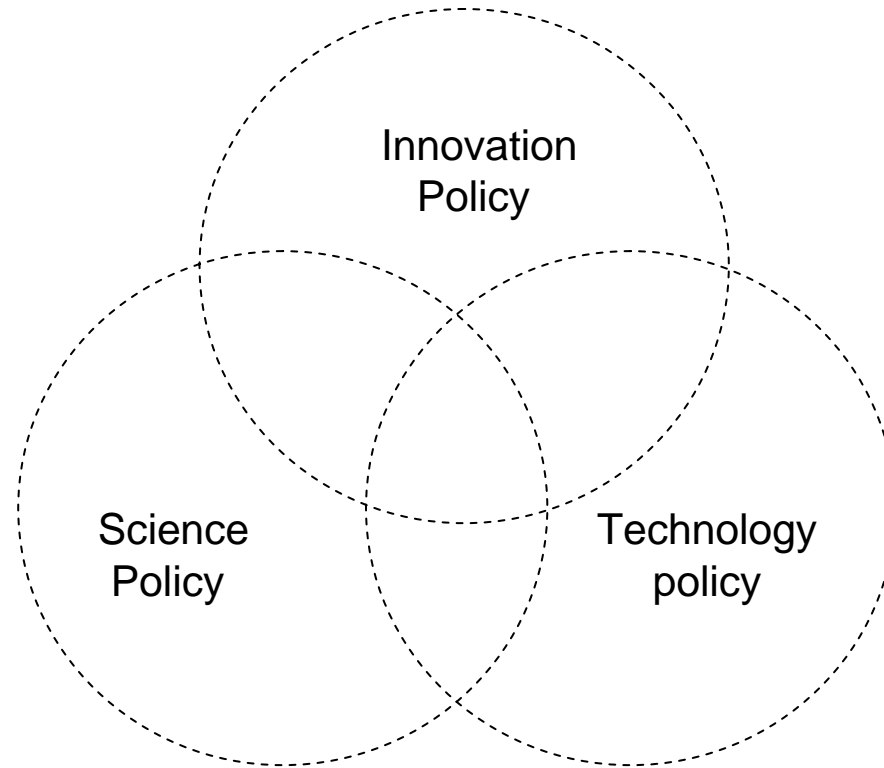


# Innovation policy and the innovative capabilities of firms

Mark Dodgson

# What is innovation policy?



## *Science Policy*

Scientific education.

Research in universities  
& government labs.

Basic research.

## *Technology Policy*

Support for the creation of  
*strategic* or *generic*  
technologies, eg IT, biotech.

Development of technology  
infrastructure eg ISDN.

## *Innovation Policy*

Firm-level focus aimed  
at building innovative  
capabilities.

Network building.

# What are innovative capabilities?

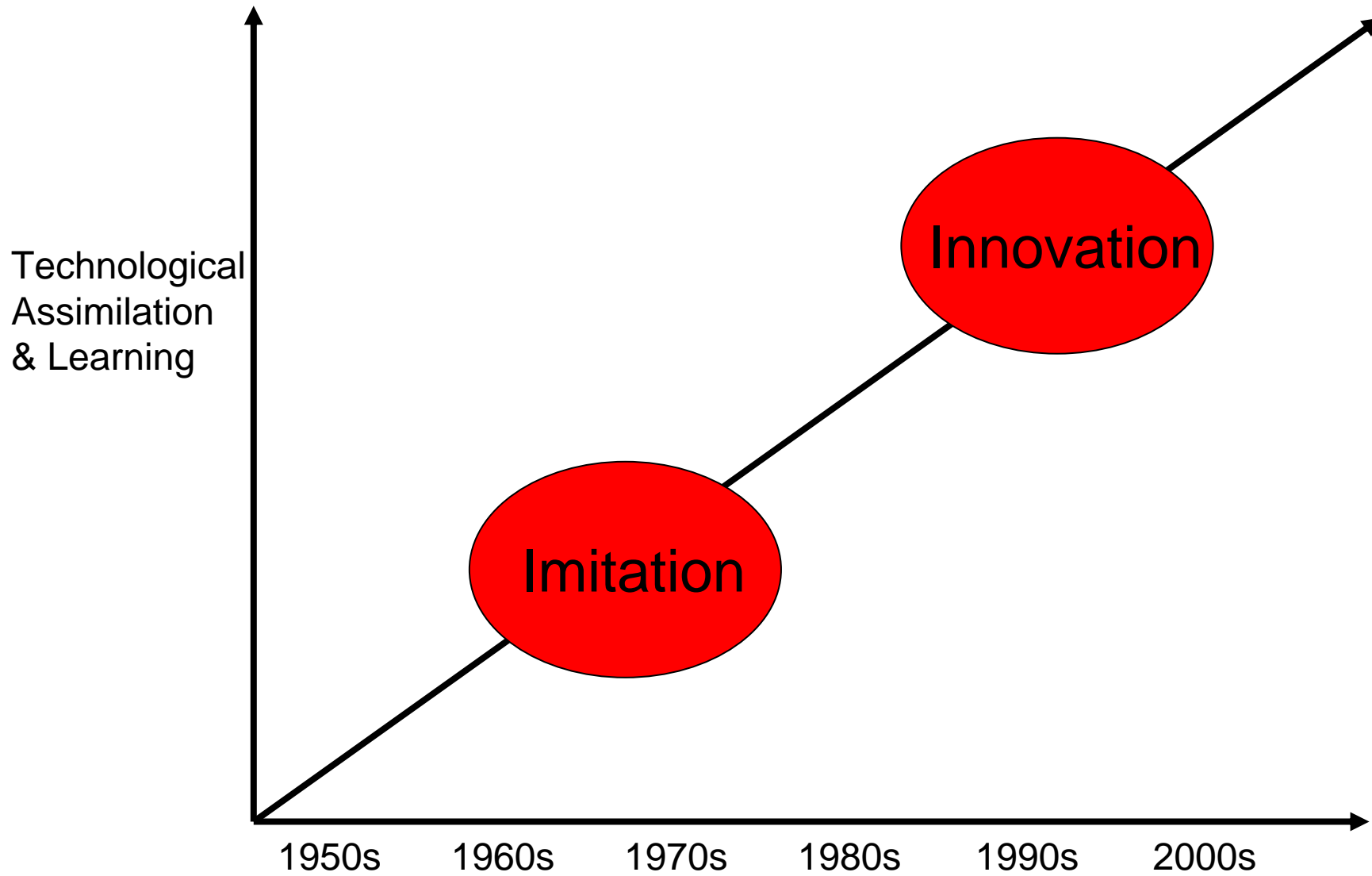
All the knowledge & skill in a firm that enable it to reconfigure its resources to create value in new ways

