Korea Economic Outlook (May 2025)

Ⅲ. In-depth Analysis

Impact of Super-Aging on the Monetary Policy Environment: Implications for Korea

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Contents

Impact of Super-Aging on the Monetary Policy Environment: Implications for Korea

KEY TAKEAWAYS

I. The study analyzes how population aging affects the monetary policy environment and explores appropriate policy responses. As of the end of 2024, Korea has become a "super-aged" society with over 20% of the population aged 65 or older, and it is projected to have the highest elderly population share among OECD countries by 2045.

II. Aging is found to induce structural shifts in the monetary policy environment—namely, slower growth, lower real interest rates, and weaker soundness of financial institutions—which can narrow monetary policy space and exacerbate trade-offs between policy objectives when the foundations of growth and financial stability weaken simultaneously. The sectoral breakdown of these structural shifts is as follows:

- **Slower growth and lower real rates:** An open-economy life-cycle model for Korea shows that aging reduces labor supply, thereby lowering potential growth, and through reduced investment and increased savings, exerts downward pressure on equilibrium real interest rates. For example, if fertility and life expectancy had remained at 1991 levels (1.71 births per woman; life expectancy 72.2 years), the equilibrium real rate in 2024 would have been approximately 1.4 percentage points higher. Scenario analyses incorporating future demographic projections likewise indicate persistent downward pressure on both growth and real rates
- **Modest disinflationary pressure:** Panel data analyses across OECD countries, combined with simulations for Korea, suggest that aging is projected to exert downward pressure on inflation of about a 0.15 percentage point per year from 2025 to 2070. However, offsetting upward pressures—such as deglobalization, supply-chain restructuring, and climate change—imply significant uncertainty about the long-term inflation trajectory.
- **Weakened financial stability foundations:** An analysis of panel data covering 7,148 banks over 27 years in OECD countries shows that aging tends to reduce banks' capital ratios and increase default risk, driven by declining profits and subsequent pursuit of higher-risk, higher-return activities. Institutions with lending structures heavily concentrated in real estate exhibit larger negative impacts.

III. Structural shifts due to aging should be addressed through structural reforms in the real and financial sectors rather than short-term measures. Should the low growth trend persist, calls for accommodative monetary policy may intensify. However, low growth driven by structural factors cannot be effectively addressed by short-term, demand-side policies and such measures may entail side effects including financial imbalances. Therefore, a sustainable solution should be sought through structural reforms aimed at strengthening the fundamentals of the real and financial sectors.

IV. Specifically, structural reforms in the real and financial sectors should proceed as follows:

To offset the decline in labor supply caused by aging, policies should expand female labor force participation and support continued employment among older workers. At the same time, improving youth employment, housing, and childcare conditions is necessary to encourage fertility recovery. To boost total factor productivity, policymakers should promote technological innovation and enhance the efficiency of resource allocation across the economy. Given that real estate–focused lenders are more vulnerable to aging effects, the current reliance on lending-based real estate financing needs to be gradually reduced. Additionally, in light of the financial market's sensitivity to external price variables, the base of the demand for the Korean won must be broadened, and foreign exchange markets should be deepened to enhance stability and resilience.

V. These structural reforms are expected to raise real interest rates and potential growth, thereby expanding monetary policy space and reinforcing the foundations of financial stability. Scenario analyses indicate that, if three structural reforms are implemented—a gradual recovery in fertility to the OECD average, expanded employment among older cohorts, and a 0.5 percentage point increase in TFP growth—both real interest rates and potential growth will be approximately 1 percentage point higher on average during 2025–2070, compared to a no-reform baseline. Higher real rates would widen policy space and alleviate structural constraints on monetary policy; stronger growth would bolster borrowers' profitability and soundness, strengthening the foundation of financial stability.

VI. In addition, efforts to enhance monetary policy effectiveness under the changed conditions should be pursued. These include continued refinement of the environment for open market operations to better reflect aging-induced changes in the policy environment; improved policy communication to more effectively manage market expectations; the use of an integrated policy framework that combines multiple instruments to achieve policy objectives; and, in particular, stronger coordination between monetary policy and macroprudential measures to improve overall policy effectiveness.

Key Findings and Implications (Key messages)

Super-aging leads to **structural shifts** in the monetary policy environment.

Growth & Real Interest Rate

Downward trend likely to persist due to aging

- Decline in labor input
- Increase in savings

Inflation

Reflecting aging effect only

⬇

Effects of other structural changes
(Deglobalization, Climate Change)

⬆

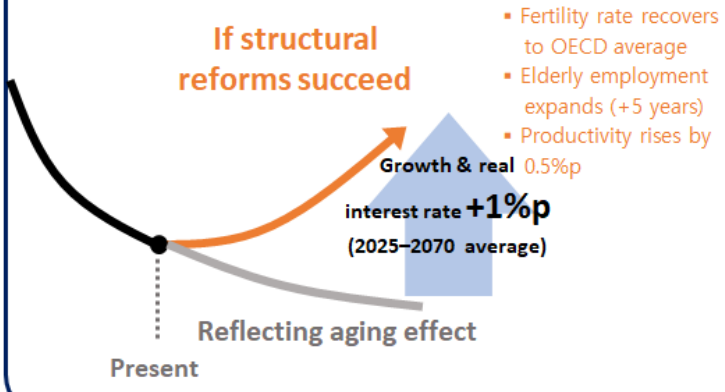
Financial Stability

Weakening of banks' soundness

- Decline in profitability
- Increase in risk-taking behavior

Structural reforms are needed in response to structural shifts.

Structural Reforms Lift Growth and Real Interest Rates



- Fertility rate recovers to OECD average
- Elderly employment expands (+5 years)
- Productivity rises by 0.5%p

Structural Reforms to Reinforce Fundamentals

Structural reforms across the real and financial sectors

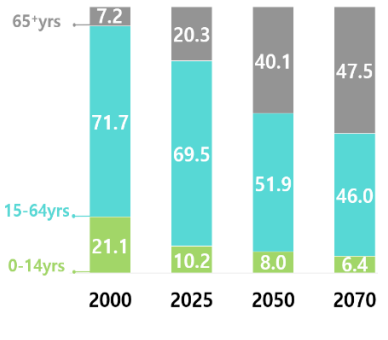
- Establish continued employment measures
- Implement structural reforms to boost fertility rates
- Enhance productivity
- Reduce reliance on debt in real estate finance
- Ensure the effectiveness of monetary policy transmission channels

1. Background and Motivation

1. Korea is experiencing population aging at a globally unprecedented pace, driven by persistently low fertility and rising life expectancy. As of December 2024, the share of the population aged 65 and over surpassed 20 percent, officially designating Korea as a super-aged society. According to Statistics Korea's 2023 population projections, by 2070 the share of elderly population is expected to reach 47.5%, surpassing the working-age population share (ages 15–64) of 46.0%, which will sharply raise the old-age dependency ratio. Korea entered the super-aged society only about seven years after entering an aged society in 2018, making it the fastest among the 25 OECD member countries (as of 2025) to reach this stage. Moreover, according to the UN World Population Prospects (2024), if current trends persist, Korea's share of the population aged 65 and over is projected to surpass that of Japan starting in 2045, resulting in the highest proportion among OECD member countries.

The share of the elderly population is increasing rapidly

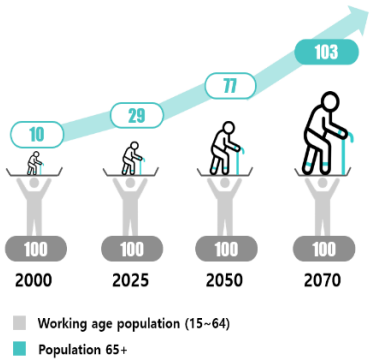
Figure 1.1. Population composition by age group



Sources: Future Population Projections (2023.12), Statistics Korea

Korea Faces Growing Burden of Elderly Support

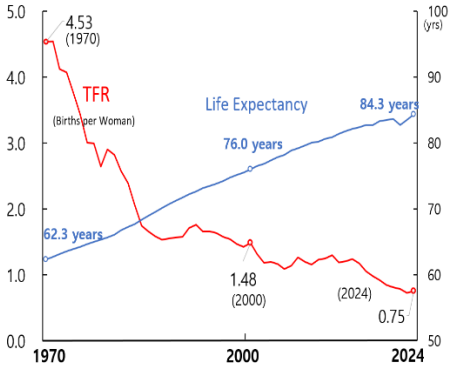
Figure 1.2. Old Age Dependency Ratio



Sources: Future Population Projections (2023.12), Statistics Korea

Falling Fertility and Rising Life Expectancy

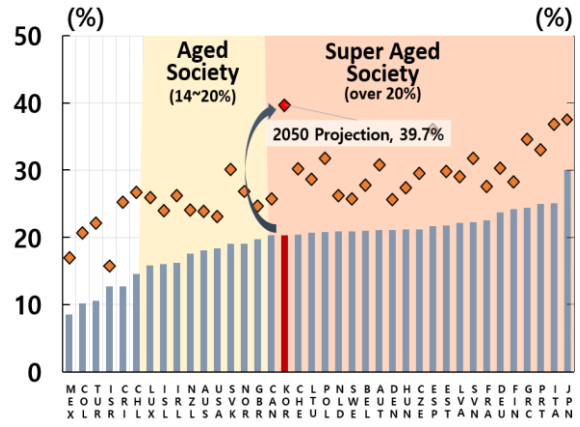
Figure 1.3. Fertility rate and life expectancy



Sources: Population Census (2025.03), Future Population Projections (2023.12), Statistics Korea

Korea Entered Super-Aged Society in late 2024

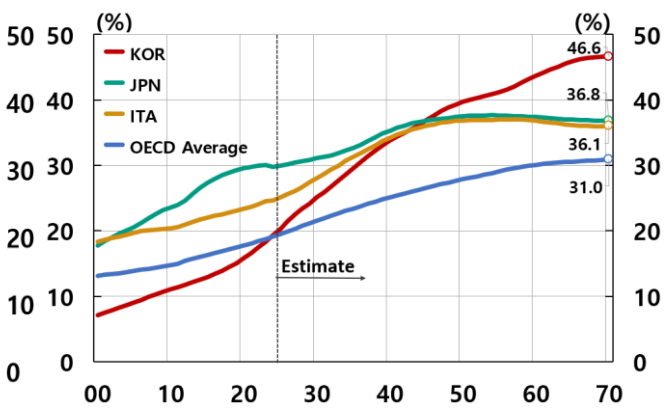
Figure 1.4. OECD Elderly Population: 2025 vs. 2050



Sources: UN World Population Prospects, the 2024 revision

Korea to Lead OECD in Elderly Population share from 2045

Figure 1.5. Projected Share of Elderly Population



Sources: UN World Population Prospects, the 2024 revision

2. Population aging can induce structural shifts across the entire environment for monetary policy—affecting growth, inflation, and the financial sector—so it is imperative to conduct a comprehensive diagnosis of these effects and assess appropriate policy responses. The decline in the working-age population, changes in consumption and saving behaviors, and evolving responses by financial institutions are all expected to have significant macroeconomic implications (e.g., Son et al., 2017).

3. This study focuses on the following key research questions, with core findings summarized in Table 1.1:

- **How will population aging affect future growth and real interest rates?**
  While it is widely agreed that aging lowers potential growth via a reduced labor supply (e.g., Cho, 2023; Lee et al., 2024), its effect on real interest rates remains ambiguous: a higher saving motive among longer-lived cohorts and lower marginal productivity of capital tend to push real rates down, whereas a rising share of elderly—who may have lower saving rates—could exert upward pressure. Furthermore, Korea's open capital markets imply that domestic real rates are influenced by global rates, complicating any quantitative assessment. Since the real interest rate is a key variable affecting saving, investment, fiscal sustainability, and overall monetary policy stance, rigorous analysis is required.
- **How will aging alter the environment for price stability, the Bank of Korea's core mandate?**
  Theoretically, aging may exert either upward or downward pressure on inflation, and empirical and model-based forecasts have yielded mixed results. For example, some studies argue that lower growth from aging may suppress inflation, while others suggest that supply constraints from a shrinking labor force may fuel inflation.
- **How will financial stability conditions—such as the health of financial institutions—be affected?**
  On one hand, higher demand for safe assets among older cohorts could reinforce financial stability by increasing the share of safe assets in the economy. On the other hand, if financial institutions seek to offset declining returns by easing lending standards or pursuing higher-risk investments, tail risks to financial stability could increase (e.g., Doerr et al., 2023; Imam & Schmieder, 2024). More fundamentally, stagnant incomes and growth could impair borrowers' repayment capacity.
- **Given these shifts, what challenges will monetary policy face, and in what direction should policy respond?**
  This report examines how changes in growth, real interest rates, inflation conditions, and financial stability environment will affect monetary policy implementation and discusses possible directions for future policy.

