Population Aging:
Impacts and Policy Imperatives

September 2017
Population Aging: Impacts and Policy Imperatives

September 2017

This document is the executive summary of a research volume published in September 2017. The full volume in Korean is available at the Bank of Korea website.

https://www.bok.or.kr/portal/bbs/P0002125/view.do?nttId=231874&menuNo=200774&pageIndex=1

The Bank of Korea
### Contents

**Foreword**  |  Wook Sohn

**Part 1**  
*Introduction*  |  Wook Sohn

**Part 2**  
*Population Aging in Korea*  |  19

- Ch. 1  
  *Causes and Characteristics of Population Aging in Korea*  
  |  Kyounghoon Park

- Ch. 2  
  *Population Policy for Aging Societies: OECD Case Studies*  
  |  Jinill Kim and Kyounghoon Park

- Ch. 3  
  *Assessment of Policy Governance*  
  |  Changyong Choi

- Ch. 4  
  *Population Aging in A Reunified Korea*  
  |  Jiyoung Choi

**Part 3**  
*Population Aging and the Macroeconomy*  |  35

- Ch. 5  
  *Population Aging and Economic Growth*  
  |  Byung Kwon Ahn, Ki-Ho Kim, and Seung Whan Ryuk

- Ch. 6  
  *Population Aging and Consumption*  
  |  Kwang Myung Chun, Hong Jig Lee, Suyeon Bang, and Dongjae Lee

- Ch. 7  
  *Population Aging and the Current Account*  
  |  Kyungkeun Kim and Soyoung Kim

- Ch. 8  
  *Population Aging and Public Finance*  
  |  Hosin Song and Joonyoung Hur

- Ch. 9  
  *Population Aging and Inflation*  
  |  Hwan Koo Kang

**Part 4**  
*Population Aging and Policy Imperatives*  |  52

- Ch. 10  
  *Population Aging and Household Assets/Liabilities*  
  |  Se-Hyung Jo, Yong-Min Lee, and Jeong-Hoon Kim

- Ch. 11  
  *Population Aging and the Financial Industry*  
  |  Kyoungsoo Yoon, Jae Hoon Cha, Sohee Park, and Sun Young Kang

- Ch. 12  
  *Population Aging and International Investment*  
  |  Jin Soo Lim and Young Rae Kim

- Ch. 13  
  *Population Aging and the Housing Market*  
  |  Kanghyun Oh, Sol Kim, Jaejun Yoon, Sanki Ahn, and Donghwee Kwon

- Ch. 14  
  *Population Aging and the Labor Market*  
  |  Chulhee Lee and Jieun Lee

- Ch. 15  
  *Population Aging and the Industrial Structure*  
  |  Jong Ku Kang

**Part 5**  
*Conclusion: Future of the Korean Economy and Policy Implications*  |  79

|  Jaerang Lee, Sungju Song, Daeyup Lee, and Byungkuk Kim |
Foreword

It is a well-acknowledged fact that Korea's population is aging rapidly, and this aging is undoubtedly one of the key sources of risk to the economy's sustainable growth. Due to longer life expectancy and falling fertility rates, Korea's population pyramid is gradually becoming an inverted triangle.

It is projected that the country's working age population will decline beginning from this year, at a pace that is among the most rapid in the world. According to a US Census Bureau report (The Aging World, 2016), the Korean population aged 65 or older is forecast to rise from 13.0% of the total population in 2015 to 35.9% in 2050, to rank second in the world only after Japan (40.1%). According to UN forecasts, a continued rate of total fertility at the current level would cause the Korean population to contract from 50 million in 2015 to 39 million in 2070.

In view of this, aging will have a broad and profound socio-economic impact for quite a while in Korea: it will significantly change not only the country's potential growth but also its consumption, current account and inflation, as well as its household finances and financial industry, not to mention the housing/labor markets and industrial structure. These anticipated changes, which will likely influence the authorities' monetary and fiscal policy decisions, call for medium- to long-term plans to set the policies' directions.

The Korean government has until this time devoted much effort to addressing this issue, yet the measures that it has adopted have, in our view, still fallen short. Policies in response to low fertility and population aging require about one generation's time in order to have their effects, and so we need to implement them steadily at the proper times and in the right directions, lest we face irreversible consequences later. Recently Japan has created a new ministererarial position to deal solely with its issue of low fertility, and has the aim of raising its fertility rate from the present level of 1.4 to 1.8 persons in order to maintain a population greater than 100 million for the next 50 years going forward. Korea, too, now needs a strong overarching institution to spearhead such policies.

To this end the Bank of Korea has been conducting wide-ranging research since late 2016, on the subject of Population Aging: Impacts and Policy Imperatives. Whenever an individual project on this subject was completed, it was first published either as a Bank of Korea Working Paper or a Monthly Bulletin article. This volume represents a collection of these projects. We have also added here an introduction and a conclusion, as well as one paper that we contracted out on the subject of policy governance.

Part 1 begins by outlining the composition of and summarizing the book, and Part 5 concludes on the topic of the future of the Korean economy and related policy implications. The other parts comprise three major components. Part 2 takes a look at
the demographic structure in Korea, the causes and characteristics of population aging, and population policy measures undertaken in major countries. It also assesses the Korean government's measures for dealing with the low fertility rate and population aging, comes up with alternatives related to policy governance, and analyzes the implications of a reunification of the Korean Peninsula for population aging. Part 3 examines the impacts of population aging on Korea's macroeconomy, including its economic growth, consumption, current account, national finance and inflation. Part 4 looks into the changes resulting from population aging in areas such as household financial behavior, the financial industry, the housing market, the labor market and the industrial structure. It also includes the implications for sectoral policies to deal with these changes.

The articles included in this volume propose policy options using widely accepted economic theory and rigorous quantitative methods related to population aging. In this regard, we hope that the book will be an important reference point for policymakers in assessing and formulating macro, financial, housing, industrial, employment, welfare and immigration policies, and that it will also contribute to the expert advice and research in this field.

Many people have contributed as authors of this book. I myself planned the collection, served as editor-in-chief, and wrote Part 1. Jaerang Lee, Deputy Director of the BOK Economic Research Institute, managed the entire process of publishing this book as the project manager, played the role of research manager on the topics included in Part 4, and also participated in writing Part 5. Byung Kwun Ahn, Head of the Macroeconomics Team of the BOK Economic Research Institute, and Hwan Koo Kang, Head of the Micro & Institutional Economics Team, were in charge of managing the research on the themes included in Parts 2 and 3 respectively, and each participated in writing a chapter as well. Song Sungju, Head of the Financial & Monetary Economics Team; Ki-Ho Kim, Seung Whan Ryuk and Young Jun Choi, senior economists of the Economic Research Institute; Daeyup Lee, Jieun Lee, Daeyoung Jeong and Ji Young Choi, economists of the Economic Research Institute; Hong Jig Lee and Kwang Myung Chun, senior economists of the Research Department; Kyungkeun Kim and Kyounghoon Park, economists of the Research Department; Suyeon Bang, junior economist of the Research Department; Kyoungsoo Yoon, senior economist of the Financial Stability Department; Dong Hwee Kwon, Sangki Ahn, Kanghyun Oh and Jae Hoon Cha, economists of the Financial Stability Department; Sun Young Kang and So Hee Park, junior economists of the Financial Stability Department; Byungkuk Kim, economist of the Monetary Policy Department; Jeong Hoon Kim, senior economist of the Financial Markets Department; Yongmin Lee and Se Hyung Jo, economists of the Financial Markets Department; Jin Soo Lim, senior economist of the International Department; Young Rae Kim, junior economist of the International Department; Dongjae Lee, junior economist of the International Affairs
Department; Jaejun Yoon, junior economist of the Human Resources & Administration Department; and Jong Ku Kang, Director General, and Sol Kim, junior economist, both of whom are temporarily dispatched to outside organizations, all participated in this research project.

Meanwhile, experts from academia have also taken part. Professor Jinill Kim of Korea University, Professors Soyoung Kim and Chulhee Lee of Seoul National University, Professor Hosin Song of Ewha Womans University, and Professor Joonyoung Hur at Hankuk University of Foreign Studies have taken leading roles in their respective joint research projects carried out with the researchers at the Bank of Korea. Changyong Choi of the KDI School of Public Policy and Management meanwhile conducted the research on the topic of policy governance. Although I cannot name them all, I would in addition like to thank all of the experts who participated in the anonymous reviews of the papers, and the designated discussants for the interim seminars, for their many meaningful and helpful comments that have contributed greatly to this project. Lastly, I wish to express my deep appreciation to all of the staff at our Bank who participated in publishing this book, including Namju Kim, economist at the Bank of Korea Economic Research Institute, along with junior economists Jaeyoung Kim, Hyun Man Kim, Sungmin Park, translators Jayoung Ahn, Haewon Chang, Yunjo Chang, Eun-ji Kim, Eunjee Kwon, Soo Yun Yang, and editors Derek Bruinooge and Michael Marking for their diligent editing and review.

Finally, I wish to note that the contents of this book represent the personal opinions of the authors, and do not necessarily reflect the official views of the Bank of Korea.

September 2017

Wook Sohn
Director General
Economic Research Institute
The Bank of Korea
Introduction

The Republic of Korea is aging rapidly, as the average woman in her childbearing years gives birth to only 1.17 children — among the world’s lowest numbers as of 2016 — while people are also living longer. The country is projected to enter into the status of an aged society from 2018, with a share of the elderly in its population of 14.3%, and to become a super-aged society with a share of 20% in 2025.

Population aging, characterized by low fertility rates and growing life expectancy, influences the whole economy: it alters macroeconomic variables such as output growth, consumption, the current account and inflation as well as household finance, the housing and labor markets, and the industrial structure. It also causes significant changes in the fiscal and monetary policy environment.

It is therefore important to assess the impact of aging from a broad, long-term perspective, so as to prepare for it in advance. The Korean government set the low fertility rate and population aging as items on its national agenda back in 2004, and since 2006 has pursued three five-year plans to tackle these issues, albeit without visible results. Given that it takes at least a generation’s time to see the effects of a population policy, failing to identify and address the current shortcomings could lead to irreversible consequences later.

Against this backdrop, the Bank of Korea has been conducting broad research to analyze the situation related to population aging and devise appropriate policies in response. Under the overarching title Population Aging: Impacts and Policy Imperatives, this volume contains 15 papers, including an assessment of the macro and long-run impacts of population aging, case studies of other countries, and evaluations of and suggestions for the policies as well as the governance framework in Korea.

Following this introduction in Part 1, Part 2 provides an overview of how population aging is unfolding in Korea, after which Part 3 undertakes a comprehensive evaluation of the
Part 1: Introduction

macroeconomic implications of population aging. Part 4 then looks into the impacts of population aging on the various economic sectors, and the related policy challenges. Lastly, Part 5 provides the economic outlook for Korea as population aging progresses, and suggests policy imperatives.

Population Aging in Korea

Chapter 1 reviews OECD panel data (1992~2012) to analyze the factors behind declining fertility rates, and compares the nature of population aging in Korea with those in major advanced countries. The author finds that Korea's fertility rate has been falling due largely to socioeconomic factors, such as working conditions that limit the time for child care and the carrying out of daily household chores by men, and the high costs of weddings and childcare, as well as sociocultural factors including the greater number of women that have achieved higher education and the changing values regarding gender equality. The fertility rate turns out to be negatively correlated with housing price inflation, which is used as an proxy indicator for weddings and childcare expenses. With regard to working conditions, as the rate of female labor force participation rises the longer male working hours negatively affect the fertility rate. With regard to the changing attitude toward gender equality, when more women are highly educated the existence of gender equality in the workplace is found to help increase the fertility rate.

The chapter studies the nature of population aging in Korea on three fronts: the historical, sociocultural, and demographical. First, on the historical front, although it is natural for a country to experience population aging as it industrializes, the Korean population has aged exceptionally rapidly because the country has undergone dramatic industrialization in a short
period of time. It also maintained a birth control policy for too long, which contributed to the current low fertility rate. Second, from the sociocultural perspective, the high costs of weddings and childcare, poor balance between work and family life, and unequal shares of time spent on childcare and daily household chores among couples are found to be holding Korea’s fertility rate down. Third, from the demographic perspective, the aging of the baby boom generation is pushing the percentage of the country’s aged population up rapidly. This aging of the baby boomers, combined with the low fertility rate, is causing the pace of population aging in Korea to accelerate.

Addressing the falling fertility rate therefore requires policies that benefit the family, including for example making weddings and childcare less expensive by stabilizing the housing market and cutting private education costs, as well as ensuring working conditions that make possible an equal sharing of household responsibilities between couples. At a more fundamental level, Korean society needs to understand the changing attitudes toward childbearing and childcare, aim for greater gender equality, and establish the necessary legal and institutional environment to support these attitudes.

Chapter 2 presents case studies of policy measures that OECD member countries have taken in response to their own population aging, and draws implications for Korea. The first case is policies that support work-life balances. Northern European countries have established family-friendly working environments that enable more women to participate in their labor markets, which helps to raise their fertility rates. These policies are quite unique in that they are promoting public responsibility for childcare and heightening the awareness of gender equality in the workplace and in society at large, unlike other conventional population aging policies that focus only focus on promoting increased childbirth. The second case is pension reforms. Major OECD countries have witnessed their aging populations push their social security expenditures up markedly, leading to increased concerns about the sustainability of their public pension systems. The governments have in response raised the ages for commencement of pension benefit receipts and have operated policies to encourage their elderly to prolong their periods of labor participation. In addition, to ease the financial burdens on their public pension systems advanced countries are working to increase their numbers of subscribers to private pensions separately from public pensions, by providing tax incentives and government subsidies. At the same time, they have policies in place to support the self-employed and low-income groups in order to ensure stable incomes for the elderly. The third case is employment policies that encourage employers to hire the elderly as the age of pension benefit receipt is raised, and the young due workforce shortages. The employment policies for the elderly include strengthened vocational training and job-search assistance, increased unemployment benefits and pensions, higher retirement ages, and the provision to employers of incentives for hiring the elderly. The employment policies aimed at youth are parts of governments’ efforts to tackle the issues of declining productivity and labor shortages that low fertility rates and population aging entail. For example, Denmark, Sweden, Finland and other Northern European nations are actively operating labor market
policies, which include providing youth with vocational training and job-search assistance through which young job seekers can hone their job skills and gain greater access to the labour market. The fourth case is immigration policies aimed at addressing labor shortages. Most of these policies are focused on attracting highly educated workers with specialized skills from overseas. They are implemented very carefully, because the issues of youth unemployment and sociocultural tolerance also need to be considered.

