

# Demographic Change and Korea's Growth Prospects

The Strategic Role of AI and Human  
Capital in an Aging Society

March 6, 2026  
RIETI BBL Seminar



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# Growth Slowdown: Structural Constraint or Strategic Choice?

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## ◆ Korea's structural shift

- Growth has declined from rapid convergence to **near-stagnation**.
- Potential growth is projected to fall below **1% by the 2040s**.
- Rapid population aging and ultra-low fertility rate
- Rising **fiscal pressure**

## ◆ More uncertain external environments

- **Rising protectionism and geoeconomic fragmentation**
- **China's technological upgrading** and rising competition for Korean exports
- External pressures constrain Korea's export-led growth model.

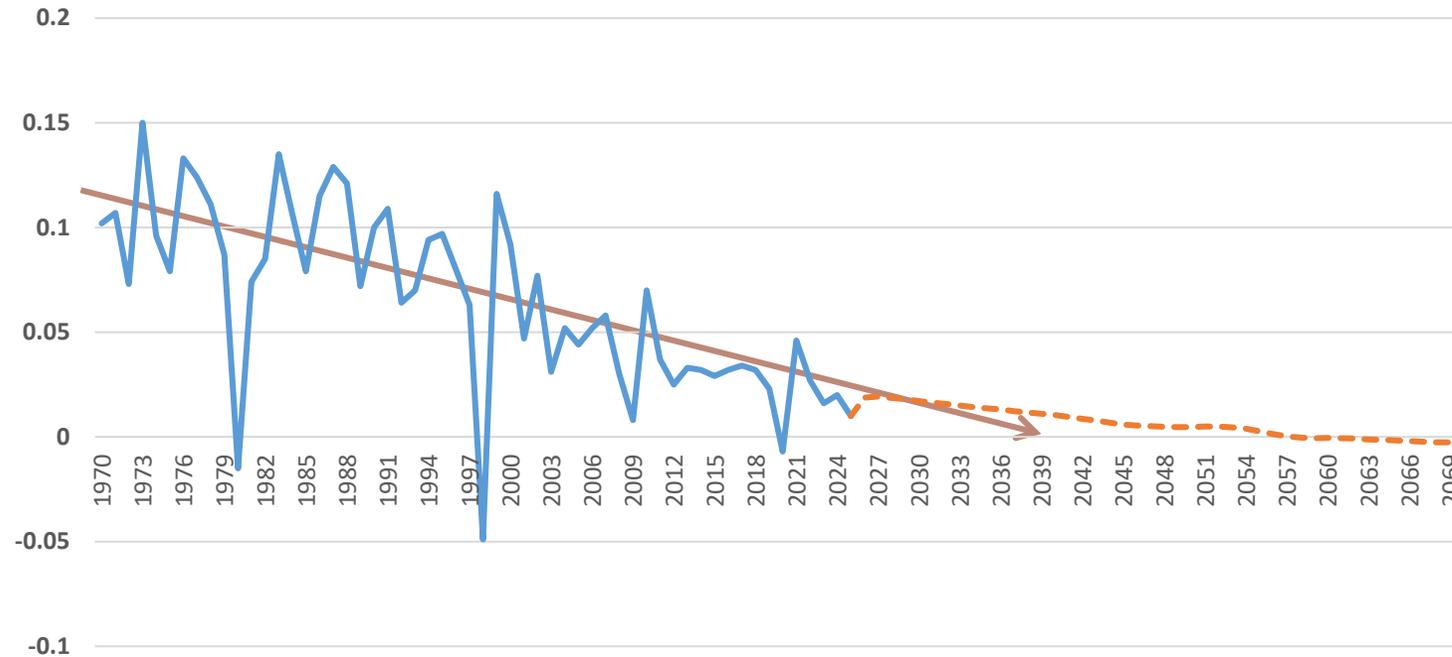
## ◆ Raising potential growth is central to long-run strategy

- National goals include growth, stability, fairness, competitiveness, and well-being.
- Without sustained income growth, other objectives are difficult to achieve.

# Korea's Declining Growth Trend

- Korea's economic growth has steadily declined over the past decades.
- Growth slowdown reflects **convergence effects, declining labor force growth, slower productivity growth.**
- OECD projections: **Potential growth** falls below 1% by 2041 and turns negative by 2058.

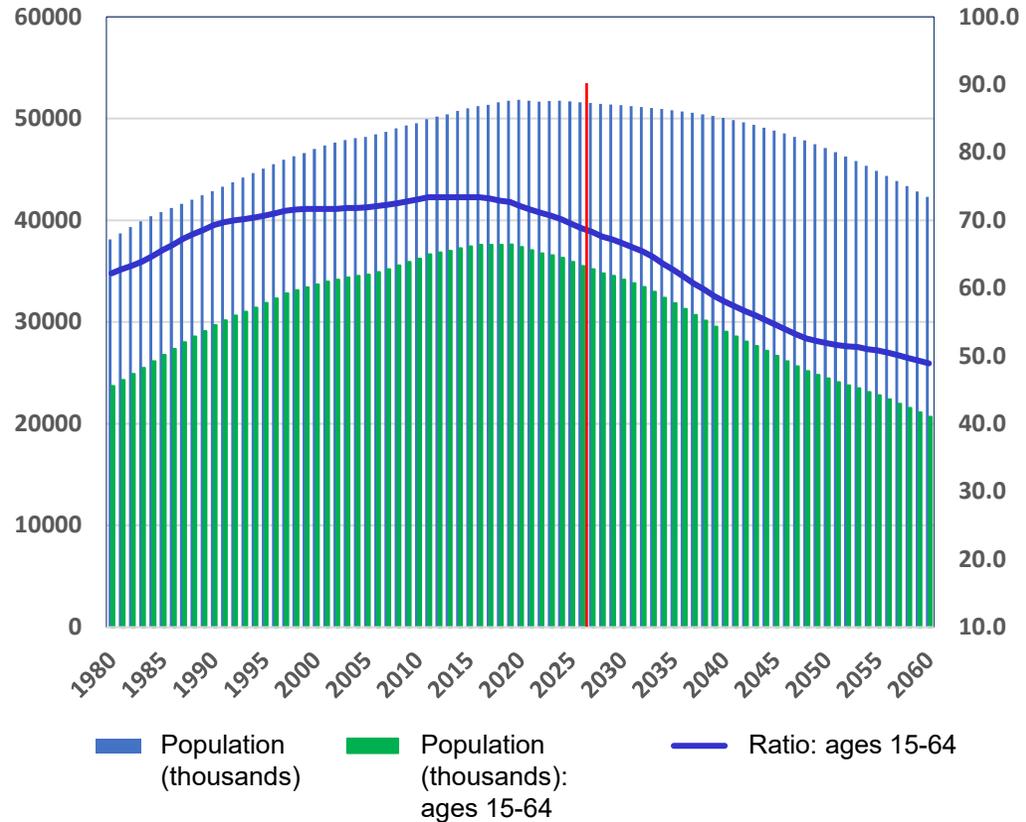
Trend and projections of GDP growth, 1970–2070



