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Evolution of Corporate Innovation System and Its Evaluation: A Case of Korea

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□ Introduction

● Status of Korea before Industrialization

- One of the poorest countries
- No technology accumulation

● Recent Korean Industry's Performance

- 5th largest producer of automobile/ 1st Producer of DRAM
- Technological leadership

Top Patent Winners of USPTO (2006)

Rank	Company	Patents
1	IBM	3,651
2	Samsung	2,453
3	Canon	2,378
4	Matsushita	2,273
5	Hewlett-Packard	2,113

□ Stage of Imitation(1)

Trigger of industrialization

- **Designed and executed by Government**
- **Export: resources for industrialization/ economy of scale**
- **Government's guarantee of foreign loan: risk absorption**

Adoption of foreign technology in the initial stage

- **Technology import**
- **Training by foreign engineer**
- **Import of production equipment: embodied technology**
- **Reverse engineering**

□ Stage of Imitation(2)

Example (1): LG Electronics

- **Owner of no experience**
- **German engineer: training of workers for radio manufacturing**
- **Reverse engineering by LG engineers**
- **Technology import for TV production: Hitachi**
- **Technology development for color TV: joint research with KIST**
- **Research lab in USA: HDTV, digital VCR**

□ Stage of Imitation(2)

Example (2): Hyundai's Automobile

- **Assembly: joint venture with Ford**
- **Government's intervention: pressure to develop own model**
- **Multiple source of technology: 26 companies in 5 countries**
- **Practice in foreign companies: learning by doing**
- **New technology for export: front-wheel driving from Mitsubishi**
- **Developing Engine : refusal of Mitsubishi/ Ricardo Engineering**
- **Independent development of engine: set up research institute**

□ Stage of Imitation(3)

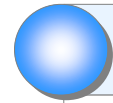
Example (3): Samsung's DRAM

- New market opportunity in the age of information
- Research institutes in Korea and USA
- Purchasing frontier technology: Micron Technology/Zytrex
- Reducing time lag of development
- World frontier since 1994

Time Lag of Korea in Development of DRAM

	64K	256K	1M	4M	16M	64M	256M
First in the World	1979	1982	1985	1987	1990	1992	1995
First in Korea	1983	1984	1986	1988	1990	1992	1995
Time lag	4 yrs	2 yrs	1 yr	6 mon	3 mon	-	-3 mon

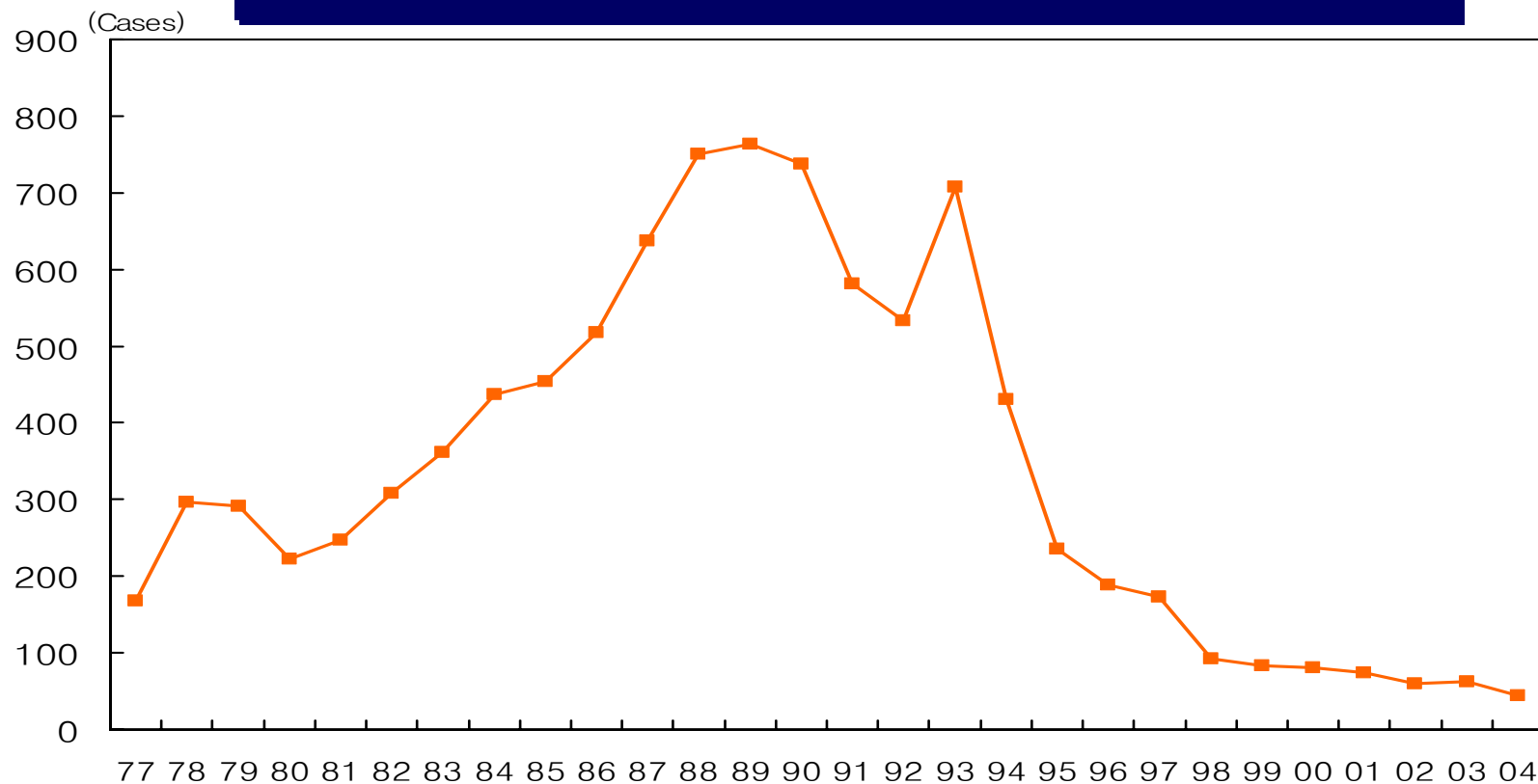
□ Stage of Innovation(1)



