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Changes in the Structure of the Employment Population in China (2010-2020)

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Abstract: *Demographic changes have a profound impact on the labor market. From 2010 to 2020, due to changes in age, gender, education level, industry, and other aspects, the labor market presents four trends: (1) The proportion of the working age population in China decreases year by year, population ageing becomes more serious, and the 'demographic dividend' gradually disappears. (2) The higher education employment population tends to be younger and more concentrated, and the "demographic dividend" is transforming into the 'brain dividend'. (3) The level of female education has improved faster than men, and the number of young women in higher education level is higher than that of men, so the "gender dividend" arrives. (4) As more women enter the labor market, all industries require higher levels of female education. As the working population is getting younger education, higher education and higher female labour participation rate, China has ushered in the "human brain dividend" and "gender dividend".*

Keywords: *China's employment population structure; Demographic dividend; Human brain dividend; Gender dividend*

1. Introduction

Nowadays China is in a critical period of change in population structure and economic transformation, complex changes in population structure lead to changes in the population structure of the labor force in the market. In the 40 years of reform and opening-up, the "demographic dividend" brought by rapid population transformation has brought an economic growth miracle to China[1]. At the same time, the continuous low fertility rate and the process of aging of the population promote the historical inflection point of negative growth of the working population[2]. Since the 21st century, the aging phenomenon has accelerated in China, and the advantages of the quantity and structure of the labor force have begun to disappear year by year[3]. Compiled by China Statistical Yearbook 2022, In 2021, the employment elasticity of the value added of the tertiary industry is only -0.0428, and that of the secondary and tertiary industries is only 0.03, indicating that China's "demographic dividend" is gradually disappearing. This is consistent with the current academic research results[3]. Although the state has adopted a series of policies to optimize the change of the population structure, such as economic transformation and upgrading and adjustment of the industrial structure[2], the labor market structure of China is still faced with a severe situation.

The working-age population of a country is the most creative and productive group in its total population and is the core force involved in national economic development[4]. At present, most studies of the employment population structure in the academic circle focus on the "demographic dividend"[3], economic growth[4], labor supply[2]and other aspects, but most studies focus on the external influencing factors of the employment population structure and ignore the detailed exploration of the internal relationship of the employment population structure. In recent years, against the background of the gradual disappearance of the "demographic dividend", some scholars began to explore the "gender dividend" and "brain dividend" on the basis of the "demographic dividend". The "gender dividend" theory pointed out that by realizing gender equality, increasing the number of female population participating in paid labor and improving the level of female productivity, higher social and economic benefits would be generated. Studies have pointed out that women will become the main driving force of economic growth in the 21st century[5]. The theory of the "human brain dividend" points out that the fundamental of current population optimization lies in education, and the educational level of the labor force can promote economic growth[6]. Existing discussions on the "demographic dividend" and "gender dividend", while those related to "demographic dividend" often lack a gender perspective, studies on the "gender

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dividend" lack attention to age structure. Data on the "brain dividend" are scarce and not easy to study. Employment population structure is related to sustained growth of the national economy[4]. The sustainable development of the "demographic dividend" should be further explored; However, there is a gap in this respect in existing research. Based on this, it is particularly important to explore the characteristics of the current employment population structure in China. Based on the aging population database in the CSMAR data in 2010 and 2020, this paper explores the structural characteristics of the current employment population and the changing trend of demographic dividend from four aspects: age, gender, education level and industry.

2. Employment Demographic Characteristics Changes Analysis

2.1. Age and gender of the working population

The main trend of population change in China in the new era is the aging of the population. At the same time, the sex ratio of the population of all ages has also changed. In 2010, 17.41% of the population was aged 0-14, 74.34% were aged 15-64 and 8.24% were aged 65 or older. Among them, in the age structure of 0-14 years, the number of females was 116,082,200, accounting for 46.50% of the total number of females. In the age structure between 15 and 64 years old, there were 477.7880 million females, accounting for 48.75% of the total population in this age group. In the age structure of 65 years and above, there were 56,405,600 females, accounting for 52.22%. In 2020, 17.71% of the population will be aged 0-14, 70.32% will be aged 15-64, and 11.97% will be aged 65 or above. Among them, in the age structure from 0 to 14 years old, the number of females was 116,460,300, accounting for 46.6% of the total number at this age. In the age structure of 15-64 years old, there were 48,107,500 females, representing 48.49% of the total number in this age group. In the age structure of 65 years and older, there were 89,710,467 women, accounting for 53.12%. Figure 1 graphically depicts the employment age structure of the current Chinese population presenting an inverted "U" shaped relationship. There are more men than women in the population aged 60 and under, and there are slightly more women than men in the population aged 60 and over, and the difference increases with age. In various studies, it has been shown that the life expectancy of females is higher than that of males, so the number of elderly females in society is generally higher than that of older men[5].