These questions guide the analytical approach taken in this study.

4. The remainder of this report is organized as follows: Chapter 2 examines the effects of aging on trend growth and real interest rates; Chapter 3 investigates inflation conditions under aging and other long-term structural changes; Chapter 4 analyzes aging's impact on financial stability; and Chapter 5 integrates these structural shifts to assess implications for monetary policy and propose key policy priorities.

[Table1.1] Research questions and key findings

(Research questions)		(Key findings)
Growth Real interest rate	How has aging affected Korea's real interest rates and growth, and what effects are anticipated going forward?	• Using an open-economy life-cycle model and holding other factors constant, population aging raises savings and lowers the marginal productivity of capital, thereby reducing real interest rates. Economic growth also slows as labor input declines. An analysis of aging's impact since 1991 suggests it has reduced real interest rates by approximately 1.4 percentage points. Scenario analyses based on demographic projections indicate that aging will continue to put downward pressure on both real interest rates and growth.
	What structural factors will shape future real interest rates and economic growth?	• Fertility, older worker employment, and productivity are key drivers. If measures to retain older workers succeed in expanding their labor participation, fertility rates recover, or productivity improves, both growth and real interest rates could rise significantly. **Fertility recovery**: Gradual recovery of fertility to the OECD average (achieving 1.58 children per woman by 2035) ⇨ Growth rate +0.7%p, Real interest rate +0.2%p (as of 2070) **Older worker employment**: Gradual expansion of older worker employment (employment duration extended by 5 years from 2029) ⇨ Growth rate +1.6%p, Real interest rate +0.2%p (as of 2029) **TFP growth**: Increase in TFP growth rate by 0.5 percentage points during 2025–2070 ⇨ Growth rate +0.7%p, Real interest rate +0.2%p (as of 2070) → If there are no large-scale structural changes in other sectors, aging will continue to depress growth and real interest rates in the near term.
Inflation	What is the impact of aging on Korea's inflation?	• Using OECD panel data and incorporating Korea's population projections, we find that aging exerts an average annual downward pressure of 0.15 percentage points on inflation over the period 2025–2070.
	What other long-term factors influence Korea's inflation outlook?	• Trends such as deglobalization and supply chain restructuring, cost increases from climate change responses, agricultural price rises due to extreme weather, and the experience of high inflation following the pandemic generally tend to push inflation upward.. ➔ Overall, when considering aging alongside these other conditions, significant uncertainty remains regarding the inflation trajectory.
Financial stability	How will aging affect financial stability, particularly the soundness of financial institutions?	• An analysis of 27 years of panel data for 7,148 banks in OECD member countries shows that aging has a negative impact on the soundness of financial institutions by lowering capital ratios and increasing default risk. This effect is primarily driven by reduced profitability and the consequent pursuit of riskier assets and business models. In particular, the adverse impact of aging is more pronounced for institutions whose lending is heavily concentrated in real estate.
Policy challenges	What are the key challenges in conducting monetary policy?	• Super-aging is expected to intensify structural constraints on the conduct of monetary policy. A decline in real interest rates may limit the policy space for interest rate adjustments, and if growth momentum and the foundation for financial stability weaken simultaneously, trade-offs between policy objectives may become more pronounced—further constraining monetary policy implementation.

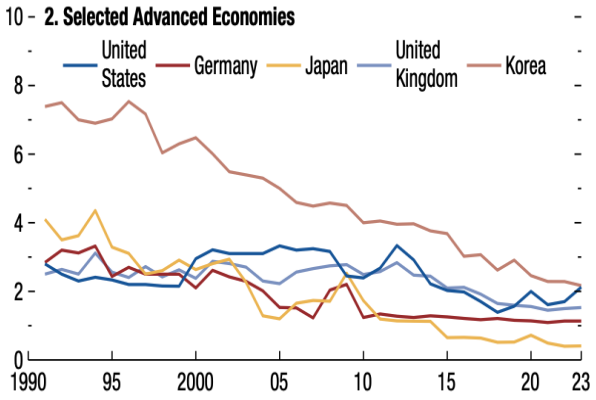
2. Growth and Real Interest Rate[1]

5. This chapter analyzes the impact of population aging on Korea's economic growth and real interest rate.

6. Korea, along with other major economies, has been experiencing a long-term decline in both growth rates and real interest rates. According to the IMF's long-term growth projections (five years ahead), most major economies are facing a slowdown in potential growth, with Korea showing a particularly sharp decline (Figure 2.1). Likewise, real interest rates have been on a steady downward trend since the 1990s (Figure 2.2).

Trend decline in growth rates

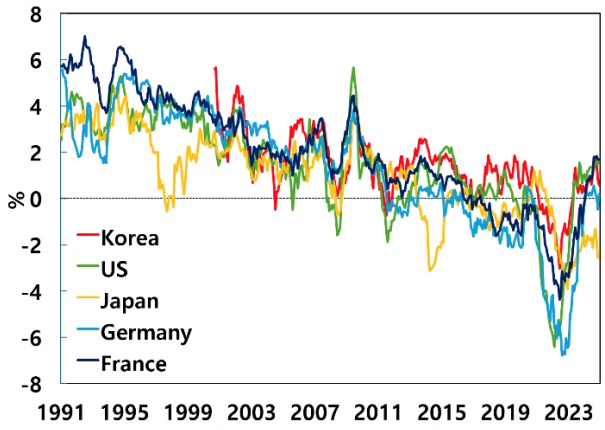
Figure 2.1. Trends in real GDP Growth[1)]



Notes: 1) Five-year-ahead real growth projections by World Economic Outlook forecast vintage
Sources: IMF WEO(2023 April)

Trend decline in real interest rates

Figure 2.2. Trends in long-term real interest rates[1)]



Notes: 1) 10-year government bond yield minus consumer price index increasing rate
Sources: OECD

7. The current trend of low growth and low real interest rates is often referred to as "secular stagnation[2]". Population aging has been widely cited as a key structural driver of this phenomenon (Summers, 2014). As life expectancy increases, households tend to accumulate more precautionary savings for retirement, leading to greater capital supply and downward pressure on the real interest rate (Eggertsson et al., 2019). In addition, other structural factors have been proposed to explain the decline in real interest rates, including the slowdown in total factor productivity (Rachel & Summers, 2019), heightened demand for safe assets following the global financial crisis (Caballero et al., 2017), and an overall excess of global liquidity (Bernanke, 2005).

8. In Korea, where population aging is progressing at an exceptionally rapid pace, it is essential to closely examine the resulting trends in economic growth and real interest rates. To this end, this report develops a life-cycle model and incorporates an open-economy framework that reflects Korea's high degree

[1] This section is a summary of the BOK Working Paper No. 2025-12, "*Demographic Shifts and the Real Interest Rate in an Open Economy: The Case of Korea*" (Lee, Park, & Hwang, 2025).

[2] A concept originally introduced by Hansen (1939), which describes a prolonged period of sluggish economic growth and persistently low interest rates.

of external openness, in order to quantitatively assess the impact of demographic changes on the real interest rate and growth.

Using the following open-economy life-cycle model, we conduct a quantitative analysis of demographic impacts:

Table 2.1 Key assumptions and features of the open-economy life-cycle model

1. Introduction of a life-cycle model to reflect demographic changes:
   - The model consists of households, firms, and the government. Households enter the labor market at age 25, retire at age 60, and die at age 100. Consumption and savings decisions are made over the life cycle, and each household survives to the next period with a fixed probability.
2. Construction of a two-country open economy model to capture Korea's high external openness:
   - The global economy is composed of Korea and a foreign country (the U.S.), which engage in trade and capital flows. Korea's government manages foreign exchange reserves as part of its external operations.
3. International capital markets are assumed to be imperfectly integrated, reflecting real-world frictions:
   - Households incur a cost proportional to the total amount of capital outflows when saving abroad. This generates an interest rate differential across countries, which gradually converges to zero as capital markets become fully integrated.
4. Households face borrowing constraints to replicate age-specific saving and borrowing patterns observed in the data.
5. Households maximize expected lifetime utility as follows:
   - Utility function: $\mathrm{U}_t = \sum_{j=0}^{J} \beta \pi_{j,t+j} \left[\frac{(c_{j,t+j})^{1-\frac{1}{\sigma}} - 1}{1-1/\sigma} \right]$
   - Budget constraint: $c_{j,t+j} + a_{j,t+j+1} + a^*_{j,t+j+1} = R_{t+j} \left(a_{j-1,t+j} + \frac{(1-s_{j,t+j}) a_{j-1,t+j}}{s_{j,t+j}} \right) + R^*_{t+j} \left(a^*_{j-1,t+j} + \frac{(1-s_{j,t+j}) a^*_{j-1,t+j}}{s_{j,t+j}} \right) + (1 - \phi_{\tau,t+j}) w_{j,t+j} I_{j \le J_R}$
   - β(=0.948): subjective discount factor, $\pi_{j,t+j}$: probability that an household born at *t* survives to age *j*, $c_{j,t+j}$: consumption of age *j* household in period *t*, $\sigma(= 0.4)$: intertemporal elasticity of substitution, $a_{j-1,t+j}(a^*_{j-1,t+j})$: domestic (or foreign) savings of age *j* household in period *t+j-1*, $R_{t+j}(R^*_{t+j})$: domestic (or foreign) real interest rate, $s_{j,t+j}$: survival rate of age *j-1* household in period *t+j*, $\phi_{\tau,t+j}$: income tax rate in period *t+j*, $w_{j,t+j}$: labor income in period *t+j*, I_j: Indicator functions are used to reflect retirement status
6. Firms operate in a perfectly competitive market, renting capital and hiring labor to produce output according to:
   - Production function: $Y_t = (K_t)^{\alpha} \left[Z_t \sum_{j=0}^{J} e_{j,t} L_{j,t} \right]^{1-\alpha}$
   - K_t: capital input, α: capital income share, Z_t: labor-augmenting productivity, $e_{j,t}$: productivity of age *j* worker in period *t*, $L_{j,t}$: labor supplied by age *j* household in period *t*
7. The government exists only in the domestic country, collects income taxes, issues bonds, conducts consumption expenditure, and accumulates foreign reserves.
8. Capital market clearing conditions:
   - Domestic: $K^H_{t+1} + B^H_t = A^H_{t+1} + A^{F^*}_{t+1}$
   - Foreign: $K^F_{t+1} = A^F_{t+1} + A^{H^*}_{t+1} + IR^{H^*}_t$
9. Model calibration:
   - The model is calibrated to match the observed real interest rate in the year 2000. It then incorporates empirical data on demographic structure and total factor productivity (TFP) to simulate the trend in real interest rates from 2000 to 2024.
10. Empirical performance:
    - The model explains most of the decline in real interest rates in both Korea (-4.2 percentage points) and the rest of the world (-2.3 percentage points), as shown in Figure 2.3 and Table 2.2. The key drivers are increased household saving due to rising life expectancy and reduced marginal productivity of capital caused by lower fertility rates.

Growth and Real Interest Rate under Baseline Scenario

9. The quantitative analysis is based on the following baseline assumptions. The demographic structure and total factor productivity (TFP) of Korea and the rest of the world follow official projections (e.g., population forecasts), while all other variables are assumed to remain at their recent levels (ceteris paribus)[3].

10. [Growth] The analysis finds that population aging has been a structural factor behind the decline in Korea's economic growth rate, and this trend is expected to continue. Aging weakens growth potential by reducing labor supply and slowing productivity. According to previous studies incorporating demographic and other structural factors, Korea's potential growth rate is projected to decline to around 0.5~1.2% by the 2040s.[4] While the life-cycle model developed in this study only reflects demographic aging and declining productivity—thus not representing a full macroeconomic forecast—it still suggests that these two factors alone could bring Korea's growth rate below 1% by the 2040s (Figure 2.5).

