Innovation and Growth: The Case of Korea

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Model A-501 (1959)
The First B/W TV-set (1966)
Technology-driven & market-pull growth

- Display Industry -
Source of Growth – major role of TFP

Accumulation *cum* assimilation
(in the spirit of Pack and Nelson, 1999)

## Channels of Technology Transfer to Korea, 1962-2005 (US$ billion)

<table>
<thead>
<tr>
<th>Period</th>
<th>FDI</th>
<th>Sum of foreign licensing and capital goods imports</th>
<th>Foreign licensing</th>
<th>Capital goods imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>1962-66</td>
<td>0.05</td>
<td>0.32</td>
<td>0.00</td>
<td>0.32</td>
</tr>
<tr>
<td>1967-71</td>
<td>0.22</td>
<td>2.56</td>
<td>0.02</td>
<td>2.54</td>
</tr>
<tr>
<td>1972-76</td>
<td>0.88</td>
<td>8.94</td>
<td>0.10</td>
<td>8.84</td>
</tr>
<tr>
<td>1977-81</td>
<td>0.72</td>
<td>28.43</td>
<td>0.45</td>
<td>27.98</td>
</tr>
<tr>
<td>1982-86</td>
<td>1.77</td>
<td>52.16</td>
<td>1.18</td>
<td>50.98</td>
</tr>
<tr>
<td>1987-91</td>
<td>5.64</td>
<td>125.31</td>
<td>4.36</td>
<td>120.95</td>
</tr>
<tr>
<td>1992-96</td>
<td>8.41</td>
<td>228.16</td>
<td>7.32</td>
<td>220.84</td>
</tr>
<tr>
<td>1997-2001</td>
<td>57.85</td>
<td>265.23</td>
<td>13.19</td>
<td>252.03</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>115.46</strong></td>
<td><strong>1,029.72</strong></td>
<td><strong>41.25</strong></td>
<td><strong>988.46</strong></td>
</tr>
</tbody>
</table>
The interplay of foreign technologies and indigenous R&D
Trend of Korea’s R&D Investment

- Private share, %
- Government share, %
- GERD/GDP, % (right axis)
Evolution of Korea’s Innovation System

**Development Stage**

**Sources of Competition**
- Factor-Driven Stage: cheap labor
- Investment-Driven Stage: manufacturing capability
- Innovation-Driven Stage: innovative capability

**Major Direction of Industrial Policy**
- 1960s: Expand export-orient light industries
- 1970s: Expand heavy and chemical industries
- 1980s: Expand technology-intensive industries
- 1990s: Promote high-technology innovation
- 2000s: Transition to knowledge-based economy

**S&T Role of Government**
- Scientific Infrastructure Building
  - MOST/KIST
  - S&T promotion act
  - 5-year economic plan includes S&T
- Scientific Infrastructure Setting
  - GRI
  - Daeduck sci. town
  - R&D promotion act
  - KSIST: highly qualified personnel
- R&D and Private Research Lab Promotion
  - NRDP
  - Promoting private research labs
  - Promotion of industrial R&D
- Leading Role in Strategic Area
  - HAN
  - Enhancing univ. research capability
  - Promoting co-op research
  - Policy coordination
  - GRI restructuring

**Innovative Capability of Private Sector**

**<New Challenges>**
Market competition is the prime driver for innovation
  • Korean firms should compete in the world markets

Human resource is the key for learning
  • The interaction between education and innovation systems

Government’s role as facilitator at earlier stages
  • Government’s active role earlier years; business took the lead later

Catch-up: assimilating foreign tech w/ indigenous efforts
  • The Effective use of technologies both domestic and abroad
Lessons

1. Managing the Economy for Industrialization
   ✓ Market intervention but promoting entrepreneurship
   ✓ Maintaining fiscal soundness: Instrumental for reforms
   ✓ Long-term perspective with gradualism and pragmatism
   ✓ Political leadership: Shared vision for nation-building

2. Education and Human Resource Development
   ✓ Sequential educational expansion
     • Shifting investment emphasis from primary, secondary to tertiary
   ✓ Mobilizing private sectors to fund education
   ✓ Investment in HRD pays off over the long run
Lessons

R&D and Innovation System

- Market competition is the prime driver for innovation
- Human resource is the key for learning
- Government’s role as facilitator at earlier stages
- Catch-up: assimilating foreign tech w/ indigenous efforts

Building Information Infrastructures

- Stepwise planning with strategic investment
  - The case of informatization promotion fund
- Government-business partnership is the key for success
  - The case of CDMA: Risk-sharing enables leapfrogging
Korea in the 21st century

- The end of high-input, high growth regime;
- There exists sizable gap in productivity
R&D/Physical Investment (%)
Are we living in a different world?

