

INNOVATIVE KOREA

Leveraging Innovation and Technology for Development

Edited by

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Innovative Korea Report



OBJECTIVES

- Analyze Korea's escape from the "middle-income trap" to transition to a high-income economy by leveraging innovation and technology.
- Share policy lessons with developing economies.



SCOPE

- Timeline: Focus on 1990s when Korea transitioned to a high-income economy, to present.
- Themes: Economic and policy analysis (the what and the how).



AUDIENCE

- Policymakers, academics, development professionals in developing countries.

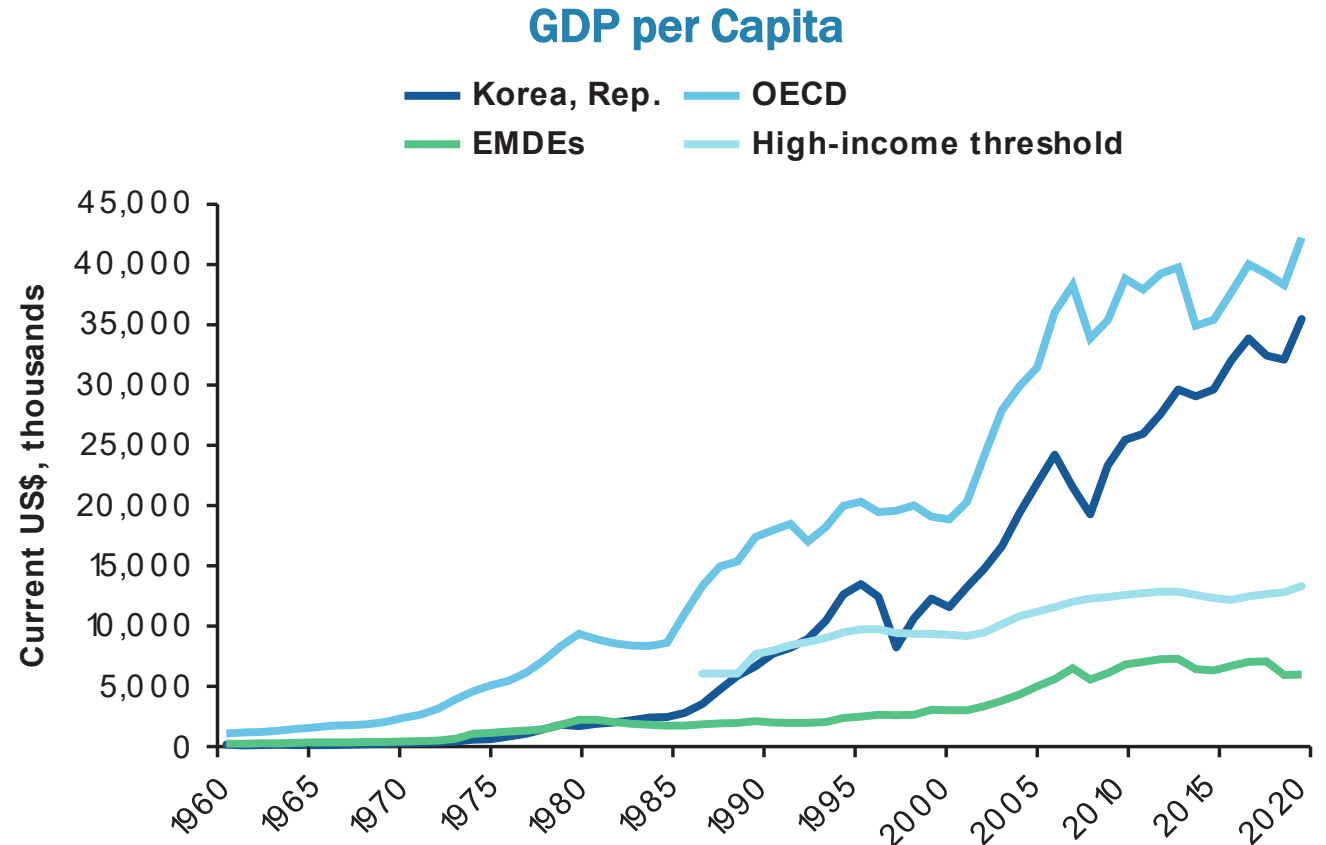


PARTNERSHIPS

- Joint report by World Bank and Korea Development Institute (KDI).

Korea's Sustained, Long Run Growth

- Korea is among the rare countries that recently escaped the “middle-income trap” and became a high-income country.
- Korea experienced three decades (1962-1991) of rapid (greater than 6 percent) growth rates
- In 1995, Korea crossed the WB's GNI per capita threshold for high-income economies
- Per capita GDP of US\$34,998 and 10th largest economy in the world (2021)



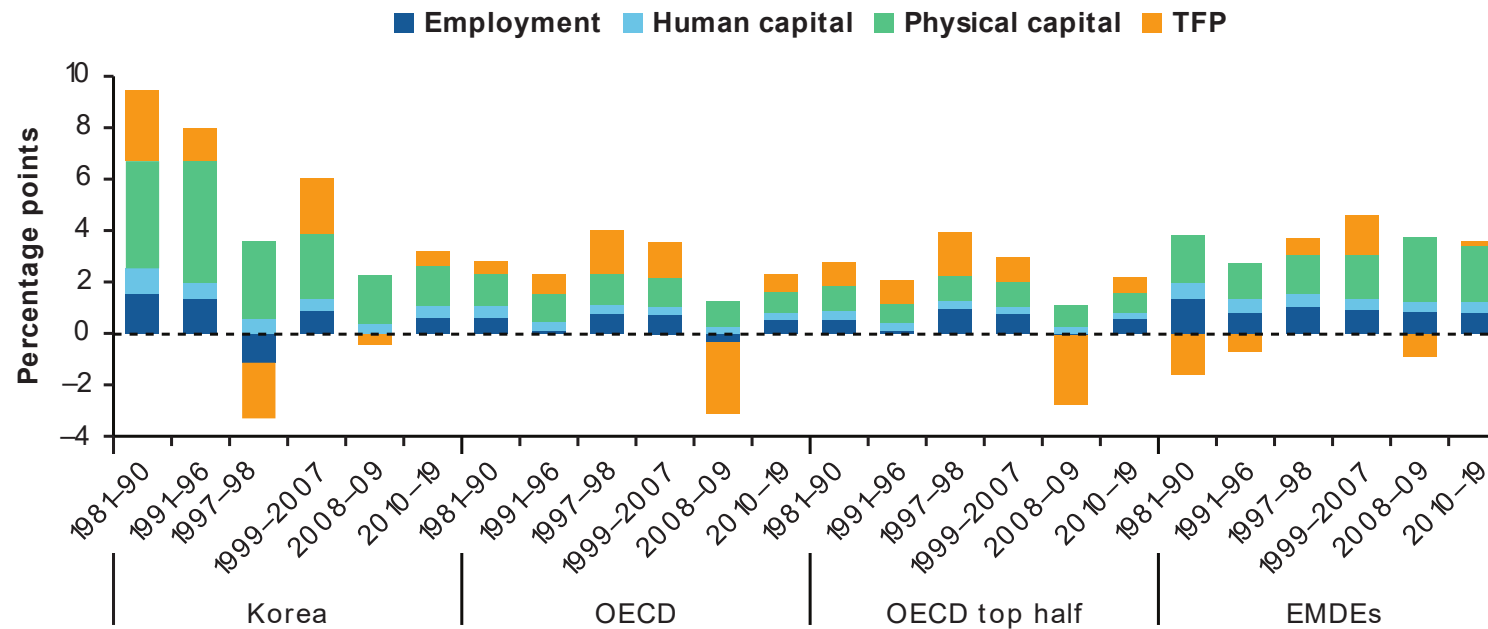
Source: Calculations based on data from World Development Indicators, World Bank (<https://databank.worldbank.org/source/world-development-indicators>).

Note: EMDEs = emerging markets and developing economies; OECD = Organization for Economic Co-operation and Development.

Korea's Sustained, Long Run Growth

- Korea's growth benefited from contributions from both investments and productivity improvements.
- After the AFC, Korea transitioned to a more productivity-led growth from input-led growth.
- Decline in productivity growth in recent decades largely explains the decline in overall growth in recent years.