11. [Real Interest Rate] The decline in Korea's real interest rate is also found to be largely attributable to population aging. Specifically, approximately 1.8 percentage points of the observed decline can be explained by demographic aging (1.4 percentage points) and the slowdown in total factor productivity (0.4 percentage points).

The model explains the structural decline in real interest rates in both Korea and the U.S., indicating that aging demographics may keep rates low for the foreseeable future.

Figure 2.3. Estimated real interest rate path

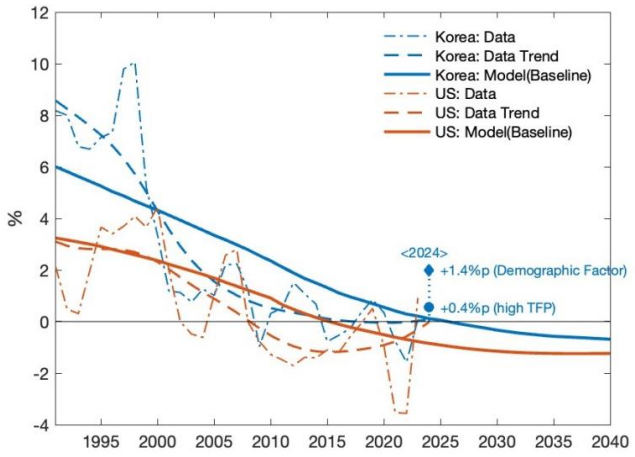


Table 2.2. Real interest rate estimates (%, %p)

Year	Korea				US	
	Data Trend[1]	Model			Data trend	Model
		Base-line	Counterfactual			Base-line
			Demo-graphic[2]	Produc-tivity[3]		
2000	4.3	4.3	5.3	4.5	2.3	2.4
2024	0.1	0.1	1.5	0.5	-0.0	-0.9
			(+1.4)	(+0.4)		
2120[4]	-	0.1	0.1	0.1	-	0.1

Notes: 1) Trend estimates of the policy interest rate—Korea's call rate and the U.S. federal funds rate—are derived by subtracting the past one-year inflation rate and removing cyclical components using an HP filter.

2) The real interest rate path is simulated under the assumption that Korea's fertility rate (1.71 births per woman) and life expectancy (72.2 years) remain at their 1991 levels through the present. Even under this assumption, population aging continues gradually, thereby exerting downward pressure on the real interest rate.

[3] Population projections are based on Statistics Korea's Future Population Projections for Korea and the United Nations' population forecasts for the weighted average of the United States, Japan, and the Euro Area. For total factor productivity (TFP), the model adopts estimates from previous studies (Kwon, 2015; Fernald, 2014) through 2070, and assumes that TFP growth in both Korea and the rest of the world converges to 1.1% beyond 2070.

[4] According to prior studies, Korea's potential growth rate is projected to decline to the following levels: 0.5% on average for 2036–2040 (Cho, 2023), 0.8% for 2031–2040 (Hwang et al., 2023), 0.7% for 2040–2044 (Lee et al., 2024), 0.7% for 2031–2040 (Kim et al., 2025), and 1.2% in 2040 (NABO, 2025).

3) The real interest rate path is also simulated assuming that Korea's total factor productivity (TFP) growth rate remained at its 1991 level of 1.8% through 2024.

4) It is assumed that international capital markets will gradually become fully integrated in the future, leading to convergence in interest rates between the two countries.

- **(Historical Trends)** To quantify the contributions of each factor, a counterfactual analysis was conducted to estimate their respective impacts on the trend in the real interest rate. First, to assess the effect of demographic aging, we assumed that Korea's fertility rate and life expectancy had remained at their 1991 levels (1.71 births per woman and 72.2 years, respectively) through 2024. Because it takes time for birth cohorts to enter the labor force, the counterfactual simulation was initiated from 1991[5]. Under this scenario, the equilibrium real interest rate in 2024 would have been approximately 1.4 percentage points higher than in the baseline case. Next, to isolate the impact of productivity, we assumed that the TFP growth rate remained constant at its 1991 level (1.8%) through 2024. Under this assumption, the real interest rate in 2024 would have been about 0.4 percentage points higher than the baseline. These findings suggest that structural declines in the real interest rate have been driven significantly by demographic changes and slowing productivity. In the absence of these two factors, the current equilibrium real interest rate would be approximately 1.8 percentage points higher (see Figure 2.3 and Table 2.2).

- **(Future Path)** Under the baseline assumptions, Korea's real interest rate is projected to continue a gradual decline due to demographic changes (Figure 2.4), before rebounding around 2060 when the national saving rate begins to decrease. It is expected to converge toward a long-run equilibrium level of approximately 0.1%. It is important to note that this projected path should not be interpreted as a forecast of the real interest rate. Rather, it illustrates the structural direction of the real rate when driven primarily by demographic factors. Additionally, the real interest rate in this model reflects only the long-run equilibrium level determined by demographic factor and productivity trends, and is conceptually distinct from the policy-relevant neutral rate of interest, which serves as a benchmark for monetary policy.

Growth and Real Interest Rate Paths under Alternative Scenarios

12. Since the future paths of real interest rates and growth depend on key assumptions, this section examines their trajectories under various scenarios, including changes in fertility rates, elderly employment, productivity, and fiscal conditions.

13. (① Fertility Recovery) If fertility recovers through structural reforms beginning in 2025, both the real interest rate and growth rate are projected to rise starting around 2050, when the newly born population enters the labor force. In this scenario, the fertility rate is assumed to increase steadily each year from 2025, reaching the OECD average total fertility rate (1.58 children per woman as of 2021) by 2035. As a result, effective labor supply rises after the 2050s, leading to an increase in the growth rate of up to 0.7 percentage points above the baseline by 2070, and a 0.2 percentage point increase in the real interest rate due to improved marginal productivity of capital (Figures 2.4 and 2.5).

[5] The downward effect of declining fertility on the real interest rate was analyzed using a counterfactual scenario starting from 1991, in consideration of the time lag between birth and entry into the labor market.

14. (② Expansion of Elderly Employment) If elderly employment gradually increases from 2025, both growth and the real interest rate are projected to rise due to higher labor input. This scenario assumes that, through continued employment policies, the average employment period of older workers gradually extends, reaching five years longer than current levels by 2029[6]. Increased labor supply raises the marginal productivity of capital, putting upward pressure on the real interest rate. As a result, Korea's growth rate in the late 2020s is estimated to be about 1.1 percentage points higher than the baseline. While the growth rate converges to the baseline in the longer term as the labor effect fades, the level of GDP remains persistently higher than in the case without an expansion in elderly employment (Figures 2.4 and 2.5).

Fertility recovery has a delayed effect, while expanded elderly employment has an immediate positive impact on real interest rates and growth

Figure 2.4. Real Interest Rate Trends in Korea[1)]

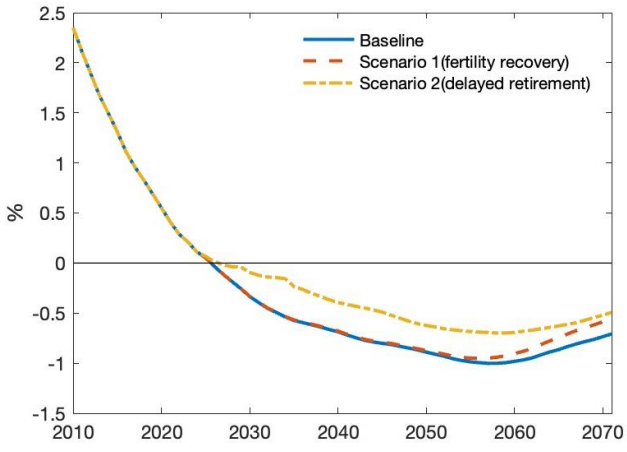
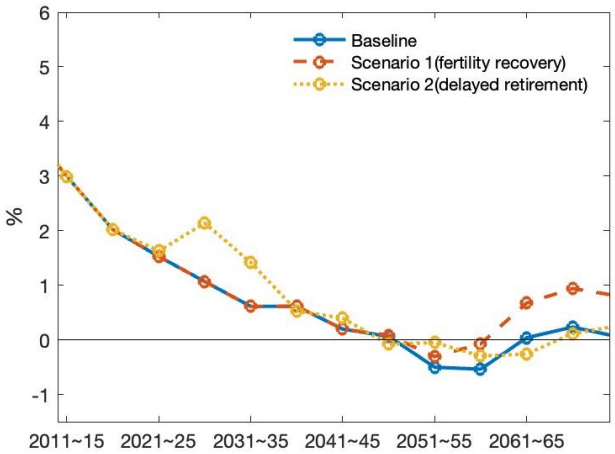


Figure 2.5. Korea's Growth Rate Trends[1] (5y-MA)[1)]



Notes: 1) The estimated paths of the real interest rate and growth reflect only projected demographic and productivity trends, and do not constitute an official economic forecast.
Sources: Authors' estimation (Lee, Park & Hwang, 2025)

15. (③ U.S. TFP Growth) If total factor productivity (TFP) in the United States improves, the U.S. real interest rate rises significantly, potentially narrowing or even reversing the real interest rate differential between Korea and the U.S. The United States is at the forefront of the so-called "Fourth Industrial Revolution," driven by advances in data science and AI. Reflecting this, we assume the U.S. (foreign) TFP growth rate is 0.5 percentage points higher each year than the baseline from 2025 to 2070. The results show that higher U.S. TFP boosts the marginal productivity of capital, raising both the real interest rate and growth rate in the U.S. In contrast, capital outflows from Korea to the higher-return U.S. market reduce domestic capital supply, leading to a rise in Korea′s real interest rate but a temporary decline in economic growth. As the U.S. real interest rate increases more rapidly and sharply, the interest rate gap between the two countries narrows considerably, with a possible reversal in some periods (Figure 2.6).

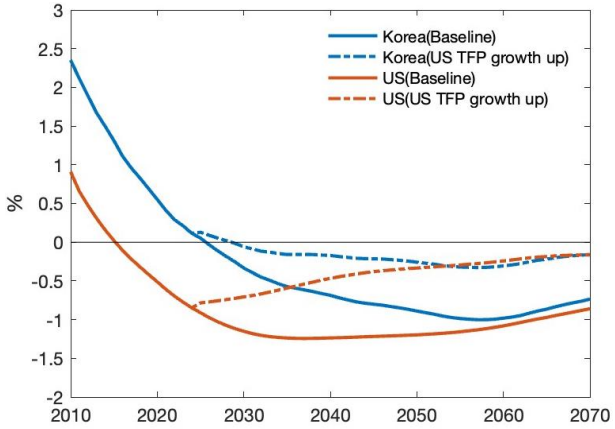
16. (④ Korea TFP Growth) If Korea experiences an increase in TFP due to technological innovation, both the real interest rate and growth rate are projected to rise, with the Korea–U.S. real interest rate gap widening. In response to aging, the adoption of technologies such as robotics and AI could accelerate

[6] The model assumes that increased employment among the elderly has no crowding-out effect on the employment of other age cohorts.

(Acemoglu & Restrepo, 2022), and Korea is expected to benefit significantly from such advancements (Oh et al., 2025a). Reflecting this, the model assumes that Korea's TFP growth rate exceeds the baseline by 0.5 percentage points annually from 2025 to 2070. As a result, the marginal productivity of capital rises, and Korea's real interest rate increases by an average of 0.3 percentage points during this period. The real interest rate gap between Korea and the U.S. widens accordingly (Figure 2.7). With rising productivity and capital inflows, Korea's economic growth rate is also projected to be consistently 0.7 percentage points higher than the baseline.

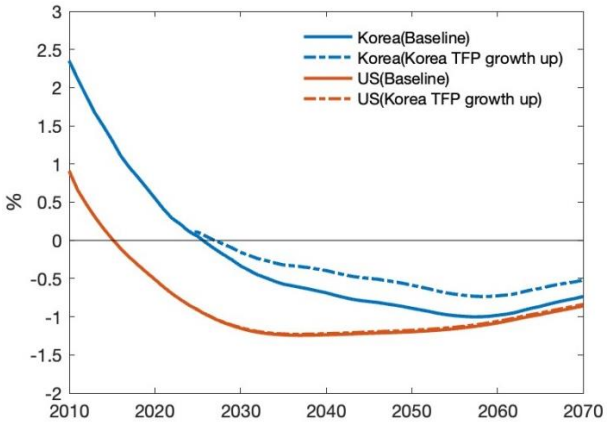
Potential reversal of Korea–U.S. real interest rate gap under U.S. productivity growth

Figure 2.6. Korea–U.S. Real Interest Rate (Scenario ③)



Wider Korea–U.S. interest rate gap under Korean productivity growth

Figure 2.7. Korea–U.S. Real Interest Rate (Scenario ④)



Notes: 1) The estimated paths of the real interest rate and growth reflect only projected demographic and productivity trends, and do not constitute an official economic forecast.