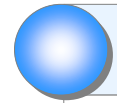
Increase in independent R&D

- Reduction of technology import in the 1990s

Number of Cases of Technology Import



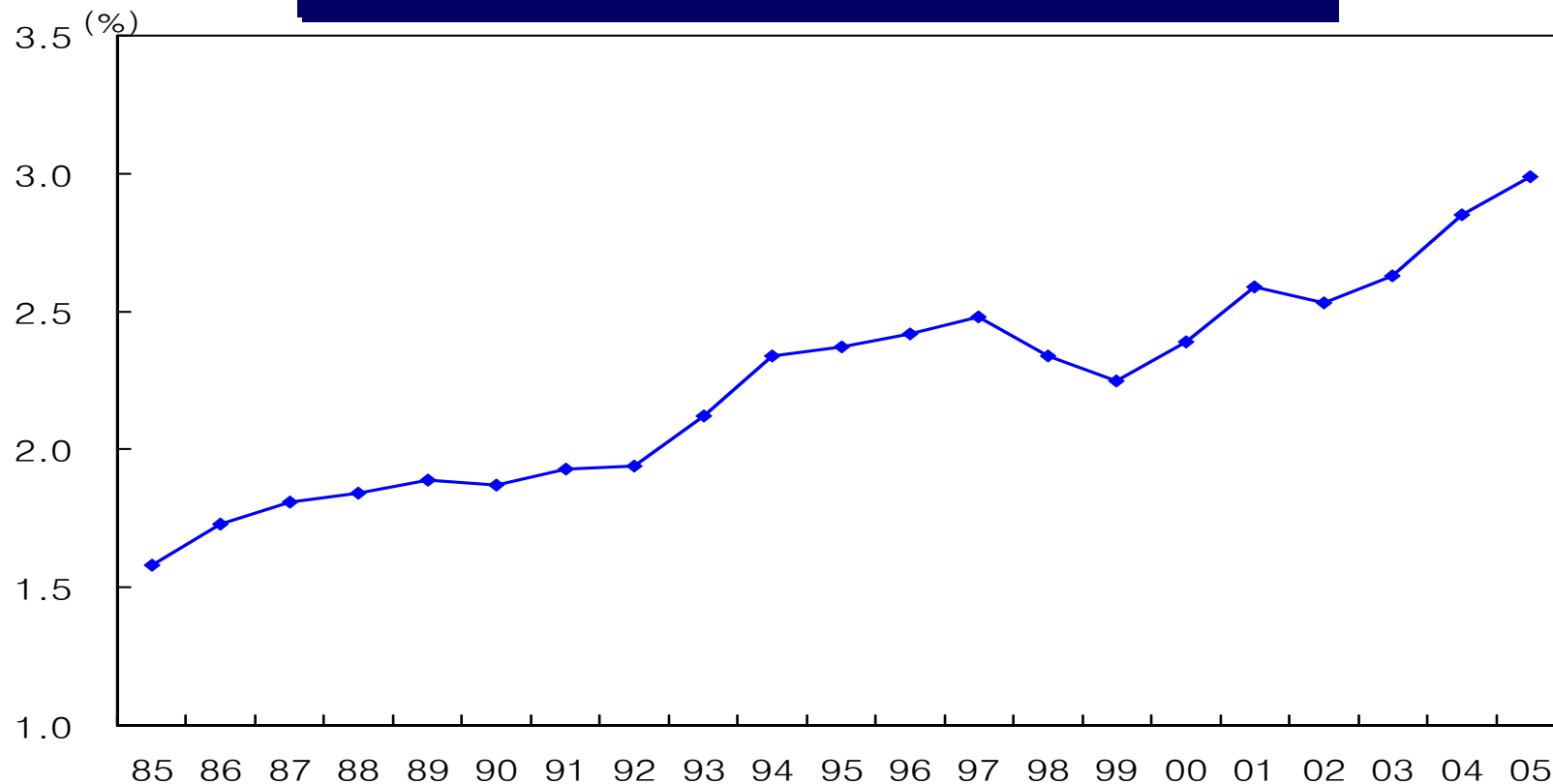
□ Stage of Innovation(2)



