

The Korean Case: Public-Private Alliances for Innovation and Export Development

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Export Development”**

Contents

- I. Development Strategies**
- II. From Imitative Catch-up to Innovative Catch-up**
- III. Contribution of Innovation to Export**
- IV. Institutional Development: Innovation of NIS**
- V. Public-Private Partnership for Innovation and Export**
- VI. Implications for Guatemala**

I. Development Strategies

- Korea was **one of the least developed countries** in terms of industrial development in the early 1960s. It has been transformed into **one of leading industrial countries** in the world during the last 45 years.

1960s

- **GNP (1960): US \$1.1 billion**
- **GNP per capita (1960): \$82**
- **Exports (1960): \$33 million**
- **Industry: Plywood and wigs**
- **Diplomacy: No member in major intern'l organizations**

Present

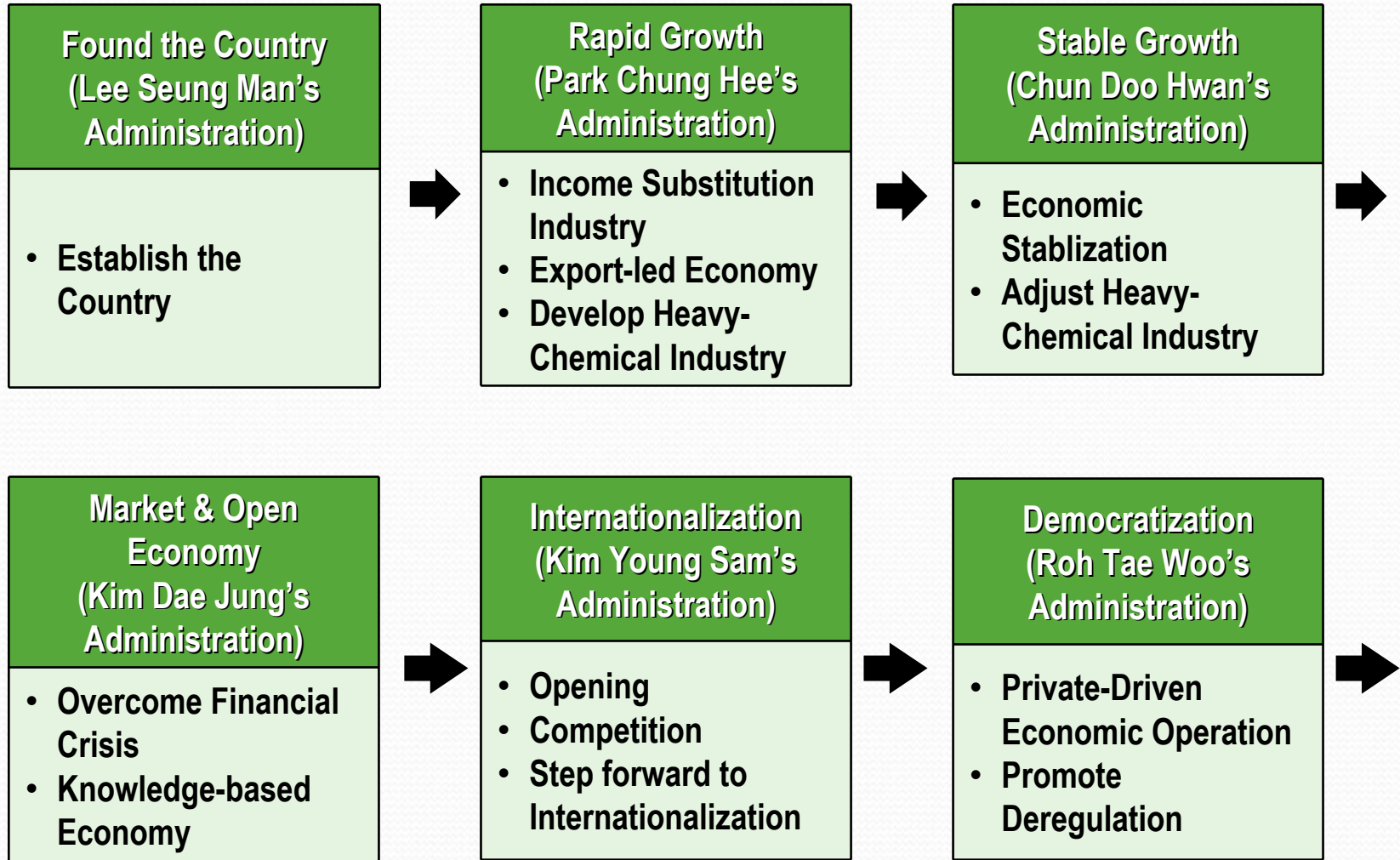
- **GDP (2007): US\$970 billion (13th)**
- **GDP per capita (2007): \$19,690**
- **Exports(2007): \$387 billion (12th)**
- **Industry: DRAM and CDMA cellular phone**
- **Diplomacy: OECD, APEC, etc.**

Development Stages in the Korean Economy

Stages of Development

1950s	1960s	1970s	1980s	1990s	2000s
Aid, Labor intensive production	Imitation Simple tech. Import of old plant/ machinery	Heavy industry Assimilation Minor innovations	R&D New product development	R&D intensive increase in science New product innovation	Innovation frontier
Traditional	Imitative Catch-up		Innovative Catch-up		Innovative Economy
Agricultural Economy	Factor-driven Economy “Extensive Growth” Outward-looking		Transition to Innovation- driven Economy Outward-looking		“Intensive Growth”

Focus of Economic Development Strategy in Each Administration



Strategies and Policies for Technology Catch-up

Focus of Industrial and Technological Strategies

	Industrial Development	Technology Development	Highlight
1960s	<ul style="list-style-type: none"> - Develop import-substitution industries - Expand export-oriented light industries - Support producer goods industries 	<ul style="list-style-type: none"> - Strengthen S&T education - Deepen scientific and technological infrastructure - Promote foreign technology imports 	1960: \$79/capita Labor
1970s	<ul style="list-style-type: none"> -Expand heavy and chemical industries - Shift emphasis from capital import to technology import - Strengthen export-oriented industrial competitiveness. 	<ul style="list-style-type: none"> - Expand technical training - Improve institutional mechanism for adapting imported technology - Promote research applicable to industrial needs 	1970: \$253/capita Labor and Capital

(Continued)

	Industrial Development	Technology Development	Highlight
1980s	<ul style="list-style-type: none"> - Transform industrial structure to one of comparative advantage - Expand technology-intensive industry - Encourage manpower development and improve productivity of industries 	<ul style="list-style-type: none"> - Develop and acquire top-level scientists & engineers - Perform national R&D projects efficiently - Promote industrial technology development 	1980: \$1,655/capita Capital and Technology
1990s	<ul style="list-style-type: none"> - Promote industrial restructuring and technical innovation - Promote efficient use of human and other resources - Improve information networks 	<ul style="list-style-type: none"> - Reinforce national R&D projects - Strengthen demand-oriented technology development system - Institutional reforms 	1990: \$5,890/capita Technology and Innovation
2000-2007	<ul style="list-style-type: none"> - Move towards High tech and high value-added industries - Develop IT industry - Search the next generation 	<ul style="list-style-type: none"> - Strengthen national and regional innovation systems - Internationalize R&D systems and information networks - R&D increase in IT, BT, NT, 	2007: \$20,045/capita Innovation and KBE

II. From Imitative Catch-up to Innovative Catch-up

Stages of Development

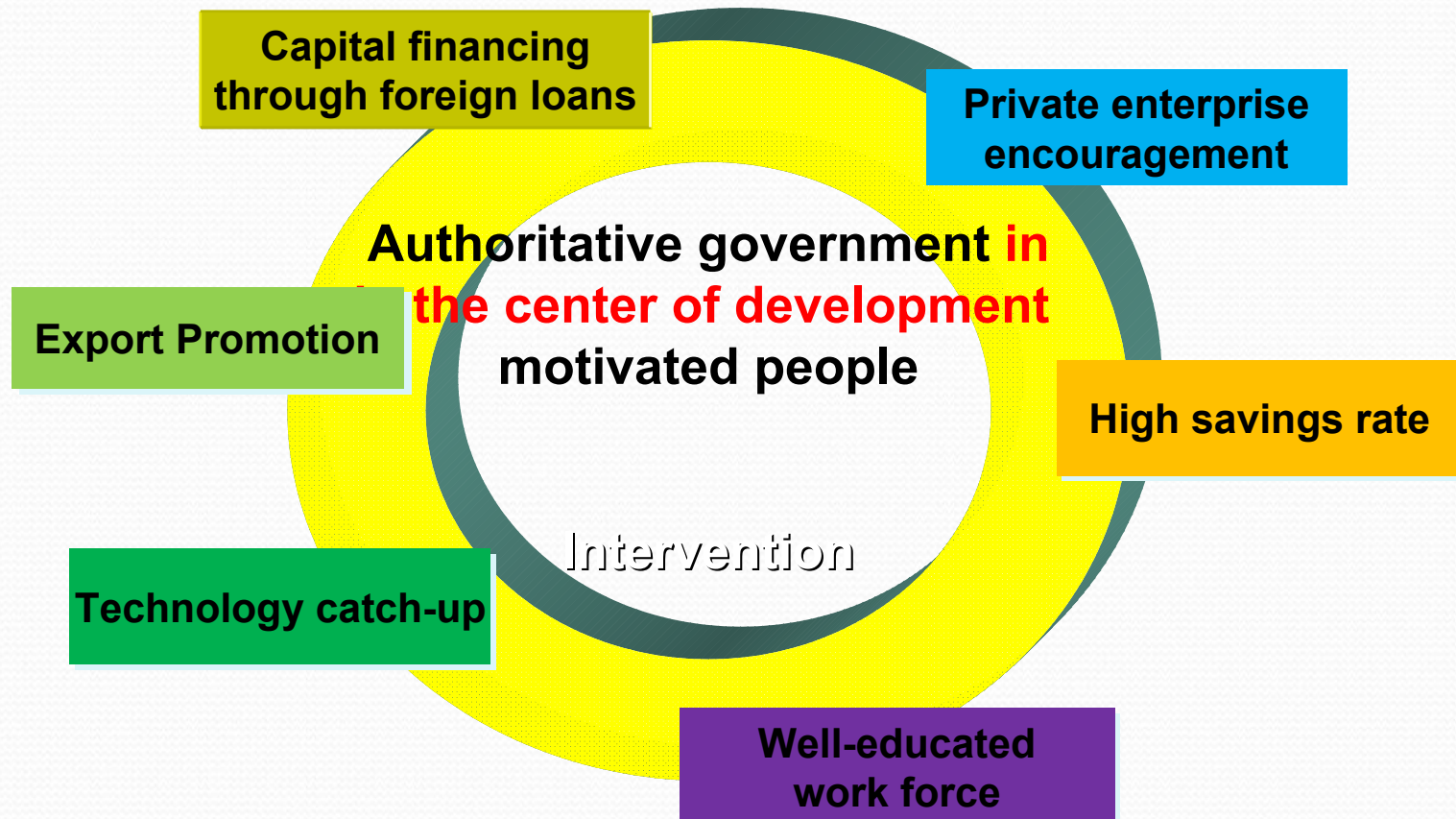
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Aid, Labor intensive production	Imitation Simple tech. Import of old plant/ machinery	Heavy industry Assimilation Minor innovations	R&D New product development	R&D intensive increase in science New product innovation	Innovation frontier
Traditional	Imitative Catch-up		Innovative Catch-up		Innovative Economy
Agricultural Economy	Factor-driven Economy “Extensive Growth”		Transition to Innovation- driven Economy		“Intensive Growth”

Characteristics of the Imitative Catch-up Period (1960s-1970s)

