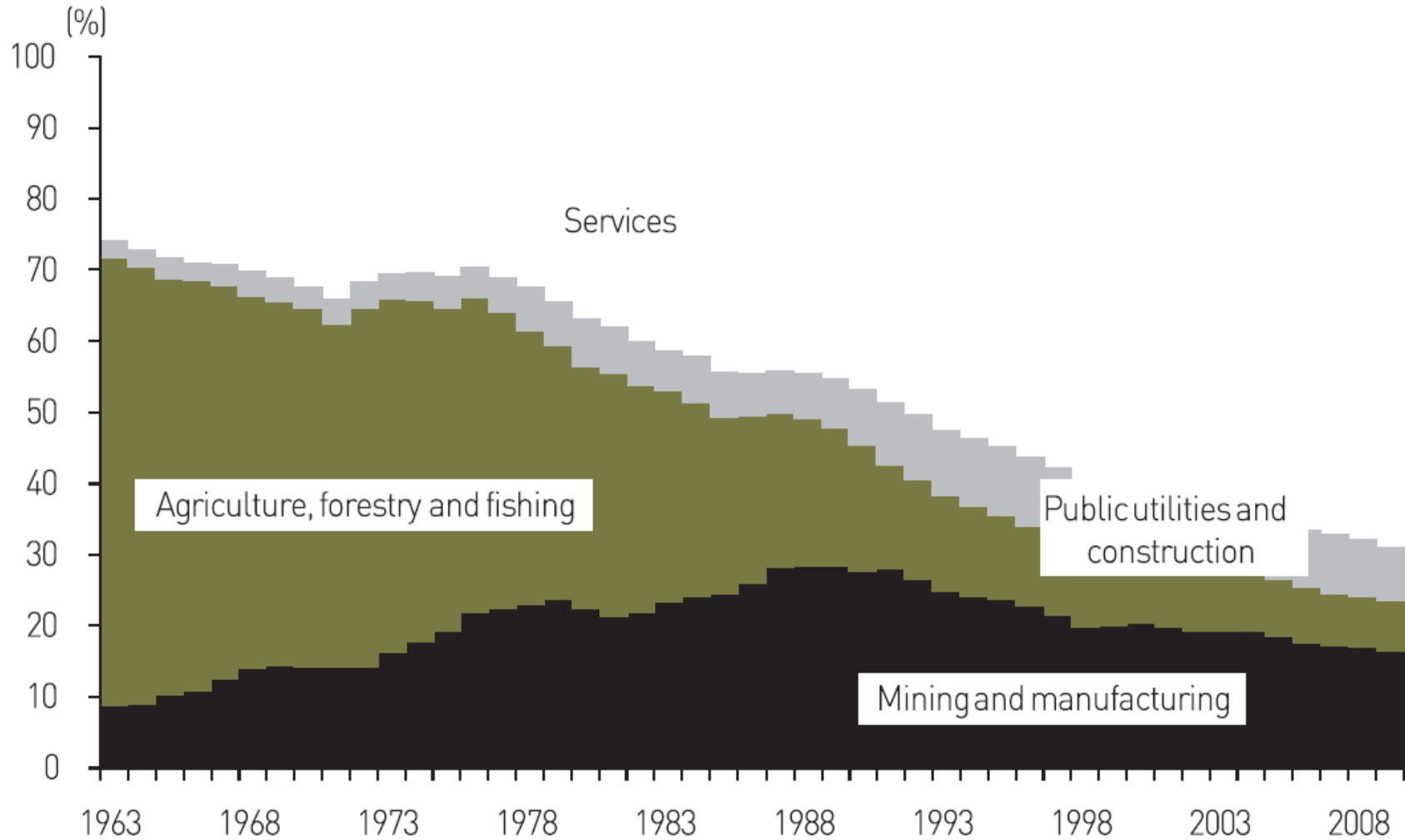


Industrialization: GDP share



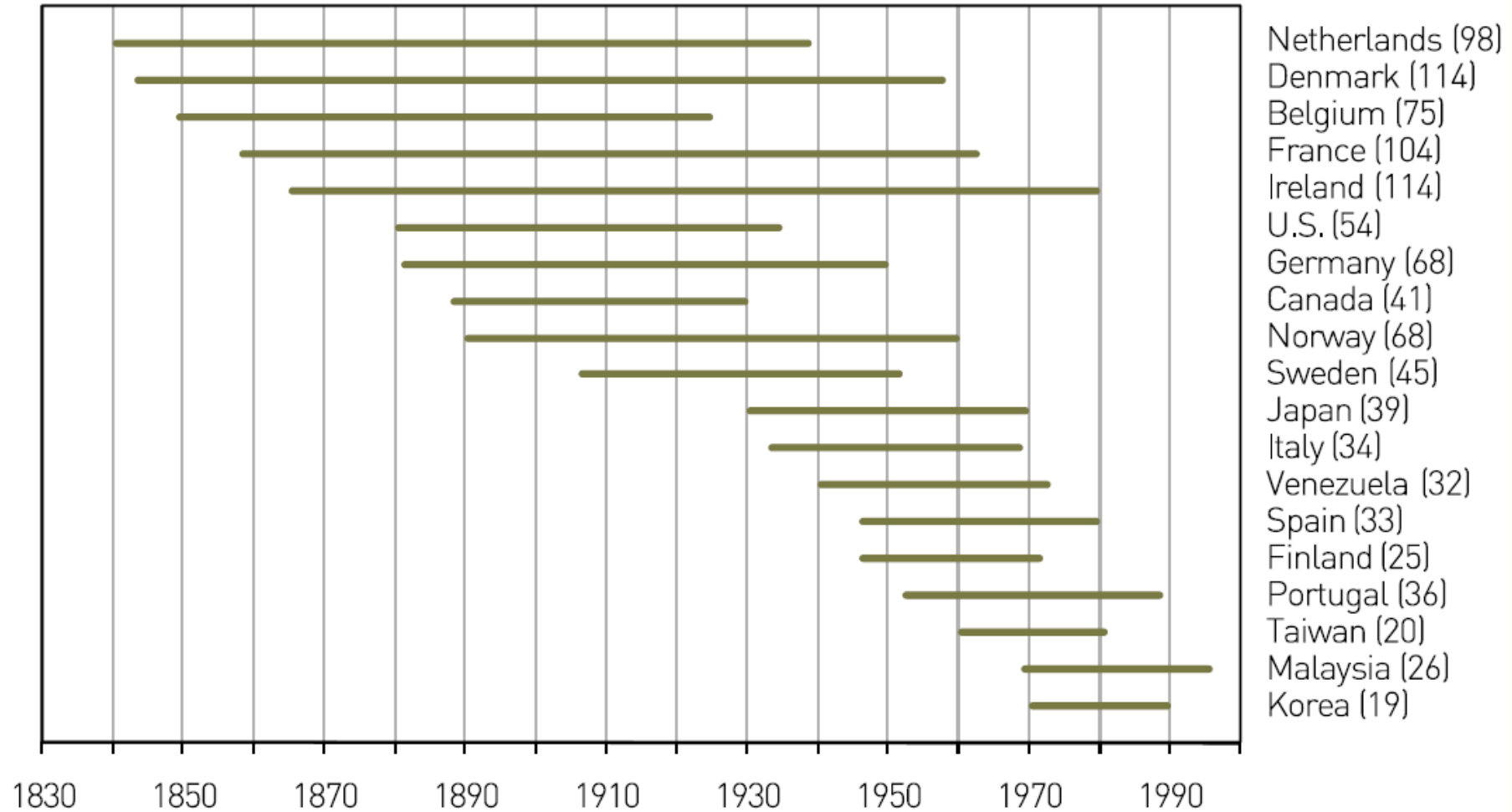
Note: Services include public utilities and construction.
Source: Bank of Korea (<http://ecos.bok.or.kr>).

Industrialization: Employment share



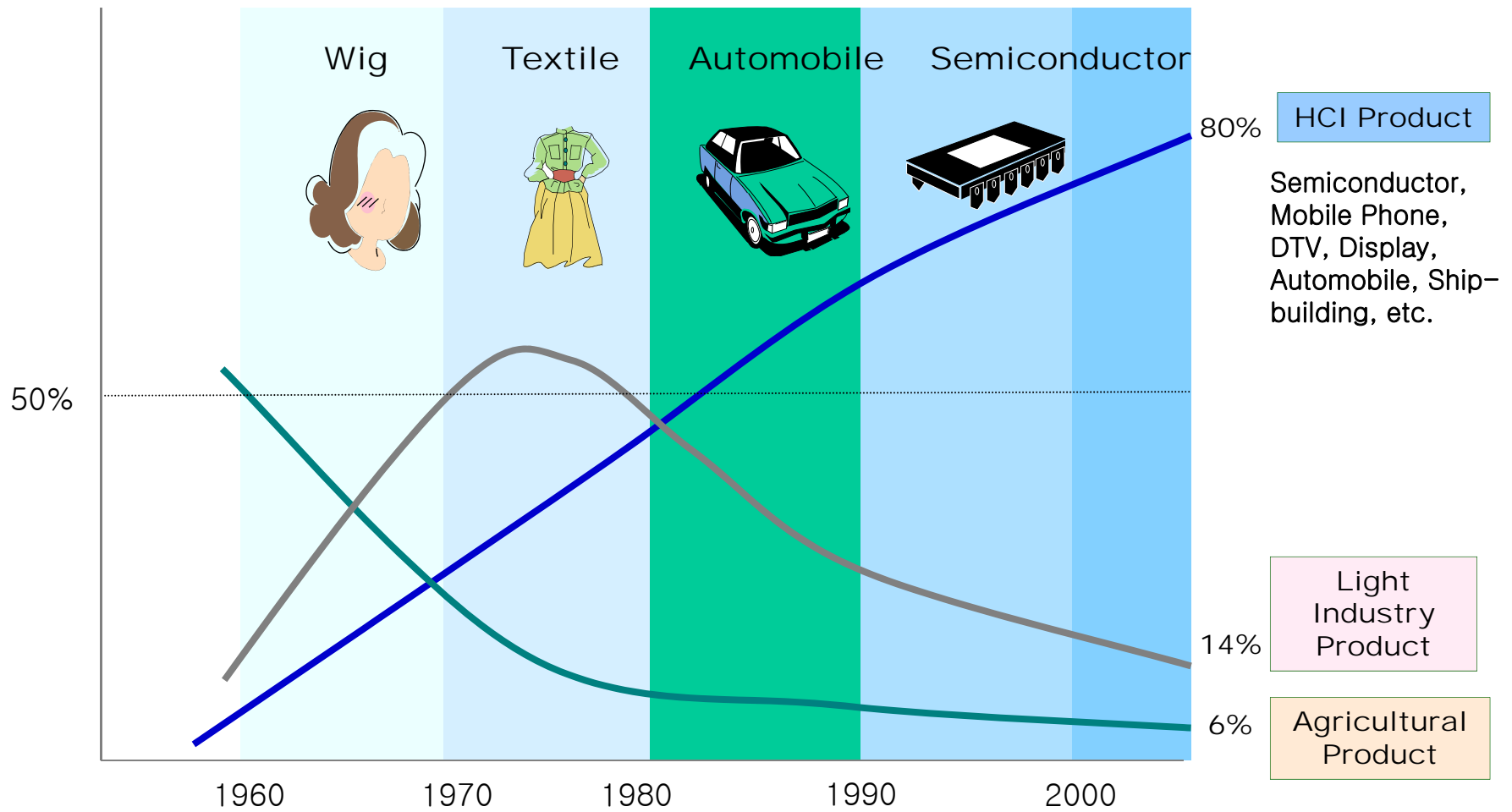
Source: National Statistical Office (<http://www.kosis.kr>).

Industrialization: How Long Did It Take?



Note: The numbers in parentheses indicate the length of the industrialization period in years.
Source: Jungho Yoo (1997).

