

Analysis of the Relationship Among China's Population Growth Rate, Technological Dynamics and Labor Income in the Past Few Years

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ABSTRACT

The increase and decrease of population not only have an important impact on a country's economy, but also have a profound impact on the country's technological progress and labor income. This paper discusses the relationship and connection among the population growth rate, technological development and labor force using the data of the past few years. The authors analyzed the specific connections between the three variables in detail, and used data analysis to reveal the relevance between China's population and technological dynamics, the technological effects of China's economic integration into the world, and the possible impact of non-globalization trends.

Keywords: Population growth, Technological dynamics, Labor income.

1. INTRODUCTION

Since the 2008 financial crisis, especially the pandemic that broke out in 2020, trade protectionism has risen, and the power of deglobalization has become stronger and stronger around the world. In terms of economy, deglobalization is mainly manifested in the weakening of global trade and the reindustrialization of developed countries. The pandemic has strengthened the government's efforts in promoting the administrative level. The pandemic has also strongly influenced China's export trade. In the face of deglobalization, China has proposed the One Belt One Road initiative and a community of shared future. As economic development, promotion in technology, population growth are closely related, we thus use data to analyze their relationships so as to give suggestions for stable development in the future.

1.1. China's Population Growth Slows Down

From the perspective of total population growth in China, in recent years, China's population continued to increase, but the growth rate was relatively stable, maintaining at about 0.5%. By the end of 2020, the total population of Mainland China (excluding Hong Kong, Macau Special Administrative Region, and Taiwan Province) was 14.1 billion, with an increase of 0.31%

compared with 2019. With a large population base and the liberalization of the two-child policy, China's total population will continue to rise slowly in the future.

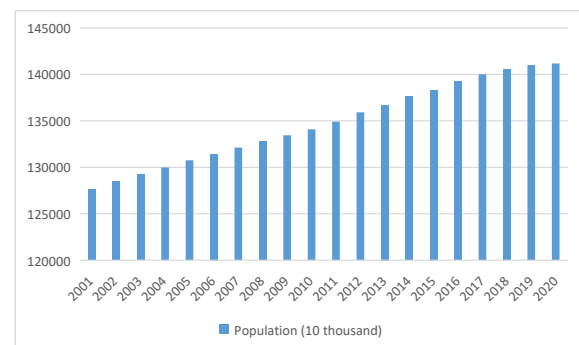


Figure 1 Population of China (2001-2020)

Since 2011, the proportion of China urban population has exceeded 50%. From 2001 to 2020, China urban population continued to increase, from 480.6 million in 2001 to 902.0 million in 2020. The increase in the proportion is obvious. By 2020, the urban population has accounted for 63.89% of the total population. Higher urbanization will have two diametrically opposite effects on China's population. First, the increase in the urbanization rate will increase the income level of residents as well as their ability to raise children, thus the total population will increase. The increase in the

urbanization rate has to some extent changed the young generation's understanding. The increasing independence and the small increase of the DINK (referring to young couple who do not want to have children) family are not conducive to the growth of the total population. At this stage, the impact of urbanization on the total population is higher than that of the former.

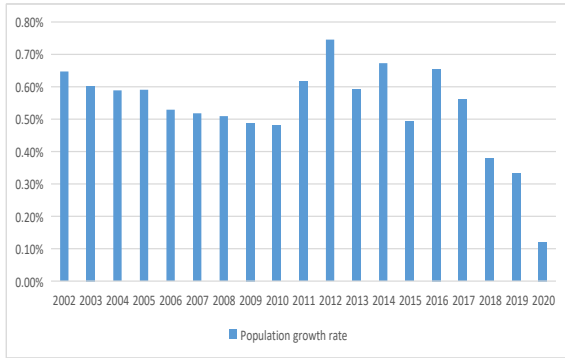


Figure 2 Population growth rate of China

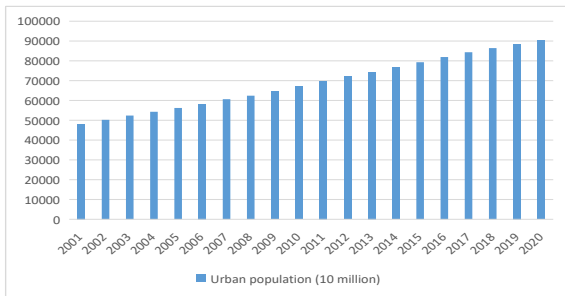


Figure 3 Urban population in China

1.2. Age Is Increasing, And The Demographic Dividend Is Gradually Disappearing

The so-called "demographic dividend" refers to the fact that if the working-age population of a country accounts for a large proportion of the total population, and the dependency rate is relatively low, there will be favorable demographic conditions for economic development. The entire country's economy is characterized by high savings, high investment, and high growth rate.