Capital, Labor and TFP Contributions to GDP Growth



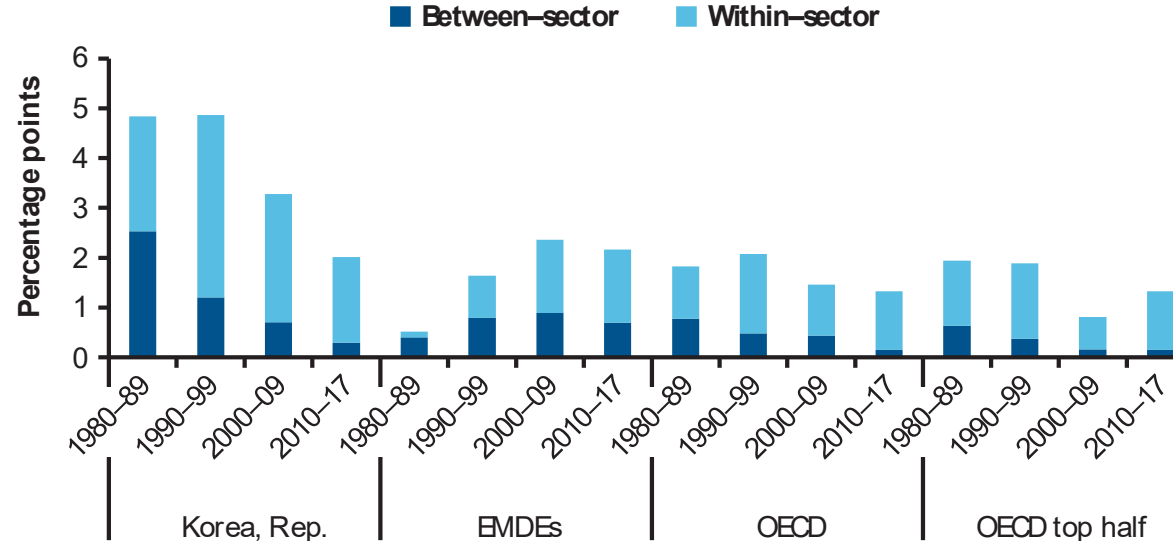
Source: Calculations based on Penn World Table 10.0.

Note: EMDEs = emerging markets and developing economies; OECD = Organization for Economic Co-operation and Development; TFP = total factor productivity.

Structural Transformation and Manufacturing Export-led Growth

- Up to the 1980s, **structural transformation** of the economy (changing sectoral composition) played a more important role in raising the country's productivity growth rate.
- Since 1990s, **within-sector productivity growth** primarily in manufacturing sector started to dominate the contribution.

Within- and Between-Sector Labor Productivity Growth

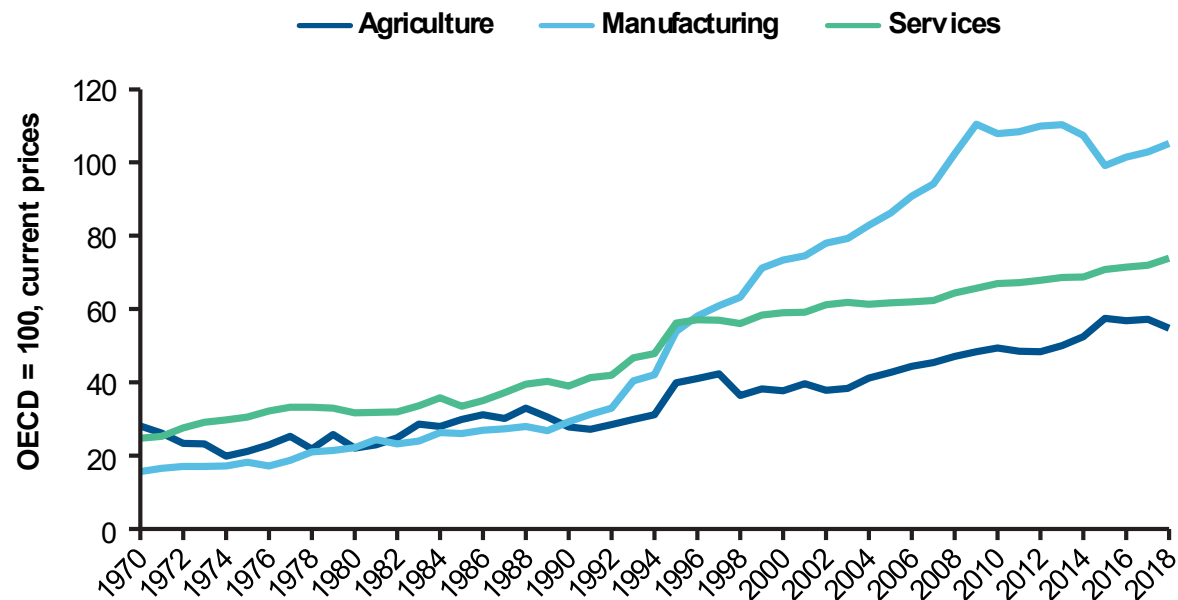


Source: Calculations based on data from the Global Productivity Database, World Bank.

Structural Transformation and Manufacturing Export-led Growth

- By 2000, Korea's manufacturing sector labor productivity reached 75 percent of OECD average, and by 2018, it surpassed OECD average
- Korea's labor productivity in the service sector still significantly lags the levels of the OECD countries, at around 60 percent of the OECD average and 30 to 40 percent of the US levels

The Republic of Korea's Sectoral Labor Productivity (OECD=100, Current prices)



Source: Calculations based on data from OECD STAN Industrial Analysis Database.

Leveraging Global Integration and International Trade

- Korea accelerated GVC integration in mid-1990s through **expansion of ODI**, especially into China
- Korea integrated into GVCs by becoming a major exporter of key intermediate goods.
- Continuous increase of the **complexity of export and greater share of high-tech exports**

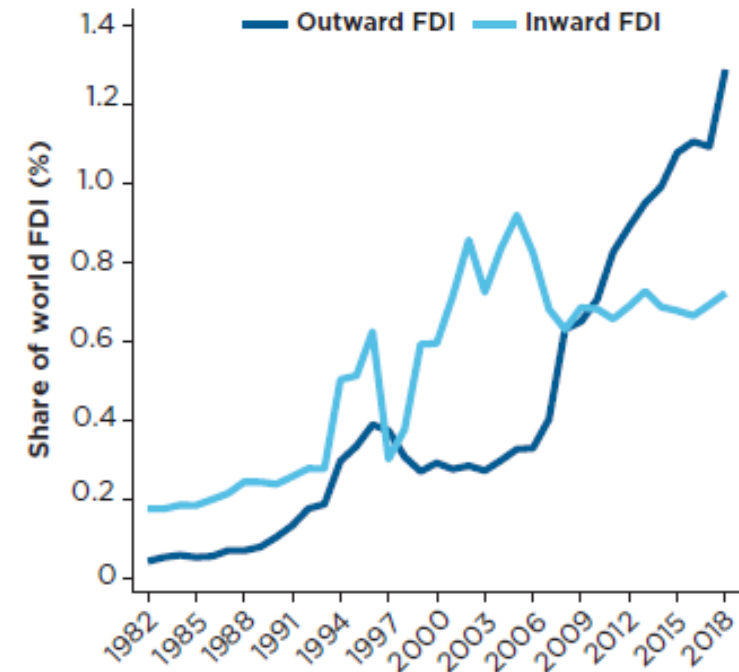
Trade Openness (Export and Import as Shares of GDP)



Source: World Development Indicators, World Bank, 2020

Note: Trade values include both goods and services.

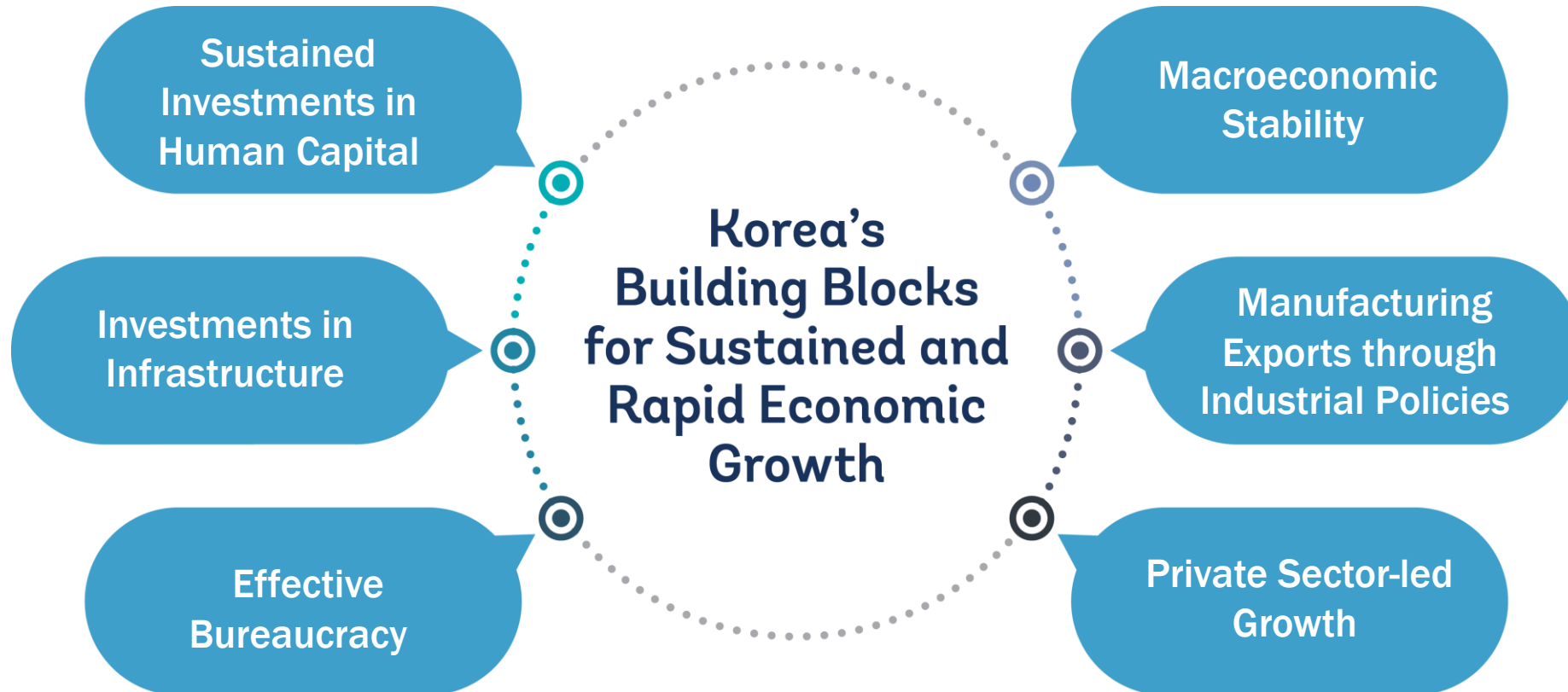
Inward and outward FDI stocks of Korea



Sources: UNCTAD Data Center.

