

Research on the Impact of Population Aging on High-quality Economic Development in China

Yahui Chen^{1, a}, Yanjun Tang¹, Yuanjing Chen², Chaolin Li^{3, b, *}

¹School of Finance, Anhui University of Finance and Economics, Bengbu, Anhui, China

²School of Chemical and Environmental Engineering, Yancheng Teachers University, Yancheng, Jiangsu, China

³School of Economics, Anhui University of Finance and Economics, Bengbu, Anhui, China

^a2943097891@qq.com, ^{b, *}952587990@qq.com

Abstract

This paper first analyzes the current situation and characteristics of China's population aging, and analyzes the impact mechanism of population aging on China's high-quality economic development from the five levels of innovation, coordination, green, openness and sharing. Secondly, the entropy weight method is used to calculate the high-quality development level of China's economy. Thirdly, this paper uses Eviews software to carry out the experimental results. The results show that the population aging has a certain role in promoting the high-quality economic development. Finally, based on the results of empirical analysis, reasonable policy suggestions are put forward.

Keywords

Population Aging; High Quality Economic Development; Action Mechanism.

1. Introduction

Since the reform and opening up in 1978, China's economic development has seized the development trend of the times, closely followed the changes in the world, and stepped into a high-speed development stage with the strength of the whole country. By 2021, China's economy has been growing by leaps and bounds. The GDP has increased to 114366.97 billion yuan, and the per capita GDP has increased to 80976 yuan, a record high. Although China's economy has obviously shown the trend of rapid take-off in the initial stage and rapid growth in the later stage, there are still many deficiencies. The unreasonable economic structure makes Chinese people pursue "quantity" growth too much, thus damaging the ecological environment. The report of the 19th National Congress of the Communist Party of China pointed out that we should achieve sustainable economic development and growth, change the pursuit of economy from "quantity" to "quality", and promote high-quality economic development. The fourth session of the 13th National People's Congress stressed the need to thoroughly implement the new development concept, combine the five development concepts with economic development, pay attention to ecological and social development while developing the economy, and not at the expense of the environment [1].

With the continuous progress of the times, people's lives have become more and more colorful. With the development of science and technology, domestic medical facilities have become more advanced and the level has been rising. Human mortality has begun to decrease and life expectancy has been extended. At the same time, people's ideas are gradually opening up. The increasing pressure of life in today's era has reduced the birth rate. In 2002, the natural population growth rate was 6.45 ‰, and then it has been in a declining state until 2011. By 2012, the population growth rate reached a 20-year high of 7.43 ‰, and then it began to decline

sharply, and by 2021, it has dropped to less than 1 ‰. Over the past 20 years, the proportion of the elderly population in the total population has been gradually increasing, reaching 14.2% in 2021, and the phenomenon of population aging has become more and more serious.

At present, the aging of the population has had a different impact on all aspects of society, which has aroused the discussion and research of people from all walks of life. In China, the population aging is serious year by year [2]. The direct consequence of this phenomenon is to change the population structure and reduce the labor force participation rate. High quality economic development is inseparable from labor supply [3]. Therefore, it is particularly important to study the consequences of population aging for high-quality economic development and maintaining social order.

2. Current Situation and Characteristics of Population Aging

2.1. Current Situation of Population Aging

2.1.1. Current Situation of Overall Population Aging

From 2002 to 2021, China's total population at the end of the year increased year by year, but the increase was small, from nearly 1.285 billion in 2002 to nearly 1.413 billion in 2021. The juvenile population (0-14 years old population) first decreased and then increased from 2002 to 2021, but still decreased in general. Its proportion in the total population decreased from 22.40% in 2002 to 17.90% in 2020. The proportion of labor force population (aged 15-64) in the total population has been increasing from 2002 to 2010, reaching the maximum in 2010, and then gradually declining. By 2020, the proportion of labor force population will be 68.60%. The proportion of the elderly population (aged 65 and above) in the total population has increased year by year from 2002 to 2021, with a large increase, from 7.3% in 2002 to 14.2% in 2021, an increase of 1.95 times. Therefore, it can be seen from the above data changes that the degree of population aging in China is becoming more and more serious.

