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Analysis of Economic Sustainable Development and Welfare Issues under the Background of Population Aging

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Abstract: This paper studies the socio-economic challenges brought about by the rapid aging of the population in China, with particular attention to its impacts on economic sustainability, the labor market, and intergenerational equity. The study found that for every 1% decrease in the working-age population, GDP growth will decline by 0.3-0.5%. Additionally, the pension and healthcare systems are facing increasing financial pressure, and regional differences make thesise challenges more severe. Specifically, the aging of the population in coastal areas is faster than in inland areas. Meanwhile, housing inequality makes intergenerational relationships more tense, as 78% of urban assets are held by the elderly, while less than 40% of young people own homes. To solve these problems, three innovative solutions are proposed. The first is to develop an Al-driven dynamic pension system. The second is to carry out blockchain-based inter generational asset exchange. The third approach is to implement the green economy retraining program. These strategic priorities emphasize technological integration, resource flow, and policy adaptability.

Keywords: Population aging, economic sustainability, pension reform.

1. Introduction

In recent years, with the continuous decline in the fertility rate and the significant increase in average life expectancy, China's population structure has undergone very prominent changes. The speed of population aging has become increasingly rapid. According to the statistics obtained from the seventh national census released by the National Bureau of Statistics, it was not until 2020 that The number of people aged 60 and above in China has reached 264 million, accounting for 18.7% of the total population. Among these people, the number of people aged 65 and above is 190 million, accounting for 13.5% of the total population. It is predicted that around 2035, this proportion will exceed 30%. By then, China will enter a society with a very high degree of aging.

What this article intends to convey is that population aging is not merely a social change; it is quite a serious one. It poses very severe challenges to the sustainable development of the national economy and the social welfare system. Let's start from one aspect. If the working-age population decreases, it will have an impact on the ability of economic growth. From another perspective, social welfare systems like pensions and medical insurance will face particularly high payment pressure. Moreover, resources are unidirectional among different generations, and employment opportunities are also uneven. This may further exacerbate social conflicts.

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2. Literature review

2.1. Economic sustainability and growth constraints

Scholars have conducted extensive research on how population aging reshapes the economic trajectory. Chen and Wang analyzed panel data from 31 provinces in China in 2020. The results of the analysis showed that for every 1% decrease in the working-age population, GDP growth would decline by 0.3-0.5% [1]. This situation mainly occurs because the labor supply has decreased, and productivity has hit a bottleneck. Similarly, Li and Zhang conducted a comparative study of the pension systems in 15 OECD countries and Asian countries in 2021 [2]. They believe that delaying retirement and diversified financing mechanisms, such as public-private partnerships, are crucial for alleviating the financial pressure of an aging society. Their research findings highlight the structural vulnerabilities of the current pay-as-you-go pension model in China. As the dependency ratio keeps rising, this pension model is at risk of bankruptcy.

2.2. Labor market adjustments and age discrimination

The shrinking of the labor force and age inequality have stimulated research on the adaptability of the labor market. Liu et al. analyzed the survey data of 10,000 Chinese workers aged between 45 and 65 in 2022. These data indicated that the re-employment rate of this group was less than 30%. Age discrimination and skill mismatch are regarded by everyone as the main factors hindering their re-employment [3]. As a supplementary study, Hu et al. proposed a framework called "Silver Human Capital" in 2022. This framework advocates for AI-driven retraining programs to integrate elderly workers into high-tech industries. Their longitudinal study conducted in Guangdong Province showed that elderly people engaged in logistics and healthcare work, after receiving training, The employment rate has increased by 15% [4].

2.3. Intergenerational equity and resource distribution

Intergenerational conflicts in terms of housing and wealth have now become a particularly crucial research frontier direction. After conducting research using spatial econometric methods in 2019, researchers such as Wang found that in China, 78% of urban housing assets are held by individuals over the age of 60 [5]. Such a situation has exacerbated the crisis of housing affordability for the younger generation. This research finding is consistent with the viewpoint proposed by Du in 2022, in which Du emphasized the role of inheritance tax reform in intergenerational wealth redistribution and youth housing subsidy programs [6]. At the same time, in 2024, Zhang compared some international models, such as Japan's "asset welfare" system. Then it was also proposed to integrate reverse mortgage programs to release the housing rights of the elderly and promote broader economic participation [7].