Changes in Export Commodity Profile

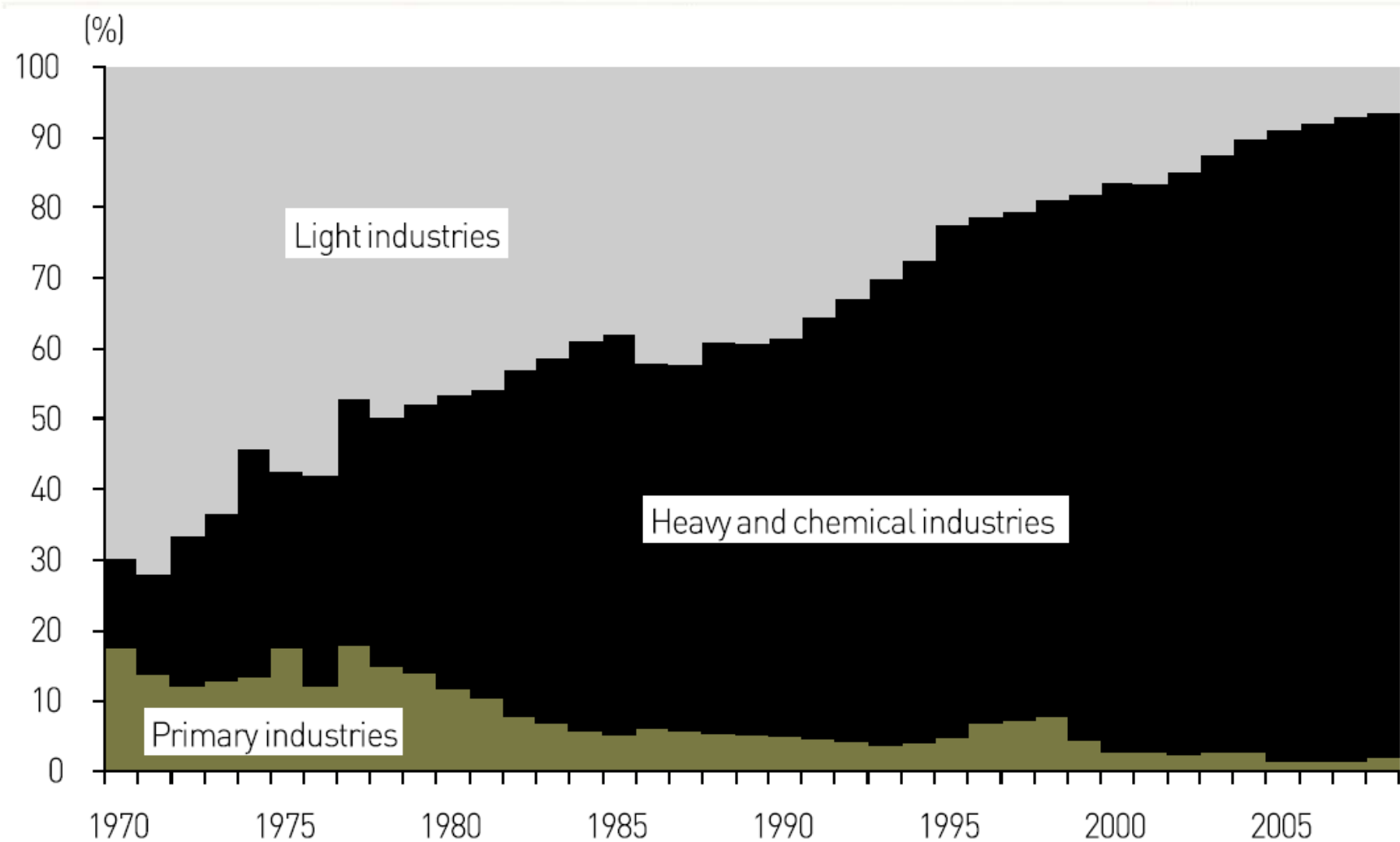


Korea's Top 10 Exports: Evidence on Industrial Upgrading



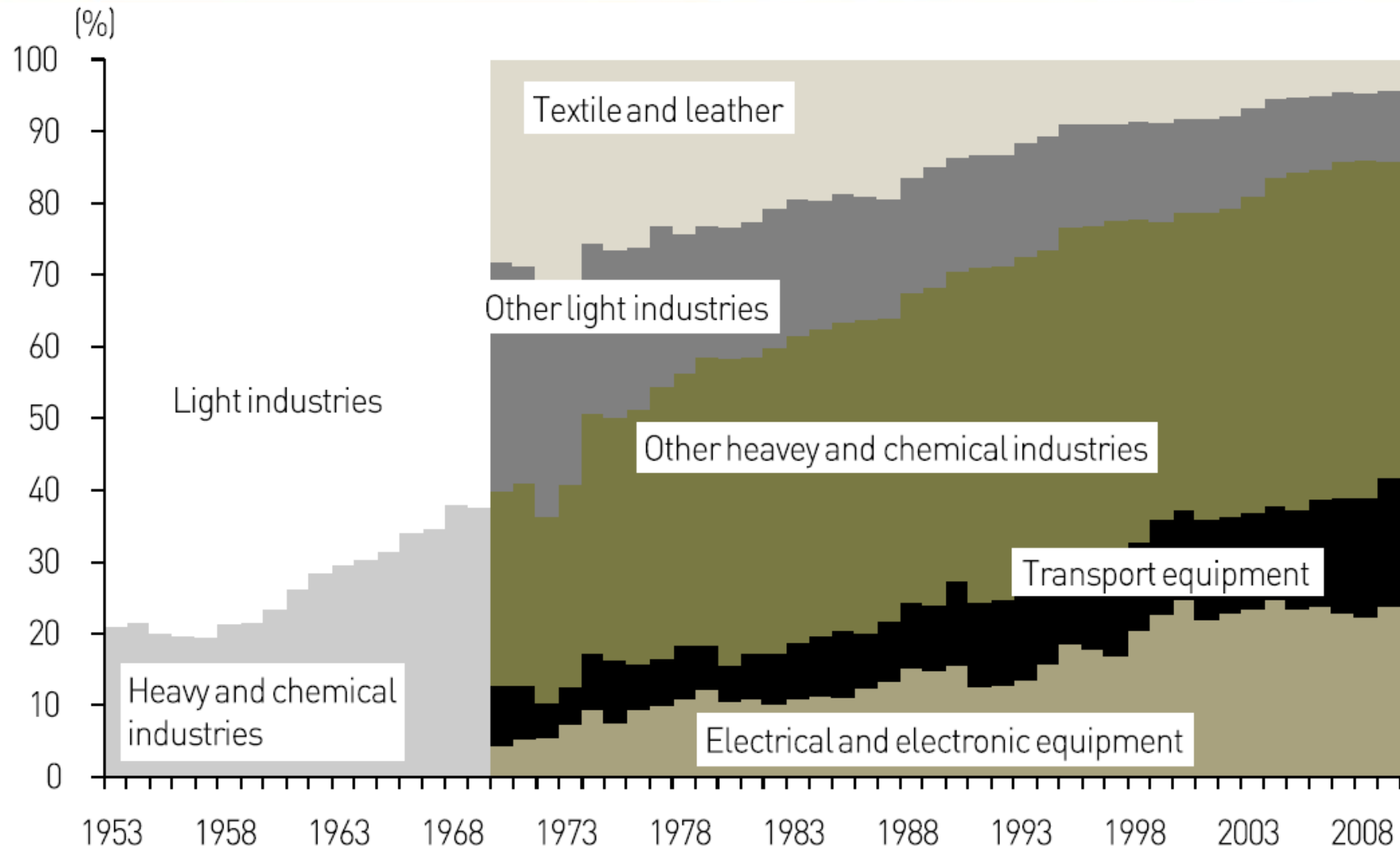
	1960	1970	1980	1990	2000
1	Iron Ore	Textiles	Textiles	Electronics	Semiconductors
2	Tungsten Ore	Plywood	Electronics	Textiles	Computers
3	Raw Silk	Wigs	Iron and Steel Products	Footwear	Automobiles
4	Anthracite	Iron Ore	Footwear	Iron and Steel Products	Petrochemical Products
5	Cuttlefish	Electronics	Ships	Ships	Ships
6	Live Fish	Fruits and Vegetables	Synthetic Fibers	Automobiles	Wireless Telecommunication Equipment
7	Natural Graphite	Footwear	Metal Products	Chemicals	Iron and Steel Products
8	Plywood	Tobacco	Plywood	General Machines	Textile Products
9	Rice	Iron and Steel Products	Fish	Plastic Products	Textile Fabrics
10	Bristles	Metal Products	Electrical Goods	Containers	Electronics Home Appliances

Export Structure



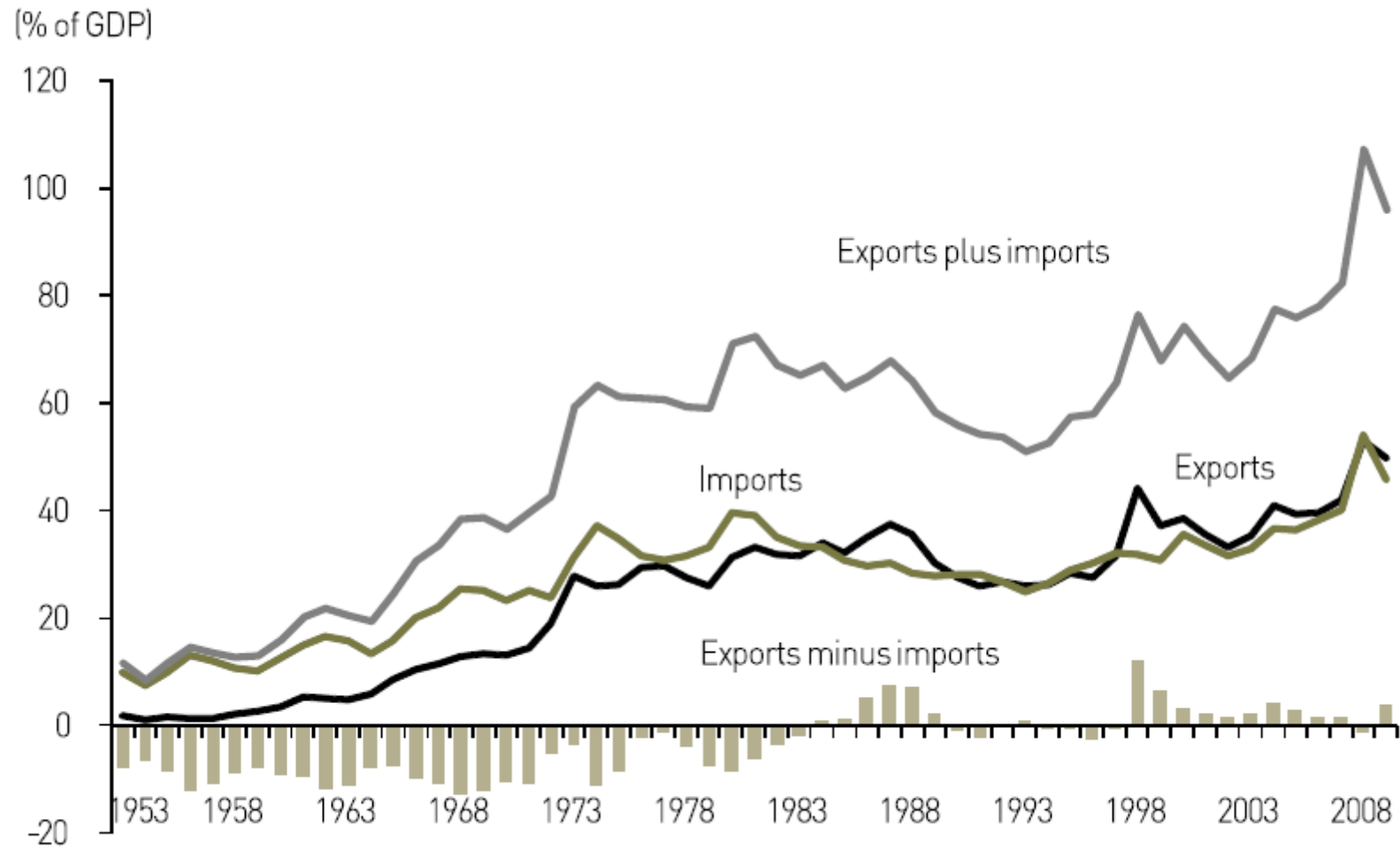
Source: Institute for International Trade (<http://www.kita.net>).

Manufacturing Structure



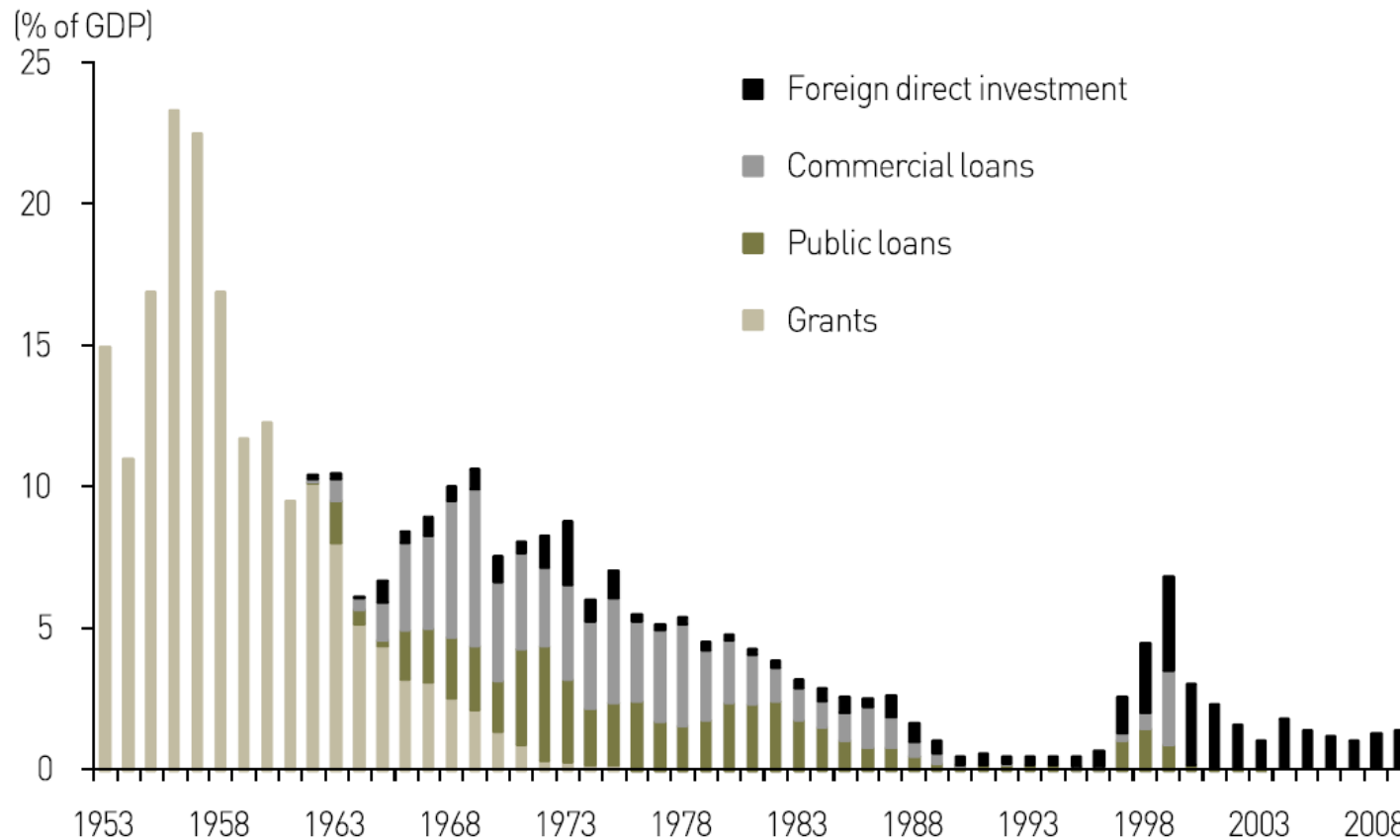
Source: Bank of Korea (<http://ecos.bok.or.kr>).