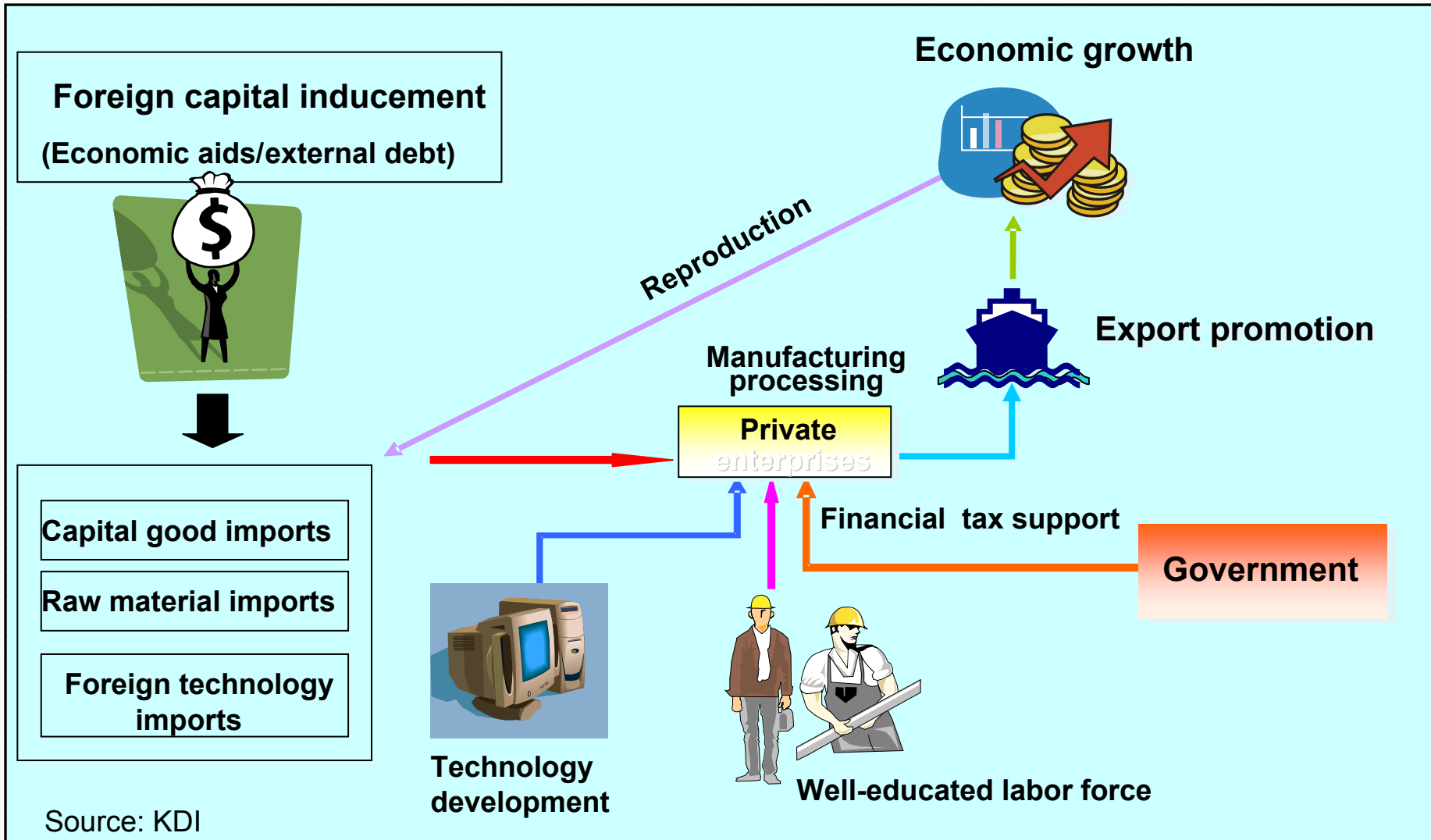
□ Background

- Korea started **export-oriented industrialization, based on processing and assembly manufacturing with matured technologies from advanced countries.**
- In order to overcome the narrow domestic market, **large enterprises** were promoted.
- These large enterprises utilized OEM for foreign companies and the technological support from them so that the large Korean enterprises secured **processing and assembly technologies** to certain extent.

Korean Economic Development Model in the Catch-Up Period



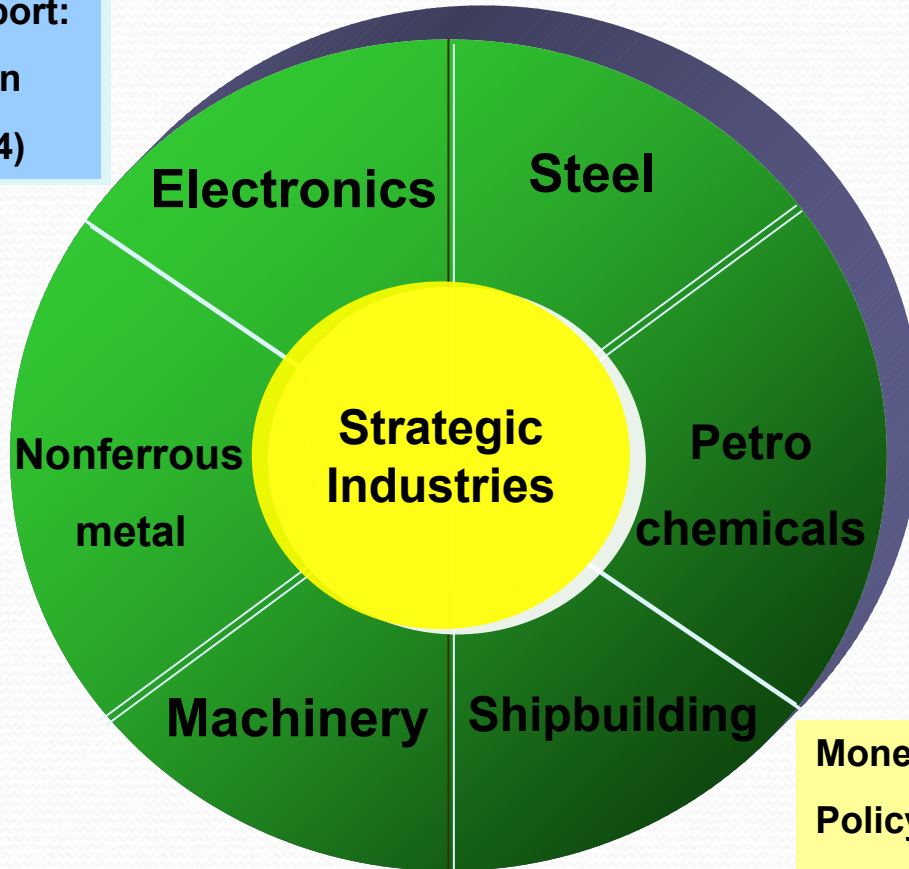
Working of the Outward-looking Development Strategy



Source: KDI

HCI Promotion Plan

Taxation and fiscal support:
The special tax reduction
and exemption law (1974)



Monetary and financial support:
Policy loans for HCI industries
Preferential interest rates
-Even below the inflation rate

- Industrial policy
- Government-Chaebols alliances

- The HIC strategy in the 1970s was implemented **without sufficient and appropriate technological capabilities** so that the large enterprises suffered and the industrial structure in Korea was distorted.
- However, paradoxically, **these problems motivated the need for technological learning.**
- The period is characterized by the 'imitative' catch-up, in the sense that domestic firms, **without self-sufficient technological capabilities, acquired the needed technologies from foreign sources.**

□ The Role of Major Players

- The **government played the leading role** in technological development and influenced the way for firms to acquire technologies.

- **GSRIs (Government-Sponsored Research Institutes) contributed significantly to enhancing national technological capability while enterprises were very weak in technological capacity.**
- **Firms acquired technologies through imports of capital goods, reverse-engineering, licensing, etc. They digested and learned transferred technologies although own R&D was very rare.**
- **The government restricted FDI to promote imports of capital goods and licensing, which encouraged the private sector's learning efforts.**

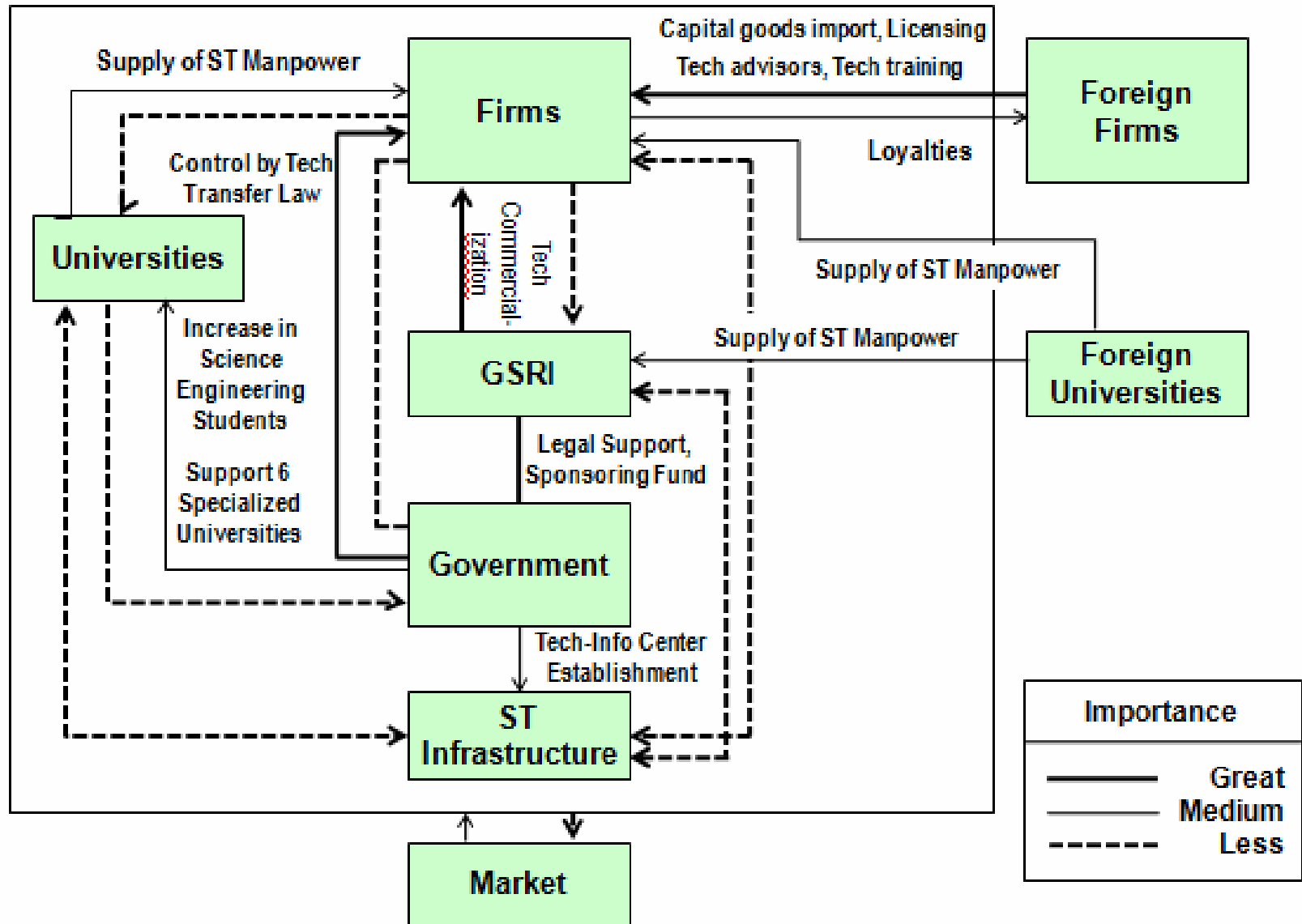
□ Characteristics

- **The imitative catch-up period in Korea is characterized by the **passive** large enterprises' R&D, Universities' supply of ST Manpower, and **strong and active leadership of the government** for the private sector and universities.**

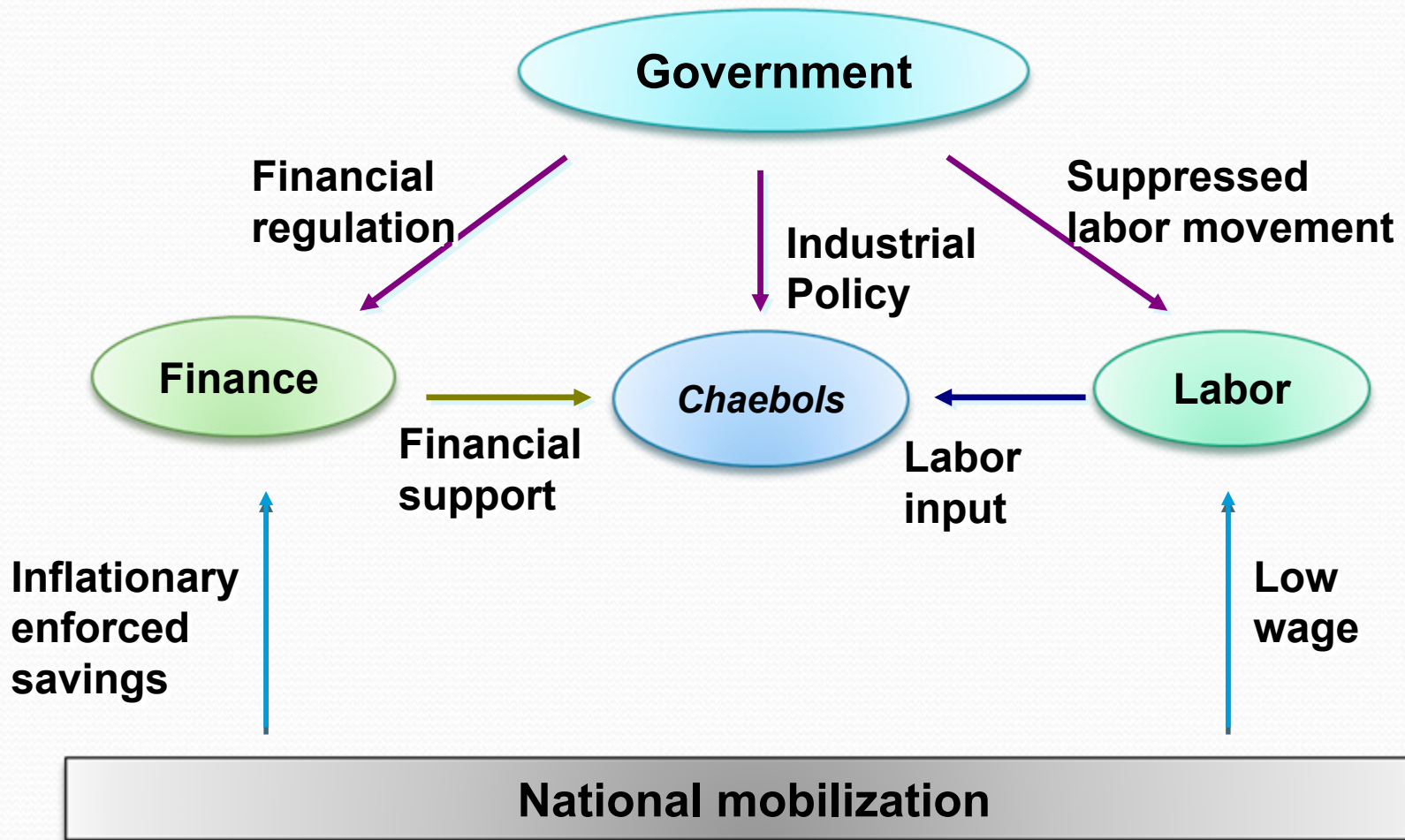
R&D Indicators in the Imitative Catch-up Period (1960s-1970s)

	1963	1965	1970	1975	1980
R&D Expenditure (bil.won)	1.2	2.1	10.5	42.7	211.7
Gov't	1.2	1.9	9.2	28.5	109.2
Private	-	0.2	1.3	14.2	102.5
Gov't VS Private	97 : 03	90 : 10	88 : 12	67 : 33	53 : 48
R&D / GNP	0.25	0.26	0.38	0.42	0.57
Number of Researcher	na	2,135	5,628	10,275	18,434
Gov't	na	1,671	2,456	3,086	4,598
University	na	352	2,011	4,534	8,695
Private	na	112	1,159	2,655	5,141
R&D Expenditure / Number of Researcher	na	967	1,874	4,152	11,486
Number of researchers / 1,000 Population	na	0.07	0.17	0.29	0.48
Number of Company Research Institutes	0	0	1	12	54

National Technology Innovation System of Korea in the 1960s~1970s

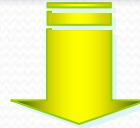


Phase – I Model



The Role of the Government in the Phase- I Model

Concentration of capital ownership
and **management by the government**



Strong control of the government over
financial institutions, resources allocations,
wages and prices



Government-led economic development strategies

- : **Export-oriented industrialization**
- : **Growth first, distribution later**
- : **Leadership in tech capability building**

Factor Affected the Transition

□ Background

- There were **substantial and rapid changes in technology-related environment in the early part of the 1980s.**
- Firms started to put greater efforts in technological development from the 1980.
- There were peculiar quantitative changes in technology indicators in this period, which were followed by qualitative changes, too.

