The Korean Approach to Innovation Policy
With a Focus on HRD and R&D

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Director of UNESCO Bangkok and the Asia Pacific Region
Outline

I. Overview
II. HRD/R&D as Sources of Innovation
III. HRD/Education
IV. R&D/S&T
V. Major Challenges
VI. Recent Policy Initiatives
VII. Some Reflections
I. Overview
Republic of Korea at A Glance

- National Ideal: Benefit all mankind [Hong-ik In-gan]
- Capital: Seoul
- Land: 38,622 sq mi (108th) ≈ Hungary/Azerbaijan
- Population: 49M (26th)
- GDP: USD 969bil. (’07, 13th)
ROK Now & Then

### 1960
- 36 yrs of colonialization, Korean War
- Per capita income of $79: one of the poorest countries in the world
- Lack of natural resources, capital, technology
- Foreign aid & Development Assistance

### Present
- OECD member country (1996)
- 13th largest economy in the world; per capita income of $24,803 (2007)
- Strong Manufacturing Sector: mobile phones, semiconductors, ship-making, steel, auto. etc.
- World’s 6th largest foreign exchange reserve (2008)
Economic & Social Development

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Human Development Index</td>
<td>0.523</td>
<td>0.82</td>
<td>0.912</td>
<td>0.921</td>
</tr>
<tr>
<td>Life Expectancy (yrs)</td>
<td>62.6</td>
<td>72.6</td>
<td>77.3</td>
<td>77.9</td>
</tr>
<tr>
<td>Infant mortality rate (per 1,000 births)</td>
<td>43</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>
II. HRD/R&D as Sources of Innovation
HRD and R&D are Key Pillars of KE

- Four Pillars of Knowledge Economy (WB)
  - Economic and institutional regime
  - Educated and skilled population → Supply of high-quality human resources (HRD/ED)
  - Innovation system → R&D as part of national innovation system
  - Information and communication technologies
## Sources of Economic Growth


<table>
<thead>
<tr>
<th>Per annum</th>
<th>GDP  (100.0)</th>
<th>Physical Capital (46.6)</th>
<th>Human Capital (12.5)</th>
<th>Labor Supply (18.1)</th>
<th>TFP (R&amp;D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROK Growth Rate</td>
<td>6.26</td>
<td>2.92</td>
<td>0.78</td>
<td>1.13</td>
<td>1.42</td>
</tr>
<tr>
<td>(Ratio)</td>
<td>(100.0)</td>
<td>(46.6)</td>
<td>(12.5)</td>
<td>(18.1)</td>
<td>(22.7)</td>
</tr>
<tr>
<td>USA Growth Rate</td>
<td>3.21</td>
<td>0.76</td>
<td>0.24</td>
<td>0.91</td>
<td>1.29</td>
</tr>
<tr>
<td>(Ratio)</td>
<td>(100.0)</td>
<td>(23.7)</td>
<td>(7.5)</td>
<td>(28.3)</td>
<td>(40.2)</td>
</tr>
</tbody>
</table>

Source: Lee, Jong-wha, Increasing Growth Rate through R&D (2005)
Innovation Profile of Korea


Knowledge Economy Forum VIII
III. HRD/Education
Overview

- **Formal Education**
  - Primary(6)-Middle(3)-High school(3)-Universities/Colleges(4-6)

- **Vocation Education & Training**
  - VE: Vocational high school-Junior college/polytechnic colleges (2-3) and polytechnic universities(4)

- **Non-formal Education & Training**
  - Public/private job training institutions; private tutoring institutions, adult education centers; in-plant training institutions, etc
Skill formation by expanding educational opportunities

- Attain international education standards
- College entrance ratio: 33.2% ('90) → 82% ('06)
- Average length of education for ages 25-64: 7 years (early 70s) → 13 years ('02)
- Korea recognized as model of economic success achieved through human resources

No discernable difference in school access across different SES groups
Expansion of Education & HRD

※ Trow, “Forms and Phases of Higher Education”: Elite(<15%) → Mass(15-50) → Universal(>55%)
Average Years of Schooling by Age Group

Source: OECD, Education At a Glance 2000

Knowledge Economy Forum VIII
## Adult Participation in LLL

<table>
<thead>
<tr>
<th></th>
<th>Age 5-14</th>
<th>Age 15-19</th>
<th>Age 20-29</th>
<th>Age 30-39</th>
<th>Age Over 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>93.5</td>
<td>85.2</td>
<td>27.4</td>
<td>1.9</td>
<td>0.4</td>
</tr>
<tr>
<td>OECD Average</td>
<td>98.3</td>
<td>80.5</td>
<td>24.7</td>
<td>5.6</td>
<td>1.6</td>
</tr>
</tbody>
</table>