Note: FDI = foreign direct investment

Foundations of Korea's Long Run Growth



Key Lessons for Developing Countries

The Asian Financial Crisis exposed the limits of the existing growth paradigm and triggered its transformation from an input-led to a productivity- and innovation-led economy.

Transition to a High Income Economy Required a Fundamental Transformation of the Growth Paradigm

Lesson 1. Evolution of the growth paradigm (governance and institutions) to transition to a more market-led economy.

- Complete overhaul of the financial sector, to market-based financial intermediation.
- From targeted industrial policies to promotion of market competition and technology
- From promoting large firms to greater focus on SMEs.
- From technology adoption to frontier technology generation.



Key Lessons for Developing Countries

Lesson 2. Sustained promotion of private enterprises.

- Historically, targeted support to large, manufacturing exporting firms to promote industrialization and diversification into higher value-added sectors.
- At higher income, greater emphasis on promoting MSMEs and entrepreneurship;
- Market competition policy, corporate governance reforms, promotion of FDI and deregulation (mixed progress)
- Promotion of high-technology, R&D-intensive startups enabled new entrants (NAVER, KAKAO).

Lesson 3. Riding the technology waves (from technology imitation to innovation)

- Early focus on STI and industrial technology upgrading, building domestic capacity for S&T, ICT infrastructure and digital government.
 - Science and Technology Promotion Act (1967); Ministry of Science and Technology; Korea Advanced Institute of Science and Technology (KAIST).
- Extensive support to enterprise R&D and digitalization of SMEs
- Direct investment in applied research through Government Research Institutes (GRIs)
- At higher income, greater emphasis on basic research
- National STI policymaking, implementation capabilities, comprehensive policy instruments
- Support for S&T education at high school and tertiary levels

Key Lessons for Developing Countries

Lessons 4. Investments in Human Capital Development:

- Korea has historically prioritized investments in human capital development.
- Public leadership role and consistent commitments to designing and implementing HCD policies over the long term
- Systematically coordinate national economic planning and human capital development planning
- Academic education focused on strengthening STEM education and R&D development
- Integration of academic and vocational and technical tracks
- Transitioning to a more market- and demand-oriented approach to training and greater integration of education and training.



Key Lessons for Developing Countries



Lesson 5. Building support for reform through social cohesion and consensus building

- Major land redistribution reforms provided an early basis for inclusive growth
- At early stages of development, expanding access to education and jobs had been the government's main approach to promoting inclusive growth (“Grow First, Redistribute Later”)
- Universal health insurance
- Post AFC, a tripartite committee of businesses, labor unions, and the government was formed to reach a consensus on difficult reforms
- Post AFC, social protection (employment insurance), social safety net, active labor market programs, skills development programs were significantly expanded



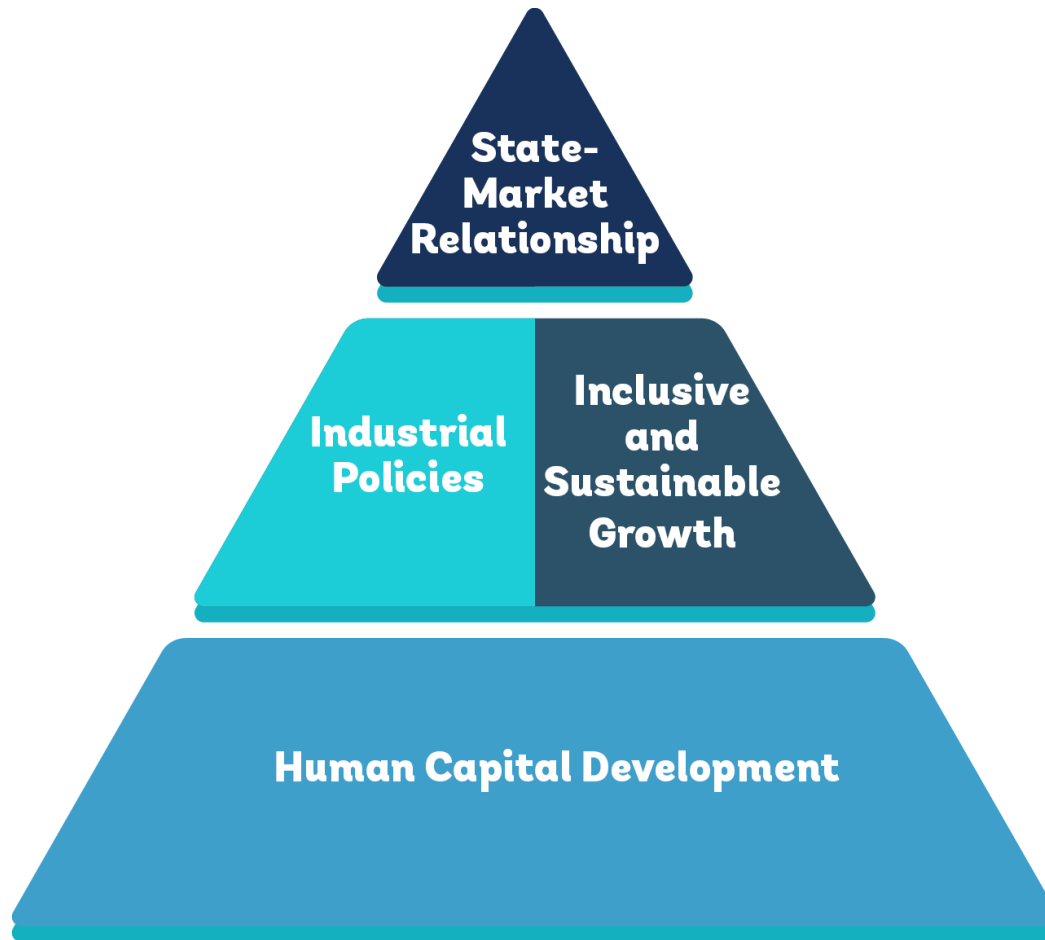
Key Lessons for Developing Countries

Developing countries can learn from Korea's current challenges

- Low productivity growth, in line with global trends since GFC
- Business deregulation
- Streamlining and prioritizing enterprise support policies
- Services sector productivity
- Persistent productivity gap between large and small firms
- Aging and declining population and low fertility rate
- High gender gap
- Transitioning to green growth



Growth Paradigm Transformation with AFC



- Up to the 1990s, Korea's growth model was based on a government-big business coalition that was led by a "development state" that actively coordinated, organized, guided and intervened in the market through targeted industrial policies to promote manufacturing exports.
- The AFC accelerated market-oriented reforms that had been initiated before the crisis.
- Fundamental shift of Korea's growth paradigm with three interrelated pillars, and a cross-cutting pillar on human capital development

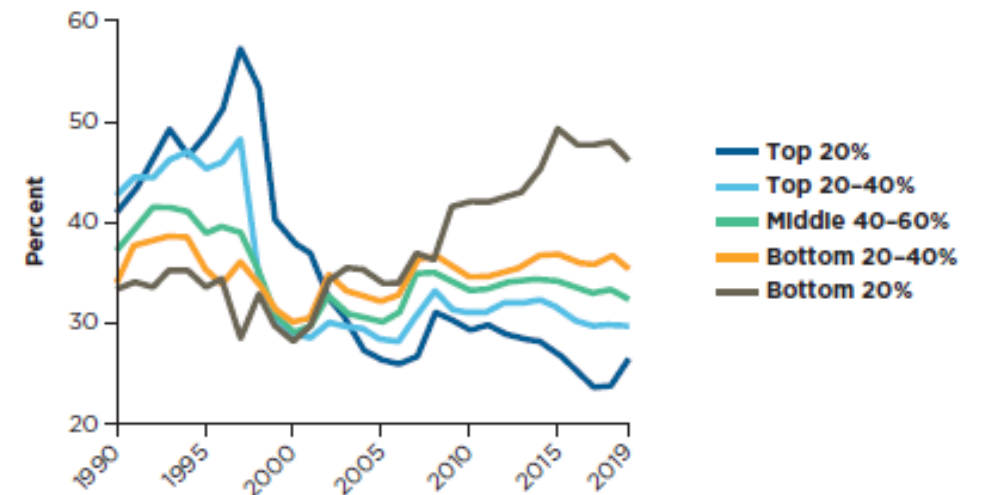
INNOVATIVE KOREA

Pillar I: Transformation of
State Market Relationship
through Market Reforms

Financial Sector Reforms and Capital Market Liberalization

- Financial sector overhaul central to the transformation from state-led to market-led growth model
- Pre-AFC, gov interventions in the financial sector resulted in significant debt accumulation:
 - Preferential access given to chaebols was central to industry policy
- Reform as big-bang approach to monetary policy reforms:
 - Capital market liberalization
 - Financial sector globalization
 - Introduction of a fully floating exchange rate system
 - Corporate and government bonds opened to foreign investors
 - Ceiling on foreign investment in equities lifted
- Comprehensive restructuring and reform
 - Financial Services Commission Act overhaul, the financial regulatory framework
 - Loan portfolio composition change from large firms to SMEs
 - Significant restructuring of the Non-Bank financial institutions (NBFIs)
- Post-AFC reforms resulted in significantly strengthened stability and resilience of the economy for GFC

Leverage, by Firm Size: Audited Firms, Republic of Korea, 1990–2019



Source: Guide 2021.