Looking at these examples of policy in advanced countries, it is judged that efforts to fight population aging will work only when policies to promote a work-life balance, pension reforms, employment policies and immigration policies are all well-coordinated. First, a balance between work and family life needs to be promoted further. For example, workers should receive greater family life-related benefits such as allowances and paid leave, while the broader society needs to have a better understanding of the benefits of infant care and maternity leave. Many best practices in advanced countries to this end have already been or are scheduled to be introduced in Korea, but only to limited degrees or with serious blindspots that hinder the achievements of their intended purposes here; remedies are thus called for. Second, to make the public pension system sustainable, encouragement of private pension systems is needed, while the age for commencing receipt of pension benefits should be raised. The pension system needs in addition to play a greater role in providing pensioners with income security in their later lives. This can be done by addressing the system’s loopholes through which low-income people and irregular workers are often left uncovered. In this way the system can work to prevent the elderly from falling into poverty. Third, the labor market needs to tap fully into the sources of manpower among the young as the labor supply runs short owing to population aging. In Korea, the youth labor force participation rate is low because of the higher tertiary enrollment ratio, the requirement of mandatory military service for men, and skill mismatches between job seekers and job vacancies. In this regard, the Korean government needs to push ahead with labor market policies that match the education provided with the needs of the labor market, so as to boost youth employment. Last but not least, consideration needs to be given to an immigration policy to attract foreign workers so as to maintain an adequate workforce. To this end Korea can learn from Sweden and Germany, countries that help foreign workers to settle in without difficulties by operating sociocultural policies that are inclusive of them, and provide language and cultural education support to establish environments in which foreign workers can get along with locals in a harmonious way.

Chapter 3 evaluates the governance of Korea’s population aging policies and provides suggestions for improving them. Korea has carried out three rounds of its Basic Plan for Low Fertility Rate and Aging Society since 2004, when the issues of the low fertility rate and population aging were added to the national agenda. This study looks into the three rounds of the Basic Plan announced by the Presidential Committee on Aging Society and Population Policy, and analyzes the current and past population aging policies pursued by the different competent authorities. Relevant statistics are also studied and in-dept interviews with the
officials concerned conducted to assess the policies from three aspects – their comprehensiveness, proactivity and effectiveness.

First, Korea’s population aging policies cover many different areas including income security, health, leisure, entertainment and safety for retirees. However, the coordination of these policies among the different authorities concerned is not well arranged and they are carried out separately under different policy goals, which undermines public spending efficiency. Second, with regard to the policies’ evolutions, it is noted that the relevant budgets, organizations and systems involved have continued to expand. The budget increase has been particularly noteworthy; the Basic Plan spent 15.9 trillion won to counter population aging in its first round (2006~2010) and 40.8 trillion won in its second (2011~2015). In its third round (2016~2020) more than 89 trillion won are being allocated. Third, concerning the policy effectiveness, some are skeptical about the visible outcomes of these expensive policies.

In this regard, the governance of Korea’s population aging policy needs a sweeping overhaul on three fronts. First, the limitations of the competent authorities involved and the committee need to be addressed. The competent authorities and the committee need budgetary and organizational support to enable them to identify needed policies and to arrange policy alternatives. However, there are several obstacles now preventing them from working as a command center in the implementation of population aging policies. The Presidential Committee on Aging Society and Population Policy is chaired by the President and is participated in jointly by both the private and the public sectors. Nevertheless, the committee may have limitations in enforcing policies due to a lack of commitment on the parts of decision makers and to the absence of power for making final policy decisions and executing the provided budgets. Second, the competent authorities need to cooperate with each other. To deal with population aging it is imperative that the relevant authorities in charge of welfare, labor, industry and healthcare work closely together. But under the current mechanism, the relevant bodies have failed to do this due to a lack of incentives for such collaboration. Third, the system needs clear visions and goals at the national level. There are no clear national visions and goals to serve as a North Star when pushing ahead with population aging policies in cases where conflicts of interest concerning the issues are expected. For example, universal programs are expected to conflict with targeted programs, the market-oriented liberal model with the welfare state model characterized by government intervention, and competition-driven efficiency with social integration built on solidarity.

We highlight Korea’s need for a sweeping overhaul in its current population aging policy scheme to achieve better policy effectiveness. The system needs to be upgraded into a planning group scheme, with the group having the authority to make final policy decisions, execute budgets. It is also necessary to consider a gradual merging of the relevant authorities into one that can comprehensively carry out population aging policies, or the setting up of a new ministry dedicated to this issue. A similar move taken by Japan was the creation of a new cabinet position charged exclusively with dealing with the low fertility rate.
(2003), and the appointment of its minister in charge of population policy as the competent minister for population aging (2015). Other recommendations include rearrangement of the population aging policies’ priorities based on their importances and values, and periodic monitoring and assessment of key programs.

Chapter 4 analyzes the effects that the reunification of South and North Korea would have on population aging. To this end, this paper sets various scenarios for potential changes in North Korea’s fertility rate and life expectancy after reunification of the two Koreas, in order to estimate demographic changes in the two countries and compare their levels of population aging. This paper assumes that the populations of South and North Korea will be integrated in 2020 through reunification, and that reunification will be completed peacefully with no loss of population. The results of analysis show that, if the populations of North and South are integrated, population aging will be mitigated compared to the case with South Korea’s population only. Considering South Korea’s population alone, the share of the elderly is forecast to peak (at 37.9%) in 2065. If the populations of South and North Korea are integrated, however, this proportion is likely to decrease to 31.4-34.9%. However, as was seen in the East German region after reunification, if North Korea’s fertility rate declines and its life expectancy converges to the level of the South, this will reduce the effects of reunification in easing the aging problem. These results suggest that the integration of the South and North Korean populations following reunification will have an effect of easing the aging problem somewhat, but that the effect will decrease substantially if North Korea’s fertility rate declines and its life expectancy rises to the level in the South.

**Population Aging and the Macroeconomy**

Chapter 5 conducts a simulation analysis of the effects of population aging on the long-term economic growth rate, using future population estimates made by Statistics Korea as well as a growth accounting and dynamic computable general equilibrium model. In the baseline scenario, which assumes that the recent trend of labor productivity will continue and the rates of participation in economic activities by age will remain unchanged from that of 2015, it is forecast that the economic growth rate will slow from an annual average of 3.9% during the 2000–2015 period to 1.9% from 2016 to 2025, and further to 0.4% between 2026 and 2035. This huge negative impact of population aging seems attributable to the rapid pace of population aging in Korea, as well as to the income-consumption pattern seen in emerging economies in which declines in earned income after retirement lead immediately to reduced consumption.

In a scenario in which comprehensive population policy measures are carried out to slow the pace of decline in the economically active population due to population aging — including a raising of the retirement age by five years, an increase in the rate of women’s participation in economic activities to the OECD level, maintainance of the current level of labor
productivity and a long-term increase in the fertility rate - it is estimated that the economic growth rate would remain at 2.8 percent (annual average) for the first ten years, and be in the 1.6 percent range over the next 10 years.

In this regard, it is necessary to comprehensively implement policy measures to slow the pace of population aging, by working to achieve gender equality and a balance between work and family life, ensuring that the public sector bears some of the burdens of childcare and education expenses, and working to raise the birth rate through for example family support policies. It is also important to consider encouraging an expansion in the influx of immigrants, given that countries experiencing sharp increases in their proportions of immigrants have seen their rates of population aging slow relatively. From a short-term perspective, delaying the time of retirement and expanding women’s participation in economic activities may be effective for mitigating the decline in labor supply due to population aging and delaying a drop in the rate of economic growth. In the longer term, it is important to improve productivity through technological development and through the enhancement of efficiency, in order to mitigate the slowdown in growth.

Chapter 6 seeks future policy measures based on an examination of the current consumption conditions for the elderly as well as their prospects. The amounts of income and consumption per elderly (aged 60 and older) household are estimated to have been 30 million and 21 million won respectively in 2015, far below the overall averages (43 million won and 31 million won, respectively). The rate of growth of this population is outpacing those of other age groups, however. The increase in the number of elderly households, the expansion in their participation in economic activities, the reform to expand the basic pension system, the increased pension incomes in line with the growing number of national pension beneficiaries, etc. are expected to work as factors causing increased consumption by the
older generation. However, expansions in precautionary savings in line with increased life expectancy, decreases in expected net interest incomes due to persistently low interest rates and slowing rates of housing price increase, and constraints on the securing of liquidity for consumption owing to the large share of real assets among total asset holdings are seen as factors limiting the growth in consumption by the elderly.

The influence that the elderly have on consumption is expected to increase even more over the 2016 to 2020 period, boosted by the accelerating pace of aging of the elderly population and by a slowdown in the decline in their propensities for consumption while their incomes continue to improve. The share in total consumption accounted for by the elderly is likely to jump from 18.8% in 2015 to 23.4% in 2020, and their contribution to consumption growth is forecast to rise from the 38.5% figure during the 2011 to 2015 period to the 60 percent level between 2016 and 2020. In this regard, it will be necessary to seek policy measures to ensure the stability of consumption by the elderly.

Chapter 7 analyzes the medium- and long-term impacts of demographic changes on the current account balance, using data from 180 countries around the world. The idea is that demographic changes can bring about differences in savings and investment rates among countries. The results of analysis show that increases in the youth and elderly dependency ratios have negative linear influences on the current account. However, there is a non-linear relationship where the influence of the elderly dependency ratio lessens as the ratio rises. This implies that this increase in the elderly dependency ratio might have brought about changes in the economic structure, in economic agents’ behaviors and in economic policies. This has led in turn to a decline in its impact.

Despite the continuous rise in its elderly dependency ratio, Korea’s total dependency ratio has fallen due to a drop in its youth dependency ratio. However, both the elderly and the total dependency ratios are expected to rise due to the rapid population aging, a development that will likely have adverse impacts on the current account balance. Given the non-linear relationship between the elderly dependency ratio and the current account, however, the impacts on the current account due to population aging are subject to change, as the progress of population aging might lead to changes in the retirement age, to greater participation by the elderly in the labour market, to structural changes in the pension system, and to changes in savings and investment behaviors.

Chapter 8 analyzes the relationship between population aging and the government’s tax revenues and expenditures via two different methods. To consider the tax revenue aspect, a DSGE model is used to determine the impacts of the decline in the productive population on the volume of tax revenues. On the tax expenditure side, this chapter looks at how the demographic changes affect the structure of fiscal spending, using OECD country panel data.

The analysis shows that Korea will experience a larger decline in tax revenues due to demographic change than those seen in the G7 countries. In comparison with the G7 countries, Korea has lower labor and capital tax revenues, which are expected to decline further as a result of demographic change. The tax revenues in these two areas are
estimated to be 72% and 74% lower respectively in 2065 than their levels in 2015.

An analysis using panel data from the OECD countries shows that a rise in the number of the elderly population has positive and statistically significant effects on social security and public health expenditures relative to total expenditures. A drop in the number of the population below age 15 meanwhile has negative and statistically significant effects on the proportion of spending on education. The estimation shows that between 2016 and 2065 an additional ₩2.8 trillion in annual fiscal spending will occur due to demographic changes. This result is based on assumed annual economic growth of 1% and fiscal spending of 32% relative to GDP. By item, social protection and welfare will require an annual average increase of ₩5.6 trillion in spending, while expenditures on education and general public services will fall by 0.5 and 2.3 trillion won respectively each year.

Chapter 9 examines how the decline in the working age population due to population aging affects long-term inflation. A study of various channels through which inflation due to population aging is transmitted, including a decline in labor supply, the savings rate, real income and productivity, asset prices and fiscal burdens, shows that the working age population began to decline from 2017, but that the impacts on inflation due to population aging have not become evident yet.

To identify the impacts of demographic changes on the long-term inflation trend, a simulation is conducted using the changes in the proportion of the working age population and in the population growth rate as exogenous variables. The simulation results show that demographic changes such as a low birthrate and population aging will exert downward pressures on long-term inflation via channels including a reduced labor supply and lower asset prices. If the impact of the changes in the working age population is reflected in the long-term inflation trend after a time lag, and the working age population falls by an average of 1%p annually, it is forecast that long-term inflation will drop by an amount ranging from 0.02 to 0.06%p from the 2020s.

These results imply that, in setting the long-term inflation target, we need to consider how the different stages of social structural changes including population aging will affect inflation. The impacts on long-term inflation of population aging and other changes in the social structure are hard to control through demand management policies. In this regard, structural reforms to deal with demographic change should be implemented continuously over a long-term horizon.

Population Aging and Policy Imperatives

Chapter 10 examines how population aging will affect the structures of household assets and liabilities. The analysis is based on panel regression models using macroeconomic panel data of OECD countries (1980-2015) and micro-panel data of the Korean Labor & Income Panel Study (KLIPS) (2004-2015).
Part 1: Introduction

The macro-panel regression models estimate the impacts of population aging on the household savings rate, the asset structure and the liability ratios. In these models the cohort and age effects are distinguished in order to examine the trends in the amounts of assets and liabilities and the ratios of financial liabilities to assets by age group. Variations in households’ assets and liabilities structures by age group are broken down into those that are due to the cohort effect, which depend on factors related to macroeconomic conditions and institutions specific to each birth year, and those caused by the age effect, which depend only on the age group irrespective of the birth year.

The macro-panel regression estimates show that, as expected, the ratio of financial liabilities to financial assets declines as population aging progresses, although not in a statistically significant way. However, the micro-panel regression estimates show that, with the cohort effect considered, the baby boomers reduce their real assets very gradually as population aging progresses, while their ratio of financial liabilities to financial assets declines. This seems to be attributable to the tendency of precautionary savings and bequest motives.

Judging from these results, population aging seems likely to cause a decline in the household savings rate and an increase in the proportion of safe assets, leading to structural changes in the financial market. However, as there have been no sudden disposals of the real assets held by the elderly, the negative impacts on the financial market are not expected to be large. To deal with possible changes in the financial market driven by population aging, development of the asset-backed securities market will be beneficial. Meanwhile, a long-term fixed income market and medium-risk/medium-return financial products need to be developed, to address the increase in preferences for safe assets. Financial education for the elderly should be strengthened as well.

Chapter 11 estimates the impacts of population aging on the domestic financial industry using international panel data and the Survey of Household Finances and Living Conditions. It then recommends appropriate measures for responding for financial institutions and government/public agencies. According to an analysis of panel data from about 30 countries between 1960 and 2016, household net financial assets –to-income ratios have risen when populations have grown older. Looking at the composition of financial assets, population aging has led to increases in demand for insurance and pension products, together with high demand for fund investment among the early-elderly group and for deposit savings among the late-elderly group. In addition, long-term interest rates have fallen and stock prices risen.

According to estimates of panel regression models using data from the Survey of Household Finances and Living Conditions for 2012 through 2016, the domestic financial industry is expected to grow until the latter half of the 2020s with a rise in demand for long-term financial assets. Low growth, low interest rates and a flattening of the yield curve driven by population aging could lead to deteriorations in financial institutions’ profitability, but the demand for portfolio investment including fund investment is expected to rise.
Meanwhile, the asset holdings of the household sector are likely to be biased toward real assets for some time if the strong preferences for real assets among the elderly group continue.

In response to these changes, the chapter suggests the following: invigoration of the long-term financial asset market; development of new business models for financial institutions in response to changes in demand; strengthening of risk management against the flattening of the yield curve as it is likely to lead to deteriorations in profitability at financial institutions; and revitalization of the asset-backed securities market to alleviate the price volatility risks of real assets.