**e.g.**

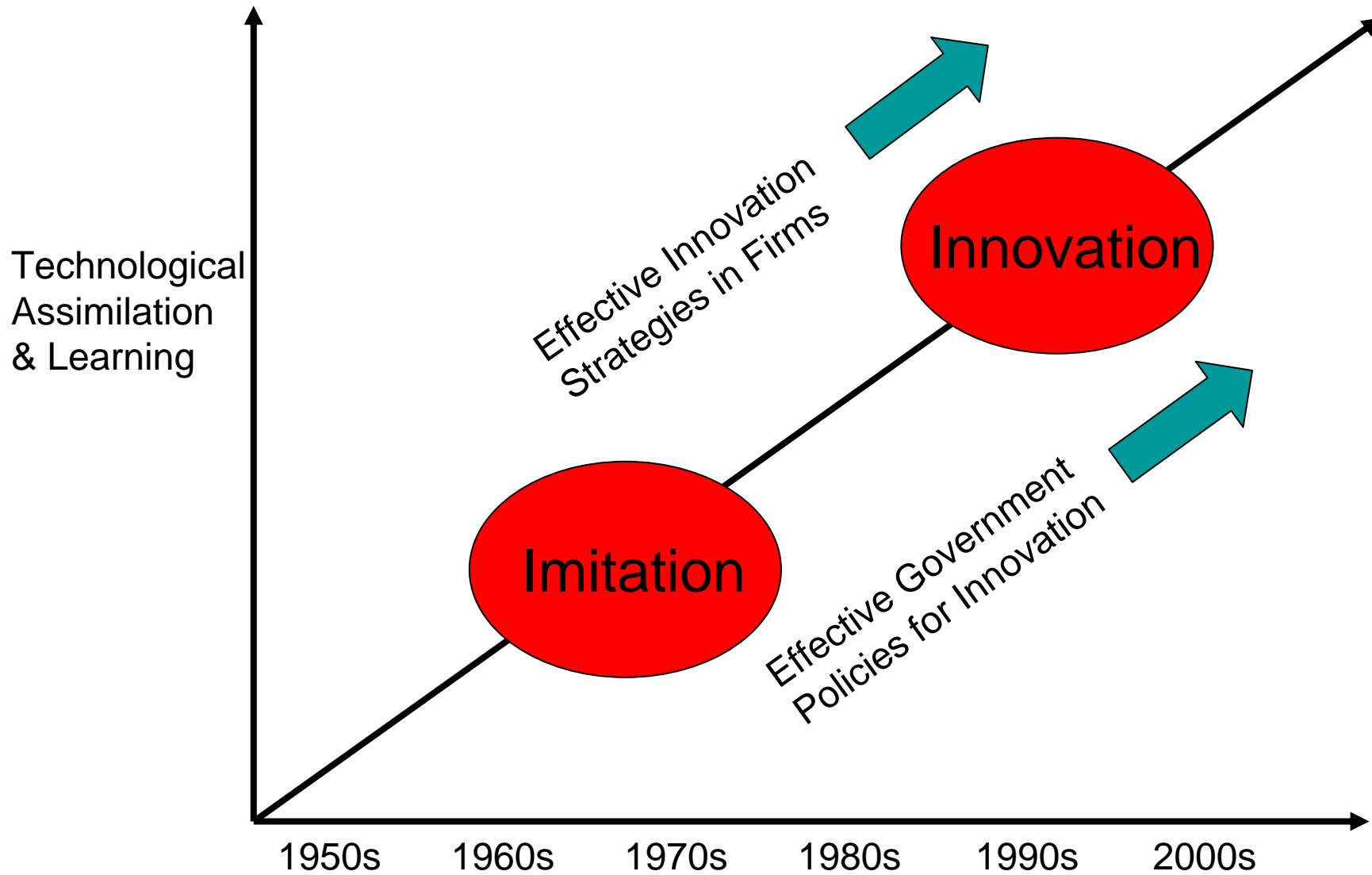
- *Forecasting*
- *Searching*
- *Acquiring*
- *Protecting*
- *Integrating*
- *Implementing*

**Learning and leverage play critical roles**

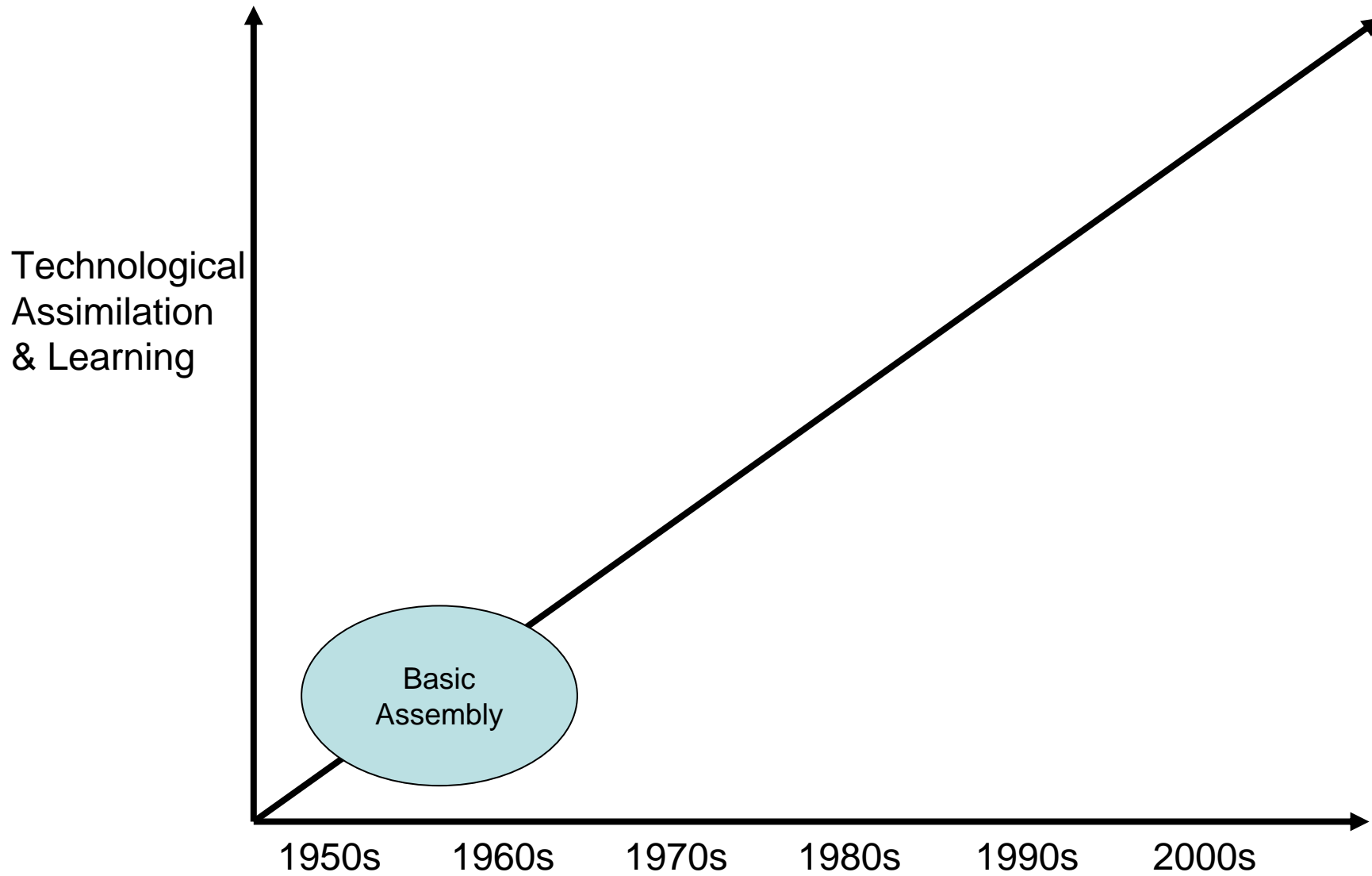
# Strategic Learning Trajectory in East Asia



