Developing countries typically start their industrialization in the assembly & production segment of the value chain, using their comparative advantage in labor-intensive manufacturing (e.g., garments). Only a few manage to move to higher value-added segments along the value chain (e.g., R&D and marketing) as well as shift up to higher value-added sectors (e.g., machinery & equipment). Close consultation between the government and the private sector is key to solving information and incentive problems in this stage, when countries try to upgrade their comparative advantage.
The Product Space and the Wealth of Nations

- Product space can be arranged like a forest:
  - A sparse periphery where products connect poorly with others
  - A dense core where products are produced with capabilities used in other products as well
- Development involves producing new things
  - Countries tend to move through the product space by developing goods they currently produce
  - Countries can move from the periphery to the core "only by traversing empirically infrequent distances"

Source: Hidalgo, Klinger, Barabasi, and Hausmann (2007)

Industrial Policy: Literature Review

<table>
<thead>
<tr>
<th>Schools</th>
<th>Insights on sector identification and promotion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent-seeking (Krueger 1974)</td>
<td>Government can’t and shouldn’t pick winners. (Self-fulfilling incompetence and corruption?)</td>
</tr>
<tr>
<td>New structural economics (Lin and Monga 2010)</td>
<td>Latecomers can pick winners in mature industries by benchmarking early movers (based on CA).</td>
</tr>
<tr>
<td>Product space (Hidalgo et al. 2007)</td>
<td>Winners are readily identifiable, but how do we go from the periphery to the core?</td>
</tr>
<tr>
<td>Strategic risk-taking</td>
<td>Winners are readily identifiable, but the key is to take strategic risks, weighing the challenges of skill accumulation, scale economies, and complementary investments against the possibility of capacity underutilization and financial distress.</td>
</tr>
</tbody>
</table>
Industrial Policy Approaches

- **Outward-Oriented, Bottom-up, Integrated Industrial Policy**
  - Discover latent and potential comparative advantage through experimentation and international benchmarking.
  - Positively reinforce successful experiments and phase out unsuccessful experiments by providing performance-based rewards.
  - Systematically study what has to be done to fill the missing links in the domestic value chain and move up the quality ladder, and make concerted efforts to aim for international competitiveness from the outset.
  - Take strategic risks, weighing the challenges of skill accumulation, scale economies, and complementary investments against the possibility of capacity underutilization and financial distress.

- **Inward-Oriented, Top-down, Ad Hoc Industrial Policy**
  - Promote upstream industries with large spillovers (“Big Push” through coordinated domestic industrialization).
  - Go top-down. Disregard feedback.
  - Problem: Insufficient Demand, Suboptimal-Scale Plants, Higher Costs, Monumental Projects

---

Korea retained the ownership of its export-oriented industrialization and progressively developed its own capabilities to add value and manage risks even as it actively learned from, and engaged with, the outside world.

---

Korea’s Big-Push Partnership: Government and Business Groups

- **Two-Tier Approach to Coordination and Innovation**
  - Government: National-Level Coordination and Innovation
  - Chaebol: Group-Level Coordination and Innovation
  - Big-Push Partnership: Information and Risk Sharing

- **International Trade as an Essential Component**
  - Coordination
  - Scale Economies: Overcoming the Limits of Domestic Market
  - Market Test and Reward Based on Performance in a Competitive Setting: Less Prone to Political Influence and Manipulation
  - Learning by Exporting: Upgrading Mechanism

- **Containment of Corruption and Rent-Seeking**
  - Changes in Political Economy (1960-61)
  - Meritocracy, Monitoring, and Incentives
Heavy and Chemical Industry Drive: Increase Local Value-Added and Establish Defense Industry

<table>
<thead>
<tr>
<th></th>
<th>1972</th>
<th>1976</th>
<th>1981</th>
</tr>
</thead>
<tbody>
<tr>
<td>GNP per capita</td>
<td>$302</td>
<td>$488</td>
<td>$983</td>
</tr>
<tr>
<td>HCI Share in Mfg. Val</td>
<td>35.2%</td>
<td>41.8%</td>
<td>51.0%</td>
</tr>
<tr>
<td>HCI Share in Mfg. Ex</td>
<td>27.0%</td>
<td>44.0%</td>
<td>60.5%</td>
</tr>
</tbody>
</table>

Targets: $10 billion in exports and $1,000 in per capita income by 1981

Instead of setting up armories or factories for specific weapons, Korea established dual-use industrial complexes, with a target production ratio of 70 percent civilian and 30 percent military in peacetime.

“Exportization of All Industries”
“Heavy and Chemical Export Promotion”

For Korea, export development—for which the nation continuously has had to measure itself against global benchmarks—has been the engine of growth and the organizing principle under which industrial upgrading, infrastructure development, and human resource development could be pursued. Korea promoted heavy and chemical industries with a view toward securing international competitiveness from the outset; they were not just for domestic demand.
Question circa 1970: “To raise the share of the domestic value-added in exports and stay ahead of late-developing countries, Korea must upgrade its industries, but do the Korean people have the right national character to succeed in sophisticated industries?”

Policymakers had initial doubts, but these young students showed the answer was positive.

Revealed Comparative Advantage:
CA-Conforming or CA-Defying or Something More?