Chapter 12 discusses population aging and household international investment. As the global financial markets become increasingly interconnected, the gaps in expected rates of return among assets, caused by the differences in the extents of population aging across countries, could lead to an acceleration in cross-border capital movements. This chapter analyzes the relationship between population aging and changes in the amounts of overseas asset holdings using panel data on 54 countries between 2001 and 2015, and looks into the impacts of population aging on different types of international investment - specifically overseas direct investment, overseas portfolio investment, overseas fixed-income investment and overseas equity investment.

The results of panel regression show that population aging leads to a reduction in overseas
Part 1: Introduction

asset holdings, with more significant effects on international direct investment than on international portfolio investment. The speed of population aging has a negative correlation with overseas asset investment, and shows a greater negative impact than the extent of population aging. Given that accumulated international assets are future sources of foreign income, a reduction in overseas asset holdings driven by population aging could cause international credit ratings to deteriorate and create capital outflow pressures. Efforts to induce international investment are therefore advised, through deregulation for example, so as to boost overseas asset holdings and thereby secure an income account surplus.

Chapter 13 offers a forecast of how population aging will affect the housing market, by focusing on changes in medium- and long-term housing demand. It is shown that some aged households that are not fully prepared for their post-retirement lives with public pensions or savings have greater incentives to sell their homes or to take out reverse mortgages. This, along with the decrease in the number of young households, is expected to cause a gradual slowdown in housing demand. Housing demand as quantified by the sum of the residential area occupied has peaked in the age group born between 1945 and 1954, and has been declining relatively among the younger age groups. The rate of increase in medium- and long-term housing demand is therefore expected to slow moderately in line with the progress of population aging.

As the number of one- to two-person households in the elderly group increases, and retirees’ needs for housing asset securitization grow, the demand for small- to medium-sized housing and apartments preferred by such retirees is expected to expand even more. However, given that the housing supply-to-demand ratio stands at 102.3% as of 2015, the slowing pace of growth in housing demand due to population aging could contribute to the increased number of vacant houses (1.069 million, about 6.5% of the total housing).

With owners of multiple housing units pursuing stable cash flows from rents, given that young households have constant demand for rental housing the current trend of change to demand for rental housing rather than housing ownership is expected to continue for a prolonged period. If housing disposals by the elderly, in particular the baby boomers, are concentrated during a short period of time, it may put downward pressures on housing prices. However, the possibility of this seems limited given the financial and economic conditions, the method of housing supply with a preference for reconstruction and redevelopment of existing apartments, and the high share in total housing of apartments, for which transactions are easy.

In light of this, it is necessary to come up with a plan to stabilize the housing supply and demand in the medium- and long-term, so that the structural changes will not cause any imbalance between supply and demand in the housing market. A plan for management of the housing stock is also needed, involving for example a housing supply plan tailored to the demand of the elderly households, an expansion of public rental housing for housing-disadvantaged persons such as the elderly, and the utilization of vacant houses. Policies need to be considered for easing the pressures for housing sales by the elderly, by
for example invigorating the use of reverse mortgages, providing support to retired households for converting their housing to rental properties, etc.

Chapter 14 examines population aging and the labor market. In order to precisely identify the impact of population aging on the labor market, the changes in the size of the future labor supply are estimated through population survey data broken down by gender and by age. The impacts of population aging on the prospects for labor supply and demand by industry are analyzed, and policy measures for coping with labor shortages are suggested.

The analysis shows that, if the patterns of labor supply by gender and by age seen in 2016 are maintained, then the labor supply as measured by the economically active population, the number of persons employed and the total hours worked will show a visible decline starting from 2030. The levels of those three indicators are likely to reach around 87%, 88% and 83% respectively of their current levels by 2050. On the other hand, assuming that policies such as extending the retirement age, mitigating the cases of women’s career interruptions, and reducing youth unemployment take root successfully, it is expected that by 2050 the economically active population and the number of persons employed will both be 92% of their current levels, and total hours worked 87%.

Even if population aging leads to a decrease in the labor supply, it is uncertain whether this will cause a labor shortage and ultimately hinder economic growth. In theory labor may not be lacking if the labor supply and labor demand decline at the same time. It is difficult to predict the impact of technological changes on labor supply and demand. However, the most important potential factor that could cause a labor shortage in the relatively near future is the fact that baby boomers (born from 1955 to 1963) are entering the elderly age cohort. In particular, industrial sectors in which aging is already under way, and where the proportions of aged workers are high due to shortages in new labor entry, may be hit hard by the exits of the elderly from work.

In view of this, it appears necessary to come up with policy measures by taking into account the specific characteristics of the changes in labor supply and demand due to population aging. In concrete terms, the future labor market conditions may vary depending upon changes in labor supply-related factors such as the economically active population, labor hours worked and productivity, as well as the changes in labor demand-related factors such as technological development and the industrial structure. Flexible policies are accordingly needed. The labor market supply and demand conditions may differ by industry, by job and by population group, and policy responses adopted in ample consideration of differences by sector and by type of labor involved are needed.

Chapter 15 covers population aging and the changes in the industrial structure. Using OECD and World Bank panel data an empirical analysis is carried out as to how the population aging in Korea is influencing value added by industry, employment, productivity and net exports. Based on the results of estimation the relevant policy implications are then provided. In addition, this chapter gives a forecast of changes in the industrial structure in line with those in the demographic structure in Korea, using the estimates from panel
Part 1: Introduction


The results of analysis show that the changes in the demographic structure in Korea in the future will lead to a reduced share of the manufacturing sector in terms of total value added (GDP) and employment, and to an increase in the share of the service sector. In addition, changes in the demographic structure will bring the relative productivity of the manufacturing sector down, while pushing that of the service sector up. The relative productivity of each industry is calculated, in comparison with the average productivity for all industries as a whole.

Looking at the changes in the shares of net exports in the values added in the different industries, that in the manufacturing sector is expected to rise, led by the high tech industries. This implies that the contribution of domestic demand to creating value added in the manufacturing sector will fall, while that of overseas demand will increase.

It is necessary to set the appropriate policy directions to ensure effective industrial restructuring to deal with these changes. It is particularly desirable to implement seamless ongoing restructuring in the low-tech manufacturing sector, since demand in this sector is expected to decrease. As for the public health, welfare, real estate, leasing and business services industries, enhancing their supply capacities and competitiveness in line with growing demand is desirable. In addition, the rapid progress in population aging is highly likely to bring about a decline in domestic demand in the manufacturing sector, and it is therefore necessary to make up for this sluggish domestic demand by means such as cultivating overseas markets and strengthening competitiveness.

Conclusion: Future of the Korean Economy and Policy Implications

Finally, Part 5 concludes by taking a look at the future of Korea's aged economy and offering various ideas for the directions of policy in response. Most of the analyses of the impacts of population aging — on the macro variables of growth, inflation and government expenditure, as well as on the individual economic sectors of finance, foreign exchange and labor — do not present bright outlooks. Considering the impacts of population aging alone, it is forecast that Korea will no longer be able to sustain growth beginning from the mid-2030s, while there will also be lower inflation of around 1 percent and smaller room for fiscal policy. In terms of the industrial structure, the share of the low-tech manufacturing sector will shrink while those of service sectors such as public health and welfare will grow. Together with this there will be negative changes in certain markets such as declines in household savings, reductions in foreign assets, and a long-term shrinkage of the workforce.

For over the past 10 years many fiscal resources have been injected to try to boost the fertility rate through the mobilization of various policy instruments, but it is assessed that the results have not met expectations. Socioeconomic factors such as wedding and child care costs, labor market conditions that limit the sharing of domestic chores in marriage, and
Introduction

sociocultural factors including changes in the level of education and the value placed on gender equality have worked as factors causing the fertility rate to fall. In addition, many assess the governance system for the measures adopted by the government to deal with the low fertility rate to have some limitations. These limitations seem to include a lack of policy leadership and driving force, a lack of linkage effects stemming from contradictions between policies, and an insufficient policy adjustment system.

Since it will take a long time to overcome the problem of population aging through the promotion of fertility, this issue should be approached continuously over the longer term. It is very important to reorganize the social and economic incentive mechanisms for promoting fertility, while setting up an incentive system to ensure that childbirth gives economic advantages to parents, through for instance reorganization of the tax system and fiscal budget expenditures, and continuously implementing policy measures for improvements in areas that can indirectly influence marriage and childbirth, such as child care and educational conditions.

In order to fill in the time gap needed before policies to promote childbirth lead to a normalization of the demographic structure, it is necessary to continue efforts to boost the rates of female and senior participation in economic activities, and to consider a complete paradigm shift in immigration policy. It is also necessary to strengthen policies to support a proper balance between work and family life, as well as to make efforts to prevent the occurrence of blind spots in the relevant policies for temporary workers and female workers at small businesses for example. In addition, employment services should be strengthened to help the elderly land jobs and to improve their labor skills. At the same time, consensus should be reached on a shift from a passive immigration policy to an active one, and detailed policy measures related to this should be established. In the short term the immigration of low-skilled laborers could be allowed, while in the long term consideration should be given to measures to make up for the labor shortage through increased productivity by an immigration influx policy focused on the mathematics and science & technology fields.

In addition, the policy governance related to population should be improved so as to enhance the impetus for policy measures to deal with the low fertility and population aging issues. Given that the laws and systems related to the low fertility and population aging issues are dispersed, a control tower function of policy executors should be strengthened to ensure integrated implementation of the relevant policies. In addition, the priorities of policy measures for dealing with the low fertility and population aging issues should be adjusted in line with the relative importance and values of the measures.

To deal with changes in the economic structure stemming from low fertility and population aging, it is necessary that efforts be made to develop new policy instruments as well as to improve the adaptability of monetary and fiscal policies to the changes in social and economic conditions. There should be monetary policy actions taken to respond to changes in interest and inflation rates stemming from the aged demographic structure. In addition, capacities should be focused on the understanding of the policy environment and the development of
Part 1: Introduction

policy instruments to prevent any decline in the efficacy of monetary policy. There is also a need to come up with medium-to long-term plans for responding to the reduction in fiscal capacity stemming from population aging, and to the impacts on the automatic stabilizer function of national finance.

Longer life expectancy is an inevitable consequence of economic growth and social development, and so it is not in itself a problem to be solved. However, a falling fertility rate is directly connected to a decline in future growth. And therefore, even if the improvements are slow and the results of policy do not turn out immediately, we need to be assured that raising the birthrate is the most critical, top-priority item on the agenda, and continue with its pursuit.
Part 2

Population Aging in Korea

<table>
<thead>
<tr>
<th>Ch. 1</th>
<th>Cause and Characteristics of Population Aging in Korea</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kyounghoon Park (The Bank of Korea)</td>
</tr>
<tr>
<td>Ch. 2</td>
<td>Population Policy for Aging Societies: OECD Case Studies</td>
</tr>
<tr>
<td></td>
<td>Jinill Kim (Korea University) and Kyounghoon Park (The Bank of Korea)</td>
</tr>
<tr>
<td>Ch. 3</td>
<td>Assessment of Policy Governance</td>
</tr>
<tr>
<td></td>
<td>Changyong Choi (KDI School of Public Policy and Management)</td>
</tr>
<tr>
<td>Ch. 4</td>
<td>Population Aging in A Reunified Korea</td>
</tr>
<tr>
<td></td>
<td>Jiyoung Choi (The Bank of Korea)</td>
</tr>
</tbody>
</table>
Chapter 1

Causes and Characteristics of Population Aging in Korea

1. Background

Among the member nations of the Organization for Economic Co-operation and Development (OECD), Korea has a population that is younger than the average so far but is aging at a faster rate than other members, as its total fertility rate is the lowest while its life expectancy is higher than average.

![Total Fertility Rates, by Country](image1)

![Percentages of Aged Populations](image2)

Notes: 1) Ratios of newborns relative to average numbers of women of childbearing age.
2) As of 2014, except for Canada (as of 2012) and Chile (as of 2013).
Source: World Bank, World Development Indicators

Notes: 1) Percentages of the populations aged 65 or above.
2) Median estimate basis.
Source: UN World Population Prospects: The 2015 Revision

We analyzed OECD panel data and identified declining fertility rates and rising life expectancies as the causes of population aging. We then focused on factors behind the declining fertility rates, so as to compare the characteristics of population aging in Korea with those in other advanced countries.

2. Methods of Analysis

Panel data from the OECD members (1992~2012) were used for our analysis. A static panel model, with fixed effects by country, was employed to study the factors behind declining fertility rates.
As the dependent variable we used the total fertility rate, and as explanatory variables we used income levels, wedding and childcare costs (housing price inflation), employment conditions (unemployment rate), times spent on childcare and daily household chores by couples (female labor force participation rate, male workplace hours), gender equality in education and employment (female tertiary enrollment rate, gender wage gap), and public spending on family benefits and public pensions.

We looked into the correlations between the factors that affect longer life expectancies, such as public spending on healthcare policies, per capita income, health facilities, healthcare providers, and fertility rates. The characteristics of population aging in Korea were compared with those in advanced countries (those with recovering fertility rates as well as countries that also have low fertility rates).

3. Results of Analysis

(1) Factors behind declining fertility rates

OECD member countries are facing declining fertility rates due largely to economic and cultural factors such as labor market conditions, changing values concerning gender equality, working conditions that limit the gender division of labor in household chores, and high wedding and childcare costs.

A 1% increase in the unemployment rate is associated with a 0.05% fall in the fertility rate, whereas a one percentage point rise in the female labor force participation rate leads to 0.3% to 0.4% growth in the fertility rate. This may be explained by the fact that countries with higher female labor force participation rates have more favorable environments for childbearing and childcare, including family-friendly work places and equal gender divisions of labor in carrying out household chores. When more women are receiving higher education, poor workplace gender equality negatively affects fertility rates. A one percentage point rise in the gender wage gap results in a 0.047% drop in the fertility rate. The resulting drop goes further down to 0.01% if there is a one percentage point increase in the female tertiary enrollment rate.

Other factors that negatively affect fertility rates include working conditions that limit the gender division of labor in household chores, and high wedding and childcare costs. When the female labor force participation rate is growing, higher housing prices, which indicate greater costs of weddings and childcare, as well as longer male working hours, lead to declining fertility rates, albeit not to large degrees.

(2) Factors behind rising life expectancy

Longer life expectancies are found to be positively correlated with advancements in
healthcare policy, income levels and medical technology, and with the existence of more healthcare providers.

(3) Characteristics of population aging in Korea

The Korean population is aging rapidly as the country has become industrialized at a fast pace. We looked at the characteristics of Korea’s population aging from three perspectives: considering its historical, sociocultural and demographic structural backgrounds.

From the historical perspective, the past protracted implementation of birth control policies held back the country’s potential fertility.

Concerning the sociocultural factors, the fertility rate has been pulled down by expensive wedding and childcare costs, poor work-family life balances, the assumption that women are responsible for childcare and household chores, and other factors. While it is expensive to rear a child in Korea, the Korean government spends significantly less on family benefits (1.4% of GDP) than do countries with recovering fertility rates (average 3.5% of GDP among France, Sweden, Norway, Denmark and Finland, which have had total fertility rates of 1.5 or higher over the last decade). Even among countries with low fertility rates (Germany, Italy, Spain, Japan and Korea, which have had total fertility rates of below 1.5 over the last decade), Korea spends considerably less on family benefits.
than do the others.