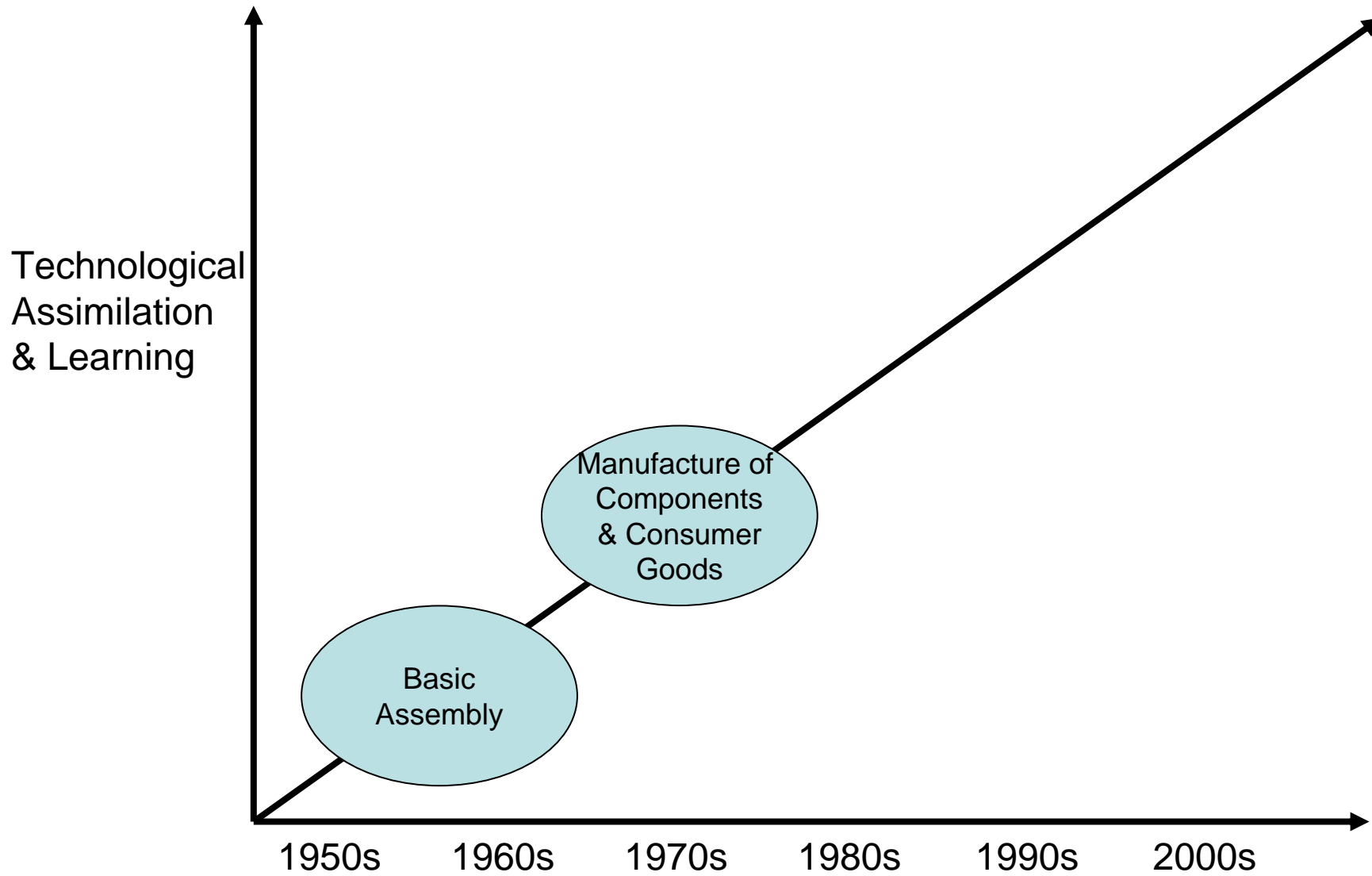
# Strategic Learning Trajectory in East Asia



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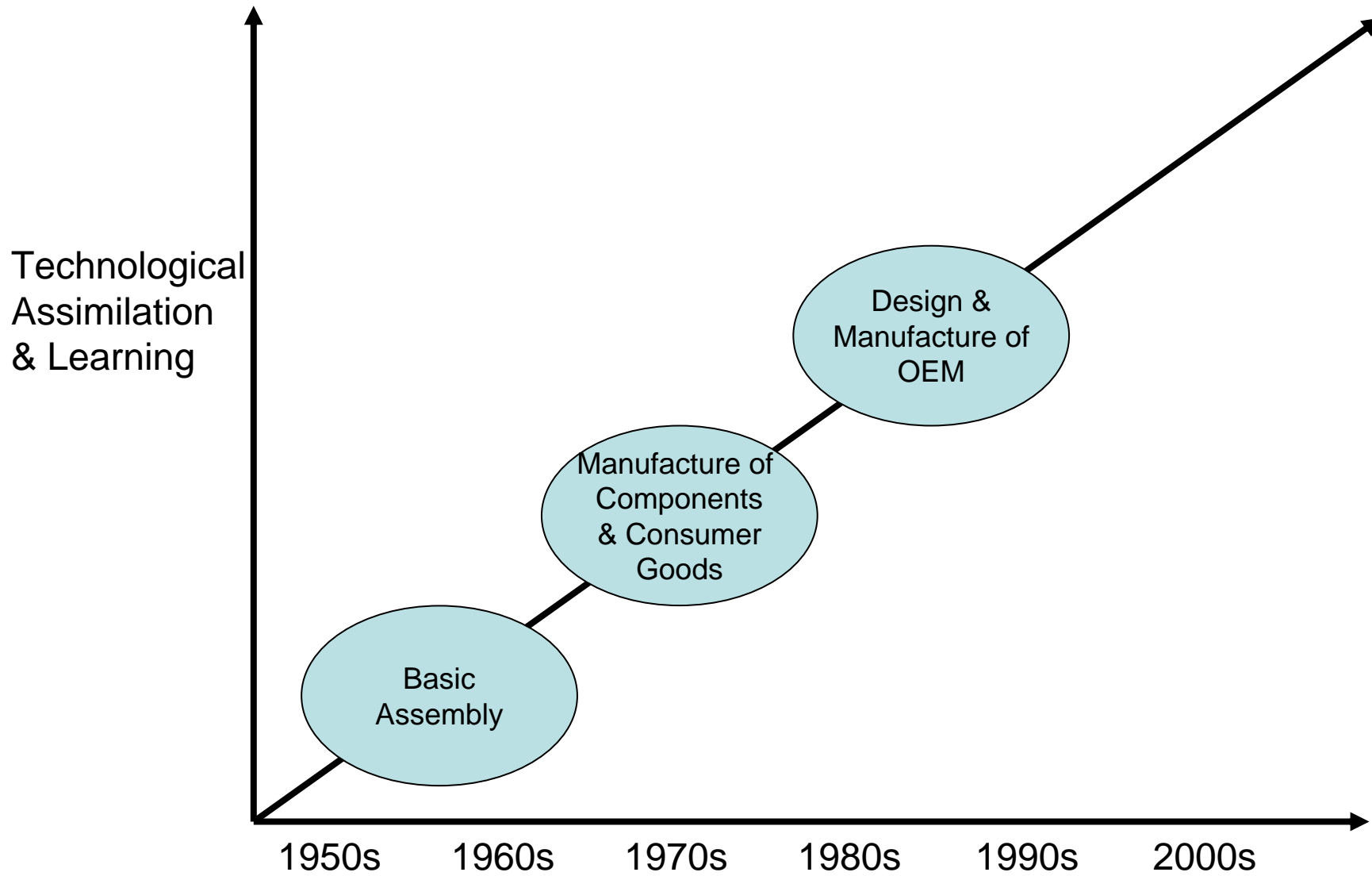


