

# Growth of KAIST and its Development

**KAIST**



2019  
Prof. Wonjoon Kim

KAIST  
Center for Innovation and  
Entrepreneurship

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# Objective

- Understanding Korean Economic Growth and the role of KAIST from Innovation Perspective

# Introduction of Lecturer

## ■ Prof. Wonjoon Kim

- Professor, School of Business and Technology Management  
KAIST (Korea Advanced Institute of Science and Technology)
- Visiting Scholar, MIT Sloan School of Management 2018
- Visiting Scholar, MIT Engineering Systems Division 2011-2012
- Adjunct Assistant Professor, NYU (New York University) Economics Dept. 2004-2005
- Post-doctoral Research Fellow, Yale University, School of Management 2003-2005



# Introduction of Lecturer

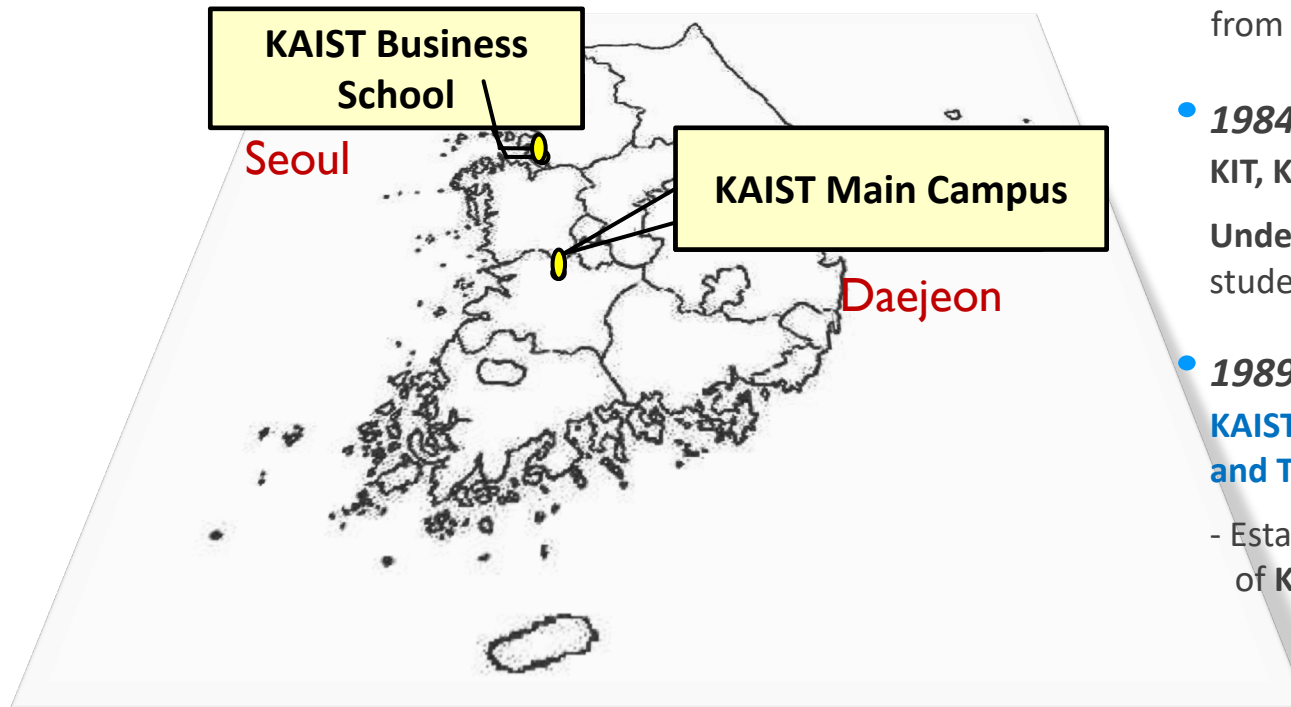
## ■ Prof. Wonjoon Kim

- Chairperson, Board of Science, Technology, and Innovation Policy, The Korean Federation of Science and Technology Societies (KOFST) (2017.3.- )
- President, Asian Innovation and Entrepreneurship Association (2013-)
- Vice President & Planning Committee Chair, The Korean Society for Innovation Management and Economics (2017-)
- Advisory Board Member of Special Committee for “The 4th Basic Plan for National Science and Technology”, National Research Foundation of Korea (NRF)
- Advisory Board of National Committee for New Growth, Korea Financial Supervisory Commission of Korea (KFSC) 2017
- Advisory Member of Special Committee for Policy for Economic Growth utilizing S&T-ICT, Presidential Advisory Council on S&T 2017





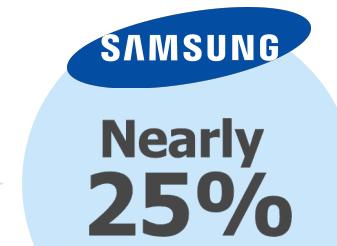
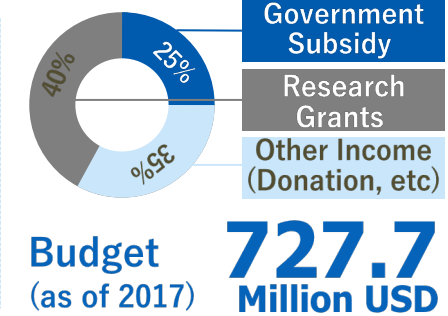
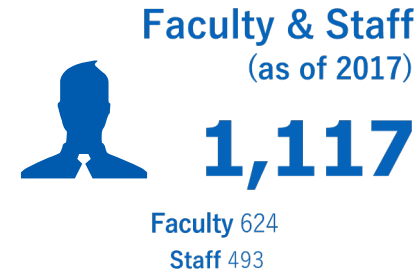
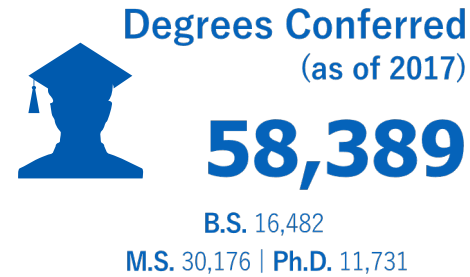
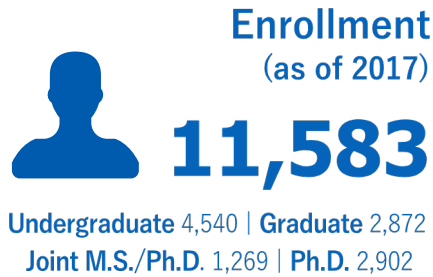
# KAIST (Korea Advanced Institute of Science and Technology)



- **1971**  
KAIS, Korea Advanced Institute of Science  
Graduate school in **Seoul** under a new law for special privileges such as exemption from compulsory military service
- **1984**  
KIT, Korea Institute of Technology  
Undergraduate school in **Daejeon** for students gifted in math and science
- **1989**  
**KAIST, Korea Advanced Institute of Science and Technology**  
- Established through the **merging** of KAIS and KIT

# KAIST Today

# Brief Statistics



2016 The World's  
Most Innovative  
Universities

2017 Asia's  
Most Innovative  
Universities

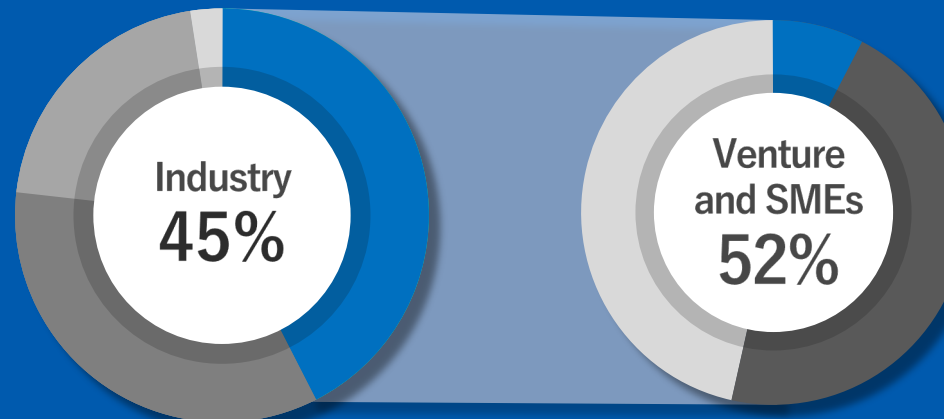
2017 QS World  
University  
Rankings

of Samsung's  
R&D workforce are  
KAIST graduates

of all Korean universities'  
engineering faculty are  
KAIST graduates

**Career Status of  
Ph.D. Graduates**  
(as of 2015)

- University Faculty: 31%
- Government and Public Institution: 21%
- Overseas Residence: 3%



Belong to SMEs  
and Venture  
1700 persons

**20%**  
Working as CEO

# KAIST History



70's

1971

KAIST established as a nation's first research university

1975

First commencement ceremony for Graduate School students

Supporting the nation's industrial development



*High-powered laser developed for the first time in Korea*



80's

1982

Constructed the nation's first Internet, the System Development Network (SDN)

