

# China's Quality Demographic Dividend and Middle-income Trap

## -- Analysis based on VAR Model

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### Abstract

China's quantitative demographic dividend is gradually coming to an end. At the same time, China's rapid growth of the national economy, which is largely dependent on the demographic dividend, has gradually slowed down. The academic circles generally believe that China faces a Middle-income trap. At present, China is facing various social problems such as irrational industrial structure and wide income gap. Scholars believe that turning China's quantitative demographic dividend into a quality demographic dividend will help China achieve further economic development. In this article, the author will evaluate the possibility of China's use of the quality demographic dividend to surpass the Middle-income trap by collating related concepts and research and calculation results based on the VAR model.

### Keywords

Demographic Dividend; Quality Demographic Dividend; Middle-income Trap; VAR Model.

### 1. Introduction

Along with the development of China's economy, China has gradually occupied a certain position in global economy, having been significantly improved in terms of per capita income and residents' living standards. In the early days of the founding of the Peoples' Republic of China, China focused on the development of the primary and secondary industries represented by agriculture and industry. China has achieved tremendous development based on its original economic foundation, resulted in a significantly improved GDP. It was an "economic miracle" of the world. Some scholars believe that this economic miracle is inseparable from China's "demographic dividend." The baby boom in the 1960s created a climax in the number of working-age people in China in the next few decades, which played a huge role in promoting China's economic development with labor-intensive industries as the pillar. After 2010, as China's "demographic dividend" generation gradually entered the age of retirement, China's demographic dividend has also entered a stage of gradual disappearance. In response to this situation, the central government has delegated a series of policies, such as the abandonment of the one-child policy, releasing universal two-child policy and the acceleration of the transformation of the industrial structure. The academic circles have also put forward various suggestions for China to figure out new development patterns. Among them, stimulating the second demographic dividend and transforming the quantitative demographic dividend into a qualitative demographic dividend seems to be consensus of view in academic circles. At the same time, in the past few decades when China seized the opportunity of demographic dividend and vigorously developed its national economy, she has gradually entered the ranks of middle- and high-income countries. Some scholars believe that China is facing or has already in the Middle-income trap. A series of measures need to be taken to prevent China's economic development from entering a state of stagnation.

Based on the current economic and social environment in China, we wish to evaluate the possibility of overcoming the Middle-income trap for China or the upcoming quality demographic dividend through a series of summaries and analyses.

In the first part of the article, we will clarify a series of concepts and definitions that will appear in the article.

## **2. Concepts**

### **2.1. Quantitative Demographic Dividend**

The concept of "demographic dividend" was first proposed by the United Nations Population Fund in 1998 in the "Status of World Population". In the process of economic development, the age structure of a country's population is characterized by a large proportion of the working-age population in the total population, and a small proportion of the young and elderly population in the total population. The labor participation rate is high, population support is relatively low, and the savings rate is high. The economy experiences a rapid development in the phase of demographic dividend.

The UN's definition of the concept is obviously a description of the quantitative demographic dividend. In this article, we apply the UN's definition of demographic dividend as quantitative demographic dividend.

### **2.2. Quality Demographic Dividend**

The quality demographic dividend is a concept put forward relative to the quantitative demographic dividend, it is sometimes referred to as the second demographic dividend. However, there is still a certain difference between the quality demographic dividend and the second demographic dividend. The scholars have not reached a consensus about the concept yet. Currently, most scholars believe that the second demographic dividend mainly refers to the adjustment of savings under pension expectations. Due to the improvement of the people's living standards, the life expectancy of the elderly has been prolonged, and the elderly have the incentive to increase their own savings levels in the years before their retirement. As the proportion of the aging population in the total population increases, the accumulation of social capital will increase to a certain extent, so as to continue to promote economic growth in this way.

The quality demographic dividend pays more attention to the economic growth and industrial structure transformation brought about by the improvement of population quality and capital. The mechanism of the quality demographic dividend on economic growth is mainly reflected by the increase of human capital stock and the optimization of human capital structure. The same as the concept of the second demographic dividend, scholars have not reached a consensus about the concept of quality demographic dividend.