From 2010 to 2020, the aging of the Chinese population increased significantly. Although the base of working-age population increased, the proportion of population decreased from 74.3391% to 70.3199%, the total number of juvenile population showed a weak upward trend, and the number of elderly population increased significantly. The "demographic dividend" of China has disappeared year by year. According to the current population structure, with the age of the working-age population aged 15-65 years old, the aging trend of China will become more severe in the future. It will follow that the total population drops in China and finally the "demographic dividend" disappears.

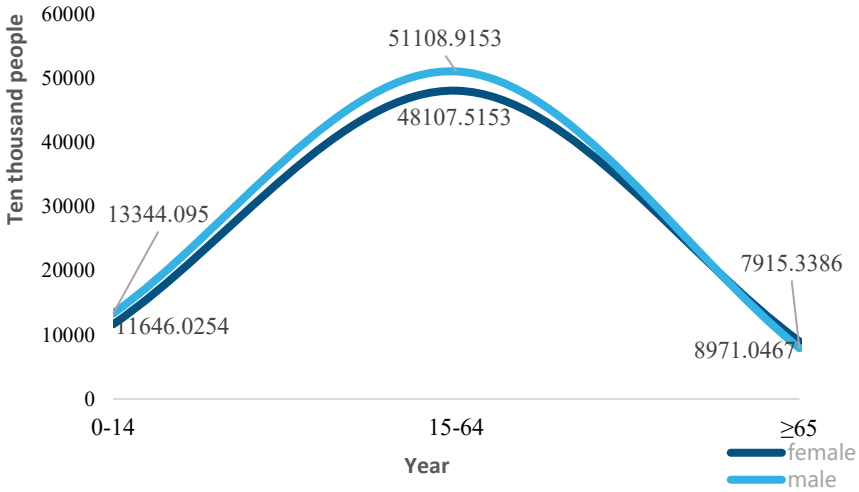

Figure 1: Age composition of China's population by gender in 2020

2.2. Education level, age and gender of the employed population

Since the People's Republic of China's compulsory education law and the China's education reform

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and development outline were successively promulgated and implemented in 1986, the nine-year compulsory education system has been popularized throughout the country, greatly improving the level of education of China and has an important impact on the structure of the educated population in China. In 2010, the employment population mainly concentrated in the age group between 20 and 49, accounting for 73.8% of the total number of employed people. The distribution of the educational level was different at different ages. In the employed population without schooling, the age is directly proportional to the structure of the employed population, and the younger the age, the fewer employed population. At this level of education, 72% of the working population is concentrated in the age group above 50. At the primary education level, 80.7% of the employed population is concentrated between 35 and 64 years old. In the junior high school education level, concentrated in the age of 20 to 49 years of employment population accounted for 81.6%. In high school education level, also concentrated in the age of 20-49 years of employment population accounted for 82.4%. In the level of college education, the employment population concentrated in the 20-44 age group, accounting for 81.3%. At the undergraduate education level, the employment population concentrated in the 25-44 years of age, accounting for 85.2%. In the postgraduate education level and above, the employment population is distributed in the age group of 25 to 49, and is more concentrated, accounting for up to 92.9%. In 2020, the age structure of the working population is mainly between 25 and 54 years old, accounting for 73.5% of the total population. The distribution of educational attainment is different at different ages. The employed population who have not gone to school is mainly concentrated in the age group above 65, and the employed population with this level of education accounts for 46.6%. With the decrease in age, the employed population who have not gone to school also gradually decreases, accounting for only 0.8% in the age group between 16 and 29. At the primary education level, 80.7% of the employed population is concentrated in the age group of 45 or older. The employed population with the junior high school education is mainly distributed in the age group between 30 and 54, accounting for 68.7%. Those with high school education are concentrated in the age group 25-29, accounting for 68.5%. At the level of college education, 79.4% of the employed population are concentrated in the age group of 20 to 44. However, the employed population with university undergraduate education is concentrated in the age group of 25-44, accounting for 74.1%. At the postgraduate education level or above, the employment population at the age of 25-44, which is also concentrated with the bachelor's degree, accounts for 82.8%.