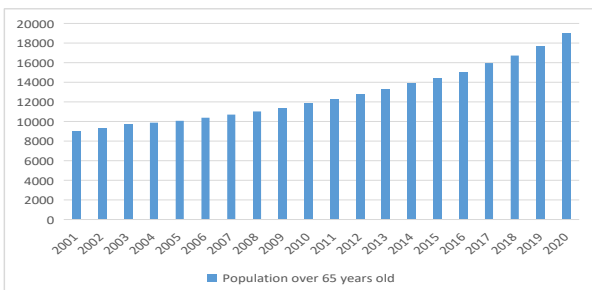


Figure 4 Population over 65 years old in China

The current retirement age in China is 60 years old for men and 55 years old for women. From 2011 to 2020, the number of people aged 15-64 in China decreased year

by year, from 1000.4 million in 2011 to 967.9 million in 2020, and the proportion of the population in this age group fell from 74.40% to 68.55%.

From 2011 to 2020, the number of people aged over 65 in China increased year by year, reaching 190.6 million in 2020, accounting for 13.50% of the of the country total population that year. In recent years, the domestic population problem has gradually emerged, basically showing that labor is intensified, the demographic dividend is gradually disappearing, and the social reality of gradually increasing pressure on young and middle-aged people is presented.

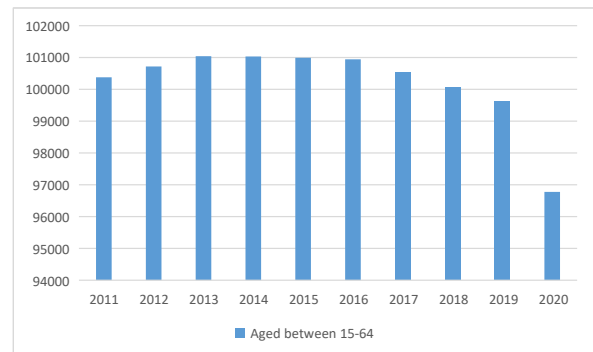


Figure 5 Population between 15-64 years old in China

The concept of solidification has changed, and the proportion of men and women in the population tends to stabilize. Since 2006, the imbalance in the ratio of men to women in China has eased year by year, and the ratio of men to women in the total population has fallen for 12 consecutive years. According to the data analysis in the table below, the male population in China has decreased year by year compared with the female population in 2011-2017. The difference in the number of male and female populations has decreased from 37.17 million in 2011 to 34.90 million in 2020. We are subject to the influence of thousands of years of traditional ideas, although the annual difference between the male population and the female population is high. However, it can still be clearly felt that the concept of the gap between men and women is gradually fading in the new era.

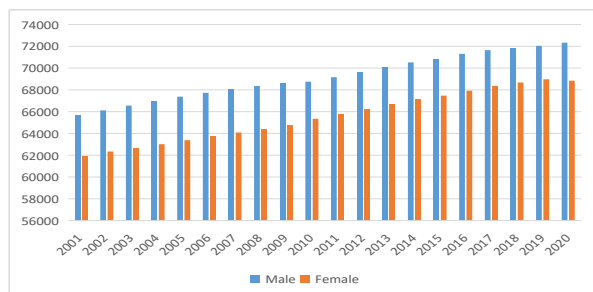


Figure 6 Male and female population in China

We found that the male to female ratio for every 100 women has a significant downward trend. The sex ratio of men to women in 2020 is 105.07:100. In recent years,

as people's concepts have changed, the awareness of equality between men and women has gradually increased, and the sex ratio between men and women has gradually decreased. However, the "patriarchy" thought that has been solidified for thousands of years still exists. In the future, with the improvement of the economic level and the change of ideological concepts, the gap in the proportion of men and women will be further reduced.

