

Analysis on the Labor Supply under the Current Family Planning Policy in China

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Abstract: Based on the analysis of national census data, through standardized measure and the reconstruction and prediction of population history, China's total working-age population aged 15-64 has maintained a sustained growth in the past few decades, the past continued downward trend of working-age population proportion have successfully turned into continued increase, and in 2010, it reached the highest point of its history. Meanwhile, the working-age population got into a sustained, rapid aging process. The proportion of working-age population aged 44 and above will exceed 45%, the average age of working-age population will be maintained at 42 years or more. With the total working-age population and structural changes, employed population will also enter the transition period, It is estimated that by 2050 the employment rate of working-age population will decrease more than 28 percent.

Keywords: Fertility policy; Working-age population; Employment; Projections

Looking back over the past 60 years population development history, China's birth control policy has experienced a historic shift from nonexistence to existence, from vague to specific, from loose to tight. At the beginning of family planning policy's implementation, it mainly advocated "later, sparser and fewer". This policy made the total fertility rate of women in childbearing age decreased from 6 to 3 in 10 year's time. Since the family planning policy to be one of the basic national policy and the implementation of the one-child policy in 1980s, the more stringent policy accelerated the historical process of fertility transition of Chinese women in childbearing age, fertility levels appeared in continuing downward trend and so far it has been to 1.4 which was in the stage of low fertility level. Although the current fine-tuned fertility policy can be divided into urban couples to only one child; in the rural, husband with no brothers or sisters or couples' first child is a girl can have another child; couples who are both only child themselves been allowed to have two children; ethnic minorities been allowed to have additional children. But its core is to promote the rapid decline in fertility and newborn population. A direct short-term result of the current fertility policy is the decline in birth rate and population size.

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However, the indirectly effect is that it alter the China's population growth and the basic structure of population in a long term. Because of the inertia and long cycle characteristics of population changes, the profound impact of current fertility policy will continue to appear. The sixth national census data shows that the total population of mainland China reached 1.339 billion³ in 2010, 90 million more than 2000; the annual growth rate of national total population was 7.03 ‰ from 2000 to 2010, Less than half of 1982-1990, only one third of rapid population growth period in China (1964-1982). It is obvious that the effect of family planning policy is very significant.

With the decline of the birth population size, one of the long-term consequences is the working-age population reduced gradually. Although China's economy sustainable development and rapid growth are affected by many factors, the reduction of the labor force has an obviously effect on it. Labor is the key elements of productive forces, and also the most active part, undoubtedly play an important role in the Sustained, stable, fast economic and social development. Working-age population is the main composition of the workforce and also the source for social and economic development. Therefore, the study on the effects of current fertility policy on the composition of the working-age population is very important. Correctly judge the situation of future labor supply, prospectively studied on the total amount and structure of the employed population, scientific analysis of the employment situation and expectations are the foundations of correct judging the Chinese economic growth in the long-term trend, accurate grasping prominent contradictions of building a moderately prosperous society, and strive to achieve continuous improvement in people's livelihood.

I Review of working-age population size and structure change

Although since 1949, there has been no complete and continuous statistical data of population age structure, and also no complete and continuous working-age population statistics or registration data. However, according to the previous national census data since 1953, Through indirect estimation of population age structure and reconstruction techniques (Wang Guangzhou, 2001), China 's working-age population totality and structure could be reconstructed since 1949, Which could show different fertility levels or birth sizes' effects on labor supply changes.

³ A sampling survey quality shows, the undercount rate of 2010 the sixth national census population was 0.12%.

1 Working-age population size

According to the previous census national data since 1953, age structure reconstruction results of China's population showed that, in the past 60 years, 15-64 working-age population continued to grow in a stable process (Figure 1). Working-age population increased from 316 million in 1949, reached to 993 million people in 2010. Viewed from the length of required time of a net increase of 100 million people, the pace of population growth and birth size in different times is very different from each other. China's working-age population was over 400 million in 1966, in 1974 more than 500 million, in 1981 more than 600 million, in 1987 more than 700 million, in 1994 more than 800 million, in 2003 more than 900 million. From the above point of time, we can see average increase of working-age population totality was 1828 million every year from 1981 to 1987, and the time to increase 100 million of population was in just six years, the rapid population growth period before the implementation of family planning policy. Since then, the average growth of the working-age population declined every year, For example, from 1994 to 2003 ,the average working-age population increased 1240 million every year and the time for working-age population increased 100 million was nine years , and the average working-age population increased 11 million every year from 2003 to 2010, the growth rate was slowing down further. Affected by the family planning policy, the fertility level of women began to decline rapidly in the mid 1970s, The effects on the size of the workforce began to appear in 1990. Since 1994, the national working-age population growth have been slowing down.