1989

Developed Korea's first satellite, KITSAT-1

Nurturing self-reliance in science and technology



*Electronic photo typesetting system*



90's

1995

Developed Korea's first Supercomputer, Hanbit-1

1997

Established nation's first Artificial Intelligence Research Center(CAIR)

Increasing the national prestige



*Launches of satellites Kitsat-1, 2 & 3*



00's

2008

Dr. So-Yeon Yi(Bio & Brain Eng.) the First Korean Astronaut

2009

Developed wirelessly charged Electric Bus

Leading the high-tech advancement



*Developed the first humanoid robot of Korea, HUBO*

# Introduction to KAIST – Overview



On its inaugural listing of  
**Top 100 World's  
Most Innovative Universities,**  
**KAIST was ranked at 10th Place**

**Only** non-US university within top 10

The Reuters Top 100: The World's Most Innovative Universities



- 1 Stanford University
- 2 Massachusetts Institute of Technology (MIT)
- 3 Harvard University
- 8 University of Wisconsin System
- 9 University of Pennsylvania
- 10 Korea Advanced Institute of Science & Technology (KAIST)



# Introduction to KAIST – Overview



6<sup>th</sup> in 2016, 2017

## TOP 100 UNIVERSITIES | 2016 RANKINGS

1	Stanford University
2	Massachusetts Institute of Technology (MIT)
3	Harvard University
4	University of Texas System
5	University of Washington System
6	KAIST
7	University of Michigan System
8	University of Pennsylvania

## TOP 100 UNIVERSITIES | 2017 RANKINGS

1	Stanford University	USA
2	Massachusetts Institute of Technology (MIT)	USA
3	Harvard University	USA
4	University of Pennsylvania	USA
5	KU Leuven	Belgium
6	KAIST	South Korea
7	University of Washington	USA
8	University of Michigan System	USA



## TOP UNIVERSITIES | 2018 RANKINGS

- |   |   |
|---|---|
| 1 | KAIST   |
| 2 | University of Tokyo                                 |
| 3 | Pohang University of Science & Technology (POSTECH) |
| 4 | Seoul National University                           |
| 5 | Tsinghua University                                 |
| 6 | Osaka University                                    |
| 7 | Kyoto University                                    |
| 8 | Sungkyunkwan University                             |

## Asia Pacific's Most Innovative Universities – 2018

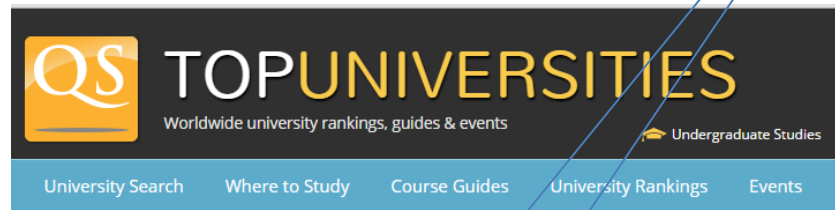
David M. Ewalt

9 MIN READ



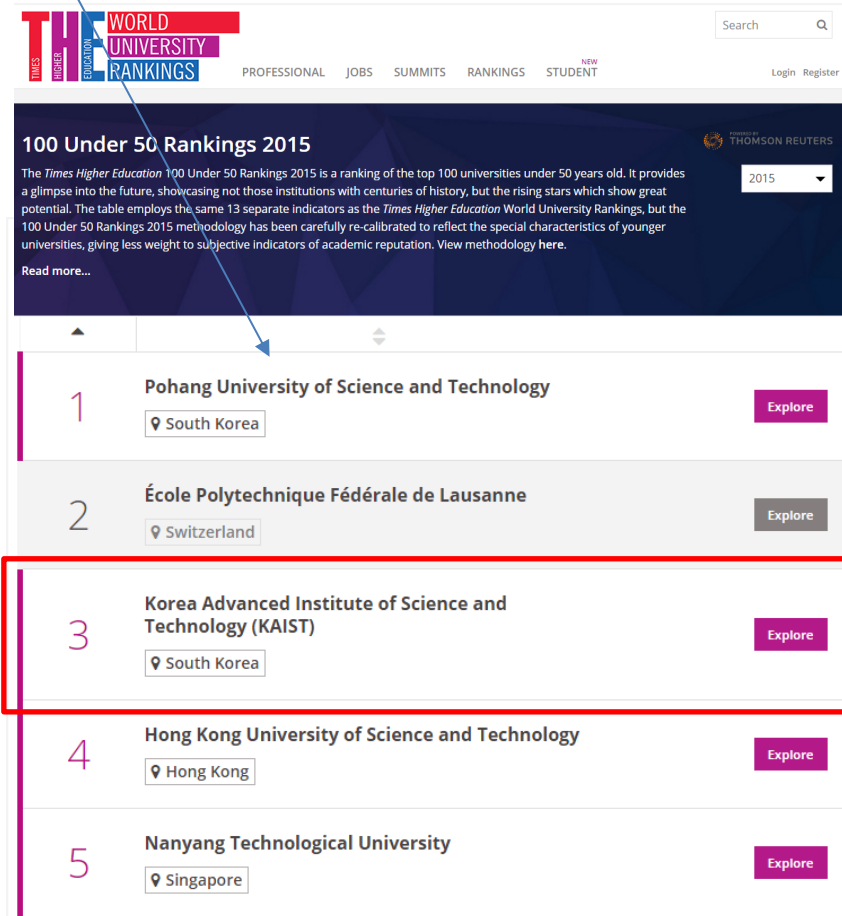
The most innovative university in the region, for the third consecutive year, is South Korea's KAIST. Formerly known as the Korea Advanced Institute of Science and Technology, it is the nation's oldest research-oriented science and engineering university, with campuses in Daejeon, Seoul and Busan. Established in 1971 by the Korean government, KAIST was modeled after engineering schools in the United States, and offers most of its courses in English.

## Why KAIST?



### QS University Rankings: Top 50 Under 50 2015

University Rankings			Rankings Indicators	
QS Top 50 Under 50				
# RANK	UNIVERSITY	LOCATION	COMPARE	STARS™
2018 ▾	University search	By location ▾		<input type="checkbox"/> Rated only
1	Nanyang Technological University, Singapore (NTU) <a href="#">More</a>	Singapore	<input type="checkbox"/>	5★ RATING
2	The Hong Kong University of Science and Technology <a href="#">More</a>	Hong Kong	<input type="checkbox"/>	
3	KAIST - Korea Advanced Institute of Science & Technology <a href="#">More</a>	South Korea	<input type="checkbox"/>	
4	City University of Hong Kong <a href="#">More</a>	Hong Kong	<input type="checkbox"/>	5★ RATING