### **2.3. Middle Income Trap**

The concept of "middle income trap" was first proposed by the World Bank in 2007. In the article "An East Asian Renaissance: Ideas for Economic Growth", the World Bank pointed out that East Asian countries are currently experiencing a stage of loss of economies of scale in the process of economic development. Relying on the accumulation of production factors may slow down or even stagnate economic growth. In other words, in the process of gradual loss of economies of scale, if measures such as industrial restructuring are not implemented in time, the marginal productivity of capital may decline.

A few years later, the World Bank once again stipulated the definition of the "middle income trap". The standard for a country to be called a Middle-income country is that its per capita GDP reaches US\$1,005; it is called a middle- and high-income country if its per capita GDP reaches

US\$3,975; when its per capita GDP reaches US\$12,276, the country becomes a high-income country. When a country's per capita GDP has been between US\$3,975 and US\$12,276 for a long time, and its economic growth rate is low and its economic growth momentum is insufficient, it is considered that the country has fallen into a "middle income trap". Since 2010, China's per capita GDP has broken through the US\$4,200 mark, and has entered the ranks of advice-income countries. Fang Cai believes that the "Middle-income trap" is a state in which the economy has not changed the impetus for economic growth in a timely manner, and thus has been in a state of a particular income stage for a long time. It is not an absolute state that locks in a certain income stage. In other words, the "Middle-income trap" does not necessarily have to occur in the Middle-income stage, it may also occur in various income stages such as low-income and high-income stages.

### 3. Previous Researches

In this part of the article, we review and summarize the development of China's quantitative demographic dividend and quality demographic dividend and its contribution to the future economy, as well as relevant literature and research discussing whether the Middle-income trap exists in China. To the current situation of China's quantitative demographic dividend, quality demographic dividend, and Middle-income trap, we lay the foundation for the analysis in the next part of the article.

#### 3.1. China's Demographic Dividend: A Dead End?

Wang Qinchi and Wang Zhe (2018) believe that China's demographic dividend in the new era will not disappear. The number, structure, distribution, quality and health of the population will still make a difference in promoting high-quality social and economic development. Firstly, from the perspective of population age structure, China's population age structure still has advantages compared with other countries at the same stage of development; secondly, The 19th National Congress of the Communist Party of China proposed a regional coordinated development strategy and a rural revitalization strategy, which will further promote the flow and re-allocation of the population between regions and urban and rural areas and provide new momentum for economic development; third, quality democratic dividend will provide strong talent support for future economic development; fourth, the "healthy China" project will provide China with a population health dividend in the future [13]. It is worth noting that the paper mainly describes the current situation of China's demographic dividend from the perspective of qualitative demographic dividend, while other papers in this part mainly elaborate on China's demographic dividend expectations from the perspective of quantitative demographic dividend.

Zhang Junliang and Zhang Xingyue (2018) analyzed the status quo of China's quality democratic dividends and quantitative democratic dividends in their article. Firstly, in terms of labor force scale and proportion, although China's working-age population is declining, its scale is still huge, and its proportion will remain at a high level for a long time; secondly, in terms of labor burden coefficient, judging from the forecast of the dependency ratio of China's population in the future, the burden coefficient and support pressure of the Chinese working population in the future is huge (Table 1); third, from the perspective of the future working age structure and age-specific labor participation rate in China, compared with 2015, China's aging in the future will be quite serious in the future (Table 2), and the labor participation rate of the age group over 60 will greatly increase (Table 3). In short, the relative shortage and relative surplus of labor supply will be a long-standing contradiction in the future. [14]

**Table 1.** Population dependency ratio of some countries in the future (%)

Year	World	China	Japan	India	Germany	Brazil	US	Russia
2015	52.5	37.7	64.0	52.2	52.1	43.8	51.2	43.5
2020	53.5	42.1	69.3	49.5	54.5	43.3	54.4	50.8
2025	54.0	44.5	71.5	47.6	60.0	44.4	58.5	56.3
2030	54.7	48.0	73.9	47.1	67.8	46.2	62.9	57.6
2035	55.7	54.5	78.3	46.5	74.7	48.4	64.8	55.0
2040	56.9	60.7	86.9	46.2	75.8	50.9	64.9	55.5
2045	57.7	63.6	92.2	46.4	75.7	54.9	64.5	59.0
2050	59.1	67.4	95.8	47.7	77.2	60.2	64.8	65.3

Data Source: United States: Department of Economic and Social Affairs, Population Division (2017); World Population Prospects: The 2017 Revision.