Sources: Authors' estimation (Lee, Park & Hwang, 2025)

17. (⑤,⑥ Expansion in Government Spending) If population aging leads to an increase in government spending, public debt will rise, resulting in upward pressure on the real interest rate. In the baseline scenario of this report, the ratio of government consumption to GDP is assumed to remain constant at 17.6%, with the tax burden ratio fixed at 23.8%. Under these assumptions, the government debt-to-GDP ratio increases to approximately 107% by around 2110 and then gradually converges to about 89%[7]. In contrast, Scenarios ⑤ and ⑥ assume that additional welfare expenditures related to aging are financed through increased government bond issuance[8]. In these cases, higher government spending crowds out private capital, pushing up the real interest rate. Specifically, if government consumption as a share of GDP increases from 17.6% by 1 percentage point (⑤) or 3 percentage points (⑥) for a period of 30 years starting in 2025, the real interest rate in 2050 rises by approximately 0.2 and 0.4 percentage points, respectively, compared to the baseline. Meanwhile, the government debt-to-GDP ratio expands to 97% under Scenario ⑤ and to 149% under Scenario ⑥ (Figures 2.8 and 2.9). It is worth noting that a rapid surge in fiscal expenditures could significantly increase public debt, raising market concerns over debt sustainability and

[7] According to Long-Term Fiscal Outlook (2025) by NABO, Korea's government debt-to-GDP ratio is projected to reach approximately 107.7% by 2050. This difference arises because NABO's projections assume a future increase in total expenditures and a decrease in total revenues, whereas this report holds other conditions—such as the government consumption-to-GDP ratio and the tax burden ratio—constant in order to isolate the effects of demographic and productivity changes.

[8] While the initial fiscal gap is financed through government bond issuance, the model assumes that, in the long run, fiscal balance is restored through increased tax revenues driven by a recovery in economic growth.

potentially limiting the central bank's room to raise interest rates (Carstens, 2025). In this model, government consumption is assumed to have no direct effect on household utility or potential growth[9].

Aging-induced increase in government spending raises real interest rates and public debt

Figure 2.8. Trends in Korea's Real Interest Rate

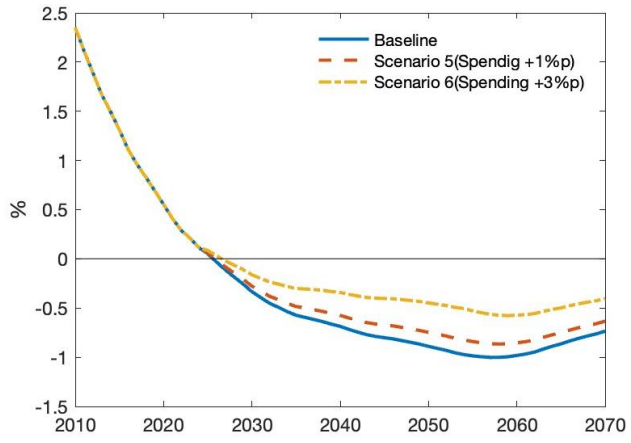
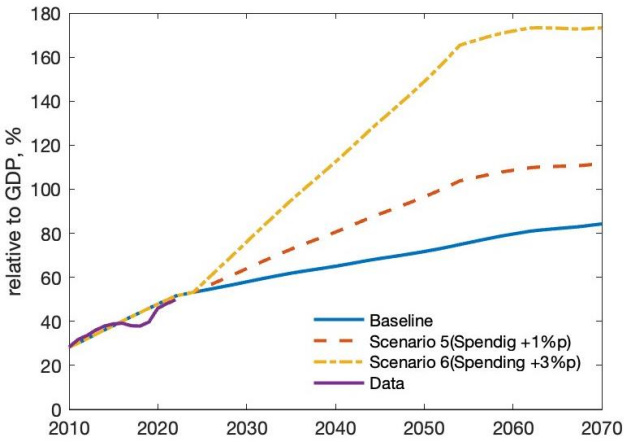


Figure 2.9. Trends in Korea's Government Debt



Notes: 1) The estimated paths of the real interest rate and growth reflect only projected demographic and productivity trends, and do not constitute an official economic forecast.

Sources: Authors' estimation (Lee, Park & Hwang, 2025)

18. The above analysis suggests that population aging is structurally lowering Korea's real interest rate and growth rate, and that this trend is likely to persist for the foreseeable future. However, structural reforms—such as a recovery in fertility rates, increased employment among the elderly, and improvements in productivity—could raise both growth and the real interest rate to some extent. These findings offer important implications for future policy design.

[9] Meanwhile, Fornaro and Wolf (2025) provide a theoretical foundation for how excessive public debt can constrain long-term growth, and Eberhardt and Presbitero (2015) as well as Jaimovich and Rebelo (2017) offer supporting empirical evidence.

3. Price Stability Conditions

19. Population aging can, in theory, exert both upward and downward pressures on the price level, and empirical findings vary depending on the aging indicator or methodological approach used. Summers (2015) and Braun and Ikeda (2022) argue that aging suppresses inflation by lowering growth and thus aggregate demand. Conversely, Goodhart and Pradhan (2020) and Kang et al. (2024) contend that a shrinking working-age population drives up wages (costs) and that a higher share of elderly, who dissave more than they save applies upward pressure on prices. Prior empirical studies also reach qualitatively and quantitatively divergent conclusions depending on indicator choice or age-group definitions, making a consistent verdict difficult (Table 3.1).

Empirical findings vary depending on the aging indicator used.

Table 3.1. Summary of Key Empirical Studies

Author (Year)	Main Finding	Primary Channel	Method and Data
Gajewski (2015)	1 pp ↑ in share of ≥ 80 years → –1.0 pp inflation 1 pp ↑ in old-age dependency → –0.1 ~ –0.2 pp 1 pp↑ youth dependency → inflation ↑	Demand side (decreased elderly consumption); Supply side (increased youth consumption)	Panel regression, 34 OECD countries (1970~2013, 4-year average)
Katagiri et al. (2020)	Increased longevity-driven aging: higher taxes on young → deflation Declining fertility-driven aging: fiscal deficits ↑ → inflation Simulation for Japan: –0.6 pp inflation impact from aging (net effect)	Political-fiscal channel (policies reflecting the preferences of elderly households)	OLG+FTPL (Fiscal theory of the price level) model, 40-year Japanese simulation
Lee et al. (2024)	Aging speed (Δ old-age dependency) ↑→disinflation (1 pp↑ → Japan: –0.03%p, U.S.: –0.08%p) Aging level (old-age dependency) ↑ → negligible effect	Demand side (changes in consumption and saving patterns)	Regional panel regression (augmented Philips curve), 47 Japanese prefectures & 50 U.S. states (1990~2010)
Yoon et al. (2014)	Elderly share ↑→ disinflation driven by weakened aggregate demand (about –0.5 ~ –0.7%p)	Demand side (decreased consumption)	Panel regression, 30 OECD countries (1960~2013)
Bobeica et al. (2017)	1 pp ↑ in share of ≥ 80 years → –0.5 pp inflation	Demand side (changes in consumption and saving patterns)	Panel regression, 34 OECD countries (1980~2000, 4-year average)
Andrews et al. (2018)	Share of 65-74 years↑ → +0.8%p inflation Share of ≥ 75 years↑ → –1.8%p inflation	Demand side (changes in consumption and saving patterns)	Panel cointegration analysis, 24 OECD countries (1980~2016)
Juselius and Takáts (2021)	Share of 0–14 years↑→ about +0.14%p inflation, Share of 15–64 years↑→ about –0.12 ~ 0.17%p, Share of 65–74 year↑→ about +0.21 ~ 0.33%p, Share of ≥ 75 years↑ → –0.76%p	Demand-supply channel (life-cycle and 'old-old' cohort effects)	Panel regression (population polynomial), 22 advanced economies (1870~2016)

Note: The old-age dependency ratio (youth dependency ratio) is defined as the population aged 65+ (population aged 0-14) divided by the working-age population (15-64).

20. To provide a comprehensive and timely assessment of how population aging affects price dynamics, one should consider the population structure across detailed age cohorts rather than relying on a single indicator or broad age band and incorporate the most recent population and inflation data. Juselius and Takáts (2021) divide the population into 17 discrete age groups and estimate each cohort's impact on inflation using data from 22 countries spanning 1870~2016. They find that higher shares of the dependent population (both youth and elderly) are associated with higher inflation, whereas larger shares of the working-age population tend to dampen inflation. Interestingly, an expansion of the "old-old" cohort (aged 75+) lowers inflation, contrary to the pattern for the "young-old" (65–74), suggesting that the very elderly curtail nonessential spending more sharply. However, because most countries in their sample had not yet entered the "super-aged" stage and the 75+ share remained low at the time, follow-up studies reflecting more pronounced aging are necessary.[10]

21. Building on the methodology of Juselius and Takáts (2021), this study reexamines the impact of demographic structure changes on inflation using data for 38 OECD countries over 1990~2023. The empirical model and data employed are as follows:

Empirical model with polynomial specification of population structure

The baseline model, incorporating only population structure variable estimates the effect of the share of 17 detailed age cohorts s_{kjt} (for $k \in (0-4, 5-9, \cdots, 75-79, 80+)$, country j, and year t) on inflation (π_{jt}) by applying panel data for population and macroeconomic variables from 38 OECD countries spanning 1960~2023:

$$\pi_{jt} = \mu + \mu_t + \mu_j + \sum_{k=1}^{17} \beta_{1,k} s_{kjt} + \beta_2 \Delta n_{jt} + \beta_3 \Delta l_{jt}^e + \epsilon_{jt}$$

Additional demographic controls include the population growth rate (Δn_{jt}) and changes in life expectancy (Δl_{jt}^e), and the specification incorporates both country and time fixed effects (μ_t, μ_j). To mitigate multicollinearity arising from the high correlation among the 17 age-share regressions, we redefine the age-group coefficients ($\beta_{1,k}$) satisfying a k-th degree polynomial in the cohort index ($\beta_{1,k} = \gamma_0 + \gamma_1 k + \gamma_2 k^2 + \cdots + \gamma_p k^p$) and imposing a normalization constraint to prevent collinearity with the intercept. Building on this, the extended model adds the Phillips curve determinants-lagged inflation (π_{jt-1}) and the output gap ($\hat{y}_{jt}$)-as additional controls. This extended specification is estimated over 1990~2023 using panel data on demographics and macroeconomic variables.

$$\pi_{jt} = \mu + \mu_t + \mu_j + \sum_{p=1}^{4} \gamma_p \tilde{s}_{pjt} + \beta_2 \Delta n_{jt} + \beta_3 \Delta l_{jt}^e + \sum_{l=1}^{2} \varrho_l \pi_{jt-1} + \beta_4 \hat{y}_{jt} + \epsilon_{jt}$$

Here, $\tilde{s}_{pjt}$ denotes the transformed age-cohort variables, and the dependent variable π_{jt} is defined as the first difference of the log CPI for country j in year t. The output gap ($\hat{y}_{jt}$) is measured as the deviation of real GDP from its long-run trend, with the trend extracted via the Hodrick-Prescott filter ($\lambda = 100$). Our empirical specification and data closely follow the baseline and extended models of Juselius and Takáts (2021). To address the end-point bias inherent in HP-filtering, we confirm that replacing the HP filter with the Hamilton filter yields virtually identical results. Table 3.2 reports the estimation outcomes for both the baseline and extended specifications.