□ Limitations and Drivers

- Because of **increased protectionism in developed countries**, firms could not easily acquire needed technologies from foreign companies so that **the digesting and absorption strategy in the imitative period could not effectively work and more.**

- There was a substantial change in the government industrial and technological policy principles. As the government liberalized the industry and economy, the government refrained from direct influence of industries but used indirect support.
- The Korean **industrial structure itself was moving from labor-intensive to R&D-intensive one.**
- Firms were ready to respond to these circumstances due to **already accumulated experiences and technological capabilities** during the 1960s and 1970s.

Characteristics of the Innovative Catch-up Period (1980s-1990s)

□ Background

- The world economy in the earlier part of the 1980s was in recession and developed countries became protective and pressed developing countries to strengthen IPRs. The Uruguay Round also pressed developing countries to open their domestic markets.
- Under the changed world economic environment, **Korean firms realized the need for their own technological development and innovative capability.**

□ The Role of Major Players

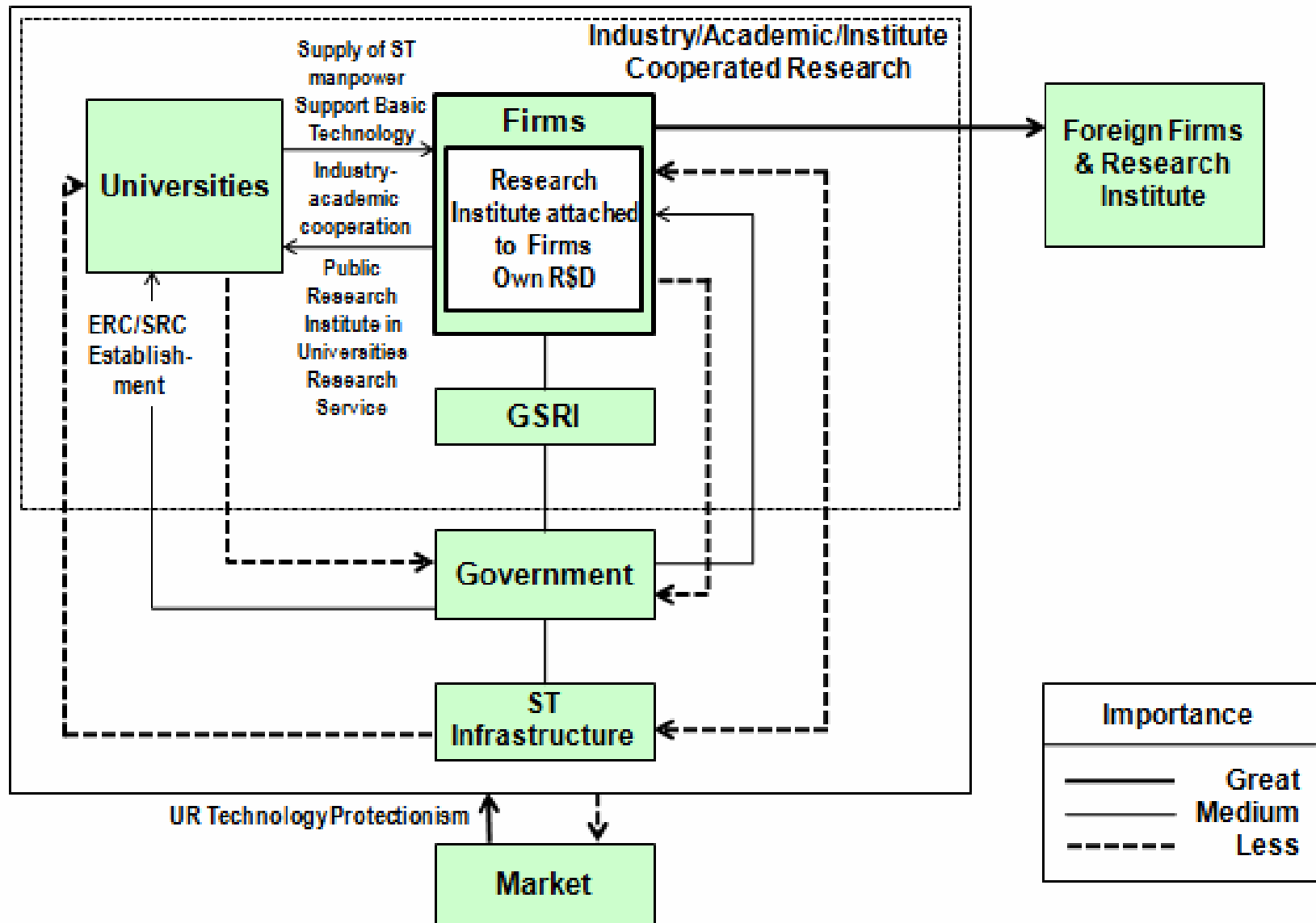
- The government focused establishing IT infrastructure and coordinated other players. In the 1990s, the **government strengthened national R&D programs aiming at making the country one of the leading countries in innovation in the 21st century.** For this, the government promoted **technology-intensive industries such as IT.** The 'Industrial Development Act' was introduced in 1986.

- The government **deregulated technology transfer** from foreign sources and offered many supportive measures such as tax exemptions and preferential finance.
 - The 1980s are the decade for **Korean large enterprises to have achieved self-sufficient technological capability building and innovation capacity, as demonstrated by DRAM, CDMA, and etc.**
 - In addition to own R&D, **firms diversified the channels of technology transfer.**
 - By 1996, more than 2,000 company research labs were established.
- **Characteristics**
- This period is characterized by **true emergence of the private sector as the innovation leader in Korea, replacing or reducing the government's leadership.**
 - The method of technological innovation became **diversified** from the imitative catch-up to the innovative catch-up.

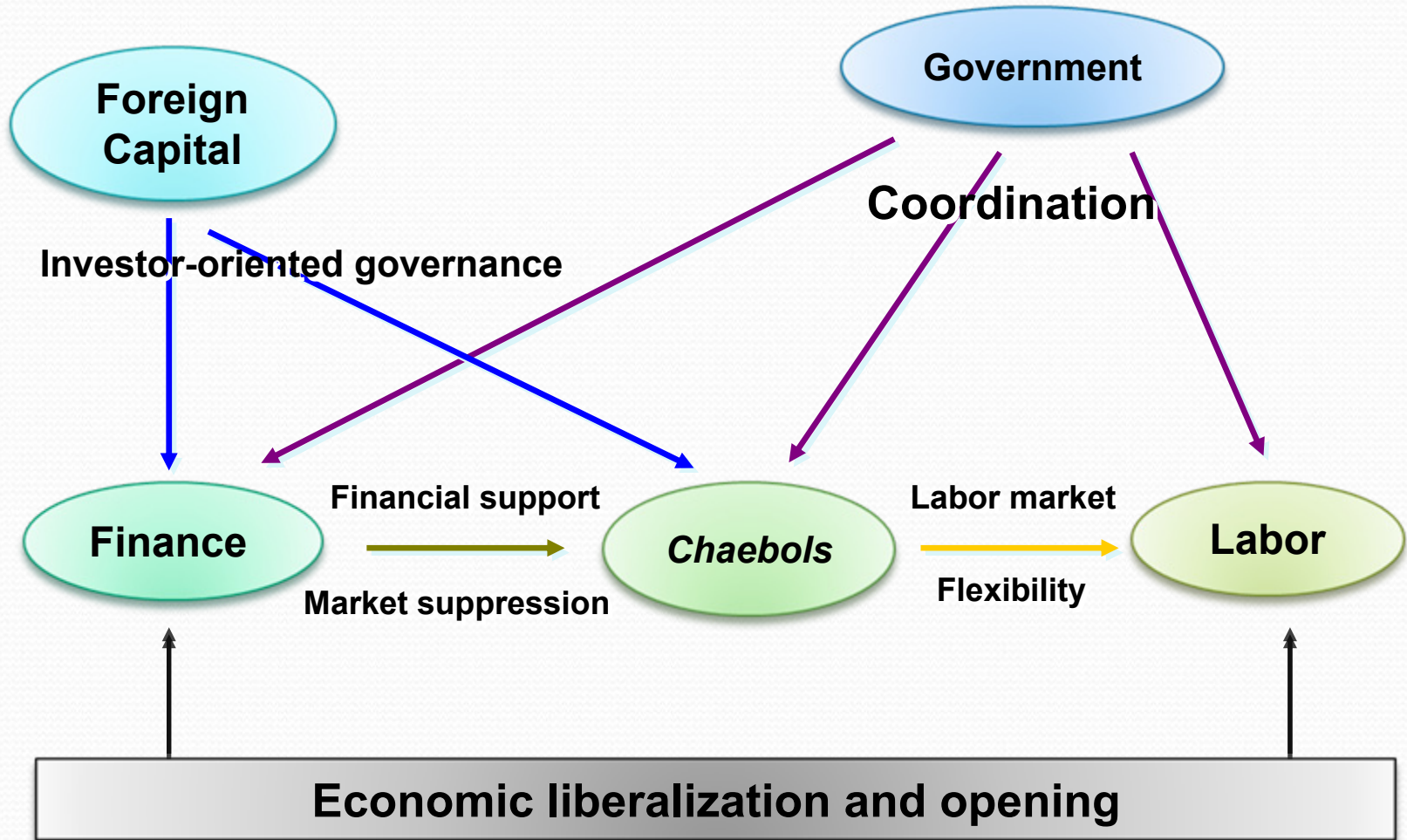
R&D Indicators in the Imitative Catch-up Period (1980s-1990s)

	1981	1982	1985	1990	1993
R&D Expenditure (bil.won)	293.1	457.7	1,155.2	3,210.5	6,153.0
Gov't	127.8	188.9	231.3	510.5	1,039.0
Private	165.3	268.8	923.9	2,700.0	5,114.0
Gov't VS Private	45 : 55	41 : 59	20 : 80	16 : 84	17 : 83
R&D / GNP	0.64	0.88	1.58	1.95	2.33
Manufacturing industry					
R&D Expenditure	111.8	182.3	688.6	2,134.7	3,596.6
R&D / Manufacturing industry GNP	0.67	0.62	1.51	1.96	2.52
Number of Researcher	20,718	28,448	41,473	70,503	98,764
Gov't	5,065	6,129	7,542	10,434	16,068
University	8,488	12,360	14,935	21,332	28,618
Private	7,165	9,959	18,996	38,737	54,078
R&D Expenditure / Number of Researcher	14,149	16,089	27,853	47,514	62,300
Number of researchers / 1,000 Population	0.54	0.72	1.01	1.64	2.24
Number of Company Research Institutes	-	-	183	966	1,690

National Technology Innovation System of Korea in the 1980s~1990s

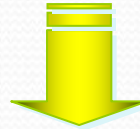


Phase – II Model



The Role of the Government in the Phase-II Model

Reducing government intervention in the market
and private sector



Liberalizing the economy and coordinating

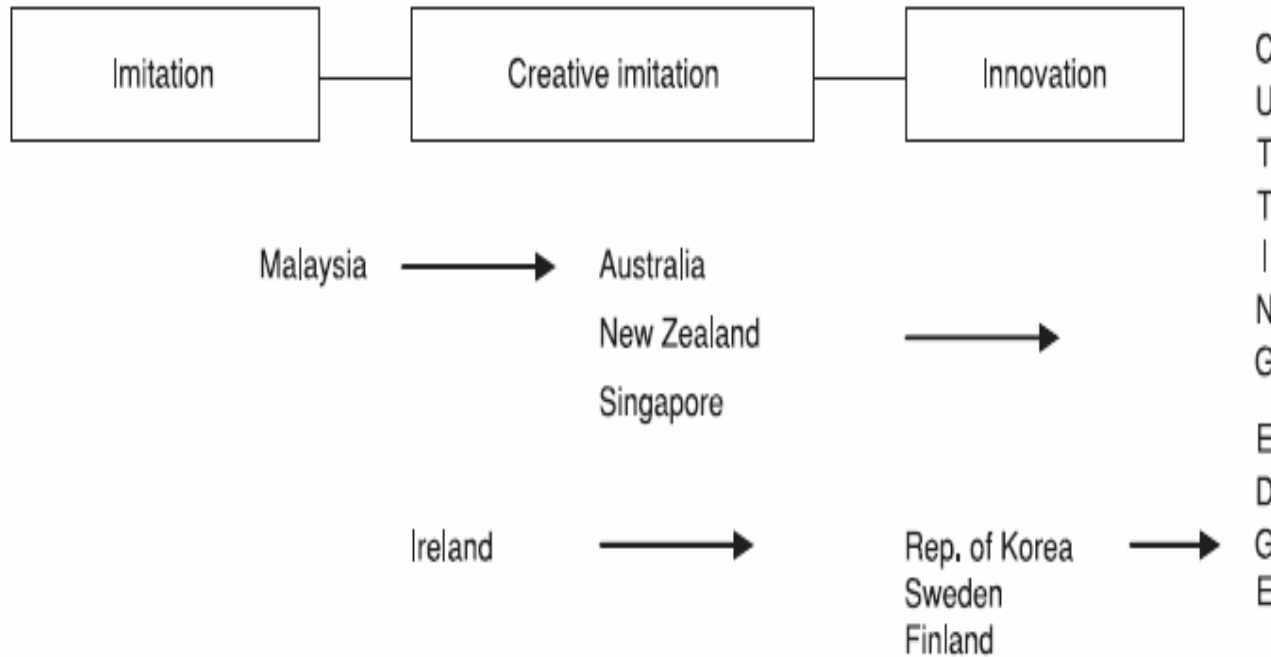


**Government-supported, innovation-oriented
development strategies**
: Innovation-oriented industrialization
: Improving business environment and
infrastructure

Source: Lee, Jong Won. 2004. (Some of the following pages also are from Lee.)