# How could Korea Catch up?

- **Historical traits explain current and future innovation direction of Korea**

1960-1970



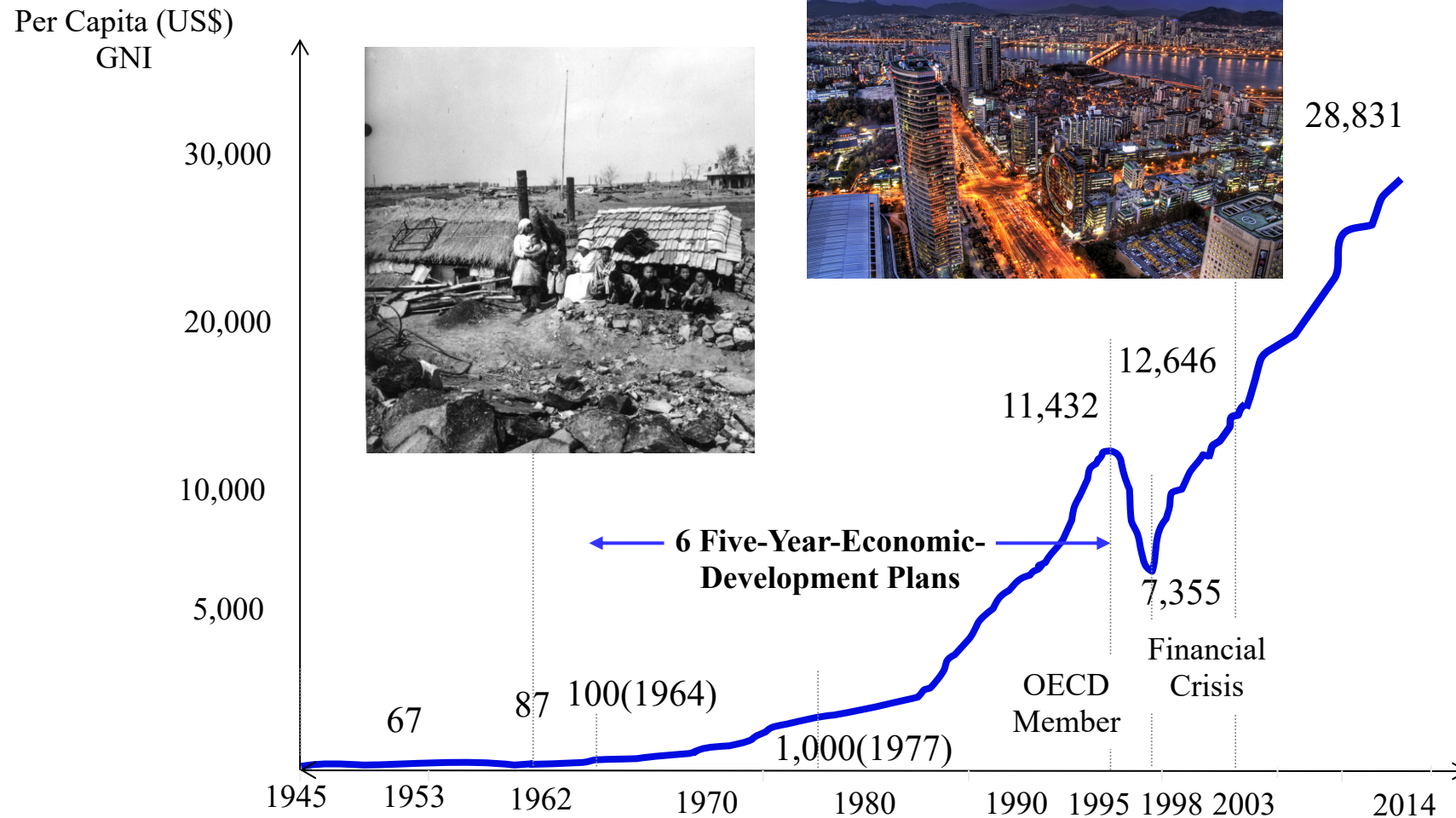
2019



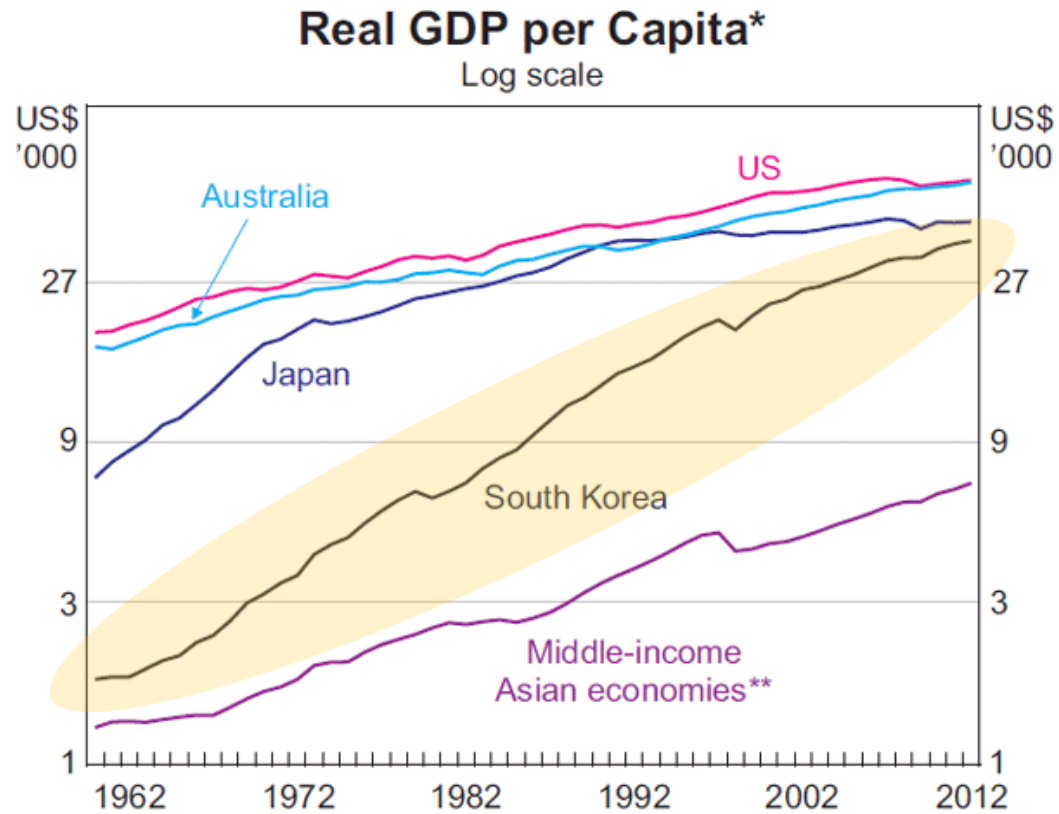
**South Korea**



# How could Korea Catch up?



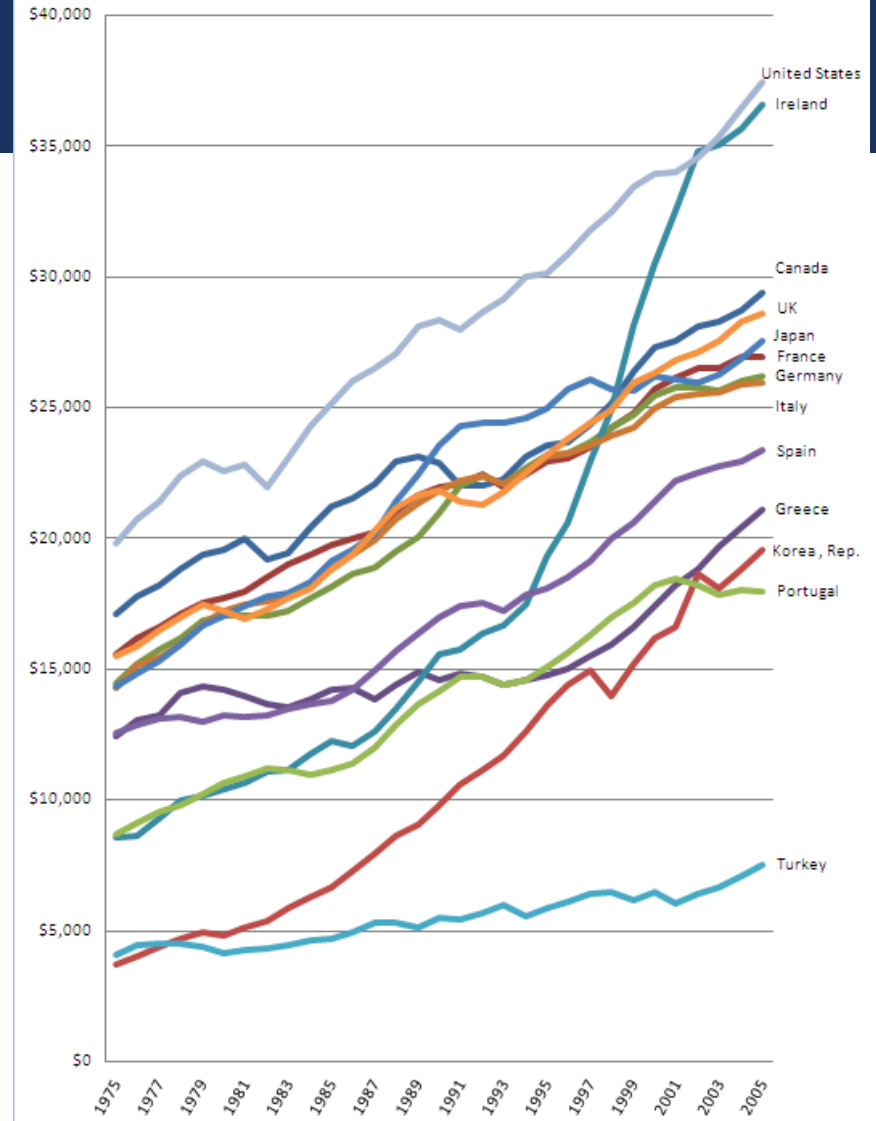
# Korean Economic Growth



\* 2012 prices converted at 2005 PPP exchange rates

\*\* Indonesia, Malaysia, Philippines and Thailand

Sources: Conference Board; Penn World Table Version 7.1; RBA



The graph above is the GDP Per Capita in Selected OECD countries. Purchasing Power Parity (PPP) converted constant 2000 international US \$. Source is World Bank World Development Indicators