2.1.2. Current Situation of Population Aging in Eastern, Central and Western China

From 2002 to 2020, the dependency ratio of the elderly population in eastern and central China was always higher than that in Western China. By the end of 2020, the dependency ratio of the elderly population in Central China was the highest, 20.83%, that in eastern China was 19.4%, and that in Western China was the lowest, 16.98%. At this time, the problem of population aging in central and eastern China was more serious. During this period, the dependency ratio of the elderly population increased by 10.12% in the central region, 6.84% in the western region, and only 6.5% in the eastern region, which is significantly lower than the growth rate of the dependency ratio of the elderly population in the central and western regions, indicating that the population aging rate in the eastern region is relatively slow.

2.2. Characteristics of Population Aging

2.2.1. Population Aging is Developing Rapidly

By 2021, China's total population is about 1.4 billion, including more than 200million elderly people. The elderly population base is relatively large. As early as 2000, China's total population was about 1.267 billion, and the elderly population was about 88million, accounting for about 7% of the total population, which has reached the standard of an aging society. In 2021, the elderly population will account for 14.20% of the total population. In just 21 years, the proportion of the elderly population has more than tripled, and aging is developing rapidly.

2.2.2. It is Characterized by "Getting Old before Getting Rich"

In 2000, the per capita GDP was 7942 yuan, and the elderly population was about 88million. In 2021, the per capita GDP will be 80976 yuan, an increase of 73034 yuan over 2000, with an average annual increase of 3478 yuan. In 2021, the elderly population was about 200million,

an increase of 112million over 2000, with an average annual increase of 5.33 million. In the past 22 years, the growth rate of China's per capita GDP is much slower than that of China's aging population.

2.2.3. Showing the Characteristics of Regional Differences

By 2020, excluding the data of Taiwan, Hong Kong and Macao, among the remaining 31 provinces and cities in China, 14 provinces and cities have an elderly dependency ratio of more than 20%, of which Chongqing is the highest and Tianjin is the lowest; There are 16 provinces and cities where the dependency ratio of the elderly population is more than 10% and less than 20%, of which Shaanxi is the highest and Xinjiang is the lowest; Only the Tibet Autonomous Region has a dependency ratio of less than 10% of the elderly population, which is 8.1%, the lowest among 31 provinces and cities; The dependency ratio of the elderly population in Chongqing is 25.5%, the highest among 31 provinces and cities. In general, the population aging phenomenon in the eastern and central regions is obviously more serious than that in the western regions.

3. Theoretical Analysis

3.1. The Impact of Population Aging on Economic Innovation

The premise of economic innovation is scientific and technological innovation, and technological innovation is inseparable from human capital. With the aggravation of the aging population in China, the number of young, energetic and highly active workforce is decreasing. In order to improve this phenomenon, it puts forward high requirements for the increase of human and capital. The constituent elements of human capital are the relevant knowledge and skills that workers need to have and use when facing problems, the cultural level and special technical level corresponding to the educational requirements of workers, and the physical and psychological health status of workers. According to the life cycle theory, although people have no viability at birth, their learning ability increases with age from early childhood, and then decreases with age when they reach a certain age. Unlike decades ago, when people rushed to meet their basic living needs, such as having enough to eat, in today's era, people live a stable life, pursue more spiritual satisfaction, and have a stronger thirst for knowledge. People's education level is improving, and people pay more and more attention to the status of Education in modern society. Therefore, the quality of human capital has been effectively guaranteed, which provides a prerequisite for innovation. Moreover, the knowledge and skills of workers are learned in school when they are young, then used in the society, and finally eliminated after scientific and technological innovation. The same is true of cultural and technological level. For the health status, the body changes from weak in childhood to strong in young adults and then to weak in old age. Therefore, the whole life cycle of human capital can be summarized as a process from less to more and then decline. On the other hand, some researchers believe that young people have a higher degree of thinking activity, their thinking is more jumping, and they are the main source of scientific and technological innovation. It seems that the proportion of young people is reduced due to the aging of the population. However, when the aging of the population reaches a certain degree, a "forced mechanism" may appear to promote technological innovation, so as to stabilize the innovation of the whole society and make China move towards high-quality and high-level economic development. Therefore, the aging of the population will play a certain role in technological innovation, and then promote the high-quality development of China's economy [4].