Competition Policy and Corporate Governance Reforms

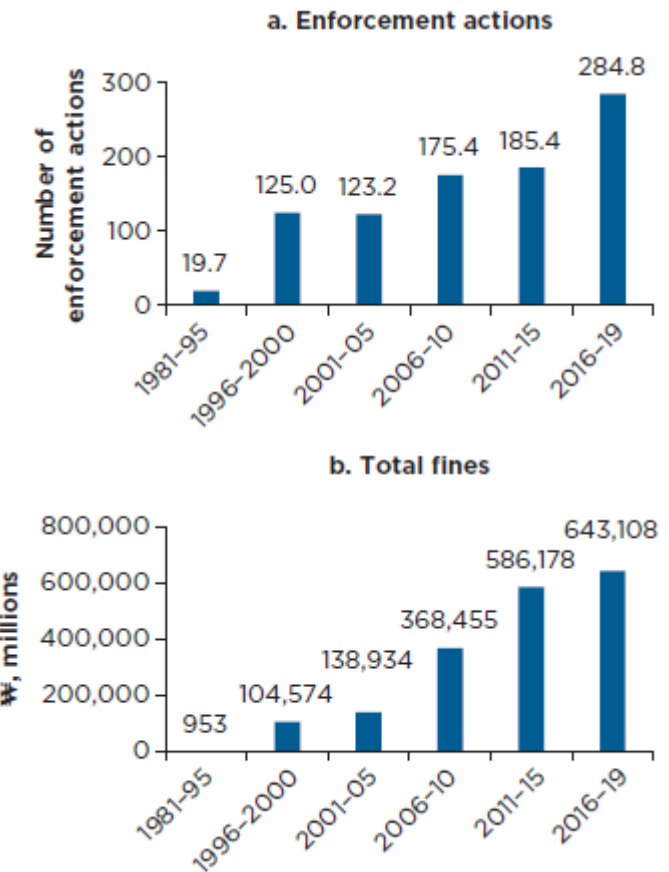
Competition Policies

- Competition policies and institutions were introduced in Korea when it was still a MIC
- In response to the AFC, the role of the Korea Fair Trade Commission (KFTC) was greatly strengthened, resulting in significant increases in enforcement actions and fines.
- Competition policies include restrictions specific to large business groups: reciprocal shareholding and limits on debt guarantees among affiliated companies.
- Policies to restrict the entry of large enterprises in sectors where SMEs are active

Corporate Governance Reforms

- Weak corporate governance was a major cause of the corporate over-indebtedness and excessive risk-taking that had led to AFC.
- Post-AFC, requirements for accounting, reporting, auditing, and disclosure of financial statements, minority shareholders rights, and role of outside directors were strengthened

Law Enforcement by the Korea Fair Trade Commission, 1981–2019



Source: Statistical Yearbook of 2019, Korea Fair Trade Commission.

Note: Panel a shows the annual average number of enforcement actions for the abuse of market dominance, merger enforcement, and cartel behaviors. Panel b shows the annual average fines for all types of violations.

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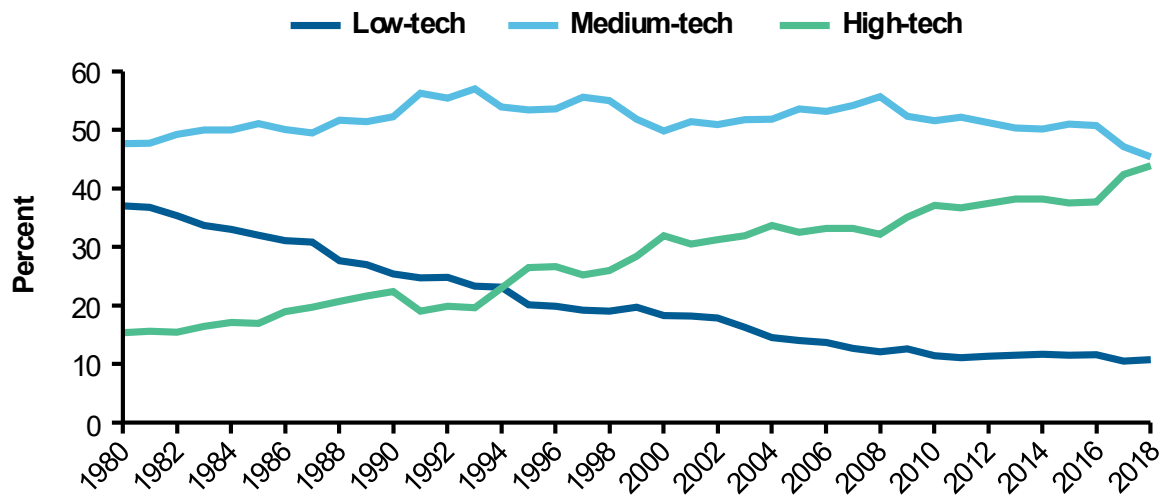
Pillar II: Transformation of Industrial Policies

Today a Global Innovation and Tech Leader, but how?

Korea converged to the global manufacturing productivity frontier by continuously upgrading its industrial technologies

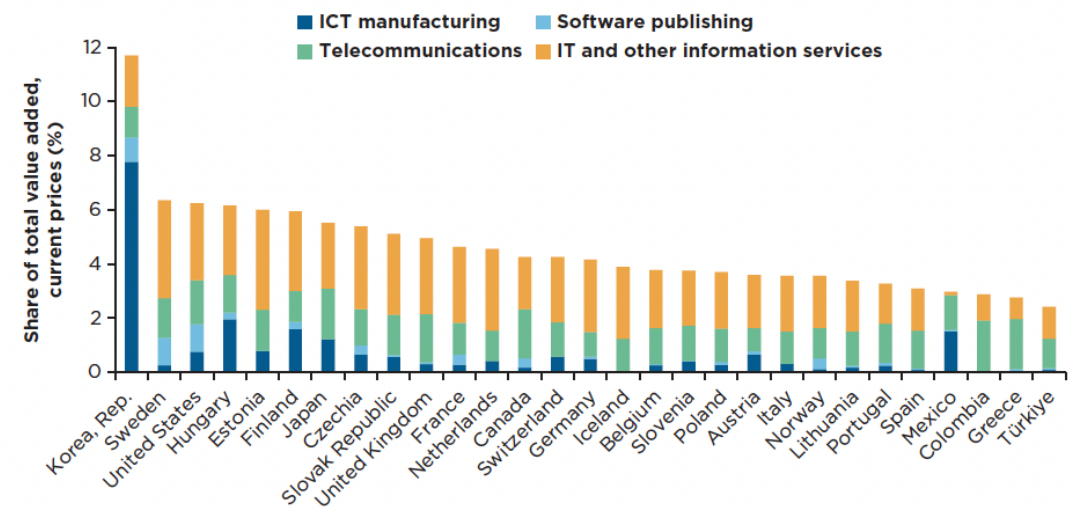
- Rising share of high-technology and R&D-intensive industries
- ICT sector accounted for 11.7% of GDP, the highest share among OECD countries, contributing to productivity improvement

Value-Added Share, by Level of Technology



Source: Calculations based on data from OECD STAN Industrial Analysis Database.