- Technical change is skill-biased also in Korea
- Higher education does not offer high returns.
Changes in Employment Structure

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales (trillion W. in current prices)</th>
<th>Total employment (‘000)</th>
<th>Overseas</th>
<th>Domestic</th>
<th>Member of labor union</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>3.8</td>
<td>30</td>
<td>1</td>
<td>29</td>
<td>24 (80%)</td>
</tr>
<tr>
<td>2002</td>
<td>18.9</td>
<td>58</td>
<td>33</td>
<td>25</td>
<td>12 (50%)</td>
</tr>
<tr>
<td>2006</td>
<td>41.0</td>
<td>82</td>
<td>53</td>
<td>29</td>
<td>9 (30%)</td>
</tr>
</tbody>
</table>
Globalization
Challenge 1: Accumulation Gap

- Despite, still relatively, high investment
- Sizable gap in capital stock, (which explains PRD gap)

Let market work, with better RF.
- Equity investment ceiling
- Separation of financial & industrial capital
- Regulation on investment in Seoul metropolitan areas
- Privatization of SOE

[Capital-labor ratio] (USA = 100)

Source: OECD STAN DB
Challenge 2: Quality Gap in HR and Education

- Over-educated Korean?
- Despite high investment, the return seems low

✓ more competition in education

IMD ranking of 60 nations

<table>
<thead>
<tr>
<th>Country</th>
<th>Education System</th>
<th>University Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>USA</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Australia</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Korea</td>
<td>41</td>
<td>41</td>
</tr>
<tr>
<td>Japan</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td>India</td>
<td>61</td>
<td>61</td>
</tr>
<tr>
<td>Malaysia</td>
<td>61</td>
<td>61</td>
</tr>
</tbody>
</table>

- Education system meets the needs of a competitive economy
- University education meets the needs of a competitive economy
Challenge 3: Innovation System

- R&D activities become comparable to peers
- But highly concentrated on large firms

- Strengthening LE-SME ties
Challenge 4: ICT Dilemma

- Divergence between ICT and non-ICT, LE and SME, exporting and domestic oriented
- Employment effect is low, will be lowered
  - Trust in internet world

![Graph showing ICT Industry's Share of GDP and Employment]

**Structure of ICT Industries**

- Share of GDP
- Share of Employment

<table>
<thead>
<tr>
<th>Year</th>
<th>Korea</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>8%</td>
<td>12%</td>
</tr>
</tbody>
</table>
Challenge 5: Governance Gap

### Rigidity of Employment

<table>
<thead>
<tr>
<th>Country</th>
<th>SG</th>
<th>US</th>
<th>IR</th>
<th>KR</th>
<th>NL</th>
<th>DE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>0</td>
<td>3</td>
<td>29</td>
<td>34</td>
<td>49</td>
<td>55</td>
</tr>
</tbody>
</table>

Source: World Bank

### Annual Work Loss

<table>
<thead>
<tr>
<th>Country</th>
<th>SG</th>
<th>DE</th>
<th>NL</th>
<th>IR</th>
<th>KR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days</td>
<td>0</td>
<td>1.4</td>
<td>2.7</td>
<td>20.3</td>
<td>30.8</td>
</tr>
</tbody>
</table>

Source: ILO

### Corporate Governance

<table>
<thead>
<tr>
<th>Country</th>
<th>SG</th>
<th>HK</th>
<th>ML</th>
<th>KR</th>
<th>TW</th>
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</thead>
<tbody>
<tr>
<td>Transparency Index</td>
<td>7.5</td>
<td>6.7</td>
<td>6.0</td>
<td>5.8</td>
<td>5.7</td>
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Source: Asian Corporate Governance Association

### Transparency Index

<table>
<thead>
<tr>
<th>Country</th>
<th>SG</th>
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<th>IR</th>
<th>US</th>
<th>KR</th>
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</thead>
<tbody>
<tr>
<td>Transparency Index</td>
<td>9.4</td>
<td>8.9</td>
<td>7.5</td>
<td>7.5</td>
<td>4.3</td>
</tr>
</tbody>
</table>

Source: Transparency International
Korea: mixture of frontier and catch-up

No single recipe. It is like an orchestra: more than simple sum of individual players, conductor’s role.

Functioning institutions are fundamental to sustain economic growth. Korea’s experiences can be seen as the evolutionary processes of systems/institutions.

Building effective institutions is very important, sometimes painful, national agenda. National implies partnership between government and business (market)

As new challenges are coming, so the needs to reform/restructure existing systems/institutions.
“Nothing is ready-made; everything is to be made.”