3.2. The Impact of Population Aging on Coordinated Development

China's population aging is characterized by "getting old before getting rich", which is reflected in the imbalance between China's population and economic development. The most direct

result of population aging is the change of China's population age structure and the disharmony of population, economy and environment, which further affects the sustainable development of China's economy. The disharmony is reflected in the following aspects: in terms of consumption, China's elderly population has increased, that is, productivity has decreased, while elderly consumers have increased. The increase of social demand for the elderly will drive the transformation and upgrading of the elderly industry, thus driving economic growth. In terms of saving, compared with young people, the elderly have higher motivation to save because of their physical health. At the same time, the elderly do not have much desire to spend in other aspects except for the necessary consumption in daily life. They are more willing to save money at this time. Therefore, with the increase of the elderly population, China's savings rate shows an upward trend. In terms of the income of urban and rural elderly residents, as China is still in a developing country and the social security system is not sound enough, the income of urban and rural elderly people in China is different. Most urban elderly people are retirees, who can not only receive pensions, but also retirement wages. However, most rural elderly people can only receive pensions, which has resulted in the widening gap between urban and rural rich and poor. However, as the consumption level in cities and towns exceeds that in rural areas, the gap between the rich and the poor in cities has been reduced to a certain extent. Therefore, on the whole, the impact of population aging on coordinated development is not obvious [5].

3.3. The Influence of Population Aging on Green Development

The impact of population aging on green development is reflected in the ecological environment and energy resources. In terms of ecological environment, influenced by the living habits and personal consumption preferences of the elderly, the elderly have a stronger awareness of environmental protection than the young. Secondly, due to physical reasons, the elderly often have a high pursuit of high-quality air environment, which makes the government need to make a difference in improving environmental pollution and creating a high-quality living environment, which will further promote the government to strengthen the management of the ecological environment and promote the stable and orderly green development of our country. In terms of energy resources and production, the direct consequence of the aggravation of China's aging population is the decline of the proportion of labor force, and the progress of science and technology. The impact of the two is to curb the consumption of energy resources. In terms of life, the rise of living standards, the improvement of people's demand and economic development has indirectly promoted the consumption of energy resources. In general, China's aging population promotes green development [6].

3.4. The Impact of Population Aging on Open Development

Population aging indirectly affects the economic open society mainly through its behavior in economic activities, which is mainly reflected in personal current account balance and import and export trade. As for the current account balance, its balance is also directly affected by consumption and deposits. The direct consequence of aging is the decline in the proportion of labor force, and the overall social savings will decrease. Therefore, the aging of the population has formed a great downward pressure on social deposits, which also indirectly affects the balance and interest of individual current accounts. In terms of import and export trade, because China's labor-intensive industry has not completely become a capital intensive industry, the decline of labor force will affect China's import and export transactions, the degree of foreign investment openness will decline, and the trade balance will increase. The reduction of the proportion of China's labor force will certainly promote the optimization of China's industrial structure, promote the transformation of China's labor-intensive industries into capital intensive industries, promote China's economic development, and offset some of its negative effects. On the whole, the impact of population aging on economic development is not obvious.

3.5. The Impact of Population Aging on Shared Development

Due to the increase of the total elderly population, the proportion of China's labor force is gradually decreasing, which directly leads to the reduction of China's total social income and the decline of the proportion of income sources of the elderly population, which is prone to create difficult classes and lead to the widening gap between the rich and the poor in China. However, the formation of poor groups is easy to promote the improvement of China's social security system structure and form the elderly welfare mechanism. For example, some public policies focus on the elderly, take the use of the elderly as the consideration standard for the use value of labor products in the production process, increase the proportion of pension, increase the contribution rate of medical insurance, etc. The accumulation of social wealth among the young and middle-aged groups is transmitted to the elderly through tax, pension and other methods, which not only improves the average distribution of social property, but also reduces the gap between the rich and the poor, thus increasing the sharing of social security. From this point of view, the problem of population aging has promoted the high-quality development of China's economy and society [7].