Source: Bank of Korea and OECD, Economic Outlook 117 long-term scenarios, 2025

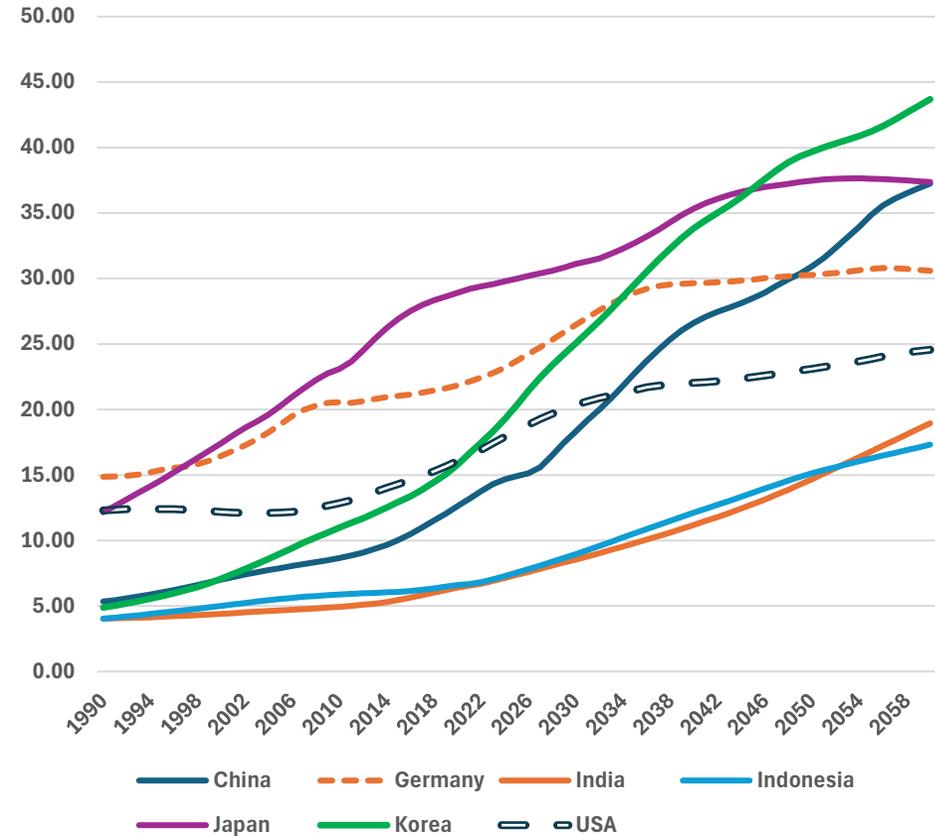
# Changes in Korea's Population Structure

## Trends and projections of total population and working-age population



Note: Projections are median values  
 Source: Statistics Korea, Korea Population Census, KOSIS

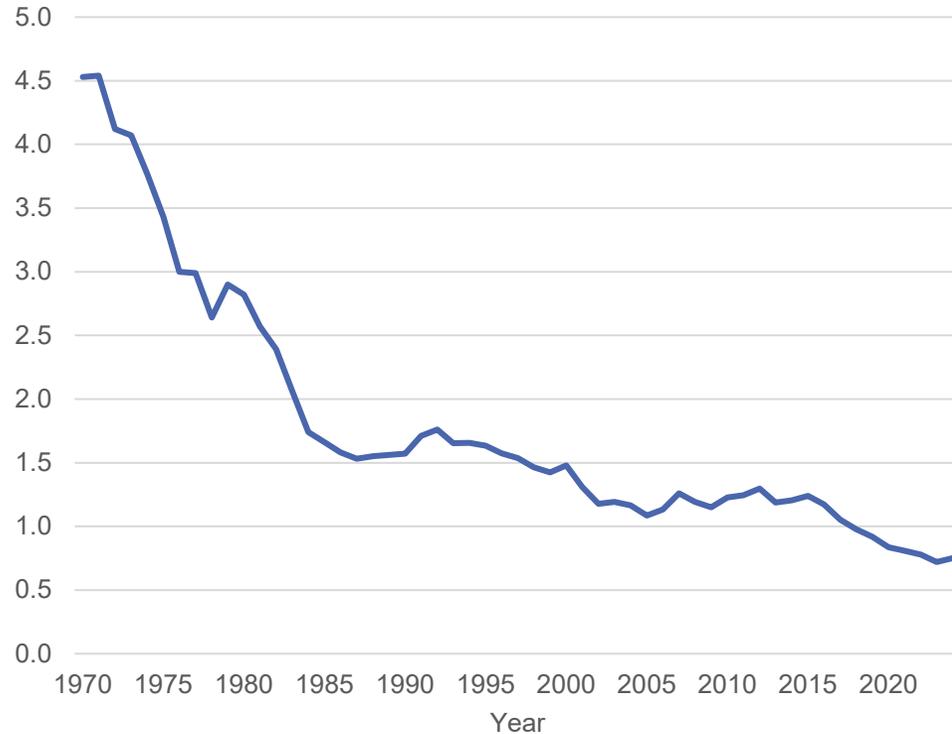
## Projected proportion of population aged 65+ in major countries



Note: Projections are median values  
 Source: United Nations, World Population Prospects 2024