2.4. Marginal contribution of this study

Most of the existing literature only focuses on isolated dimensions, such as pension reform or labor policies. However, this paper makes a comprehensive consideration, combines multi-disciplinary insights, and spans the field of economics to propose a comprehensive policy framework. It should be noted here that this paper introduces the method of geospatial analysis. Use it to assess the differences in the impact of aging in different regions, just like the situation where there is a "care desert" in rural areas. This article also advocates the adoption of technology-driven solutions to address the gap between urban and rural areas in China, such as the elderly care platform supported by artificial intelligence. This article links the development trend of the macroeconomy with the

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welfare demands at the micro level, thus addressing the deficiencies in formulating scalable and fair policies in an aging society.

3. Economic sustainability and welfare challenges under population aging

3.1. Core data and projection

As shown in Table 1, China's population aging has accelerated at an unprecedented rate. According to the Seventh National Population Census (2020), the proportion of individuals aged 65+ reached 13.5% and is projected to exceed 30% by 2035. Key trends include the rapid scale and speed of aging: the population aged 60+ grew from 264 million in 2020 to 297 million in 2023, with an annual growth rate of 3.2%, far surpassing the global average. Regional disparities further intensify these challenges, as coastal regions (e.g., Shanghai: 18.3% aged 65+) face more severe aging compared to inland provinces (e.g., Tibet: 7.2%). Concurrently, the old-age dependency ratio will surge from 21.1% in 2020 to 52.6% by 2035, meaning two workers will support one retiree.

Table 1: Key aging indicators (2020–2035)

Indicator	2020	2023	2035 (projected)
Population aged 65+ (%)	13.5%	14.9%	30%+
Workforce size (Million)	880	860	740
Old-Age dependency ratio	21.1%	25.3%	52.6%

3.2. Economic growth constraints and labor market shifts

A 1% decline in the working-age population reduces GDP growth by 0.3–0.5%, and by 2035, the workforce will shrink by 120 million, lowering annual GDP growth by 0.8%. Labor shortages in construction and manufacturing have driven wage increases of 15–20%, while 23% of Guangdong's manufacturing assembly lines now use robots. Healthcare and elderly care spending will rise from 38% of total medical expenditures in 2020 to 55% by 2035, growing at 12% annually. Notably, Japan's "Lost Decades" demonstrated a negative correlation between aging and economic growth (correlation coefficient: -0.27), suggesting China must prioritize AI and green energy innovation to counteract these effects.

3.3. Pension and healthcare burden

China's pay-as-you-go pension model faces insolvency risks, with the pension fund deficit projected to reach ¥10 trillion by 2035. Solutions include integrating multi-pillar pension systems and long-term care insurance pilots, which reduced out-of-pocket elderly care costs by 30% in 15 cities. Healthcare spending for seniors will account for 55% of total medical costs by 2030, necessitating policies like telemedicine expansion and rural elderly care subsidies.

3.4. Labor market reforms: delayed retirement and skill retraining

Delaying retirement age to 65 by 2045 aims to retain 80 million workers by 2035, yet challenges persist: 45% of firms avoid hiring workers over 45 due to perceived productivity gaps, while retraining programs in Guangdong boosted senior employment in logistics by 15% through AI-driven training. Policy recommendations include tax incentives for companies hiring workers aged 55+ and public-private partnerships with tech firms to design vocational training modules.

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3.5. Intergenerational equity and housing inequality

Urban housing inequality is stark: 78% of assets are held by those aged 60+, while millennials face homeownership rates below 40%. Reverse mortgages could unlock housing equity for elderly care funding, and inheritance tax reforms might redirect revenues to youth housing subsidies.