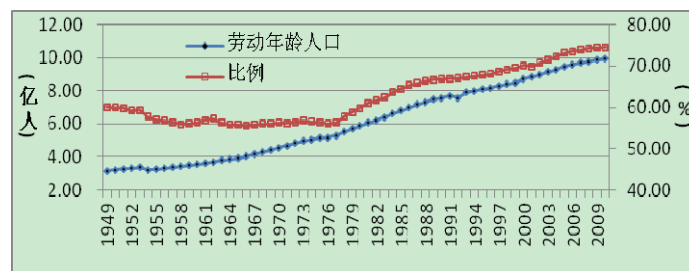


Figure 1: China's total working-age population and proportion from 1949 to 2010

Although the Chinese working-age population totality has been growing steadily, the characteristics of changes of the proportion of working-age population in the total population are different completely. Since 1949, the proportion of working-age population could be divided into two distinct phases, if seen 1977 as a turning point (Figure 1). The first stage is significant decline phase (1949-1977) ; In this stage, the proportion of working-age population has been in decline or relatively stable Slight fluctuations ,The proportion of working-age population was stable at about 56%. In 1966, the proportion dropped to the lowest level 55.48%. Compared with 1949, it

decreased by 5%. The second stage is rising phase (1978-2010). From 1978 (population born in 1963 became into the working age), The proportion of working age population in the total population has grown at a steady and sustainable pace. By 2010, the share of working-age population creeps up to 74.5%, an 17% increase over the 1978's figure.

In sum, the total working-age population aged 15-64 has maintained a sustained growth in the past few decades, the past continued downward trend of working-age population proportion have changed into continued increase, and in 2010, it reached the highest point of the history.

2 Age structure of working-age population

With the continued growth of working-age population, the internal structure of the working-age population has also undergone significant changes. According to the change process of working-age population structure and characteristics, it can be roughly divided into three stages.

The first stage is a relatively stable phase (1949-1966). In this stage, the Proportion of working-age population aged 15-24 was roughly around 30%, 25-44 was about 45%, and 45-64 was about 25%. The average age of the population in working-age was about 34.5-35.5 years old.

The second stage is fluctuating phase (1967-1997), The main features of the changes in this phase were that fluctuation range in the proportion of working-age population in 15-24 years and 25-44 years become greater, However, the proportion of 45-64 years has remained relatively stable. At this stage, the proportion of working-age population aged 15-24 was between 24%-36 %, and in 1997, this proportion was dropped to 24.78%, for the first time lower than that of 45-64 years' 24.94%. At the same time, working-age population ratio aged 25-44 exceeds 50%, reached 50.28 percent, close to the maximum . In this stage, most of time, the average age of the working-age population was below 34.5 years old. The lowest was 33.64 appeared in 1986.

The third stage is continuous aging phase (1998-2010). There was a downward trend of the proportion of working-age population aged 15-24 and 25-44, while the proportion in 45-64 years was increased , it is the main features of changes in this phase. From 1998, the proportions of working-age population aged 45-64 continued to rise, and reached 32.68% by 2010, while the proportion of 15-24 and 25-44 decreased to 22.90% and 44.42%. At the same time, the average age of the working-age population continued to rise, reached 38.02 years old in 2010.

Viewed from the change process of working-age population structure, despite the proportions of working-age population in different ages changed a lot, affected by the

impact of fertility levels, the total amount and structure of the working-age population especially that in the 44 -year-old and below occurred large fluctuations and changes. But the working-age population in 45 years and above is still in the relatively steady rise process. Therefore, if only viewed from the average age of working-age population, since it reached its lowest value in 1986, the average age of the working-age population increased sustainedly and rapidly, the average annual increase of 0.18 years, and it showed that China's working-age population has entered the sustained, rapid aging process.