**Shares of Public Family Benefits Provided, by Country**

Panel A Countries with Recovering Fertility Rates

Panel B Countries with Low Fertility Rates

Note: 1) Public spending on family benefits such as childcare allowances, parental leave pay, and other childcare subsidies, as percentages of GDP (2011).
Source: OECD Family Database

Korea has few, and especially few male, beneficiaries of paid and/or non-paid parental leaves.

**Recipients / Users of Paid Parental Leave, by Country**

Panel A Countries with Recovering Fertility Rates

Panel B Countries with Low Fertility Rates

Note: 1) As of 2013.
Source: OECD Family Database

With regard to demographic features, the aging of countries’ baby boomers is causing rapid increases in the proportions of their aged populations. The aging of these boomers, in combination with its low fertility rate, is also causing the pace of population aging in Korea to accelerate.
4. Implications

Although it is natural for a country to experience population aging as it industrializes, if the society fails to keep up with the pace of aging the adverse side effects will be profound.

The results of our study suggest that, in order to address the problem of a declining fertility rate, it is crucial to implement policies that provide benefits for raising families. Such policies may include easing the financial burdens of weddings and childcare by stabilizing the housing market and cutting the costs of private education. Another example would be promoting working conditions that enable workers to achieve work-family life balances and working couples to share the responsibilities of childcare and household chores equally.

At a more fundamental level, a broader portion of society needs to understand changing views toward childbearing and childcare, and to aim to achieve gender equality. To this end, the related legal and institutional resources need to be established.

In addition, there is a need for provision of comprehensive support measures for the elderly who have become impoverished due to the rapid social changes stemming from population aging. Such measures should include improvements in pension systems and healthcare insurance in preparation for people’s retirements.

Our study also suggests that policies to educate teenagers and improve youth employment conditions are needed, given that it takes several generations to see the fertility rate recover and population aging ease.
1. Background

Major advanced countries have experienced rapid population aging due to decreasing fertility rates and rising life expectancy. This has led to increasing burdens on them in supporting the elderly and to decreasing proportions of their working-age populations. In response, governments have implemented population policies to mitigate the problems that low fertility rates and population aging entail, such as a drop in the potential growth rate, a rise in the costs of the social security system, and intergenerational conflicts.

Since its population is aging much faster than those of major advanced countries, Korea has a particular need for devising appropriate measures to deal with the many anticipated adverse side effects of population aging.

2. Methods of Analysis

We conducted case study research on the policy reactions that OECD countries have taken in response to their population aging, and came up with some implications for Korea. We looked into the policies to support work and family life balances, pension systems, employment policies and immigration policies undertaken by OECD members as policy responses.

This study also reviewed the measures that the Korean government has taken to address the country’s low fertility rate and population aging. The results were then compared with those in the major OECD member economies.

3. Results of Analysis

(1) Work-family life balance support policies

Countries especially in Northern Europe have established family-friendly working environments enabling more women to participate in their labor markets, which has helped...
them to raise their fertility rates. In the past, policies to boost fertility rates focused only on having more babies. However, work-family life balance policies are promoting public responsibilities for childcare and raising awareness of gender equality in the workplace and in society at large.

(2) Pension systems

Population aging has pushed social security expenditures up markedly, leading to concerns about the sustainability of public pension systems. In response major countries have raised their legal ages for pension eligibility and have implemented policies to encourage the elderly to prolong their periods of active labor.

Governments have linked their public pension schemes with private pension systems, and worked to increase the numbers of insured people so as to ease the fiscal burdens from their public pension systems and to support the income security of the self-employed and low-wage earners.

(3) Employment policies

While the perception of the capacity for work of the elderly needs to be changed, vocational training and other job-related services for the elderly also need to be provided, such as job search assistance tailored to their job skills.

Active labor market policies (ALMP) which link education with job training help to match employers with young job seekers to address the issue of skill mismatches in the youth labor market. ALMP are parts of countries' effort to tackle labor shortages.

A recent study by the World Bank (McKenzie, 2017) explains that ALMP have provided vocational training, wage subsidies, job search assistance, etc. with the aim of helping labor markets to function more efficiently. The study points out, however, that institutional and policy changes are necessary in order to deal with issues outside of the labor market, such as inflexible labor laws or lack of access to the financial system and infrastructure.

(4) Immigration policies

Major countries have been aggressive in attracting highly educated workers with specialized skills from overseas to immigrate to them in efforts to deal with their labour shortages due to population aging. In the process of attracting foreign workers, the issues of domestic youth unemployment and sociocultural tolerance have also been taken into account.
4. Implications

Korea has undertaken three rounds of policy actions since 2004, when the issue of the low fertility rate and population aging were added to the national agenda. It may be too early yet to see any immediate outcomes of these policies, since Korea’s fertility rate decline and its population aging are both occurring much more rapidly than in most advanced economies. The results of the measures taken need to be viewed over a long-term horizon.

In dealing with population aging, learning from the examples of major countries is necessary but reaching a shared understanding at a broader sociocultural level is just as crucial. Policies promoting a better work-family life balance are needed to boost both female labour force participation and the fertility rate. At a more fundamental level, however, in order for these policies to work a broader section of society needs to share the desire for gender equality both at home and in the workplace.

The Korean population is aging at the fastest rate in the world. Population policy for an aging society will work only when a work-family life balance, the pension system, employment policy, and immigration policy are all well-coordinated.

Sociocultural change is particularly essential, involving for example greater social awareness of the gender wage disparity and parental and maternity leave, increases in benefits for raising families, childcare allowances, and the related leave from work. It is also necessary to provide stronger support related to childbirth and childcare to irregular workers and small business employees, who are often excluded from consideration due to policy blindspots.

With regard to the national pension system, the government should raise the pension age and link the national system with private pension systems in order to promote its sustainability. At the same time, the system should play a greater role in providing pensioners with income security in their later years. This can be done by addressing the system’s blindspots, concerning for example low-income earners and irregular workers, in order to prevent the elderly from falling into poverty.

Employment policy needs to take a different approach, toward a division of labor between the younger and older generations and age-based measures tailored to workers’ needs. Members of the older generation need job search assistance enabling them to find jobs related to their work experiences and skills. This can prevent older people from working in fields in which their previous work is irrelevant and they get paid little, or from starting their own businesses without much related knowledge or experience and ending up impoverished. The younger generation needs to be better utilized through aggressive labor market policies that help to match education received with labour market needs to support youth employment.

In addition, sociocultural policies inclusive of foreign workers are necessary, in order to establish an environment that is friendlier to them so that they can settle into society without difficulties and get along with locals in a harmonious way.
Ch. 3. Assessment of Policy Governance

Chapter 3
Assessment of Policy Governance

1. Background

In order to appropriately address population aging and the “demographic cliff” caused by the low fertility rate, policy makers need to consider not only demographics but other various areas such as government finance, the labor market, industry and welfare.

In this chapter we have examined the governance of Korea’s population aging policies, in order to derive implications for their better integration and engagement.

2. Methods of Analysis

We looked into the three rounds of the Basic Plan for Low Fertility Rates and Aging Society announced by the Presidential Committee on Aging Society and Population Policy, and analyzed the current and past population aging policies of the different competent authorities. Relevant statistics were also studied, and in-dept interviews with concerned officials were conducted.

Qualitative analysis was carried out on the structure of the policies from three aspects: namely their comprehensiveness, their proactivity, and their effectiveness. We studied the progress made by and the limitations of the current policies, with the objective of then offering suggestions for improvement.

3. Results of Analysis

(1) Comprehensiveness, proactivity and effectiveness of population aging policies of Korea

- Comprehensiveness: The policies are covering many different areas, including income security, health, leisure, entertainment and safety for retirees. However, there are limitations in coordination among the different authorities and they are being carried out separately under different policy goals, which undermines the efficiency of public spending use.

- Proactivity: The relevant budgets, organizations and systems continue to expand. The budget increase has been particularly noteworthy. The Basic Plan spent 15.9 trillion
won to counter population aging in its first round (2006~2010) and 40.8 trillion won in its second (2011~2015). In its third round (2016~2020) more than 89 trillion won is allocated to that end.  

- Effectiveness: Some are skeptical about the workability of these expensive policies. It should however be noted that such policies by their natures need time before they show outcomes. For policies related to an aging society, resource mobilization does not directly deliver the intended results. Bringing about sociocultural changes and raising social awareness also require time.

(2) Analysis of policy governance

- Limitations of the competent authority and committee: The competent authority and committee need budgetary and organizational support to identify needed policies and to arrange policy alternatives. However, there are several obstacles preventing them from serving as a command center in implementing policies to counter population aging. The Presidential Committee on Aging Society and Population Policy has the president as its chair and is participated in jointly by both the private and public sectors. However, the committee may have limitations in enforcing policies due to shortages in commitment among decision makers and to the absence of power to make final decisions on policies and execute the given budgets.

- Lack of cooperation: To deal with population aging, it is imperative that the relevant authorities, including those in charge of welfare, labor, industry and healthcare, work closely together in collaborative governance. But under the current mechanism, the relevant bodies have failed to do so due to the absence of incentives for such cooperation.

- Unclear national visions and goals: There are no clear national visions and goals to serve as guideposts in pushing through policies when conflicting values on the related issues are expected. For example, universal programs are expected to stand against targeted programs, a market-oriented liberal model against a welfare state model with government intervention, and competition-driven efficiency against social integration built on solidarity.

---

1) According to the “fiscal plan” of the third round of the Basic Plan for Low Fertility Rates and Aging Society
4. Implications

Korea needs a sweeping overhaul of its current population aging policy scheme, in order to improve the policy effectiveness. The current system needs to be upgraded to a planning group scheme, in which the group has the authority to make final decisions on policies, execute the budget, and change its organizational structure. This will enable it to comprehensively carry out population aging policies.

It is also necessary to consider gradually merging the authorities concerned into one, or setting up a new department dedicated to this task. This will make it possible to carry out the policies with consistency over the medium to long term. The priorities of the policies need to be rearranged in the order of their importances and values, while key programs should be subject to periodic monitoring and assessment.

---

2) Japan created a new cabinet position for dealing exclusively with its low fertility rate (2003), and appointed the minister in charge of population policy as the competent minister for population aging (2015).
Chapter 4
Population Aging in A Reunified Korea

1. Background

Both South and North Korea have already become aging societies, and their total fertility rates (TFR) are below the levels necessary to maintain their population sizes.\(^1\) In this regard, attention must be paid to the aging of the Korean population after reunification.

The aging of the North Korean population after reunification is expected to work as a factor causing the costs of reunification to rise, and will likely have a negative impact on the growth potential of the Korean economy.

Based on the case of German reunification,\(^2\) this study sets various scenarios for changes in the North Korean fertility rate and life expectancy after reunification of the two Koreas, and compares the levels of population aging of the reunified Korea under these different scenarios.

2. Method of Analysis

This paper assumes that the populations of South and North Korea will be integrated in 2020, and that thanks to a peaceful reunification process there will be no population loss. It is also assumed that after reunification the demographic changes in South Korea will be consistent with the UN’s projections (based on the median fertility and mortality rates),\(^3\) while those in North Korea will deviate from the UN forecasts due to shocks from the reunification.

The data used include population estimates and forecasts, age-specific fertility and survival rates (life expectancy), and sex ratios at birth in North and South Korea from the UN World Population Prospects (2015 revision).

The Cohort Component Method, in which future population growth and changes are estimated based on assumptions regarding birth, death and migration, is used to estimate North Korea’s population from 2020 to 2100. The populations of South and North Korea

---

1) This is called replacement-level fertility, and refers here to a TFR of 2.1 children per woman. If the replacement level is sustained, then in the absence of migration each generation will replace those passing on of the older generations.

2) East Germany’s fertility rate decreased by one-half immediately after the reunification, and then recovered to the level of West Germany over a substantial period of time. The gap in life expectancies between East and West Germany also gradually narrowed.

3) The UN’s population forecasts for South and North Korea are based on the assumption that the current state of peninsular division will continue.
are divided into four groups (South Korean females, South Korean males, North Korean females and North Korean males), and broken down into five-year age groups (0, 1-4, 5-9, … , 75-79, 80 or older) to understand how the age structure is formed.

3. Results of Analysis

Four scenarios are developed, which vary depending on the changes in the fertility rate and life expectancy in North Korea after reunification, and the results under these scenarios are compared with those under the baseline scenario.4)

Based on the case of German reunification, the different scenarios are set in consideration of situations in which North Korea’s fertility rate plunges or its fertility rate and life expectancy gradually converge to the levels of South Korea.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Major Assumptions</th>
<th>Projection Results (2065)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline scenario</td>
<td>UN Prospects (median) (1.94 persons → 1.83 persons)</td>
<td>UN Prospects (median) (71.7 → 85.3)</td>
</tr>
<tr>
<td>Scenario 1</td>
<td>Plunge → converge (1.94 → 0.97→ 1.76)</td>
<td>UN Prospects (median) (71.7 → 85.3)</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>Converge (71.7 → 91.9→ 93.7)</td>
<td>34.9%</td>
</tr>
<tr>
<td>Scenario 3</td>
<td>Plunge → converge → increase (1.94 → 0.97→ 1.83)</td>
<td>Converge (71.7 → 91.9→ 93.7)</td>
</tr>
<tr>
<td>Scenario 4</td>
<td>UN Prospects (upper-level) (1.94 → 2.29→ 2.33)</td>
<td>31.4%</td>
</tr>
</tbody>
</table>

Notes:
1) Changes between 2020, when reunification is expected to be completed, and 2100
2) Compared with the elderly population ratio in 2065, when population aging is likely to peak in South Korea
3) Based on the assumption that the North Korean fertility rate will fall by one-half by 2025, shortly after the reunification
4) Based on the assumption that North Korean life expectancy will converge to the level of South Korea’s in 2075

The results of our population projections suggest that under all scenarios (including the baseline scenario) population aging is mitigated when the populations of the North and South are integrated, compared to the case where South Korea’s population alone is considered,5) but the degrees of mitigation vary significantly depending on the assumptions

4) A simple integration of the South and North Korean populations from the UN forecasts (based on the median fertility and mortality rates), which are based on the assumption that the current state of division will continue.
Concerning shocks to North Korea’s fertility rate and the convergence of its life expectancy with that in South Korea.

The elderly population ratio of the reunified Korea will fall by 4.5 percentage points if North Korea’s fertility rate plunges and then converges to the level in the South, and if the North Korean life expectancy is consistent with the UN forecasts (median) (Scenario 1).

If North Korea’s fertility rate plunges and its life expectancy converges to the level in the South, then the elderly population ratio of the reunified Korea will decline by 3.0 or 3.5 percentage points (Scenarios 2 and 3, respectively), as reunification is somewhat less effective in mitigating population aging in these scenarios. Meanwhile, if North Korea’s fertility rate rises then the elderly population ratio of the reunified Korea will decline by 6.5 percentage points even if its life expectancy converges to the level of South Korea’s (Scenario 4). Population aging is mitigated to the largest extent in this scenario.