Although the gender differentiation is weakening, and the national population crisis still cannot be underestimated

At this stage, China is facing the reality of increasing elderly people and a low fertility rate. China's population aging and declining birthrate coexist in the current development situation, and the population crisis cannot be underestimated. However, based on the huge domestic population base and the proportion of the population in childbearing age, the total population of China will continue to increase steadily in the future; the liberalization of the comprehensive two-child policy and the idea of delaying the retirement age can alleviate the aging to a certain extent. We have found that social problems such as pension overdrafts caused by intensified urbanization. In addition, as people's perceptions are changing, the trend of gender differentiation will gradually weaken, but it will still have a more profound impact in the short term.

2. TECHNOLOGICAL CHANGES BETWEEN 2014-2019

Since the reform and opening up, China has been continuously committed to pursuing technological development in order to improve its economy. These scientific achievements are mainly reflected in the field of artificial intelligence, agricultural technology, information technology, and transportation.

In 2020, the country invested a total of 2442.6 billion yuan in research and experimental development (R&D), an increase of 228.2 billion yuan or 10.3% over the previous year. Innovation is the primary driving force for technological development, and technological innovation serves as the strategic support to the modern economic system [1]. In the early stage, China set the goal of building a strong country in science and technology and realizing modernization, so the development of science and technology has become an important part of China's economic investment since 2014. 3D printing, wearable smart devices, the Internet of Things, robots, and other terms have appeared in people's lives. This is because in the past five years of technological development, people have been constantly developing Internet+, intelligence, and artificial intelligence. Well-known companies including Huawei and Alibaba are also responding to the call and launching their own cloud platforms and cloud services, letting the Internet enter the

"cloud" era [2]. In addition, as the autonomous car industry has entered the 21st century, many Chinese companies have been devoting themselves to the research and development of autonomous car technology.

In agriculture area, Yuan Longping's hybrid rice has increased its production by 600 million tons so far. The introduction of genetically modified technology has brought good news for the prevention and control of plant diseases and insect pests as well as the off-season cultivation of crops. This also provides a material basis for population growth. New transportation modes such as high-speed trains, light rails, subways, and suspension trains have sprung up, and air transportation has been further developed. This greatly shortens the transportation distance, reduces transportation costs, and increases people's income.

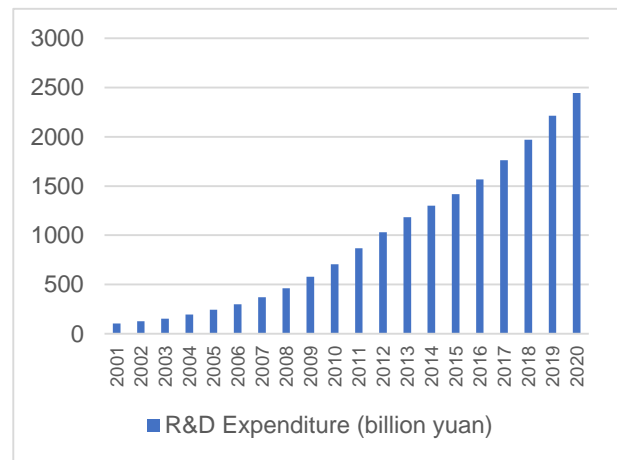


Figure 7 R&D expenditure in China.

China has been investing huge funds in research and innovation activities, which is a core indicator to measure the country's innovation capability. Considering the combination of technology and economy, China's R&D investment intensity is still in the stage of rapid improvement compared with other countries, and its international ranking is improving. Although the growth rate of China's R&D expenditure has dropped slightly in recent years, it is still much higher than that of the United States, Japan, and Europe. In 2013, China's total R&D funding input surpassed Japan, becoming the world's second largest R&D funding country, and the gap compared with the United States was rapidly narrowing. China is transitioning from the stage of rapid growth to the stage of high-quality development, and the construction of technological power has provided important support for economic enhancement.

3. LABOR INCOME

Generally, as GDP continues to rise, gross national income also specifically rises along with GDP. From 2010-2017, the share of labor income in GDP in China has been decreasing significantly. This is literally because when GDP (economic development) growth

slows down, capital income would grow faster than labor income.