**Table 2.** The internal age structure of the working-age population in China from 2015 to 2050 (%)

Age	2015	2020	2025	2030	2035	2040	2045	2050
16-19	9.53	8.43	8.20	6.64	7.57	8.22	8.24	8.12
20-24	10.52	9.55	8.46	8.48	7.01	8.44	8.44	8.60
25-29	11.98	10.54	9.58	8.75	8.96	8.19	8.19	8.81
30-34	10.05	11.99	10.57	9.90	9.24	7.58	7.58	8.53
35-39	9.17	10.05	12.01	10.91	10.44	9.67	9.67	7.89
40-44	11.86	9.15	10.04	12.37	11.48	9.94	9.94	10.05
45-49	12.08	11.79	9.11	10.31	12.98	11.18	11.18	10.30
50-54	9.28	11.92	11.66	9.29	10.76	12.19	12.19	11.53
55-59	7.84	9.06	11.66	11.77	9.60	13.58	13.58	12.46
60-64	7.68	7.51	8.71	11.58	11.96	10.99	10.99	13.69

**Table 3.** 2015-2050 China's labor force participation rate by age

Age	2015	2020	2025	2030	2035	2040	2045	2050
16-19	29.46	27.97	26.49	25.00	23.75	22.5	21.25	20.00
20-24	86.98	85.45	84.09	83.13	82.13	81.08	80.00	78.86
25-29	90.93	89.55	88.30	87.39	86.42	85.40	84.32	83.17
30-34	91.60	90.27	89.04	88.15	87.20	86.19	85.12	83.98
35-39	91.77	90.45	89.23	88.34	87.40	86.39	85.32	84.18
40-44	90.00	88.58	87.28	86.36	85.38	84.34	83.25	82.10
45-49	85.52	83.96	82.59	81.63	80.63	79.59	78.52	77.40
50-54	74.20	72.81	71.63	70.83	70.02	69.20	68.37	67.53
55-59	62.53	61.71	61.04	60.59	60.14	59.69	59.24	58.78
60-64	46.55	46.78	46.97	47.10	47.23	47.35	47.48	47.60
65 and above	23.74	25.21	26.45	27.29	28.15	29.03	29.91	30.81

Liao Wanli (2018) believes that China's aging problem is gradually becoming prominent, and the demographic dividend is steadily weakening: as of 2017, China's population above 65 years old accounted for 11.4% of the total population, facing the threat of population aging; similarly, in 2017, China's dependency ratio was about 37%, and the demographic dividend has tended to decline.[15]

Du Wanwan and Yang Rongwei (2019) pointed out that China's demographic dividend is fading day by day, for instance there are continuous decrease in the proportion and number of the labor force and the rising trend of the population dependency ratio. In addition, the author also believes that China's aging process is irreversible over a long period of time, and the age structure of China's population will undergo tremendous changes, the proportion of the labor force will be greatly reduced, and the demographic dividend will soon disappear.[16]

Generally speaking, scholars have different views on the status quo and forecast of China's demographic dividend, but they can be roughly divided into two groups: one group believe that China's demographic dividend is facing or even experiencing a downward trend, another group believe that China's demographic dividend, from the perspective of quality demographic dividend, not only has not stagnated or declined, but is about to become an important driving force for economic development. In short, from the academic perspective, China's demographic dividend, from the perspective of the quantitative demographic dividend, has undoubtedly reached the end of its period; however, from the perspective of the quality demographic dividend, China is now in the period of the arrival of the quality demographic dividend after the quantitative demographic dividend. It is vital for China to seize the opportunities brought by the quality demographic dividend to further develop education, promote the transformation of industrial structure, encourage innovation and entrepreneurship, and let the quality demographic dividend bring China's economy to rapid development again.

### **3.2. Does the Middle-income Trap Exist in China?**

Regarding the existence of the Middle-income trap in China, and even the existence of the Middle-income trap itself, there have been a lot of discussions within scholars. We make a summary of the relevant views and conclusions of Chinese scholars in this part of the paper.