4. Implications

The integration of the South and North Korean populations following reunification will have the effect of easing the population aging problem in South Korea somewhat. The decline in the North’s fertility rate and convergence of its life expectancy with the South’s can however cause population aging in the united Korea to intensify. Reunification is unlikely to help ease South Korea’s population aging significantly, since North Korea too has already become an aging society (since 2004) and population aging is progressing extremely rapidly in South Korea whose population is almost twice the size of North Korea’s.

However, if North Korea’s fertility rate rises after reunification, to exceed its replacement-level fertility rate, this will help to ease population aging in the united Korea substantially, even if North Korea’s life expectancy converges to the level in South Korea.

In this regard, attention needs to be paid to ensuring that the social and economic disruptions occurring immediately after reunification can be reduced in order to prevent a fertility shock in North Korea. Preparations should also be made for an increase in the costs of reunification due to a convergence of North Korea’s life expectancy with that of South Korea, including for health and medical care expenses and pension funds.

5) Considering South Korea’s population alone, the elderly population ratio is expected to peak (at 37.9%) in 2065. If the populations of the South and North are integrated, however, this proportion is likely to fall to from 31.4 to 34.9%.
Part 3

Population Aging and the Macroeconomy

<table>
<thead>
<tr>
<th>Ch. 5</th>
<th>Population Aging and Economic Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Byung Kwun Ahn, Ki-Ho Kim and Seung Whan Ryuk (The Bank of Korea)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ch. 6</th>
<th>Population Aging and Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kwang Myung Chun, Hong Jig Lee, Suyeon Bang and Dongjae Lee (The Bank of Korea)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ch. 7</th>
<th>Population Aging and the Current Account</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kyungkeun Kim (The Bank of Korea) and Soyoung Kim (Seoul National University)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ch. 8</th>
<th>Population Aging and Public Finance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hosin Song (Ewha Womans University) and Joonyoung Hur (Hankuk University of Foreign Studies)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ch. 9</th>
<th>Population Aging and Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hwan Koo Kang (The Bank of Korea)</td>
</tr>
</tbody>
</table>
Chapter 5

Population Aging and Economic Growth

1. Background

The impacts of population aging on the macroeconomy depend largely on systems, policies and economic agents' behaviors, and will therefore vary depending on how we cope with population aging. Among the impacts of population aging on the macroeconomy, this study conducts a simulation analysis of the effects on the economic growth rate using the future population projections of Statistics Korea, and derives implications.

2. Method of Analysis

The authors estimate the impacts of population aging on economic growth in Korea using growth accounting analysis and a dynamic Computable General Equilibrium (CGE) model.

(1) Growth accounting analysis

The economic growth rate is defined as the sum of the rate of labor productivity growth, the change in the labor force participation rate, the change in the share of the working-age population in the total population, and the total population growth rate, and is projected in reflection of the population projections of Statistics Korea:

\[ \dot{y} = \left( \frac{\dot{y}}{e} \right) + \left( \frac{\dot{e}}{l} \right) + \left( \frac{\dot{l}}{p} \right) + \dot{p}, \]

where \( y, e, l, p \) represent real GDP, the economically active population, the working-age population and the total population respectively; the superscripts of the equation represent the growth rates, and the equation is derived from \( y = \left( \frac{y}{e} \right) \times \left( \frac{e}{l} \right) \times \left( \frac{l}{p} \right) \times p \), an equation identifying real GDP with population factors.

(2) Dynamic Computable General Equilibrium model

A small-scale macroeconomic model, including consumption, the labor supply and education investment of the household sector, as well as the demand for labor and capital of the corporate sector, is used to conduct a general equilibrium analysis of the impact of
3. Results of Analysis

This study focuses on demographic changes and does not take into sufficient account capital productivity and total factor productivity. In this regard, it is worth noting that the growth path presented in this study should not be considered as the potential growth forecast.

The baseline scenario assumes that the recent trend of labor productivity growth since 2000 until recently will continue, and that the labor force participation rates by age group (from 15 through 64 years old) will remain unchanged from those in 2015, while the population forecast reflects the 2016 population projections of Statistics Korea.

(1) Growth accounting analysis

In the baseline scenario, it is projected that the economic growth rate will decline from an annual average of 3.9% during the 2000~2015 period to 1.9% between 2016 and 2025, and further to 0.4% during the 2026~2035 period, owing to population aging.

This large negative effect of population aging is attributable to the rapid pace of population aging in Korea, and also to the income-consumption pattern of emerging economies in which a decline in earned income after retirement leads immediately to a reduction in consumption. The effects of population aging vary significantly depending on the systems, policies and economic agents’ behaviors. In this regard, the authors assume
various scenarios for coping with population aging, and analyze the effects of diverse policy measures:

① A five-year delay in retirement: A retirement delay of five years will have the effect of easing the decline in the economic growth rate due to population aging by 0.4%p for the following ten years, and by 0.2%p for the ten years after that.\(^1\)

② Raising the women’s labor force participation rate to the OECD average level (66.8%): This will have the effect of easing the drop in the economic growth rate by 0.3~0.4%p over the following twenty years. For example, if the women’s labor force participation rate rises by 1%p each year, from 57.4% as of 2015 toward the world’s highest level of Iceland (83%), it will bring about an increase in the economic growth rate of 0.6~0.7%p compared to the baseline scenario.

③ Maintaining labor productivity: If the labor productivity growth rate is maintained at its 2016 level of 2.1%, the economic growth rate is expected to rise by 0.4%p annually for the following ten years, and by 0.8%p per year for the decade after that, compared with the projections for the baseline scenario.

This paper also analyzes the scenario involving a comprehensive set of measures for coping with population aging. This scenario assumes that retirement is delayed by five

\(^1\) The delay in retirement may weaken youth employment. However, since there is little competition between the youth and the elderly for employment and they rarely replace each other, the effects on youth employment due to delays in retirement are not considered here.
years, that the women's labor force participation rate is raised to the OECD average level, that labor productivity is maintained and that the fertility rate is raised over the long term. In such a case, the economic growth rate would be in the upper-2% range (annual average) for the following ten years, and in the mid-1% range for the ten years after that.

(2) Scenario analysis using CGE model

In order to conduct a structural analysis of the effects of population aging on economic growth, a scenario analysis is conducted using a CGE model, and the results turn out to be similar to those drawn from the growth accounting analysis:

① Delaying retirement: If retirement is delayed by five years, the economic growth rate is foreseen rising by an annual 0.1 to 0.2%p over that under the baseline scenario, for the following twenty years.

② Raising women's labor force participation rate: If the rate is raised gradually, by 0.5%p per year for example, to the average OECD level, then the economic growth rate can be expected to increase by an annual average of 0.25~0.28%p for the following twenty years.

③ Enhancing total factor productivity: If the total factor productivity growth rate were raised by 1.0%p over a decade, it is projected that the economic growth rate would increase by an annual average of 0.5%~0.6%p over the following twenty years.

④ Introducing foreign workforce: If there were an influx of an additional 2 million foreign workers (from 962 thousand workers as of May 2016, Statistics Korea), and of unskilled workers in particular, this would boost the economic growth rate by 0.1%p.

4. Implications

In order to cope with population aging we need to implement comprehensive measures that contribute to a slowdown in population aging and at the same time a reduction of its negative effects on the economy.

In order to slow population aging, active promotion is needed of policies to raise the birth rate, such as measures to promote gender equality and a work and family life balance, to ensure public budget support for childcare and education, to support the families, etc. Policies focusing on echo boomers (those aged 25 to 38 as of 2017), the
offspring of baby boomers, need to be urgently implemented in order to enhance the birth rate. Considering the cases of some foreign countries, it seems that an expansion in the inflow of immigrants will help to slow population aging, given that countries that have experienced sharp increases in their proportions of immigrants have shown relative slowdowns in their rates of population aging. However, it is necessary to develop the immigration policy cautiously, considering the possibility that it could result in social conflicts as are seen in some European countries.

In the short term, delaying the time of retirement and expanding women’s economic activities may be effective means of mitigating the decline in labor supply due to population aging and delaying a drop in the economic growth rate. In the long term, it is expected that increasing productivity through technological innovation and improvements of efficiency can contribute to an easing of the slowdown in growth due to population aging.
Chapter 6
Population Aging and Consumption

1. Introduction

With the recent low-growth trend persisting, the elderly are actively participating in job-seeking and consumption activities and thus are having an increasing influence on the national economy. Future policy measures need to be developed based on an examination of the current and projected consumption patterns of the elderly.

2. Analysis Method

(1) Trend of elderly consumption

In 2015, the average income and consumption per elderly household (head of household aged 60 or older) reached KRW 30 million and KRW 21 million, respectively, which were significantly lower than averages of households of all age groups (KRW 43 million and KRW 31 million, respectively). Based on these figures, elderly income and consumption accounted for 18.8% and 19.3% of the total income and consumption, respectively, which were far below elderly households’ proportion of the total number of households (29.1%).

\[
\begin{align*}
\text{Total income} & = \text{number of households} \times \text{income per household} \\
\text{Total consumption} & = \text{number of households} \times \text{consumption per household} \\
& = \text{number of households} \times \text{income per household} \times \text{propensity for consumption}
\end{align*}
\]

The recent growth in the elderly’s income and consumption, however, outpaces that of other age groups overall. The growth rates of average income and average consumption by households headed by people in their 60s recently exceeded those of households headed by those in their 40s during 2011-2015, and the gap between the two groups is widening because of the different growth rates in the number of households.

(2) Factors affecting elderly consumption

(Factors encouraging consumption)

① (Increase in the number of elderly households) The number of households composed of people aged 60 and above increased by around 4.6% each year during 2011-2015
(growth for households overall was 1.7% per year during the same period).

② (Increase in elderly employment rate) With insufficient savings for retirement, the elderly have greatly increased their participation in economic activities\(^1\) as their life expectancy has grown.

③ (Increase in elderly households’ pension income) With the number of recipients of the national pension rising and the basic pension system being revised and expanded, the pension income of the elderly increased by an annualized average of 9.3% during 2011-2015.

**Factors restraining consumption**

① (Longevity risk) As the life expectancy of elderly people increased by 1.46 years during 2011-2015 (based on those aged 65), their precautionary savings expanded as well to meet their demand for post-retirement funds.\(^2\)

② (Decline in expected assets income of the elderly) Elderly people’s expected income from property has decreased, mainly due to persistent low interest rates and a slowdown in housing price growth.\(^3\)

③ (Lack of liquidity for consumption among the elderly) Elderly households hold most of their assets in the form of real-estate properties (82%), and are thus limited in their ability to secure the liquidity needed for consumption.\(^4\)

**3. Future Prospects**

As elderly incomes continue to increase, the influence of the elderly on consumption is likely to continue to show a high growth trend from 2016 to 2020, boosted by the accelerating pace of population aging and a slowdown of the decline in the elderly’s propensity to consume. The annual rate of growth in the number of elderly households will

---

1) The employment rate of the elderly grew by 0.6%p each year during 2011–2015 (0.2%p for young people).
2) Longevity risk is estimated to account for a quarter (annual average of 0.25%p) of the decline in the elderly’s propensity to consume from 2011 to 2015 (annual average of 1.0%p).
3) Unlike young and middle-aged people, the elderly saw their net interest income decrease during 2011–2015.
4) Approximately half of low-income households are expected to be able to strengthen their purchasing power through asset securitization.
Part 3: Population Aging and the Macroeconomy

I accelerate (4.6% during 2011-2015 → 5.3% during 2016-2020) due to the baby boomer generation joining the elderly population.

Disposable income per household will also maintain a relatively high growth trend (4.4% → around 4%), boosted by increasing participation in economic activities and a larger number of private-pension recipients. The propensity to consume of the elderly is anticipated to maintain its downward trend for the time being but at a slower rate (-1.0%p → around -0.3%p), due to their increased pension incomes.

The share of the elderly in total consumption is expected to increase from 16.9% in 2015 to 23.4% in 2020, with their contribution to consumption growth increasing from 38.5% during 2011-2015 to the 60% range during 2016-2020.

4. Implications

In response to the increasing influence of the elderly on consumption, the government should strengthen its policy support to help the elderly become a major economic group that serves to bolster the national economy. In particular, the government needs to focus on reducing the uncertainty involving the elderly's future income flows in order to boost their propensity to consume, which is currently significantly lower than those in other countries.

① (Providing suitable jobs for the elderly) The government should create jobs that suit the characteristics of the elderly in terms of the nature of the work and working hours, and expand its vocation training and job referral services to help the elderly secure such jobs.

② (Stimulating the securitization of the elderly’s assets) The government should induce the elderly to supplement their low incomes through securitization of their assets.

③ (Reducing uncertainty involving the receipt of pension payments) The government should thoroughly reassure people concerning the sustainability of pensions by enhancing the mid- and long-term fiscal soundness and transparency of old-age pensions, including the national pension and private pensions.

④ (Expanding the consumption base of the elderly) It is necessary to establish infrastructure aimed at boosting consumption by the elderly, including cultivating senior-friendly industries (silver industries).
Chapter 7
Population Aging and the Current Account

1. Background

For the past four decades, Korea’s youth dependency ratio has declined sharply, while its elderly dependency ratio has risen steadily. Dramatic demographic changes are expected to continue going forward. Demographic changes can cause discrepancies in savings and investment rates among countries, leading to cross-border capital flows, which might ultimately affect nations’ current account balances. In this study, we carried out an empirical analysis of the medium-term impact of demographic changes on the current account.

2. Analysis Method

Data from 180 countries (from 1981 to 2015) was used for analysis. To find out the medium-term impact of demographic changes on the current account, a five-year non-overlapping dynamic panel was created. Explanatory variables included the youth and elderly dependency ratios, and squared dependency ratios in consideration of non-linearity. As control variables, net external assets, economic growth rate, terms of trade volatilities, monetary aggregates, income level, and openness were taken into account.

3. Analysis Results

The rises in the youth and elderly dependency ratios were found to have negative linear influence on the current account. These dependency ratios seem to affect the current account through savings rather than investment. However, there exists a non-linear relationship where the influence of the elderly dependency ratio declines as the ratio goes up. This implies that the increase in the elderly dependency ratio might have been accompanied by changes in the economic structure, economic agents’ behavior and economic policies, which in turn led to a lessening of its impact.

In the case of Korea, although population aging is expected to have negative influence on the current account, the negative relationship is likely to weaken going forward. Based on the analysis of a sample where the elderly dependency ratio is over 15%, the change in Korea’s current-account-to-GDP ratio after 25 years is estimated to be $-0.69\%$. 
4. Implications

Despite the continuous rise in the elderly dependency ratio, Korea’s overall dependency ratio declined due to the fall in the youth dependency ratio. However, both the elderly and total dependency ratios are expected to rise due to rapid population aging, which is likely to have adverse impacts on the current account. Given the non-linear relationship between the elderly dependency ratio and the current account, however, the impact of population aging on the current account is subject to change, as the advancement of population aging might lead to changes in the retirement age, greater participation of the elderly population in the labor market, structural changes to pensions, and changes in savings and investment behaviors.
1. Background

With demographic changes represented by the low birth rate and aging population expected to continue, this paper is aimed at analyzing the impact of such changes on the fiscal front, and drawing policy implications.