Exports and Imports (1953-2009)



Source: Bank of Korea (<http://ecos.bok.or.kr>).

Inflows of grants, loans, and FDI (1953-2009)



- Sources: 1) Among grants, financial aid from U.S and international organizations are from Bank of Korea, *Economic Statistics Yearbook*, 1984, p.245, and reparation payments from Japan are from Economic Planning Board, *Whitepaper on Reparation Payments*, 1976, p.29.
- 2) Commercial and public loans (1962-1965) are from Ministry of Finance, *Thirty-Year History of Fiscal and Financial Policies*, 1978, p.97.
- 3) Commercial and public loans (1966-2007), foreign direct investment and GDP are from Bank of Korea (<http://ecos.bok.or.kr>).

Part-02

Evolution of Trade Policy in Korea

KDI

Import-Substitution in the 1950s

- One of the poorest country in the world
- Pursued import-substitution industrialization
 - “Three white” industries etc.
 - Limited by the small size of domestic market
- Dependent on foreign aid
 - 50% of government expenditure, 70% of import
 - Domestic currency overvalued, import regulated
 - Lack of foreign currency for investment

Export-Promotion in the 1960s

- First 5-year economic development plan (1962-)
 - To end the vicious circle of poverty
- Rapid export expansion started
 - Three devaluations triggered export expansion
- Export drive by strong export promotion policy
 - Export targets (1962), monthly export promotion meetings (1964), Korea Trade Promotion Agency (KOTRA, 1962)
 - Comprehensive Export Promotion Program (1964)
 - Subsidies, tax incentives, credit incentives, tariff rebates ...
 - All abolished by the 1980s (too costly; countervailing duties)

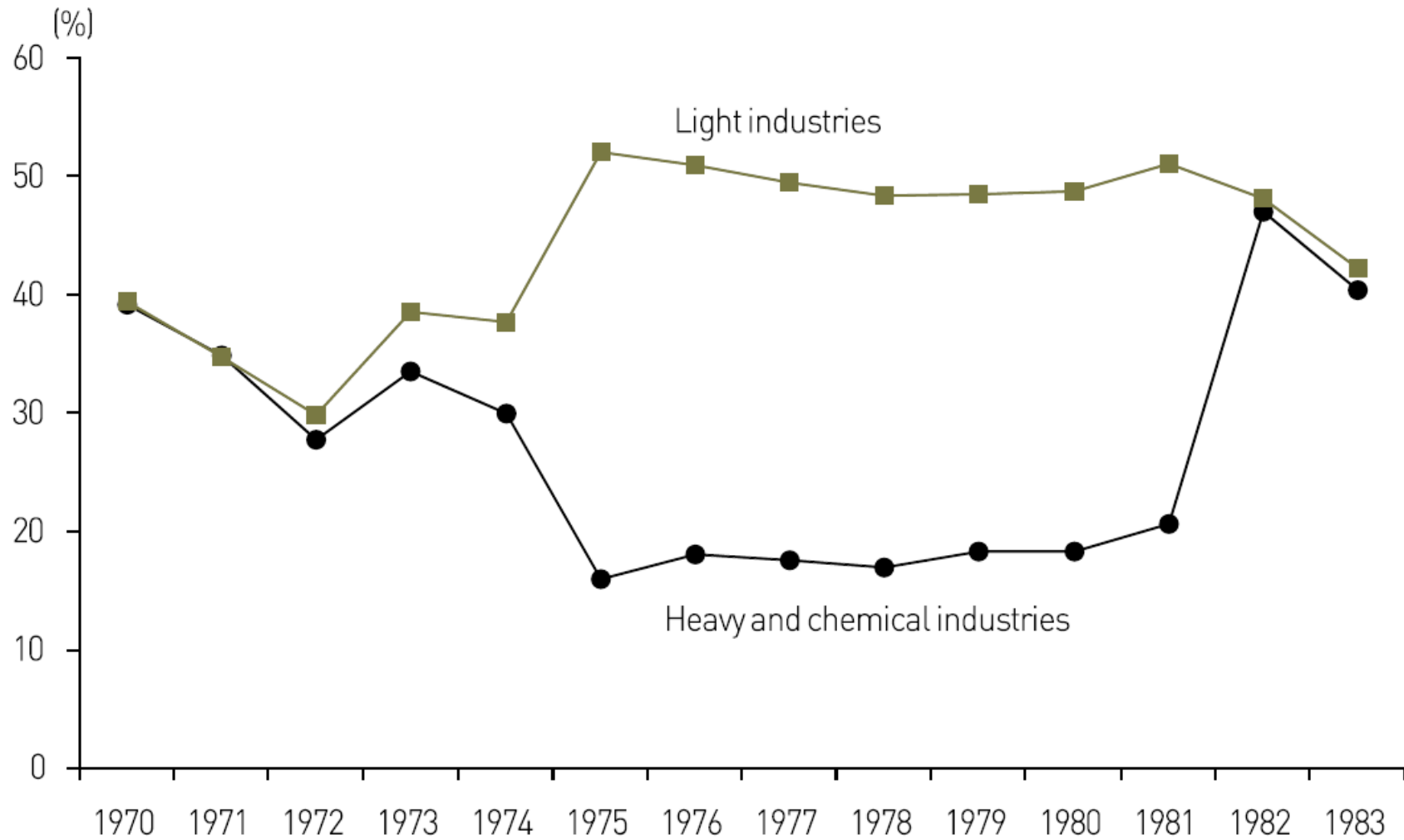
Promoting HCIs in the 1970s

- Government-led HCI promotion
 - To promote the defense industry for self-defense
 - To catch up Japan in HCIs
 - To respond to increased protectionism in light industries
 - To achieve import-substitution in capital goods
- Top-down approach towards private firms
 - Long-term policy loans at preferential rates with tax benefits
 - Public investment in human capital and infrastructure
 - Giving favors to large enterprise groups (“Chaebol”)
- Temporary import-substitution measures to protect HCIs

Stabilization / Liberalization in the 1980s

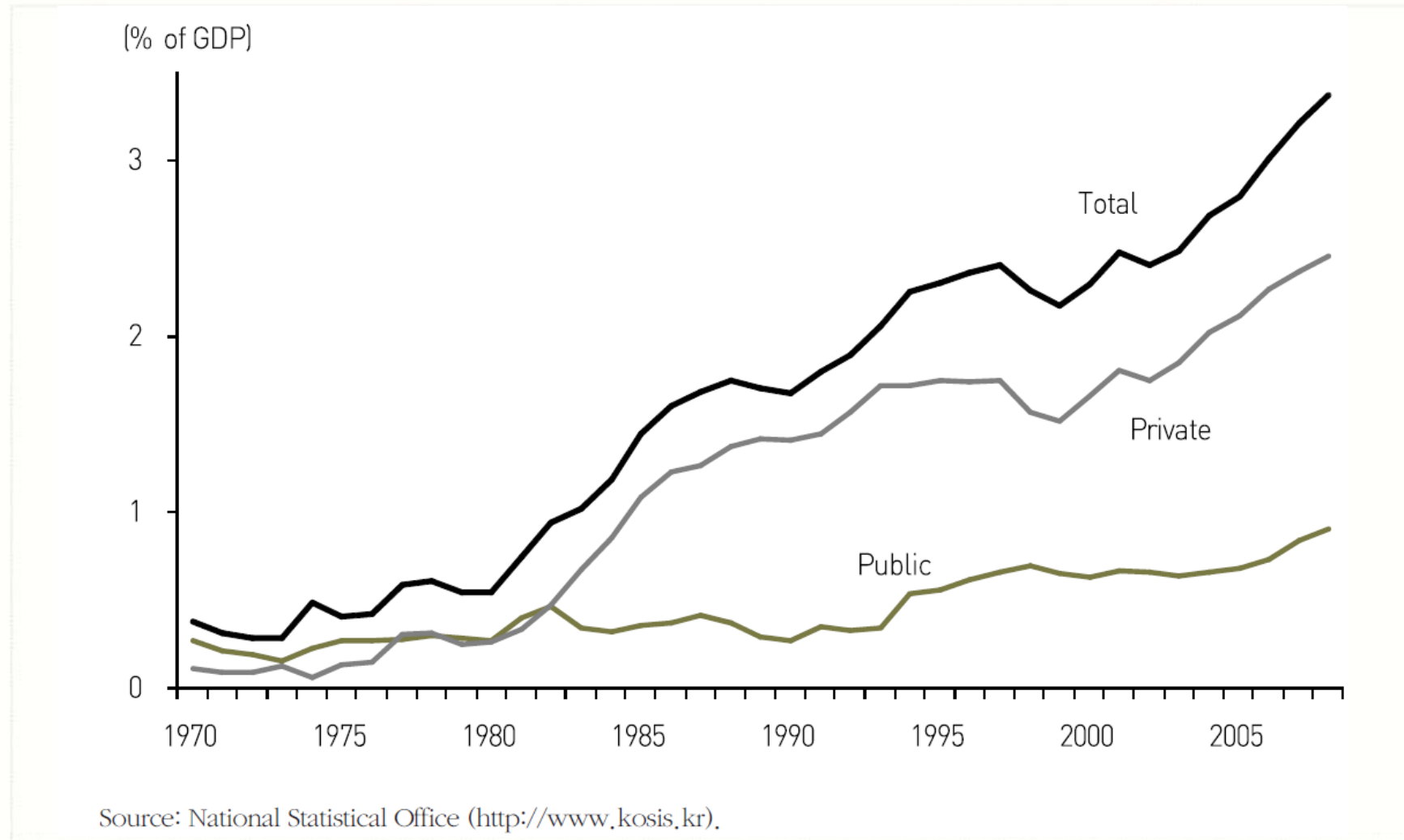
- Drastic change in policy directions
 - From growth to stability
 - From government-led to private-sector-led
- Macroeconomic stabilization
 - Comprehensive Economic Stabilization Program (1979)
- Industrial rationalization
- Financial liberalization
- Market opening