From Imitative Catch-up to Innovative Catch-up: Where is Korea now?

STAGES IN THE DEVELOPMENT OF TECHNOLOGICAL INNOVATION IN SELECTED COUNTRIES



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of Organisation for Economic Co-operation and Development (OECD), *OECD in Figures 2006–2007 and Main Science and Technology Indicators*, Paris, 2006; and Innometrics, "European Innovation Scoreboard 2006. Comparative Analysis of Innovation Performance", 2006 [online] http://www.proinno-europe.eu/doc/EIS2006_final.pdf.

R&D/GDP of Korea

S Korea ranks high in R&D spending

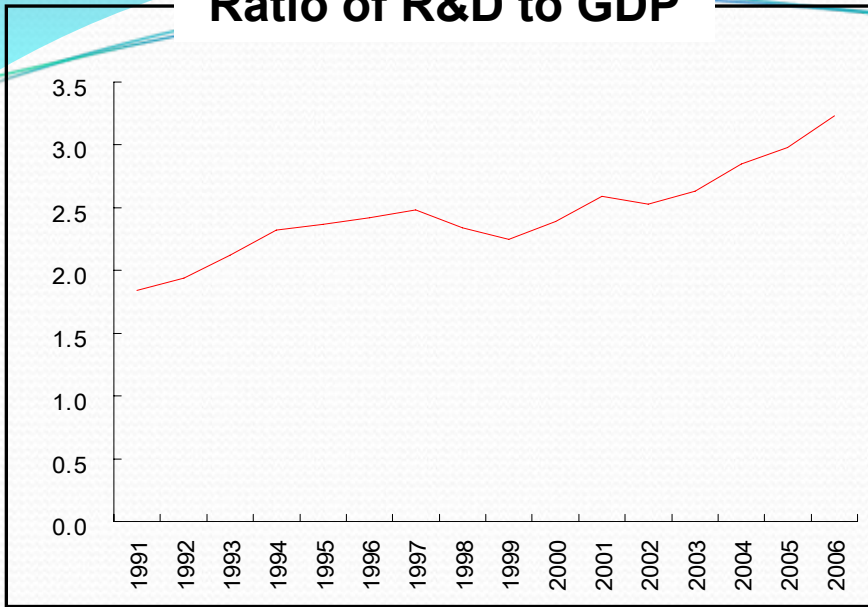
R&D, % of GDP



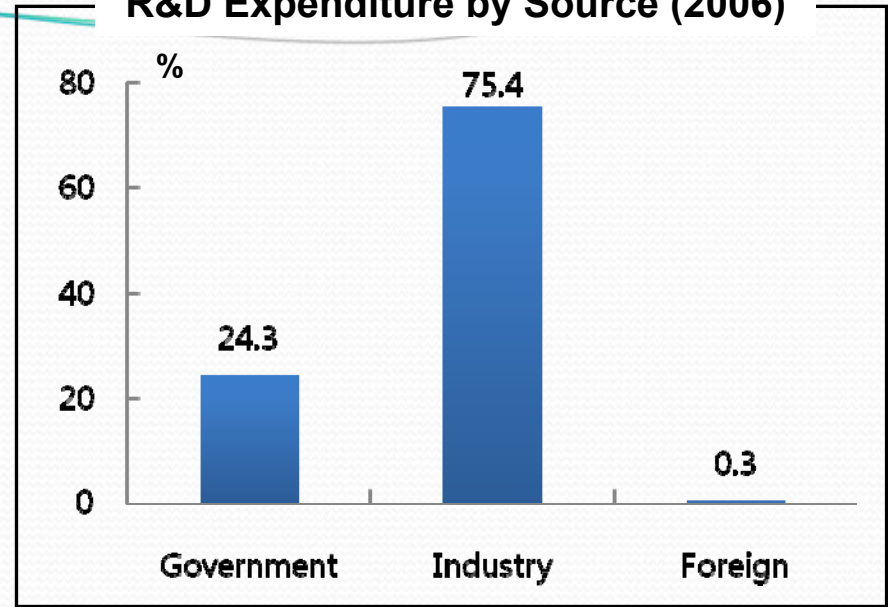
Source: OECD in Figures 2007

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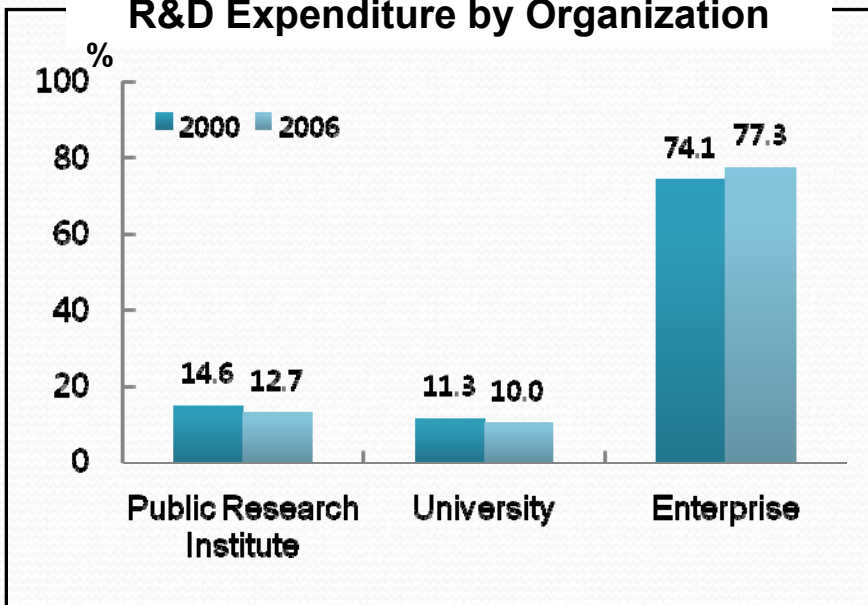
Ratio of R&D to GDP



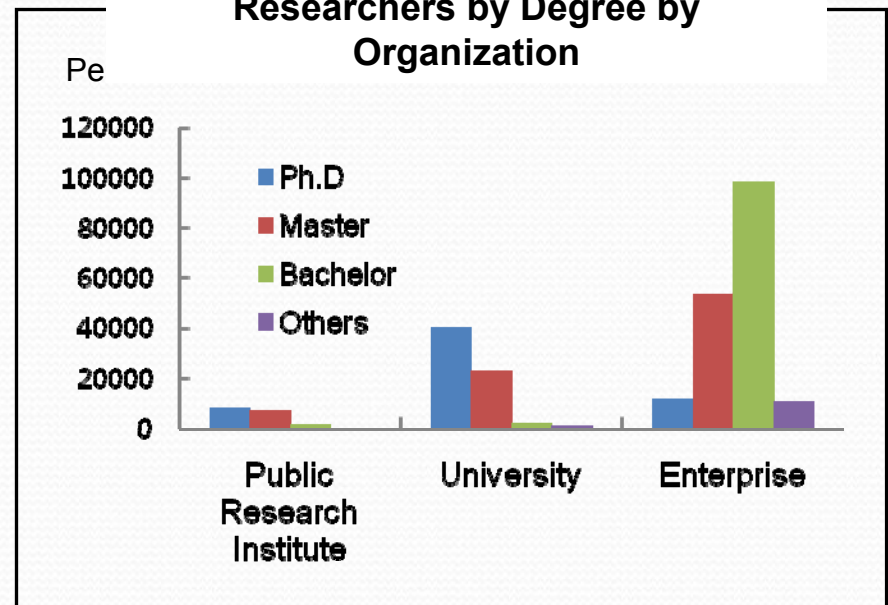
R&D Expenditure by Source (2006)



R&D Expenditure by Organization



Researchers by Degree by Organization



III. Contribution of Innovation to Export

Export-Oriented Industrialization

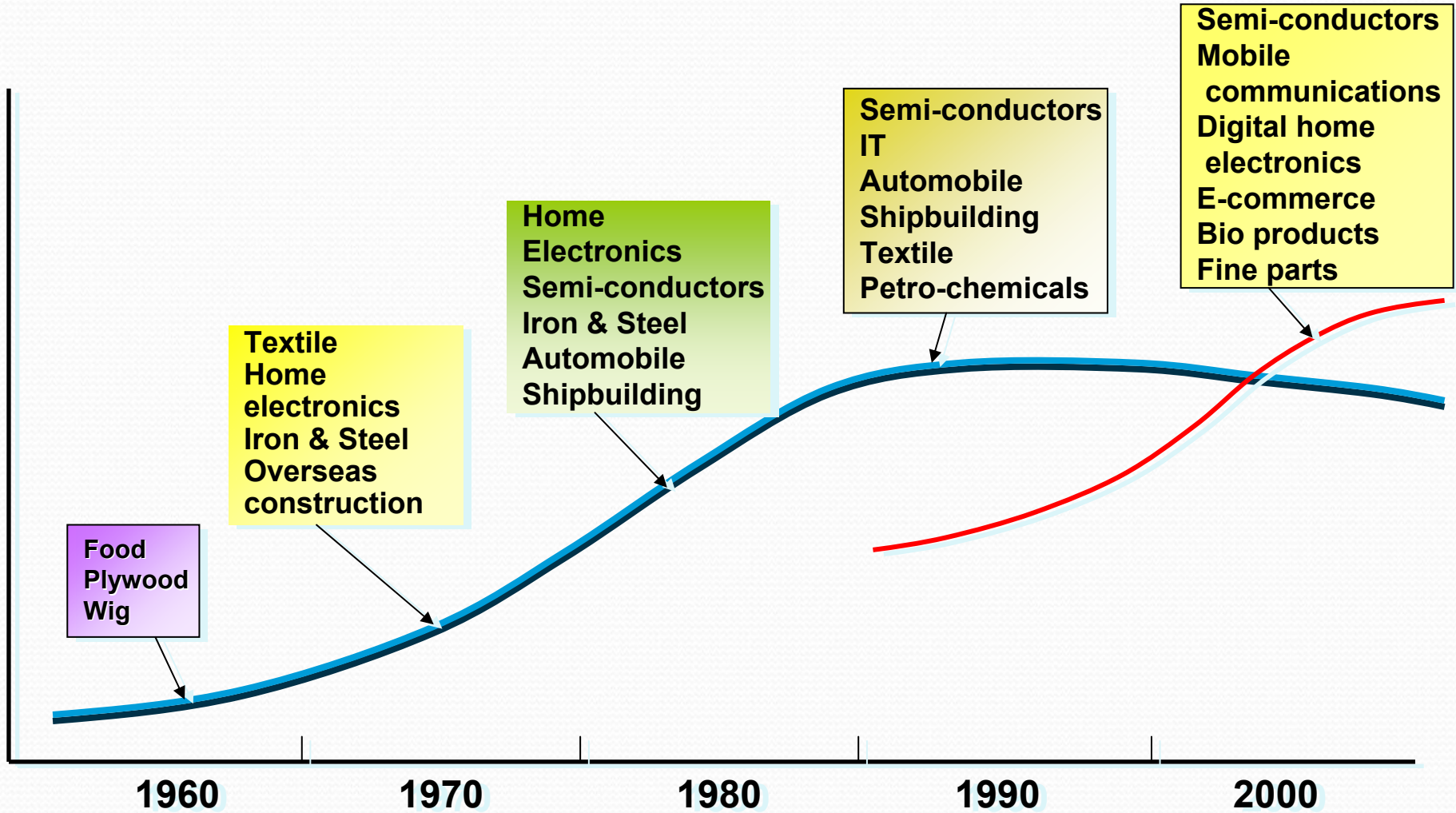
- Korea's industrial development has been achieved through export-oriented strategies.
- During 1960s and 1970s, the period when Korea accomplished the development of major industries, export growth outpaced GDP growth

Rapid Increase of Exports' Share in GDP

(%)

1960	1965	1970	1975	1980	1985	1990	1995	2000	2005
3	9	14	24	28	32	26	24	34	36

Changes in Dominant Industries and Top Exports



Industrial Competitiveness

- Korea's leading export industries have accomplished considerable development and led the world market in these fields through the quantitative and the qualitative growth in recent years.
- Six leading industries in terms of world market share (rank): **Shipbuilding(1st), Motor Vehicle (6th), Steel (8th), Petroleum-Chemistry (5th), Textile (5th), IT (CDMA 1st, Semiconductor 3rd, Digital Home Appliances 5th).**
- Despite late-comers' catching up, Korea will maintain its competitiveness in these areas for the time being.