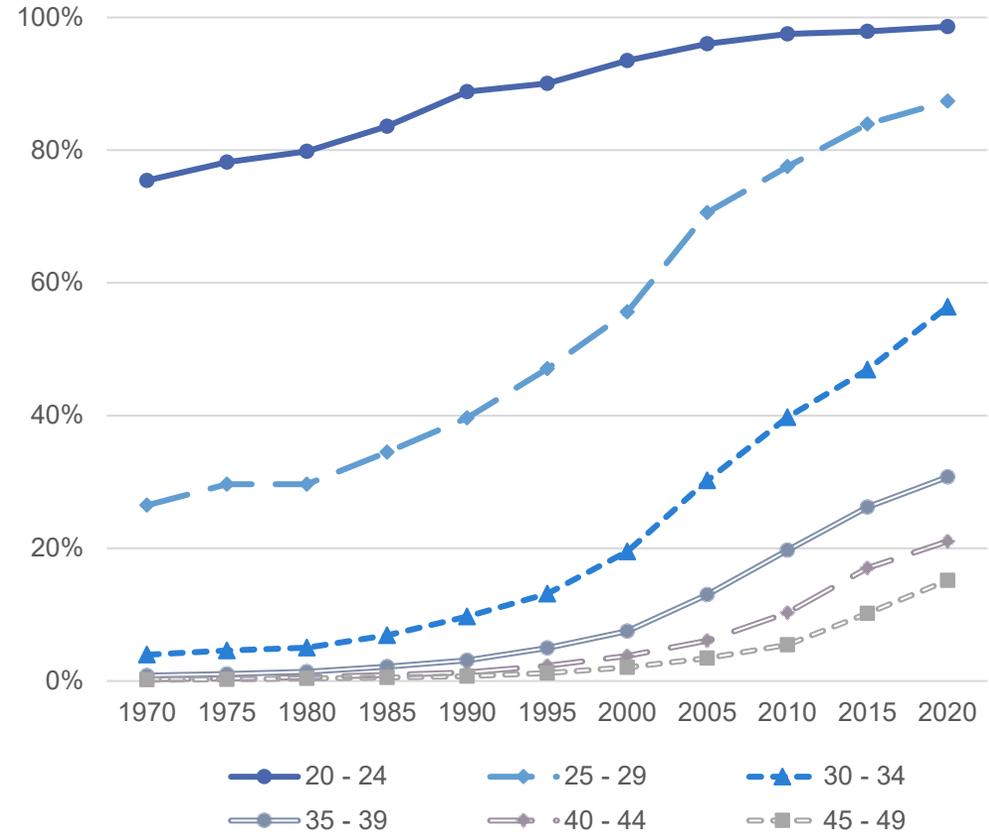
# Low Fertility in Korea

## Fertility rate



Source: Statistics Korea, Vital Statistics of Korea, KOSIS)

## Share of never-married by age groups



Source: Statistics Korea, Korea Population Census, KOSIS

# Central Questions

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- ◆ **Will demographic change determine Korea's future — or is it policy-dependent?**
- ◆ **Can AI and human capital offset labor decline and population aging?**
- ◆ **What institutional and policy design allows technology and human capital to translate into sustained growth?**

# Japan Matters for Korea

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- ◆ Japan experienced rapid population aging and growth slowdown earlier than Korea.
- ◆ It has developed strong technological capability and human capital.
- ◆ Korea can learn from Japan's successes — and its policy constraints.
- ◆ Korea still has relatively more fiscal and policy space, allowing earlier structural adjustment.
- ◆ Closer cooperation can help both countries address shared structural challenges.

# Demography and Growth

# How Demographic Change Affects Growth

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## ◆ Demographic headwinds

- A shrinking labor force creates a **direct drag on economic growth**.
- Population aging may reduce **average productivity**.
- **Innovation incentives** may weaken as the workforce ages.
- However, **demography does not predetermine growth trajectories**.

## ◆ Offsetting margins (quantity and quality of labor)

- **Labor force participation of women and older workers** is expected to continue rising.
- A gradual recovery in fertility may partially mitigate long-run labor decline.
- **Labor quality** improves through human capital accumulation

## ◆ Capital deepening and technological response

- Labor shortages can stimulate **physical capital accumulation**.
- **Labor-saving technologies** can develop.
- Labor can be more easily replaced by capital with higher elasticity of substitution.

## ◆ Quantitative implication (Korea)

- Higher labor quantity and quality, capital substitution, and faster technological progress can **raise potential growth rate by about 1 percentage point** in the medium term, offsetting demographic drag. (Han and Lee, 2020; Lee and Song, 2024)

# Sources of Economic Growth in Korea

## Estimated direct impact of labor input decline on growth

Growth Rate in the Working-age Population (A)	Change in the GDP Growth due to the Change in the Working-age Population Growth (B = A x Labor share)
2023–50	Between 2023–50 and 2010–19
-0.014	-0.008

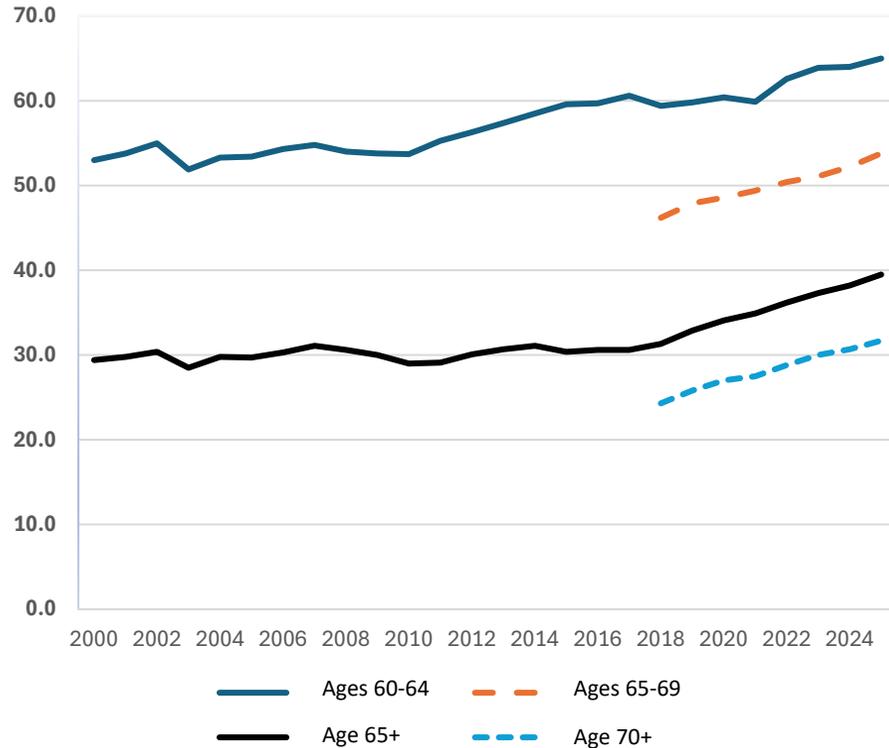
## Growth accounting, 2010~2019

GDP Growth	Contribution from			
	Labor	Human Capital	Physical Capital	Total Factor Productivity
0.0333	0.0034	0.0047	0.0179	0.0074
100%	10.1%	14.0%	53.6%	22.3%