3.6. Avant-garde stratagems in geriatric welfare

Smith et al. attested to the efficacy of AI-enhanced wearable apparatuses, effectuating a diminution of 15% in hospital admissions amongst the elderly cohort via perpetual health surveillance [8]. Kim and Patel, meanwhile, advanced proposals for blockchain-integrated elder care consortia, rendering service delivery translucency an escalation by a margin of 30% within bucolic vicinities [9]. Instances drawn from these treatises underscore the augmented role technology assumes in ameliorating life quality among senescent demographies whilst navigating systemic ineptitudes.

4. Feasible solution

4.1. Al-driven dynamic pension systems

The government can make a radical change to the pension system by leveraging artificial intelligence and predictive analytics and creating adaptive models that can adapt to real-time demographic and economic changes. Machine learning algorithms can be used to analyze the development trends of life expectancy, health data, and the specific conditions of the labor market. This is to dynamically adjust the contribution rate, the retirement age and the payment schedule. Tan et al. Reveal that Singapore's "National Longevity Insurance" has utilized artificial intelligence to recalibrate benefits based on actuarial risks, which has reduced fiscal imbalances by 20-25%. China can integrate a similar system with the national social security database, thus achieving a personalized retirement plan that is balanced, sustainable, and fair. Blockchain technology can enhance transparency. It enables citizens to track the distribution of pension funds in real time, thereby increasing people's trust in the public system.

4.2. Intergenerational digital asset exchange platforms

The blockchain-based digital market can narrow the resource gap between different generations by enabling the elderly to turn underutilized assets into money. Things like housing rights or professional knowledge can be converted into tokens and then used for services or subsidies that the younger generation can enjoy. In Japan, there is a pilot project called "Silver Token", which demonstrates such potential. In this project, the elderly exchange their idle properties for digital tokens, and young families can use these tokens to exchange for discounted rents. According to Yamamoto, the pressure on housing has been reduced by 12%. In China, If these tokens are combined with the infrastructure of the digital RMB, it can bring into play the more than 20 trillion yuan of housing wealth that has not been moved much, and at the same time promote cooperation among different generations. Smart contracts can enable transactions to proceed automatically, ensure transaction security, and also reduce management costs. To encourage everyone to participate, token holders can receive tax deductions or educational credits, thus creating a circular economy that benefits all age groups.

4.3. Green economy retraining for seniors

This research aims to redirect elderly workers into roles that can adapt to climate change and align the redeployment of the elderly workforce with environmental goals. The European Union has a "Green Jobs for the Elderly" program, which has conducted retraining for 50,000 elderly people in

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the field of renewable energy, such as solar panel installation and urban green space management. After the training, the employment rate of these elderly people increased by 18%.

China can adopt a framework similar to that of other countries and cooperate with technology companies to jointly design modular training programs suitable for the skills of the elderly. For instance, those retired engineers can engage in the maintenance of wind turbines, while those who were previously engaged in education can organize community climate literacy workshops. These measures can enable the elderly to have a longer period of time to continue to exert their abilities and engage in productive labor. At the same time, they can also accelerate the process of carbon neutrality. Pilot projects in provinces like Guangdong can test the hybrid training model, which combines online courses with practical internships. This is done to ensure that this training model can be promoted and used on a larger scale.

5. Conclusion

This paper conducts a systematic examination of the socio-economic impact of population aging in China from three related dimensions: economic sustainability, labor market dynamics, and intergenerational equity. The main results obtained from the research show that the labor shortage caused by population aging may lead to a decrease of 0.3-0.5% in the annual growth rate of GDP. The pension and medical systems are also facing financial pressures that have never been seen before. Housing assets have all been concentrated in the hands of the elderly, which has made the affordability crisis of young people more serious and also made the problem of systemic imbalance in resource allocation more obvious.

Some solutions, including AI-driven pension models, blockchain-based asset exchanges, and green economy retraining, demonstrate how technological and policy innovations can alleviate these challenges. These strategies not only enhance the efficiency of the system but also promote cooperation among different generations, transforming the aging population, which originally seemed to be a burden, It has transformed into an opportunity for sustainable development.

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