World Market Share of Major High- and Medium-Tech Industries in Korea, 2005

	Share in the world market (%)	Rank
Automobile	9.4	5
Machinery	2.5	10
Semiconductors	25.3	2
Digital electronics	1.9	10
Electronic medical equipment	1.5	13
Bio	1.4	14
Aerospace	0.4	15
Environment	1.2	16
Shipbuilding	25.7	1

Source: Ministry of Industry and Energy, ROK

Evaluation of the Strategy

□ Trends in Exports (Performance)

-The average annual growth rate in exports in 1964~2004 was 21.1%, which was the highest in the world.

Target and Actual Achievement

(\$0.1 billion)

Target amount	Achieved year	Export amount	World rank	Remarks
1	1964	1.2	90	
10	1971	10.7	48	
100	1977	100.5	24	
1000	1995	1,250.6	12	
2000	2004	1,722.7	?	11 times the numbers of export items in 1964, 6 times the number of partner countries, 130 times the number of trade firms.

Exports by Small and Large Firms

(Unit: million US dollars, %)

	2002	2003	2004	2007
Total Exports	162,471 (100.0)	193,817 (100.0)	184,883 (100.0)	371,489 (100.0)
SMEs	68,309 (42.0)	81,699 (42.2)	72,208 (39.1)	113,676 (30.6)
Large Enterprises	94,053 (57.9)	112,015 (57.7)	112,460 (60.8)	257,813 (69.4)
Other (Public sector)	110 (0.1)	103 (0.1)	216 (0.1)	n.a.

Note: The numbers in the parenthesis are the shares in total exports

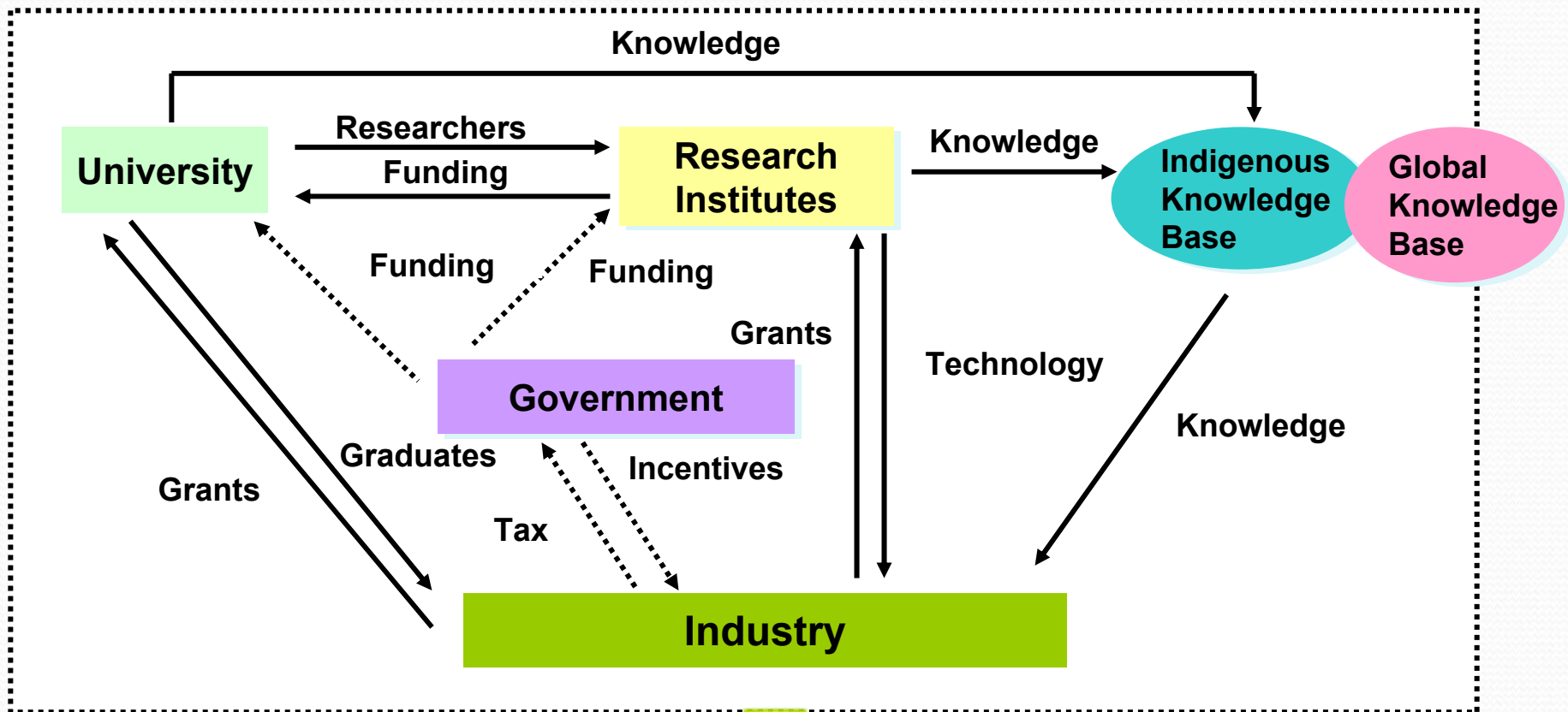
Source: The Export-Import Bank of Korea

IV. Innovation of NIS

Main Characteristics of the NIS

- The NIS (**National System of Innovation**) is the **network of institution in the public and private sectors** whose activities and interactions initiate, generate, modify, and diffuse new technologies.
- The Korean NIS before the 2004 reform was for the era of the catch-up period.
- **The private sector in general had concentrated on the rapid commercialization** of outside technologies and imitating global front-runners. The private sector's R&D share of the nation total was 74 percent in 2002, a proportion much higher than the OECD average.

Interactions in a National Innovation System



- Industrial & Technological Deepening
- Transition to Knowledge Based Economy
- Sustainable Economic Growth

Source: Suh. 2000

History of Government R&D Programs

Decade	Emphasis and Initiatives	Remarks
1960 Infant Stage of ST Policy	<ul style="list-style-type: none"> - Imports of foreign technology - Laws for ST promotion - Established MOST, KIST, etc. 	R&D/GDP = 0.3%
1970 Building Institutions	<ul style="list-style-type: none"> - Imitation and reverse engineering - Laws for R&D promotion - Established 16 GRIs 	R&D/GDP = 0.4~0.8% Public : Private = 50 : 50
1980 National R&D Program	<ul style="list-style-type: none"> - Development of indigenous technology - Started National R&D program - Promotion of private sector's laboratories 	R&D/GDP = 0.8~2% Public : Private = 20 : 80
1990 Diversification of Gov't R&D	<ul style="list-style-type: none"> - Development of high-tech - Promotion of university research - Started Highly Advanced National (HAN) Project 	R&D/GDP = 2~3%
2000 Elaboration of Gov't R&D	<ul style="list-style-type: none"> - Development of knowledge-base economy - Started Creative Research program, National Research Laboratory Program, The 21st Century Frontier Program, etc. 	R&D/GDP = 3%

STI Administration System in Korea

- There were three organizations undertaking ST coordinating function in different ways: the **National Science and Technology Council (NSTC)**, the **Presidential Advisory Council for Science and Technology (PACST)** and the **Ministry of Planning and Budget**. The NSTC consists of 10 ministers and is chaired by the President. The Ministry of Science and Technology served as the secretariat of the council. The main function of the council was short-term and long-term policy coordination, while its member ministries were in charge of implementation.
- The role of the **Presidential Advisory Council for Science Technology was to recommend long-term science, technology and innovation strategies to the president**. The ministry of Planning and Budget allocates the yearly budget for R&D and related activities in the public sector, as well as for supporting the private sector.

The New NIS and Governance (Since 2004)

Basic Direction and Objects (Key Concepts)

- **Integration**
- **Coherence**
- **Increasing efficiency and productivity**
- **Selection and concentration**
- **Innovation-driven economy**

Strengthening the STI Governance

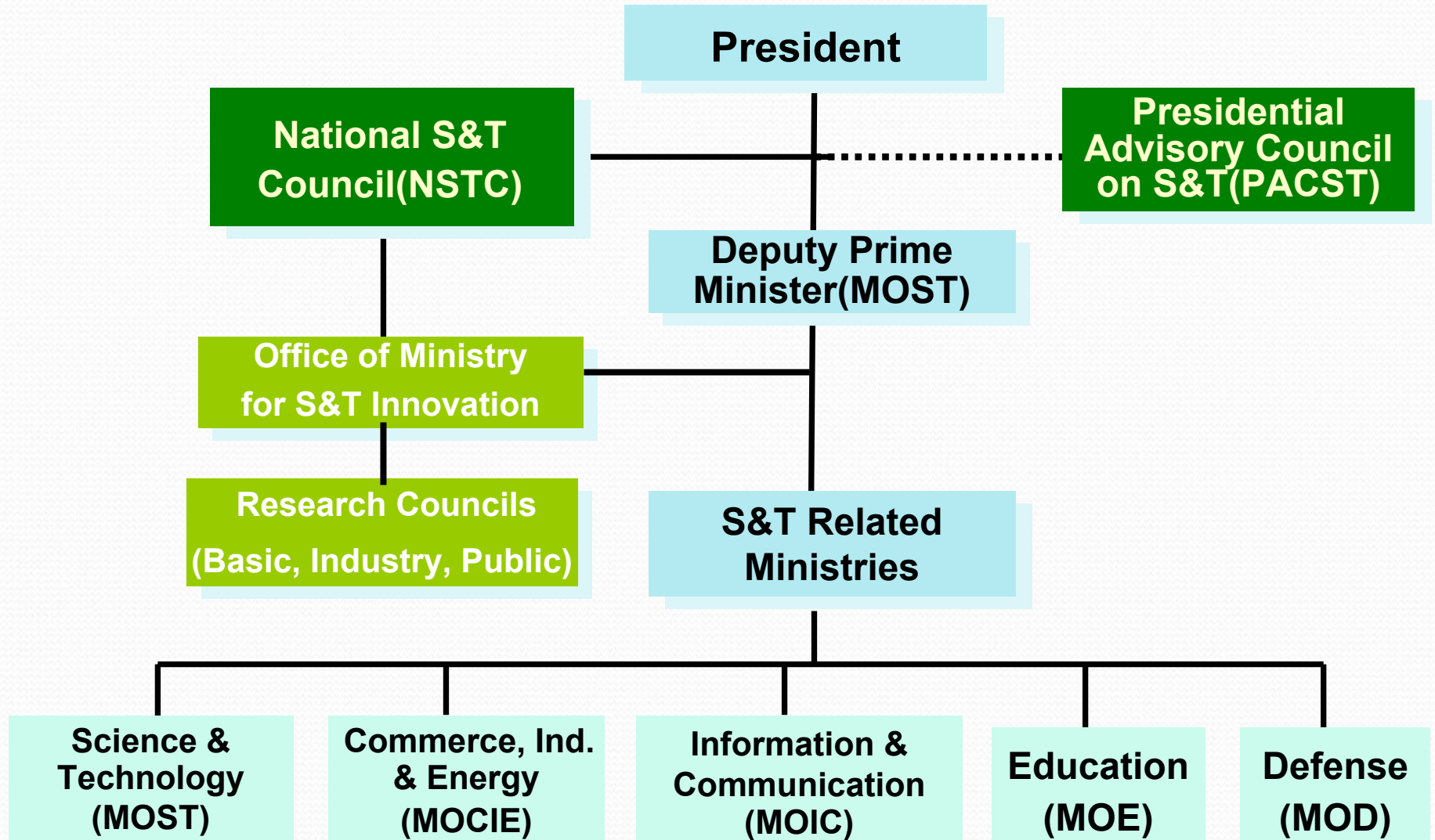
❑ Strengthened Role of NSTC

- The government plans to strengthening the role and authority of the National Science & Technology Council by:
 - **Monitoring and coordinating strategies for new growth technology development**
 - **Ensuring the results of NSTC's evaluation and coordination be reflected in budget-allocation**