4. Measurement and Analysis of High-quality Economic Development Level

4.1. Construction of Measurement Index System

Developing economy with high quality refers to a sustainable development with low product investment requirements and high resource allocation. Paying attention to product quality and economic benefits is the main trend of the development of market economy at present. Therefore, we have built a high-quality economic development level measurement system from the five aspects of technological innovation, coordinated development, green development, open development and shared development. This paper constructs five first-class indicators and eighteen second-class indicators, most of which are obtained from the National Bureau of statistics, and a few are obtained through calculation.

(1) Innovative development. Science and technology is the main source of strength for a country's economic development, and science and technology is an important means for a country to promote economic and social development. Scientific and technological innovation plays a vital role in high-quality economic development. In order to ensure the steady progress and high-quality development of China's economy, the state has invested a lot of funds and human capital in scientific and technological research and development. The paper selects three indicators such as total R&D expenditure to evaluate the development level of China's scientific and technological innovation

(2) Coordinated development. Coordinated development is the guarantee for China's sustainable economic growth. Although China's economy as a whole has been in a state of stable growth, there is still a large gap between the economies of various regions. There are many problems, such as the obvious gap between the rich and the poor between urban and rural areas, the conflict between the natural environment and social production. Coordinated development can effectively deal with these imbalances in economic development and promote the establishment of a harmonious society in China. This paper selects four indicators such as urbanization rate to measure the level of coordinated development in China.

(3) Green development. The goal of green development is to make people and nature coexist harmoniously, which is a development model with long-term significance. With the rapid development of the domestic market economy, the problems of environmental pollution and the consumption of various resources have become a stumbling block to the sustainable development of the domestic market economy. The Fifth Plenary Session of the 18th Central

Committee of the Communist Party of China clearly pointed out the concept and mode of scientific economic development, stressed that the government must pay attention to and protect nature, make rational and full use of various resources, and regard the combination of economic development and ecological environment as a major strategic model to promote the sustainable development of the whole Chinese society. The development of green economy should promote the high-quality and healthy development of China's economy and society from the aspects of resource conservation and environmental governance. This paper selects three indicators such as forest coverage to measure the level of green development in China.

(4) Open development. Since the reform and opening up, China's comprehensive national strength and international status have been continuously improved, which proves that open development is an inevitable requirement to promote high-quality economic development and improve the country's comprehensive strength. Opening to the outside world will help spread our culture to all parts of the world and improve our international influence; It will help to form a trade interaction mechanism and form a new pattern of mutual integration and mutual promotion; It will help to form a domestic and international double cycle, and promote the high-quality development of China's economy. This paper selects four indicators to measure the level of China's open development: export volume, import volume, the balance of goods import and export trade, and the calculation of foreign trade dependence.

(5) Shared development. Shared development is a prerequisite for achieving common prosperity. China implements the people-oriented development concept, puts the common interests and requirements of all the people in the first place, and the fruitful achievements of scientific and technological progress and economic and social development are shared by the Chinese people. Sharing the stable role that development provides for high-quality economic development. This paper selects four indicators such as the number of medical and health institutions per capita to measure the level of shared development in China.

4.2. Measure Method

Using the above high-quality economic development measurement system, the high-quality economic development indicators of China from 2004 to 2020 are calculated. First, the data are standardized according to the different indicator types, and then the standardized data are translated, and then the entropy weight is calculated.

$$\text{Standardization: } Y_{ij} = \begin{cases} \frac{X_{ij} - \min(X_{ij})}{\max(X_{ij}) - \min(X_{ij})}, & X_{ij} \text{ is a positive indicator} \\ \frac{\max(X_{ij}) - X_{ij}}{\max(X_{ij}) - \min(X_{ij})}, & X_{ij} \text{ is the inverse index} \end{cases}$$

$$\text{Translation: } T_{ij} = Y_{ij} + 0.0001$$

$$\text{Calculate } P_{ij} \text{ value: } P_{ij} = T_{ij} / \sum_{i=1}^n T_{ij}$$

$$\text{Calculating information entropy: } E_j = -\frac{1}{\ln n} \sum_{i=1}^n P_{ij} \ln(P_{ij}), \text{ where, } 0 \leq E_j \leq 1$$

$$\text{Calculation } G_j \text{ value: } G_j = 1 - E_j$$

$$\text{Calculate entropy weight: } W_j = G_j / \sum_{j=1}^m G_j, j = 1, 2, \dots, m$$

Finally, the linear weighting method is used to calculate China's high-quality economic development index from 2004 to 2020.