Value added of the ICT Sector, 2020

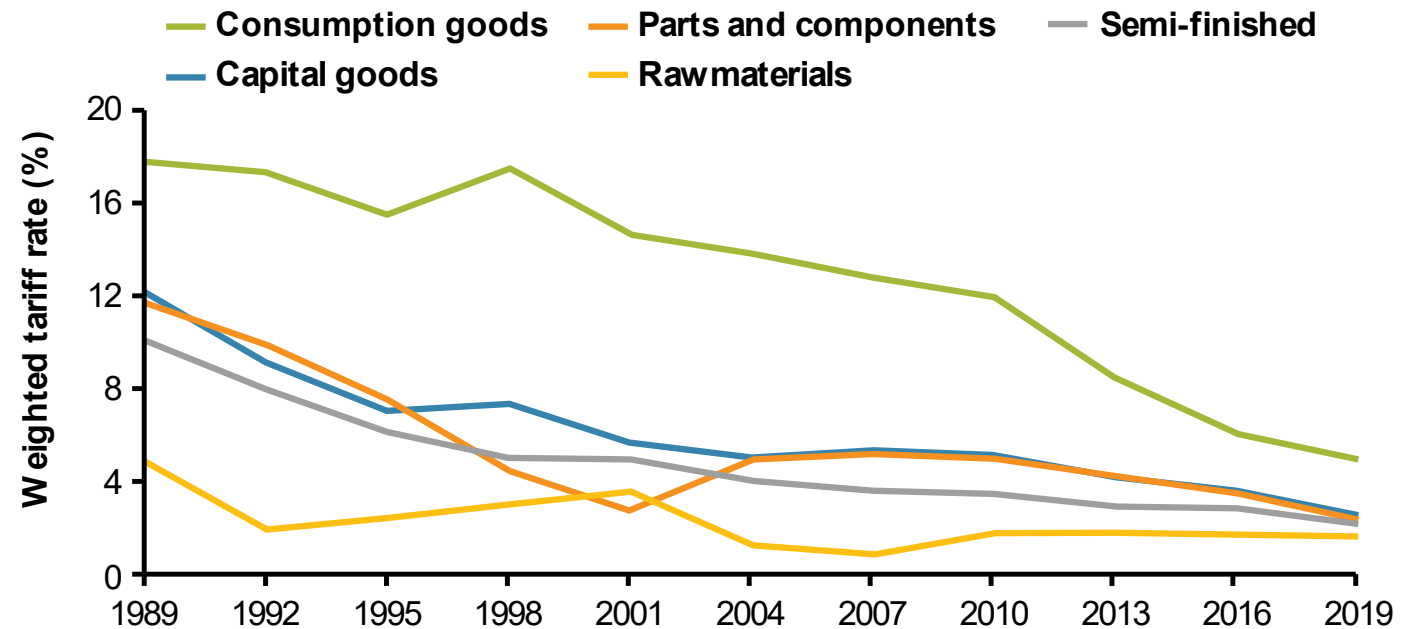


Source: STAN structural indicators (iSTAN), 2022 edition, OECD

Promotion of Export

- The government launched a major **tariff rate reduction** program in the 1980s
 - Simple average tariff rate of all products was reduced from **23.7%** (1983) to **8%** (1994).
- Since mid-1990s, important liberalization was pursued through **17 FTAs with more than 50 countries**
- Korea complemented tariff reductions with major trade facilitation reforms, including **Export Credit Agencies (ECAs)** and **Export Promotion Agencies (EPAs)**
- Korea is ranked **1st** in the **2021 Global Survey of Digital and Sustainable Trade Facilitation**, and **17th** out of **139** in the **2023 Logistics Performance Index**

Effectively Applied Weighted Tariff Rates

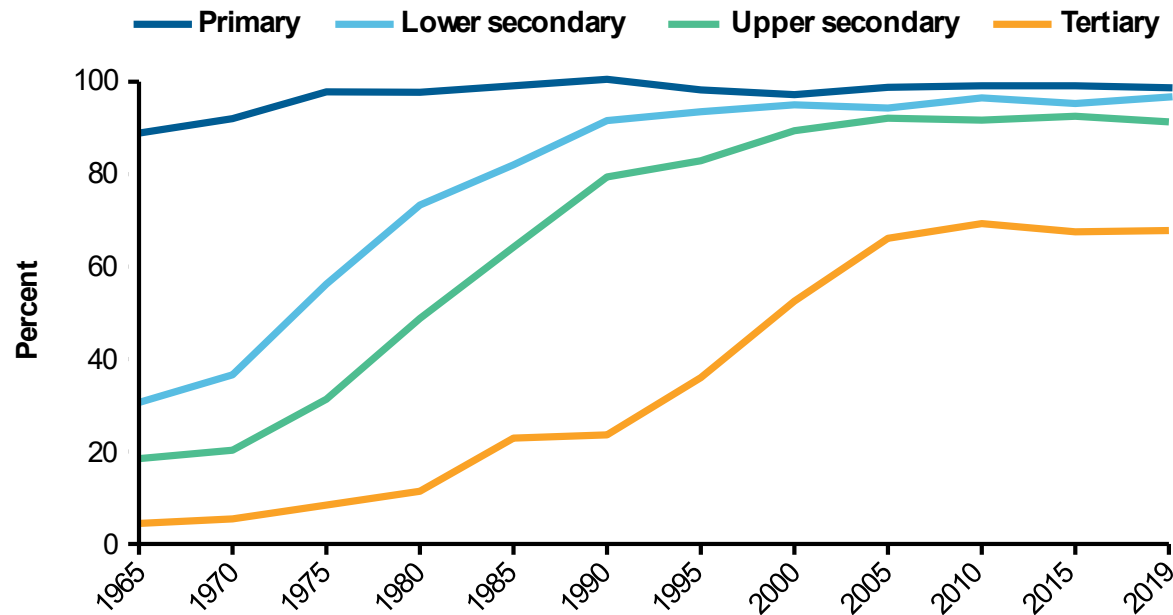


Source: Calculations based on data from the Korea Trade Statistics Promotion Institute.
Note: Tariff rates are weighted by the product import shares.

Producing an Educated and Skilled Workforce

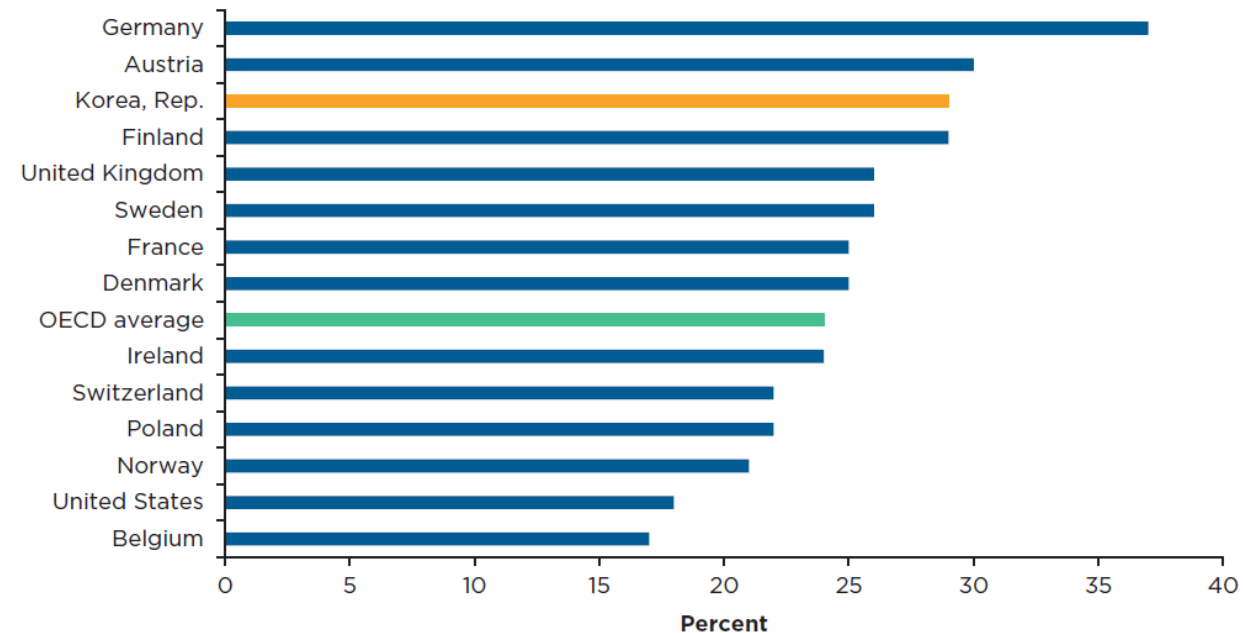
- Sequential expansion of primary education, secondary and then tertiary education.
- Academic education reforms focused on strengthening STEM education and R&D development
- Integration of academic and vocational and technical tracks

Gross Enrolment Rates, Korea



Sources: Koh et al. 2010; Ministry of Education and Korean Educational Development Institute (various years).

Share of Tertiary Graduates in STEM Fields, 2015



Source: OECD 2017.