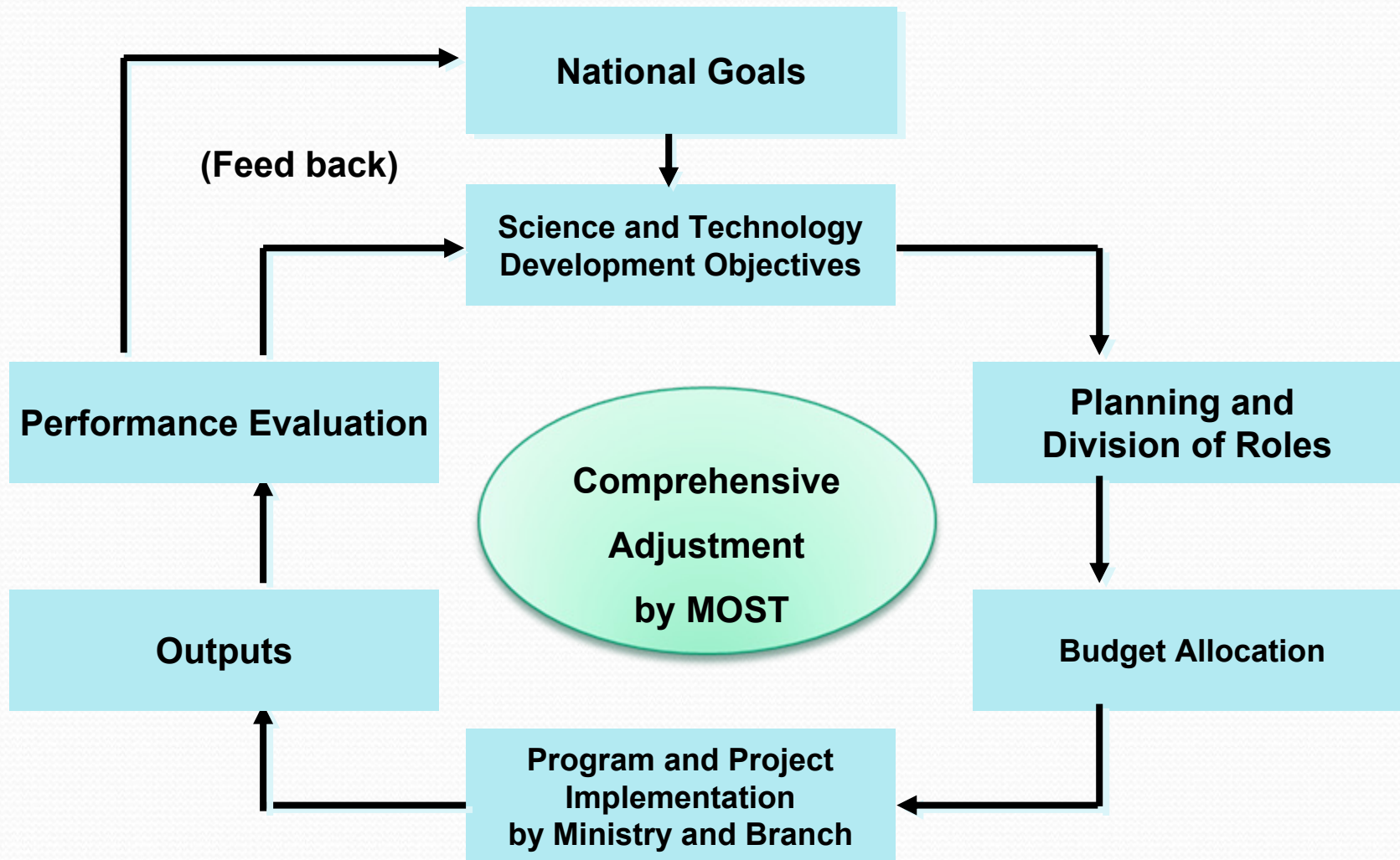
❑ Enhancing the Role of MOST

- MOST was given the mission and power for coordinating major STI policies of the government and the Minister of Science and Technology became a deputy prime minister.

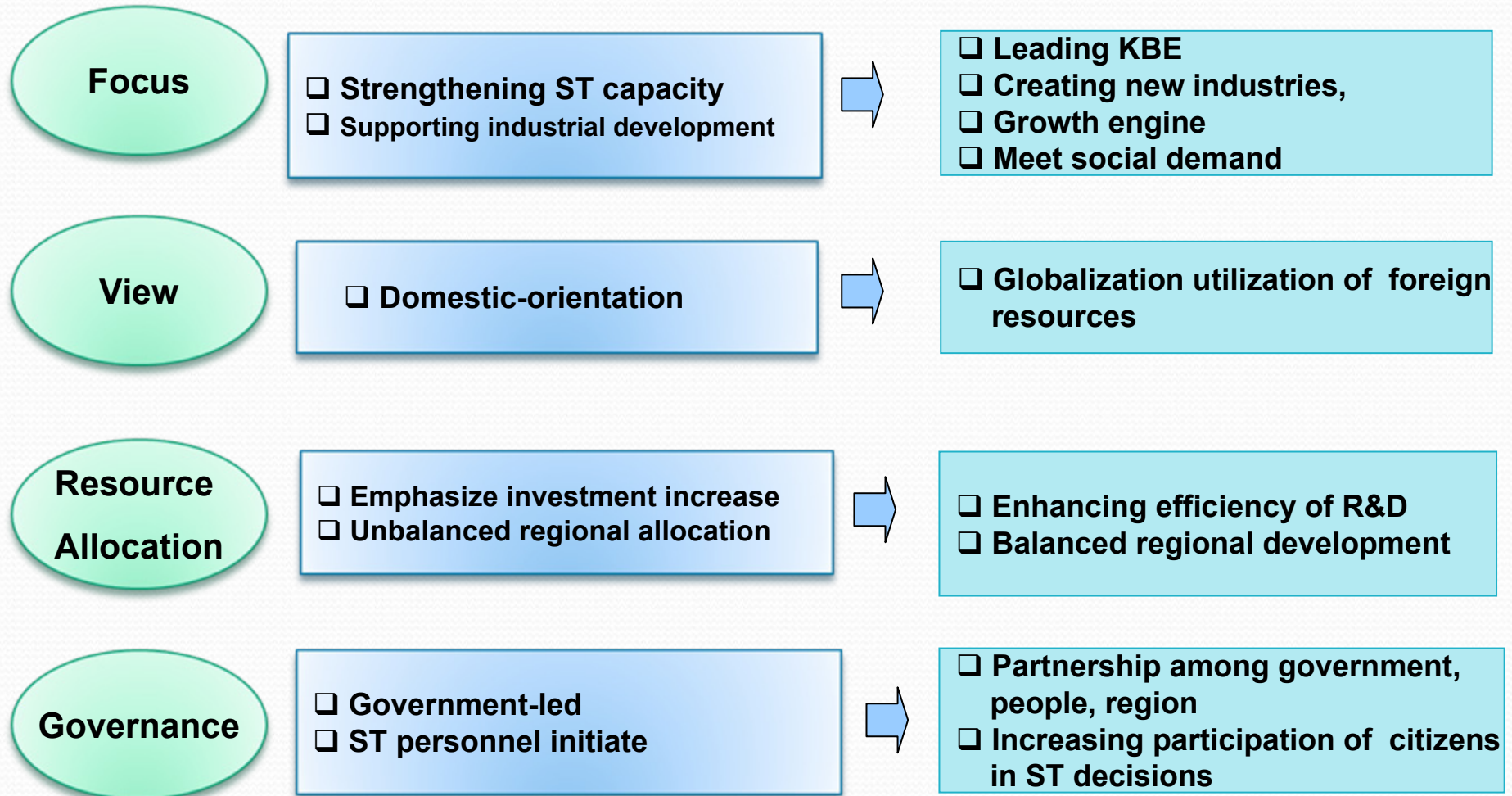
New Science and Technology Governance



Basic Scheme for the New NIS



Shift in STI Policy in Korea



National Innovation Strategy

Innovation Resources

- Science & engineering workforce
- Access to higher and postgraduate education
- Availability of risk capital
- High quality of information
- Infrastructure

Innovation Policy

- Subsidy and grant program
- R&D tax policy
- Education policy & funding
- Intellectual property protection policy
- Openness to international trade and investment

National “Knowledge” Stock

- “Basic” research investments
- Cumulative innovation record
- Overall technological sophistication

Strategies for Securing National Competitiveness

- ❑ **Acquisition of World-top-class Technologies**
 - Korea should pour more R&D efforts to core technologies and emerging technologies on the basis of strong basic science

- ❑ **World Class Education for HRD**
 - For this and stronger international competitiveness, the Korean education system should be reformed as quickly and broadly as possible

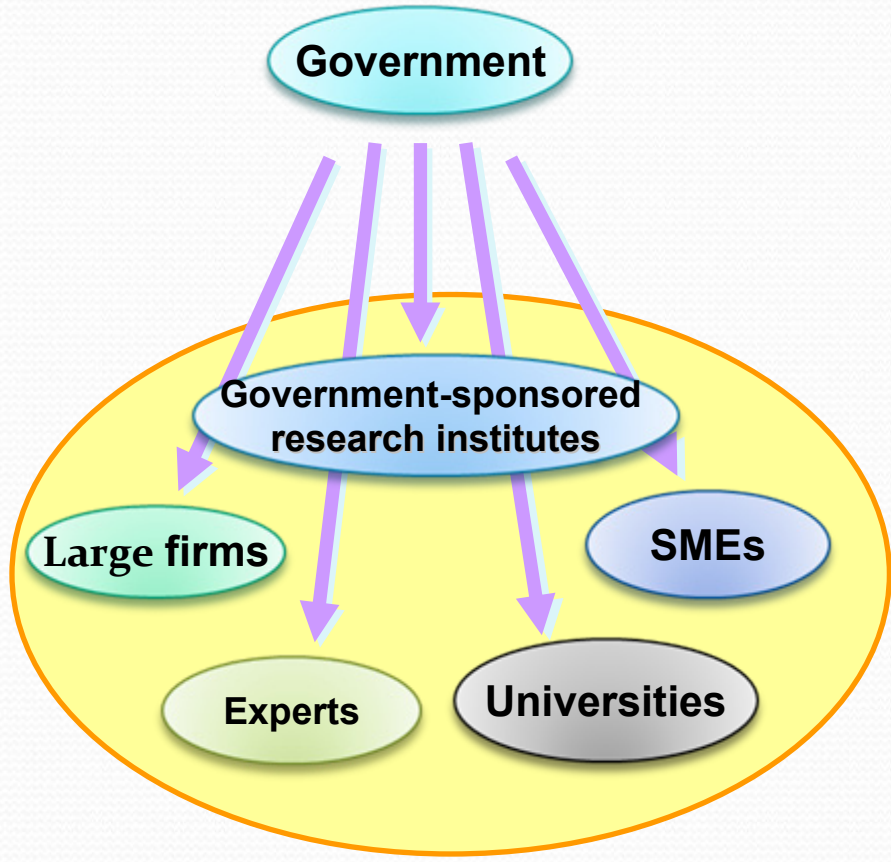
- ❑ **Innovation-driven Economy and Innovation of NIS**
 - Through a balanced and efficient NIS, Korea should realize an innovation- driven economy ahead of China

- ❑ **Active Opening of the Economy**
 - All these require active opening of the economy to the world.
The whole country should be a 'special economic zone'

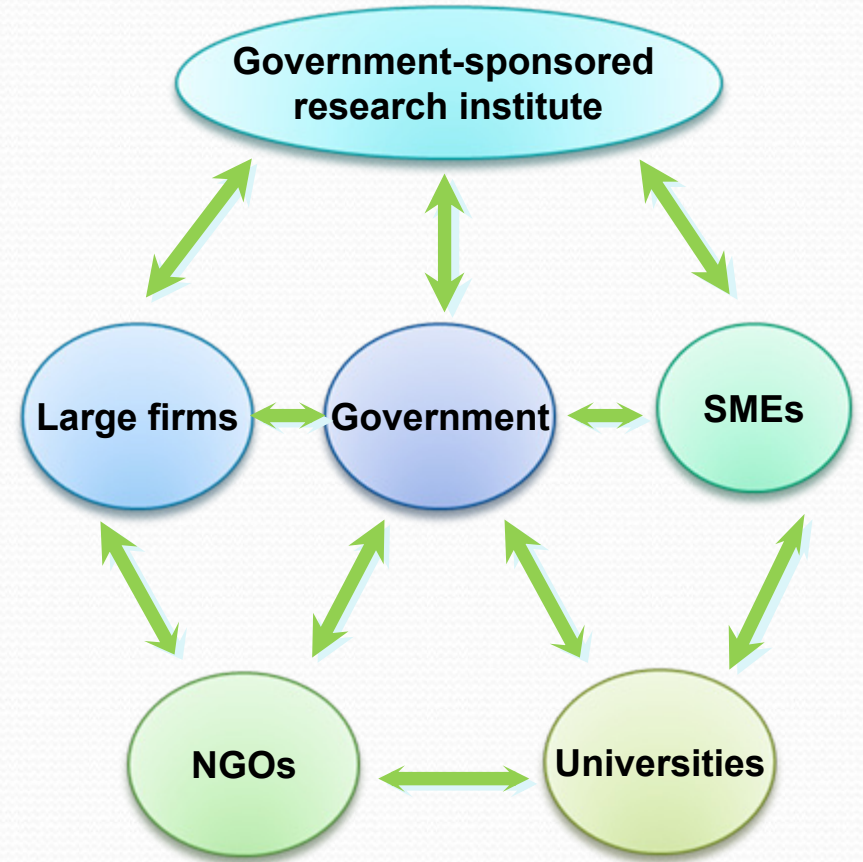
V. Public-Private Partnership (PPP) for Innovation and Export