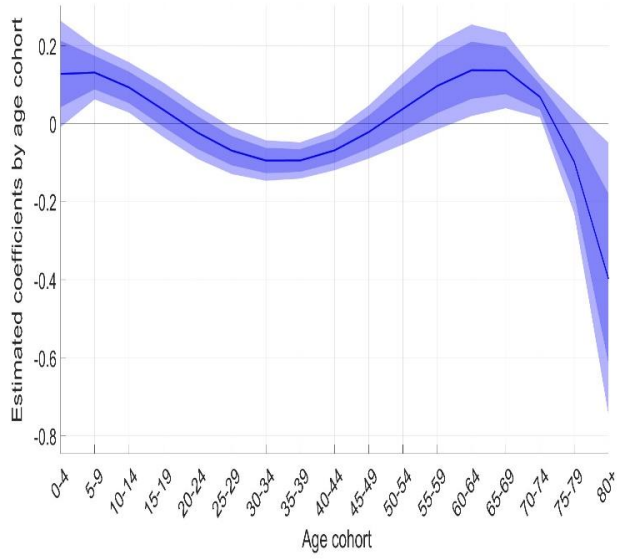
[10] According to the UN Population Prospects, the pace of aging has accelerated dramatically. For example, in 2015 the average share of those aged 65+ in OECD countries was only 16.3%, and just six, Finland, Portugal, Germany, Greece, Italy, and Japan had crossed the 20% threshold defining a "super-aged" society. However, by 2025, the average share has risen to 19.5%, and 25 countries now meet the super-aged criterion.

22. Empirical estimates reveal a statistically significant "inverse N-shaped" relationship between age structure and inflation across 38 OECD countries. Specifically, increases in the shares of the population aged 0–19 and 50–74 are associated with upward pressures on prices, whereas increases in the 20–49 and 75+ cohorts exert downward pressures (Figure 3.1).[11] Notably, even within the elderly group the effects diverge: the "young-old" (65–74) are inflationary, while the "old-old" (75+) are disinflationary. It implies that the former remaining net consumers that support aggregate demand, whereas the latter sharply curtail nonessential spending except for necessities and healthcare services.

23. Based on the estimated cohort-specific effects and the National Statistical Office's population projections, a simulation indicates that, ceteris paribus, demographic shifts will reduce Korea's inflation rate by an average of 0.15 percentage points per year over the next 45 years (2025~2070), with a standard error of 0.056. When the population is aggregated into four broad cohorts, ages 0–19, 20–49, 50–74, and 75+, the decline in the 0–19 share marginally lowers inflation by 0.01 pp annually, whereas the expansion of the 75+ cohort reduces it by approximately 0.16 pp per annum.[12]

Age distribution and inflation exhibit an "inverse N-shaped" relationship

Figure 3.1. Inflation effects by age distribution



Note: Dark and light blue shades indicate the 68 and 90% confidence intervals, respectively.
Source: Authors' estimates from the extended model using panel data for 38 OECD countries covering 1990 to 2023

Results from country-level panel data analysis

Table 3.2. Fixed-effects panel model estimation results

	Baseline model	Extended model
$\tilde{s}_{1jt}(\times 1)$	0.78***	0.12
	(0.33)	(0.13)
$\tilde{s}_{2jt}(\times 10)$	-0.25***	-0.50*
	(0.07)	(0.29)
$\tilde{s}_{3jt}(\times 100)$	0.02***	0.56**
	(0.01)	(0.26)
$\tilde{s}_{4jt}\ (\times 1000)$	0.00***	-0.19**
	(0.00)	(0.08)
Δn_{jt}	0.55**	0.40***
	(0.36)	(0.16)
Δl^{e}_{jt}	0.00	0.00
	(0.00)	(0.00)
π_{jt-1}		0.58***
		(0.08)
π_{jt-2}		-0.02
		(0.03)
$\widehat{y_{jt}}$		0.10***
		(0.03)
μ_t	Yes	Yes
Countries	38	38
Time period	1960~2023	1990~2023
N of obs.	2000	1923
Age str. F-test	0.00	0.00

Notes: The dependent variable is the consumer price inflation rate for each country, and the independent variable is the transformed age group variable. Standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

[11] The estimated coefficients represent the change in the annual CPI inflation rate (percentage points) associated with a one-percentage point increase in each cohort's population share. For example, a one-percentage point rise in the share of those aged 80 and over is estimated to lower inflation by approximately 0.4 percentage points.

[12] The simulation also shows that changes in the 20–49 cohort's share exert a modest upward effect of 0.02 pp on inflation, while the effect of the 50–74 cohort's variation is not statistically significant.

24. The preceding OECD-average simulation does not capture Korea's unique aging profile. Nonetheless, the coexistence of opposing factors in Korea, which partially offset one another, indicates that the findings still hold a certain degree of relevance. Korea has a high elderly poverty rate[13] and an underdeveloped public pension system, which limits seniors' ability to consume. Consequently, reduced spending by the "old-old" cohort leads to weaker aggregate demand and may exert more pronounced disinflationary pressure than in other aging economies. Conversely, Korea's aging is predominantly driven by ultralow fertility rather than longevity gains.[14] This contrasts with Japan where aging has been chiefly longevity-driven and suggests that in Korea, labor shortages and resultant wage pressures may impart stronger inflationary effects.[15] As these countervailing forces partially offset one another, the OECD-average result is likely to remain broadly applicable to Korea.

25. While the preceding analysis has focused on demographic drivers of inflation, it is essential to recognize that prices are influenced by a wide array of other structural factors. Notable upside pressures include deglobalization and supply-chain realignment, post-pandemic episodes of high inflation, and climate-related shocks.[16]

• **(Deglobalization and supply chain ealignment)** Historically, globalization has worked to restrain domestic price and wage increases,[17] but since the Global Financial Crisis its momentum has slowed, causing global supply chains to contract and be reconfigured. This trend can exert a persistent upward pressure on inflation (Lagarde 2023).[18] Moreover, heightened trade barriers (tariffs) under protectionist policies directly raise import prices and, in turn, domestic inflation expectations.[1920] Geopolitical conflicts such as the Russia–Ukraine war have inflicted immediate supply shocks and are reshaping global production networks, imparting long-lasting, structural upward pressure on prices.[21] In this context, Jerome Powell (2025) has warned that the world is entering "an era of more frequent and persistent supply shocks". The continuation of this trend may signal a structural shift in the inflation regime, departing from the historical norm.

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[13] In 2023, the poverty rate among Koreans aged 66 and over was 39.8%, the highest among OECD member countries.

[14] Bong (2023) estimates that between 2020 and 2070, 70% of the increase in the share of aged 65 and over stems from low birth rates, with only 30% attributable to rising life expectancy.

[15] Moreover, Acemoglu and Restrepo (2022) demonstrate that labor-force declines spur automation and the adoption of robots, which could mitigate wage growth and thereby slow overall price increases.

[16] Additionally, the expansion of government debt discussed earlier may itself exert upward pressure on prices.

[17] For example, Côté and de Resende (2008) estimate that Canada's expanded trade with China reduced its CPI inflation by about 0.1 percentage point per year.

[18] Global trade relative to world GDP had risen steadily since 1970 but plateaued after the 2008 financial crisis, the US–China trade war, and the 2020 pandemic. Recent high-tariff measures by the new US administration and a broader turn toward economic nationalism are likely to deepen this deglobalization trend.

[19] Cavallo et al. (2021) find that the 20% tariffs imposed by the United States on Chinese goods in 2018 led to an 18.9% increase in US import prices.

[20] In early 2025 (February–April), the US announced plans to impose 10~50% tariffs on imports from nearly all trading partners, including China, Canada, and Mexico. According to World Economic Outlook (April 2025), the IMF revised its forecast for US CPI inflation in 2025 up to 3.0%, citing both direct impacts of tariff-induced supply disruptions and indirect effects from heightened policy uncertainty. It also projects global CPI inflation at 4.3% in 2025, warning that further supply-chain disruptions and policy uncertainty could push prices even higher.

[21] The 2022 Russia–Ukraine war disrupted energy and commodity supplies, driving European inflation up by approximately 4.4 percentage points within a few months, while the United States and several Asia–Pacific economies experienced additional inflation increases of 1–2 percentage points (Maurya et al. 2023).

• **(High inflation experience)** Prior to the COVID-19 pandemic, vivid memories of elevated inflation were largely confined to older cohorts who lived through the 1970s and early 1980s. However, the rapid surge in prices following the pandemic, unseen for roughly four decades, has made high-inflation experiences common across all age groups. It is well established that firsthand inflation experiences have long-lasting effects on individuals' inflation expectations, and elevated expectations can become a structural driver of future price increases. D'Acunto et al. (2023) document that households aged 60 and over who lived through the late-1970s and early-1980s inflation maintained persistently higher inflation expectations than younger cohorts. Likewise, Conrad et al. (2022) find that individuals with past high-inflation experiences are significantly more likely to anticipate higher future inflation, a result corroborated by Weber et al. (2025). In particular, Conrad et al. (2022) show that the top 5% of households in terms of historical inflation exposure are about 14.5 percentage points more likely to expect higher inflation than the bottom 5%.

• **(Climate change)** Physical risks from climate change and transition risks associated with the shift to a low-carbon economy can amplify inflationary pressures through supply-chain disruptions and higher production costs (Kotz et al. 2023; Parker 2018). Kotz et al. (2023), analyzing data from 121 countries, find that a 1°C rise in monthly average temperature is associated with an increase of approximately 0.17 percentage points in the cumulative 12-month consumer price inflation rate. Moreover, an IMF World Economic Outlook (2022) simulation suggests that introducing a carbon tax to cut global CO_2 emissions by 25 percent from 2022 levels by 2030 could raise world inflation by 0.1~0.4 percentage points per year. However, some studies note that severe climate-driven natural disasters can suppress aggregate demand or, under strong price-rigidity assumptions, yield negligible inflationary effects or even exert deflationary pressure.

26. In summary, population aging is likely to exert a modest downward pressure on prices in the near term. However, given the coexistence of other structural upside factors, considerable uncertainty persists regarding the longer-term path of inflation.

4. Financial Stability Conditions

27. Population aging can exert both favorable and adverse effects on financial stability through multiple channels. While the majority of the studies indicate a predominantly negative influence, some studies underscore positive factors, such as older households' preference for safe assets, necessitating close examination. Aging may undermine the profitability of financial institutions by weakening borrowers' repayment capacity amid slower economic growth, heightening interest-payment burdens, compressing net interest margins in a low real-interest-rate environment, and amplifying collateral-value fluctuations. Diminished profitability, in turn, can constrain banks' capital-buffer accumulation and may elevate their risk appetite, prompting greater allocation of funds to high-risk sectors. Conversely, if the share of safe assets favored by the elderly rises economy-wide, it could also bolster overall financial-market stability.

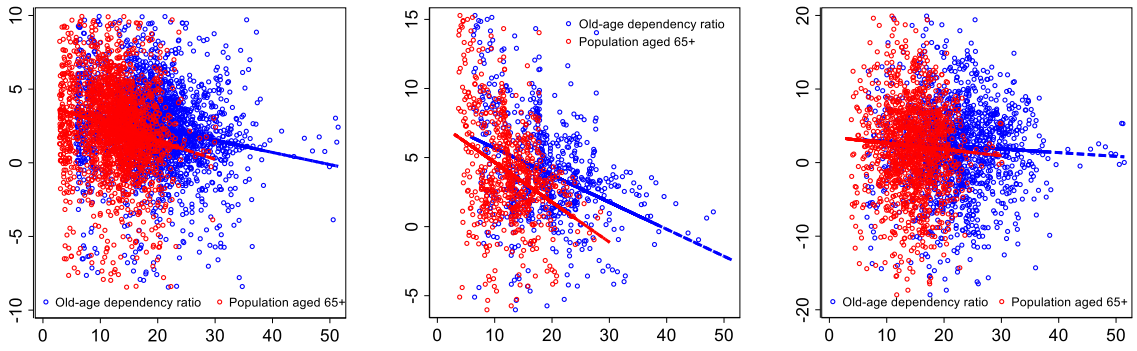
Population aging can erode financial institutions' profitability and heighten their risk-taking incentives.