2. Analysis Method

For the tax revenue aspect, we used a DSGE model to find the impact of the decline in population on the size of tax revenues. An IMF model (2012) was used to look at the impacts of demographic changes on fiscal revenues in Korea and G7 countries. Using the results of the medium-scale DSGE model of Hur and Lee (2017), we conducted a quantitative analysis of how tax revenues change in line with demographic changes.

On the expenditure side, we looked at how demographic changes affect the structure of spending. Using OECD country panel data, we estimated the impacts of demographic changes on spending related to social security, health, education1) and others.

3. Analysis Results2)

Tax Revenues

It was found that Korea had a larger decline in tax revenues from demographic changes than G7 countries. Compared to G7 countries, Korea has lower labor and capital tax revenues, which are predicted to further decline driven by demographic changes.

Estimation of a medium-scale DSGE model using Korean data shows that both labor and capital tax revenues are likely to fall sharply in the future. The revenues in these two tax items are estimated to decline by 2065 by 72% and 74%, respectively, relative to those...

1) Social security and health expenditures are preferred by the elderly population, while education expenditures are preferred by the younger generations.

2) The fiscal balance forecast requires a clear range of fiscal balance items to be included, and an analysis that takes into consideration of the mutually endogenous relationship between fiscal revenues and expenditure. It should be noted that the paper does not focus on this, and therefore the difference between the estimated tax revenues and expenditures suggested here should not be regarded as a forecast on fiscal balance.
in 2015. In terms of the amount, labor and capital tax revenues in 2015 were ₩119 trillion and ₩50 trillion, respectively, while the labor and capital tax revenues are forecast to be around ₩86 trillion and ₩37 trillion, respectively, in 2065.

**Tax Expenditure**

An analysis using panel data from OECD countries shows that a rise in the elderly population exerts positive and statistically significant effects on social security and public health expenditures relative to the total expenditures, while a drop in the population under the age of 15 had negative and statistically significant effects on the proportion of educational spending.

The estimation shows that an additional ₩2.8 trillion of fiscal spending will occur on an annual average, depending upon demographic changes between 2016 and 2065. By item, social protection and welfare will require an annual average increase of ₩5.6 trillion in spending, while the expenditures on education and general public services will decline by 0.5 trillion and 2.3 trillion, respectively, every year.

**4. Implications**

As tax revenues are expected to decline and the demand for fiscal expenditures increase with population aging continuing for a considerable time period, a long-term strategy in terms of fiscal policy is required.
Chapter 9
Population Aging and Inflation

1. Background

As inflation has remained low, despite the accommodative monetary policies continuing in major advanced countries since the global financial crisis, there has been growing interest in whether demographic changes such as a low birth rate and population aging affect the long-term trend of inflation. In Japan, population aging has been pointed to as one of the major causes of the long-lasting stagnation and deflation since the 1990s.

Existing studies suggest that population aging has a long-term impact on inflation via diverse and complicated channels such as ① labor supply, ② savings rate, ③ real income and productivity, ④ asset prices, and ⑤ fiscal burden. However, there has not been a consistent conclusion, as the stages and forms of demographic changes and the direction and degree of each path’s impact can differ depending on the circumstances of individual countries.

2. Analysis Method

This paper analyzes how the decline in working-age population caused by population aging affects long-term inflation. It examines how the population aging affects inflation through each of the above-mentioned transmission channels. This paper offers the simulation results achieved from the application of a real business cycle-based monetary model of Korea’s economic structure and future population forecast.

3. Analysis Results

(1) Impacts of population aging on inflation via transmission channels

① Decline in labor supply: Reduced production following the decrease in working-age population caused by population aging exerts upward pressure on inflation before aggregate demand is adjusted. If population aging leads to a long-term weakening of demand, however, it would exert long-term downward inflationary pressure.

② Savings rate: Despite having fallen gradually since the 1990s, the pace of the decline in the savings rate has not exceeded that of population aging.
Part 3: Population Aging and the Macroeconomy

③ Real income and productivity: Although the share of the elderly population continues to increase, the rates of growth in real income and productivity have remained low since the 2000s, regardless of the advancement in population aging. The long-term increase in real income due to the declining labor supply would depend on the rise in female and elderly labor force participation, the improvement in the elderly productivity, and the reduction in youth unemployment.

④ Asset prices: Housing prices have not shown a downward trend, as the labor force participation of the elderly remains high, despite their growing proportion in the total population.

⑤ Fiscal burden: Given the continuously healthy fiscal conditions, population aging has not reached a level where it impacts inflation via changes in the fiscal burden. If the increase in the fiscal burden caused by population aging exerts upward pressure on tax revenues in the long term, it could play a role as a factor reducing inflation.

(2) Results of model simulation

To find out the impact of demographic changes on the long-term inflationary trend, a simulation was conducted using the changes in the proportion of the working-age population and the rate of growth in the population as exogenous variables from 1990 to 2060.

The simulation results show that demographic changes such as a low birth rate and population aging would exert downward pressure on long-term inflation via channels including reduced labor supply and asset prices. If the impact of the working-age population changes is reflected in the long-term inflationary trend with a time lag, and the working-age population falls by an annual average of 1%p, the long-term inflationary trend is forecast to drop by a range of 0.02-0.06%p after the 2020s.

- Simulation 1: Based on the long-term inflation average of 2.7% between 2000 and 2015, it was estimated that the annual average trend inflation rate will drop by 0.06% from the 2020s.

- Simulation 2: Based on the long-term inflation average of 1.4% between 2012 and 2015, it was estimated that the annual average trend inflation rate will drop by 0.02% from the 2020s.

If the data on TFP growth is added to the exogenous variables on top of the demographic changes, the impact on inflation declines slightly, which means a 1%p decline
in the working-age population would lead to a 0.02~0.05%p drop in the long-term inflationary trend.

Impact of Demographic Changes on Long-term Inflation

4. Implications

These results imply that in setting the long-term inflation target, the central bank should consider how inflation will be affected by the different stages of social structural changes, including population aging.

The impact of population aging and other social structural changes on long-term inflation is hard to control with demand management policies. In this regard, structural reform policies to deal with demographic changes should be implemented continuously over the long-term horizon.

---

1) This paper aims at estimating the extent to which demographic changes impact the long-term inflation trend without any changes in other factors, instead of suggesting an inflation target determined through estimation of optimal inflation with diverse factors taken into account comprehensively.
Part 4

Population Aging and Policy Imperatives

<table>
<thead>
<tr>
<th>Ch. 10</th>
<th>Population Aging and Household Assets/Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Se-Hyung Jo, Yong-Min Lee, and Jeong-Hoon Kim</td>
</tr>
<tr>
<td></td>
<td>(The Bank of Korea)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ch. 11</th>
<th>Population Aging and the Financial Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kyoungsoo Yoon, Jae Hoon Cha, Sohee Park, and</td>
</tr>
<tr>
<td></td>
<td>Sun Young Kang (The Bank of Korea)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ch. 12</th>
<th>Population Aging and International Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jin Soo Lim and Young Rae Kim (The Bank of Korea)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ch. 13</th>
<th>Population Aging and the Housing Market</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kanghyun Oh, Sol Kim, Jaejun Yoon, Sangki Ahn,</td>
</tr>
<tr>
<td></td>
<td>Donghwee Kwon (The Bank of Korea)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ch. 14</th>
<th>Population Aging and the Labor Market</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chulhee Lee (Seoul National University) and</td>
</tr>
<tr>
<td></td>
<td>Jieun Lee (The Bank of Korea)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ch. 15</th>
<th>Population Aging and the Industrial Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jong Ku Kang (The Bank of Korea)</td>
</tr>
</tbody>
</table>
Chapter 10
Population Aging and Household Assets/Liabilities

1. Background

As population aging proceeds rapidly and baby boomers begin to join the elderly group, Korea is expected to experience wide-ranging impacts across its political, economic and social arenas. Some have voiced concerns about a possible worsening of financial institution soundness if retiring baby boomers, which have relatively large amounts of assets and liabilities, sell their real assets hastily, decreasing the value of collateral.

Against this backdrop, this paper analyzes the impact of population aging on the financial market in terms of household assets and debts, based on (i) a macro-panel model using macroeconomic indicators of OECD countries and (ii) a micro-panel model using data from the Korean Labor and Income Panel Study (KLIPS).

2. Analysis Method

The macro-panel model uses macroeconomic indicators of OECD countries (from 1980 to 2015), while the micro-panel model uses data from KLIPS (from 2004 to 2015).

A fixed-effects model is used for the macro-panel model, to estimate how population aging affects the household savings rate, asset structures and liabilities ratios. Dependent variables include the household savings rate, the proportions of risky and safe assets, and the ratio of financial liabilities to financial assets, while macroeconomic variables like GDP growth, household consumption, inflation, and terms of trade are used as explanatory variables.

In the micro-panel model, cohort and age effects are distinguished to examine the trends in the sizes of assets and liabilities and the ratio of financial liabilities to assets by age group.

3. Analysis Results

(1) Results of analysis using macro-panel model

1) The number of baby boomers born between 1955 and 1963 stood at 7.11 million (14.3% of the total population) in 2015.

2) Variations in households’ asset and debt structures by age group are distinguished between the cohort effect, which is dependent on factors related to macroeconomic conditions and institutions specific to each birth year, and the age effect, which is dependent only on the age group, regardless of birth year.
It was found that the higher the degree of population aging, the lower the household savings rate and investment in risky assets, which is in line with the life-cycle theory and earlier research results. The results concerning the household savings rate\(^4\) are in line with a previous study finding that the elderly group, which has weakened income sources, also is also associated with reduced savings.

The proportions of risky and safe assets\(^5\) were found to be in line with the forecast that the higher the age, the greater the risk aversion and the proportion of safe assets relative to that of risky assets. The ratio of financial liabilities to financial assets was found to decline as population aging progresses, which was in accord with expectations but not statistically significant.\(^6\)

(2) Results of analysis using micro-panel model

With the cohort effect considered, the baby boomers were found to reduce their real assets very gradually as population aging progresses, accompanied by a decline in the ratio of financial liabilities to financial assets. A temporal influence was found whereby baby boomers accumulate more real and financial assets compared to the previous generations (a positive cohort effect). The baby boomers were not forecast to dispose of their real assets quickly\(^7\) even after they retire and join the elderly group. However, disposal of real assets as aging advances was marked in high-income households with significant real assets.

Meanwhile, the ratio of financial liabilities to financial assets was found to decline due to the reduction in financial liabilities as aging progresses.

4. Implications

The advancement of population aging is likely to cause a decline in the household savings rate and a reduction in the proportion of risky assets, accompanied by an increase in financial assets. The ratio of financial liabilities to financial assets is expected to decline due to the reduction in financial liabilities as aging progresses.

---

3) As the analysis used OECD country data, the impact of population aging may differ across countries depending on the degree and pace of aging, the structure of the elderly employment markets, and the degree of pension and welfare system development.
4) The household savings rate refers to the household net savings rate in the national accounts (household disposable income − household final consumption spending) divided by household disposable income.
5) Risky assets include stocks and funds, while safe assets are cash, deposits, insurance and pensions. Their proportions are defined relative to financial assets.
6) In the micro-panel analysis, however, it was found that the older the elderly are, the more they tend to dispose of their real assets to increase financial assets or repay their debt, making the fall in the ratio of financial liabilities to financial assets statistically significant.
7) This is attributable to their tendency to gradually reduce real assets from precautionary savings and bequest motives.
rate and an increase in the proportion of safe assets, leading to structural changes in the financial market. However, as no sudden disposal of the real assets held by the elderly was observed, the negative impact on the financial market is not likely to be large.

To minimize the negative influence of population aging on the financial market, the following policy measures need to be pursued:

① Although it seems unlikely that households would dispose of their real assets in a hasty manner, the development of the securitization market (reverse mortgages, etc.) would be beneficial, as there might be growing demand among some elderly to sell off their real assets.

② As preferences for safe assets increase in line with population aging, an environment should be created to foster the insurance and pension markets, through for example developing the long-term fixed-income market and medium-risk medium-return financial products.  

③ In addition to the provision of financial products suitable in times of population aging, financial education for households will need to be strengthened to help them to properly compare and evaluate investment products.

8) Real estate funds, special asset funds (artworks, ships, etc.), etc.
Chapter 11
Population Aging and the Financial Industry

1. Background

The rate at which the population ages is expected to accelerate in Korea, as the working-age population started to drop after peaking in 2016. Population aging will bring behavioral changes to households in terms of saving, spending and supply of labor, thereby posing significant implications for the financial industry. However, it seems that there has been a lack of studies that examine this topic in a comprehensive and expansive manner, due to the complexity of the channels through which the changes spread and the different extents of impact anticipated for each financial sector and product.

This study forecasts the implications of population aging on the Korean financial sector by using international panel data and the Survey of Household Finances and Living Conditions, and proposes appropriate responsive measures and policies for financial firms and the public sector.

2. Analysis Method

For the purpose of this study, the channels through which the impacts of population aging and the associated household behavioral changes spread to the financial industry are divided into two categories: direct and indirect.

By performing an empirical analysis\(^1\) on the changes in households’ net asset to disposable income ratio, and in the sizes of assets and liabilities, this study forecasts the effects of population aging spreading through direct channels.

In addition, the study also forecasts the effects of population aging spreading through indirect channels, by analyzing its effects on interest rates and stock prices, which are major price variables.

(1) Changes in household net worth to disposable income ratio

According to the empirical analysis, the household net asset to disposable income ratio\(^2\)

\(^1\) Each data set is estimated by means of panel data acquired from 25–32 countries (between 1960–2016) using either a dynamic panel model or fixed/random effects model, depending on the goodness of fit.

\(^2\) Household net assets = total assets (real and financial assets) – total liabilities
increases as the population ages.

The increase in household net assets to disposable income is driven by a rise in net assets. Households accumulate more assets as they delay their retirement age due to an increase in residual life expectancy, while, at the same time, asset prices rise.

(2) Changes in compositions of household financial assets and liabilities

While the demand for insurance and pension products increases in general, those in their early old age (aged between 65 and 74) hold their assets mainly in the form of funds and those in their late old age (aged 75 or above) in the form of savings deposits. In addition, the share of liabilities compared to income increases in late old age.

When deciding the composition of financial assets, those in their early old age, who have longer residual life expectancy, are likely to place greater focus on profitability, and those in their late old age are likely to place greater focus on stability. In addition, it is expected that leveraged investments will increase particularly among the elderly group, who have robust credit scores thanks to their histories of debt repayment.

(3) Changes in financial asset prices

In general, long-term interest rates fall (flattening of the yield curve) and stock prices rise as the population ages. The decline in long-term interest rates is attributable mainly to an increase in demand for long-term assets as a means to prepare for post-retirement life, and to reduced inflation risk from low growth rates (decrease in term premiums). On the other hand, the rise in stock prices is driven mainly by investment from the high-income group, who are incentivized to expand their wealth by the increase in their residual life expectancy.

3. Analysis Result

As there are limitations to what can be achieved in terms of forecasting how aging population will affect the Korean financial industry using international panel data only, data from the domestic Survey of Household Finance and Living Conditions was also used for simulation (i.e., the changes in the number of households in each age group were applied) to draw the following conclusions.