Source: OECD, Education At a Glance 2006
Quality – PISA

- K-12 education: comparable to world standard & OECD average
- Higher education: begin to “catch-up”

### International Student Assessments

<table>
<thead>
<tr>
<th>Rank</th>
<th>PISA 2003 (15 years old)</th>
<th>PISA 2006 (15 years old)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Math</td>
<td>Reading</td>
</tr>
<tr>
<td>1</td>
<td>HK-China</td>
<td>Finland</td>
</tr>
<tr>
<td>2</td>
<td>Finland</td>
<td>Korea</td>
</tr>
<tr>
<td>3</td>
<td>Netherlands</td>
<td>Australia</td>
</tr>
<tr>
<td>4</td>
<td>Korea</td>
<td>Lichtenstein</td>
</tr>
<tr>
<td>5</td>
<td>Lichtenstein</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>:</td>
<td>::</td>
</tr>
</tbody>
</table>

- K-12 education: comparable to world standard & OECD average
- Higher education: begin to “catch-up”
Class Size and Dropout Rate

![Chart showing trends in class size and dropout rate from 1970 to 2006 for primary, middle, and high school levels.](chart.png)
Equity in Education Investment

- Educational investment by income level (2005)

<table>
<thead>
<tr>
<th>Highest deciles</th>
<th>Lowest deciles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational expense of total expenditure</td>
<td>8.5%</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Highest deciles</th>
<th>Lowest deciles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average educational expense by income group</td>
<td>780,000 won</td>
</tr>
</tbody>
</table>
Equity in PISA Performance

Percentage of students at each proficiency level on the science scale, OECD

<table>
<thead>
<tr>
<th>Country</th>
<th>Below L1</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
<th>Level 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>7.6</td>
<td>16.8</td>
<td>24.2</td>
<td>24</td>
<td>18.3</td>
<td>7.5</td>
<td>1.5</td>
</tr>
<tr>
<td>France</td>
<td>6.6</td>
<td>14.5</td>
<td>22.8</td>
<td>27.2</td>
<td>20.9</td>
<td>7.2</td>
<td>0.8</td>
</tr>
<tr>
<td>Finland</td>
<td>3.6</td>
<td>13.6</td>
<td>29.1</td>
<td>32.2</td>
<td>17</td>
<td></td>
<td>3.9</td>
</tr>
<tr>
<td>Korea</td>
<td>8.7</td>
<td>21.2</td>
<td>31.8</td>
<td>25.5</td>
<td>9.2</td>
<td></td>
<td>1.1</td>
</tr>
<tr>
<td>OECD Average</td>
<td>5.2</td>
<td>14.1</td>
<td>24</td>
<td>27.4</td>
<td>20.3</td>
<td>7.7</td>
<td></td>
</tr>
</tbody>
</table>
Major Strategies

- Link Ed to Macro-Economic Development Plans
  - 5-Year Development Plans (1962~1991): top-down educational policies to support economic development plans and provide trained workforce * Specialization of national HEIs to support industrial policy since ‘70s
  - 5-Year National HRD Plan (2001-2008): education policies as a key human resources development strategy

- Sequential Expansion Approach
  - Prior to 1975: 65% education spending on primary ed
  - After 1975: investment expanded to secondary ed
  - Since late 1990s: investment in quality of higher ed
Sustained Public Investment in Education
Major Strategies (cont’d)

- Government Investment through Education Tax

- Mobilization of Private Resources
  - Enrollment share of private HEIs (2006): 74.6%

- Use of Government Research Institutes (GRIs) in Education Policy Process
IV. R&D/S&T
Overview

- Acquisition of technologies for development (60s-70s): import substitution and export-expansion
  - Development of light industries and heavy & chemical industries
    → Developing domestic absorptive capacity to digest, assimilate and improve upon the transferred technologies

- Promotion of technology transfer
  - Shortage of foreign exchanges, strong desire for economic independence: restrictive stance toward DFI and FL
    → Policy relying on long-term foreign loans to finance industrial investment

- Private industries’ responses
  - Establishment of in-house R&D centers in large-firms (“Chaebol”)
R&D Investment

GERD (Gross Domestic Expenditure on R&D)

Government R&D Budget

Trend of GERD and BERD (1993–2007)