Producing an Educated and Skilled Workforce

- National economic planning and human capital development planning have been closely coordinated

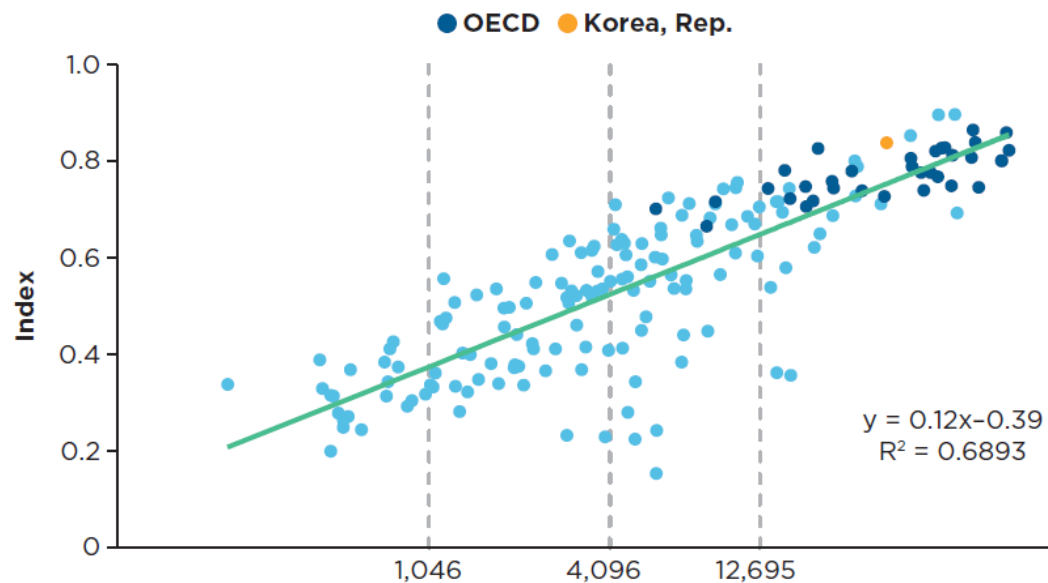
	Major Strategies for National Econ. Dev.	Major Strategies for Manpower Development
1950s	Build SOC and industry base	Universalize 6-yr primary education Decrease Adult illiteracy
1960s	Develop Labor-intensive light industry with export-promotion	Introduce Vocational high school curriculum and junior college system and vocational training system
1970s	Build Self-reliant growth base Develop Heavy and chemical industries	Expand Secondary school and junior college Introduce Compulsory vocational training system
1980s	Develop Technology-intensive industry	Expand Higher education Promote Research and development
1990s	Promote High-tech innovation Develop Information industry	Strengthen Higher education (science and technology) Introduce Employment insurance system
2000s	Promote High-value added technology innovation	Develop Highly skilled human resources for new technology area Strengthen Industry-higher education collaboration
2010s	Promote Innovation-led and balanced growth	Restructure High school system Expand Industry-higher education collaboration Cultivate Basic sciences and high tech R&D manpower

Investing in Digital Adoption and R&D Capabilities

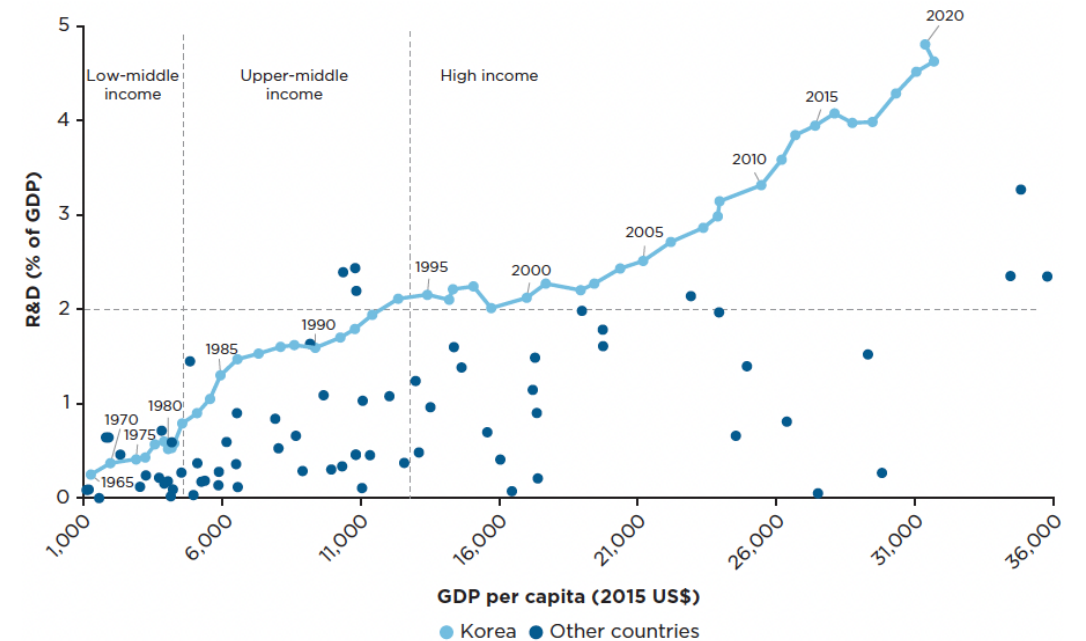
Korea has among the highest levels of digital adoption globally, but there is a significant technology gap between large and small firms

R&D spending increased rapidly in the 1980s when Korea was still a MIC and now it is the second highest (% of GDP) in the world.

Digital Adoption Index, OECD Countries, 2021



R&D versus GDP per capita, across Countries, 1965-2020

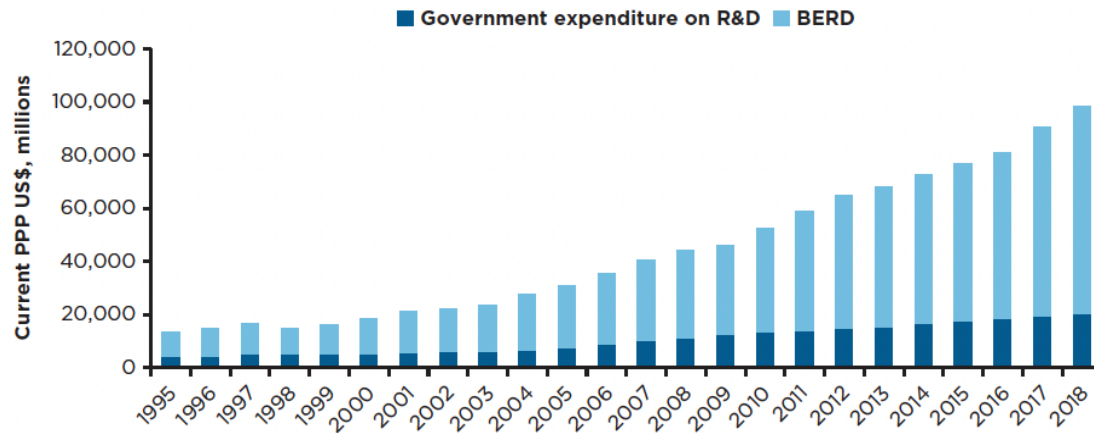


Source: Calculations based on data from World Bank 2017, updated for 2021.

Sources: Hong, Choi, and Kim 2020, based on World Bank 2020.

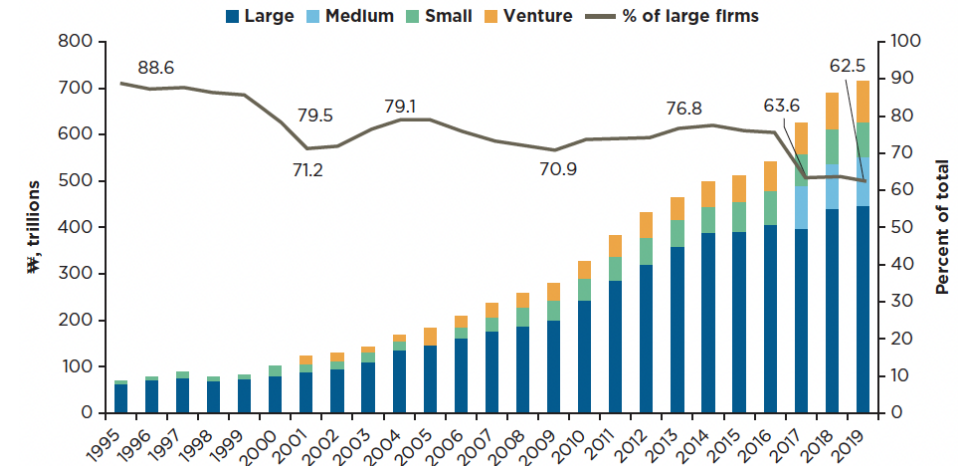
Policy Shift from Promoting Firms to Innovation