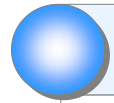
Increase in the ratio of R&D expenditure to GDP

- Ratio of R&D to GDP : top level of the world

Ratio of R&D Expenditure to GDP



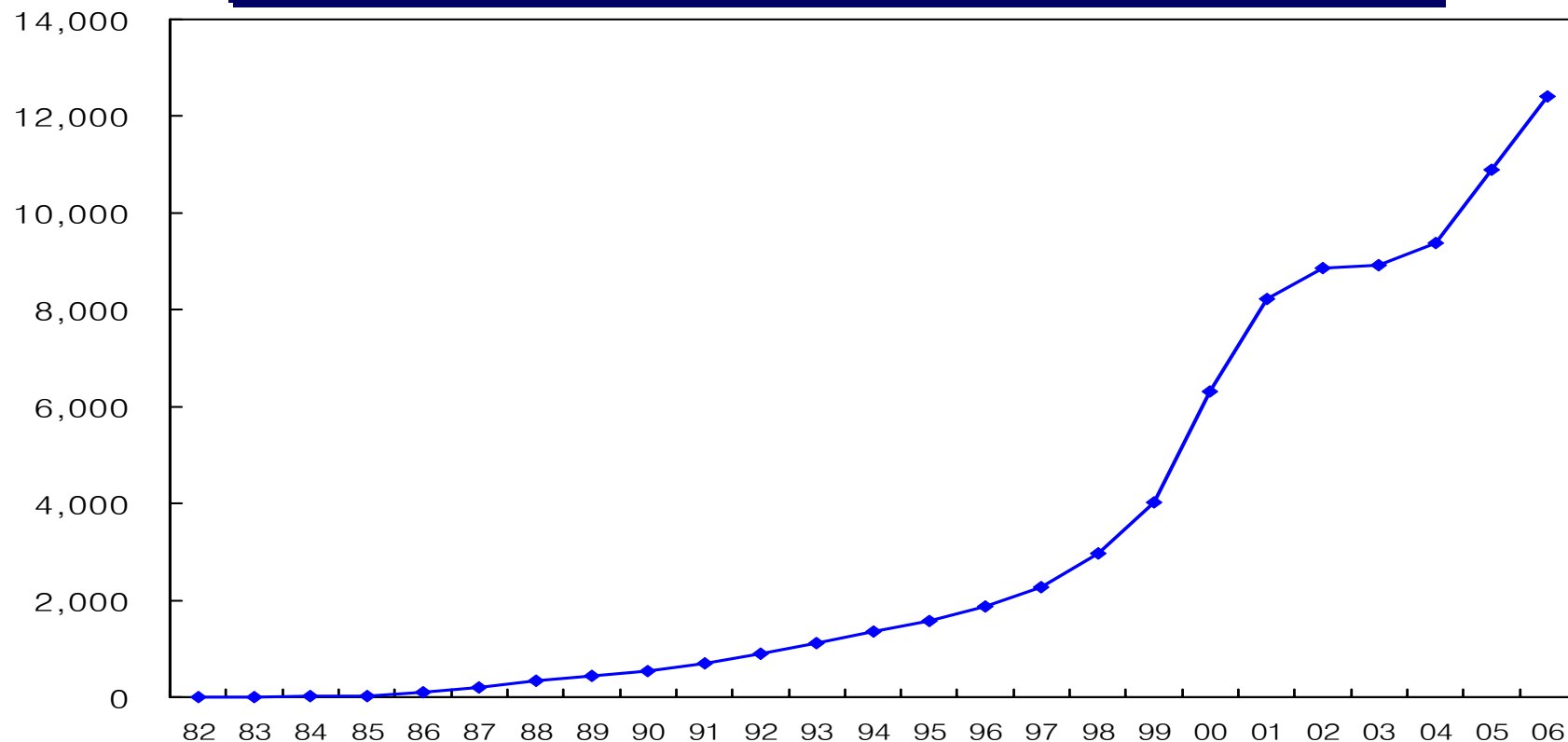
□ Stage of Innovation(3)