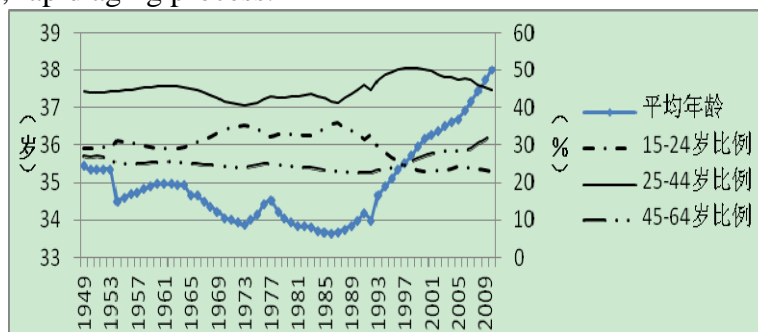


Figure 2: China working-age population structure and the average age

II Population size, structure and pattern of employment

The population size and structure of employment is affected by the labor supply (e.g. working-age population structure), but also by economic gross and structure (e.g. economic development). And it is also affected by the labor market and employment policy. Due to the lack of China's statistical survey on employment and registration data, it is difficult to review the change and to summarize the long-term rule of employment population.

1. Population size and structure of employment

According to the census and sample survey data since 2000, the national employment population aged 16-64 is 691 million⁴ in 2010, about 14 million more than in 2000, and about 13 million over 2005. Among them, urban employment population is 318 million, accounted for 46.02% of the workforce. Compared with 2000, the urban employment population increased by about 93 million in 2010, and the proportion increased by nearly 13%.

Analysis from the age structure, the employment population aged 25-44 was 362 million (accounting for 52.45%), and the employment population aged 45-64 was 226 million (accounting for nearly 1/3) in 2010. The change of employment population was mainly reflected the reduction of age group under 44 and the increase in age

⁴ The employment population refers to the population aged 16-64, the below is same.

group over 45 during 2000-2010. Compared with 2000, the employment population aged 16-44 fell by about 31 million, while the employment population aged 45-64 continued to increase in about 45 million. As a result of the change of employment population age structure, the average age of employment population growth. The average age of the national employment population aged 16-64 was 39.23 years olds in 2010, 2.2 years older than 2000. Compared with the aging of working-age population, the aging of the employment population is more obvious.

Table 1: Population size and structure of employment population aged 16-64

unit: 100 million, %

age group	2000		2005		2010	
	size	percentage	size	percentage	size	percentage
16-24	1.11	16.39	0.90	13.22	1.02	14.83
25-44	3.84	56.80	3.76	55.45	3.62	52.45
45-64	1.81	26.81	2.12	31.33	2.26	32.72
16-64	6.77	100	6.78	100	6.91	100
Among them: urban	2.25	33.23	2.84	41.89	3.18	46.02
average age ⁶	37.01		39.11		39.23	

Data sources: calculated from the following data: (1) the National Bureau of statistics, in 2000 the fifth national census long form summary data; (2) the National Bureau of statistics, 1% national population sample survey in 2005; (3) the National Bureau of statistics, in 2010 the sixth national census long form aggregated data.

2. The employment pattern and the expected employment years

The expected employment years was determined by the pattern of employment. As employment is closely related to the age, and age-specific employment rate is relatively stable, therefore, age-specific employment rate can be as a basic model to measure the employment status and progress. In 2010, the national working-age population aged 16-64 was 975 million. Among them, the economic active population was 754 million (accounted for 77.37%⁷), while the economic inactive population was 221 million people. In the economic inactive population, the population aged 16-24 accounted for 45.47%, that is to say, nearly half of the economic inactive

⁵ This is calculated according to the long table data.

⁶ This is calculated according to the long table data. Associated long table data is slightly different from short form data.

⁷ According to the sixth statistics, working age population, employment population, economic activity population and economic inactive population are aged 16-64. This is calculated according to the long table data. Due to sampling error and other reasons, the relevant index is different from short form data.

population is in the age 16-24, which suggests that school education make them not to participate in economic activities.

From the age-specific employment rate, the curve of age-specific employment rate about population aged 16 years and over showed inverted U type, as shown in figure 3. The age-specific employment rate of population aged 25-44 is the highest, reaching more than 87%. And, it becomes to decrease significantly from the age of 50. By the age of 64, age-specific employment rate fell to 44.11%. From the change in employment patterns during 2000-2010, the difference of employment pattern is mainly manifested in the age-specific employment rate of the younger population. We can see from Figure 3, the age-specific employment rate at the age of 25 and below in 2000 is significantly higher than that of 2010 and 2005.