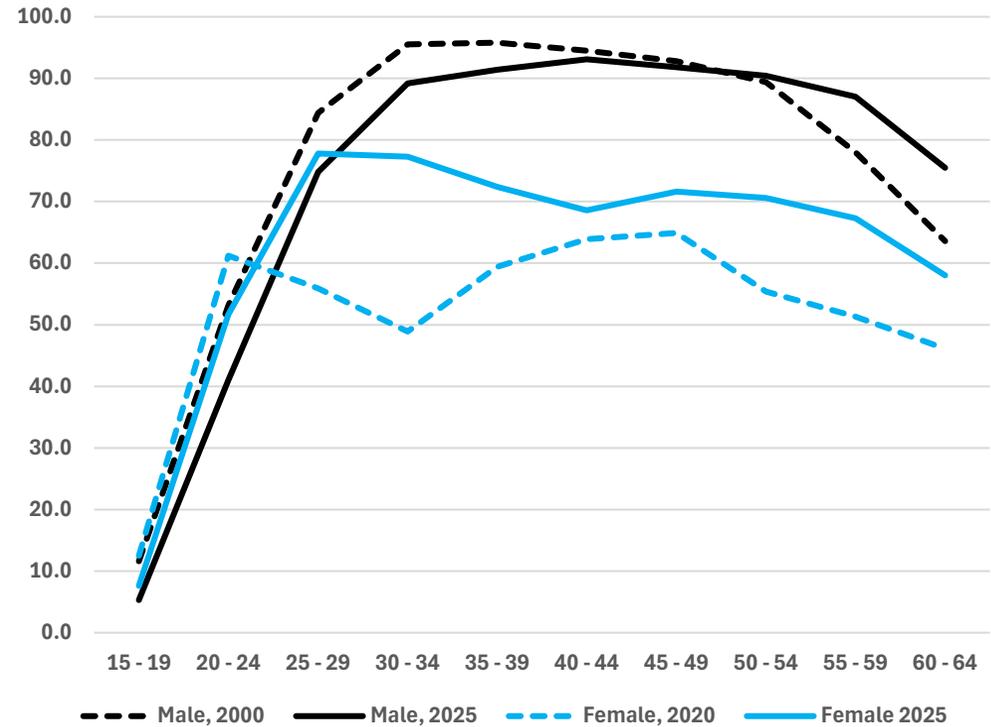
Source: Lee, J. and E. Song, "Demographic Change and the Long-Term Economic Growth Path in Asia," *Economic Modelling*, 2025

# Rising Labor Supply: Women and Older Workers

**Employment rates by age group for the elderly**



**Labor market participation rates by gender**



Source: Statistics Korea

# Does Aging Hinder Aggregate Productivity?

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## ◆ Mixed evidence

- Increasing elderly employment can raise **aggregate GDP**, but may slow **average human capital growth and aggregate labor productivity**. (Han and Lee, 2020)
- Empirical evidence on aging and individual productivity is **inconclusive**.
  - Physical and cognitive abilities often decline with age.
  - Older workers can be better-educated and more experienced.
- Workforce age effects depend on **skills, technology, and institutions**.

## ◆ What shapes the outcome?

- **Human capital** of older workers
- Industry-level investment in **ICT capital** (Ilmakunnas and Miyakoshi, 2013; Lee et al., 2022)

## ◆ Technology as a key margin

- New technologies (ICT, AI) can **complement** older workers and raise productivity.
- Aging can stimulate **technology adoption and automation**.
  - Positive link between aging and GDP per capita (Acemoglu and Restrepo, 2017)

# Human Capital and AI as Engines of Growth

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**Human capital • AI**



**Economic growth**



## **Institutions and policy**

Education • labor market • R&D • regulation • data • infra

# **Why Human Capital Matters for Growth**

# Human Capital

## Inputs

 Education

 Training

 Job experience



## Outputs

 Skills

 Knowledge

 Intelligence

# Human Capital, Productivity and Economic Growth

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## ◆ Micro evidence: human capital and individual labor productivity

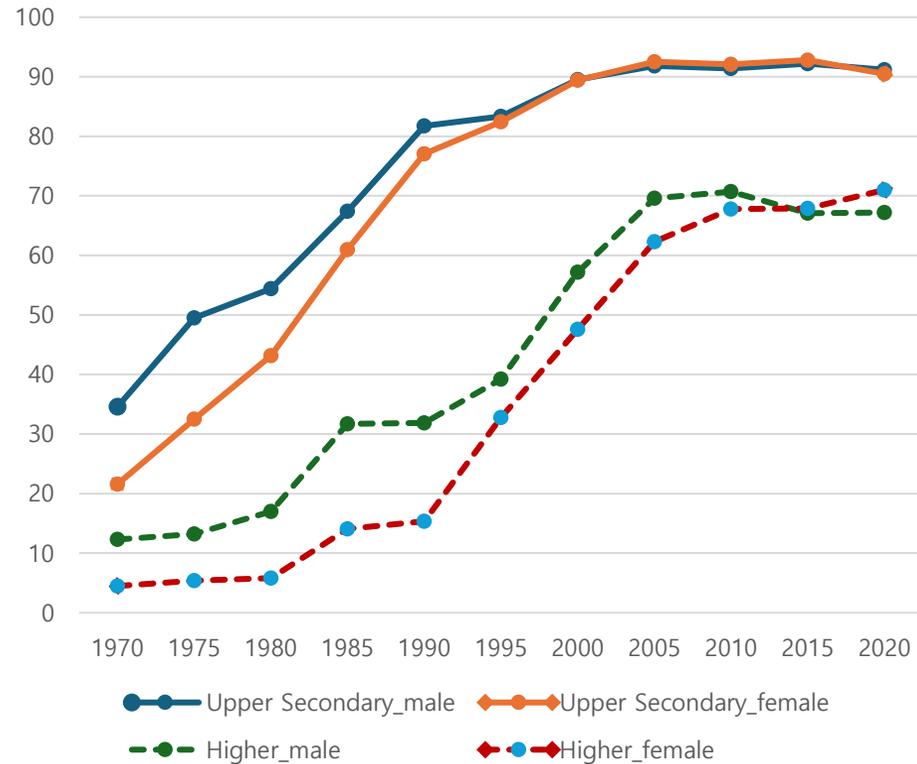
- Higher **educational attainment** (average years of schooling) (Mincer, 1974; Barro and Lee, 1994)
- Improvements in the **quality of education** (test scores) (Lee and Lee, 2024)
- Higher **adult skills**: literacy, numeracy, and problem-solving (Hanushek et al., 2014)
- Accumulation of **work experience and learning-by-doing** (Lagakos et al., 2018)