# Economic Growth?

## ■ Climbing up the ladder of Global Value Chain (GVC)?

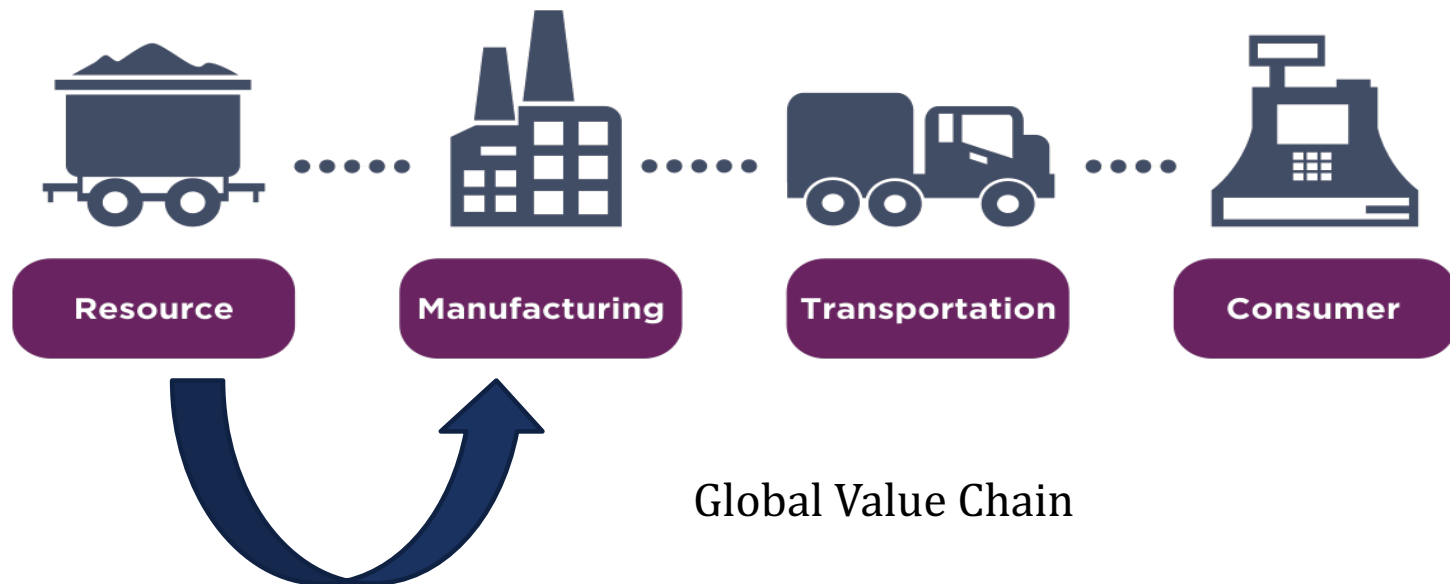
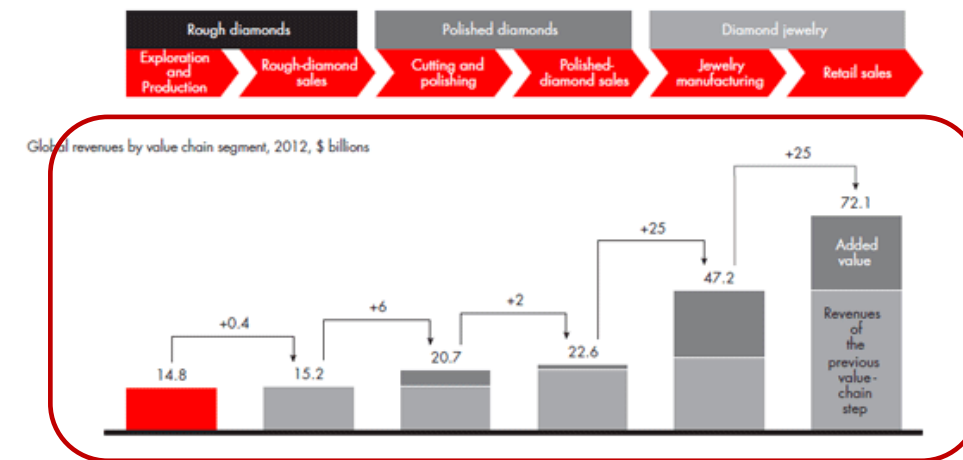


Figure 7.4: The greatest add to value comes in jewelry manufacturing and retail sales



Note: Jewelry manufacturing value is estimated as approximately 65% of retail sales based on the historic average  
Source: IDEX, Tacx Ltd. and Chaim Even-Zohar

# How could Korea Catch up?

- **Two Industrial Strategies (Policies) for Successful Catch-up**
  - **Incremental Innovation Strategy:** Upgrading of Existing Industry
  - **Radical Innovation Strategy:** New Industry Creation with High Value Added

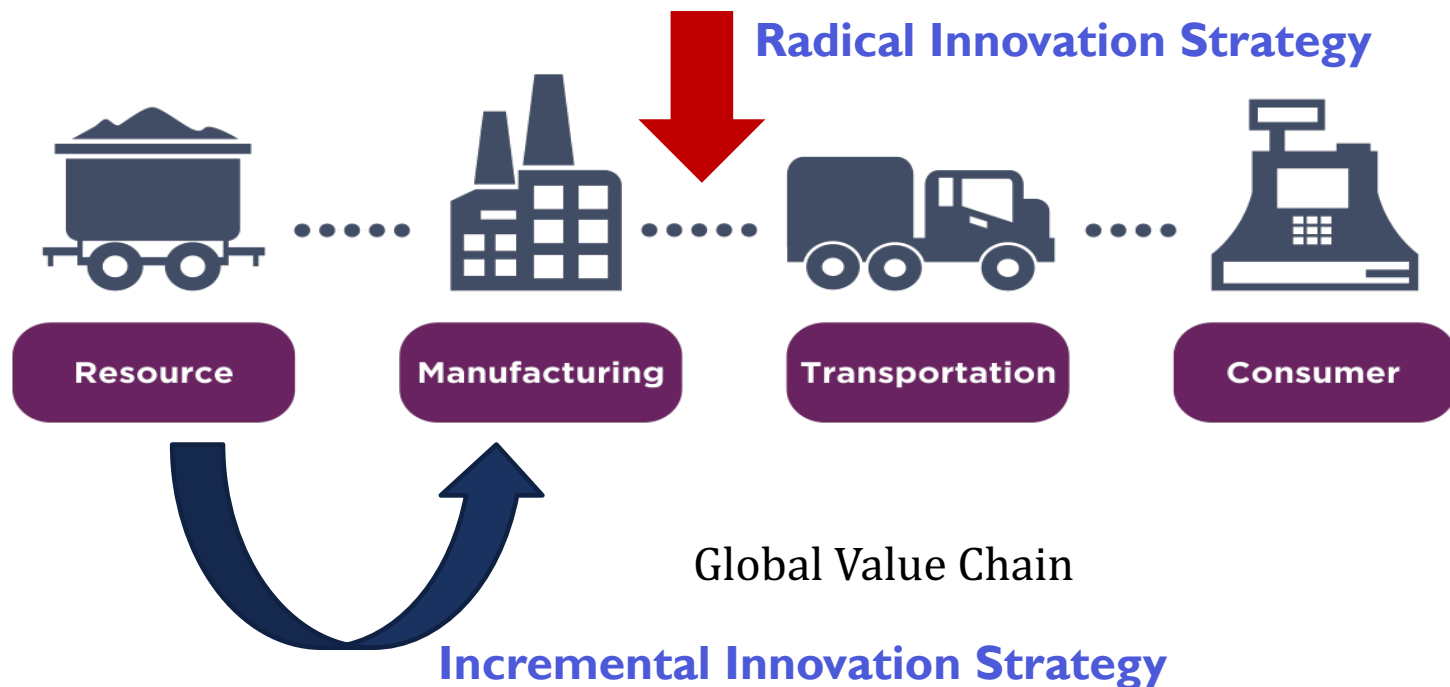
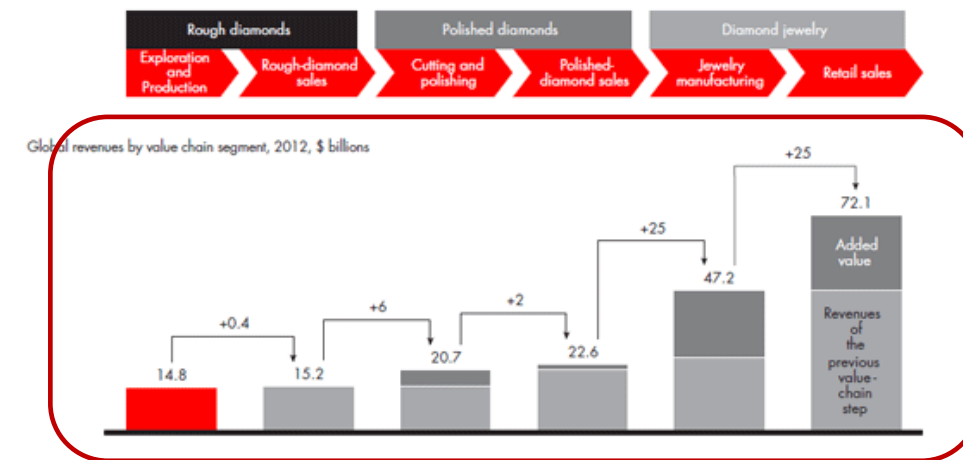


