The Influence of Population Aging on Economic Growth

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Abstract. Population aging has emerged as a critical demographic challenge worldwide, profoundly impacting economic structures and growth trajectories. This study aims to systematically examine how aging influences economic growth through multiple mechanisms, including labor supply, savings and investment, fiscal pressure, and consumption patterns, identifying effective policy measurements. To address these questions, the study employs a mixed-methods approach combining quantitative analysis of latest demographic and macroeconomic data from sources such as the UN and China's National Bureau of Statistics, alongside comparative case studies of Japan and Germany, which can be utilized as a precedent reference. The results indicate that aging exerts significant downward pressure on labor supply and national savings, while increasing fiscal burdens through pension and healthcare expenditures. Moreover, consumption structure shifts toward elderly-oriented services and products, giving rise to the 'silver economy'. More importantly, the comparative analysis reveals that countries adopting integrated strategies, such as Germany's emphasis on vocational training and high-skilled immigration, which exhibit greater economic resilience than those relying on isolated measures. Overall, this research demonstrates that proactive, multi-dimensional policies, including pension system reform, promotion of lifelong learning, and technology-driven productivity enhancements, which are essential elements to mitigate the adverse effects of aging and harness potential opportunities for sustainable growth. The findings offer evidence-based insights for policymakers in China and other aging societies seeking to navigate demographic transitions.

Keywords: Population aging, economic growth, labor market, fiscal sustainability, silver economy.

1. Introduction

Population aging represents one of the most significant demographic transformations of the modern era, with profound implications for global economic stability, growth patterns, and social welfare systems. This demographic shift, characterized by declining fertility rates and increasing life expectancy, is reshaping economic structures and challenging traditional growth models across both developed and developing economies. The economic ramifications of population aging extend beyond mere statistical changes in population composition, affecting fundamental aspects of economic organization including labor markets, savings behavior, fiscal sustainability, and consumption patterns.

Globally, the pace and scale of population aging are unprecedented. According to the United Nations, the population aged 65 years or over is projected to increase from 10% in 2022 to 16% in 2050, representing a fundamental shift in global population structure [1]. This trend is particularly pronounced in East Asia and Europe, where several countries already have more than 20% of their populations aged 65 and above. China's demographic transition has been especially rapid due to its previous one-child policy and remarkable improvements in life expectancy. Current statistics indicate that China's population aged 65 and above reached 14.9% in 2022 and is projected to exceed 26% by 2050, signaling the urgent need to understand and address the economic consequences of this demographic shift [2].

The economic implications of population aging are multifaceted and complex. Research by Maestas, Mullen, and Powell demonstrates that population aging significantly affects economic growth through reduced labor force participation and productivity [3]. Their findings indicate that a 10% increase in the population aged 60 and above is associated with a 5.5% reduction in per capita Gross Domestic Product (GDP) growth, primarily driven by declines in labor supply [3]. Similarly,

Grigoli, Koczan, and Topalova document how workforce aging contributes to slower productivity growth, particularly in sectors requiring rapid skill adaptation and technological innovation [4].

Beyond labor market effects, population aging influences national savings rates and investment patterns. As Bloom, Canning, and Fink established, aging populations typically exhibit lower savings rates as older households tend to dissave rather than accumulate assets [5]. This behavioral shift affects capital formation and investment patterns, potentially reducing resources available for productive investment. Concurrently, aging creates new investment demands in healthcare, elderly care facilities, and specialized housing, giving rise to what has been termed the "silver economy" – economic activities specifically targeting older consumers [6, 7].

Fiscal sustainability represents another critical challenge associated with population aging. Rising pension obligations and healthcare expenditures place increasing pressure on public finances [8]. The International Monetary Fund estimates that age-related public spending will increase significantly across advanced economies in the coming decades, potentially crowding out other productive public investments in education, infrastructure, and research [9]. Japan's experience is particularly illustrative, where social security expenditures now account for over 33% of the central government budget, constraining fiscal flexibility and limiting resources for growth-enhancing investments [10].

Despite these challenges, population aging also creates new economic opportunities. The emergence of the silver economy has stimulated innovation and market development in various sectors, including healthcare technology, specialized financial products, and leisure services tailored to older consumers [11]. As Chen and Liu document, aging populations generate distinct consumption patterns that can drive structural economic changes and create new growth vectors [11].

