China's "Demographic Dividend" and the Transformation of Foreign Direct Investment

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Abstract. Since the reform and opening up, China has made full use of the advantages of the demographic dividend in the process of demographic transition, and achieved rapid economic development. However, since 2012, China's demographic dividend has gradually disappeared, and the attraction of foreign direct investment in labor-intensive industries has greatly decreased. In addition, the industrial structure is unreasonable, and the gap of regional development is widening. A series of problems have followed in the process of changing the age structure of the population.

Keywords: demographic dividend, foreign direct investment, total population, population age structure.

1. Introduction
In the 40 years since the reform and opening up, China's economy has experienced unprecedented high-speed growth. China's huge market demand, rich labor and resource endowment, rapid growth rate, and stable political environment have attracted a large number of foreign direct investment [1]. The inflow of foreign capital continues to climb, providing a strong impetus for economic growth. However, with the arrival of the cyclical results of family planning policy, the proportion of the elderly population in China continues to rise, and the trend of population aging is prominent. This paper will discuss the impact of demographic dividend on the transformation of China's foreign direct investment from two perspectives: the change of the total population and the change of the demographic structure.

This paper studies the development and transformation of FDI in China from the perspective of demographic dividend, which is of great practical and theoretical significance. The practical significance is that with the emergence of a new round of "employment shortage" in China, the contribution rate of China's first population dividend to the economy has reached 25% [2], so when entering the second population dividend period, whether the population dividend still has a contribution to the economy, the theoretical significance is to study the impact of demographic dividend changes on the economy from the perspective of demographic transition.

With the change of the total amount and structure of population dividend, whether the investment environment of China is still attractive to FDI or not is of great significance both in theory and in reality.
1.1. Literature review

1.1.1. Demographic dividend changes. From the analysis of most previous scholars' studies, the social dependency ratio is generally used as a measure of demographic dividends. David E Bloom and Jeffrey G Williamson [3] (1997) studied Asian emerging economies (Korea, Japan, Hong Kong, Singapore), the reason for the rapid economic development, found that the demographic change played a key role, and the economic growth advantage brought by the higher proportion of the working age population in the total population is called "demographic dividend". Lin Yifu, Cai Fang [4] (2003) analyzed the huge advantages brought by the comparative advantages of China's labor force from the perspective of economic development strategy and reform. The population policy in the early days of New China created a large number of labor resources for the early days of reform and opening up. It is a key reason for attracting foreign investment and creating a "Chinese miracle" since the reform and opening up. Cai Fang [5] (2010) demonstrated the gradual disappearance of China's demographic dividend and the arrival of the turning point of Lewis by predicting the trend of population change. He emphasized that only by maintaining a rapid and stable economic growth can China get rid of the predicament of “being old before getting rich”.

1.1.2. Foreign direct investment. There has been academic debate about the impact of FDI on the economic development of the host country. Some scholars believe that the introduction of FDI is beneficial to the economic development of the host country. Ronald Lee [6] (2016) believes that the introduction of FDI will accelerate the competition of domestic enterprises, prompting enterprises to actively innovate and enhance their own competitiveness. Tan Li [7] (2002) studied foreign direct investment from the perspective of industrial structure upgrade. He believed that the introduction of foreign direct investment can bring the technology and capital required by the host country to adjust the industrial structure. On the other hand, Easterly [8] (1993) believed that the introduction of FDI would have a crowding-out effect on the domestic investment of the host countries. Zhang Haiyan [9] (2002) raised some issues in China's efforts to attract FDI. China cannot effectively convert existing savings into investment, so it is overly dependent on foreign investment.

1.1.3. Demographic dividend and foreign direct investment transformation. The relationship between demographic dividend and FDI has been controversial. Huang Chuanrong [10] (2004) pointed out that, on the one hand, the disappearance of the demographic dividend will make China's manufacturing industry less attractive to foreign investors. On the other hand, the disappearance of this comparative advantage has forced China to actively transform and upgrade the industrial structure, especially the FDI structure. Liu Shenglong and Guo Weilong [11] (2013) pointed out that with the disappearance of the demographic dividend, competition among enterprises will intensify, technological and management innovation, and reform of the market system will attract more FDI.

To sum up, the disappearance of China's demographic dividend will definitely have an impact on China's foreign direct investment. As for the positive effect or the negative effect, it needs to be analyzed from different specific analysis perspectives.