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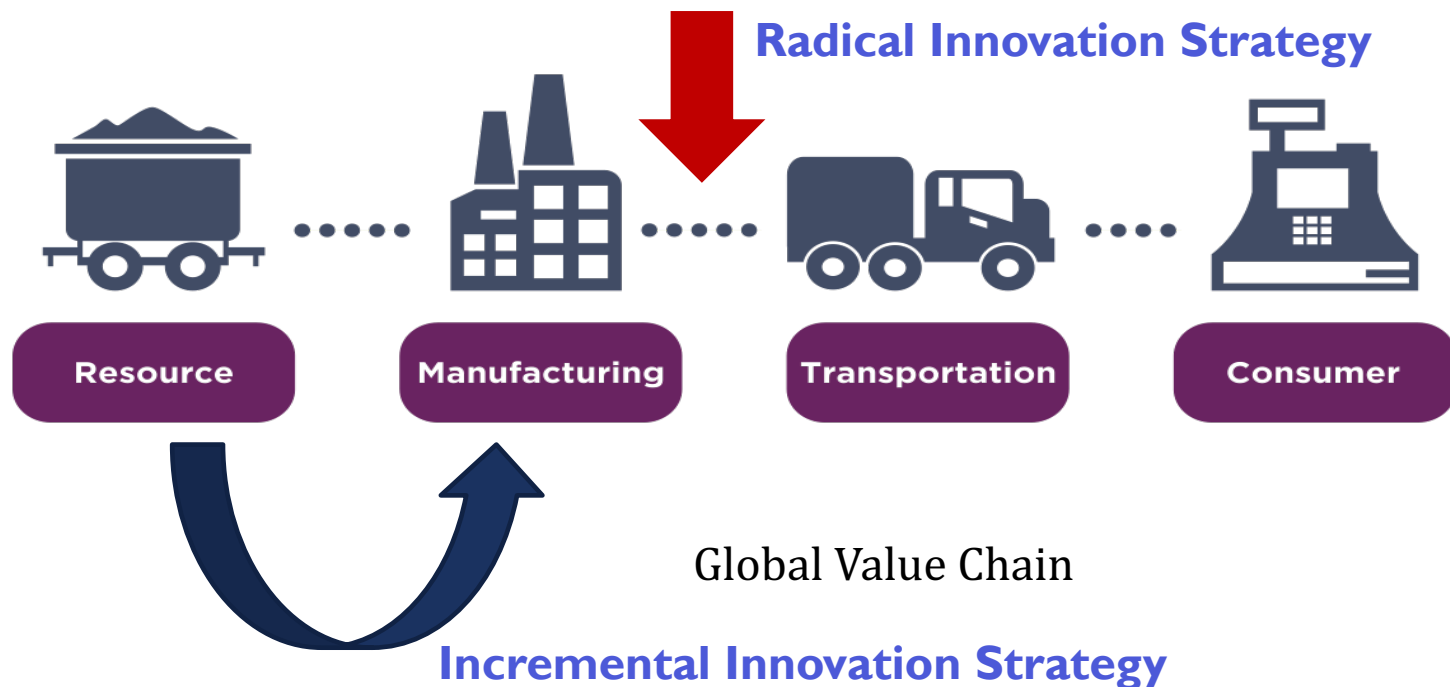
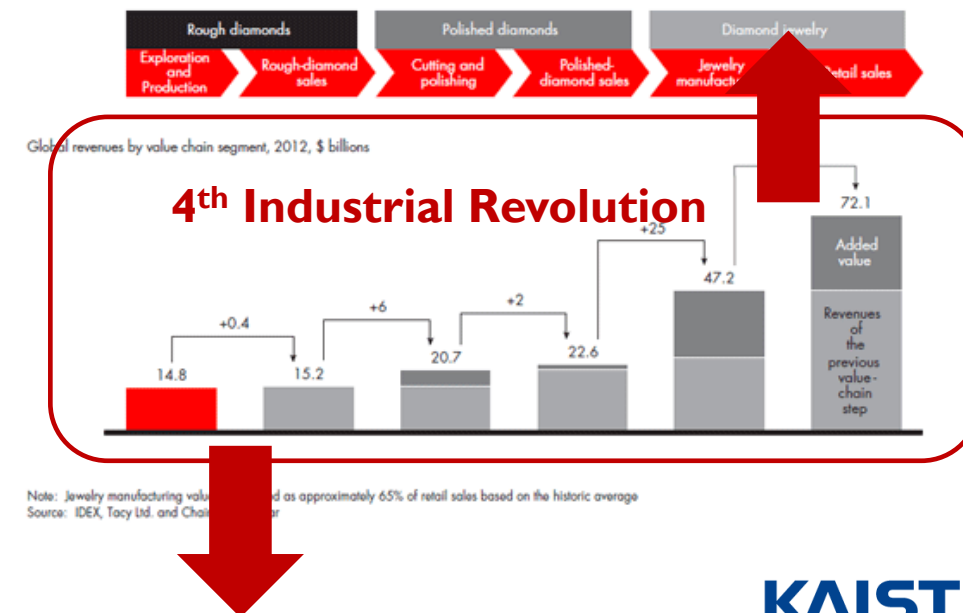


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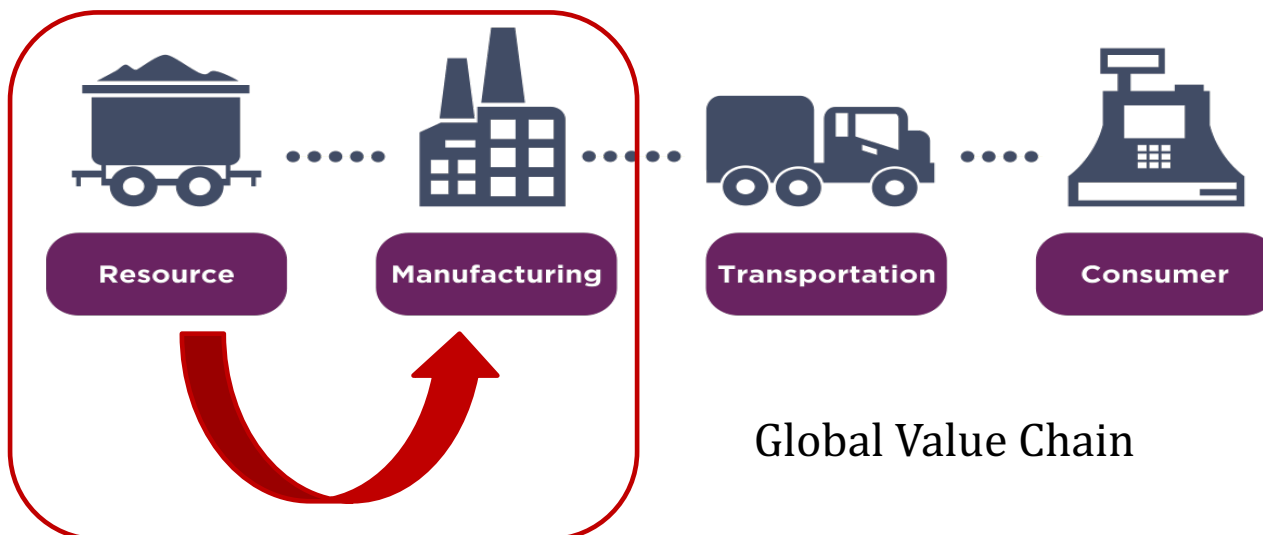


# How could Korea Catch up?

## ■ Two Industrial Strategies (Policies) for Successful Catch-up

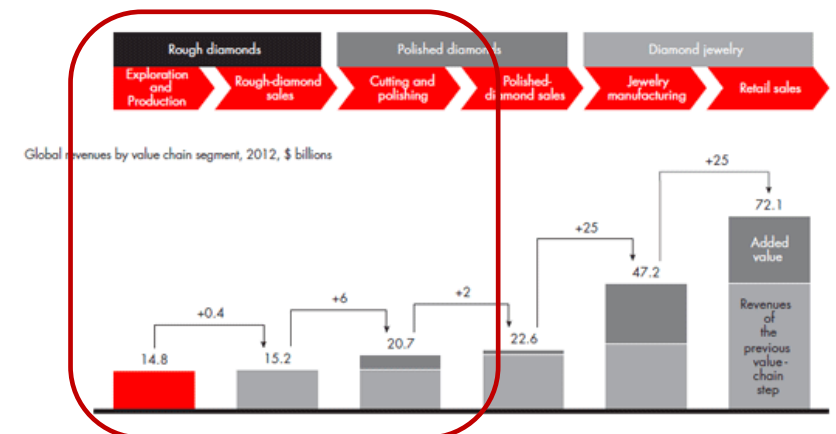
### ■ Incremental Innovation Strategy: Upgrading of Existing Industry

- Low-risk and low-return
- Low capital cost
- Many developing countries: Agriculture, Simple Manufacturing
- OEM (Own-Equipment Manf.) => ODM (Own-Design Manf.) (=> OBM (Own-Brand Manf.))