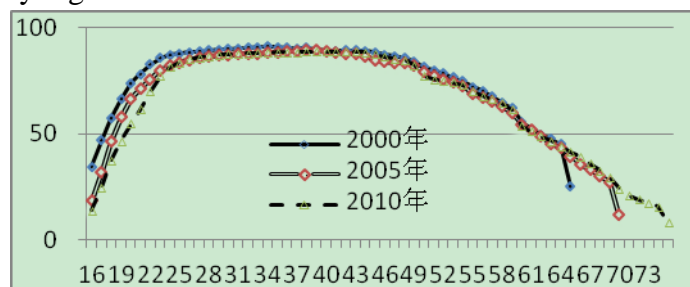


Figure 3 Age-specific employment rate of the working-age population, 2000-2010⁸

Employment is also related to the age structure of the working-age population, in addition to the conditions of employment restrictions. In order to eliminate the influence of the differences in age structure, the employment data has been standardized, and the indicator of average expectation employment years has been constructed in this article.

$$\text{average expectation employment years} = \sum_{K=16}^{64} \frac{\text{employment population aged } K}{\text{population aged } K}$$

The average expected employment years is equal to the sum of age-specific employment rate. If person entering the labor market in 16 years old and Withdrawal from the labor force market in 65 years old, the range of average expectation employment years is 0-49 years. The population employment is more fully, when average expected employment years closer to 49 years. In 2010, the national average expected employment years was 35.95 years. It was shortened by 2.19 years, compared with 38.15 years in 2000. Among them, the average expected employment years of population aged 16-24 years old is shortened by 1.45 years, accounting for more than 2/3 of all shortened years. In addition, there is very big difference on the average expected employment years between urban and rural employment population.

⁸ The employment rate of 65 in figure 3 is about 65 years and over in 2000, 70 years and over in 2005 and 75 years and over in 2010.

For example, the average expected employment years of urban working-age population is 30.90 years, and the rural is 40.75 years in 2010. The average expected employment years of rural population was more than urban working-age population 10 years. The main reasons are as follows. The age-specific school enrollment rate of rural population aged 16-24 is lower than that in urban population. Just like the other side of the coin, the age-specific employment rate of rural population aged 16-24 is relatively higher than that of urban population. And the situation of urban is just the opposite of rural.

III Labor supply under the current birth-control policy

The size of newborn population is affected by fertility, gross and structure of all women of childbearing age, and it can influence the scale of the working-age population in the future. Compared with changes in quantity, the fertility level of fertile women has great impact and more sensitive to the scale of birth. Therefore, the role of birth-control policy is quite significant. Though the effects of birth extent to the working-age population is lagging behind, it has revealed the influence of the current birth-control policy on working-age population, especially the one-child policy carried out more than 30 years.

1. Working-age population projection

From the perspective of working-age population's changes, the people that will reach working-age in 2025 having been born. If the impact of international migration and birth-control policy are not considered, the quantity and structure of working-age population will be only related to the probability of death. It can be predicted that the number of China's population aged 15-64 will continue to rise before 2013, and the working-age population will reach the maximum of about 1 billion people. From 2014, the amount of working-age population will keep declining, which is a major turning point in the history of Chinese labor supply for the working-age population began to decline for the first time. Specifically, the working-age population will reduce about 2.6 million per year on average from 2013 to 2025. If the current birth control policy remains unchanged, it can be predicted that the working-age population will further drop rapidly, and reduce about 9.7 million per year on average from 2025 to 2050. As can be seen from Figure 4, the working-age population will drop to around 730 million, which is close to 73% of the current number and was 26.81% less than in 2010. In addition, it has a clear downward inflection point when take the proportion's changes of working-age population into consideration, which lower 0.6% in 2013 than in 2010 and fall faster and faster. It can be expected that the proportion of

working-age population will down to 69.7 % in 2025, 4.78% lower than in 2010 ; and will drop to about 60% by 2050 , 13.51% lower than in 2010; and will have an average annual decrease of 0.35% from 2025 to 2050.

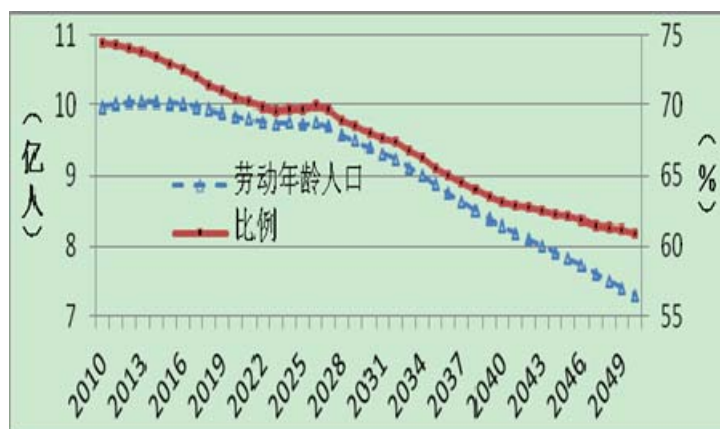


Figure4 The size and proportion of working-age population (2013-2050)