(1) Continued growth of financial industry and increase in demand for long-term financial assets
Despite population aging, it is expected that the Korean financial sector will continue to grow until the end of 2020 as demand for long-term financial assets steadily increases. Due to an increase in the number of households headed by those in their 50s who have accumulated more assets relative to other age groups, the size of financial assets is forecast to reach its peak by 2028 (the pace of growth is expected to further accelerate when taking the Japanese case into account).

**Forecast of Household Financial Assets and Liabilities**

**Forecast of Financial Assets under Different Scenarios**

![Graphs](image)

Note: 1) Baseline scenario: demographic changes only; scenario 1: increases at a rate similar to Japan's nominal GDP growth (past Japanese nominal GDP growth rate x 0.63, +0.24%); scenario 2: increases at a rate similar to Japan's financial asset growth (past Japanese financial asset growth rate x 0.63, +2.44%)

Sources: Bank of Korea, Statistics Korea, author’s calculations

As the population ages, the number of insurance and pension assets is expected to grow given that such products enable long-term saving and wealth management. As a result, the demand from financial institutions for long-term financial assets is projected to increase as they seek to decrease the level of maturity mismatch.

**2) Decrease in financial institutions’ profitability and increase in their demand for high-return financial products**

While it is possible that the low growth, low interest rate environment and the flattening of the yield curve ushered in by population aging could result in a deterioration of financial institutions' profitability, the demand for high-return instruments such as equities and portfolio investments is forecasted to grow.

The profitability of financial firms is expected to worsen due to the reduced loan-deposit margins of the banking sector and the narrower rates of return generated from the asset management activities of insurance, pension and asset management companies. On the other

---

3) The share of insurance and pension assets in total household financial assets has been growing (24.3% in 2008 → 31.8% in 2016),
hand, the size of stock investment or indirect investment via asset management companies may grow, particularly among the elderly, under the low interest environment (the elderly in countries such as the US and euro area nations that have advanced financial markets, including for equities and fixed-income products, invest actively in financial assets).

### Share of Equity Investment from Household Financial Assets

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>35-44</td>
<td>10</td>
<td>15</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>45-54</td>
<td>20</td>
<td>25</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>55-64</td>
<td>25</td>
<td>30</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>65-74</td>
<td>30</td>
<td>35</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>75+</td>
<td>35</td>
<td>40</td>
<td>25</td>
<td>30</td>
</tr>
</tbody>
</table>

Sources: FRB, ECB, Statistics Japan, and Survey of Household Finance and Living Conditions

### Share of Fund Investment from Household Financial Assets

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>35-44</td>
<td>5</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>45-54</td>
<td>10</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>55-64</td>
<td>15</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>65-74</td>
<td>20</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>75+</td>
<td>25</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

### (3) Possibility of further increase in concentration of real assets

If the appetite for real assets among the elderly population remains high, it is possible that the excessive share of real assets in the overall household sector will also continue to remain high.

Unlike some major countries like the US, euro area nations and Japan, in Korea real assets account for bigger share of total household assets among the older age group (real assets account for 82% of total assets among those 60+ years of age). Thus, it may be possible that the excessive share of real assets grows further, if population aging proceeds without financial deepening or changes in household investment behaviors.
4. Implications

(Long-term financial markets)

It is important to help the long-term financial markets grow more active, in preparation for the increased demand from financial institutions for long-term financial assets owing to an increase in insurance and pension assets among the household sector.

The government is advised to increase issuance of long-term debt such as treasury bonds, in order to help financial institutions decrease the level of maturity mismatch, to raise funds for the government coffers in a stable manner, and to promote financial development.

Investment banks should have greater capacity to assume risks by enhancing expertise relating to securities issuance and acquisition (e.g., increase the number of specialized employees, recapitalize), thereby making the corporate bond market more active in the early stage of population aging.

(New source of profits and tighter risk management for financial institutions)

In the face of flattening of the yield curve and the subsequent deterioration of profitability, financial institutions need to develop new business models to increase their profits and, at the same time, tighten their risk management.

While the source of income is heavily concentrated in loan-deposit margins at present, the banking sector needs to diversify this source to include, for example, advisory services, private banking services, joint activities with affiliated firms, financial technology, and technology financing. In addition, banks should seek to enhance the efficiency of their business operations.

The insurance sector needs to provide a wider range of policies closely related to
Part 4: Population Aging and Policy Imperatives

population aging, such as healthcare and nursing-related products, while strengthening its risk management, such as recapitalizing in response to the existing long-term contracts with guaranteed rates of return.

Securities and asset management companies need to enhance their asset management capacity by engaging more actively in alternative investments (e.g., real estate, maritime, aviation) and international investments (e.g., in Southeast Asia). In addition, they need to develop a variety of alternative investment products to meet the portfolio investment needs that are emerging as population aging progresses, thereby catering to different types of customers.

(Invigorate liquidation of real assets)

As the share of real assets among the elderly could remain high for a prolonged period of time, it is important to introduce initiatives or instruments for liquidation of real assets (real estate) in order to reduce risks related to housing price volatility and liquidity.

Although private reverse mortgage products exist in Korea through which real estate can be liquidated, they are not actively used due to housing price volatility and uncertainty pertaining to life expectancy.

Hybrid reverse mortgage products linked with life insurance, and derivative products linked with the housing market index should be introduced. In the medium to long term, various private reverse mortgage products need to be developed based on the data retrieved from managing public reverse mortgage programs.

In addition, it is necessary to positively consider the adoption of pension schemes linked with non-residential real estate, with which the elderly may collect annuities using their real estate as collateral.
Chapter 12
Population Aging and International Investment

1. Background

As the global financial markets become ever more integrated, cross-border capital flows are becoming more active. In such an environment, the differences in degrees of population aging across countries could cause the expected rates of return for both financial and real assets to vary widely, thereby further amplifying cross-border capital movements.

In addition, if Modigliani's life-cycle hypothesis\(^1\) is applied to the external sector, accumulated international investment assets are used to cover consumption when a mismatch between income and consumption occurs due to population aging. In other words, the funds for consumption will be replenished by sales of international investment assets, which form a part of external savings.

This study deduces the impact of population aging on the external sector, including an examination of the validity of the life-cycle hypothesis, by analyzing how population aging affects the foreign investment of residents, and also derives policy implications related to population aging in Korea. For this study, the relationship between population aging and foreign investment was analyzed for each investment type by applying the national panel model.

2. Analysis Method

A dynamic panel analysis was conducted using data between 2001 and 2015 from 54 countries, while applying the Arellano-Bond estimator to address the endogeneity problem.

\[
y_{it} = \alpha + \beta_1y_{it-1} + \beta_2 Demo_{it} + \beta_3 X_{it} + \mu_i + \epsilon_{it}
\]

\(y_{it}\): dependent variable, \(Demo_{it}\): demographic variable, \(X_{it}\): macroeconomic variable, \(\mu_i\): country fixed effect, \(\epsilon_{it}\): error term

The dependent variables include the log value of foreign investment (the sum of foreign direct investment and foreign portfolio investment), foreign direct investment, foreign

---

1) Households save money during their working-age phase as income exceeds consumption, but liquidate the assets they had saved in the post-retirement phase as their income falls short of their consumption.
portfolio investment, foreign fixed-income investment and foreign equity investment. The demographic variables include the old-age dependency ratio, the young-age dependency ratio, the pace of aging and the working-age population ratio. The macroeconomic variables include real GDP, domestic credit/GDP, the economic freedom index, the inflation rate and the financial crisis dummy variable.

3. Analysis Result

According to the analysis, Modigliani’s life-cycle hypothesis was found to be valid in the external sector. The size of a nation’s foreign investment decreases as the youth and elderly take up increasing shares of the population, whereas the size of foreign investment increases as the share of the working-age population expands.

First of all, population aging is found to significantly diminish foreign investment, with the impact on foreign direct investment more significant than that on foreign portfolio investment. Population aging leads to a reduction in international investment assets, which implies a decline in future sources of foreign currency.

Therefore, there is a possibility that a sharp decline in international investment assets could generate capital outflow pressures, as it could cause deterioration in the country’s international credit standing and raise insolvency concerns.

Foreign direct investment is usually long-term investment, and thus is heavily influenced by population aging, which is a structural change. On the other hand, foreign portfolio investment is relatively less affected by population aging, given that it is mostly short-term funds, sensitive to corporate performance and interest rate differentials between countries.

The pace of aging showed a negative correlation with international investment assets, together with higher statistical significance and stronger impact than those of the degree of aging. If population aging proceeds faster than the pace of improvement in economic fundamentals, it could further accelerate the decline in international investment assets.

Meanwhile, the working-age population ratio showed a positive correlation with international investment.

4. Implications

Considering that progress in population aging could undermine stability in the external sector, Korea needs to devise measures to minimize such potential negative impacts, as its population is aging at an unprecedented pace.

Firstly, in order to lessen the reduction in future sources of foreign currency driven by population aging, Korea needs to increase its primary income balance surplus, by inducing
international investment through measures such as deregulation, and thereby strengthen the structure of international investment assets.

Secondly, Korea also needs to increase its national income to slow down the pace of reduction in international investment assets. For this, Korea needs to devise effective policies to raise its birth rate and support childcare, to ultimately increase the working population in the long run.
Chapter 13
Population Aging and the Housing Market

1. Background

In the medium and long term, elements of the population structure, including householder age, were the key drivers of changes in housing demand with respect to

1. housing space and housing tenure, such as owner-occupancy, leasehold deposit (or jeonse), or monthly rent,

2. housing type, such as detached housing, multi-family housing, or apartments, and

3. purpose of owning property, such as for one’s primary residence or for investment reasons.

With a low fertility rate and aging population, Korea will see its baby boomers (born from 1955 to 1963) start to enter the senior age group (aged 65 or more) in force from 2020. Therefore, the effect of population aging on the housing market may be compressed.

In line with recent findings, views are generally divided. Some argue that population aging will eventually put downward pressure on housing prices through lowered housing demand as individuals sell their houses or convert them to rental properties, while using less living space for themselves.

On the other hand, a considerable amount of research suggests that population aging will have a limited influence, considering the home ownership trend based on investment demand and on the increase in one- and two-person households.

2. Features of the Korean Housing Market

(Housing tenure)

The owner-occupancy ratio currently stands at 56.8% as of 2015, a slight increase from 53.3% in 1955. When it comes to comparison by age group, the owner-occupancy ratio is higher in the elderly age groups.

The owner-occupancy ratio of the younger generation is lower than that of the prior generation for multiple reasons, including unemployment issues and less positive perceptions of home ownership.

1) Owner-occupancy ratio by age group (%: 2015 Population and Housing Census):
(people in their thirties) 39.2 (people in their forties) 53.8 (people in their fifties) 62.6 (people in their sixties) 72.4 (people in their seventies and older) 76.1

2) When the elderly (born from 1945 to 1950) and baby boomers (born from 1955 to 1963) were in their thirties, their owner-occupancy ratios were 45.1% and 38.4% respectively, while that of the eco-generation (born from 1979 to 1985) stands at 33.1%.
Homeowners tend to expand their housing space until they reach their early forties due to reasons such as child bearing and education. Then, after their mid-sixties, they tend to use less living space as their children find jobs or get married and their post-retirement income is reduced.

(Housing type)

As of late 2015, apartments account for 60.4% of housing, a drastic increase from 1.9% in 1975. While the structure of the housing supply is centered on apartments, the preference for apartments is more pronounced in the younger generation.

The increase in one- and two-person households has led to increased preference for small- and medium-sized housing.

(Rental housing market)

While the current percentage of renter households (leasehold deposits, monthly rent, free of charge, etc.) is 43.2% as of late 2015, maintaining a consistent level for a prolonged period, those paying monthly rent account for a rapidly increasing share. However, people in the senior age groups are less likely to be rental tenants.

As for incentives for maintaining home ownership as an investment, the pursuit of capital gains (key money deposits) has weakened, while the pursuit of cash flows (monthly rent) has increased.
3. Analysis Results

Our outlook focuses on how Korea’s rapidly aging population will affect the housing market, specifically in terms of changes to housing demand in the mid and long term.

(1) Slowing of the mid- and long-term housing demand increase

Some aged households with insufficient funds for post-retirement living expenses may have to sell their homes to supplement their reduced income. This, in turn, will act to slow the growth of housing demand, on top of the already weakening demand from younger households.

Disposing of housing (reducing housing space, entering into a reverse mortgage, etc.) by retirees to pay living expenses and repay debt will increase at a moderate pace after retirement (age 60) and will show a clear increase from age 70, the effective retirement age.

According to the empirical analysis, it is expected that the increase in housing demand in the mid and long term will moderately slow in terms of total quantity (quantified sum of housing space). In particular, housing demand will witness a relative decline among the younger generation, while the demand will be highest for individuals born from 1945 to 1954.

(2) Preference for small- and medium-sized houses and apartments continues, while concerns over increasing vacancy of deteriorated houses exist

As more senior citizens live alone or with a partner and their need for liquidating housing...
assets after retirement increases, it is expected that the demand for small- and medium-sized houses and apartments will rise even more.

However, considering that the current housing supply ratio (the number of houses/the number of households) for 2015 is 102.3%, the slowing of housing demand growth in line with population aging is the cause for the increase in vacancy\(^3\) of deteriorated houses or houses in areas where demand is relatively low.

(3) **Structural changes to the rental housing market, centered on monthly rent**

Owners of multiple houses and households of people aged 50 or more are being induced to pursue the stable cash flows offered by rent, and as young households exhibit steady demand for rental housing, the current shift toward rental housing is expected to continue for a prolonged period.

However, the speed of the rental housing market restructuring to monthly rent will be relatively slow in the Seoul metropolitan area, mainly due to demand for leasehold deposits, as the area has demand from landlords for leveraged investment using deposit money and is also in high demand from tenants, attracted by the quality of children’s education and the convenience of transportation.

---

\(^3\) The number of vacant houses in Korea currently stands at 1,069 million units for 2015, about 6.5% of the total houses. Meanwhile, the number of houses for which more than 30 years has passed since construction completion (the term for apartment reconstruction approval) will be about 4.5 million units for 2016 to 2025, of which apartments will account for 2.77 million units (61.5%).
Part 4: Population Aging and Policy Imperatives

Estimate of the Number of Households Leasing out Month-to-Month Rental Housing

<table>
<thead>
<tr>
<th>Year</th>
<th>Under 50</th>
<th>Aged 50s</th>
<th>Aged 60 or over</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>113.7</td>
<td>27.7</td>
<td>39.7</td>
</tr>
<tr>
<td>2013</td>
<td>128.9</td>
<td>32.7</td>
<td>46.2</td>
</tr>
<tr>
<td>2014</td>
<td>134.4</td>
<td>42.7</td>
<td>49.2</td>
</tr>
<tr>
<td>2015</td>
<td>131.5</td>
<td>45.1</td>
<td>47.8</td>
</tr>
<tr>
<td>2016</td>
<td>135.0</td>
<td>42.9</td>
<td>48.4</td>
</tr>
</tbody>
</table>

Note: 1) In addition to residential housing, households with rental deposit liabilities and rental income for housing.
Sources: BOK, Statistics Korea (Survey of Household Finances and Living Conditions)

Ratio of Households with Home Ownership Living in Jeonse/Monthly Rent Housing by Area

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Seoul Metropolitan area</td>
<td>3.5</td>
<td>3.3</td>
<td>2.8</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Nationwide: 2.7%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: 1) Type of residence is either leasehold deposit or monthly rent, and head or member of tenant household also owns housing.
2) Comparison to the number of total households by area.
Source: Statistics Korea (2016 Korea Housing Survey)

(4) Limited possibility of rapid adjustment in housing prices

If the elderly households, mainly baby boomers, collectively sell houses in a short period of time, it might put downward pressure on housing prices. However, such possibility is limited considering factors such as macroeconomic conditions, an adjustment in housing supply, and the high ratio of apartments.