Marginal effective tax rates on corporate income

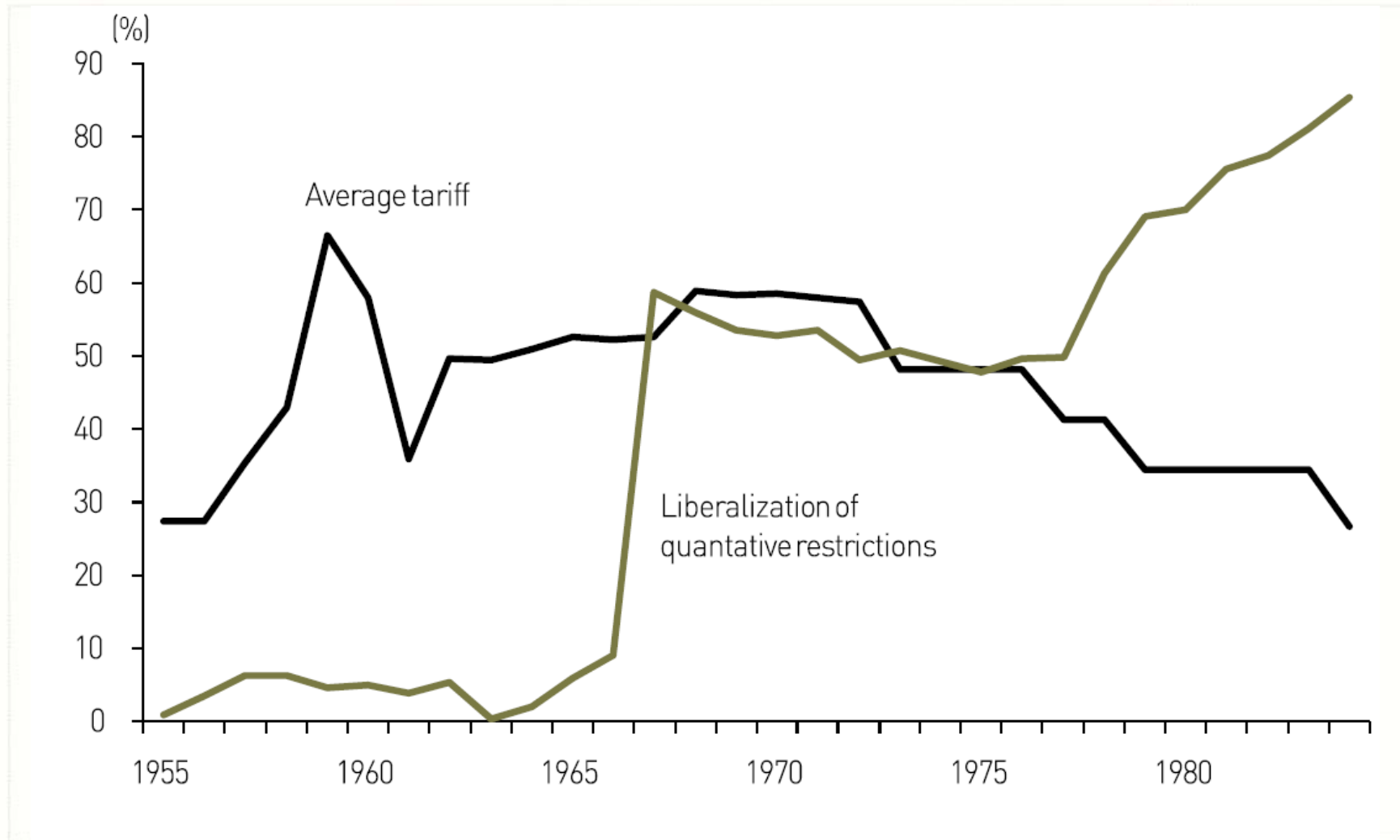


Source: Tae-won Kwack (1985). Recited from Jungho Yoo (1991).

Trend in R&D expenditure

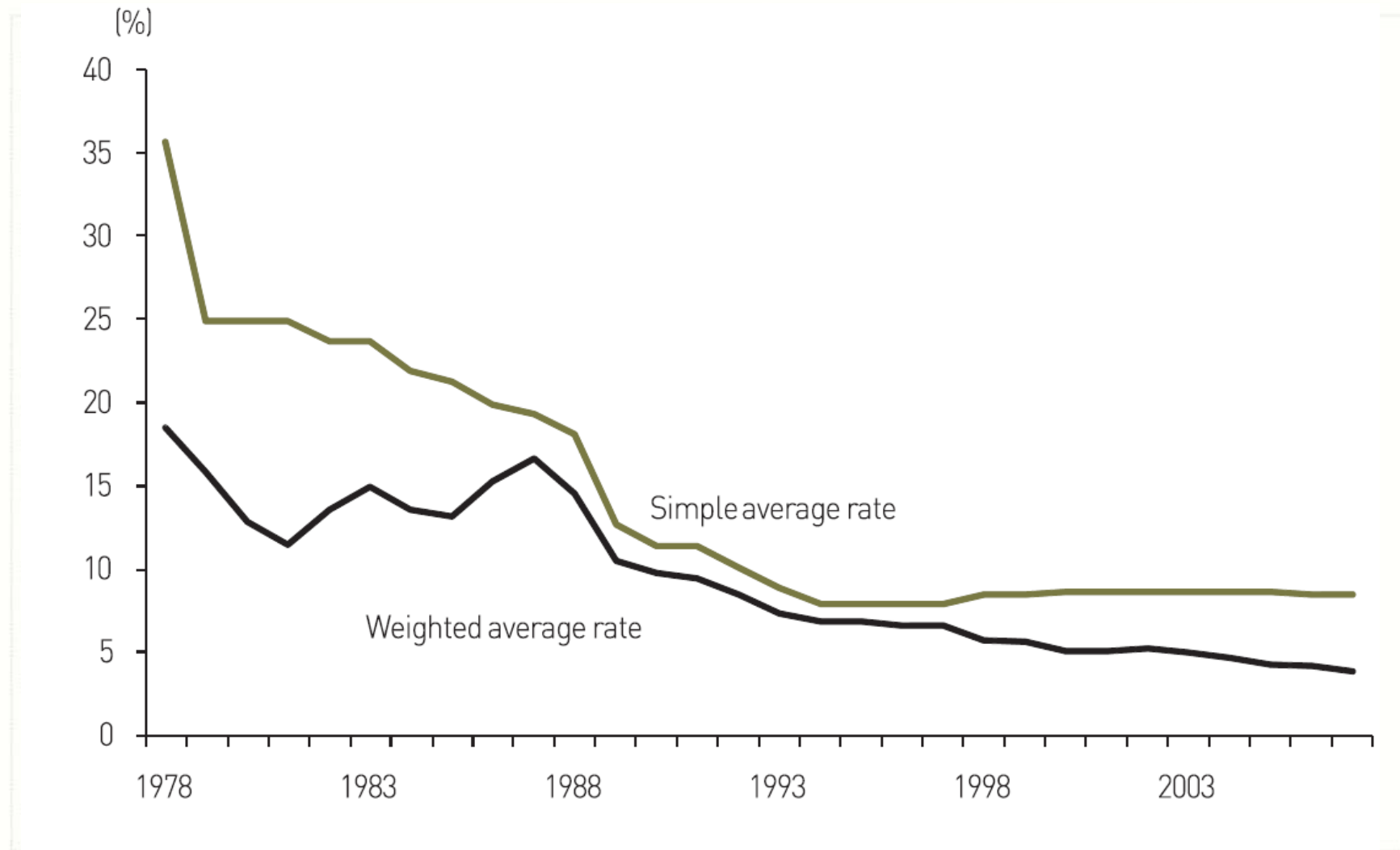


Import liberalization



Source: Kwang Suk Kim (1991).

Korea's tariff rates (1978-2007)



Source: APEC (<http://www.apectariff.org>).

Part-03

Case Study: Automotive Industry

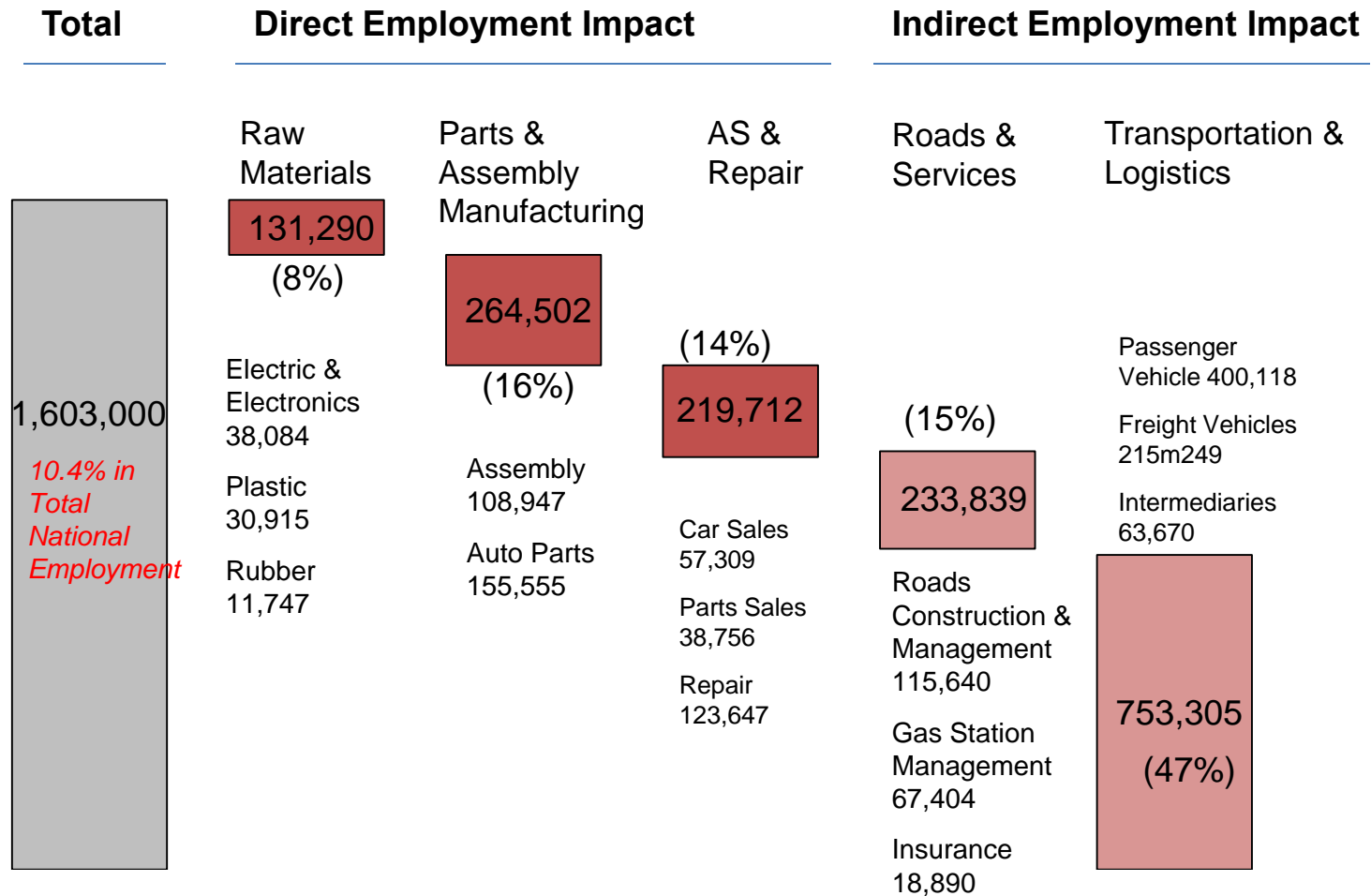
KDI

Korea's industrial policy involve top down / economy wide directives for technological upgrading and achievement of international scale

Industry	1 st 5 Year Plan 1962-66	2 nd 5 Year Plan 1967-71	3 rd 5 Year Plan 1972-76	4 th 5 Year Plan 1977-81	5 th 5 Year Plan 1982-86
Basic Policy Direction	<ul style="list-style-type: none"> Onset of industrialization Export-first principle Development of import substitution industries 	<ul style="list-style-type: none"> Strengthening of the international competitiveness of light industry Domestic production of industrial raw materials Introduction and absorption of technologies (KIST) 	<ul style="list-style-type: none"> \$10bn exports Proclamation of HCI (development six leading industries) Proclamation of domestic development of technologies, education of technological manpower 	<ul style="list-style-type: none"> Expansion of research facilities industrial rationalization (energy saving) 	<ul style="list-style-type: none"> International class Precision Plant export
Light	Import substitution	Establishment of export oriented infrastructure	Export maximization	Saving energy	Intl. scale
Chemical	Cement /Fertilizer/ Oil refinery	Petrochem. Complex	Methanol Plant		Fine chemical industry
Metal		Iron & steel mukk			Intl. scale (20-60mn tons)
Shipbuilding	Wooden vessels		Hyundai shipyard		Intl. scale
Machine	Small car assembly	Bus, truck assembly	Parts development / automobile mfg. plant	Mass production (300K) / Exports (\$150MN)	Precision machinery large scale machinery
Electronics	Radios, telephones	TV	Gumi complex	Mini computer, VTR	Semiconductors & Computers
Technology & Engineering	Civil & architect	Equipment sub contract / R&D by KIST	Scientists	Specialised research institute (Daeduk)	Plant engineering / Process development

Sectoral targeting? – some industrial activity has a far-reaching impact on employment and technology across sectors