2. Analysis of China's demographic dividend and foreign direct investment

2.1. Demographic dividend status
Since the reform and opening up, with the progress of social productivity and the implementation of family planning policy, China's total population has experienced a rapid growth for 60 years, but the birth rate has shown a rapid downward trend. According to the national statistical data in the past 20 years, the birth rate of China's population has decreased from 14.03% in 2000 to 10.48% in 2019, and the mortality rate has increased from 6.45% in 2000 to 7.14% in 2019, showing a slow upward trend. In general, the natural growth rate of population has continued to decline, which has declined by about 4 percentage points in the past 20 years.
With the change of the total population, the age structure of the population has also changed significantly. According to the age structure in Table 1, the birth rate changed significantly from 2000 to 2018. The population aged 0-14 shows a downward trend year by year; before 2010, the population aged 15-64 shows a steady increase trend, but after 2010, there is a turning point, decreasing year by year; while the population aged 65 and above has been rising steadily, accounting for 11.9% of the total population by 2018. According to the United Nations age structure standards, if the population of a region over 65 years old reaches 7% or more, it can be considered as an aging society. According to data analysis, China has entered an aging society at the beginning of this century, and the level of aging has been rising, and old-age care has become an important social burden.

Table 1. Age structure of the national population in even years from 2000 to 2018.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total population</th>
<th>0-14 years old proportion</th>
<th>15—64 years old proportion</th>
<th>65 years old and over proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>127747</td>
<td>29012</td>
<td>23%</td>
<td>89910</td>
</tr>
<tr>
<td>2002</td>
<td>128453</td>
<td>28774</td>
<td>22%</td>
<td>90320</td>
</tr>
<tr>
<td>2004</td>
<td>129988</td>
<td>27947</td>
<td>21%</td>
<td>92184</td>
</tr>
<tr>
<td>2006</td>
<td>131448</td>
<td>25961</td>
<td>20%</td>
<td>95068</td>
</tr>
<tr>
<td>2008</td>
<td>132802</td>
<td>25166</td>
<td>19%</td>
<td>96680</td>
</tr>
<tr>
<td>2010</td>
<td>134091</td>
<td>22259</td>
<td>17%</td>
<td>99938</td>
</tr>
<tr>
<td>2012</td>
<td>135404</td>
<td>22287</td>
<td>16%</td>
<td>100403</td>
</tr>
<tr>
<td>2014</td>
<td>135675</td>
<td>22558</td>
<td>17%</td>
<td>100469</td>
</tr>
<tr>
<td>2016</td>
<td>138271</td>
<td>23008</td>
<td>17%</td>
<td>100260</td>
</tr>
<tr>
<td>2018</td>
<td>139538</td>
<td>23523</td>
<td>16.8%</td>
<td>99357</td>
</tr>
</tbody>
</table>

Data source: National Statistical Yearbook of China, which is sorted out by the author.

2.2. Status of foreign direct investment

Since the introduction of FDI in China in 1979, foreign direct investment has developed well. In 2002, the actual amount of FDI absorbed by China reached 52.7 billion US dollars, surpassing the United States for the first time and becoming the country with the largest amount of FDI in the world, and becoming the country with the largest amount of FDI attracted by developing countries for 21 consecutive years.

Since 2001, the absorption and utilization of foreign direct investment has gradually matured and steadily increased. China's foreign investment policy has changed. The use of foreign investment is more focused on quality. The field of foreign investment has also been further expanded. The overall utilization rate of foreign investment in China is rising[13]. As far as the ways of FDI in China are concerned, there are mainly Sino foreign cooperative operation, Sino foreign joint venture, wholly foreign-owned enterprise, joint stock company with foreign investment, cooperative development, etc. From the perspective of spatial distribution of FDI, from 1979 to 2016, on the one hand, the total amount of FDI attracted and utilized by the whole country and various regions is increasing yearly; on the other hand, the proportion of FDI absorbed and utilized by various regions in the East, the middle and the West is constantly changing. Although the actual use of FDI in the eastern region has been increasing, but compared with other regions, its proportion is declining year by year, while the proportion of FDI in the central and western regions is not large, but the absolute number and proportion are showing an upward trend.
Based on the analysis above, we know that China's demographic dividend is gradually declining. At the same time, China's FDI is gradually showing a downward trend. In order to further confirm whether there is a relationship and specific relationship between the two, we need to do an empirical analysis to demonstrate the relationship between the two.