Global Value Chain

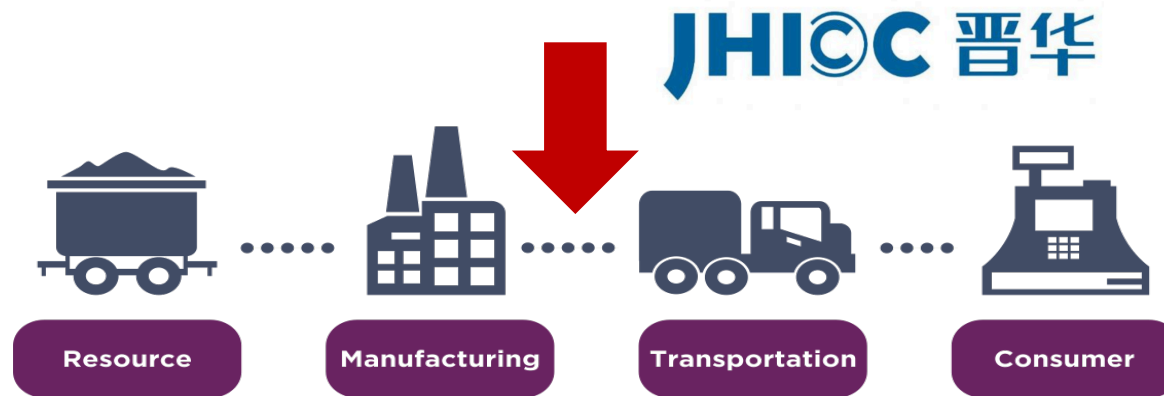
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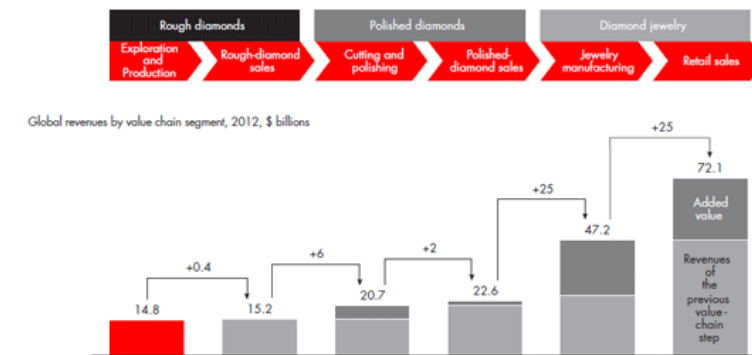
- **Two Industrial Strategies (Policies) for successful catch-up**
  - **Radical Innovation Strategy:** New Industry Creation with High Value Added
    - High-risk and high-return
    - High capital costs (High political commitment)
    - Only a few countries (China, Korea, Israel, Taiwan)



Global Value Chain



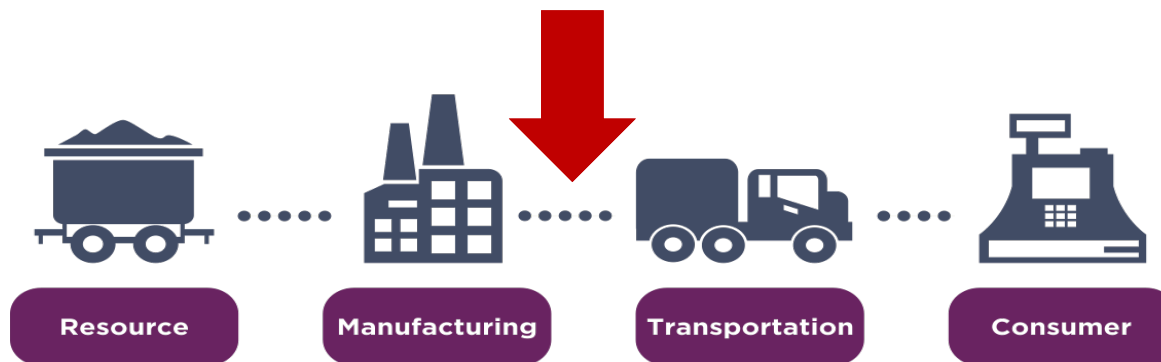
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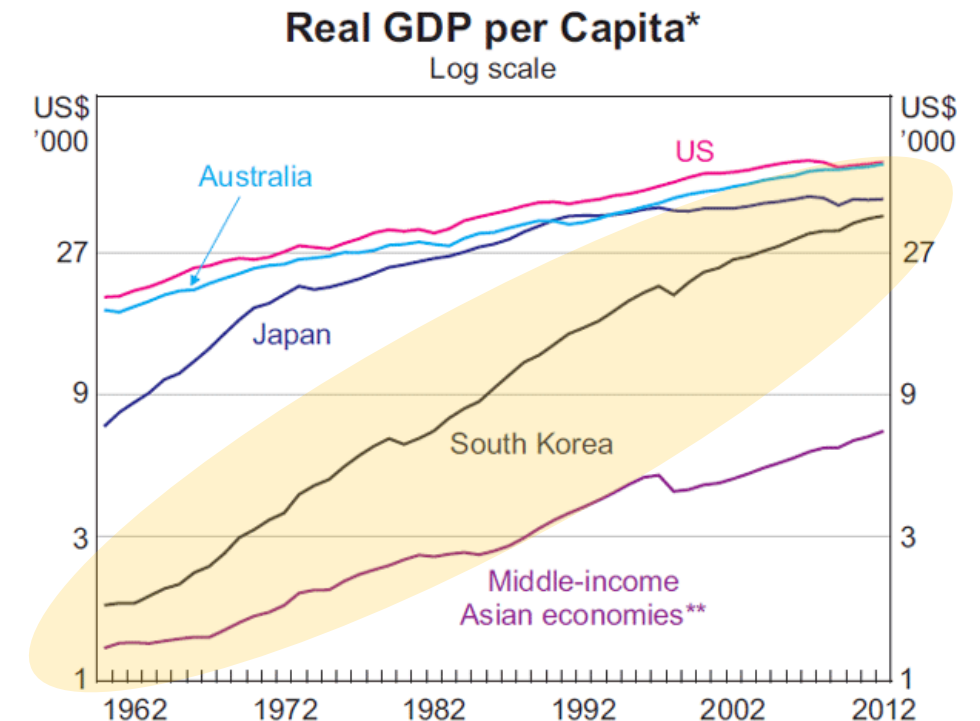
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    - Only a few countries (China, Korea, Israel, Taiwan)
    - **“Korea”**



Global Value Chain



\* 2012 prices converted at 2005 PPP exchange rates

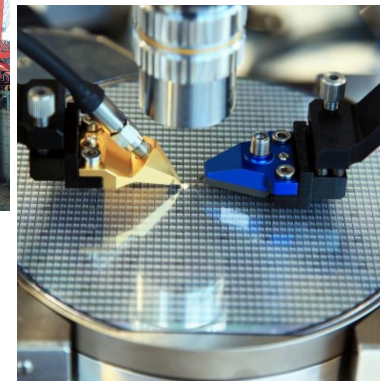
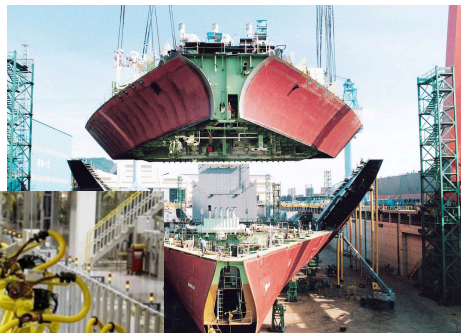
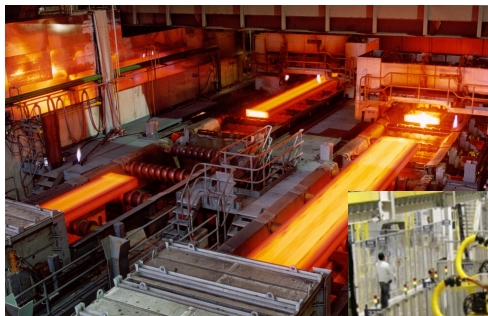
\*\* Indonesia, Malaysia, Philippines and Thailand

Sources: Conference Board; Penn World Table Version 7.1; RBA



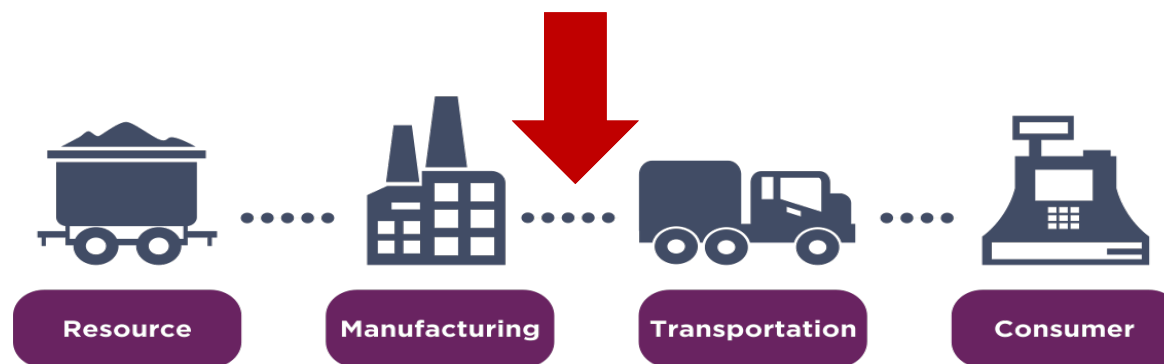
# How could Korea Catch up?