From 2010 to 2020, the concentration degree of the total employed population is getting older and older. The age of the main employed population increases from 20-49 years old to 25-54 years old, and the overall age increases by about 5 years. However, it is surprising that the employment population with higher degrees in China is younger and more concentrated, mainly in the age group 25-44 years, and in 2020, there are fewer people under the age of 29 with low education (less than high school), which indicates that China is ushering in a "brain dividend".

Due to the solidification of the traditional concept of gender difference in society, there may be differences in the level of education of employees of different genders. Therefore, the adjustment effect of different genders on the age structure of employees under the same level of education is further discussed in detail. In 2010, the proportion of female workers who had not attended school was smaller than that of male workers at both ages 16-39 and 65 and older. This indicates that before the nine-year compulsory education system was promulgated and implemented, the educated group was mainly male, and the educational level of females was not valued by society. However, with the reform of the educational system and the promulgation of corresponding policies, the society also made progress and opened up, and female education was gradually popularized and men and women gradually equaled in the right to receive education. At the same level of education, there are different age demographics among employed persons of different genders. At the primary education level, the number of women aged 16-19 and over 55 is less than that of men. The age distribution of female and male in junior high school, senior high school, junior college, undergraduate and graduate schools is roughly the same, showing that female workers in higher education are younger than men. In general, women working in higher education mainly concentrate in the age group of 25-29, and the proportion of the same sex population is much higher than that of men. We can find that with improvement in education level, the structure of female proportion shows a younger trend. In 2020, the proportion of female workers aged 16-49 and 65 and older who had not attended school was lower than that of male workers, and the proportion of female workers aged 16-19 was close to zero, indicating that men and women have achieved equality in the right to education. At the primary education level, the proportion of females aged 16-34 and over 65 is lower than that of males. The proportion of female junior middle school students in 16-29 years old and over 50 years old is also significantly lower than that of male students, indicating that the education level of female working population has been greatly improved. The age distribution pattern of women and men in high school, junior college, undergraduate and graduate schools is roughly the same, showing that

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women with higher education are younger than men, but the concentration is lower than that in 2010. In general, female workers with higher education mainly concentrate in the age group between 25 and 34. In 2020, with the improvement of the level of education of women, the structure of the female proportion will become younger. From 2010 to 2020, the age structure of female workers in secondary education tends to be younger (16-49 years old), and the proportion of young women in higher education level (16-39 years old) is higher than that of male workers.

2.3. Industry, gender and education level of the employed population

The development of the industry is closely related to the education level of the labor force. The more educated the labor force is, the better its ability to learn and adapt, and the more it can give impetus to innovation, which in turn promotes productivity and increases the social economy. In the real society, employment refers to taking on the role of laborers in gainful labor positions. However, women pay much more in unremunerated labor than men and invest much less in gainful labor time. Gender employment difference prevails in all walks of life. In 2010, the education level of the employed population in all industries in China was mainly concentrated in junior high school, accounting for 48.8%, followed by primary school, senior high school, junior college, college, never attended school, graduate school, accounting for 23.9%, 13.9%, 6%, 3.7%, 3.4%, 0.4%, respectively. There are great differences in the educational level of the employed population in different industries under different genders. In the total industry analysis, female workers who did not attend school accounted for 5.2% of the total number of employed women, while male workers who did not attend school accounted for 1.9% of the total number of employed men. The proportion of female students with the primary education level is 27.6%, while the proportion of male students is 20.9%. Female students with junior high school education account for 45.8%, while male students account for 51.2%. Women accounted for 11.7 percent of those with high school education, while men accounted for 15.6 percent. Women accounted for 5.8% and men accounted for 6.1% at the college level. The proportion of women with a bachelor's degree is 3.6%, while the proportion of men is 3.8%. At the postgraduate education level, the females accounted for 0.3% and the male 0.4%. In 2020, the education level of the employment population in all industries is still mainly concentrated in junior high school, but compared to 2010, the concentration is decreased, accounting for 41.7%, other high school, primary school, junior college, college, never went to school, graduate students accounted for 17.5%, 16.3%, 11.3%, 9.8%, 2.4%, 1.1%.Broken down by gender, women who had not attended school accounted for 4.1% of female workers, while men who had not attended school accounted for 1.1% of employed men. The proportion of women with only a primary education level was 19.3%, compared to 14% for men. Female students with junior high school education accounted for 38.3%, while male students accounted for 44.3%. Those with high school education accounted for 15.2% of females and 19.2% of males, and those with junior college education accounted for 11.3% of females and 11.3 percent of males. The proportion of women with a bachelor's degree is 10.6%, higher than that of men (9.1%). Female post-graduate education represented 1.2%, higher than male students accounted for 1%.