In Japan, housing sales prices showed a long-term downward trend after the early 1990s, when the working-age population started to decline. In the case of Korea, however, the method of housing supply underwent a transformation to center on reconstruction and redevelopment, and transaction volume is supported by the large share of apartments. Thus, it is less likely that a shock from reduced demand for housing purchases due to aging will have a rapid effect, as occurred in Japan.

---

4) The turnover rate for housing transactions (quantity of housing transactions/quantity of housing stock) in Korea is 10.4% in 2016, well above Japan’s turnover rate for housing sales (0.39% in 1988 and 0.32% in 2013).
4. Implications

As population aging progresses, housing demand growth is expected to slow down at a moderate pace in the mid and long term. Furthermore, population aging may cause structural changes in the housing market, such as a restructuring of the rental housing market centering on monthly rent, and an increase in housing vacancy, both in deteriorated houses and houses in remote areas.

Therefore, it is necessary to come up with a plan to stabilize the housing supply in the mid and long term so that the structural changes will not cause an imbalance of supply in the housing market. Also, a housing stock management plan is needed, including a housing supply tailored to the demand of aged households, expanded public rental housing for housing-disadvantaged persons such as the elderly in underprivileged communities,5) and utilization of vacant houses.

Constant measures to ease the house-selling pressure for the senior age group are needed, such as vitalizing reverse mortgages and supporting the conversion of retirees’ houses to rental properties.

---

5) Among households of seniors aged 65 or more, the number of households whose living standard falls short of the minimum level defined by the Ministry of Land, Infrastructure and Transport currently stands at 229,000 families in 2016 (a total of 1,027 million families fall short according to Korea Housing Survey.)
Chapter 14
Aging and the Labor Market

1. Background

There is a general concern that the size of the labor force will diminish with ongoing population aging. However, only a few studies have investigated the effect of population aging on the Korean labor market and offered policy alternatives related to the issue.

In order to investigate the effect of population aging on the future labor market, this study ① estimates the size of future labor supply, ② analyzes the effect of population aging on labor shortages across industries, ③ suggests policy measures to minimize the future labor shortages.

2. Analysis Method

(Estimate the effect of population aging on projected labor supply indices)

Future labor supply is projected using (i) gender- and age-specific labor supply indices (i.e., economically active population, employed population and total weekly working hours) for the current year (2016) and (ii) the projected population from 2016 to 2050. The various labor supply indices between 2016 and 2050 are then compared.

Changes in the size of future labor supply are projected under three scenarios in which government measures to achieve the following outcomes are successful: increased elderly employment, increased female employment, and decreased youth unemployment.

(Project on how population aging will affect future labor demand and supply)

Using data from the Local Area Labour Force Survey, we identify the industries that are likely to experience serious labor shortages in the near future due to population aging.

3. Analysis Results

(1) Effect of population aging on the size of future labor supply

Labor supply \( (L_t) \) in the long run is expected to decrease with population aging, but the
extent of the decrease seems to vary\(^1\) according to labor supply indices, such as the economic activity participation rate by gender and age \(P_{jat}\), the employment rate \(E_{jat}\), working hours \(H_{jat}\) and labor productivity \(\lambda_{jat}\)\(^2\).

\[
\bar{L}_t = \sum_j \sum_a \lambda_{jat} H_{jat} E_{jat} P_{jat} N_{jat}
\]

If the current (2016) patterns of gender- and age-specific labor supply are maintained, the decrease in the labor supply index measured by the economically active population, the employed population and total working hours will become visible starting from 2030,\(^3\) and the figures in 2050 are likely to reach around 87%, 88% and 83%, respectively of their current levels.

On the other hand, if policies such as those promoting increased elderly employment, increased female employment and decreased youth unemployment are successfully implemented, it is expected that in 2050, the economically active population and the employed population will each remain at 92% of their current levels, and total working hours will stand at 87% of its current level.

(2) Effect of population aging on future labor demand and supply

Even if labor supply declines with population aging, it is uncertain whether this will in fact cause labor shortages. Theoretically, labor shortages may not arise if labor demand and supply decline at the same time.

The long-term trend of labor demand is highly unpredictable because of rapid technological changes in areas such as such as information, communication, and technology (ICT) and artificial intelligence (AI). However, the extent of labor shortages will widely differ across industries and across work types because of sectoral disparities in labor-demand changes.

The most critical factor relating to labor shortages in the near future is the entrance of baby boomers (born from 1955 to 1963) into the senior age group. The exit of aged workers will have major effects in sectors where aging is already underway or in industries where the entry of young workers is insufficient to meet rapidly growing labor demand.\(^4\)

\(^{1}\) Projected labor supply \((\bar{L}_t)\) is calculated based on the assumption that current patterns of all gender- and age-specific labor supply indices other than population will remain unchanged from the base year \((t = 0; 2016)\).

\(^{2}\) Labor productivity is not used in the actual computation because it is hard to estimate by gender and age. Instead, the potential effects are discussed qualitatively.

\(^{3}\) The annual number of newborns held steady at 600,000 to 700,000 from the mid-1980s, and has since fallen to around 400,000 since 2002. Therefore, new labor is not likely to decrease rapidly until the next 10 to 15 years when the population born after 2002 enters the labor market.
4. Implications

Policy responses must be introduced in consideration of changes in labor demand and supply due to population aging. Future labor supply and demand conditions will vary according to changes in labor supply factors such as the economically active population, working hours, and productivity, and also according to changes in labor demand factors such as technological advancement and industrial structure; thus, flexible policies are needed. Since labor supply and demand conditions will differ across industries, work types, and population groups, the policy responses will need to take into all these into consideration.

Starting from around 2030, 10 to 15 years from now, labor shortages are likely to be a serious issue. In order to prepare for this in advance, it is necessary to effectively carry out policies related to childbirth and childcare, foreign workers, and employment of the elderly and women.

In order to increase the fertility rate, the female marriage rate and the fertility rate of married women should be increased in tandem. Therefore, in addition to marriage encouragement/support policies such as encouraging earlier first marriages, we need to maintain existing policies that encourage childbirth among married couples. Policies that may indirectly influence childbirth and marriage, such as expanding social welfare spending, stabilizing housing and jeonse (key money deposit) prices, and improving childcare and education, should be reviewed closely.

When it comes to foreigner labor policy, it is important to balance short-term plans to add foreign labor to sectors not preferred by Korean nationals with long-term plans to supply high-quality foreigners to future growth sectors.

As for employment policies for aged workers, the employment rate for highly skilled and highly educated workers needs to be maintained as much as possible, such as by supporting reemployment to jobs where previous work experience can be used, so that the decline in productivity due to population aging can be alleviated.

In order to increase the rate of women’s participation in economic activities, the greatest imperative is to establish an environment in which women can achieve work-life balance. This will require the establishment of gender equality at work and home and more policies to support childbirth and childcare.

---

4) Social welfare services, public administration/national security/social security administration, repair businesses, healthcare, other machinery and equipment manufacturing, automobile and trailer manufacturing, education services, medicine/precision/optical instrument and watch manufacturing, finance- and insurance-related services, etc.
Chapter 15
Population Aging and the Industrial Structure

1. Background

In the future, the rapid progress of population aging in Korea is expected to have major impacts on all sectors of the economy and society. Population aging is highly likely to have different impacts on individual industries in various ways, not only on production but also employment and other areas. This suggests that it is necessary to take differentiated steps for individual industries to deal with population aging.

This paper conducts an empirical analysis as to the future impacts of Korea’s population aging on added value, employment, productivity and net exports, all for each industry, and comes up with relevant policy implications.

2. Analysis Method

This paper carries out a regression analysis on the impacts of changes in the demographic structure on the industrial structure using OECD and World Bank panel data. The share of added value, the share of employment, relative productivity, and the net export/added value ratio, all by industry, were used as dependent variables.

The share of the elderly, the share of the productive population, and the population/total land area ratio were used as explanatory variables showing changes in the demographic structure, and per-capital income, the college entrance rate, the trade volume/GDP ratio, the current account/GDP ratio, the real effective exchange rate, and real GDP growth rate, as control variables.

This paper derives changes in the industrial structure in line with changes in the demographic structure in Korea, using the estimate from the regression analysis and Future Population Estimation made by Statistics Korea. It calculates the share of added value, the share of employment, relative productivity, and the weight of exports, all by industry, in line with changes in the share of the elderly, the share of the productive population, and the overall population.

3. Analysis Results

Future changes in Korea’s demographic structure will work to reduce the share of the manufacturing sector and to increase the share of the services sector, both in terms of
Part 4: Population Aging and Policy Imperatives

total added value (GDP) and employment.

Looking at the results by industry, the shares of the textile & leather industry and low-tech manufacturing industries are projected to decline significantly, and those of the health care & welfare and business service industries to increase greatly.

According to the calculation of changes in the relative productivity of each industry compared to the average productivity for all industries, changes in the demographic structure will bring down the relative productivity of the manufacturing sector, while pushing up the relative productivity of the service sector.

The fall in the relative productivity of the manufacturing sector, led by the low-tech manufacturing sector, is highly likely to be caused by decreases in added value and demand for products followed by a gradual decline in employment. The rise in the relative productivity of numerous service industries, including public administration and the financial & insurance industry, could be attributable to growth in demand and added value followed by growth in employment after some time lag.

Looking at changes in the share of net exports in the added value of each industry, the share of net exports in that of the entire manufacturing sector will rise, led by high-tech industries, in line with population aging. This implies that the contribution of domestic demand to the creation of added value in the manufacturing sector will be reduced, while that of overseas demand will be raised due to the demographic changes.

4. Implications

Effective industrial restructuring must be induced to deal with changes in the demographic structure, including population aging. Particularly since demand in the low-tech manufacturing sector will decline, it is desirable to implement seamless ongoing restructuring. As for the public health & welfare and business service industries, it is desirable to enhance their supply capacities and competitiveness in line with growing demand.

There is a high possibility that some industries will see a labor shortage, while others will not, in the process of population aging. Therefore, it is necessary to establish a long-term labor supply and demand plan that reflects this. The high-tech manufacturing sector and a considerable number of service industries, such as the public administration industry, the financial & insurance industry, the transport & storage industry, and the business service industry, may see slower growth in employment compared to demand for goods as the demographic structure changes. Therefore, labor should be supplied to these sectors in a timely manner.

Meanwhile, low-tech manufacturing industries are highly likely to see a moderate decrease in employment after a decline in demand for goods stemming from population aging. Therefore, it is desirable to induce an appropriate labor supply in advance.
A rapid advancement of population aging is highly likely to bring about a decline in domestic demand in the manufacturing sector. Therefore, it is necessary to make up for sluggish domestic demand by, for instance, cultivating overseas markets and strengthening competitiveness. However, there could be major changes in the shares of added value and employment, both by industry, in line with future developments in AI and Fintech. Hence, it is necessary to forecast changes in the industrial structure in view of these possibilities.
Part 5

Conclusion

Future of the Korean Economy and Policy Implications

Jaerang Lee, Sungju Song, Daeyup Lee,
Byungkuk Kim (The Bank of Korea)
Conclusion

Future of the Korean Economy and Policy Implications

1. Population Aging and the Korean Economy

The analysis of the impacts of population aging on economic growth, inflation, and the financial sector does not present a bright outlook for the future. Population aging is expected to push down economic growth to the 0% or lower range after the mid-2030s. Inflation will fall into the lower 1 percent range in the long run. The government’s fiscal space will shrink gradually with a substantial increase in government expenditure and a reduction in tax revenues. In addition, labor force growth will slow down over the long run, the net international investment position will shrink, and housing demand will weaken. The industrial structure is expected to change: while the output share of low-tech manufacturing sectors will fall, that of service industries such as public health & welfare will rise.

2. Policy Implications

For more than 10 years, the government has made great efforts to boost the fertility rate by injecting fiscal resources and adopting various policy instruments. However, the results have not met expectations. Various socioeconomic and sociocultural factors have worked to lower the fertility rate. They include rising childcare costs, labor market conditions generating gender inequality in housework, a rising education level, and changing gender equality values. The government’s policy governance system is assessed to have had limited effects, constrained by a lack of linkage effects stemming from contradictory policies, insufficient policy adjustment mechanisms, and a shortage of experts.

Since it takes a long time to overcome population aging by raising fertility rates, the issue should be approached in a consistent and continuous manner over the longer term. Social and economic incentives should be reformed in ways that encourage childbirth. Incentives should be adjusted, for example through tax reform, to ensure that childbirth can give economic advantages to parents. Measures to improve factors that can indirectly influence birth and marriage, such as childcare and education conditions, should be implemented steadily.

In order to fill the time gap needed for childbirth-promotion policies to lead to a normalization of the demographic structure, it is necessary to make efforts to boost the labor force participation of women and the elderly. For example, efforts should be made to prevent the occurrence of blind spots in policies for temporary workers and female
workers at small-scale businesses. Support for greater work-life balance should also be strengthened. Employment services should be enhanced to help the elderly find jobs and improve their working ability.

An overhaul of immigration policy should be considered, from a passive policy to a more active one. Labor shortages could be addressed by increasing productivity through STEM (science, technology, engineering, and mathematics)-focused immigration policy.

Policy governance related to demographics needs to be improved to enhance its ability to deal with the low fertility and population aging issues. Given that laws and systems related to low fertility and population aging are dispersed, the role of the relevant organizations should be strengthened to ensure integrated implementation of the relevant policies. Priorities for the measures should be adjusted depending upon the importance and value of those measures. The government should cultivate experts on population aging and encourage active participation by the private sector.

In response to changes in the economic structure stemming from the low fertility rate and population aging, it is necessary to make efforts to develop new policy instruments, while seeking changes in existing monetary and fiscal policies. Preparations should be made against changes in the financial market and lower inflation over the longer run stemming from an aged demographic structure, and greater efforts should be made to ensure the effectiveness of monetary policy. Measures are also needed to address the weakened automatic stabilizer function of the government budget and to deal with reduced fiscal space.

While longer life expectancies are an inevitable consequence of economic growth and social development, a falling fertility rate is directly related to a decline in the growth potential of future generations. Therefore, even if it takes a long time to resolve this issue, it is necessary to take the view that a higher fertility rate is the most fundamental factor to ensure sustainable economic growth, and relevant policies should be consistently pursued.