- **Two Industrial Strategies (Policies) for successful catch-up**
  - **Radical Innovation Strategy:** New Industry Creation with High Value Added
    - High-risk and high-return
    - High capital costs (High political commitment)
    - Only a few countries (China, Korea, Israel, Taiwan)
    - **“Korea”: Steel, Automobile, Ship Building, Electronics, Heavy Chemical Industries**

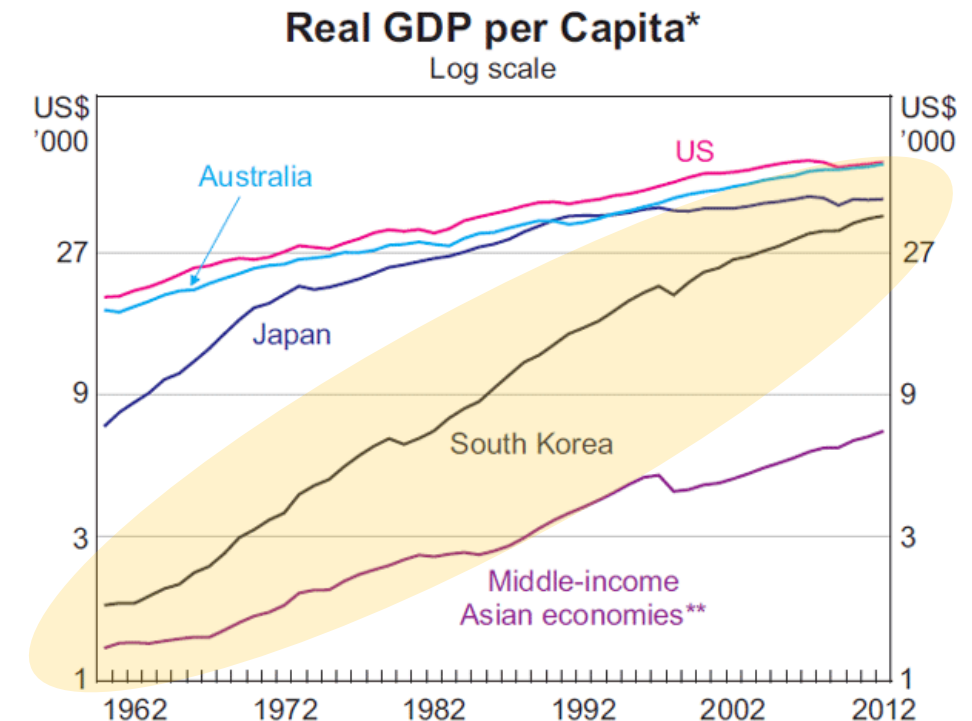


# Catching-up Strategy of Developing Nations

- **When is it possible?**
  - **Windows of Opportunity**
  - **Absorptive Capacity**
  - **Unique Innovation Strategy**



Global Value Chain



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Sources: Conference Board; Penn World Table Version 7.1; RBA

# Catching-up Strategy and Higher Education

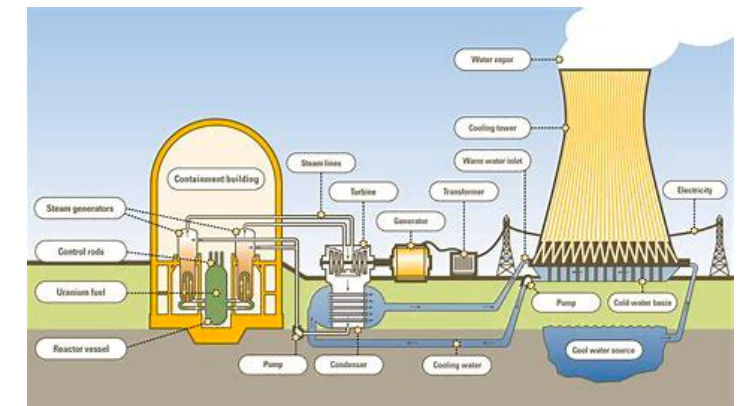
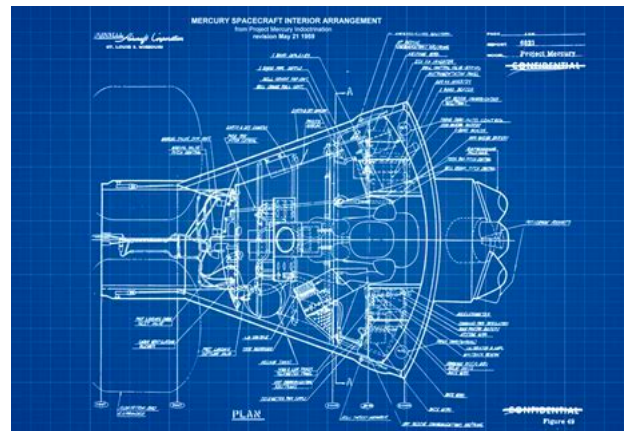
## ■ When is it possible?

### ■ Windows of Opportunity

- High Frequency of Innovation
- High Fluidity of Technological Trajectory
- Low Tacitness of Knowledge

### ■ Absorptive Capacity

### ■ Unique Innovation Strategy



# Catching-up Strategy and Higher Education

- **When is it possible?**

- Windows of Opportunity

- Absorptive Capacity

- National capacity to understand advanced knowledge and to internalize them into its own innovation

- Through what activity can we build the capacity?

- “Research & Development”

- “Research (University) & Development (Industry)”

- Which actor can build the capacity?

- Higher Education (University), esp. Research-oriented University - KAIST

- Government Research Institutions (GRI) – KIST

- Unique Innovation Strategy



# Catching-up Strategy and Higher Education

Leadership  
(Government)

Physical Capital  
(Technology)



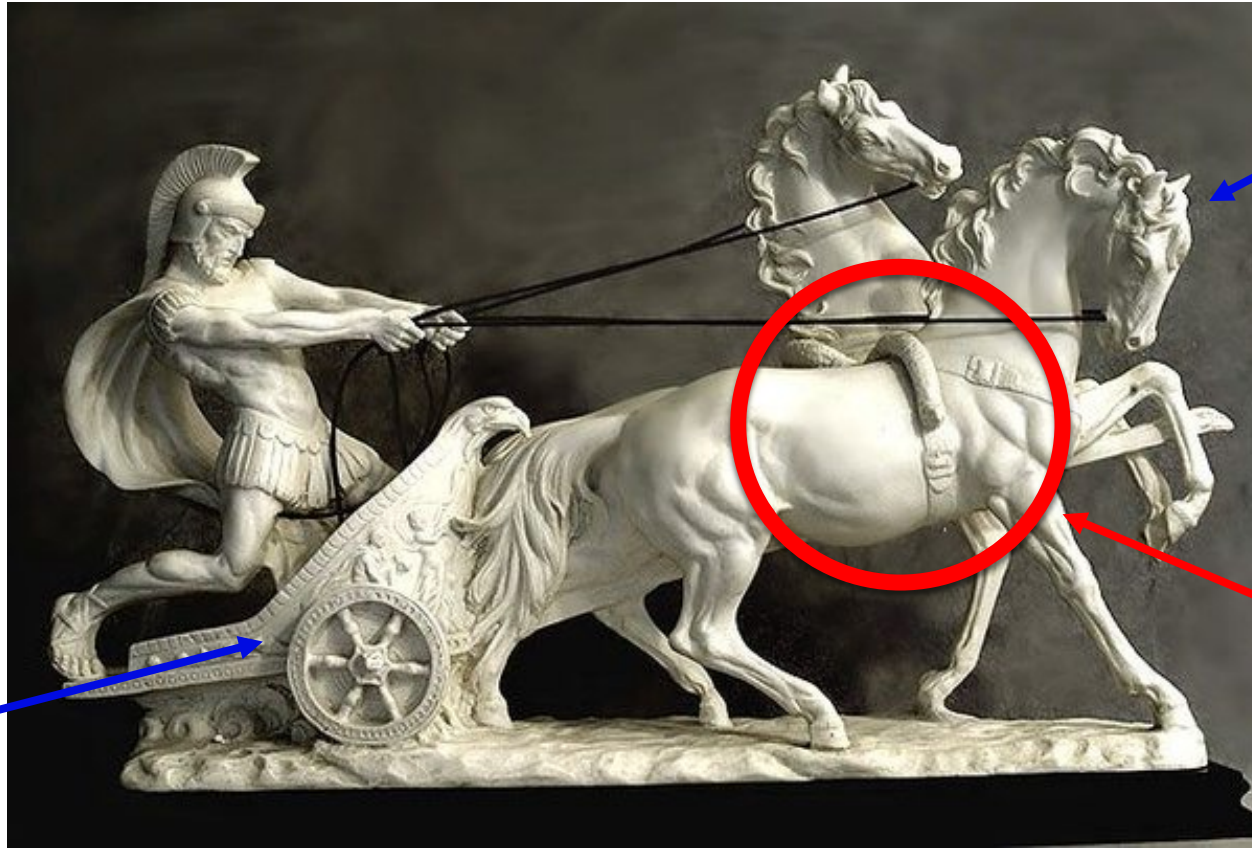
Human & Intellectual  
Capital (Labor)