This study addresses two fundamental research questions: First, through what specific mechanisms does population aging affect economic growth, particularly in rapidly aging societies like China? Second, what policy responses have proven most effective in mitigating negative economic impacts while harnessing potential opportunities created by demographic aging? To address these questions, the study employs comparative analysis of country experiences, examining Japan's technological adaptation strategies and Germany's human capital-oriented approaches [12, 13].

The theoretical significance of this research lies in its integrated examination of multiple economic channels through which aging affects growth, moving beyond siloed analyses to provide a comprehensive understanding of demographic impacts. Practically, the study aims to provide evidence-based policy recommendations that can help policymakers in China and other aging societies navigate demographic challenges while promoting sustainable economic development.

2. Theoretical Mechanism

Population aging exerts profound and complex influences on economic growth through multiple channels. First, from the perspective of the labor market, the decline in the proportion of the working-age population directly leads to a reduction in the supply of labor. According to data from the National Bureau of Statistics in 2022, the proportion of the 15-64-year-old working-age population in China has dropped from 74.5% in 2010 to 68.3% in 2022 and is projected to fall below 60% by 2050. Moreover, according to data from the United States, for every 10% increase in aging, the per capita GDP growth rate decreases by approximately 0.2 to 0.3 percentage points, with the decline in labor force participation rate contributing about 57% of the negative impact. This influence is not only reflected in quantity but also in quality: an aging labor force is often accompanied by a decline in physical strength, a slower pace of skill renewal, and a weakening of innovative vitality, which may create a comparative advantage in industries that require high-intensity physical labor or rapid learning of new technologies. Additionally, older workers tend to perform better in positions that require rich experience and interpersonal skills, which partially mitigates the overall impact of aging on productivity.

Secondly, aging has a significant impact on the structure of savings and investment. Elderly people tend to reduce savings and increase consumption, which will lead to a decline in the overall national

savings rate. China's national savings rate has dropped from 51.6% in 2010 to 45.7% in 2022, and it is expected to continue to decline as aging accelerates [2]. At the same time, the investment structure undergoes profound changes: capital shifts from traditional productive investment to more areas such as elderly care and healthcare. Research shows that the proportion of healthcare expenditure in GDP in aging countries is on average 2-3 percentage points higher than that in younger countries [6]. However, this transformation also creates new investment opportunities. For instance, "silver industries" such as elderly care real estate, health care, and rehabilitation equipment have become hotspots for investors. It is estimated that the market size of China's silver industries will reach 10 trillion yuan by 2030 [7].

In terms of fiscal sustainability, the pressure from public expenditures such as pensions and healthcare is increasing sharply. By 2050, the global population aged 65 and above will account for 16% of the total population, and in China, this proportion will reach 26.1% [8]. The proportion of pension expenditures in GDP will rise from the current 4% to over 8%. Such changes in the expenditure structure may force the government to raise taxes or cut expenditure on education, science and technology, and other areas that are conducive to long-term growth, thereby indirectly suppressing economic growth. [9] Japan's experience shows that the proportion of social security expenditures in the central government's budget rose from 19.5% in 1990 to 33.7% in 2022, while the proportion of expenditures on education and science and technology dropped from 9.8% to 6.5% during the same period [10].

In addition, aging has a structural impact on consumption and industrial structure. The consumption structure shows a clear trend of "silvering": the demand for healthcare, elderly care services, and leisure travel has significantly increased. Chen & Liu based on the China Household Finance Survey data, found that the proportion of healthcare expenditure of families over 65 years old is 2.3 times that of families under 35 years old [11]. This change drives the economic structure to tilt from manufacturing to services, giving rise to new forms of "silver economy". Japan's experience shows that aging has promoted the rapid development of industries such as medical care, home-based elderly care, and health food. These industries have grown at an average annual rate of 4.5% in the past decade, far exceeding the average GDP growth rate [12].

3. Practices and Insights of Different Countries in Addressing Aging Population

As the country with the highest degree of aging in the world, Japan's experience in addressing this issue holds significant reference value. The proportion of the population aged 65 and above in Japan has reached 29.1%, and it is facing a severe shortage of labor [13]. To address this, Japan has implemented a series of policy measures: gradually raising the legal retirement age from 60 to 65; promoting robot technology and automation solutions: currently, Japan has the highest density of industrial robots in the world, with 385 robots per 10,000 employees; and moderately opening up to foreign workers. These measures have to some extent alleviated the labor pressure: the labor participation rate of the 65-69 age group in Japan has increased from 40.3% in 2013 to 50.1% in 2022 [14, 15].