[CASE] South Korea's auto manufacturing related jobs

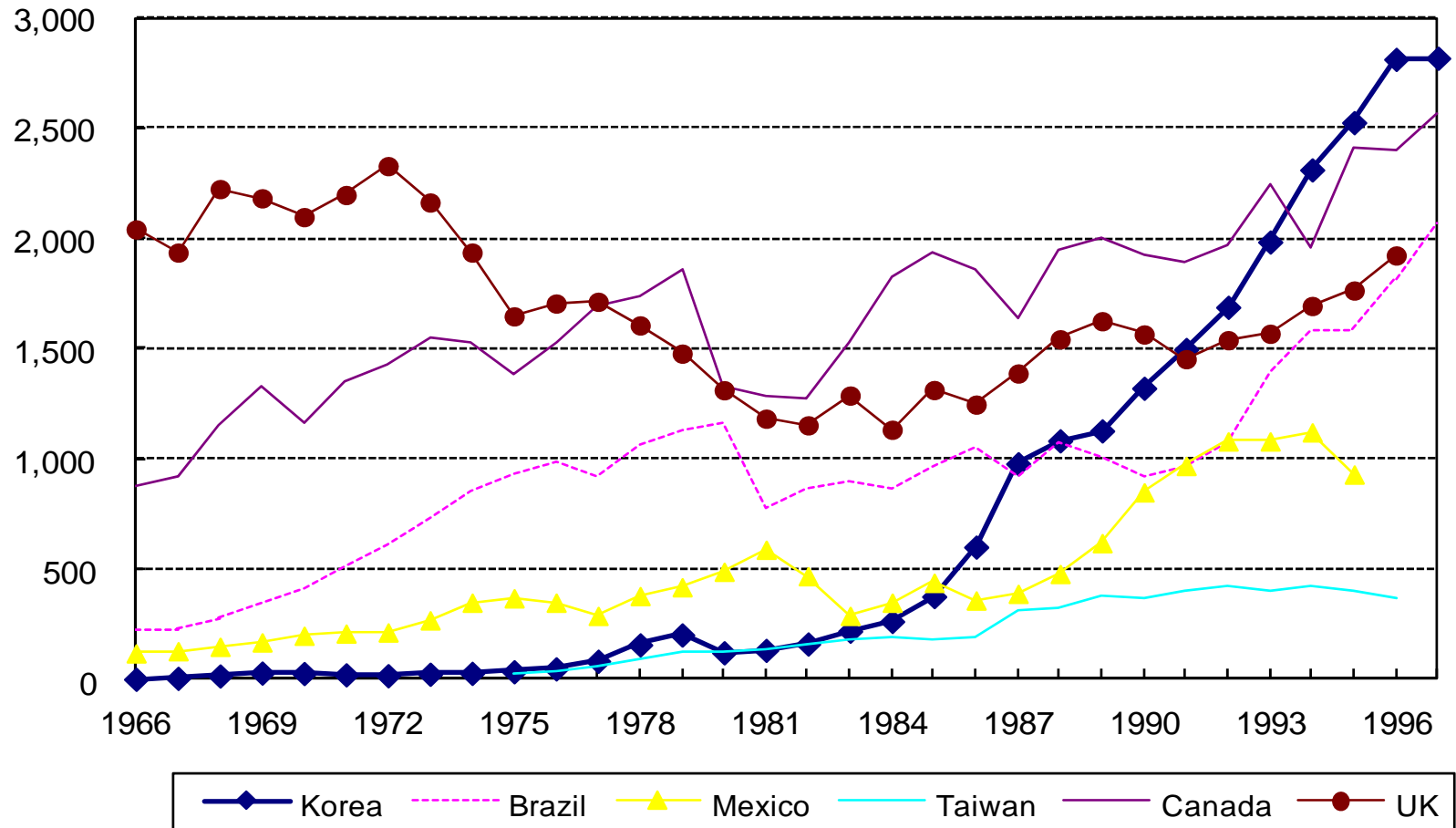


Automotive industry in developing countries

	Korea	Taiwan	Brazil	Mexico
First Promotion Plan	1962	1961	1956	1962
Assembly Sector	Indigenous model development by local assemblers	Indigenous model development by local or foreign assemblers	Global production strategy by multinationals	Global production strategy by multinationals
Components Sector	Import substitution, subcontracting system	Import substitution	Import substitution	Import substitution
Export Promotion	Exports of indigenous model	Exports of foreign models and localized components	Exports of foreign models and localized components	Exports of foreign models and localized components
Production (2003 vs. 2010)	3,177,870 4,271,741	386,686 303,456	1,827,038 3,646,133	1,575,447 2,347,524
Exports (2003 vs. 2010)	1,814,938 2,772,107	6,338 36,914	534,740 767,432	1,195,147 1,921,839

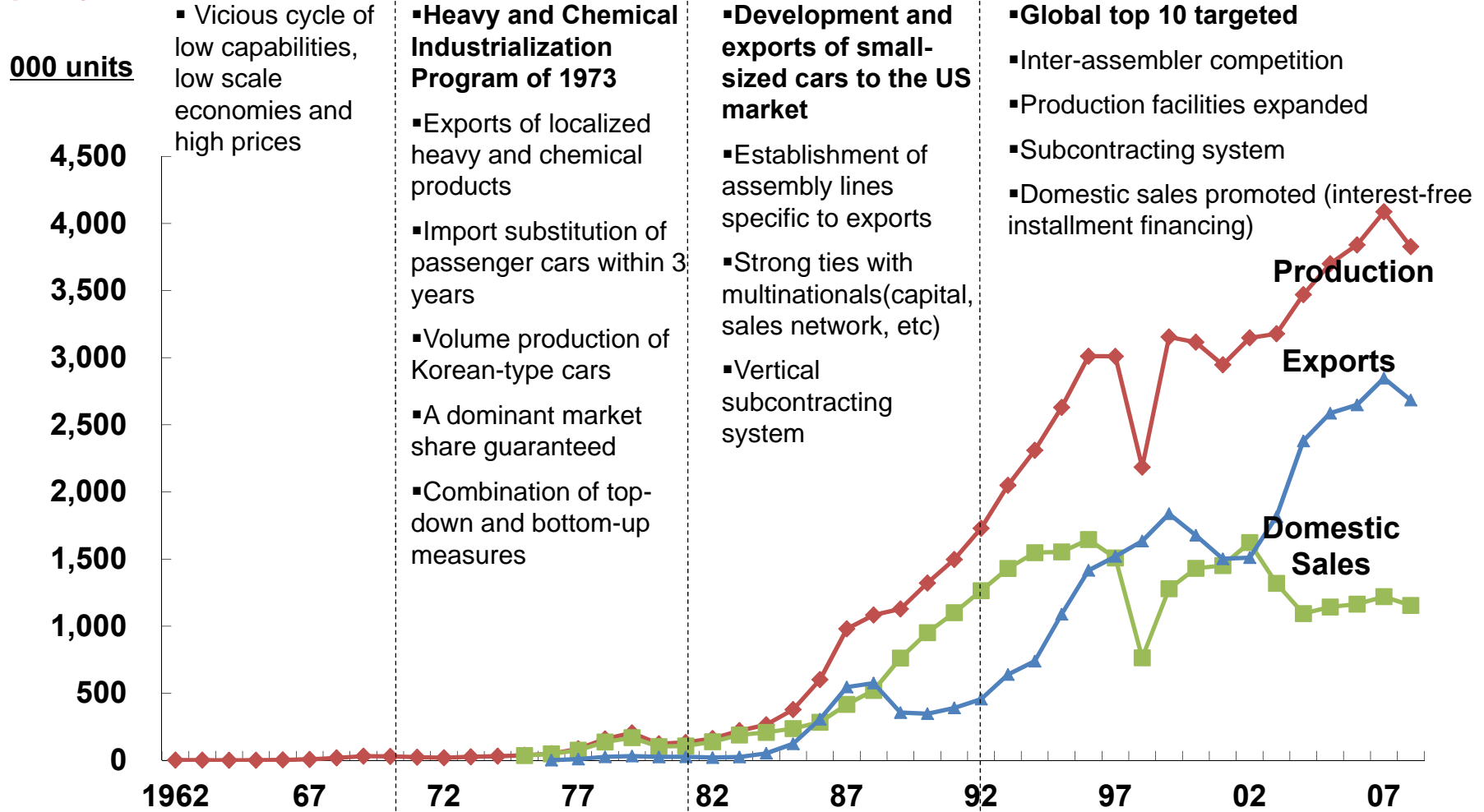
000units

Production of motor vehicles(1966-97)



Evolution of Industrial Policy in Korea: Auto Industry

Korea's auto industrial policy



Technical evolution should be the underlying force of industrial development

Development stages in the Korean automobile sector

	Foundation 1962-1974	Heavy & Chemical Industry push 1975-1981	Export drive 1982-1988	Home base 1989-1994
Character	Kit assembly	Local model, mass production	Restyling, JIT, front-wheel drive	Advanced design of engines and transmission
Local content (%)	30	85	97	97
Models produced	9	11	10	13
Mid-stage volume	14000	57000	264000	1000000~
Acquired technology	Inspection, production management	New model development, quality control	Mass production, JIT, front-wheel drive, US standards	Design with advanced technology

Source: Hyun, Y.S. (1989) A technology strategy for the Korean motor industry; as cited in Auty, R. (1994) *Economic Development and Industrial Policy*, Ch.4

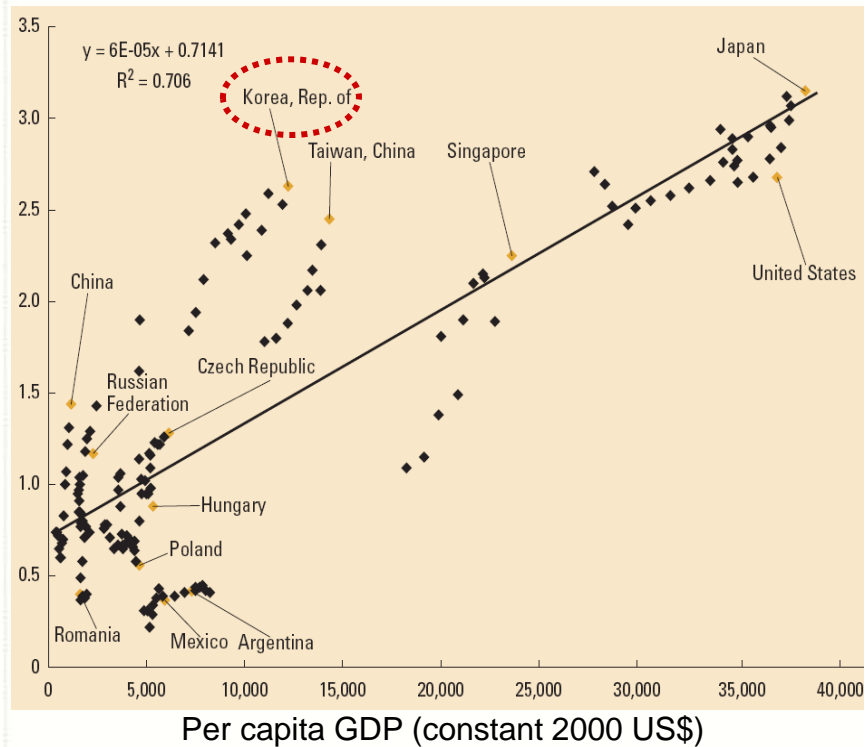
Korea's Transition Toward a Knowledge Economy **KDI**⁷

Korea's transition toward a knowledge economy was intimately linked to export promotion, industrial upgrading, and human resource development, and institution-building was largely complete by the end of the 1980s.

	1960s	1970s	1980s	1990s	2000s
Development Stage	Factor-Driven	Investment-Driven		Innovation-Driven	
Industrial Policy	Support Export Development	Promote Heavy and Chemical Industries	Shift from Industry Targeting to R&D Support	Provide Information Infrastructure and R&D Support	Promote New Engines of Growth and Upgrade R&D
S&T Policy	<ul style="list-style-type: none"> - MOST/KIST - S&T Promotion Act - Five-Year Economic Plan Including S&T 	<ul style="list-style-type: none"> - Government Research Institutes - Technical and Vocation Schools - R&D Promotion Act - Daedeok Science Town 	<ul style="list-style-type: none"> - National R&D Plan - Private Sector Initiatives in R&D 	<ul style="list-style-type: none"> - Informatization - E-Government - GRI Restructuring - U-I-G Linkages 	<ul style="list-style-type: none"> - Universities' Leading Role - Efficient NIS - RIS and Innovation Clusters

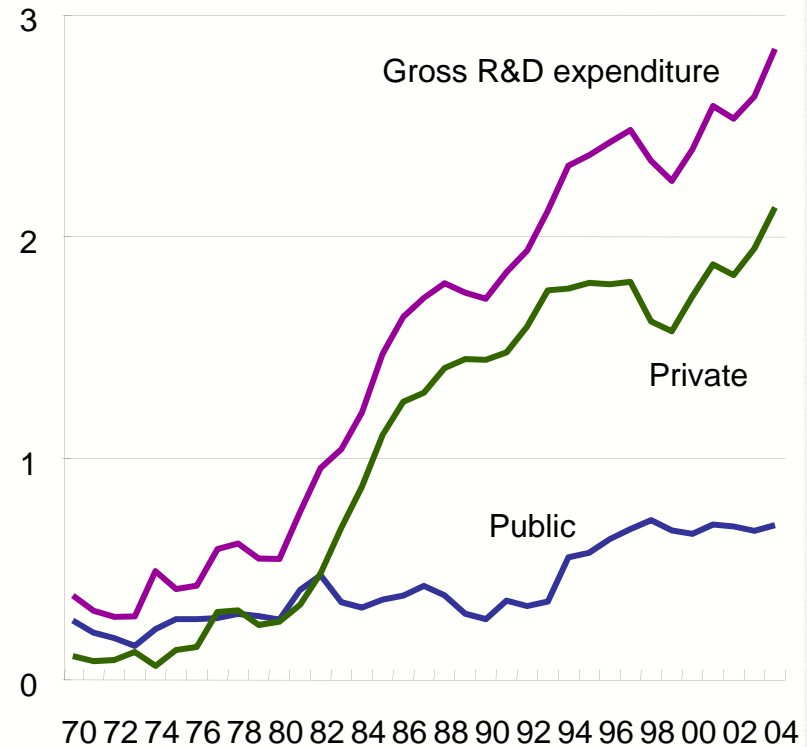
Korea's R&D Expenditure Trends

Gross R&D expenditure (% of GDP)



Source: World Bank (2007).