First, the Middle-income trap itself. Cai Fang (2011) believes that the concept of the Middle-income trap has sufficient economic theoretical framework and empirical basis. In the complete economic development process, an economy initially faces a poverty trap as a vicious circle, and the growth of per capita output will be immediately offset by the increase in population, the per capita income level will be diluted by the increase in population, and the standard of living is maintained at best, and it is difficult to form sufficient savings. Even with some technological progress in the traditional sense, the "critical minimum effort" to break the equilibrium trap cannot be completed. Put the economy into a middle income trap-this makes the economy fall into the middle income trap.[9] Li Yining (2012) believes that problems related to the concept of "middle income trap" have been mentioned and studied by many economists since the end of the 19th century, but these economists gave the same problem different names, such as Marx Weber's theory of belief dynamics, Pareto's excellent molecular cycle theory, Rostow's premature consumption theory, etc. [17] Most scholars believe that the Middle-income trap, as a state of economic development, exists in the real world. However, some scholars have put forward different views. For example, Wang Shaoguang (2018) believes that the Middle-income trap is a false proposition. Its concept does not have a solid theoretical basis, and empirical evidence does not support the concept of Middle-income trap. The growth rate of late-developing countries from Middle-income to high-income is much faster than that of Western countries, so the development experience of Western countries cannot be considered universally applied. [3] Liu Bo (2017) believes that whether a long-term Middle-income status constitutes a "trap" depends mainly on whether this stagnation is accompanied

by social problems such as a huge gap of wealth, social unrest, and polarization. [5] Although the scholars mainly divide into two opposing views on this issue, looking at the various currently existing literature, literature supporting the concept of "middle income trap" is overwhelming in quantity and quality. In contrast, the literature that does not support the concept of "middle income trap" is mostly opinion-based discourses and empirical research, with less theoretical evidence. Therefore, we prefer to believe that the development state of "middle income trap" is real.

Second, whether the Middle-income trap exists in China. Li Yining (2012) believes that China has not yet fallen into the Middle-income trap, and is able to completely bypass or exceed the Middle-income trap.[17] Xu Xiaonian, however, believes that China has fallen deeply into the Middle-income trap and it is quite difficult to get out of the Middle-income trap in a short time. Wang Yan and Shen Tanming (2019) believe that there is no enough practical evidence to take wage increases as a sufficient condition for the Middle-income trap, it is an over-interpretation of the Lewis dual model; the relationship between technology and economic growth is complicated, and the exhaustion of technological dividends is not a sufficient condition for the formation of Middle-income trap.[2] The Social Development Research Group of the Department of Sociology of Tsinghua University (2012) believes that China is not facing the "middle income trap" but the threat of "restructuring trap".[8] Chen Xiaowei (2019) believes that China has not yet fallen into the Middle-income trap, but it is clear that China has a series of problems such as large income distribution gaps, reform risks, rising labor costs, disconnection between urbanization and industrialization, and insufficient innovation. It is necessary to be highly vigilant against the Middle-income trap and the government should adopt a series of measures to prevent China from falling into the Middle-income trap.[1] Ma Yan (2009) believes that China has not yet fallen into the Middle-income trap, but should make use of the period of high growth to accelerate the reformation of growth mechanisms.[11] Cai Fang (2008) believes that to prevent China from falling into the Middle-income trap, it is necessary to strengthen the unity of and fairness and efficiency of employment, so as to promote fair redistribution, formulate correct economic and social policies according to China's national conditions, improve the income distribution process.[12] Cai Fang and Wang Meiyuan (2014) believe that China is experiencing a slowdown in economic growth in the upper middle income stage, and it should attach great importance to the problem of widening income gap and avoid the risk of the middle income trap. [6]

To summarize, most scholars believe that China has not yet fallen into the Middle-income trap, however for a long period of time, it is facing a series of problems such as increasingly worsening income inequality, insufficient innovation, and aging population. Therefore, we should attach great importance to the restructuring of social and economic development patterns and education mode to avoid the risk of falling into the Middle-income trap.

#### **4. Is the Quality Demographic Dividend able to Help China Avoid the Middle-income Trap?**

In this part, we use the collected data to calculate and evaluate China's possibility of bypassing the Middle-income trap with the help the quality demographic dividend.