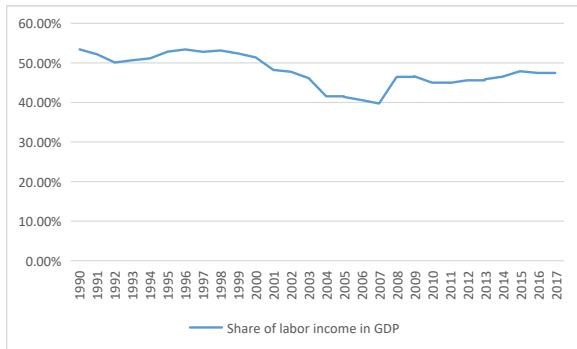


Figure 8 Share of labor income in China

Labor income and economic development was found to be strongly correlated. The capital income (absolute value) is time-dependent and would accumulate with the rolling interest. This means that as GDP continues to rise, the total income also rises. In the last decade, the share of labor income in China's GDP has been decreasing in a subtle way. Capital is highly mobile, while labor is usually subject to various sort of physical constraints. Capital can choose to flow to areas where yields are higher or even go abroad, and can be guaranteed to eat risk-free interest. However, labor supply is not only limited by physical scope, but also by the age of the worker, showing how definitely capital mostly is highly mobile [3,4]. Especially during the economic crisis, because of the high mobility of capital, some people can successfully bottom out quality assets and essentially realize the redistribution of capital. However, this is definitely irrelevant to the proletariat.

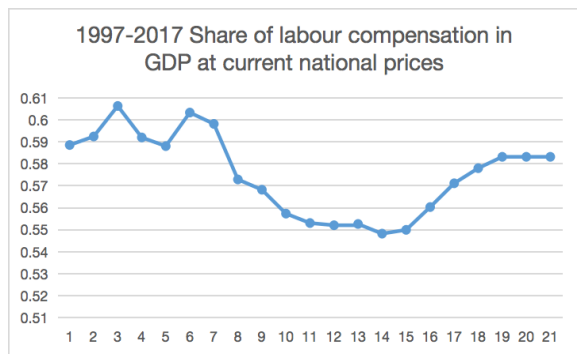


Figure 9 Share of labor compensation in GDP

4. CONCLUSION

In the past few decades, China has relied on its huge population and some of its policies to achieve rapid development in the fields of technology and economy, allowing China's labor force to increase their income.

High population spurs technological change because it increase the number of potential inventors. Technological progress increases labor's income, but high income affect the rate of population [5]. Population

and technology are closely related. China's economy has continued to grow in the past four decades. One of the widely accepted core factors is that the reform and opening-up have transformed the demographic dividend into productivity. The working-age population continues to grow, the supply of labor is sufficient, and the return on capital and total factor productivity have increased. China has long remained the world's most populous country and the second largest economy, and there is a great correlation between the two. Population dividends need to match economic conditions. Only when a series of economic and social development decisions match population dividends can the population dividends be stimulated and transformed into economic dividends. In the early stage of China's reform and opening-up, the supply of labor was almost unlimited, and the labor price was very low, which created a good population opportunity [6]. At the same time, reform and opening-up promoted the free flow of labor, introduced a large amount of foreign capital, and formed a labor-intensive industrial structure [7]. The match between the two enabled China to reap the first demographic dividend by relying on the high labor participation rate, creating a miracle of economic growth. In the future, China's demographic dividend will not disappear, but will transform. China's economy can no longer rely on labor-intensive industries, and must transform to rely on capital-intensive, financial-intensive, and technology-intensive industries. In such an environment, China's industry development depends more on technological development and the quality of labor.

Over the past two decades, China has implemented the one-child policy, which has slowed down China's population growth. It also has a negative impact on China's economic and technological development. China's fertility level has also increased after the liberalization of the two-child policy in 2015 [8]. In 2021, China has liberalized the three-child policy and regulated the tax rate of real estate, and limiting the growth of housing prices. The purpose is to increase China's population growth rate in order to cope with the economic recession caused by the decline in the population in the next few decades.

As for the extent to which these measures implemented by the Chinese government will affect the extent of population growth, how many future changes in population growth will affect the development of economics and technology, and how technological development will increase China's labor income and how will it affect China's economy, Whether the conclusions drawn in this article are applicable in the future. It will take us decades to study.

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