Human Resources in R&D

Number of Researchers

- 1964: 2,962
- 1997: 138,438
- 2007: 289,098

Researchers per 1,000 Labor Force

- 1964: 1.4
- 1997: 4.7
- 2007: 9.2

Reversal of Korean Brain Drain

<Changing trend in residence choice for Korean scientists and engineers>

<table>
<thead>
<tr>
<th>PhD year</th>
<th>Total no.</th>
<th>Stay in USA</th>
<th>Return to Korea</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Just after PhD</td>
</tr>
<tr>
<td>Before 1970</td>
<td>118</td>
<td>83.90%</td>
<td>3.40%</td>
</tr>
<tr>
<td>1980-1987</td>
<td>396</td>
<td>31.60%</td>
<td>39.40%</td>
</tr>
</tbody>
</table>

Government interventions/policy leverages

- Overall improvement in economic conditions
- Networking & support of KSEs organizations’ for information sharing
- Expansion of higher education & GRI's in the late 1980s
- Other incentives: the “Brain Pool” project, post doctoral appointments, etc
Quantitative Growth of R&D Performance

S&T Paper

1981: 4 (53rd)
1997: 7,870 (18th)
2007: 25,494 (12th)

International Patent

1984: 10
1997: 30
2007: 288

1984: 6,295 (4th)
1997: 7,060 (4th)
2007: 1,891 (4th)

No. of SCI paper publications

No. of Application (PCT) No. of Registration (USA)

Quantitative Growth of R&D Performance (cont’d)

S&T Competitiveness (IMD)

World Ranking

21th 14th 12th 14th 17th 17th 13th 6th 10th 7th 6th 14th

2001 2002 2003 2004 2005 2006 2007 2008

Science Technology

Major Strategies

- Systematic Government Approach
  - Establishment of GRI s: 28 S&T GRI s accounting for about 14% of GERD, complementing research areas uncovered by the private sector

- Financial resources
  - Large-firm-oriented industrial development → “Chaebol” system → Increased abilities of private industries to finance long-term, risky R&D projects

- Public investment in HR in R&D
  - Various approaches to promote S&T: Daeduck Science Town (1973), Government scholarships for S&T majors
V. Major Challenges
Global Economic Crisis
- Adverse impact on export-oriented economies: int’l trade accounts for 29.4% of national economy
  - IMF projection on Korean economic growth rate in 2010: 1.5%

Declining Fertility Rate
- Prevalence of conservatism/lack of dynamism
  - Lowest Fertility Rate in OECD: 1.08 (2007)

Severe Competition in Manufacturing Sector
- China & other emerging economies
HRD/Higher Education

- High-stake college entrance examination oriented system
- Declining school age population
- Mismatch between demand and supply
- Low level of internationalization
  - Imbalance between inbound and outbound students mobility: 63,952 vs. 216,867 (2008)
R&D/S&T

- Low efficiency of R&D investment compared to advanced countries
- Universities harbor 72.7% Ph.Ds but account for about 10% of GERD
- Lack of fundamental/generic technology
- Relatively weak SME sector
VI. Recent Policy Initiatives
New Governance

MOE&HRD
Headed by DPM
Formal Edu/LLL/HRD

MOST
Headed by DPM
S&T

MEST
Headed by Minister
Formal Edu/LLL/
HRD/R&D/S&T

Integration of super ministries (MOEHRD + MOST), 2008
Finance/Investment

- Restructuring of financing programs
  - Shift from rigid line-item budgeting to block grants or formula-based funding
  - Introduction of competitive funding and performance-based funding

- Expanding investment in basic and fundamental research to 50% of the gov’t R&D
Management

- Deregulation of HE administration and new technology-based start-up of SMEs
- Information disclosure and accountability
- Improving R&D management system in accordance with the needs of researchers
  - Integration of Korea Science & Engineering Foundation (KOSEF) and Korea Research Foundation (KRF) under the umbrella of MEST
Some Notable Initiatives

- World Class University Program (WCU)
  - 70 million USD for next 5 years in a few selected univ.
  - Tapping more effectively into global knowledge systems through joint research, joint submissions to international journals, strategic alliances, etc.

- Promotion of gifted education in S&T
  - Two additional science high schools by 2012

- Promotion of centers of excellence in science and engineering education
  - Establishment & support SP, TP etc
VII. Some Reflections
Role of Government: from direct initiatives to advocacy, information broker

Mobilization of Private Resources/Initiatives

Importance of Education & HRD

Continuous/Sustained Effort for Reform
Thank you so much!

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