# Strategic Learning Trajectory in East Asia

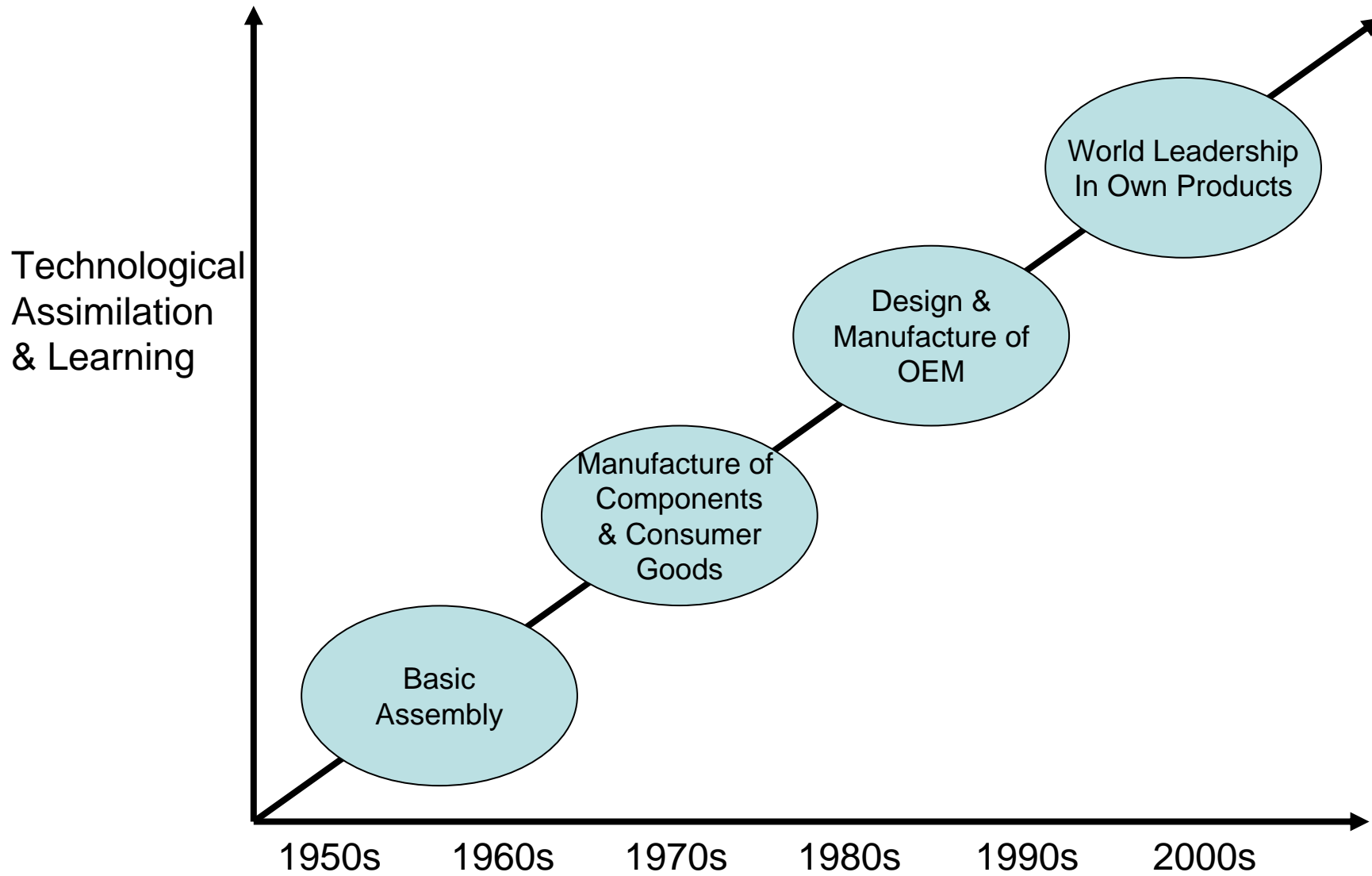




# Strategic Learning Trajectory in East Asia



# Strategic Learning Trajectory in East Asia



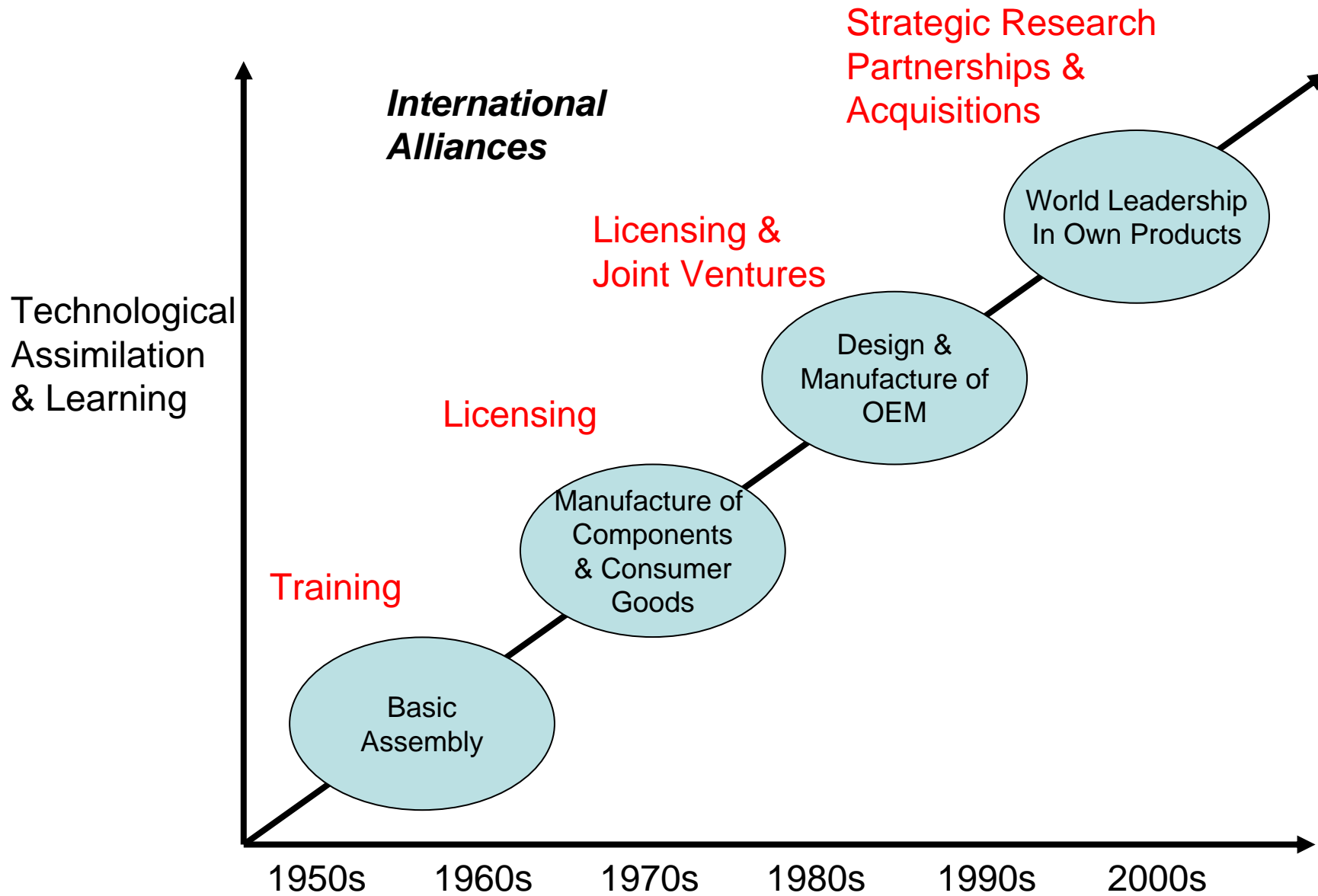
# Models of leverage & learning

*Model A* – Indigenous large firms

*Model B* – Clusters of small firms combined with public sector agencies

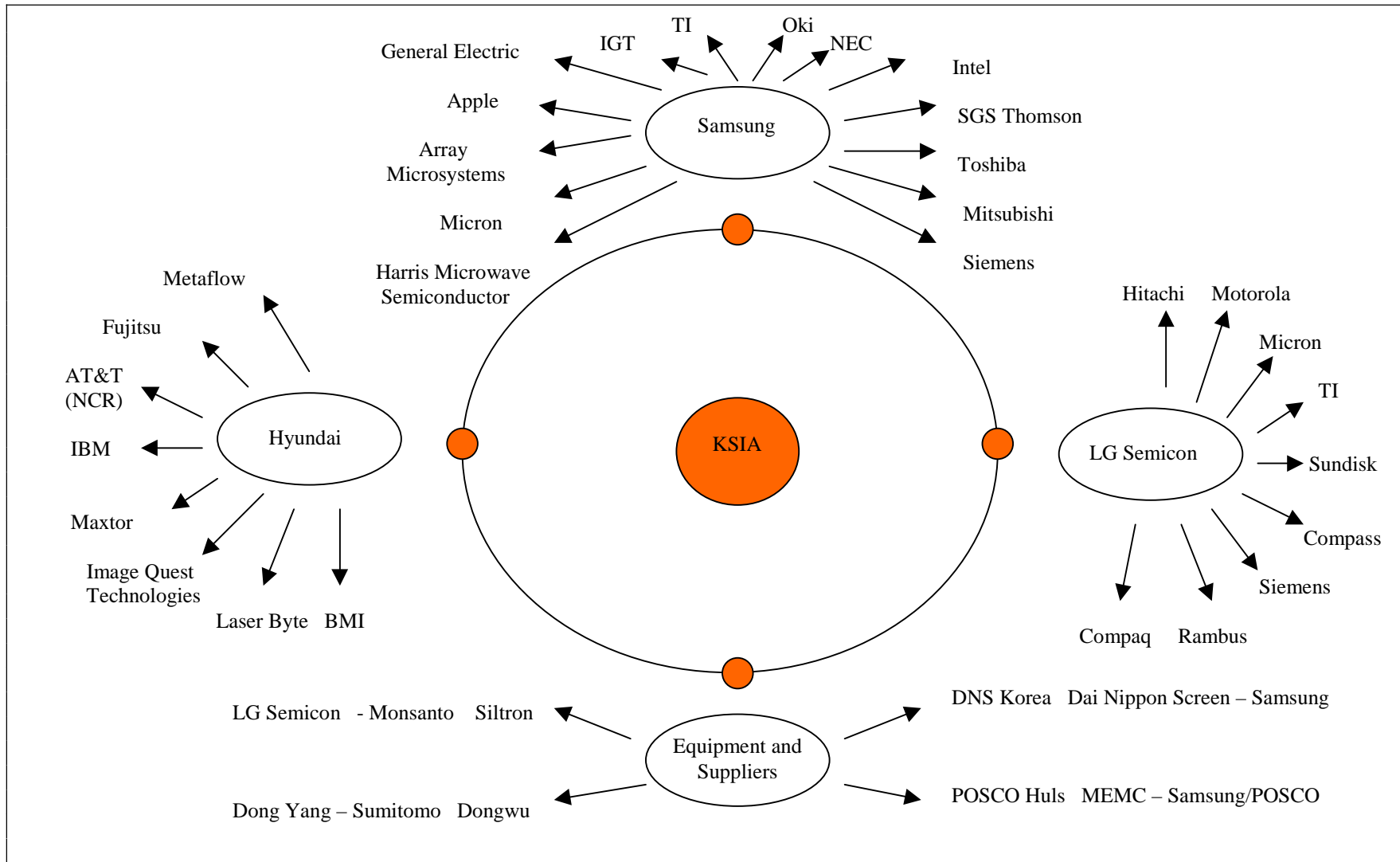
*Model C* – Foreign multinationals

# Strategic Learning Trajectory in East Asia



# The key to Korean success:

A national system of economic learning built around *Chaebol*





In 2003, Samsung Electronics Corporation:

- employed over 80,000
- ranked 59 in Fortune Global 500
- ranked 9<sup>th</sup> in US top patenting list, with 1313 patents
- generated revenues of \$47.6 billion
- generated profits of \$5.6 billion

The world's largest electronics company in 2004

# Samsung's Technology Relationships with US & European Firms – 1980s,90s

---

## Hewlett Packard

Sole distribution of HP products  
 Licenses for: software design assembly test & programming technology  
 SEC-HP Co - minority JV  
 Joint development and production agreement for RISC microchips and workstations - OEM and own sales

## TI

Licenses for: DRAM

## Micron Technology

Licenses for: DRAMs  
 Cooperation on memory devices

## Bell Telephone Manufacturing

License for: electronic switching cooperative agreement to exchange & produce technology

## INTEL

License for: ASIC technology

## Motorola

Design chips and develop systems and applications software