[Table 4.1] Summary of the impact of population aging on financial stability

Main channel	Description	Related studies
⊕ **Strengthening of safe-asset preference**	· Older households' greater demand for safe assets → higher economy-wide share of safe assets, lower share of risky assets on financial-institution balance sheets	Cho et al. (2017); Li et al. (2024)
⊖ **Decline in borrowers' repayment capacity**	· Slower economic (income) growth → weaker debt-servicing capacity → higher credit risk and larger losses for financial institutions	Liu & Hu (2013); Maestas et al. (2023)
⊖ **Increase in interest-expense burden**	· Slower economic (income) growth → subdued loan demand for new investment; precautionary saving for retirement and stronger safe-asset preference → rise in interest-bearing liabilities ⇒ higher funding costs	Imam & Schmieder (2024)
⊖ **Compression of net interest margins**	· Aging-induced fall in real rates → narrower net interest margins (especially near the zero-lower bound) → lower profitability · Greater demand for long-term safe assets → long-term rates decline → reduced profitability of real-estate-backed (long-term) lending, exacerbated by early repayment and refinancing	Carvalho et al. (2016); Sudo & Takizuka (2020); Claessens et al. (2018); Yoon et al. (2017); Seo (2025)
⊖ **Volatility/decline in collateral values**	· Lower birth rates and household formation, property sales for living expenses, and weaker commercial-property demand amid slower growth → fall in collateral values → greater incentives for borrowers to default → larger losses for financial institutions	Sun et al. (2024)
⊖ **Intensified risk-taking by financial institutions**	· Profitability erosion through the above channels → stronger incentives to offset losses via increased risk-taking	Doerr et al. (2023); Imam & Schmieder (2024)

28. First, the correlations between aging indicators and macroeconomic variables suggest that population aging may act as a structural force undermining the soundness of financial institutions. Using data for 38 OECD economies over 1960–2023, we examine the relationship between two aging indicators—the old-age dependency ratio and the share of the population aged 65 and above—and three key macro variables: per-capita income growth, the real interest rate, and real house-price inflation. The aging indicators exhibit statistically significant negative correlations with all three variables.[22, 23] Put differently, deeper aging tends to coincide with lower per-capita income growth, real interest rates, and house-price appreciation. These results imply that aging can adversely affect banks' profitability by weakening borrowers' repayment capacity, compressing net interest margins, and depressing collateral values. As noted earlier, declining profitability can constrain banks' ability to replenish capital buffers and may heighten their risk appetite, leading to greater exposure to high-risk assets. Ultimately, such changes can erode banks' capital-adequacy ratios and reduce their distance-to-default.

Decline in per-capita income growth	Decrease in real interest rates	Stagnation or decline in house-price appreciation
[Figure 4.1] Aging index and per-capita income growth	**[Figure 4.2] Aging index and real interest rates**	**[Figure 4.3] Aging index and house-price inflation**



Source: Authors' calculations based on World Bank data.

29. To rigorously analyze the relationship between population aging and the soundness of financial institutions, we construct an unbalanced panel dataset of 7,148 banks[24] in OECD countries (1997–2023[25]) and estimate the fixed-effects model presented below.

$$Y_{i,j,t} = c + \beta_1 X_{j,t} + \beta_2 X_{j,t} \times INT_{i,j,t-1} + \sum_k \eta_k Z_{i,j,t-1} + \theta_i + \tau_t + \epsilon_{i,j,t}$$

[22] Kang et al. (2012), Yoon et al. (2017), and Yoon et al. (2018) report similar findings; the present analysis updates the country-level time series to 2023 and enlarges the sample from roughly 27–30 to 38 economies.

[23] Using robust standard errors, the correlations with income growth and real interest rates are significant at the 1 percent level, while the correlation with house-price inflation is significant at the 10 percent level.

[24] The sample spans commercial, cooperative, and savings banks using Moody's Analytics BankFocus.

[25] Because a substantial share of observations is available only from 2013 onward, the results should be interpreted with appropriate caution.

The dependent variable $Y_{i,j,t}$ represents the soundness of bank i located in country j in year t. It is proxied by either the Basel capital-adequacy ratio (BIS ratio) or the natural logarithm of the Z-score.[26] In both cases, larger values of the dependent variable indicate greater bank soundness. The main explanatory variable $X_{j,t}$ is a country-year aging index.[27] The control variable vector Z includes bank-level characteristics—log total assets, profitability (net interest income / total assets), liquidity (liquid assets / interest-bearing liabilities), and the deposit funding ratio (deposits / total assets)—as well as macroeconomic controls such as real GDP growth and CPI inflation. To allow the impact of aging to vary with features of each bank, we augment the specification with interaction terms ($X_{j,t} \times INT_{i,j,t-1}$) between the aging index and bank-specific indicators (e.g., the share of interest income and the share of residential mortgage lending). All regressions incorporate bank fixed effects (θ_i) and year fixed effects (τ_t) to absorb unobserved heterogeneity and common time shocks. Observations in the top and bottom 1 percent of the distribution for both the dependent and independent variables are excluded to mitigate the influence of outliers.

30. Estimation results reveal that population aging impairs bank soundness—lowering capital adequacy and raising default risk—and thus exerts a negative influence on financial stability. According to the fixed-effects estimates in Table 4.2, a one-percentage-point increase in the old-age dependency ratio reduces the BIS capital ratio of banks by 0.64 percentage points (Result [1]) and decreases the Z-score by 1.98 percent (Result [4]). These findings align with earlier studies that regard aging as a threat to financial stability (Doerr et al., 2023; Imam & Schmieder, 2024).[28] The adverse effect persists when the old-age dependency ratio lagged by twenty years is used as an instrumental variable (Results [2] and [5])[29] and when the share of the population aged 65 or above is employed as the aging measure (Results [3] and [6]). Considering that Korean commercial banks currently report an average BIS capital ratio of 15.85 percent[30], a 0.64-percentage-point decline is economically significant. Furthermore, Chiaramonte et al. (2015) find that European banks' Z-scores were about 9 percent lower during the global financial crisis than in normal times; hence a 1.98-percent decline attributable to aging is also noteworthy. Nonetheless, caution is warranted: coefficient magnitudes may vary with the choice of aging indicator and estimation strategy, and the present analysis captures average tendencies across OECD countries, so its direct application to a specific nation or region carries inherent limitations.

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[26] The Z-score—calculated as $Z = \frac{ROA+Equity/Asset}{\sigma(ROA)}$, where ROA denotes return on assets—measures the extent to which a bank's capital can absorb earnings volatility; higher values imply lower default risk. Following Hesse & Čihák (2007) and Beck & Laeven (2006), the standard deviation of ROA is computed over the entire sample period using annual data.

[27] We employ the old-age dependency ratio as the baseline measure and use the share of the population aged 65+ for robustness checks.

[28] However, Imam and Schmieder (2024) conclude that population aging lowers banks' default risk because they misinterpret the aging-induced decline in the Z-score as a reduction in risk. As noted above, a lower Z-score in fact signifies higher default risk for banks.

[29] This approach is adopted from Doerr et al. (2023) that assumes the predetermined variable (the ratio two decades earlier) is exogenous to contemporaneous confounding factors.

[30] Financial Supervisory Service, "Status of BIS-Based Capital Ratios of Bank Holding Companies and Banks as of end-September 2024 [provisional]," 28 November 2024.

[Table 4.2] Bank Panel Regression Results[1)]

	[1]	[2]	[3]	[4]	[5]	[6]
	Capital adequacy ratio (BIS ratio)			Z-Score (in log)[2)]		
	FE	FE-IV	FE	FE	FE-IV	FE
Old-age dependency ratio	-0.64***	-0.36***		-1.98***	-1.35***	
	(0.04)	(0.06)		(0.17)	(0.25)	
The share of population aged 65+			-1.23***			-4.95***
			(0.09)			(0.35)
Total assets (in log)	-2.47***	-2.38***	-2.33***	-10.73***	-10.53***	-10.37***
	(0.32)	(0.25)	(0.32)	(0.85)	(0.64)	(0.85)
Net interest income / Total assets	0.08	0.06	0.12	6.14***	6.09***	6.36***
	(0.19)	(0.15)	(0.20)	(0.41)	(0.33)	(0.41)
Liquid assets / Interest-bearing liabilities	0.04***	0.04***	0.04***	0.02	0.02	0.03
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)
GDP growth	0.21***	0.22***	0.23***	0.78***	0.81***	0.82***
	(0.03)	(0.03)	(0.03)	(0.08)	(0.08)	(0.08)
Other control variables	O	O	O	O	O	O
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N. of observations	50,354	50,119	50,354	50,354	50,119	50,354
N. of banks	7,148	6,913	7,148	7,148	6,913	7,148
Adjusted R-sq	0.05	-	0.04	0.23	-	0.24

Notes: 1) Robust standard errors are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

2) For ease of interpretation, log(Z-Score) has been multiplied by 100.

Source: Authors' calculations based on OECD Statistics, World Bank, and BankFocus data.

31. Based on the transmission-channel analysis, population aging has been found to have a detrimental effect on bank soundness by (i) diminishing profitability and (ii) consequently intensifying risk-taking behavior.

- **(Decline in profitability)** We distinguished the dependent variables of the previously introduced fixed-

effects model into net interest income and non-interest income[31] relative to total assets in order to analyze the impact of population aging on profitability.[32] The estimation results (Table 4.3) indicate that, as population aging intensifies (a one-percentage-point rise in the old-age dependency ratio), banks' net interest income-to-asset ratio decreases by 0.05 percentage points. This can be interpreted as the adverse effect of a compression of net interest margins due to aging-induced declines in real interest rates and reduced loan demand caused by slower economic growth. By contrast, the effect of aging on non-interest income is not statistically significant, possibly reflecting banks' strategy of compensating for lower interest income by expanding sales of trust and insurance products aimed at the elderly.

• **(Intensification of risk-taking behavior)** To examine whether banks responded to declining profitability by increasing risk-taking behavior, we estimated a fixed-effects model in which the dependent variable is the loan-to-equity ratio, following prior research (Kim and Yoon, 2009) that regards excessive loan expansion relative to equity as indicative of risk-seeking conduct. According to the estimation results in Table 4.4, as population aging progresses, banks tend to increase their loans relative to equity, and this risk-taking tendency is more pronounced when profitability relative to assets is lower. Similar results are obtained when the growth rate of risk-weighted assets relative to total asset growth is used as an alternative dependent variable. However, in columns (3) and (4) the interaction term with non-interest income is not statistically significant, suggesting that the aging-induced intensification of risk-taking behavior is driven mainly by the reduction in interest income.

[31] Net interest income is defined as interest revenue earned on financial assets minus interest expenses paid on deposits and similar funding. Non-interest income comprises fee and commission income, securities and derivatives trading gains, other product trading and valuation gains, insurance-related income, property-related income, and other operating income.

[32] When net interest income is used as the dependent variable, the presence of its lagged value among the regressors can introduce bias in the within-group estimator (Nickell, 1981). Accordingly, we employed the system-GMM method of Blundell and Bond (1998), which is known to mitigate the Nickell bias, and applied the same approach to non-interest income for consistency.

Population aging reduces bank profitability

[Table 4.3] Relationship between population aging and bank profitability[1)]

	(1) Net interest income / Total assets	(2) Non-interest income / Total assets
Aging metric[2)]	-0.05***	-0.01
	(0.01)	(0.04)
Other control variables	O	O
N of obs.	50,353	50,342
N of banks	7,148	7,148
N of inst.	34	37
AR(1) p-val.	0.00	0.08
AR(2) p-val.	0.74	0.27
Hansen J	0.60	0.54

Notes: 1) Robust standard errors are reported in parentheses. ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.
2) The old-age dependency ratio is employed; results are similar when the share of the population aged 65 and above is used.

Source: Authors′ calculations based on OECD Statistics, World Bank, and BankFocus data.

Profit reductions amplify risk-taking behavior

[Table 4.4] Population aging and banks' risk-taking behavior[1)]

	(1) Loans / Equity	(2) Loans / Equity	(3) Growth rate of risk-weighted assets[2)]	(4) Growth rate of risk-weighted assets[2)]
Aging metric[3)]	0.10***	0.29***	0.40***	0.47*
	(0.02)	(0.04)	(0.12)	(0.26)
Aging metric × Non-interest income (to total assets)	-0.01***	-0.02***	-0.05***	-0.08**
	(0.00)	(0.01)	(0.02)	(0.03)
Aging metric × Net interest income (to total assets)	-0.01***	-0.02***	0.01	0.02
	(0.00)	(0.00)	(0.02)	(0.03)
Other control variables	O	O	O	O
N of obs.	50,342	50,342	39,183	39,183
N of banks	7,148	7,148	6,562	6,562
Adj. R-sq	0.24	0.25	0.23	0.23

Notes: 1) Robust standard errors are reported in parentheses. ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.
2) Defined as the growth rate of risk-weighted assets relative to the growth rate of total assets.
3) Columns (1) and (3) use the old-age dependency ratio; columns (2) and (4) use the share of the population aged 65 and above.