(% of GDP)



Source: Ministry of Science and Technology, Bank of Korea

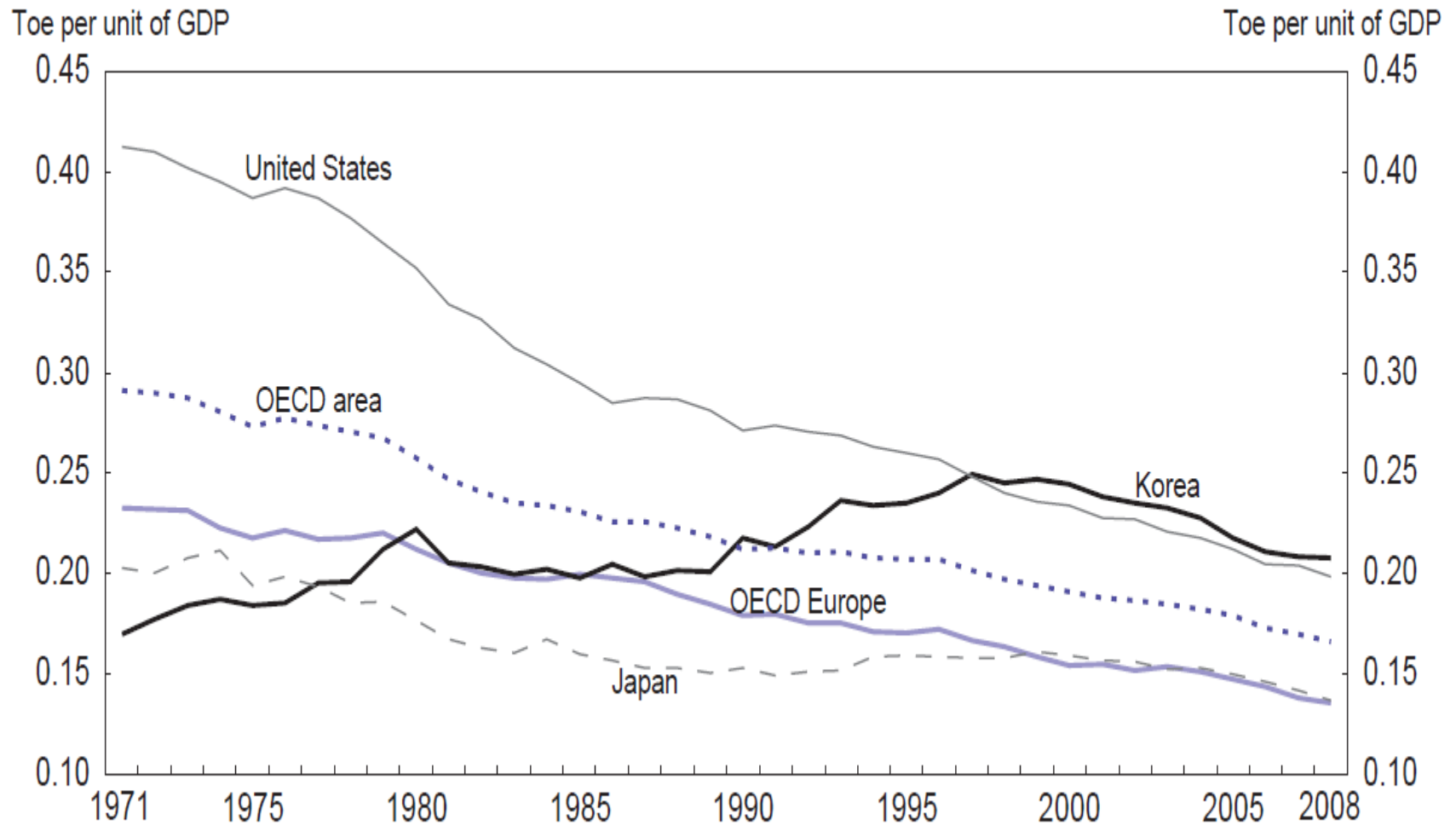
Exposed to global competition, private-sector companies came to realize that innovation was key to their prosperity and dramatically increased their R&D expenditures.

Part-04

Green Growth in Korea

KDI

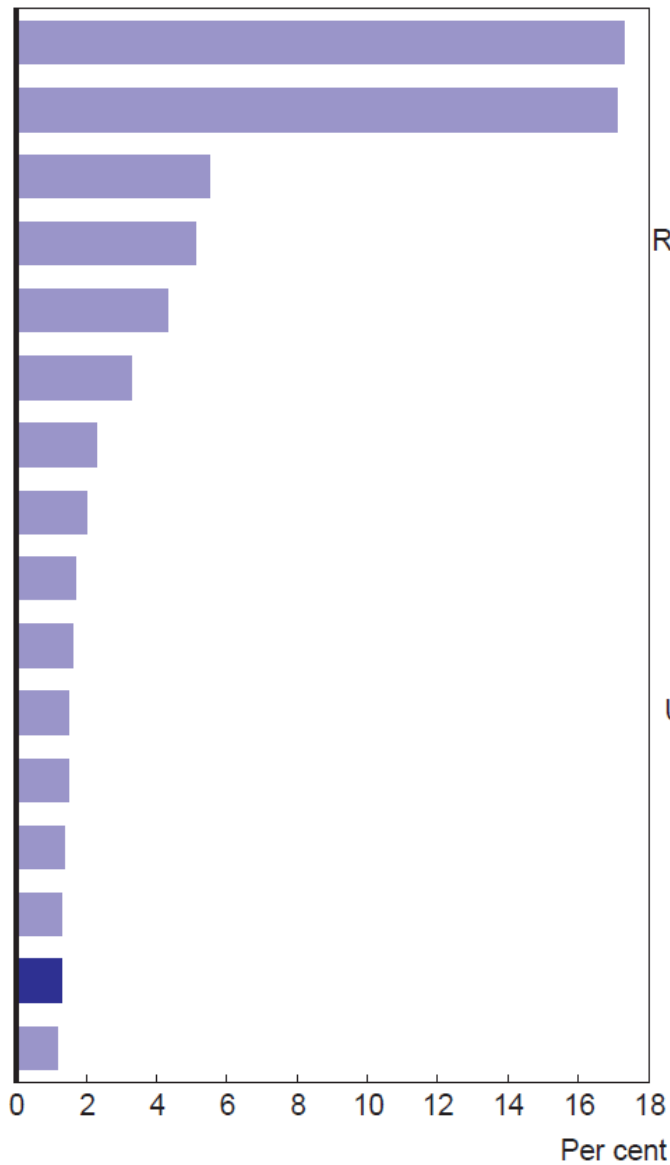
Figure 2. Korea has become one of the most energy-intensive economies in the OECD area
Tonnes of energy per unit of GDP in thousand 2000 US\$ using PPP exchange rates



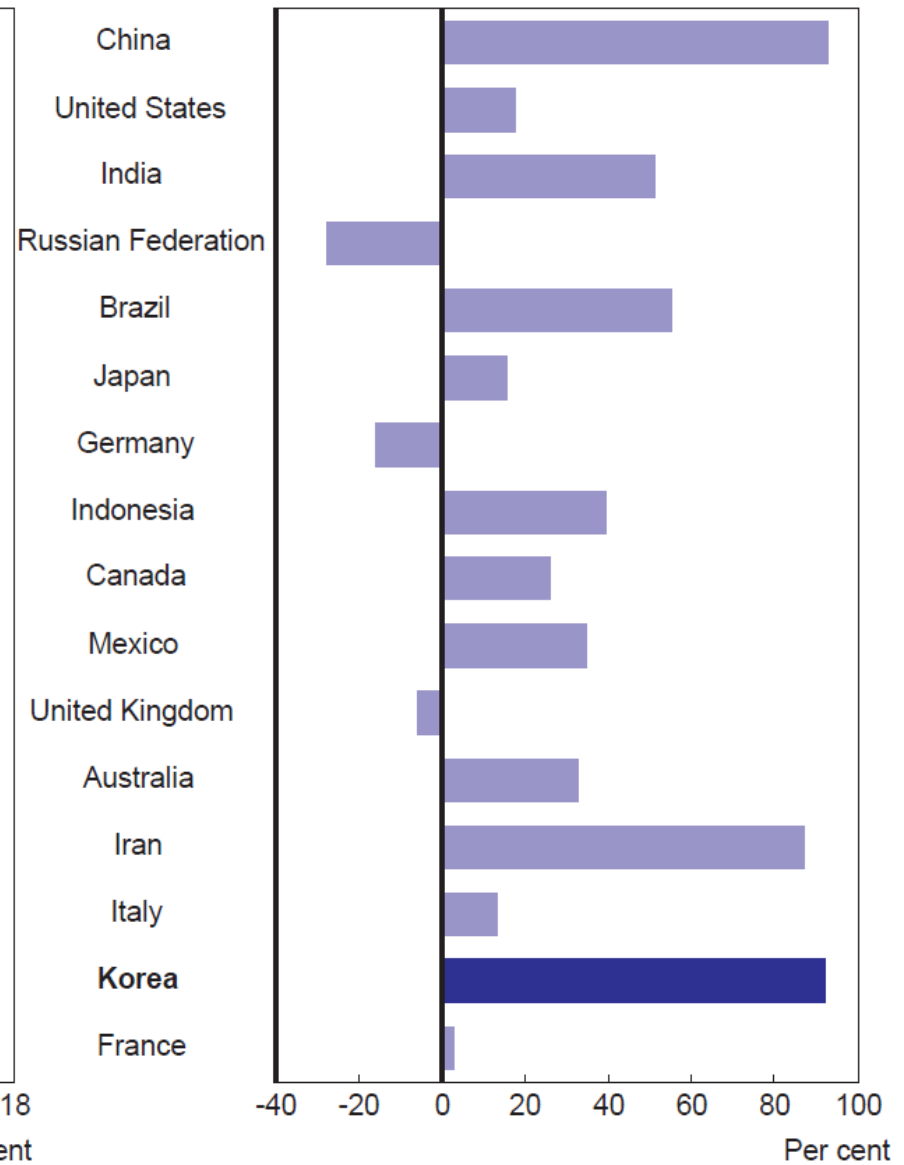
Source: IEA/OECD (2009a), *Energy Balances of OECD Countries 2009*, IEA/OECD, Paris.

Figure 3. International comparison of greenhouse gas emissions

A. Share of global greenhouse gas emissions in 2005

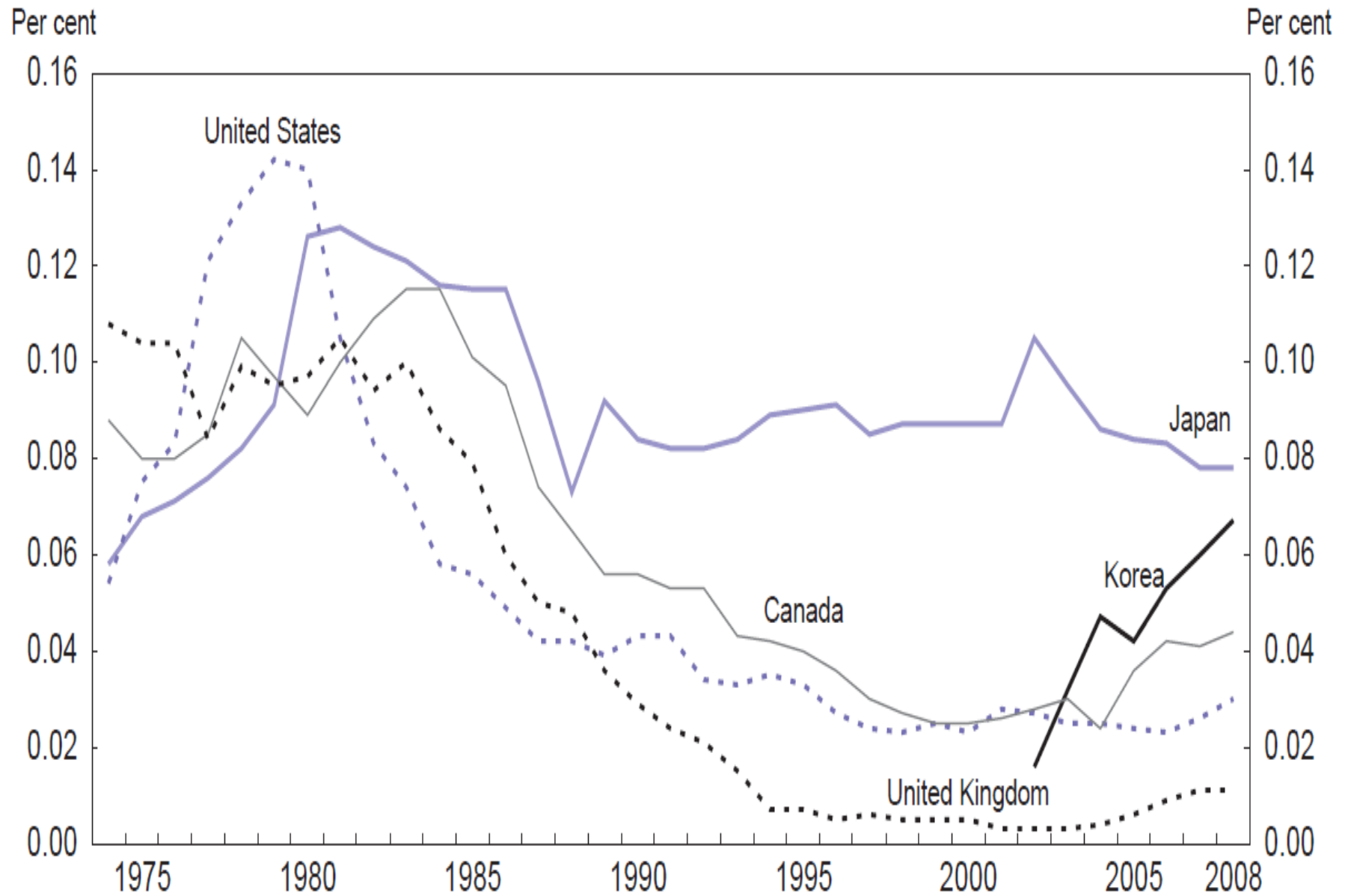


B. Growth in greenhouse gas emissions between 1990 and 2005



Source: OECD Environmental Database.