##### **4.1. Methods**

As mentioned earlier in the paper, the concept of "quality demographic dividend" does not have a clear definition yet. In this paper, we tend to understand the concept of quality demographic dividend as the dividend of human capital quality, that is, as the dividend of human capital quality, that is, the increase of human capital stock and the improvement of human capital structure. According to the statistics, China has been experiencing an increase in its human

capital stock and an improvement in its human capital structure in the past 20 years: the proportion of the number of college students in the total population has increased in years, from less than 0.3% in 1999 to over 2% in 2019. Similarly, the proportion of China's employed population in the three major industries has grown from approximately 5:2.3:2.6 in 1999 to approximately 2.6:2.7:4.6 in 2019 (primary industry: secondary industry: tertiary industry).

In this part of the paper, we analyze the impact of China's quality demographic dividend on the speed of China's economic development, and the possibility of China to bypass the Middle-income trap with the help of the quality demographic dividend.

## 4.2. Data Collection

We use the proportion of the number of people in school to the total population (%) to measure the human capital stock, the proportion of the number of employees in the three major industries (%) to the total number of employees to measure the human capital structure, and the GDP index (%) to measure the speed of economic growth. This article selects data from 1999 to 2019, and the data source is the National Bureau of Statistics.

## 4.3. Results

### 4.3.1. Building Model

When conducting quantitative analysis, the logarithmic form of the above data is used for investigation, for it can eliminate possible heteroscedasticity while eliminating exponential growth. The natural logarithm of several indicators is processed and counted as LZX (the proportion of the number of students in school to the total population), LJY (the proportion of the number of employees in the tertiary industry in the three major industries to the total number of employees), LSC (the total domestic product Value index). The unit root test results are as follows:

Exogenous variables: Individual effects  
 Automatic selection of maximum lags  
 Automatic lag length selection based on SIC: 0  
 Total number of observations: 53  
 Cross-sections included: 3

Method	Statistic	Prob.**
ADF - Fisher Chi-square	29.3157	0.0001
ADF - Choi Z-stat	-4.01454	0.0000

\*\* Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results D(UNTITLED)

Series	Prob.	Lag	Max Lag	Obs
D(LJY)	0.0990	0	3	18
D(LSC)	0.0090	0	3	17
D(LZX)	0.0005	0	3	18

Figure 1. ADF inspection results

Subsequently, we use these data to establish a VAR model, and the lag order is 2.

It can be seen from the R statistics that the model fits well. Next, the estimated model needs to be tested for stability, because the validity of a specific result has a very large relationship with whether the model is stable. In this paper, AR roots are used for testing, that is, if the reciprocal of all root moduli of the VAR model is less than one, that is, it is located in the unit circle, then it is stable. The unit root graph is shown in Figure 3.

All the unit roots fall within the unit circle, which means the set model is stable, showing that there is a long-term stable relationship between the three variables.

In the next part, we will use the impulse response function to analyze the relationship between quality demographic dividend and economic growth.

Included observations: 16 after adjustments  
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1		
LJY(-1)	1.000000		
LSC(-1)	2.845574 (0.11313) [ 25.1539]		
LZX(-1)	-0.368999 (0.01822) [-20.2570]		
C	-15.27919		
Error Correction:	D(LJY)	D(LSC)	D(LZX)
CointEq1	-0.056533 (0.09486) [-0.59596]	-0.435126 (0.04759) [-9.14374]	0.190000 (0.14378) [ 1.32148]
D(LJY(-1))	-0.123915 (0.34692) [-0.35719]	0.097445 (0.17403) [ 0.55993]	0.374386 (0.52581) [ 0.71201]
D(LJY(-2))	0.004078 (0.34275) [ 0.01190]	0.193916 (0.17194) [ 1.12781]	-0.297215 (0.51950) [-0.57212]
D(LSC(-1))	0.126000 (0.20535) [ 0.61360]	-0.130865 (0.10301) [-1.27039]	-0.070268 (0.31124) [-0.22577]
D(LSC(-2))	0.063317 (0.16553) [ 0.38250]	-0.251464 (0.08304) [-3.02823]	0.122953 (0.25089) [ 0.49006]

(a)