# Economic Growth and University-Industry Collaboration

Leadership  
(Government)

Physical Capital  
(Industry)



Human & Intellectual  
Capital (University)

University-Industry  
Collaboration

# Korea's Economic Growth and University-Industry Collaboration

- **“Radical” Innovation Strategy of Korea**
  - **National Industry Strategy for High & Sequential Impact**
    - Strategic selection of key industries: Easy to catch up, high value potential
      - Steel, Automobile, Ship building, Electronics, Heavy Chemical
    - Export-driven industry development
  - **National Strategy for Human Resource and R&D**
    - Strategic support of technological innovation of key industries through government research institution (KIST)
    - Industry-oriented human resource development (KAIST)



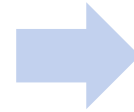
# Korea's Economic Growth and University-Industry Collaboration

- KIST provided key technologies for strategic industries like automobile, steel, electronics, ship building, chemical industries

Dr. Hyung Sub Choi



Dr. Zae Quan Kim



"KIST only hires researchers who will support technology innovation of industry. Those who want to do basic research, please find other positions in other places. Because we do this industry-oriented research now, our future generations will be able to do basic research and receive Nobel prize in the future."

# Korea's Economic Growth and University-Industry Collaboration

- KAIST provided key human resources for industry to scale up innovations
  - **KAIST played the major role of breaking through the innovation barriers of Korea in 1970-80 and provided high quality human resources for innovation in Korea**
    - President Junghee Park pushed its establishment and provided unique role
    - National law only for KAIST securing its independence and supports
    - All students are supported by Government Scholarship
    - Military exemption for all PhDs
  - **Currently, KAIST is still leading the innovation of Korean education systems with various innovative systems and research**
    - Top 1% of Korean high school students enter KAIST





# KAIST History



## 70's

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KAIST established as a nation's first research university

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First commencement ceremony for Graduate School students



## 80's

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Constructed the nation's first Internet, the System Development Network (SDN)

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*Launches of satellites KITSAT-1, 2 & 3*

Leading the high-tech advancement



*Developed the first humanoid robot of Korea, HUBO*



# Key Lessons from KAIST

1. Strong political will of the government
2. Strong external support in early periods
3. High level of independence
4. Acquisition of highly talented faculty members
5. Acquisition of highly talented students
6. Active interaction with industry
7. Unique cultural code

# Key Lessons from KAIST

## I. Strong political will of the government

- Then President Jung-hee Park deeply acknowledged the need for a new science and technology university in order for the development of high-tech-based economy
- Thanks to President Park's strong will, KAIST enjoyed unprecedented prerogatives: secure government funding & independence from the Ministry of Education
- It is tradition that Korea's President participate in the KAIST Graduation Ceremony

# Key Lessons from KAIST

## 2. Strong external support in early periods

USAID contributed to the establishment of KAIST in 4 ways:

### 1. Emphasis on the need of a new sci & tech university

- USAID, together with Dr. Geun-mo Jung of Korea, emphasized on the need of a new university for future Korean economy to Korean government

### 2. Development of KAIST's blueprint

- USAID sent a group of scholars to Korea for a feasibility study and they later submitted 2 reports. The first report dealt with the realizability of KAIST; the second report contained the design of KAIST.

### 3. Financial support

- USAID lent 6 million dollars as a long-term and low-interest loan

### 4. Continued advice and evaluation of performance

- KAIST was required to submit 5-year plans of university operation to USAID
- USAID offered continued advice to KAIST after it was established

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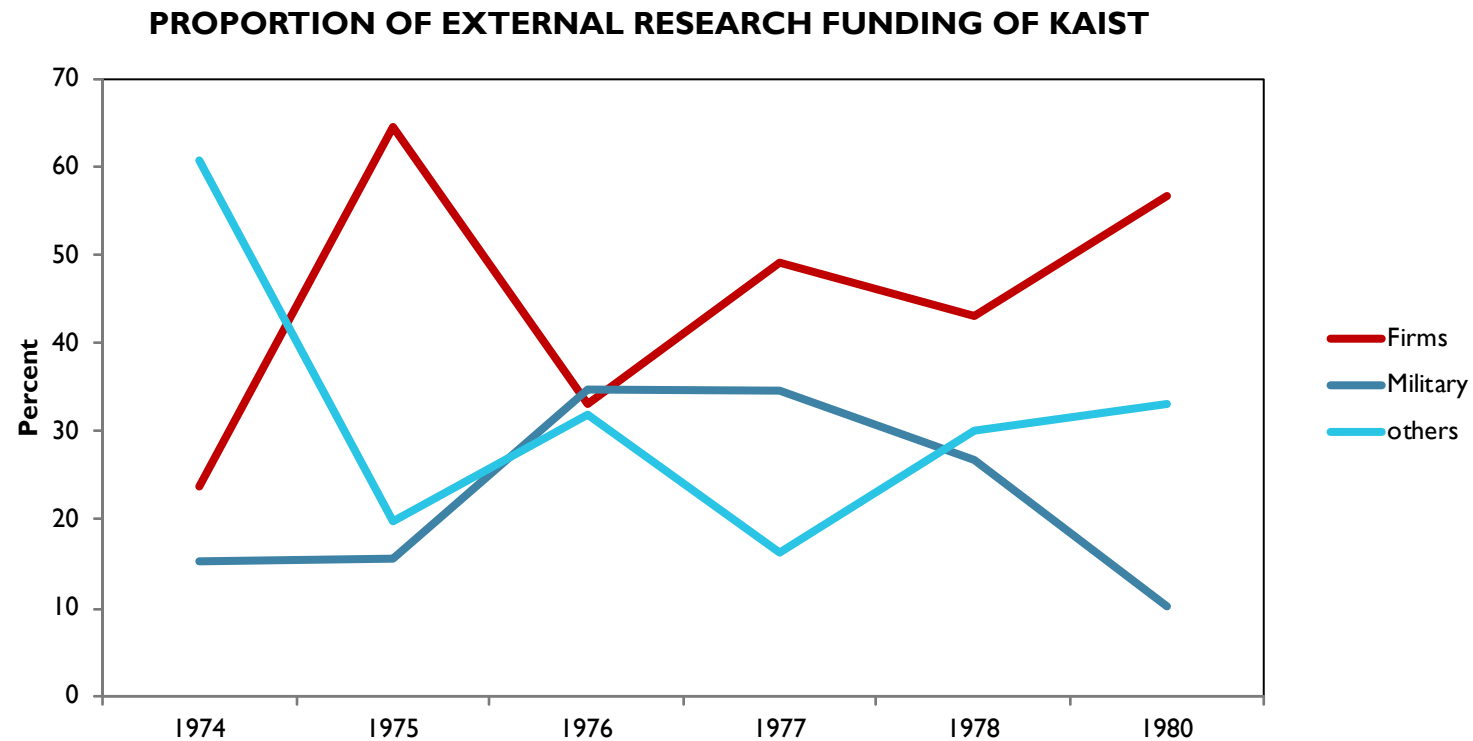
## 6. Active interaction with industry

- Original vision of KAIST: to educate students specifically for 'Korean' Industry development at that time
- Education of high-quality human resource who are apt to the request of industry. This will secure the important and unique collaboration with industry sector
  - Industry Scholarship Program



# Key Lessons from KAIST

## 6. Active interaction with industry



## Key Lessons from KAIST

- Two big national spending on EDUCATION and INDUSTRY can create synergy or not depending on how well **university and industry collaborate** in education and research
- Aligning “Industry Development Strategy” and “Higher Education and R&D Strategy” is the key to successful industrial transformation and upgrading in the global value chain
- To develop competent university in science and technology, aligning its development direction with the need of industry is important
- Breaking the organizational inertia (rigidness) of existing organizations with new one, if possible
- Other lessons



Thank you!