## ◆ Macro mechanisms: human capital and economic growth

- Higher **physical capital accumulation** (Mankiw, Romer, and Weil, 1992)
- **Knowledge spillovers** among skilled workers (Lucas, 1988)
- Enhanced **R&D capacity and technological innovation** (Romer, 1990)
- Greater **ability to absorb and adapt foreign technologies** (Nelson and Phelps, 1966; Borensztein et al., 1998)

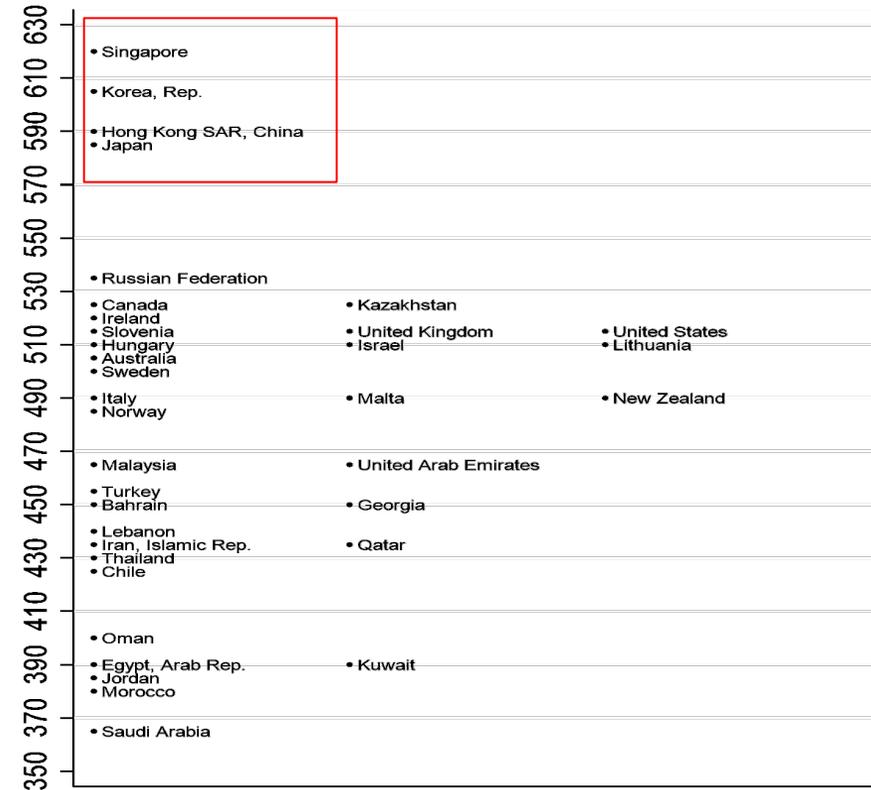
# Strong Human Capital Development

## School enrollment rates



Source: Lee, J.W. and E. Song, Why Marriage and Fertility Are Falling in Korea: Evidence from Longitudinal Data, 2025, working paper

## Mathematics scores (TIMSS, 2015)



Source: IEA (International Association for the Evaluation of Educational Achievement), Trends in International Mathematics and Science Study (TIMSS) 2015 Results in Mathematics.

# Challenges to Korea's Human Capital

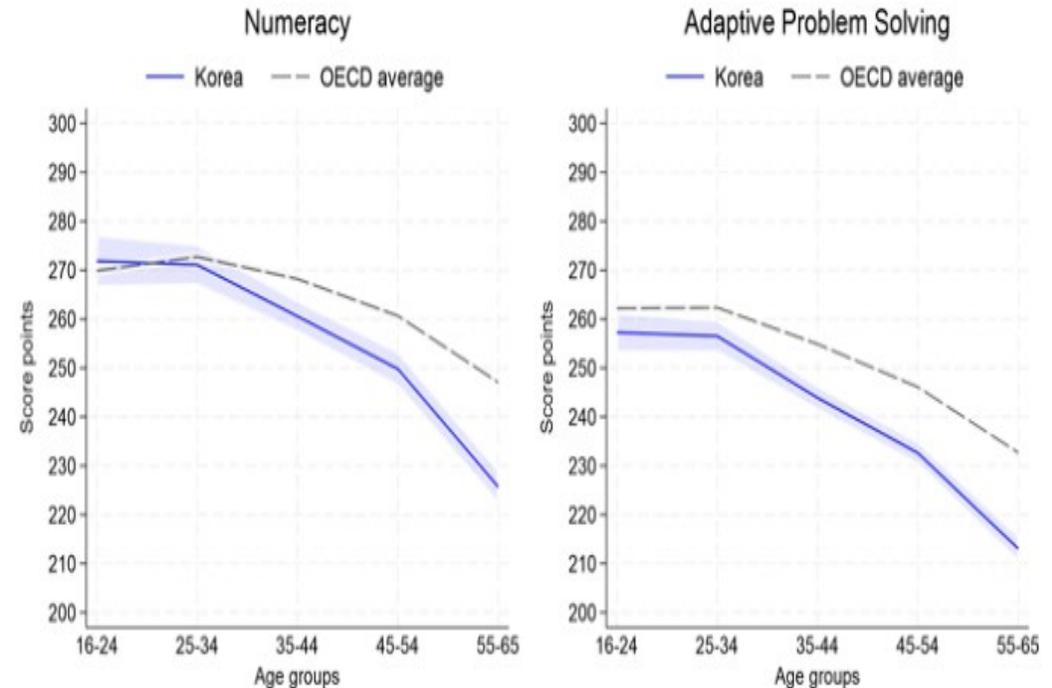
- Low quality of college education
- Education–job mismatch
- Low level of adult skills