D(LSC(-2))	0.063317 (0.16553) [ 0.38250]	-0.251464 (0.08304) [-3.02823]	0.122953 (0.25089) [ 0.49006]
D(LZX(-1))	0.333382 (0.23141) [ 1.44068]	-0.779315 (0.11608) [-6.71335]	1.541410 (0.35073) [ 4.39482]
D(LZX(-2))	-0.263156 (0.24681) [-1.06621]	1.300642 (0.12381) [ 10.5048]	-0.821893 (0.37409) [-2.19706]
C	0.009940 (0.01028) [ 0.96685]	-0.074231 (0.00516) [-14.3928]	0.024390 (0.01558) [ 1.56522]
R-squared	0.450948	0.972166	0.990653
Adj. R-squared	-0.029473	0.947811	0.982475
Sum sq. resids	0.000301	7.57E-05	0.000691
S.E. equation	0.006133	0.003076	0.009295
F-statistic	0.938652	39.91660	121.1322
Log likelihood	64.34819	75.38589	57.69451
Akaike AIC	-7.043523	-8.423236	-6.211814
Schwarz SC	-6.657229	-8.036942	-5.825520
Mean dependent	0.010759	-0.000819	0.078578
S.D. dependent	0.006044	0.013467	0.070214
Determinant resid covariance (dof adj.)		7.77E-15	
Determinant resid covariance		9.72E-16	
Log likelihood		208.4301	
Akaike information criterion		-22.67876	
Schwarz criterion		-21.37502	

(b)

Figure 2. VAR regression results

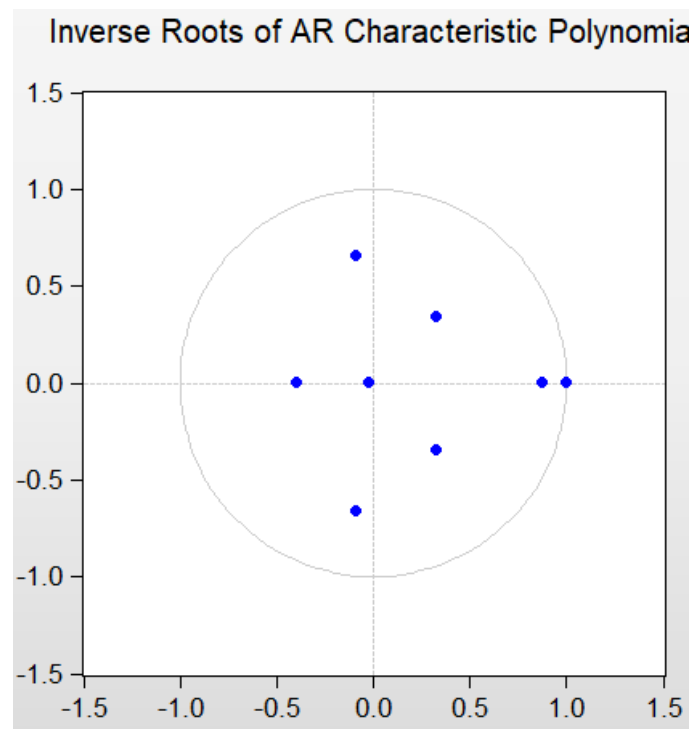


Figure 3. AR inspection diagram

### 4.3.2. Impulse Response Function Analysis

The figure below shows the pulse response of LSC to LZX and LJY. After a positive shock to LJY in the first period, the economic growth rate will experience a reverse fluctuation. After the third period, the fluctuation caused by this shock will become positive and will continue to be so in the long run. This impact reached its highest point in the fourth period. The impact of LZX on economic growth is similar to that of LJY, but more obvious. Like LJY, in the short term, the economic growth rate will fluctuate in the opposite direction to this shock, and it will become positive fluctuations in the second and third periods, and reach its highest point in the third period.

The impact of human capital stock and human capital structure on China’s economic growth is positive in the medium and long term, and the improvement of human capital structure has an obvious positive impact on economic growth, and it will promote China’s economic growth in the long run.