Germany offers another model of response. Although the proportion of its population aged 65 and above is also as high as 22.6% (in 2022), its economy maintains strong resilience and productivity, with a per capita GDP of 48,200 US dollars in 2022 [16]. Germany's success mainly lies in three aspects: first, it has implemented targeted technical immigration policies, attracting about 150,000 high-skilled immigrants each year; second, it has improved its vocational training system, particularly focusing on the skills update of middle-aged and elderly employees, with the participation rate of vocational training for employees aged 45-64 reaching 58% ; third, it has a flexible retirement system, allowing employees to choose their retirement time between 62 and 70 years old, and providing partial pension options. Studies show that the employment rate of the 55-64 age group in Germany is 61.5%, much higher than 50.1% in Japan and 38.6% in China [17, 18].

By comparing key indicators of China, Japan and Germany, some differences can be found. Japan has the highest elderly dependency ratio (51.2% in 2022), but also the highest labor force participation rate of people aged 65 and above (25.1%), reflecting the effect of its delayed retirement policy [13]. Germany has an elderly dependency ratio of 36.7% but has alleviated the pressure of labor shortage through high labor productivity [16]. China's elderly dependency ratio is currently 21.8%, but it is rising at the fastest rate and is expected to exceed Japan's current level by 2035 [8]. In other comparative studies, it is shown that Japan's policies focus on tapping the potential of the existing labor force, while Germany pays more attention to improving labor productivity and attracting international talents [12].

4. Policy Recommendations

To systematically address the challenges of an aging population, China needs to implement the following policy improvements. In the labor market, a gradual retirement age increase policy should be adopted, considering raising the retirement age by one year every two years over a period of 20 years, gradually increasing it from 60 to 65. At the same time, a flexible retirement system should be established, allowing workers to choose their retirement time between the ages of 62 and 68, and providing pension rewards for those who delay retirement. More importantly, the construction of a lifelong vocational training system should be strengthened, especially for skills update programs targeting workers over the age of 45.

In terms of pension and fiscal system reform, efforts should be accelerated to transition the pension system towards a fully funded model. It is feasible to increase the pension contribution rate by 0.5% annually and expand the investment scope of pension funds from government bonds to high-quality corporate bonds and index funds. This is expected to increase the investment return rate by 2 to 3 percentage points. [5]

In terms of industrial and technological transformation, efforts should be made to vigorously develop the "silver economy" to form new growth points. Priority should be given to supporting service sectors such as smart elderly care, telemedicine, and health management, as well as manufacturing industries such as rehabilitation equipment and assistive devices. The government can offer tax incentives, for instance, by reducing the corporate income tax rate for enterprises in these industries by 15% to encourage supply input. Research estimates that the silver economy is expected to contribute 15-20% to GDP growth by 2030 [11]. At the same time, technological innovation and automation should be encouraged to replace labor with capital and technology. More importantly, in the face of an aging population, technological progress and productivity improvement are key to maintaining long-term economic growth. It is estimated that an annual increase of 0.5% in total factor productivity can offset the negative impact of a shrinking labor force [15].

In conclusion, China needs to adopt a comprehensive strategy to address the aging population issue, integrating labor market reforms, fiscal system optimization, and industrial transformation and upgrading. At the same time, it should draw on international experience to effectively solve the numerous problems brought about by population aging.

5. Conclusion

This study sets out to systematically analyze the multifaceted impact of population aging on economic growth and to identify effective policy strategies to mitigate its adverse effects. Through a structured examination of mechanisms including labor supply, fiscal sustainability, and structural economic shifts, this research confirms that aging poses substantial challenges to long-term economic development, most notably through a shrinking workforce and escalating public expenditure pressures.

The most significant findings indicate that aging societies experience a significant decline in labor force participation and a reorientation of national savings away from productive investment—yet also

catalyze the emergence of a new "silver economy" centered on elderly-oriented goods and services. As a result, the comparative analysis demonstrates that integrated policy approaches, involving combining institutional reforms, human capital enhancement, and technological adaptation, which prove far more effective than fragmented measures.

The primary contribution of this research lies in its systematic integration of macro-level demographic data with micro-level behavioral responses within a unified analytical framework, offering a complete perspective on aging's economic development. By applying international experiences within China's specific demographic trajectory, this study provides actionable and evidence-based insights for policymakers seeking to turn demographic challenges into sustainable development opportunities.

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