SITC 0, 1 (Food and Beverages), SITC 2, 4 (Crude Materials), SITC 3 (Mineral Fuels), SITC 5 (Chemicals), SITC 6, 8 (Manufactures), SITC 7 (Machinery and Equipment)
Revealed Comparative Advantage: CA-Conforming or CA-Defying or Something More?

Korea had a strong and increasing comparative advantage in light industries when it made its strategic gamble to promote heavy and chemical industries in 1973, after benchmarking advanced industrial nations with similar natural endowments as Korea’s.

![Graph](image)

SITC 0, 1 (Food and Beverages), SITC 2, 4 (Crude Materials), SITC 3 (Mineral Fuels), SITC 5 (Chemicals), SITC 6, 8 (Manufactures), SITC 7 (Machinery and Equipment)

Diversification into High Value-Added Areas: LG Story

- My father and I started a cosmetic cream factory in the late 1940s.
- At the time, not one company could supply us with plastic caps of adequate quality for cream jars, so we had to start a plastics business. Plastic caps alone were not sufficient to run the plastic molding plant, so we added combs, toothbrushes, and soap boxes.
- This plastics business also led us to manufacture electric fan blades and telephone cases, which in turn led us to manufacture electrical and electronic products and telecommunications equipment.
- The plastics business also took us into oil refining, which needed a tanker shipping company.
- The oil refining company alone was paying an insurance premium amounting to more than half the total revenue of the largest insurance company in Korea. Thus, an insurance company was started.
- This natural step-by-step evolution through related businesses resulted in the Lucky-Goldstar (LG) group as we see it today.

The chaebol and state-owned enterprises (SOEs) served as centers of local capacity development and external interaction. They were willing to pursue vertical integration and related diversification on their own, but usually worked in conjunction with government policy when they ventured into unrelated industries.
Korea’s Transition Toward a Knowledge Economy

Korea's transition toward a knowledge economy was intimately linked to export promotion, industrial upgrading, and human resource development, and institution-building was largely complete by the end of the 1980s.

<table>
<thead>
<tr>
<th>Development Stage</th>
<th>1960s</th>
<th>1970s</th>
<th>1980s</th>
<th>1990s</th>
<th>2000s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor-Driven</td>
<td>Investment-Driven</td>
<td>Innovation-Driven</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Industrial Policy**
  - MOST/KIST
  - S&T Promotion Act
  - Five-Year Economic Plan including S&T

- **S&T Policy**
  - Government Research Institutes
  - Technical and Vocational Schools
  - R&D Promotion Act
  - Daedeok Science Town
  - National R&D Plan
  - Private Sector Initiatives in R&D
  - Informatization
  - E-Government
  - GRI Restructuring
  - U-I-G Linkages
  - Universities’ Leading Role
  - Efficient NIS
  - RIS and Innovation Clusters

Korea’s R&D Expenditure Trends

Exposed to global competition, private-sector companies came to realize that innovation was key to their prosperity and dramatically increased their R&D expenditures.
### Korea's Top 10 Exports: Evidence on Industrial Upgrading

<table>
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<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Iron Ore</td>
<td>Textiles</td>
<td>Textiles</td>
<td>Electronics</td>
<td>Semiconductors</td>
</tr>
<tr>
<td>2</td>
<td>Tungsten Ore</td>
<td>Plywood</td>
<td>Electronics</td>
<td>Textiles</td>
<td>Computers</td>
</tr>
<tr>
<td>3</td>
<td>Raw Silk</td>
<td>Wigs</td>
<td>Iron and Steel Products</td>
<td>Footwear</td>
<td>Automobiles</td>
</tr>
<tr>
<td>4</td>
<td>Anthracite</td>
<td>Iron Ore</td>
<td>Footwear</td>
<td>Iron and Steel Products</td>
<td>Petrochemical Products</td>
</tr>
<tr>
<td>5</td>
<td>Cuttlefish</td>
<td>Electronics</td>
<td>Ships</td>
<td>Ships</td>
<td>Ships</td>
</tr>
<tr>
<td>6</td>
<td>Live Fish</td>
<td>Fruits and Vegetables</td>
<td>Synthetic Fibers</td>
<td>Automobiles</td>
<td>Wireless Telecommunication Equipment</td>
</tr>
<tr>
<td>7</td>
<td>Natural Graphite</td>
<td>Footwear</td>
<td>Metal Products</td>
<td>Chemicals</td>
<td>Iron and Steel Products</td>
</tr>
<tr>
<td>8</td>
<td>Plywood</td>
<td>Tobacco</td>
<td>Plywood</td>
<td>General Machines</td>
<td>Textile Products</td>
</tr>
<tr>
<td>9</td>
<td>Rice</td>
<td>Iron and Steel Products</td>
<td>Fish</td>
<td>Plastic Products</td>
<td>Textile Fabrics</td>
</tr>
<tr>
<td>10</td>
<td>Bristles</td>
<td>Metal Products</td>
<td>Electrical Goods</td>
<td>Containers</td>
<td>Electronics Home Appliances</td>
</tr>
</tbody>
</table>

### The Superstar model: Low FDI, high R&D, high royalty payments

![Graph showing deviations from expected level for Finland and Korea](source: Maloney (2004))
“Latin” model: high FDI, low R&D, moderate royalty payments