**3. Impact of demographic dividend on foreign direct investment**

**3.1. From the perspective of total amount**

The impact of total population on FDI is mainly based on changes in the number of laborers. Before the implementation of the family planning policy, China's birth rate was very high. With the efforts of several generations, the rich working-age population has become a major advantage of China's economic development.

Manufacturers' basic factor inputs include labor and capital factor inputs. In an open market environment, capital factors are divided into domestic investment and foreign investment. GDP is used to represent the level of total output, DKI is used to represent domestic investment, and FDI is actually used to represent foreign investment. LA represents the input of labor factors. Introducing the econometric model, the equation is as follows:

\[
\ln FDI_t = b_1 + b_2 \ln GDP_t + b_3 \ln DKI_t + b_4 \ln LA_t + u
\]

This paper collects relevant data from 1992 to 2018 for statistical analysis. In the process of OLS estimation, the results are as follows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard deviation</th>
<th>t statistics</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C$</td>
<td>10.18451</td>
<td>0.148101</td>
<td>68.76726</td>
<td>0.0000</td>
</tr>
<tr>
<td>$\ln GDP$</td>
<td>0.064098</td>
<td>0.031706</td>
<td>-2.021639</td>
<td>0.0550</td>
</tr>
<tr>
<td>$\ln DKI$</td>
<td>0.015479</td>
<td>0.009515</td>
<td>-1.626801</td>
<td>0.1174</td>
</tr>
<tr>
<td>$\ln LA$</td>
<td>0.182413</td>
<td>0.044739</td>
<td>4.077279</td>
<td>0.0005</td>
</tr>
</tbody>
</table>

$R^2 = 0.971221$  
F Statistics = 258.7290
\[ \ln \text{FDI} = 10.18451 + 0.064098 \ln \text{GDP} + 0.015479 \ln \text{DKI} + 0.182413 \ln \text{LA} \]  

(2)

\[ \begin{array}{cccc}
  t & = 68.76726 & -2.021639 & -1.626801 & 4.077279 \\
  P & = 0.0000 & 0.0550 & 0.1174 & 0.0005 \\
  R^2 & = 0.971221 & F \text{ Statistics} = 258.7290 & D.W. = 0.430926 
\end{array} \]

From the above results, it can be seen that the fitting goodness R^2 of the equation is close to 1, which indicates that the fitting effect of the regression equation is very good.

In order to test whether the cointegration relationship between variables is established and whether the regression results are true and effective. Now we test the stability of the residual. The estimated value of the residual sequence \( \mu \) obtained from the regression equation is:

\[ \lambda = \ln \text{FDI} - 10.18451 - 0.064098 \ln \text{GDP} + 0.015479 \ln \text{DKI} - 0.182413 \ln \text{LA} \]  

(3)

The ADF test of \( \lambda \) was carried out with Eviews, and the test results were as follows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>ADF</th>
<th>Critical value(5%)</th>
<th>Prob.*</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \lambda )</td>
<td>-3.256288</td>
<td>-1.954414</td>
<td>0.0022</td>
<td>stable</td>
</tr>
</tbody>
</table>

The ADF value of the residual is -3.256288, which is less than the critical value of 5%, indicating that the residual is a stationary sequence. Therefore, there is a long-term cointegration relationship between lnFDI and \( \lambda \).

In short, there is a relationship between the total demographic dividend and FDI, and the impact of the total demographic dividend on FDI is positive, which explains the rapid growth of FDI in China in the early days of reform and opening up and the slowdown of FDI growth in recent years.

3.2 From the perspective of structure

The demographic structure of a country can reflect a country's economic development level and potential.

According to the data collection and analysis of the social dependency ratio, it can be seen that the total social dependency ratio has been on the rise after a short decline, with 2011 as the turning point; the elderly dependency ratio has been on the rise, and the growth rate has been significantly accelerated since 2011; the general trend of the child rearing ratio has decreased, before 2011 it decreased at a faster rate, and after 2011 it has increased at a relatively gentle rate.