## Control Data

Cross licensing in computer manufacturing & technology

## Corning Glass

Samsung-Corning JV  
 Links to AFL & MPI

## IBM

Samsung Data System -JV  
 Cross licensing for: semiconductor design & production technology  
 Joint development & selling desktop PCs

## + General Instruments

## Advanced Risc Machines -UK

## USA Video

## Madrigal

## Qualcomm

## Dancall-Denmark

## Hales Design Group

## Rambus

## Weitek

## Micron Technology

## AT&T

Joint development of network & pen-based PCs (AT&T - marketing SEC- development & production)

## ITT

Licensing for: digital switching exchange semiconductors optic fibre technology

## Philips

License for: video disk player magnetron technology

## USA Video

## ISD

# Samsung's Technology Relationships with Japanese Firms – 1980s,90s

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## Toshiba

Licences for :

- fax machines
- airconditioners
- cellular modular phones
- word processors
- washing machines
- Hi Fi, VCRs

Joint development projects in:

- Computerized typesetting
- LCD drive ICS, ASICs,
- Flash memories

## Fujitsu

Cross licensing in LCDs

- + Shibasoko
- DNS
- Towa
- Toray

## Sanyo

Licences for:

- microwave oven technology
- automatic sales machines

## Matsushita

Licenses for:

- magnetron production technology
- VCRs

Joint development of broadcasting VCRs

## Mitsubishi

Joint standardization of DRAM

## NEC

Joint production of DRAMs

## Sharp

Licences for :

- semiconductor technology
- SRAM, ROM, DRAM

## Sony

Licenses for;

- VCRs
- broadcasting cameras

## Ikegami

Licenses for :