In 2010, the proportion of female workers with low qualifications was higher than that of male workers in all industries, while the proportion of female workers with higher education was lower than that of male workers, and female workers in general were at a low level of education. In 2020, the structure of the female employment population in all industries will change dramatically. Although women with low education still account for the majority of female employees and are significantly higher than men, in higher education, the proportion of women with bachelor and postgraduate education is higher than that of men.

In order to further explore the differences of gender in various industries and continue to explore the regulation effect of gender on the level of education in the same industry. (All industries include mining, the production and supply of electricity, gas and water, the production and supply of electricity, heat, gas and water, real estate, public administration, social security and social organizations, public administration and social organizations, international organizations, construction, transportation, storage and postal services, education, finance, residential services, repairs and other services, population services and other services; scientific research, technical services and geological survey; scientific research and technical services; agriculture, forestry, animal husbandry, fisheries, wholesale and retail trade; water conservancy, environmental and public facilities management; public health, social security and social welfare; public health and social work; culture, sports and recreation; information transmission, computer services and software; Information transmission, software and information technology services, manufacturing, accommodation and catering, leasing and business services.) In 2010, the industry of international organizations had the highest educational requirements for employees in all industries, and

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the difference between male and female educational levels was also the largest, among which the educational level of female employees was concentrated in undergraduate and postgraduate education. The level of male employees is scattered, mainly distributed in junior high school, senior high school, junior college and undergraduate, accounting for 21%, 25.2%, 14.4% and 27.9%, respectively. Education, finance, manufacturing, wholesale and retail trade, water conservancy, environmental and public facilities management, scientific research, technical services and geological survey, health, social security and social welfare, information transmission, computer services and software, accommodation and catering, residential services and other service industries have more relaxed conditions for women's education level. The role of gender discrimination in these industries is small, which encourages and promotes women's employment participation. In 2020, the difference in educational attainment between the working population of different genders in various industries was significantly reduced compared to 2010. The residential and other service industries have the highest educational requirements for employees in all industries. The education level of female employees in this industry is similar to that of male employees, mainly distributed in junior college and bachelor degree, with female accounting for 24.6% and 42.7%, and male accounting for 26.7% and 35.3%, respectively. In mining industry, public administration and social organization, international organization, construction industry, electricity, gas and water production and supply industry, the five industries have strict requirements on the education level of female employees, and there is a large gap between male and female education in these industries. The health, social security and social welfare industry has higher educational requirements for women, but it is relatively relaxed, and it is also more inclusive for women with lower educational qualifications. In education, agriculture, forestry, animal husbandry, fishery, transportation, storage and postal service, scientific research, technical service and geological survey, water conservancy, environment and public facilities management, manufacturing, accommodation, and catering and other industries, the proportion of women with higher education is lower than that of men, and the impact of female gender discrimination in these industries is very small. There are still signs of sexism in other industries, but the impact of discrimination is still modest. From 2010 to 2020, with the participation of more women in the labor force, the structure of the educational level of the employed population by gender in various industries has undergone great changes and the phenomenon of gender discrimination in the labor market has been improved to some extent, although it still exists.

3. Conclusions and the Enlightenment

3.1. Conclusions

Based on the cross-analysis of the age, sex, education level and industry of the employed population, this paper makes a comprehensive discussion on the characteristics and trends of the current employment population structure. The discussion draws the following conclusions.