Figure 5. Government energy RD&D budget as a share of GDP



Source: IEA/OECD Energy Database.

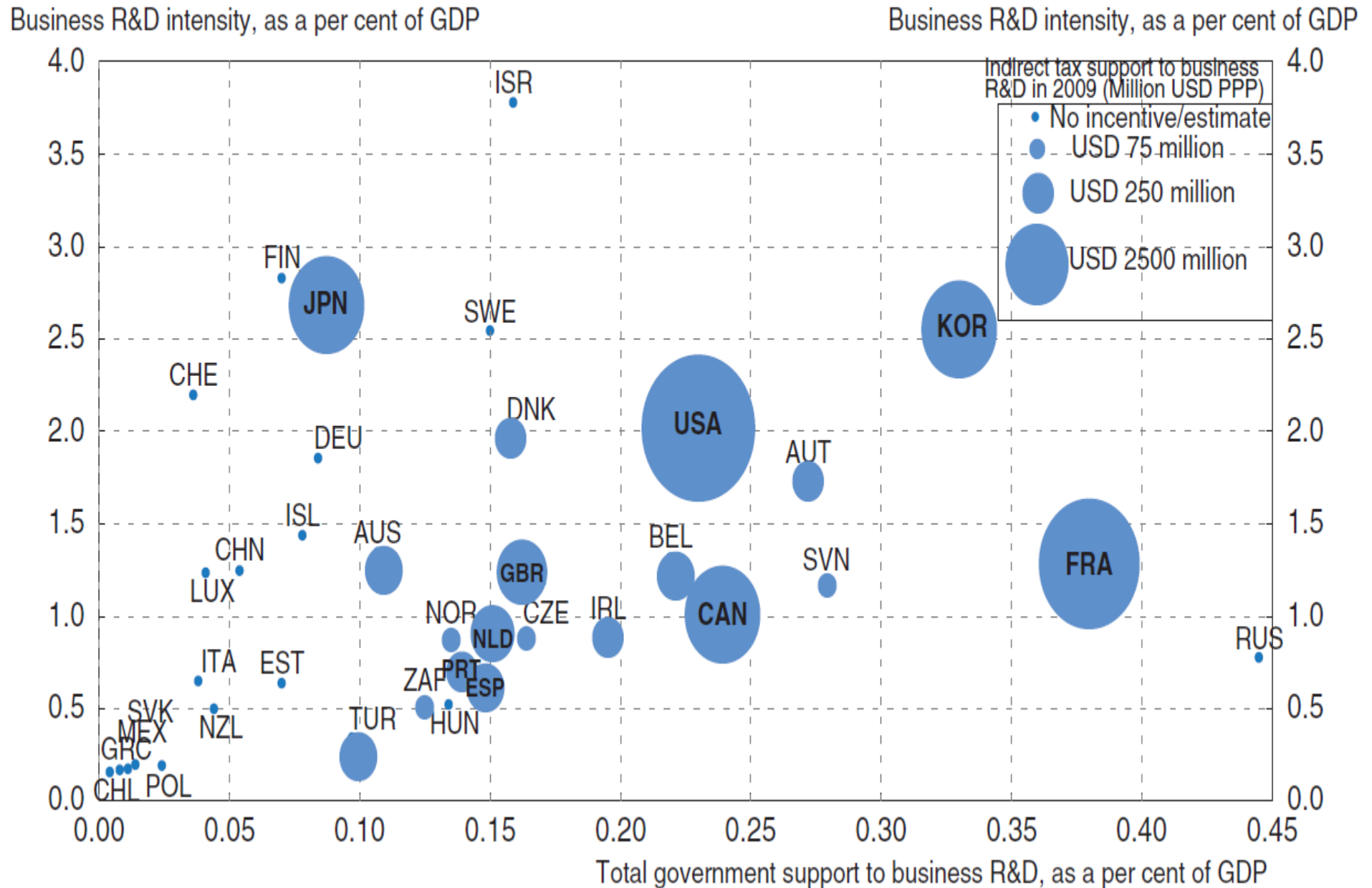
Table 2.1. The development of Korea's Green Growth Strategy

	Action	Date
Vision	The President proclaims "Low Carbon/Green Growth" as the nation's vision to guide development during the next 50 years	September 2008
	Announcement of the "National Strategy for Green Growth" up to 2050	July 2009
Institutional framework	Establishment of the "Presidential Committee on Green Growth" and its secretariat	January 2009
	Creation of the local green growth committees in each of the 16 metropolitan cities and provinces	November 2009
	Start of the monthly implementation evaluation meetings, chaired by the prime minister	September 2011
Medium-term plan	Launch of the "Five-Year Plan for Green Growth" (2009-13)	July 2009
Emission target	Announcement of a target to reduce greenhouse gas emissions by 30% relative to the BAU baseline by 2020	November 2010
	Setting reduction targets by sector and industry	July 2011
Legal foundation	Enactment of the "Framework Act on Low Carbon, Green Growth"	January 2010
	Submission of a bill to the National Assembly to create an Emission Trading Scheme	April 2011

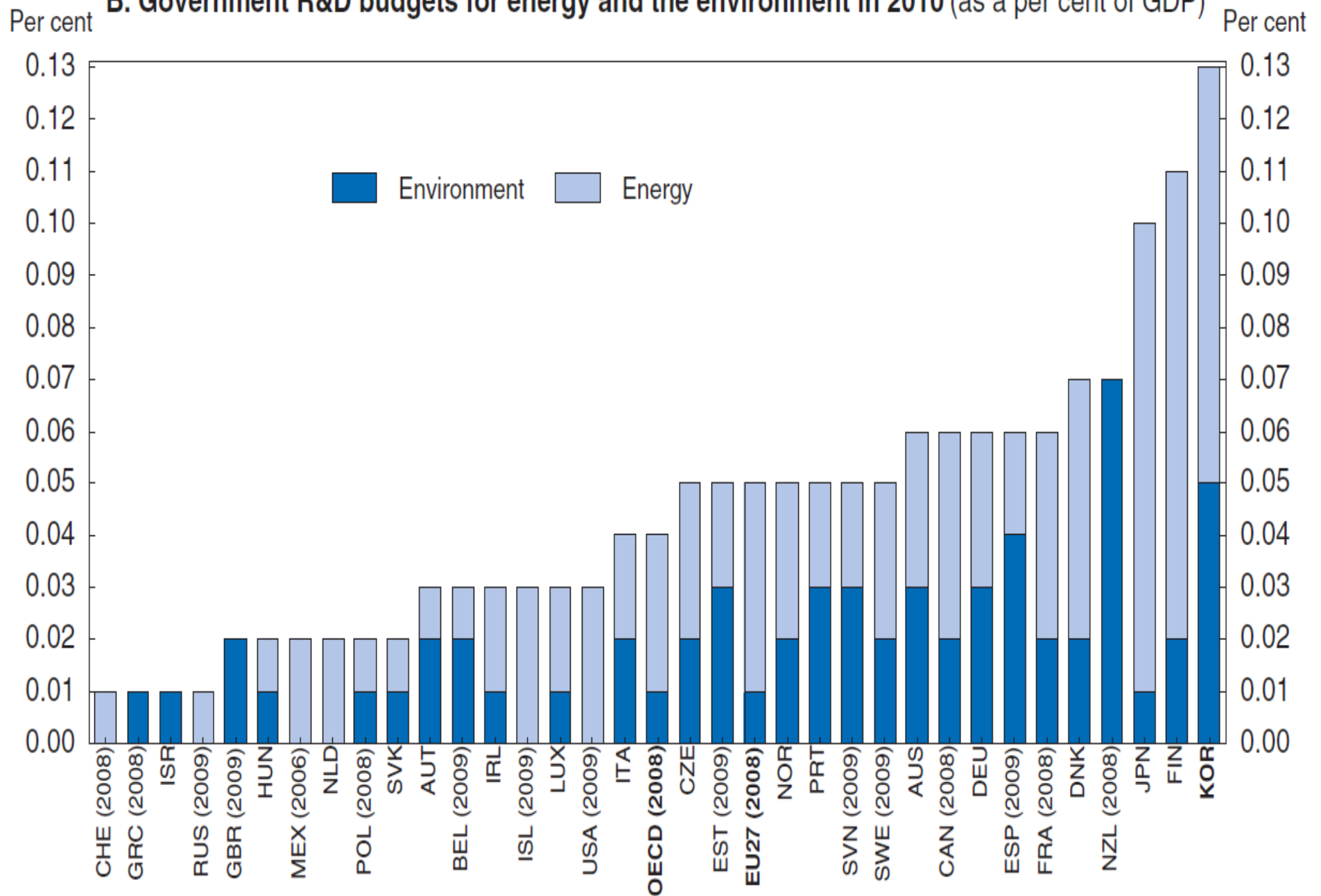
Source: Presidential Committee on Green Growth.

Figure 2.5. **R&D spending and green technologies**

A. Business R&D intensity and government support to business R&D in 2009



B. Government R&D budgets for energy and the environment in 2010 (as a per cent of GDP)



Source: OECD (2011e), OECD Science, Technology and Industry Scoreboard 2011.

- Acemoglu, Aghion, Bursztyn, and Hemous (2012), *American Economic Review*, 102(1), pp.131-166
 - This paper introduces endogenous and directed technical change in a growth model with environmental constraints.
 - The final good is produced from “dirty” and “clean” inputs.

This paper shows that:

- ✓ Sustainable growth can be achieved with temporary taxes/subsidies that redirect innovation toward clean inputs;
- ✓ Optimal policy involves both “carbon taxes” and research subsidies, avoiding excessive use of carbon taxes;
- ✓ Delay in intervention is costly, as it later necessitates a longer transition phase with slow growth; and
- ✓ Use of an exhaustible resource in dirty input production helps the switch to clean innovation under laissez-faire.

Challenges in Green Growth Promotion

- Export Promotion
- Monitoring and Evaluation
- Public-Private Partnership

The background of the slide features a close-up photograph of vibrant green leaves with water droplets on their surfaces. The leaves are arranged in a way that frames the central text. The overall aesthetic is clean and natural, emphasizing the 'Green' aspect of the title.

Green PPPs in Korea

Jongyeon (Jon) Lee, PhD

Public and Private
Infrastructure Investment
Management Center (PIMAC)

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Green PPPs in Korea **Track Record**

II

Green PPPs in Korea **Effects**

III

Green PPPs in Korea **Current Issues**

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Green PPPs in Korea **Role of PIMAC, KDI**

V

Green PPPs in Korea **Roadmap**

I. Green PPPs in Korea Track Record

Fields of Green PPPs

Environmental (5)

- ① Sewer and Sewage Treatment Plants
- ② Livestock Wastewater Treatment Plants
- ③ Waste Disposal Facilities
- ④ Wastewater Treatment Facilities
- ⑤ Recycling Facilities

Water Resources (1)

- ① Water Supply Facilities

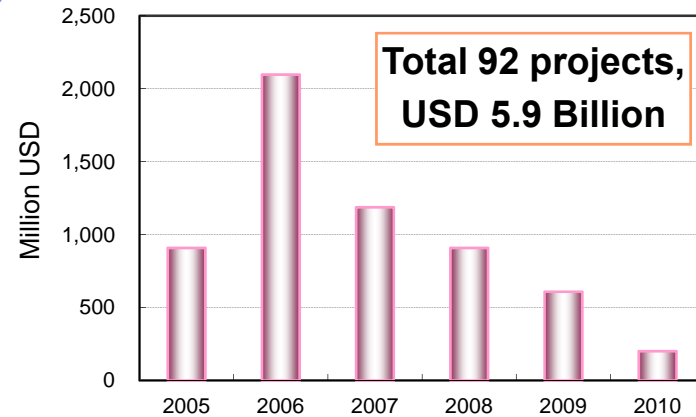
Recent Track Record

USD 2,664M

Total 63 projects



< BTO facilities by type >



< BTL (Sewage Treatment) by year >

I. Green PPPs in Korea Track Record

■ BTL Projects: Sewer

	Total	2005	2006	2007	2008	2009	2010
Length (km)	9,915	1,570	3,611	1,539	2,204	791	200
Cost (Mill\$)	5,915	909	2,097	1,188	909	609	202
No. of Projects	92	17	29	15	16	11	4

■ BTO Projects: Sewerage, RDF Facilities, etc.