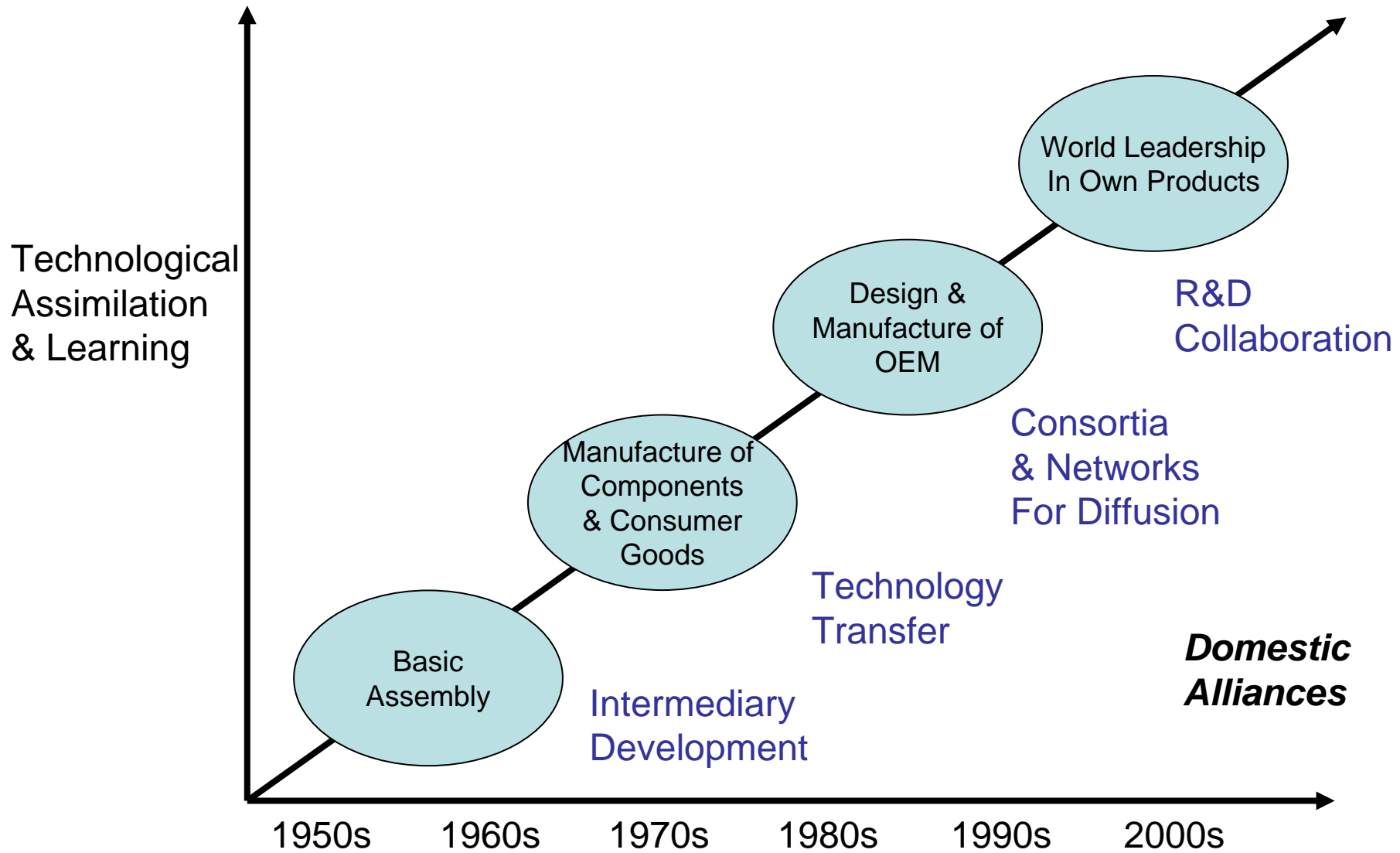
- broadcasting colour monitors

## Oki

Technology transfer and technical assistance for synchronous DRAMs



# Strategic Learning Trajectory in East Asia



# Policy learning – Institutions for collaborative research

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*Developed in Britain*



*Then transferred to Europe*



British Research  
Associations (1917)

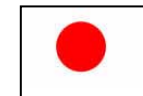


Germany  
France  
Sweden



*And there on to Asia...*

Japanese Technology Research  
Associations 1961



Taiwan's ITRI 1973



Korean Industrial Research  
Associations 1982



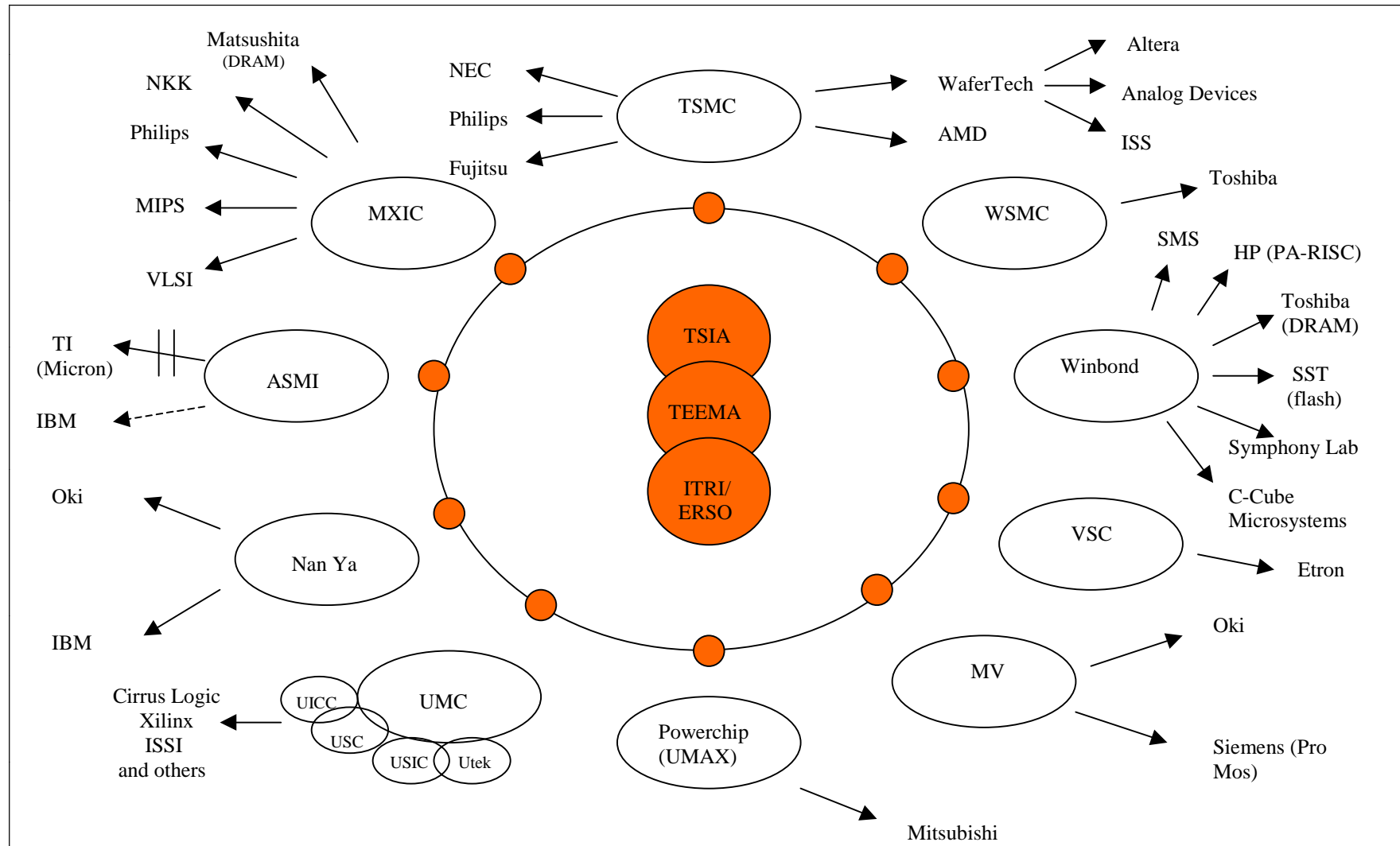
# Major patenting organizations in US, 2001...