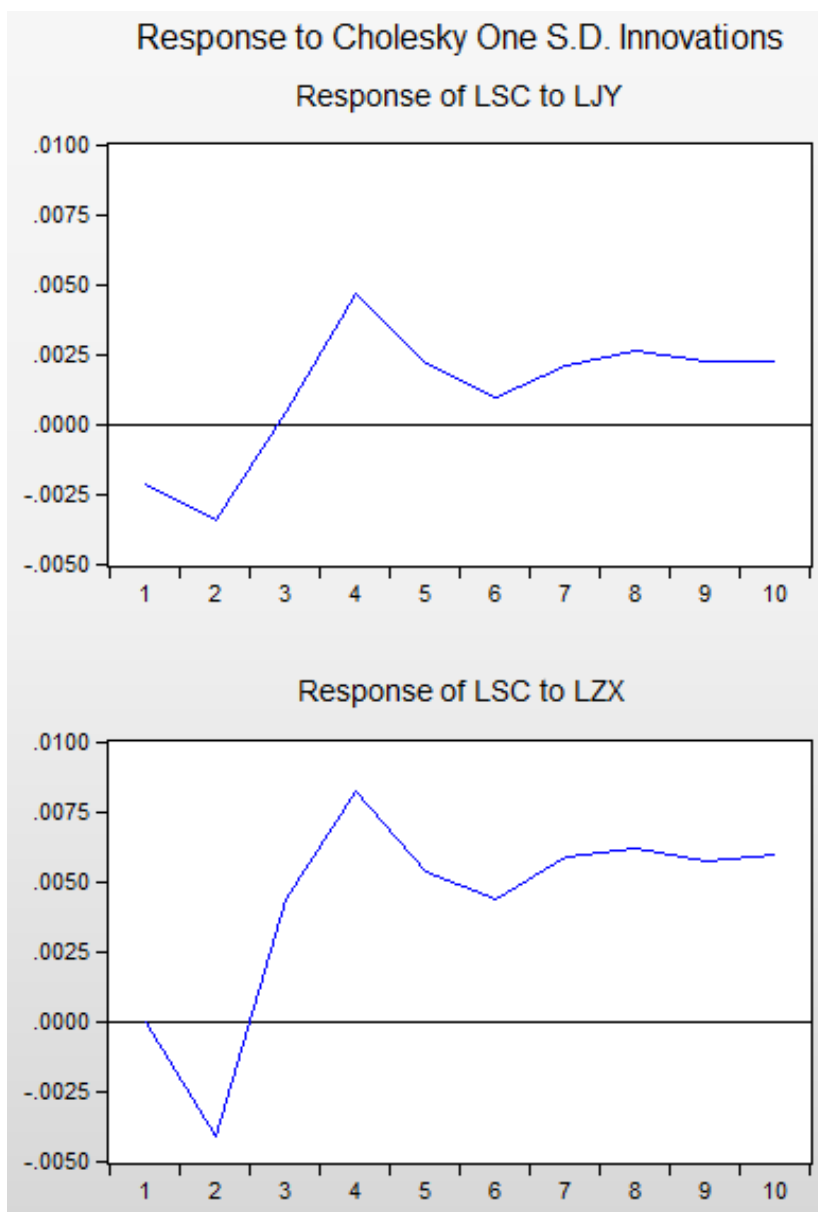


Figure 4. Pulse response of LSC to LZX and LJY

## 5. Conclusion

According to the analysis in the previous part of the article, China's quality demographic dividend has a very strong positive effect on the growth rate of China's economic development. This shows that when China's quantitative demographic dividend is reaching its limit, increasing the stock of human capital and improving the structure of human capital can effectively alleviate the slowdown and stagnation of the national economy. Among them, the improvement of human capital structure plays an important role in maintaining and promoting China's economic growth. Nowadays, when the quantitative demographic dividend is declining, China's quality demographic dividend will become the key to China's rapid growth again. In order to seize this potential opportunity, China should focus on increasing its human capital stock and improving its human capital structure. The specific measures include, firstly, to promote the reform of China's higher education and cultivate talents needed for the development of the national economy in the medium and long term; secondly, to promote the reform of China's industrial structure, further increase the proportion of the tertiary industry in the economy, and increase the added value of the tertiary industry; third, encourage innovation and encourage the development of high-tech industries.

The research has its limitations. The number of the data is limited due to the limits of data sources.

In conclusion, as China is facing the Middle-income trap, paying attention to the cultivation of quality demographic dividend, focusing on the transformation of industrial structure and the corresponding personnel training policy reform, will help China to bypass or surpass the Middle-income trap and achieve a further economic leap. This will further improve economic status of the country.

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