## Enrollment share of universities ranked in the top 50 and 100 (Average, 2011–18)

Rank	Country	Top 50	Top 100
1	Singapore	26.8	42.9
2	China, Hong Kong	15.6	23.2
3	Canada	15.1	18.1
4	Switzerland	9.4	18.8
5	United Kingdom	8.9	15.7
6	United States	7.3	12.4
7	Belgium	4.4	13.6
8	Sweden	3.1	19.8
9	Germany	3.0	11.2
10	Japan	1.0	1.8
11	Republic of Korea	0.3	1.4
12	Netherlands	0.2	19.3
13	Ireland	0	3.9
14	Denmark	0	3.3

Source: Lee, H., & Lee, J. W. (2025). Higher Education Quality, Income and Innovation: Cross-Country Evidence, Working Paper;

## Skill proficiency by age groups (PIAAC 2022)



Source: OECD, *Survey of Adults Skills 2023: Korea*

# **AI, Productivity, and the Future of Work**

# AI as a General-Purpose Technology

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## ◆ Transformative nature of AI

- AI is emerging as a new **general-purpose technology (GPT)**, comparable to steam power, electricity, and IT.
- Unlike past GPTs, AI directly augments **cognitive tasks**: prediction, optimization, and content creation.
- Rapid **self-improvement** and scalability may amplify economy-wide effects
- The long-run trajectory of **AGI and its societal implications** remain highly uncertain

## ◆ Opportunities and risks

- Potential to substantially **increase productivity** of workers, firms, and the overall economy
- But **concerns** remain:
  - Job displacement and income inequality
  - Market concentration in digital platforms
  - Governance, privacy, and national security issues

# AI, Productivity, and Economic Growth

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## ◆ Channels through which AI raises productivity

- Direct improvement in **labor productivity**
- **Automation of routine tasks** → reallocation toward non-routine, high-value work
- Increased investment in **intangible and knowledge capital**
- Enhanced **efficiency of innovation** and R&D processes

## ◆ Uncertainty in aggregate growth effects

- Productivity gains may be concentrated in specific sectors.
- **Diffusion** across the economy takes time: “productivity J-curve”. (Brynjolfsson et al., 2019)
- Organizational and institutional **adjustment costs** are substantial.
- Aggregate growth effect estimates are diverse:
  - Conservative model-based estimates (Acemoglu, 2024) : +0.1 percentage point annually
  - More optimistic estimates (Aghion & Bunel, 2024) : ① Past GPT-based: +0.8–1.3 percentage points;  
② Model-based: median 0.68 percentage points

# AI and the Labor Market

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## ◆ Job displacement and complementarity

- Automation substitutes for **routine tasks**, lowering wages for affected workers.
- Wages and employment in non-routine jobs may increase.
- Complementarity effects can generate **new job opportunities**. (Filippucci, et al., 2024)

## ◆ Evidence on worker productivity

- AI tools, including generative AI and LLMs, significantly enhance worker performance. (Brynjolfsson, Li & Raymond, 2025)
- Productivity gains are observed for both skilled and less-skilled workers.

## ◆ Aggregate employment effects

- Industry linkages and demand spillovers may offset displacement.
- Net employment and wage effects depend on:
  - **Skill composition**
  - **Technology diffusion**
  - **Institutional context**

# Projected Impact of AI on Korea

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## ◆ Impact on Individual Workers

- Effects depend on the degree of **AI exposure and task-level complementarity**.
- About 50% of jobs in Korea are highly exposed to AI. (IMF & Bank of Korea, 2025)
  - 24%: High exposure + high complementarity → higher productivity and wages
  - 27%: High exposure + low complementarity → job displacement and income risk

## ◆ Labor market effects

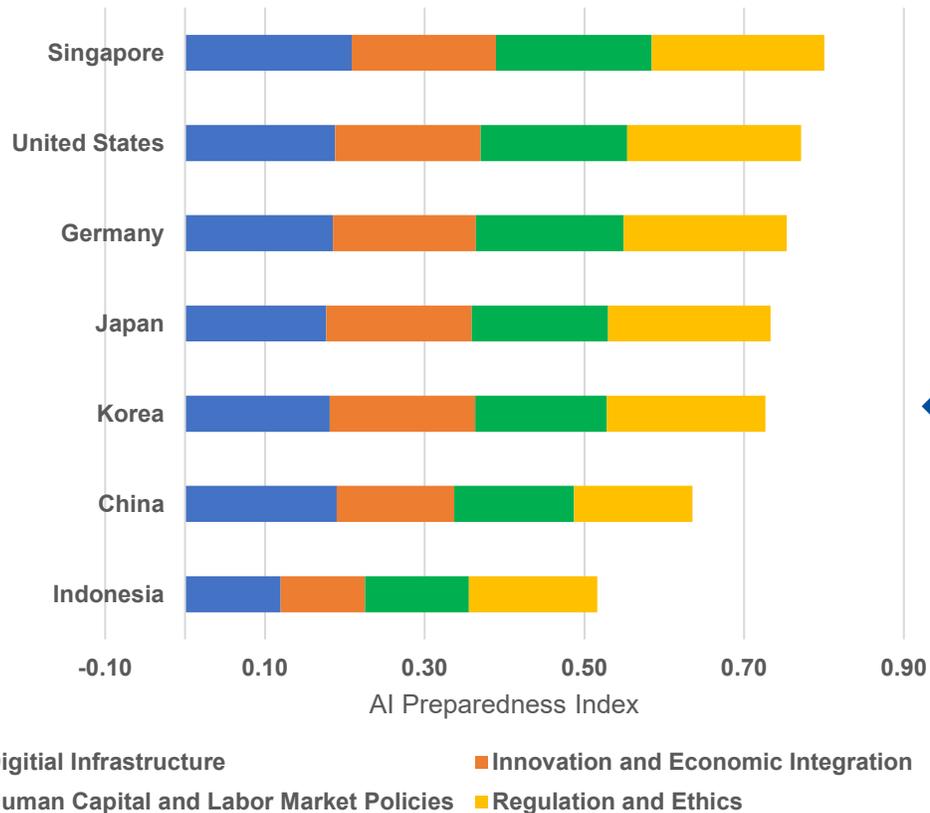
- AI generates a mix of job displacement, task augmentation, and productivity gains.
- Productivity gains may be larger for older and highly skilled workers. (Lee et al., 2022)
- Labor market rigidity and dualism constrain worker mobility.
- Risk of widening inequality across workers, firms, and industries