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| <i>Country</i> | <i>Research Institute</i>     | <i>Total Patents</i> |
|----------------|-------------------------------|----------------------|
| <b>Korea</b>   | <b>ETRI (6<sup>th</sup> )</b> | <b>504</b>           |
| <b>Taiwan</b>  | <b>ITRI (3<sup>rd</sup>)</b>  | <b>986</b>           |

# The key to Taiwanese success:

A system of economic learning built around small firms & research institutions



# Industrial Technology Research Institute

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## *Fields*

**Communications & Opto-electronics**

**Materials & Chemical Technologies**

**Precision Machinery**

**Sustainable Development Technologies**

**Biomedical & Nanotechnologies**

**Advanced Technologies for Industry**

## *Some Facts*

**Employs 6000, including 4900 R&D staff  
(820 with PhDs)**

**13,000 ITRI staff have moved into industry**

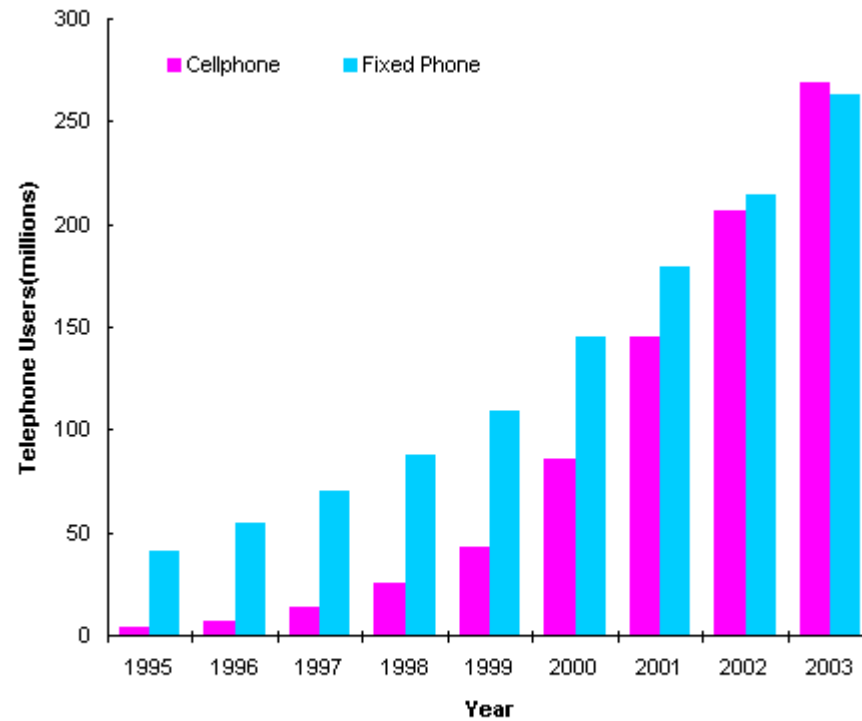
**In 2001, ITRI provided:**

- **training programs for 70,282 people**
- **technical services for 30,427 firms**
- **contract research for 1014 firms**
- **joint R&D for 339 firms**



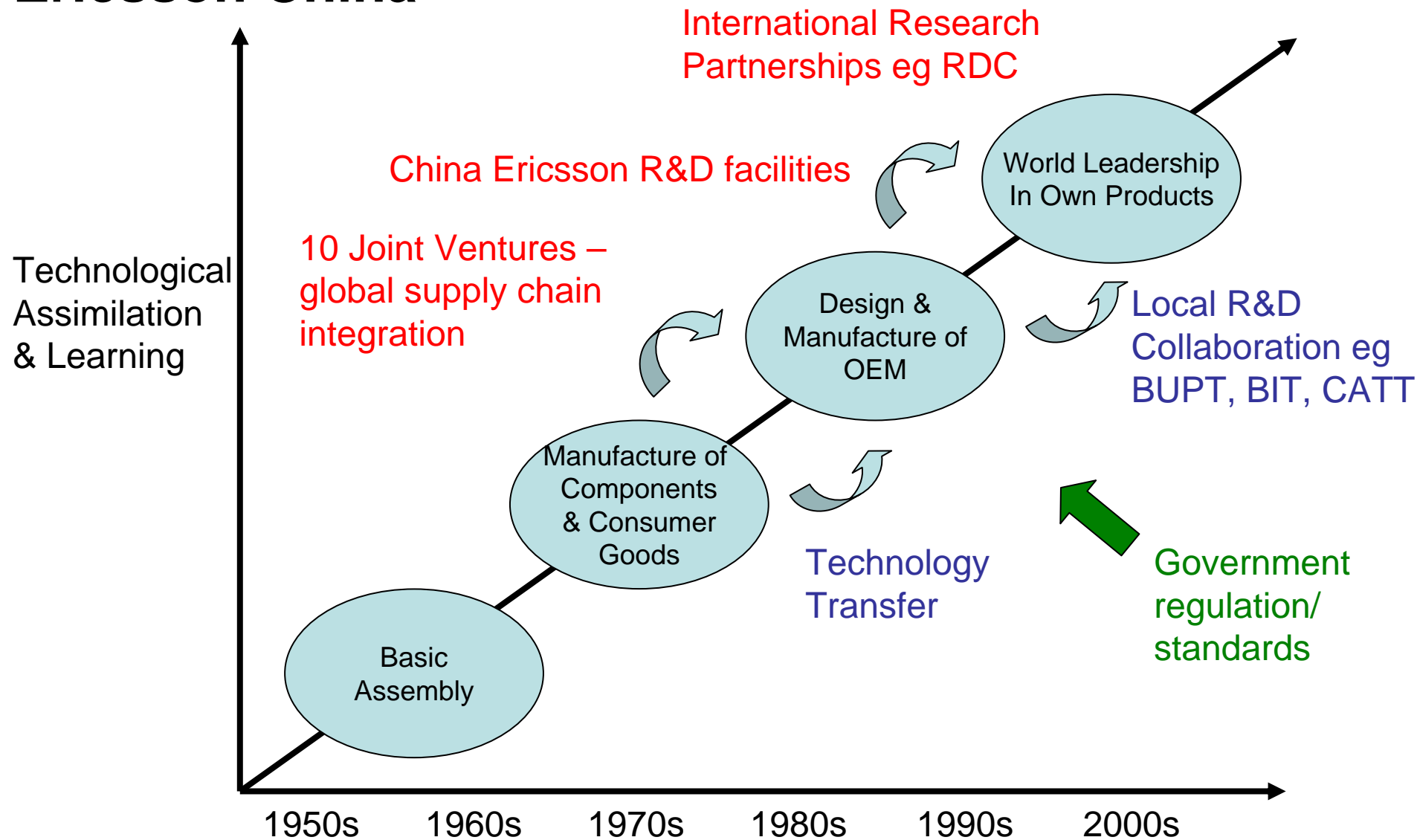
- Started doing business in China in 1892
- In China to:
  - produce for local market
  - integrate into global supply chain
  - support international R&D
  - demonstrate commitment
- 10 joint ventures, 4 wholly-owned subsidiaries, 25 sales offices
- 9% of Ericsson's worldwide sales; 35% GSM market in China, increasingly growing into 3G; largest customer to China Mobile
- BMC producing 10 million handsets a quarter
- 4500 employees, including 675 in R&D
- 6 R&D facilities
- R&D investment 1985-2000 - \$290m  
2000-2005 - \$500m

# Telephone users – China, 1995-2003



Fixed phones include Xiao Ling Tong (35 million in 2003).