Sources of R&D Expenditure, 1995-2018



Source: OECD

R&D Expenditures, by firm size, 1995-2019

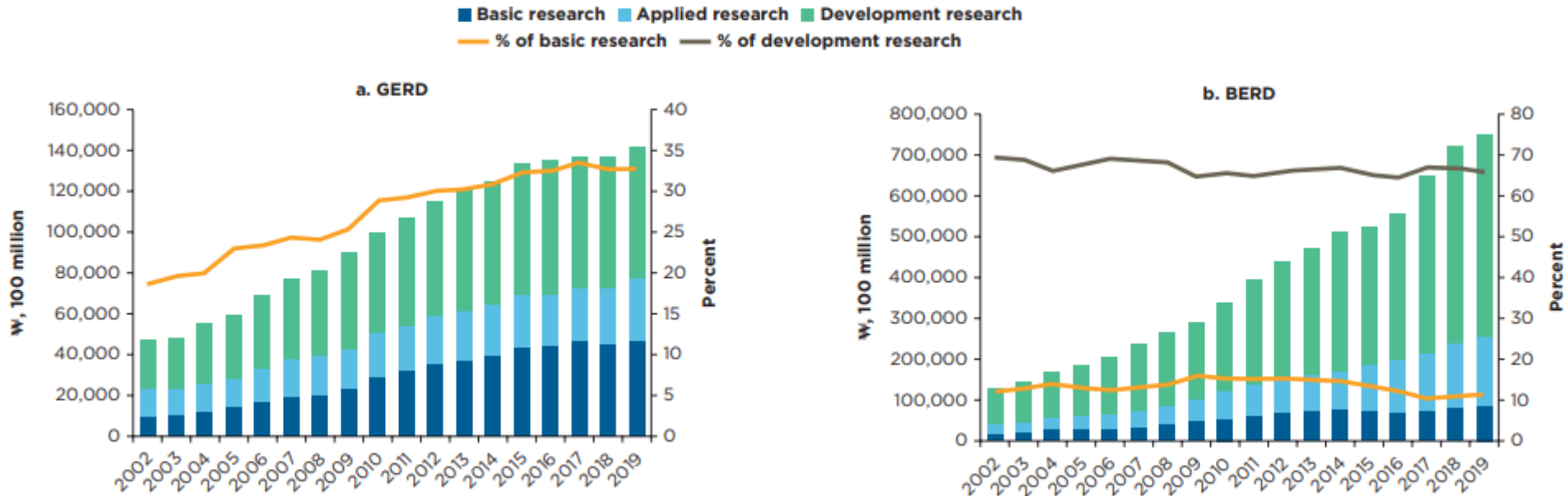


Source: Data from Korea Institute for Advancement of Technology; NTIS Stats, National Science and Technology Information Service, <https://www.ntis.go.kr/rndsts/>.

- R&D in Korea has been led by the private sector since the 1980s, in particular the large manufacturing firms
 - One of the highest BERD to GDP in the world, 3.6% in 2018 which is more than twice the OECD average of 1.7%.
 - The top five enterprises accounted for 54 percent of manufacturing R&D spending
- Post AFC, the government reoriented from technology adoption to domestic frontier technology innovations and basic research.

Policy Shift to Promoting Basic Research

Distribution of R&D Expenditures by Research Stage: GERD and BERD, 2002-19



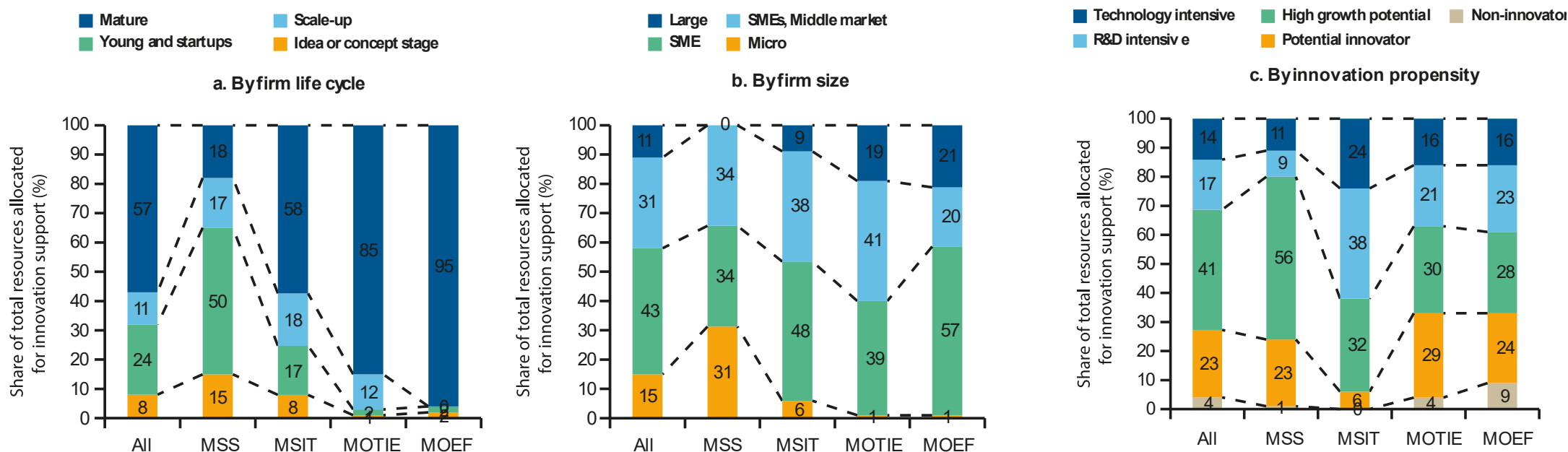
Source: Industrial Statistics Analysis System (<https://istans.or.kr/wh/whAbout.do?chn=1>) (accessed: February 1, 2021).
Note: The units for R&D expenditures are , 100 million W, around US\$93,000.

- Up to the mid-1990s, the government and the business sector prioritized applied and developmental research to promote manufacturing exports. Post-AFC, the government shifted gears, recognizing that future economic performance would require more upstream basic research capabilities.
- The 2000s witnessed an expansion of private research spending and institutions due to the R&D tax credit provisions

Policy Shift from Promoting Large to Small Firms

- Since the AFC, government support for business innovation was reoriented from large firms to SMEs, which became the largest beneficiaries of public support for innovation
- By 2018, only 11% of the public policy support for enterprises was allocated to large firms, 58% to MSMEs, and 31% to “middle market” firms.
- 54% of policy support is allocated to tech-intensive firms and potential innovators.

Targeting of Beneficiaries by Ministry in 2018 as Share of Total Resources Allocated, 2018



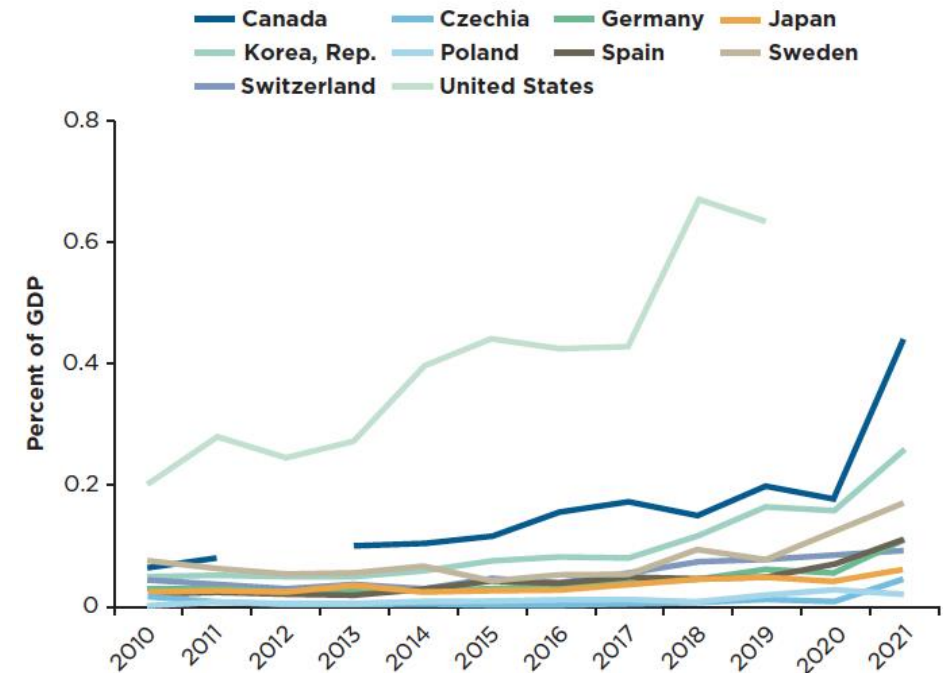
Sources: Frias et al. 2021, based on data from MOEF 2017; ministry budget and planning documents.

Note: MOEF = Ministry of Economy and Finance; MOTIE = Ministry of Trade, Industry, and Energy; MSIT = Ministry of Science and ICT; MSS = Ministry of SMEs and Startups

Focus on Promoting Innovative Entrepreneurship

- The size of Korea's venture capital market has grown in the last decade to one of the biggest in the world.
- In 2019, VC investments was equivalent to 0.16% of GDP, the third highest among all OECD countries after the United States and Canada.
- Early to mid-2000s produced first generation of tech-based venture firms: **Kakao, Naver and Celltrion**, today among the ten largest companies in Korea by market capitalization.
- Venture firms now account for **11.5%** of the total business R&D and about half of SMEs' R&D, even though venture firms make up only **1%** of the total number of SMEs

Venture Capital Investment, Selected Countries, 2010-21



Source: Science, Technology and Innovation Scoreboard, Organisation for Economic Co-operation and Development (<https://www.oecd.org/sti/scoreboard.htm>).