## ◆ Aggregate productivity and growth

- AI adoption could raise GDP by 12.6% in the medium to long run. (IMF & Bank of Korea, 2025)
  - 8.4% from labor complementarity
  - 4.2% from economy-wide productivity gains

# Korea's AI Landscape and Preparedness

## AI preparedness index



Source: Cazzaniga, et al. (2024). "Gen-AI: Artificial intelligence and the future of work." IMF Staff Discussion Note

## ◆ Korea as an AI Front-Runner

- Around 48% of large firms adopted AI in 2023 (IBM survey)
- 33% of firms with 10+ employees use AI technologies or services in 2023
- Korea is a key global producer of AI semiconductors (about 23% of global semiconductor exports)

## ◆ AI Preparedness

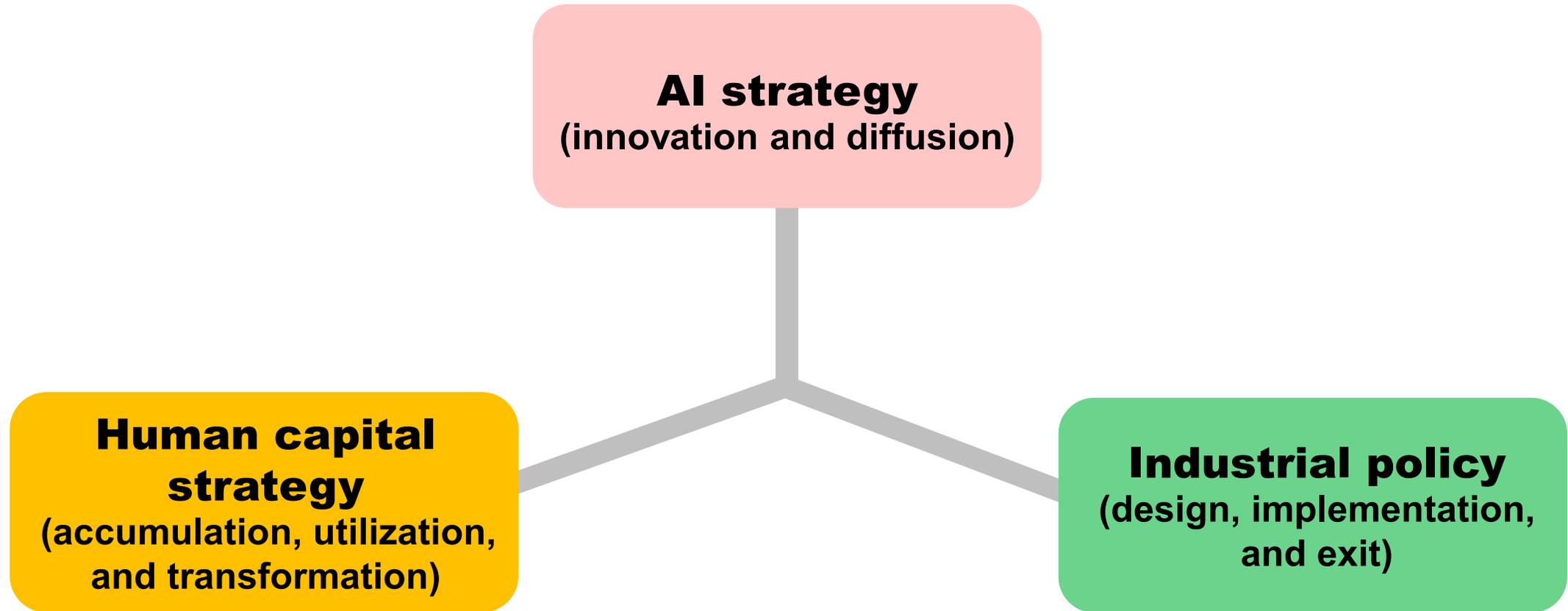
- Ranked **15th** out of 165 countries in the AI Preparedness Index
- **Strengths:** Digital infrastructure, Innovation capacity, Regulatory and ethical frameworks
- **Weaknesses:** Human capital utilization, Labor market policies

# **Enhancing Long-Term Growth under Demographic Pressure**

# Growth Strategy for the AI Era

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- **AI technology, human capital, and industrial policy**— must be aligned.
- Productivity gains arise from **complementarity**— not isolated policy.
- Structural policies must be supported by **macroeconomic stability** and sustained **aggregate demand**.



# Human Capital Strategy: Accumulation, Utilization, and Transformation

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- ◆ **Improving education quality and reducing skill mismatch**
  - Emphasize problem-solving and critical thinking
  - Expand **industry-linked curricula** and field training
  - Expand effective retraining and **lifelong learning** systems
- ◆ **Extending and upgrading older workers' participation**
  - Raise the **statutory retirement age**
  - Provide incentives for continued labor force participation after retirement
  - Support skill development in digital and AI-related competencies
  - Promote **healthy and productive aging** through supportive healthcare systems
- ◆ **Enhancing labor market flexibility**
  - Remove institutional barriers to **job mobility and task transition**
  - Shift toward **competency- and performance-based system**
- ◆ **Strengthening knowledge diffusion**
  - Promote collaboration among universities, research institutes, and firms
  - Ensure R&D outcomes translate into human capital and productivity gains

# AI–Human Capital Complementarity Is Key

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## ◆ Leveraging Human Comparative Advantage