# Strategic Learning Trajectory – Ericsson China





# Historical Differences in Industry & Industry Policy in Asia

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|                  | <b>Industrial Structure</b> |                     | <b>Encouraging<br/>Of FDI</b> | <b>Innovation<br/>Supporting<br/>Institutions</b> |
|------------------|-----------------------------|---------------------|-------------------------------|---|
|                  | Large Firm<br>Based         | Small Firm<br>Based |                               |   |
| <b>Korea</b>     | <b>+</b>                    |                     | <b>-</b>                      | <b>+</b>  |
| <b>Taiwan</b>    |                             | <b>+</b>            | <b>+</b>                      | <b>+</b>  |
| <b>Singapore</b> | <b>+</b>                    |                     | <b>+</b>                      | <b>-</b>  |
| <b>China</b>     | <b>+</b>                    | <b>+</b>            | <b>+</b>                      | <b>-</b>  |

---

# Evolving institutional models for technological learning

*Model A*

(large domestic)

*Model B*

(SMEs & PSAs)

*Model C*

(MNCs)

# Evolving institutional models for technological learning

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Korea



# Evolving institutional models for technological learning

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Korea



Taiwan

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Korea



Taiwan



Singapore

# Evolving institutional models for technological learning

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(large domestic firms)

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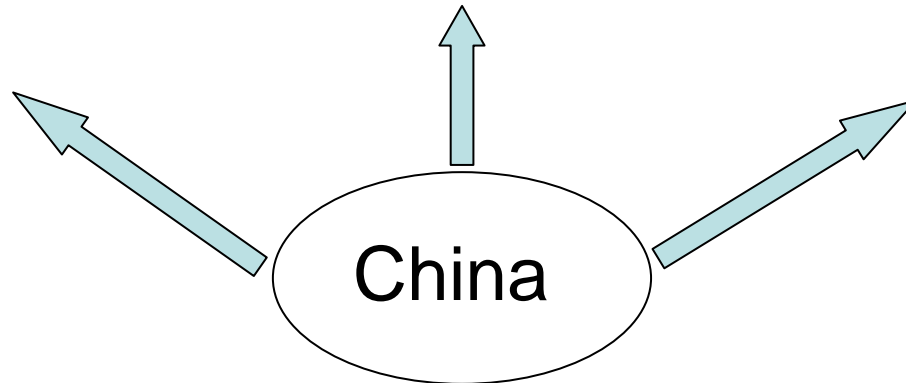
Korea



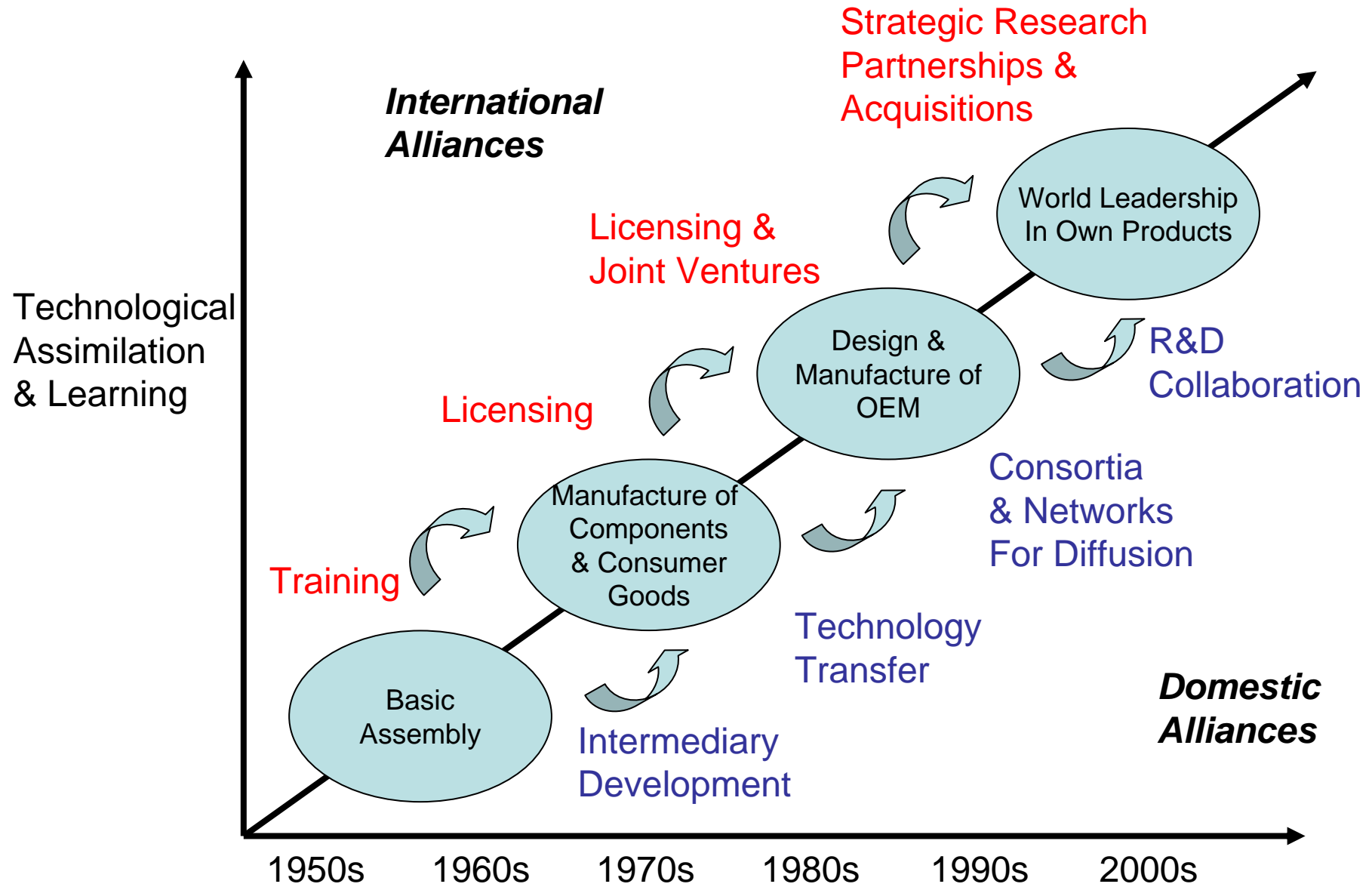
Taiwan



Singapore



# Strategic Learning Trajectory in East Asia



## Conclusions...

Innovation policy aims to develop the innovative capabilities of firms

Innovative capabilities enable firms to learn & leverage

The strategic learning trajectory of Asian economies has evolved through strategies in, and policies for:

- large domestic firms

- small firm clusters around research institutes

- overseas multinational companies

Their role is evolving, with considerable experimentation occurring, and the policy challenge is to learn lessons across sectors, regions and nations.