Source: Authors′ calculations based on OECD Statistics, World Bank, and BankFocus data.

32. A heterogeneity analysis centered on banks' loan portfolios reveals that the adverse impact of population aging is greater for institutions with a higher share of real-estate–collateralized lending. To assess this heterogeneity, we extend the fixed-effects models for capital adequacy and the Z-score by including interaction terms between the aging metric and loan-structure variables. Table 4.5 shows a clear pattern: the larger the proportion of real-estate secured loans in total lending, the more pronounced the

deterioration in bank soundness associated with aging. Specifically, a 10-percentage-point increase in the share of real-estate secured loans reduces the capital-adequacy ratio by an additional 0.04 percentage points and the Z-score by a further 0.14; when the share of the population aged 65 or above is used as the aging metric, the corresponding additional declines are 0.05 and 0.19, respectively. These results indicate that, because demographic aging depresses long-term interest rates and thereby the profitability of long-maturity loans, banks that rely heavily on real-estate lending are more susceptible to profitability erosion and the consequent intensification of risk-taking behavior. Moreover, banks with business models centered on real-estate secured loan may be more exposed to aging-induced fluctuations in collateral values: a fall in collateral values heightens borrowers' incentives to default, directly increasing bank losses and weakening soundness (Chu et al., 2025).[33]

[Table 4.5] Heterogeneous effects by the share of real-estate secured lending[1)]

	(1)	(2)	(3)	(4)
	Capital adequacy ratio (BIS ratio)		**Z-Score (in log)[3)]**	
Aging metric[2)]	-0.60***	-1.07***	-1.86***	-4.45***
	(0.04)	(0.09)	(0.17)	(0.36)
Aging metric × Real-estate secured loan share (per 10 pp)	-0.04***	-0.05***	-0.14***	-0.19***
	(0.01)	(0.01)	(0.02)	(0.03)
Aging metric × Consumer loan share (per 10 pp)	0.01	0.02	-0.02	-0.02
	(0.01)	(0.02)	(0.02)	(0.04)
Aging metric × Corporate loan share (per 10 pp)	0.00	0.01	-0.03	-0.04
	(0.01)	(0.02)	(0.03)	(0.06)
Other control variables	O	O	O	O
N of obs.	50,354	50,354	50,354	50,354
N of banks	7,148	7,148	7,148	7,148
Adj. R-sq	0.06	0.05	0.24	0.24

Notes: 1) Robust standard errors are reported in parentheses. ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.
2) Columns (1) and (3) use the old-age dependency ratio, whereas columns (2) and (4) use the share of the population aged 65 and above.
3) For ease of interpretation, log(Z-Score) has been multiplied by 100.

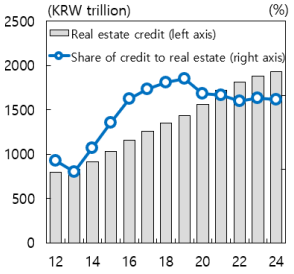
Source: Authors' calculations based on OECD Statistics, World Bank, and BankFocus data.

[33] Chu et al. (2025) further warn that, when real-estate credit is excessive, external or domestic shocks can prompt rapid deleveraging, dampening household and corporate spending and aggravating real-economy conditions; this feedback loop can tighten property and credit markets and transmit adverse effects across the financial system.

33. Korean financial institutions are particularly susceptible to aging-related risks because their loan portfolios are heavily concentrated in real-estate credit, such as residential mortgage lending. As of end-2024, the volume of real-estate credit[34] supplied by Korean financial institutions (including non-banks) stood at KRW 1,932.5 trillion, equivalent to 49.7 per cent of total private-sector credit. Between 2014 and 2024, real-estate credit expanded by an average of KRW 100.5 trillion per year, more than doubling (2.3 times) relative to end-2013. Although the household-debt-to-GDP ratio has recently declined slightly, the ratio of real-estate-related corporate debt has risen rapidly, so the overall growth of real-estate credit continues unabated.

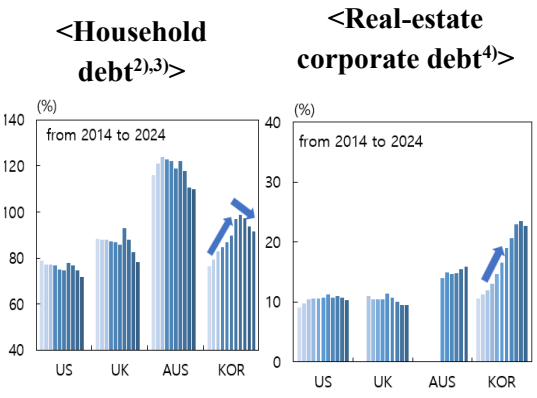
Continuous increase in real-estate credit supplied by financial institutions

[Figure 4.4] Outstanding real-estate credit[1)]



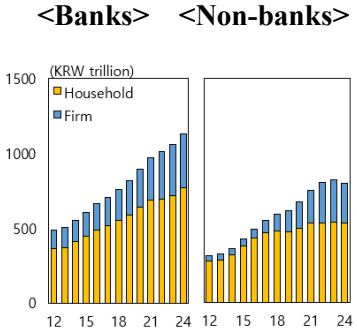
While the household-debt ratio has eased somewhat recently, the ratio of real-estate-related corporate debt has risen rapidly

[Figure 4.5] Debt-to-GDP ratios



Banks account for roughly 55–60 per cent of total real-estate credit supply

[Figure 4.6] Changes in real-estate credit[5)]



Notes: 1) Real-estate credit supplied by financial institutions equals the sum of household real-estate loans and loans to real-estate and construction firms (including project-finance loans)
2) Based on total household debt
3) For the United States, the United Kingdom, and Australia, the last observation is 2023
4) Loans to the real-estate and construction sectors; for the United States, commercial real-estate loans
5) Excludes land-collateralized loans for which the lender type cannot be identified.

Sources: Bank of Korea; Financial Supervisory Service; BIS; IMF; Central banks

34. In summary, population aging can weaken the foundations of financial stability by reducing the soundness of financial institutions. This outcome appears to arise from a tendency for institutions to expand their exposure to high-risk, high-return segments amid profitability pressures generated by aging. Korea warrants particular vigilance: its loan portfolios are heavily concentrated in real-estate credit—especially residential mortgages—and its household-debt-to-GDP ratio is already elevated, amplifying the risks associated with demographic aging.

[34] It is defined as the sum of household real-estate loans (housing-related loans + non-housing real-estate–collateralized loans) and loans to real-estate and construction firms (including project-finance loans), but excluding real-estate–collateralized loans to non-real-estate firms, which may be deployed for productive purposes.

5. Policy Implications

35. Korea's transition to a super-aged society is expected to impose multifaceted constraints on the conduct of monetary policy. As population aging accelerates, the Korean economy is likely to face a "triple burden" of weakening growth potential, declining real interest rates, and heightened financial stability risks. Aging tends to lower both potential growth and real interest rates, thereby increasing social demand for accommodative monetary policy. At the same time, it may undermine the profitability and soundness of financial institutions, thereby amplifying financial stability risks. Furthermore, if low growth and low real interest rates persist over the long term, structural increases in exchange rate volatility may also emerge.[35] In such an environment—where growth momentum erodes while the foundation of financial stability weakens—the trade-offs among monetary policy objectives are likely to become more pronounced. In addition, the structural decline in real interest rates limits the room for adjusting the policy rate, thereby constraining the flexibility of monetary policy.[36]

36. The deterioration in policy conditions stems from the weakening of real and financial sector fundamentals due to population aging, and thus requires structural reforms in response (IMF, 2025; Bodnár & Nerlich, 2022). Specifically, reform priorities can be structured around four key areas: (1) restructuring of the labor market in response to the shrinking working-age population, (2) measures to support fertility recovery, (3) productivity enhancement, and (4) improvements in the structure of financial markets.

37. First, in response to the decline in the working-age population, the structure of the labor market needs to be reformed. It is essential to raise the labor force participation rate of all human resources in the economy while ensuring that their skills and experiences are utilized more efficiently. Measures should be developed to promote continued employment among the elderly, whose exit from the labor market has been accelerating rapidly (Oh et al., 2025b). In particular, it is important to prevent the underutilization of accumulated human capital among older individuals by encouraging their continued employment in primary jobs for a longer period (Lee et al., 2025). Such efforts should be accompanied by carefully designed policies to avoid potential adverse effects on youth employment. At the same time, it is necessary to reform the seniority-based wage structure, which remains a structural impediment to elderly employment. The participation of women and foreign workers in the labor market should also be enhanced. Korea's female labor force participation rate remains below the OECD average, and the country’s ability to attract highly skilled foreign talent is relatively limited.[37] To address these constraints, it is essential to reduce the burden of caregiving, expand flexible work arrangements, and alleviate the mismatch between academic majors and occupational choices (Kam & Lee, 2018). Improving settlement conditions would also help facilitate

[35] Given their substantial influence on domestic financial market stability and inflation dynamics, exchange rates constitute an important macroeconomic variable.

[36] As population aging increases fiscal demand, an excessive accumulation of government debt could further narrow the policy space for interest rate adjustments. In particular, when the government debt-to-GDP ratio is excessively high, raising interest rates may significantly increase the government's interest burden, thereby acting as a constraint on the central bank’s ability to tighten monetary policy.

[37] As of 2024, Korea’s female labor force participation rate (ages 15–64) stood at 64%, below the OECD average of 67%. In addition, the share of foreign professionals relative to the total population in Korea averaged only 0.09% during 2016–2020, significantly lower than that of Singapore (6.6%), Japan (0.3%), and the European Union (0.2%).

the inflow of global talent.

38. Second, structural support and institutional reforms are needed to address Korea's persistently low fertility rate. Hwang et al. (2023) identify excessive competitive pressure among the youth and heightened insecurity in employment, housing, and childcare as key drivers of the ultra-low fertility trend. Accordingly, a comprehensive policy response is warranted—one that includes expanding access to stable and quality jobs for young adults, stabilizing the housing market, enhancing childcare infrastructure and financial support for child-rearing, and increasing the effective utilization of parental leave and flexible work arrangements. In Korea's case, excessive population concentration in the Seoul metropolitan area and the resulting intensification of competitive pressures have increased the burden of housing and education costs, thereby acting as a disincentive to childbearing. Accordingly, it is necessary to promote balanced regional development (Chung, Minsu et al., 2024) while simultaneously undertaking structural reforms of the education system (Chung, Jongwoo et al., 2024).

39. Third, comprehensive structural reforms aimed at enhancing productivity across the economy are urgently required. Lee et al. (2024b) underscore the importance of actively supporting and encouraging firms' technological innovation. In particular, securing technological and product competitiveness in future strategic sectors—such as digital transformation, green technologies, national security, safety, and cultural industries—is critical to ensuring the sustainable prosperity of the Korean economy (Lee et al., 2024a). Furthermore, improving allocative efficiency necessitates a shift toward high value-added industries, the identification of new growth engines, the revitalization of the service sector, and the transition to an intangible asset–based economy. In Korea's case, the concentration of credit in the real estate market remains a key factor behind inefficient resource allocation, which calls for targeted corrective measures (Chu et al., 2025). These efforts should be accompanied by broader institutional reforms, including improvements in labor market efficiency, the investment environment for firms, and the effectiveness of entry and exit processes for businesses.

40. If these policies are implemented in a comprehensive and coordinated manner, they are expected to mitigate the structural constraints arising from population aging and help lay the foundation for sustainable economic growth. In particular, under the fiscal pressures associated with aging-related expenditure increases, structural reforms that raise fertility rates, boost productivity, and expand elderly employment are projected to increase both the real interest rate and the potential growth rate by approximately 1 percentage point on average over the period 2025–2070 (see Figures 5.1 and 5.2).

Structural reforms are projected to raise both the real interest rate and the growth rate by approximately 1 %p.