- The goal is **complementarity**, not competition, with AI
- AI should be used as a productivity amplifier, not a labor replacement.
- **AI** excels at: large-scale data processing; routine task automation; and computation, analysis, and prediction.
- **Humans** excel at: problem definition; intuition, communication, collaboration, and empathy; and ethical judgment and accountability.
- **Hybrid Intelligence = Human Intelligence + Artificial Intelligence**

## ◆ Reorienting Education and Training

- From memorization to **4Cs (Critical thinking, Creativity, Communication, Collaboration)**
- Strengthen digital literacy and lifelong learning

# AI Strategy: Innovation, Diffusion and Inclusion

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## ◆ Strengthening the innovation infrastructure

- Expand AI computing, data, and digital infrastructure
- Improve efficiency and focus of R&D investment
- Establish trustworthy **AI standards and norms**

## ◆ Enabling diffusion and inclusion

- Reduce **adoption costs** and learning burdens for firms and workers
- Strengthen support during technological transition:
  - Reskilling and upskilling
  - Job transition assistance
  - Social safety nets

# Korea's Current AI Strategy

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## ◆ Korea's AI policy initiatives

- National AI Strategy: ambition to become an **AI G3** country
- **M.AX** (Manufacturing AI Transformation)

## ◆ AI great transformation: flagship projects

- AI adoption across **key industries**: robotics, autonomous vehicles, AI factories, semiconductors, drone, shipbuilding, home electronics
- AI-driven public services
- Development of domestic and global AI talent
- Expansion of public data openness and AI infrastructure

## ◆ Goal: top-three global AI power:

- Build national AI infrastructure ("AI Highway")
- Secure core AI technologies
- Promote industry–academia–research collaboration
- Expand nationwide AI utilization

# The Role of Industrial Policy

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## ◆ Rationale for industrial policy

- Traditional justifications: infant industry protection; coordination failures; externalities
- **New context:**
  - Geoeconomic fragmentation. supply-chain risks, rise of onshoring and friend-shoring
  - Potential gains from **supply-chain resilience** (Grossman et al., 2023; Liu et al., 2024)

## ◆ Limitations and risks

- Difficulty in selecting winning industries
- **Productivity losses** from excessive protection
- **Weakened competition, rent-seeking, and political capture**

## ◆ Principles for effective industrial policy

- High-quality **design** and **implementation** (performance-based, competition and transparency)
- Government–private sector **collaboration** and **experimentation**
- Rapid **exit** from failed policy choices
- Facilitate industrial transformation by **reallocating AI and human capital**

# Korea's Industrial and Growth Strategy

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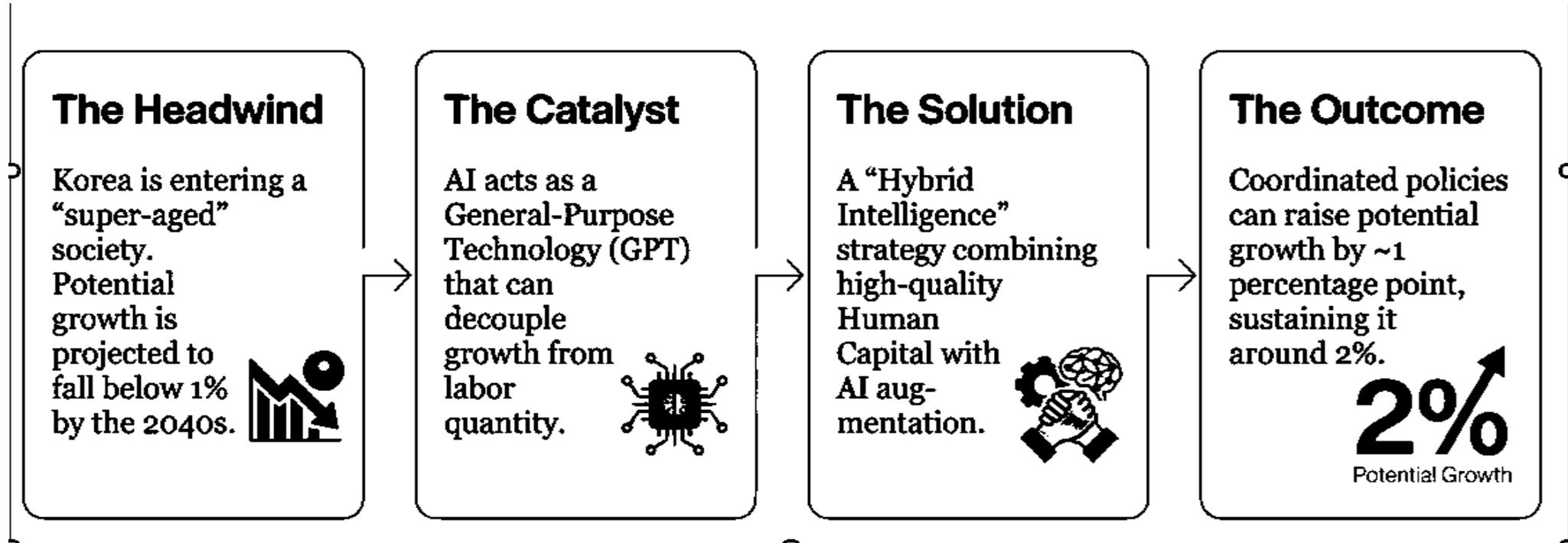
## ◆ Developing national strategic industries

- Advance semiconductors to a top-two global powerhouse
- Nurture new growth engines: **defense, biotech, K-culture**
- Shift petrochemical and steel industries toward low-carbon, high-value-added production
- Enactment of the **Special Act on Semiconductors** (2026)

## ◆ Economic security and supply chain resilience

- Enact **supply chain stabilization and national resource security legislation** (2023–24)
- Stabilize supply chains and secure critical minerals
- Strengthen global strategic cooperation
- Leverage U.S. investment to expand market access and strengthen industrial capabilities.

# Key Takeaway (I): Demography is Not Destiny



**AI × Human Capital  
× Institutions**



**Higher Productivity  
Sustained Growth**

## **Key Takeaway (II): Implement Coordinated Policies**

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**Extend  
& upgrade**  
participation  
of older  
workers

**Pivot**  
education  
toward the  
4Cs and non-  
routine skills

**Deepen**  
labor market  
reform for  
mobility and  
reallocation

**Align**  
AI, human  
capital, and  
industrial  
policy

*Thank you*

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