Two kinds of PPP

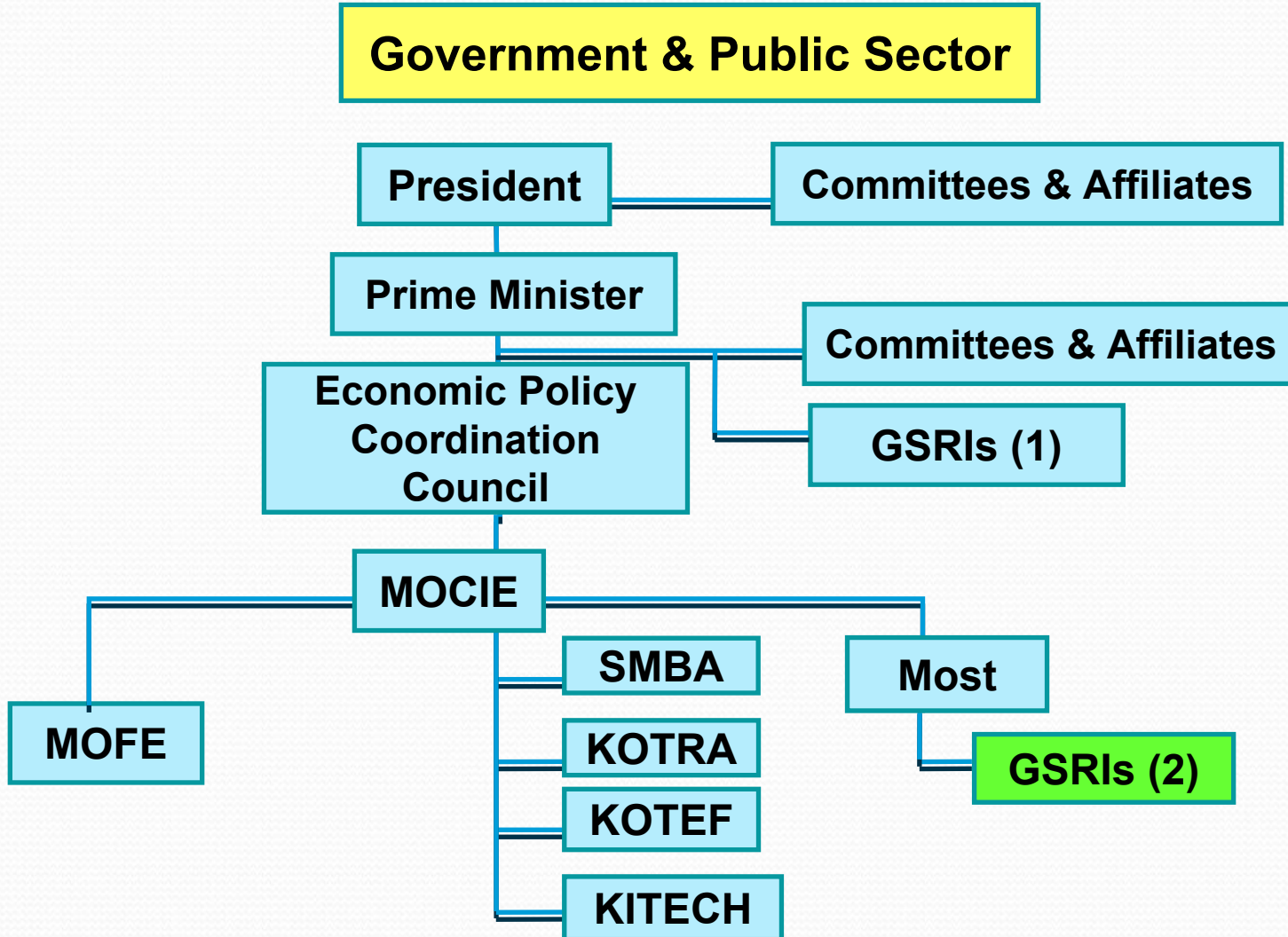
Hierarchical PPP (Phase I)



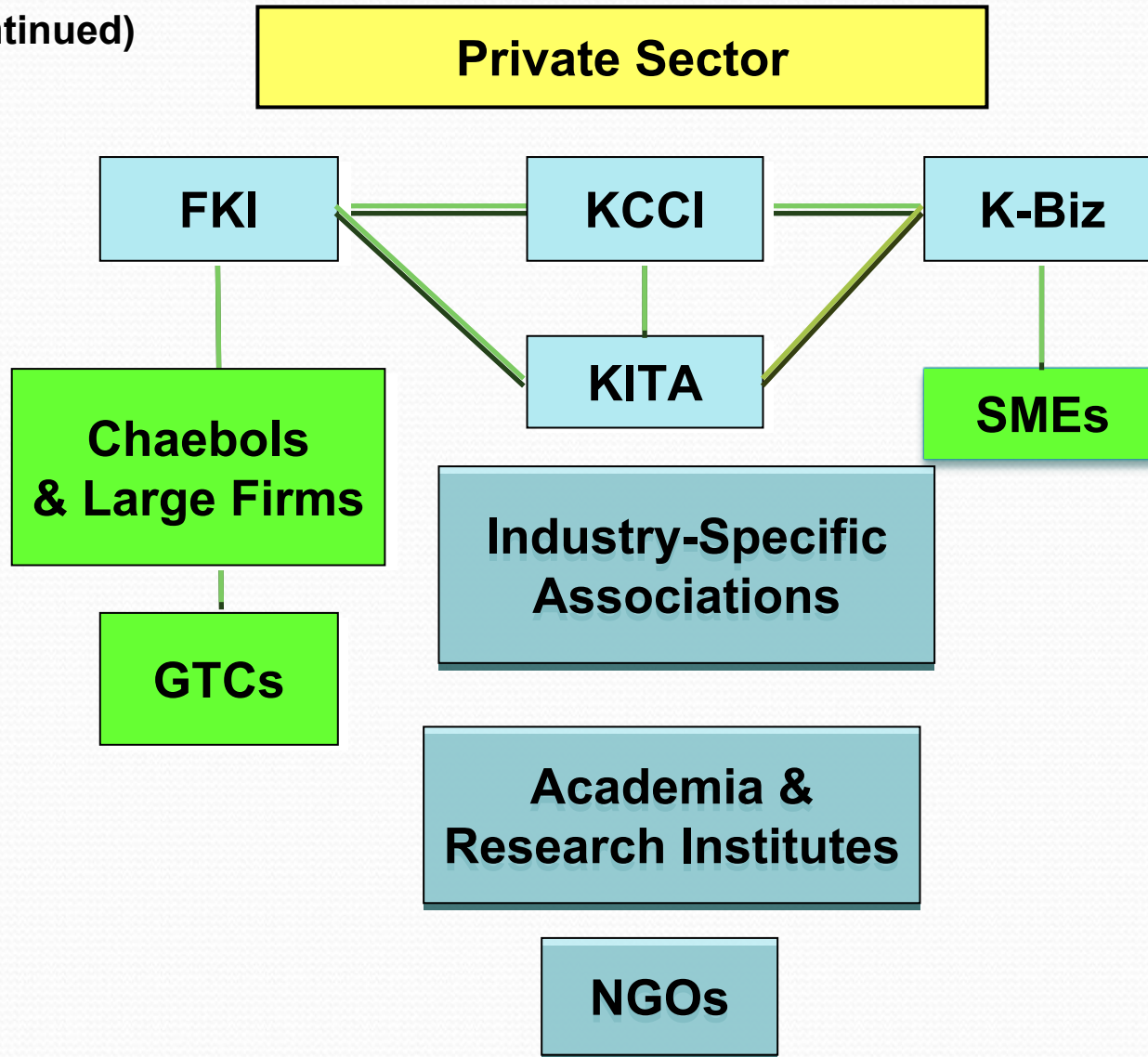
Horizontal PPP (Phase II)



Major Players in the Economy



(Continued)



PPP Case 1: **Monthly** Export Promotion Conference

- **Practical Forum for Trade Presided by the President**
 - Established in December 1962. **The most important administrative support mechanism for export promotion**
 - Attended by major government high-level officials (Ministers, etc.), leaders of public organizations, civilian experts, leading exporters and industrial associations

- **Effects of the Conference**
 - Enhancing **the general public's awareness** about importance of export
 - **Problem shooting, especially directed by the President**
 - **Sharing information and visions** among participants
 - Encouraging leading exporters and **inducing cooperation of the private sector**
 - The conference made great contributions to the high export performance during the Phase-I period.

PPP Case 2: Research Consortium

□ Government Role in Research Consortium

- **Joint R&D in the form of a consortium of the government, GRIs, and the private sector (large companies) was the most important and effective mechanism in high-tech development in Korea** such as TDX, D-RAM, CDMA Mobile Phone, Digital TV, and Wibro.
- **GSRIs especially played the role of monitoring foreign technology trends and mediating** original sources and research participants.

□ Degree of Government Interventions

- Government intervened and led research consortia **when the technology is under substantial uncertainties and risks.**
- However, for the industries and technologies under **slow innovation**, the government only took the role of protecting the industries (e.g. automobile, electronic, PC).
- For the **mature stage of a new product**, firms could take care of further (process) innovation within their capacity.

PPP Case 3: Chaebols and General Trading Companies

□ Background

- Chaebol is a business group of large companies which is owned and managed by family members or relatives in many inter-connected business areas.
- **Chaebols are characterized by ambitious and aggressive entrepreneurship**, paternalistic leadership and centralized planning and coordination.

□ General Trading Companies (GTCs)

- The prioritized mission of GTCs was to expand Korea's exports, especially of heavy industry products. In addition, it was expected to attain economies of scale in the world market, **specialized enough in exportation to gain international competitiveness, self-sufficient and independent of the government, and capable of overseas marketing.**
- The GTC system had the effect of institutionalizing export activities in Korea.

- Once a company was designated as GTC, it could enjoy the enhanced credibility of the company both in domestic and world markets, and the **group companies having a GTC earned privileged position on various national projects** such as chemical and heavy industry plants plus access to subsidies.
- Since GTCs deal with a variety of products and a great range of functions, most of GTCs have been structured according to the product. Each product division is in charge of sales and exports of products in charge, and takes full responsibility of its own performance.
- **GTCs have been driving forces for expanding export in Korea. GTCs also contributed to Korea's industrialization by leading the export of heavy industries. GTCs also pioneered to diversify the export markets.**
- In terms of employment, export expansion led by GTCs generated a full of job opportunities. The employees that GTCs hired could build global sense and capabilities necessary for sales person through opportunities of frequent business trips to overseas and various training programs.

PPP Case 4: SME Innovation

❑ The Achilles' tendon of the Korean Economy

- **The relative weak innovation capacity of SMEs** in Korea becomes the serious challenge to the Korean economy for sustainable growth.
- Although ventures have been promoted, their contributions to the growth are insufficient.
- Such public and private organizations as Small and Medium Business Agency (SMBA), KAITECH and large firms have been helpful for enhancing innovation capacity of SMEs with limited effects.

❑ Technology Development of SMEs

- About **7%** of SMEs are doing R&D.

Technology Cycle of SMEs in Korea

(%)

	Introduction Period	Growing Period	Matured Period	Declining Period
1996	9.2	26.7	48.9	15.2
2002	12.1	39.2	36.3	12.5
2004	12.7	46.7	34.7	6.0

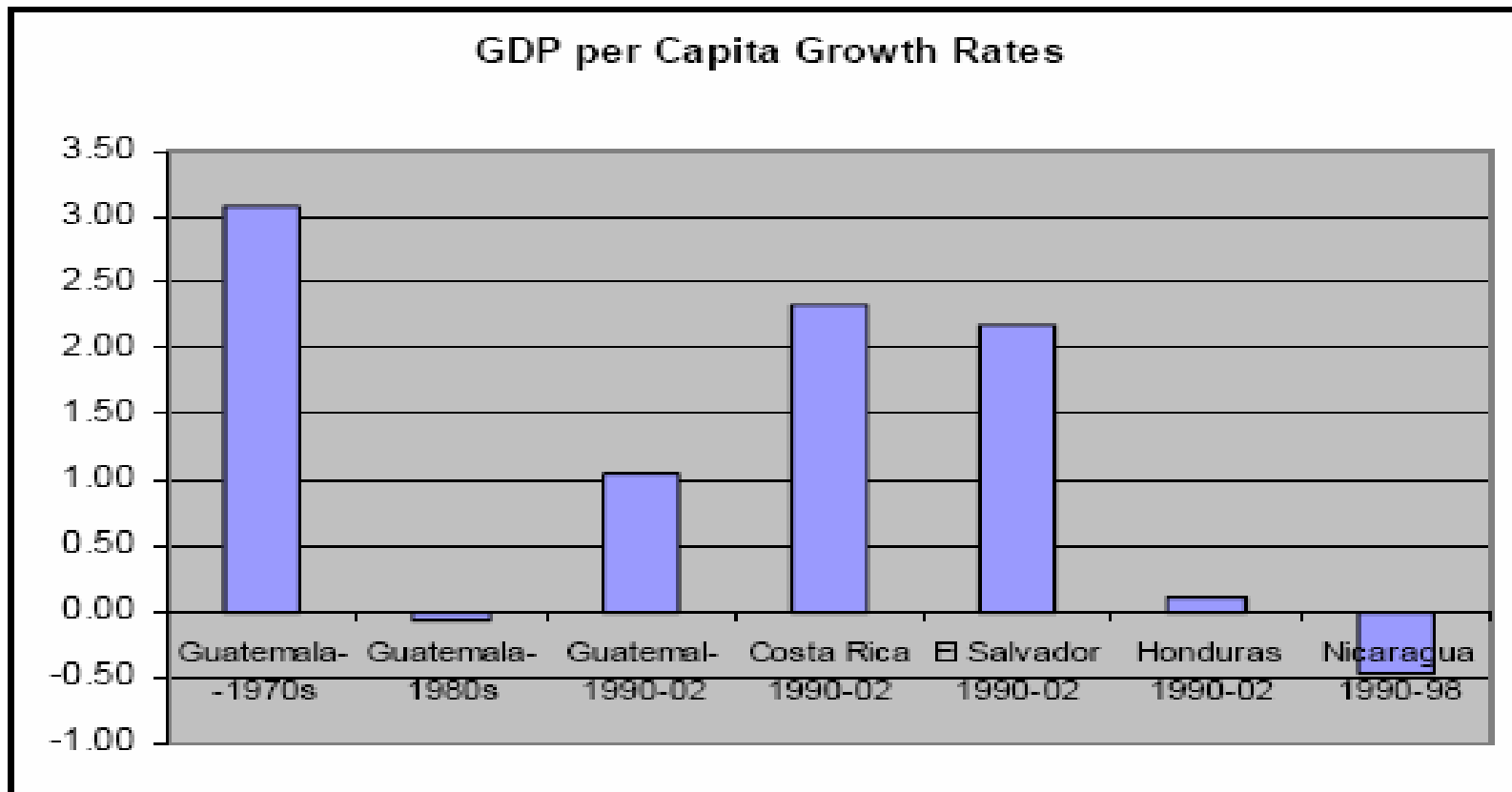
VI. Implications for Guatemala

Economic Performance of Guatemala

	Unit	2002	2003	2004	2005	2006
GDP	One hundred million dollar	233	249	273	319	362
GDP per capita	Dollar	1,990	2,074	2,219	2,534	2,809
Growth Rate	%	2.2	2.1	2.8	3.2	4.6
Financial Balance/GDP	%	-0.7	-1.8	-1.1	-1.5	na
Rate of Consumer Price Increase	%	8.1	5.6	7.6	9.1	6.6
Goods Balance	Million dollar	-2,972	-3,116	-3,808	-4,370	-4,700
Total Amount of Foreign Debt/GDP	%	20.0	20.0	19.4	16.9	14.1