![Figure 3. Changes in China's social population dependency ratio from 2002 to 2018.](source)


In order to specifically study the impact of population age structure on FDI, an empirical model was established to analyze the relationship between them.

\[ \ln \text{fdi} = C_1 + C_2 \ln \text{gdp} + C_3 \ln \text{dki} + C_4 \ln(1 + dr) \]  

(4)
dr refers to the dependency ratio of the working age population, also known as the social dependency coefficient. gdp, dki and fdi respectively refer to the per capita GDP, per capita investment in fixed assets and per capita actual use of foreign direct investment. In the process of OLS estimation, the results are as follows:

Table 6. Regression results.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard deviation</th>
<th>t statistics</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>lngdp</td>
<td>0.265472</td>
<td>0.143005</td>
<td>1.856381</td>
<td>0.0763</td>
</tr>
<tr>
<td>lndki</td>
<td>-0.000958</td>
<td>0.102561</td>
<td>0.009344</td>
<td>0.9926</td>
</tr>
<tr>
<td>ln(1+dr)</td>
<td>-1.852842</td>
<td>0.056842</td>
<td>32.59623</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>1.292355</td>
<td>0.096489</td>
<td>13.39376</td>
<td>0.0000</td>
</tr>
<tr>
<td>R²</td>
<td>0.996442</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
\ln fdi = 1.292355 + 0.265472 \ln gdp - 0.000958 \ln dki - 1.852842 \ln (1+dr) \]  \hspace{1cm} (5)

\[
t = 68.76726 \quad -2.021639 \quad -1.626801 \quad 4.077279
\]

\[
P = 0.0000 \quad 0.0763 \quad 0.9926 \quad 0.0000
\]

\[
R² = 0.996442 \quad F \text{ statistics} = 2147.217 \quad D.W. = 1.458483
\]

It can be seen from the above results that the goodness of fit R2 of the equation is close to 1, indicating that the fitting effect of the regression equation is very good.

The estimated value of residual sequence \( \mu_t \) can be obtained by regression equation:

\[
\lambda = \ln fdi - 1.292355 - 0.265472 \ln gdp + 0.000958 \ln dki + 1.852842 \ln (1+dr) \]  \hspace{1cm} (6)

Table 7. Stability test results.

<table>
<thead>
<tr>
<th>Variable</th>
<th>ADF</th>
<th>Critical value (5%)</th>
<th>Prob.*</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \lambda )</td>
<td>-4.448771</td>
<td>-1.954414</td>
<td>0.0001</td>
<td>stable</td>
</tr>
</tbody>
</table>

The ADF value of the residual at the horizontal value is -4.448771, which is less than the critical value of 5%, indicating that the residual is a stationary sequence. Therefore, there is a long-term cointegration relationship between \( \ln fdi \) and \( \lambda \).

In a word, through the above empirical analysis, there is a negative relationship between the demographic dividend structure. The change of demographic dividend structure shows that the proportion of the working age population in the total population decreases, that is, the increase of social dependency ratio will reduce FDI.

4 Conclusions and policy recommendations

4.1 Conclusion

Through the above empirical analysis, the total amount and structure of population dividend have an important impact on FDI. Firstly, the increase of total population will increase the inflow of FDI, and the increase of dependency ratio will reduce the inflow of FDI. Secondly, GDP and DKI will also have an important impact on FDI. Specifically, the rapid growth of GDP will attract more FDI, while the increase of DKI will play the opposite role, which will have a "crowding out effect" on FDI.

4.2 Policy recommendations

First, we should attach importance to the development of human capital and increase the investment in science, education, culture and health. Fundamentally improve the quality of labor, and then improve labor productivity.
In addition, we should appropriately extend the retirement age, establish a retirement employment market for the relatively younger elderly.

Second, we should give full play to the role of the second demographic dividend period, attach importance to capital accumulation and encourage preventive savings.

Third, enhance the industrial level of FDI and promote the upgrading of the industrial structure. We should strengthen the opening up of the service industry, promote the flow of foreign capital to the service industry, and encourage foreign investors to actively invest in modern service industry and infrastructure construction.

Fourth, enhance the diversification of the introduction and use of FDI, and improve the quality of imported FDI. Guide foreign investment into the reorganization and transformation of domestic enterprises, as well as the vitality of state-owned enterprises stimulated by merger and acquisition, equity participation, reinvestment and other forms.

References