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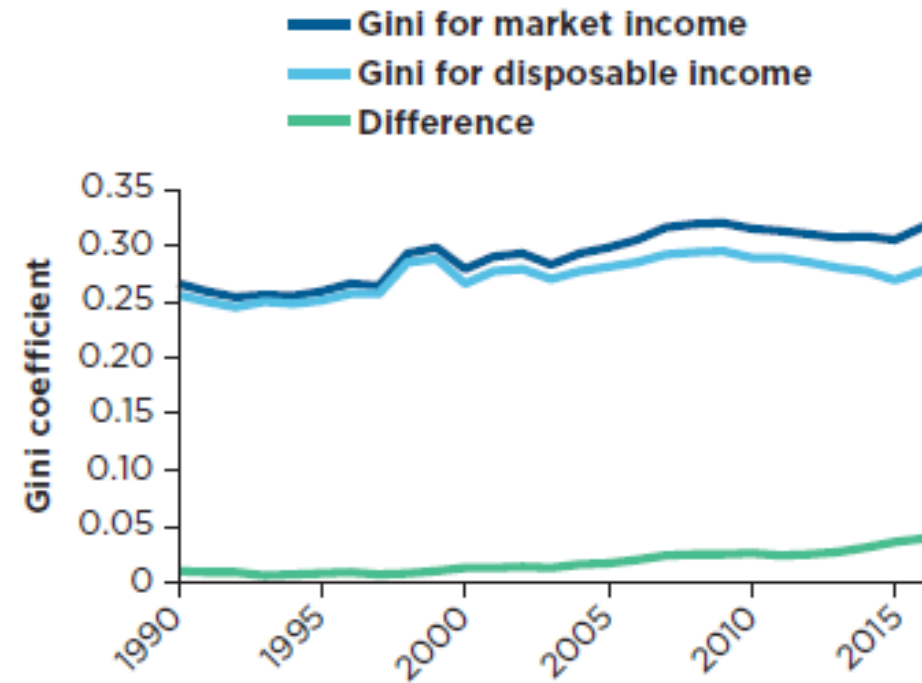
Pillar III: Inclusive and Sustainable Growth

Inclusive and Sustainable Growth

Korea succeeded in rapid growth with moderate levels of inequality and significant reduction in poverty up to the 1990s

- Expanding access to education and jobs had been the government's main approach to promoting inclusive growth (“Grow First, Redistribute Later”)
- Rapid growth and poverty reduction helped mobilize broad support for Korea's growth policies
- Korea began to build its social safety net system in the 1970s and significantly expanded it following the AFC

Gini Coefficients, 1990-2016



Source: Statistics Korea (<https://kosis.kr>).

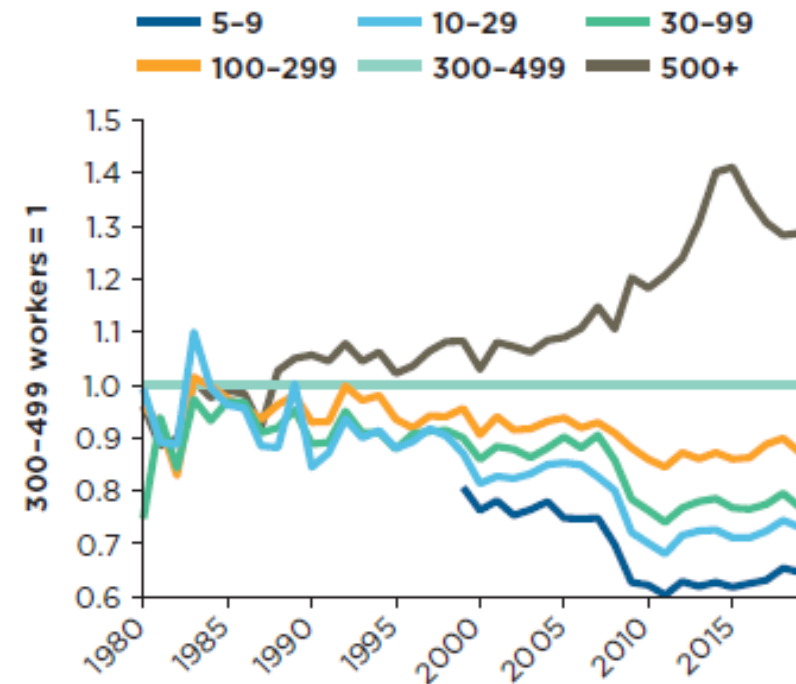
Note: The data are for urban households with two or more members.

Inclusive and Sustainable Growth

A key driver of inequality has been the large productivity gaps between large and small firms, which have led to large wage gaps

- The productivity gap between large firms and SMEs is one of the largest among OECD countries
- The average wage in establishments with 5–9 workers is currently only 65 percent of the average wage in establishments with 300–499 workers
- Jobs in large enterprises, which often have better benefits and working conditions, are becoming increasingly scarce

Wage, by Establishment Size, 1980–2019

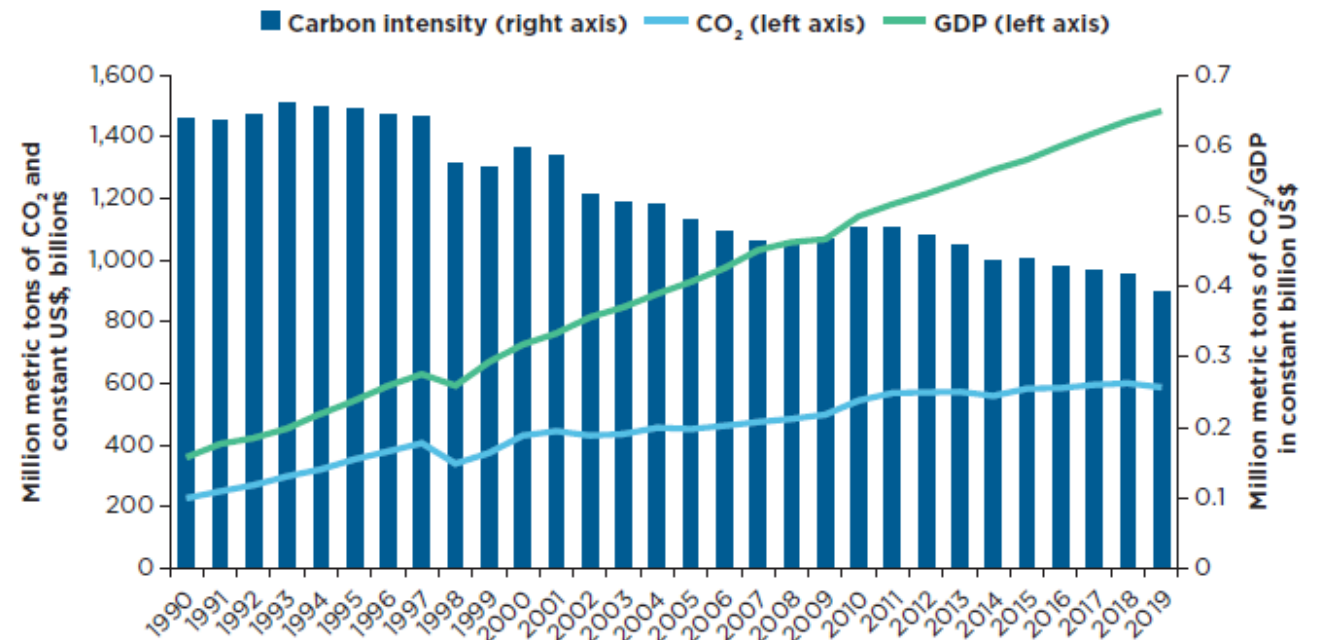


Source: Ministry of Employment and Labor, Survey of Working Conditions by Employment Type; data from Statistics Korea (<https://kosis.kr>).

Inclusive and Sustainable Growth

- As Korea became a high-income economy, social concerns for the environment, pollution, and the quality of life became a greater priority (efficiency and equity tradeoff)
- Korea's economic growth had been based on a carbon-intensive manufacturing sector, but Korea has started to decouple GDP growth from carbon emissions
 - In 2010-19, real GDP growth and carbon emissions growth were 3.3 percent and 1.6 percent

Greenhouse Gas Emissions, GDP, and Carbon Intensity, 1990–2019



Sources: For emissions from combustion, IEA 2021; World Development Indicators, World Bank (2005–20) (<https://data.worldbank.org>); for GDP, World Bank data.

THANK YOU



WDR Framework Applied

Creating and enabling markets

- **Promoting private enterprises**
 - From growth and expansion of large conglomerates (efficiency-driven) to favoring smaller firms and entrepreneurs (equity-driven)
- **Infrastructure investments**
 - Physical capital accumulation; early investments in ICT leveraged digital and technology adoption

Rewarding Merits

- **Rewarding performer firms for R&D investments and exports**
 - R&D, STI policies, tax incentives, export promotion/facilitation
- **Rewarding human capital investments**
 - Aligning economic development plans (demand) with human development plans (supply)

Managing incumbency

- **Functioning State-market relationship**
 - Financial market institutions with oversight role and minimal distortions
 - Financing for tech ventures
 - Competition policies (KFTC)
- **Evolution of industrial policy**
 - from market creation (interventionist) to facilitation (coordination, PPPs); from favoring firms and industries to promoting innovation