4.3. Measurement Results and Analysis

4.3.1. National High-Quality Economic Development Level from 2004 to 2020

The high-quality development level of China's economy has been gradually rising, from 0.1325 in 2004 to 0.8764 in 2020, an increase of 6.6 times. Through the measurement of high-quality economic development level, it is found that among the above 18 indicators, the three

indicators with the highest entropy weight are forest coverage, per capita sulfur dioxide emissions and foreign trade dependence, which are 0.0838, 0.0834 and 0.0856 respectively, indicating that these three indicators have the highest contribution rate to high-quality economic development level.

4.3.2. High Quality Economic Development Level of All Provinces in China

The high-quality economic development level of all provinces in China (excluding Taiwan, Hong Kong and Macao) has improved in general from 2015 to 2019. In 2015, among the 31 provinces, Tianjin had the highest economic high-quality development index and Sichuan had the lowest; In 2017, Shandong had the highest economic high-quality development index and Hainan had the lowest; In 2019, the highest high-quality economic development index is Sichuan, and the lowest is Tianjin. In these five years, Sichuan has the fastest and Tianjin has the lowest rate of high-quality economic development. Generally speaking, the economically developed regions have a higher level of high-quality economic development due to the high degree of openness, talent accumulation and other factors, while the economically underdeveloped regions have a lower level of high-quality economic development due to the low level of science and technology, sparse talent and other reasons.

5. Empirical Analysis

5.1. Variable Selection and Data Collection

(1) Select the variable. In this paper, the high-quality economic development level index is selected as the explanatory variable. There are five explanatory variables, namely, the child dependency ratio, the elderly dependency ratio, and the number of employees in the primary, secondary and tertiary industries.

(2) Data collection. In order to estimate the model, this paper selects the data of China's child dependency ratio, elderly dependency ratio, primary, secondary and tertiary industries from the National Bureau of statistics from 2004 to 2020, and obtains the high-quality economic development index according to the above.

5.2. Model Construction and Statistical Test

5.2.1. Model Building

In this paper, the software Eviews is used to analyze by using the multiple linear regression model in econometrics.

$$Y = C + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5$$

Where, Y is the high-quality economic development index, X1 represents the child dependency ratio (unit: %), X2 represents the elderly dependency ratio (unit: %), X3 represents the number of people employed in the primary industry (unit: 100 million), X4 represents the number of people employed in the secondary industry (unit: 100 million), and X5 represents the number of people employed in the tertiary industry (unit: 100 million).

Use Eviews software to generate Y, X1, X2, X3, X4 and X5, and use these data to perform OLS regression on the model.

5.2.2. Statistical Test

According to the regression results, the determination coefficient of the model is 0.995, indicating that the model has a good fitting degree to the data. At the significance level of 5%, the p value of F test is 0, and F test passes. For the five explanatory variables, T-test of X1 passed, and T-test of other explanatory variables failed.

5.3. Econometric Test

The variance expansion factor method of Eviews software is used to test the multicollinearity of the model. It can be seen that the Vif values of the five explanatory variables are 13.95, 90.06, 3496.01, 248.16 and 1795.98 respectively, which are greater than 10, indicating that the model has serious multicollinearity problems. The stepwise regression method is used to eliminate the two explanatory variables of the number of employed people in the primary industry and the number of employed people in the secondary industry. The multicollinearity is eliminated, and a new regression equation is obtained with the child dependency ratio, the elderly dependency ratio and the number of employed people in the tertiary industry as the explanatory variables and the high-quality economic development index as the explanatory variables. The regression equation passed the F-test and the t-test of the three explanatory variables. The newly obtained regression equation is tested for heteroscedasticity by white test. The value of nR^2 is 13.9, and its p value is greater than 0.05, so there is no heteroscedasticity. Since the DW value of the newly obtained regression equation is 1.435, at the significance level of 0.05, when the number of explanatory variables $k=3$ and the sample size $n=17$, $d_L = 0.897$, $d_U = 1.710$, then $d_L < DW < d_U$. It is uncertain whether there is autocorrelation. The LM Test method is used to test the autocorrelation. The value of nR^2 is 1.818, and the p value is greater than 0.05, so there is no autocorrelation. Therefore, the modified model is