Judging from the composition of working-age population, if the current birth-control policy remains unchanged, it can be seen from figure 5 that the proportion of population aged 15 to 24 will keep declining rapidly. The proportion of working-age population aged 15 to 24 is 22.90% in 2010, and it will decline to 15.23% in 2025, which is lower 7.87% than that in 2010. Based on the current birth-control policy, it is expected that the proportion of people aged 15-24 will decline to 13.93% by 2050, which is about 8.97% lower than that in 2010. The situation of population aged 25 to 44 is similar to that of people aged 15-24, but it has a small rebound after 2030. In 2050, the proportion of working-age population aged 25 to 44 will drop to 38.37%, which is about 6% lower than in 2010. It can be found clearly that the proportion of working-age population aged 45 to 64 has a relatively stable upward trend, and will rise to 43.81% by 2025 which is increased by 11.14% than in 2010, then will rise to 47.69% in 2050 which is increased by 3.88% than in 2025 and higher than in 2010 more than 15%. In one word, the proportion of the working-age population aged 45 to 64 will continue to rise.

Apart from the decline of young working-age population, it is obvious that has the problem of the aging population, and the rise of the working-age population's average age is also an important feature of aging of working-age population. Judging from the average age of the working-age population, it is expected to rise to 41.76 years in 2025, 3.74 years higher than that in 2010. By 2050, the average age of the working-age population will be further increased to 43.18 years, 5.16 years was higher than that in 2010, compared to 2025 increased by 1.4 years old. In brief, if the birth-control policy keeps the same, the average age of the working-age population will be a continuous and stable increase, it will exceed 40 years old by 2020, surpass 42 years old by 2026 and be greater than 43 years old by 2049.

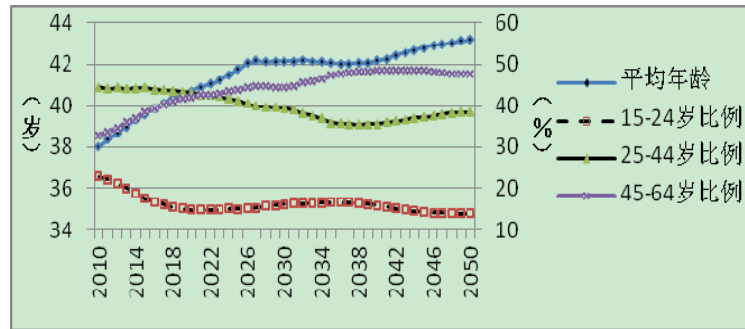


Figure5 The average age and age structure of working-age population (2013-2050)

2. Employed population projections

The basic condition of the working population is determined by the patterns of employment, the size and structure of working-age population. In fact, projection of employed population is the estimate of working-age population and employment pattern. In order to estimate employed population's number, results and trends, it is an assumption that future employment pattern of working-age population has been unchanged.

First of all, according to figure 6, it can be estimated that the employment population aged 16 to 64 will reach its peak of 705 million in 2015, which is about 20 million more than in 2010. The size of employment population began to shrink after 2015 and will drop to about 671 million people in 2025. In this period, there is an average annual decline of 350 million people. It can be predicted that the size of working population aged 16-64 will decline to 492 million people which number is 28.72% lower than in 2010 and is 178 million less than in 2025. In this period, it can be estimated that the gross of working population aged 16-64 will reduce 710 million every year on average. According to changes in employment patterns and the average expected time of employment, it can be seen that the improvement of education of population aged 16-64 has led to the shortening of the average employment time. Therefore, it can be sure that these estimates are the actual maximum possible results. In other words, the speed and magnitude of reduction of working population aged 16-64 is very likely greater than current projections.

Secondly, from the employment proportion of the total population, the proportion of the working population reached a maximum of 51.75% in 2013. In other words, more than half of the population is employed population aged 16-64 which number is expected to decrease by 3.78% and decline to 47.98% in 2025. If the current fertility policy unchanged, the proportion of working population aged 16-64 will drop to about 41% by 2050. Compared with 2013, it will decrease by 20 % or more.