Dissemination of R&D to SMEs

- Emergence of innovative SMEs (called “venture firms”)

Number of Industrial Research Institutes



□ Policies for Technological Innovation(1)

Evolution of policies for technological innovation

- In 1980s financial subsidies and tax incentive were introduced
- Diversification along with the expansion of gov. R&D programs
- Recently more specific policies to cope with various demands of industry

Types of policies in Korea

- Tax incentives
- Financial support
- Government subsidies for industrial R&D
- Procurement of tech. products
- Building up infrastructure and other indirect support

□ Policies for Technological Innovation(2)

Tax incentives

- Common support measure in OECD countries
- Tax deduction for R&D expenditure : changes in favor of SMEs

Financial support

- Important policy to overcome “death valley” of tech. innovation
- Emphasis on SMEs with innovation capability
- Risk of payback and ‘moral hazards’ among recipients

Government subsidies

- Implemented in form of gov. R&D programs
- Require large public expenditure and may have negative effect to crowd out R&D investment of industry

□ Policies for Technological Innovation(3)

Procurement

- Wide use in defense sector etc. to facilitate commercialization
- Government should have clear roadmap on tech. development

Infrastructure and indirect support

- Building up of legal and institutional infrastructure : IPO, standards, certification etc.
- Technology transfer, research equipment, tech. advice & consulting

Impact and Challenges

- Contribution to the expansion of industrial R&D, esp. of SMEs
- Recent study : Large firms benefited greater than SMEs
- Needs for effective and target-oriented policies in future

□ Review on Technological Capability(1)

Development of Industrial Tech: World Frontier

Rank in Patent Application of WIPO

	2002	2004	2006
1	USA(41,296)	USA(43,350)	USA(50,089)
2	Germany(14,326)	Japan(20,264)	Japan(26,906)
3	Japan(14,063)	Germany(15,216)	Germany(16,866)
4	UK(5,376)	France(5,185)	France(6,109)
5	France(5,089)	UK(5,026)	Korea(5,935)
6	Netherlands(3,977)	Netherlands(4,284)	UK(5,064)
7	Sweden(2,990)	Korea(3,558)	Netherlands(4,452)
8	Switzerland(2,755)	Switzerland(2,899)	China(3,910)
9	Korea(2,520)	Sweden(2,851)	Switzerland(3,488)
10	Canada(2,260)	Italy(2,189)	Sweden(3,312)

□ Review on Technological Capability(2)

Concentration of R&D on large firms

- (Ex) Patent registration of Korea in USPTO: 4,132
 – Samsung: 1,316(32%), Top 4 firms: 47%

CR 10 of R&D	Korea	USA	Japan
	43.2%	21.9%	34.2%

Concentration of R&D on a few industries

	Korea	USA	Japan	Germany	France
Manufacturing	100.0	100.0	100.0	100.0	100.0
Electronics	43.8	19.9	19.8	11.7	14.6
Automobile	17.1	14.3	13.1	32.4	15.6
Chemical	7.3	16.5	15.8	18.6	22.5
Machinery	4.3	5.2	14.3	14.6	6.9
Others	28.4	44.1	41.6	32.3	42.0

□ Review on Technological Capability(3)

 **Policy direction: Polarization → Dissemination**

- Support for upgrading technology of SME

 **Policy direction: More emphasis on basic research**

- Strengthen basic research leading to fundamental technology
- Establish an effective network among academia, public labs and industry



Thank You !