$$Y = -0.2328 - 0.0197X_1 + 0.0537X_2 + 0.1598X_5$$

5.4. Conclusion

From the above empirical analysis, it can be clearly seen that 0.0537 is the influence coefficient of China's elderly population dependency ratio on the level of high-quality economic development, and it is positive at the significance level of 0.05, indicating that population aging plays a role in promoting high-quality economic development. Although China's aging population is increasing, the proportion of the elderly is very small, which shows that most of the elderly can still take care of themselves. Some of them have a healthy body, superb work skills and years of work experience. These elderly people can still be re employed, continue to contribute to the society and promote the progress of China's scientific cause.

6. Suggestions

6.1. Give Full Play to the "Talent Bonus" Brought by the Aging Population

The high-level talents in the aging population have rich career experience and superb work skills, which are rare among young people. These are the precious wealth of the society. The large amount of experience accumulated by the elderly in their own work field and the skills explored through practice can be taught to the young people in the new era through social re employment, so as to cultivate a number of capable, responsible and responsible successors for the country in the new era. Moreover, the reemployment cost of the elderly is low, and they do not need to adapt to the working environment. Their high-tech working ability can create more value for the society faster, and promote scientific and technological progress and high-quality economic development. Therefore, the state should build a comfortable reemployment platform for the elderly on the premise of ensuring their physical and mental health, so that they can continue to promote the development of the times. At the same time, the state should improve and perfect the reemployment welfare mechanism for the elderly, encourage more elderly people to reemploy, and continue to shine in their own fields.

6.2. Guide and Attach Importance to the Healthy Development of the Elderly Industry

Under the inevitable trend of population aging, the actual needs of the elderly for themselves are increasing, which puts forward requirements for the upgrading of the industrial structure of the elderly. From the perspective of demand, with the increase of the elderly population, the demand for medical care, elderly entertainment and elderly care is also increasing. For example, the elderly have a greater demand for walking aids such as crutches and wheelchairs if they are unable to move; The elderly who have entered the aging stage have strong interest in Universities for the elderly and various entertainment facilities for the elderly; The elderly with poor health have a great demand for rehabilitation centers and medical facilities. The state should vigorously support and guide the development of these industries and give the elderly a high-quality pension life. In terms of supply, enterprises and society, as suppliers, should respond to national policies and implement some favorable behaviors under the premise of legal permission, such as hiring professional talents, injecting new impetus into the elderly industry, improving the internal promotion mechanism of enterprises, attracting more people to enter the elderly industry market, providing high-quality services to drive the consumption of the elderly, and building a complete industrial chain, Promote the development of domestic industries for the elderly and drive the sustainable and stable development of the economy. The government should improve relevant laws and regulations, formulate corresponding preferential policies to reduce taxes and financing, increase the investment of financial funds, ensure the healthy development of the elderly industry, and build a contemporary domestic elderly industry system.

6.3. Improve the Social Security System

The aging population has risen rapidly, forming a huge potential consumer market. However, due to the physical condition of the elderly, they often do not choose to spend most of their money except for the necessary consumption in daily life. Their consumption concept is "save as you can", and they choose to save more money to prevent the future situation of being ill with no money to cure or the situation of being unable to do anything in case of major accidents in the family. One reason for this phenomenon is that China's social security system is not perfect. China's old-age security system is not the same in urban and rural areas. The medical security system in rural areas is not sound enough. It is difficult and expensive to see a doctor, and there are many problems, such as the medical equipment is not advanced enough, and the medical expenses cannot be reimbursed in different places. The state should solve this problem as soon as possible so that rural areas can enjoy the same level of medical security as cities. Secondly, with regard to old-age insurance, the state should accelerate the reform of the old-age insurance system, promote the process of national integration, and ensure that the basic old-age insurance can meet the basic living security of the elderly. The state should deepen the reform of the social security system to ensure that the elderly can rely on them in their old age. Only in this way can the elderly have no worries behind them. They can use their savings for consumption and improve the quality of life of the elderly, which is conducive to improving the consumption level of residents and driving high-quality economic development.

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