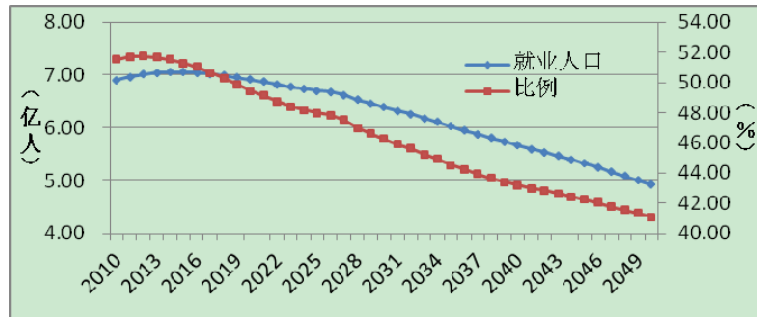


Figure6 The size and proportion of employment population aged 16 to 24 (2013-2050)

Third, from the employed population age structure, population aged 16 to 24 will continue to reduce, and decrease from 106 million to 63 million by 2025. Its proportion also will drop to 9.44%, which is more than in 2010 decreased by 6%. Some trends can be found in Figure 6. Despite the proportion of employed population aged 16 to 24, due to the impact of the age structure, has fluctuated, but is expected that will be stable at between 9% and 11 % from 2025 to 2050. As same as changes in the proportion of the employed population aged 16-24, the proportion aged 16-24 is also declining, will drop to 49.36% by 2025, compared with 52.91% in 2010 fell by 3.55%. The proportion is expected to get the lowest point in 2038, drop to 42.71% , then rise to 46.95% in 2050. Unlike the former, the proportion of the employed population aged 45 to 64 continues to rise and rises to 41.2% by 2025. Compared with 2010, the proportion rose by 9.48%, and it can be forecasted that the proportion of employed population aged 45 to 64 in total is 42.77% by 2050.

As a summary, the average age of the working population continues to rise and will rise to 41.91 years old by 2025, compared with 38.92⁹ in 2010 increase by 2.99. In this period, the rising velocity of the average age is the fastest, and the increase is also the largest. If the current fertility policy remains unchanged, the average age of the working population will reach 42.77 years old by 2050. Although the average age of the occupied population will rapidly increase, it is still relatively young compared to the average age of the working-age population.

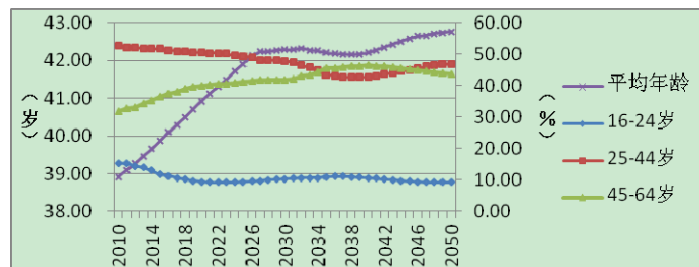


Figure7. The structure and average age of employment population aged 16 to 24 (2013-2050)

⁹ It is slightly different from long form data.

IV Conclusions and discussion

This study makes a brief summary of the history of workforce in China, and the process and trend of change are analyzed. Some basic conclusions can be found from the above research , as following:

First, China's working-age population continues to grow into a transitional period which has a sustained decline. Whether to adjust fertility policy or not, in the history of China, the process of rapid decline after 2025 has never experienced before.

Second, Proportion of the working-age population in China has entered another transitional period. Compared with the condition of the 1977 years ago, there was a radical difference after 1977. Previous decline was due to the rapid growth of the newborn population; the reason of latter decline was that working-age population who retire from the labor market is increasing rapidly.

Third, the working-age population is aging rapidly. The proportion of working-age population over the age of 44 will be over 45%, more than 15% greater than that of the current. For a long time, the average age of the working-age population will more than 42.

Fourth, with the working-age population structure change tendency, employed population will also enter the corresponding turning period. Unlike working-age population, the number of employed population decline relatively faster. From 2010 to 2025, working-age population will reduce about 26%, and the employed population will be reduced by more than 28%. Considering the change trend of average expected employment time, it can be estimated that employed population will be reduced about one third.

Considering the complexity of labor employment, more complicated factors related to industrial structure, urbanization and education are not taken into account. The research has made the appropriate simplification and attempt to the quantity, structure and trend of employed population. Thus, the paper just roughly predicts the future trend, and there are a lot of questions call for further research and summary.

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