3.1.1. The proportion of working-age population decreases, the total employed population tends to be aged, and the "demographic dividend" gradually disappears

During the 12 years from 2010 to 2021, the aging degree of the population is significantly aggravated, and the age of the main employed population increases from 20-49 years to 25-54 years, and the overall age increases by 5 years. The working-age population decreased from 74.34% to 69.99%. The youth population aged 14 and under is growing at a slower rate than the elderly population aged 65 and above, and the country's "demographic dividend" is disappearing year by year. According to the current population structure, with the working age population aged 15-65 years old, the trend of aging of China will increase in the future, and as the overall population drops, the "demographic dividend" of China will eventually disappear.

3.1.2. The employment population with higher education tends to be younger and more concentrated, and the female education level has been improved, ushering in the "brain dividend" and "gender dividend"

Currently, the higher education employment population is mainly concentrated in the age group of 25-44, and in 2020, the employment population with a lower education background (less than high school) will be less than that of 29 years old. This indicates that China has ushered in the "human brain dividend". From 2010 to 2020, the education level of the female working population increased at a faster rate than that of the male working population. The age structure of the female employment group tends to be younger in secondary education (16-49 years old), and the proportion of young female (16-39 years old) in the higher education level is higher than that of the male employment group. This shows that China

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attaches high importance to female education, and more women are pursuing higher degrees. "The gender dividend" is the contribution to social and economic progress.

3.1.3. Industries have higher requirements for female education level, but gender discrimination among industries has improved greatly in recent years.

In 2010, in all industries, the proportion of female employees with low education level is higher than that of male employees, while the proportion of those with higher education level is lower than that of male employees, and the overall state of low education level. In 2020, the structure of the female employment population in all industries will change dramatically. Although women with low education still account for the majority of women and are higher than men, in higher education, the proportion of women with bachelor's level, postgraduate level or above is higher than that of men. This indicates that the employment rate of female graduates participating in the society increases, and to a certain extent, it also reflects that all industries in the society have higher requirements for female employees than men. Due to the solidification of women's traditional social status, today's female workers need a higher degree to obtain the same social work opportunities as men, and the society has stricter requirements on female workers' education. However, with the participation of more women in the labor force, the structure of the education level of the employed population classified by gender in various industries has changed greatly, and the phenomenon of gender discrimination between industries has improved significantly.

3.2. Enlightenment

The base of the female employment population has been lower than the male employment population, which is not only related to the female population less than the male population, but also inseparable from the traditional social division of labor. In the past, women were more likely to do unpaid work, mainly in domestic services, which were not counted in the employed population. Nowadays, against the background of the debt of our population, more and more women are joining the paid work of society. However, based on the traditional gender concept and the function difference between men and women, women are often in a weak position in the employment society. With the passage of time and the continuous reform of social and demographic division of labor structure, women began to play an important role in promoting the stable growth of social and economic, and the era of "gender dividend" also gradually opened. Although employment discrimination still exists in individual industries, in terms of the overall environment, from the analysis of educational level, it has been greatly improved. With a positive attitude we can believe that with the passage of time and the continuous progress of the society, this kind of employment discrimination will be less and less. In the context of aging, with the gradual disappearance of "demographic dividend" and the crossing of Lewis turning point, China's economic growth mode will also change, and the source of China's long-term economic growth will eventually change to rely on technological progress and productivity improvement[7]. At present, the employment population education level of young people, higher education, and the increase of female labor participation rate have created new opportunities for this economic growth transition, namely the end of the "demographic dividend", "human brain dividend" and "gender dividend".

In the future, one of the keys to China's stable economic growth is to create a suitable policy environment and reform the existing institutional arrangements to adapt to the characteristics and development trend of the present population structure. When policy planning and institutional design take into account the capacities, needs and aspirations of different gender populations in light of their differences and characteristics, it will be possible to fully tap the potential and maximize the role of everyone.At the same time, social welfare policies should be appropriately strengthened to encourage women of appropriate age to give birth, and certain protection policies should be adopted for women to give birth at work. In addition, emphasis should be placed on the cultivation of talents education, focusing on increasing the cultivation of technical and innovative talents.

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