Total		Solicited		Unsolicited	
Cost (Mill\$)	Cnt.	Cost (Mill\$)	Cnt.	Cost (Mill\$)	Cnt.
3,380	63	426	16	2,954	47

II. Green PPPs in Korea **Effects**

▣ Saving Budget through Negotiations

- Total Project Cost

(Unit: Million USD)

	2005	2006	2007	2008	2009	Total
Counts	17	22	8	13	9	69
Posted	957	1,331	621	787	481	4,177
Negotiated	841	1,041	551	740	458	3,631
Saved	116	290	70	47	23	546

Saved 13%

- O&M Cost

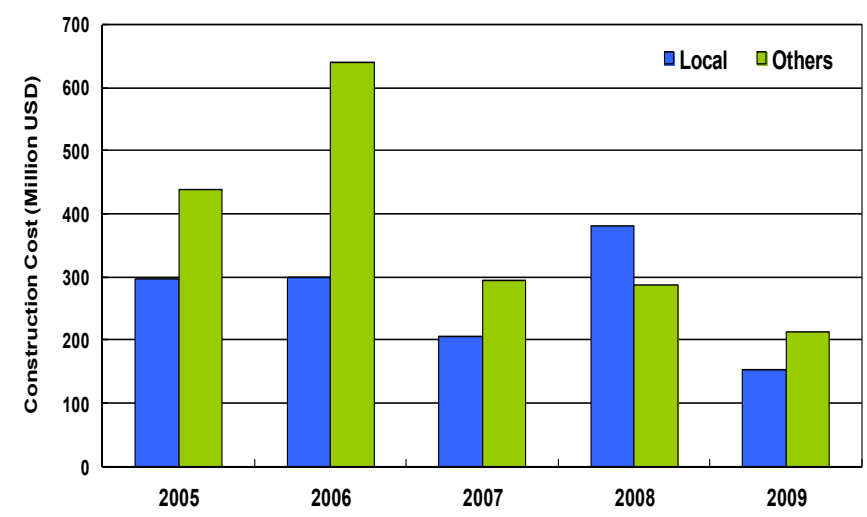
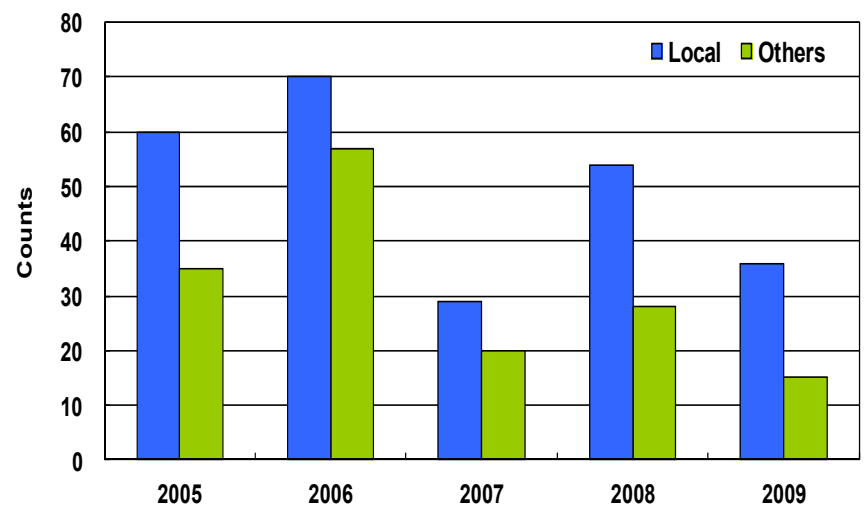
(Unit: Million USD)

	2005	2006	2007	2008	2009	Total
Posted	127	423	149	193	122	1,014
Negotiated	110	263	111	165	99	747
Saved	17	160	38	28	23	267

Saved 26%

II. Green PPPs in Korea **Effects**

■ **Balanced Regional Development**



Number of Companies: 249 Local > 155 Others

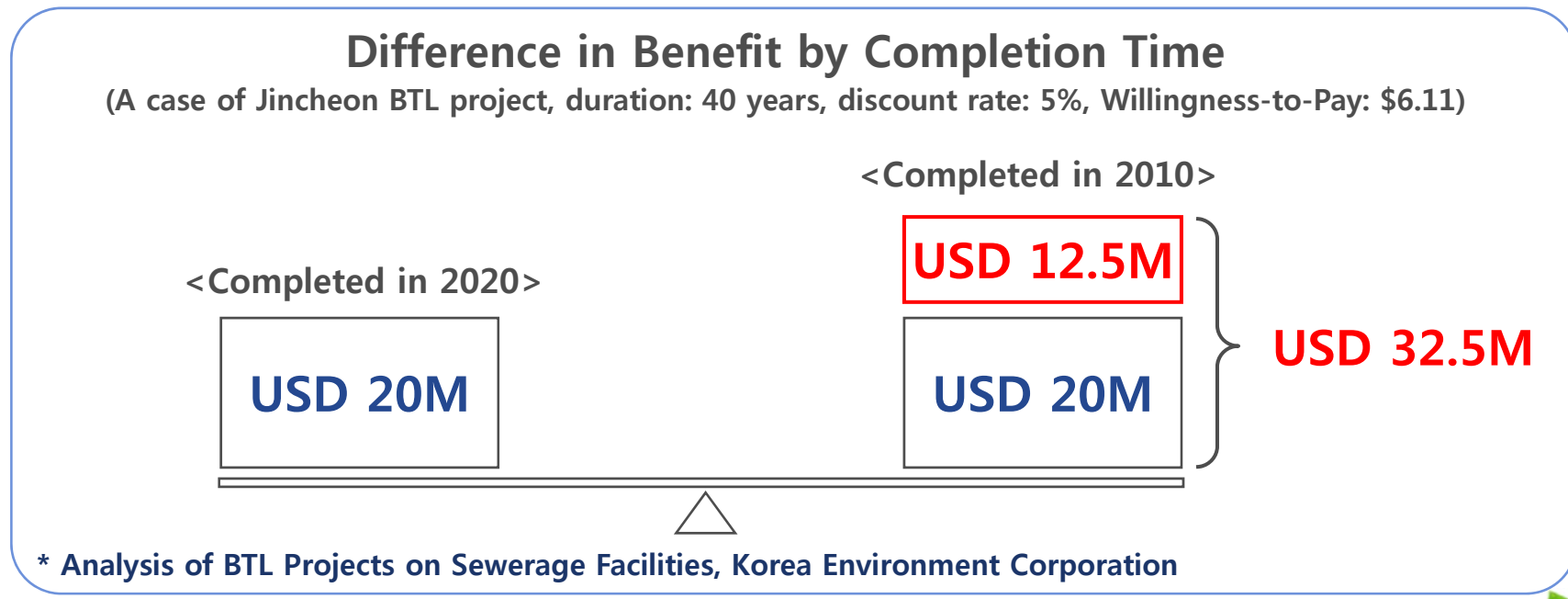
Average No. of Participating Companies per Project: 3.4 Local > 2.1 Others

⇒ Rising Proportion of Local Companies

II. Green PPPs in Korea **Effects**

■ **Early Provision of Services**

- **Early Completion of Project with Efficient Financing**
- **Reducing Social Cost of Residents Incurred before Completion**
- **Raising Residents' Benefit by Pre-Investment**



* Analysis of BTL Projects on Sewerage Facilities, Korea Environment Corporation

III. Green PPPs in Korea **Current Issues**

■ **Changed paradigm from conventional processing facilities to low carbon emission and recycling type facilities using new renewable energy**

■ **Increased needs for maintenance & improvement of old facilities (e.g. sewer)**

■ **More demand/interest on projects for improving living environment (e.g. eco-friendly river parks)**

■ **Introducing various and complex PPP methods**

- **Composite structure of BTO+BTL for linked projects**

(e.g. sewer + sewage treatment plant)

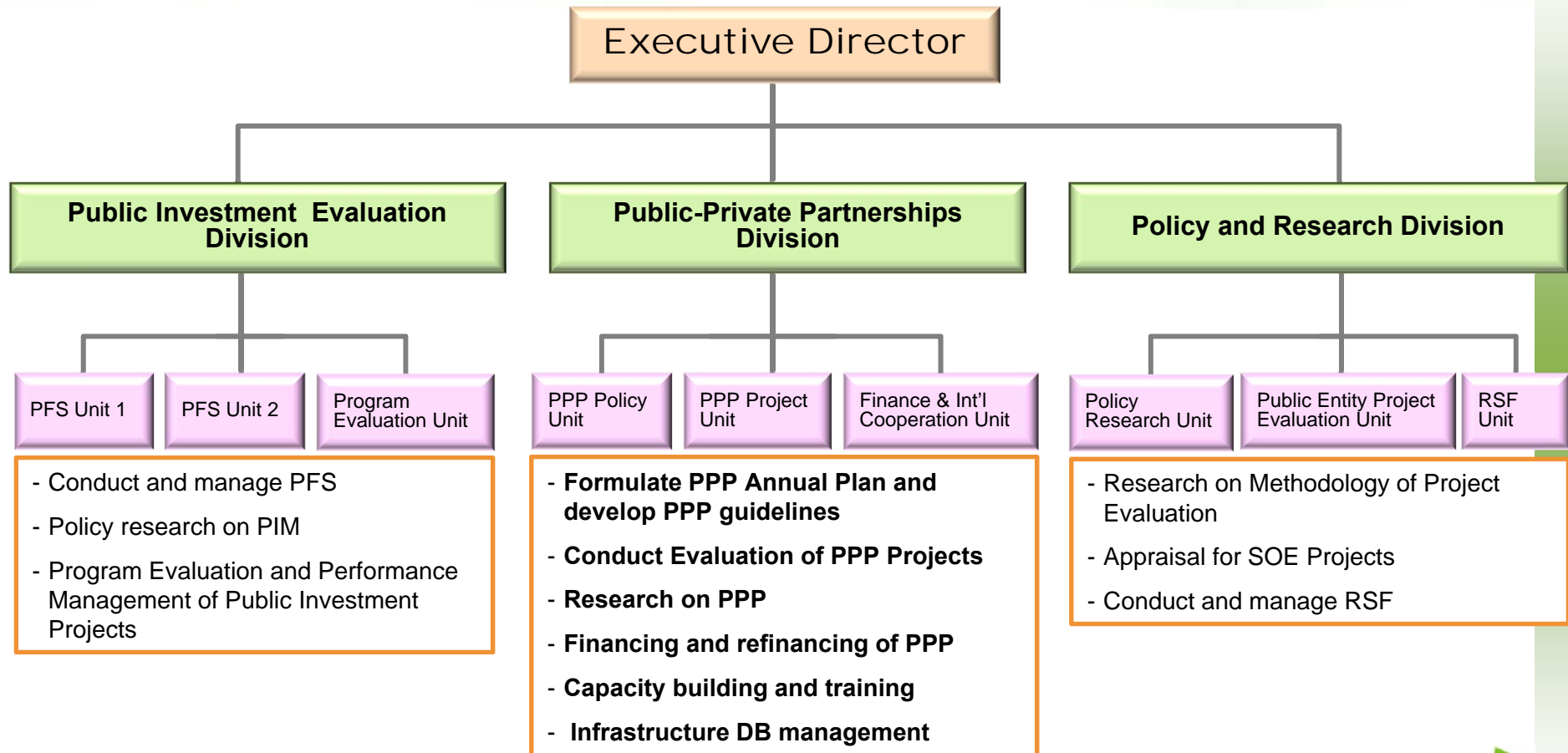
- **Bundling for securing feasibility and O&M efficiency**

(e.g. incineration + landfill + renewable fuels)

- **Needs more for Rehabilitation (RTO/RTL) than Building(BTO/BTL)**

IV. Green PPPs in Korea **Role of PIMAC, KDI**

■ **KDI PIMAC enables comprehensive and systematic management of both traditional public investment and PPPs**





Green PPPs in Korea Roadmap

(Preliminary) Feasibility Studies Considering Characteristics of Environmental Facilities

- ▶ Green PPP projects make great impacts on public
- ▶ Indirect benefits should be considered for B/C analysis
 - put more weights on policy analysis
- ▶ Objectivity, neutrality, and transparency of evaluation must be secured
 - establish/designate independent (specialized) organization(s) for evaluation

Government Subsidy Systems to Facilitate New Projects

- ▶ Give incentives to green pilot projects
- ▶ Government subsidy programs should not be complicated and too different by project type and by facility type





Administrative Support for Resolving Complexity

- ▶ Green PPP projects are hard to lead inter-regional cooperation (e.g. NIMBY)
- ▶ Establish support system in accordance with trend of projects becoming complex more and more

Simplifying Process for Similar Projects with Identical Purpose

- ▶ For similar projects with same purpose, simplify recurring review process required in Basic Plan for PPP to shorten construction period and raise efficiency





Thank You