Figure 5.1. Trends in real interest rate

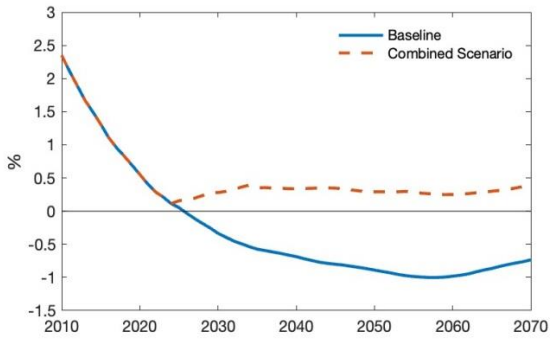
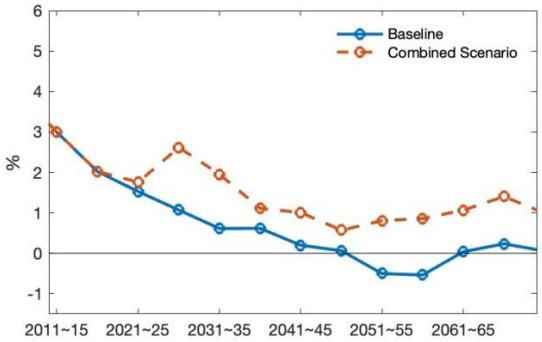


Figure 5.2. Trends in GDP (5-year average)



Notes : The assumptions applied to the integrated scenario are as follows.

– Fertility rate: Gradual recovery to the OECD average starting in 2025, reaching 1.58 by 2035 (same as Scenario 1)

– Elderly employment: Gradual extension of employment duration among the elderly over a five-year period starting in 2025 (same as Scenario 2)

– Productivity: Average annual total factor productivity (TFP) growth increases by 0.5 percentage points during 2025–2070 (same as Scenario 4)

Source: Authors′ own estimates (Lee, Park & Hwang, 2025)

41. Fourth, structural reforms in the financial sector are also required, particularly to reduce excessive reliance on real estate lending and to deepen the foreign exchange market. As shown earlier, financial institutions with high exposure to real estate lending are more vulnerable to the adverse effects of population aging. Moreover, excessive exposure to real estate lending may trigger abrupt deleveraging in the event of domestic or external shocks, potentially undermining financial system stability. It is therefore necessary to gradually reduce the sector's dependence on real estate credit (Chu et al., 2025; Kim & Na, 2024). In Korea's case, the risk is amplified by the fact that real estate is not only closely linked to household debt but also accounts for the majority of the assets held by low-income elderly households. In addition, given that Korea's financial markets are highly sensitive to external conditions and price variables, it is essential to strengthen the stability and resilience of the foreign exchange market by expanding the demand base for the Korean won and enhancing market depth.

42. While the aforementioned structural reforms are essential to alleviating the constraints posed by population aging, parallel efforts should also be pursued to enhance the effectiveness of monetary policy under evolving macro-financial conditions.

43. Above all, it is critical to operate monetary and macroprudential policies in a coordinated manner to reinforce the foundations of financial stability. In particular, under conditions of low growth and weakening financial stability, where trade-offs between policy objectives become more pronounced, it is essential to actively utilize an Integrated Policy Framework (IPF) that enables the coherent alignment and coordination of various policy instruments. In this context, close collaboration between interest rate policy and macroprudential measures must be recognized as a key component of effective policy implementation (Lee & Kang, 2023; see also BOX1 in this paper).

44. At the same time, continued efforts are needed to enhance the effectiveness of monetary policy itself. The decline in the natural real interest rate due to population aging may narrow the policy space for interest rate–based actions and weaken the overall effectiveness of monetary transmission. Accordingly, institutional reforms are needed to complement conventional tools. Specifically, the transition toward a benchmark rate system centered on KOFR (Korea Overnight Financing Rate) and the introduction of two-way repo transactions should be leveraged to improve the effectiveness of open market operations. Moreover, strengthening policy credibility and transmission requires more refined expectation management through effective communication with financial markets.

Conclusion

45. Population aging constitutes a structural shift that fundamentally transforms the operating environment for monetary policy. Addressing this shift requires more than short-term demand management or piecemeal measures; instead, a structural policy approach is essential. This paper has provided empirical evidence that aging demographics may lower potential growth and the natural real interest rate, while also weakening the foundations of financial stability. Such an environment can reduce the policy space for interest rate adjustments and intensify trade-offs among policy objectives. To overcome these constraints, it is imperative to enhance the underlying resilience of the real and financial sectors through structural reforms, while continuously adapting the policy instruments and operational framework to the evolving macro-financial landscape.

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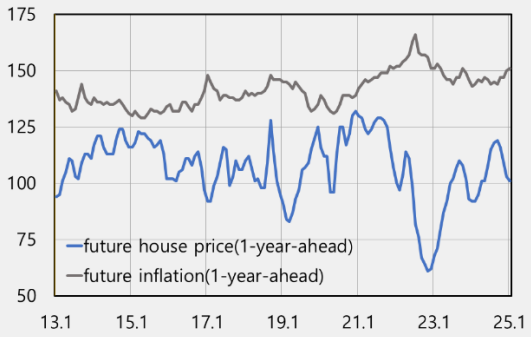
BOX 1 Characteristics and Implications of Housing Price Expectations[38]

We investigate the dynamics of housing price expectations among Korean households, focusing on one-year-ahead expectations regarding the direction of house prices relative to current levels[39]. Using a vector autoregression (VAR) model, we evaluate the macroeconomic implications of these expectation. To identify effective policy responses, we further examine how housing price expectations react to different combinations of macroprudential and monetary policy using a state-dependent local projection approach. The analysis is based on monthly data spanning from January 2013 to January 2025.

Figure A.1 and Table A.1 summarize the main characteristics of housing price expectations. The data reveal three notable characteristics**: (i) housing price expectations follow dynamics that are distinct from those of inflation expectations; (ii) they exhibit considerable volatility; and (iii) they display strong persistence—once formed, expectations of rising or falling prices tend to persist over time.** This pattern suggests that Korean households primarily view housing as an investment asset, adjusting their expectations more actively in response to macroeconomic conditions than they do for consumption goods. A further explanation is that, unlike consumer prices—which are targeted by central banks through a formal 2% inflation objective—there is no dedicated policy authority tasked with ensuring housing price stability.

Housing price expectations follow different dynamics.

[Figure A.1] Trend of housing price and inflation expectations



Source: Bank of Korea.

Housing price expectations exhibit high volatility and strong persistence.

[Table A.1] Volatility and persistence of sentiment

	Housing Price Expectations	Inflation Expectations
Avg.	7.03	41.26
Std.	14.44	7.54
Std./Avg.	2.05	0.18
Persistence	0.914	0.952

Note: 1) All values are computed by subtracting the baseline value of 100.
2) Persistence was computed as the sum of AR(p) coefficients, with p chosen by AIC.

[38] We provide brief overview of our main findings. For more details, please refer to BOK Issue Note No. 2025-15.

[39] This index is constructed based on household survey responses, as follows:
100 + (「share of rise 」× 1 + 「share of modest rise」× 0.5)- (「share of fall 」× 1 + 「share of modest fall」 × 0.5)

Housing price expectations play a critical role in shaping both home purchasing behavior and borrowing decisions, thereby potentially exerting significant effects on financial stability. The subsequent VAR analysis shows that a positive sentiment shock—defined as a one-standard-deviation increase in expectations—leads to a rise in actual house prices and an increase in household loans (Figure A.2).

A positive shock to sentiment leads to an increase in house price and household debt.

[Table A.2] Description of VAR model

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + B_1 X_t + u_t$$

Endogenous Variables (***Y***)	Housing price expectations (CSI), Industrial production, Real house price (or real household loan), CPI, Call rate
Exogenous Variables (***X***)	Constant term, U.S. Industrial production, Commodity price index, Effective federal funds rate
Identification	Recursive

Note: All variables are seasonally adjusted, log-transformed, and multiplied by 100, except for the call rate and effective federal funds rate.

[Figure A.2] Impulse response (%) to a housing price expectations shock

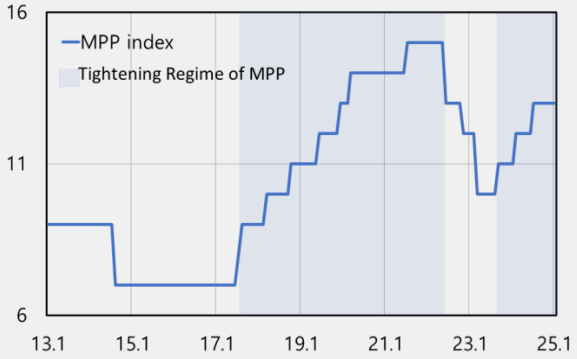
Note: The solid lines indicate the median estimates, while the dashed lines represent the 5th, 95th percentiles derived from 1,000 bootstrap replications.

Stabilizing housing market sentiment necessitates effective coordination between monetary and macroprudential policies. Evidence from the state-dependent local projection analysis (Figure A.3) shows that monetary policy exerts a significant influence on sentiment when both policy instruments move in the same direction (solid navy line). In contrast, the effectiveness of monetary policy is substantially weakened when the two policies are implemented in opposing directions (solid gray line). For example, a concurrent increase in interest rates and tightening of macroprudential regulations—such as loan-to-value (LTV) and debt-to-income (DTI) limits—leads to a sharp decline in housing price expectations in the short run. Conversely, when macroprudential policy is eased during a period of monetary tightening, the impact on expectations becomes negligible.

These findings highlight the importance of coherent policy coordination and suggest that, during periods of monetary easing, a complementary tightening of macroprudential policy may be necessary to mitigate financial imbalances stemming from housing market expectations.

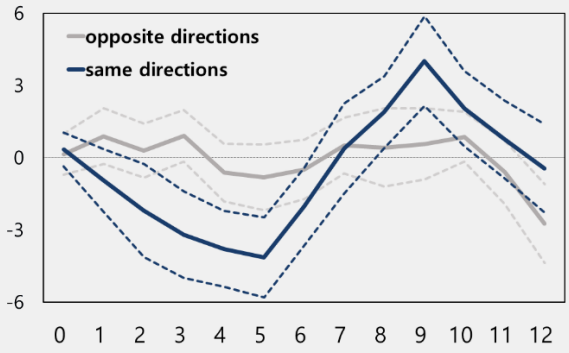
The effectiveness of contractionary monetary policy in stabilizing housing price expectations in a downward direction is contingent upon the concurrent tightening of macroprudential policy.

[Table A.3] Trend of MPP index



Note: A macroprudential policy (MPP) index is constructed by summing dummy variables that take the value of 1 for tightening, for easing, and 0 for no change at each point in time, based on changes in the level and scope of LTV, DTI, and DSR regulations.
Source: IMF, author's calculations.

[Figure A.3] Impulse response of housing price expectations (%) to a contractionary monetary policy shock



Note: The solid lines indicate point estimates, while the dashed lines indicate 68% confidence interval calculated using Newey-West standard errors.

The specific local projection (LP) estimation model is specified as follows.

[Table A.3] Description of LP model

$$CSI_{t+h} = D_t^A(\alpha^A + \beta_h^A shock_t^{MP} + \sum_{i=1}^{2} \Pi_{i,h}^A Y_{t-i}) + D_t^B(\alpha^B + \beta_h^B shock_t^{MP} + \sum_{i=1}^{2} \Pi_{i,h}^B Y_{t-i}) + \sum_{j=0}^{h} \Gamma_j X_{t+j} + \upsilon_{t+h}, \quad h = 0,1,...,12$$

$\boldsymbol{Y, X}$	Same set of variables as in the VAR model.
$\boldsymbol{shock^{MP}}$	Monetary policy shocks identified from VAR model.
$\boldsymbol{D}$	$\boldsymbol{D_t^A}$ ($\boldsymbol{D_t^B}$) is a binary variable that takes the value of 1 when the macroprudential policy regime and the direction of the monetary policy shock are aligned (misaligned), and 0 otherwise.
$\boldsymbol{\beta}$	$\boldsymbol{\beta_h^A}$($\boldsymbol{\beta_h^B}$) is an impulse response coefficient conditional on the alignment between the macroprudential policy regime and the direction of the monetary policy shock.