Average Annual Per Capita Growth in Guatemala and Comparable Countries

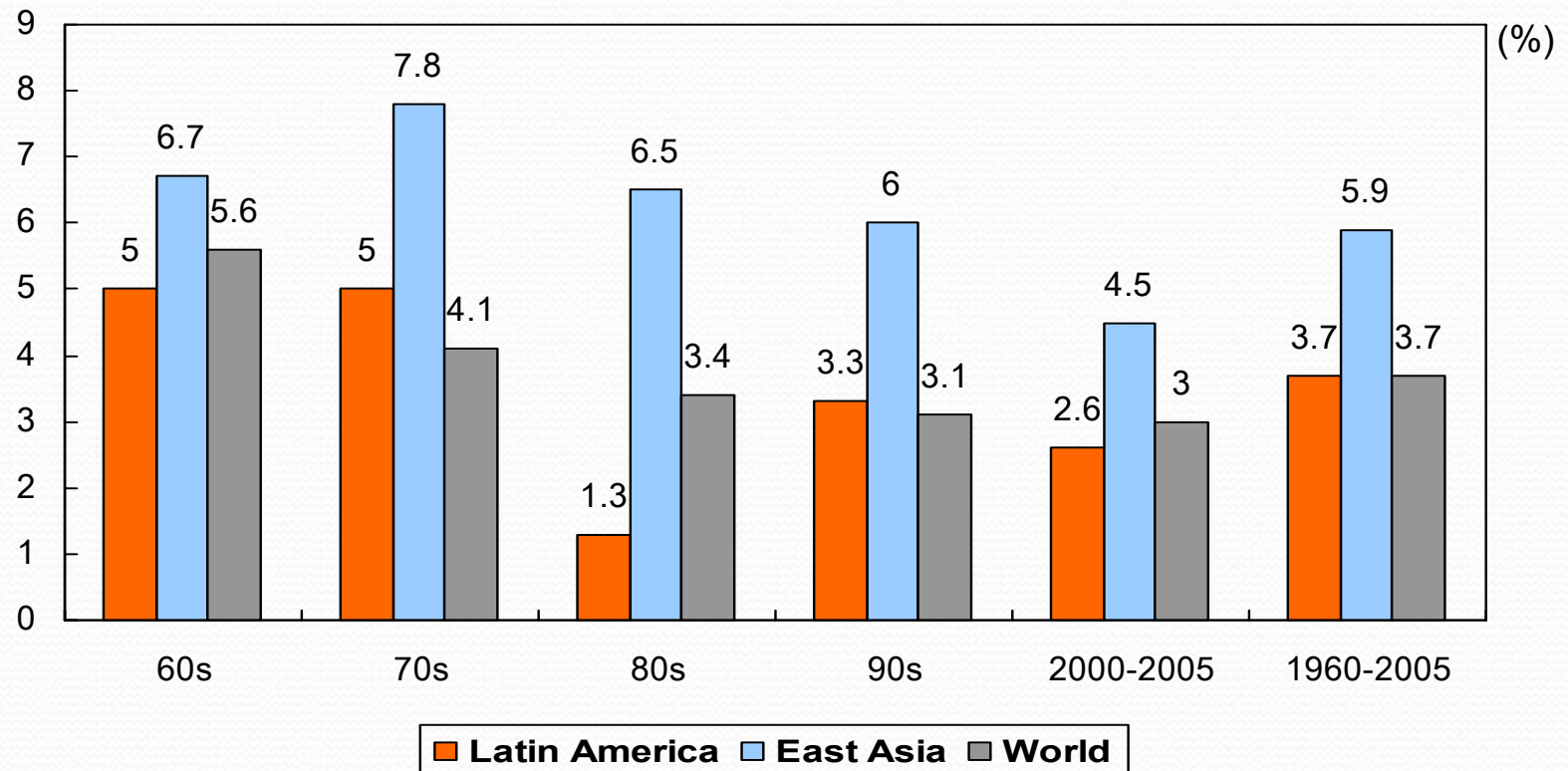
(%)



Source: World Bank. *World Development Indicators*.

Economic Performance of LA and EA

Economic Growth Rates in Latin America and East Asia

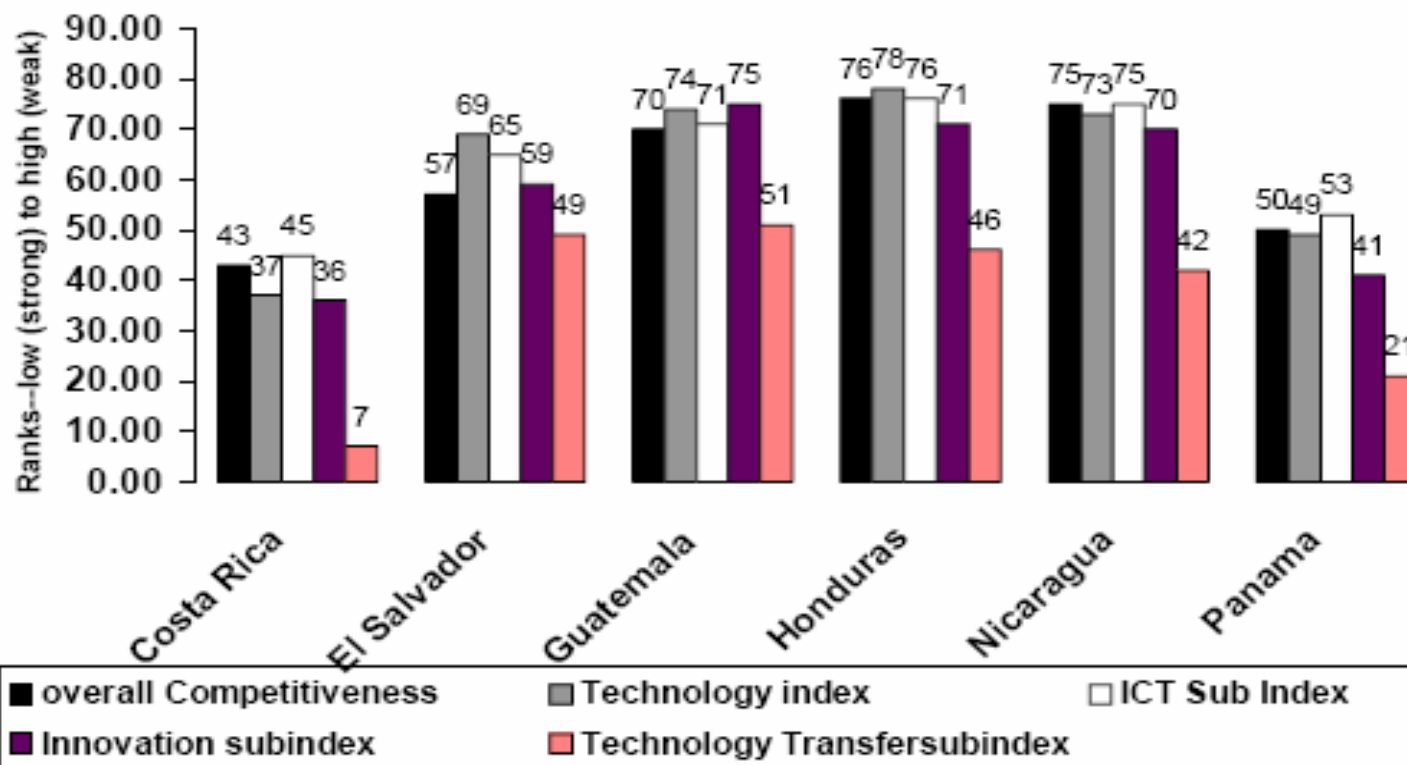


Note: East Asia includes China, Hong Kong, Indonesia, Korea, Malaysia, the Philippines and Thailand.

Source: World Bank. WDI (2007)

Innovation Capacity of Guatemala

Technology Indicators of Guatemala and Comparators



Source: World Bank. *Investment Climate Assessment*.

❑ Features of National Innovation of Guatemala

- Guatemala's **R&D/GDP is about 0.2%** in the late 1990s, which is very low, compared to competitors.
- **Patent activity** is also very weak (5 patent applications and 3 grants in 2001).
- Although recently firms became active in both process and product innovations, still the efforts are insufficient to substantially enhance the international competitiveness of firms in Guatemala.

❑ Weaknesses

- **Technological content of imported machinery and equipment is low.**
- **Firms are not active in obtaining licensing.**
- **Technological linkages among firms, universities and research institutes are limited.**
- **Protection of IPRs is weak.**

Innovation Capacity of Guatemala and Korea

Variable	Guatemala (Group: All)		Latin America (Group: All)		Korea, Rep. (Group: All)	
	actual	normalized	actual	normalized	actual	normalized
Annual GDP Growth (%), 2002-2006	2.96	2.37	3.89	3.69	4.80	5.04
Human Development Index, 2005	0.69	2.90	0.77	4.93	0.92	8.19
Tariff & Nontariff Barriers, 2008	78.40	5.33	73.59	4.26	66.40	2.07
Regulatory Quality, 2006	-0.09	4.93	-0.05	5.10	0.70	7.07
Rule of Law, 2006	-1.02	1.07	-0.43	4.75	0.72	7.57
Total Royalty Payments and receipts(US\$/pop.) 2006	0.03	1.34	15.42	6.29	134.20	8.21
Scientific and Technical Journal Articles / Mil. People, 2005	1.28	1.51	21.40	4.86	339.50	8.20
Patents Granted by USPTO / Mil. People, avg 2002-2006	0.15	4.57	0.90	6.68	88.44	9.00
Adult Literacy Rate (% age 15 and above), 2007	73.20	1.95	90.02	3.71	97.90	6.48
Gross Secondary Enrollment, 2006	53.47	2.43	82.60	4.38	97.50	7.57
Gross Tertiary Enrollment, 2006	8.70	2.25	30.20	5.08	92.60	9.84
Total Telephones per 1,000 People, 2006	650.00	4.71	712.92	4.86	1,380.00	7.86
Computers per 1,000 People, 2005	20.00	3.04	84.58	5.29	530.00	8.70
Internet Users per 1000 People, 2006	100.00	4.14	185.83	5.55	700.00	9.57

Source: World Bank. KAM

Highlights and Implications (Principles)

- ❑ Operation of the Economy and the Different Stage of Economic Development
 - In the earlier stage (Phase- I Model), a strong government leadership may be of necessity. However, **in the later stage (Phase-II Model) when the economy becomes more diversified and complicated, the role of the market mechanism and the public-private partnership gain the importance.**

- ❑ Linking Technological Innovation and Trade
 - **A comprehensive and well-balanced NIS (national innovation system) is needed.** Korea reformed its NIS and ST governance drastically in 2004. Although the reform is on the halfway, it renders the lesson of the importance of **coordination and integration major institutions and activities (programs).**

❑ Performance of the Korean Economy

- Even if a country is not endowed with sufficient resources for economic growth, the country still can successfully grow by concentrating and fully utilizing its own limited resources with **an innovative strategy**.

❑ Political Regimes and Achievements

- **The characteristics of political regime and leadership** are crucial for economic development.
- Institutional reforms and policies, including innovation and export promotion, require **a committed leadership and efficient bureaucracy** to be successful.
- Especially **the people should be convinced that their efforts will be properly rewarded** if they follow the government's guide and policies.

- Development Strategies, Institutions, and Trade
 - Two kinds of public-private partnership: Authoritative Regime and Democratic Regime
 - Authoritative Regime corresponds to the imitative catch up period.
 - Democratic Regime corresponds to the innovative catch up period.
 - If the people of a country can **share the same vision and the trust** between them is strong, the chance of successful trade and innovation is high. Latin American countries need to **harmonize the interests of social classes and ethnic groups**.
 - Industrial organization in terms of the relationship between **large firms and small firms**, once structured, is hard to change.
 - The Korean case of **General Trading Companies (GTCs)** confirms that large firms can assist exports of SMEs effectively.

❑ Technological Capability Building

- Technological capability building requires **proper institutional development in terms of laws and regulations, establishment of research institutes and investment in R&D.**
- **National innovation system** itself should be innovated over time to strengthen the coordination mechanism.

❑ Innovation and SMEs

- Two kinds of issues for SME innovation: **the promotion of technology-intensive SMEs** such as ventures and the **transformation of traditional SMEs to innovative SMEs.**
- A stronger **triangular cooperation among the industry, university, and research institutes** is the essence for SME innovation.

❑ Innovating the System

- Economic system cannot be innovated overnight. Reforms and innovation require patience and consensus building, allowing institutional and policy experiments. **High quality of bureaucrats and experts from the private sector including think tanks** are one of the success factors.

❑ The Role of Government

- The government of Guatemala can **initiate institutional building** and providing **science and technological infrastructure** in order to encourage the private sector's R&D and innovation capability building. (e.g. GSRI)
- **Higher education** should be strengthened for the supply of R&D manpower.
- The government can initiate **joint R&D consortia**, with companies, universities and research institute for target technology development.

❑ Large Firms' Role

- A few large firms can establish GTCs for export market exploration and SMEs.
- **Large firms should initiate own R&D** in promising areas.

Muchas Gracias!