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China growth to 2030: Two-child policy and economy factors change

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Two-child policy and economy factors change

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ABSTRACT: This research aims to analyze how two-child policy influence the future demographic change in China and then how it is related to the economic factors to affect the future economy change in China. Two questions will be focused on. One is the trend of economy factors change, another is which group of population, divided based on the age of population, will affect each economy trend most. A simulation model will be used in the first question during the process. Data about how Chinese demographic change under different growing pattern will first be collected, also the economy factors. By doting the comparison on the economy factors between the situation under stable fertility and two-child policy, the conclusion obtained as two-child policy will influence most of the economy factors in a good way, and few will be influenced negatively. As for another question, how economy factors will be impacted by different age population will also be analyzed, by using the regression model.

I. Introduction

Population plays a decisive role in one country's economy trend. From the past fifty years, China had the period of economic prosperity, which had a lot connection to Chinese sharply demographic growth. In the other word, Chinese economic prosperity, in some ways, had depended on its relatively massive population and citizen labor. From the year 1970 to 1974, the annual population growth rate of China was above 2%. Since 1975, the rate was between 1% to 2%, and until year 1998, the annual population growth rate of China was below 1%. The population grew dramatically since the year 1970 (818 million population) and the population broke the point in 2005, which was 1.3 billion, which showed trend to slow down the growth. In 2018, the total population of China had reached 1.393 billion. As the reason for using 1970 as the beginning year, it's because China had gradually stepped into a developing period and the population can truly reflect the dramatic growth without extrinsic factor.

In the same historical periods, China's annual growth rate of GDP grew steadily, and remains positive. One exception was in the year 1976, because of the catastrophic natural calamities and political change, China's economy and population were influenced and became negative. In other years, Chinese annual growth rate of GDP was higher than the United States of America in the same year, also reached 10% in several years. As an agricultural focused country, the industrial value change had a significant meaning for China's economy change. Besides several years, the annual increase rate of industrial value of China was above 10% from the year 1970 to 2011. Till 2018, this rate remains relatively high as 5.8%. By analyzing these two rates, related to the population growth, it's obvious to see that the economy grew with the population increased since 1970 to 2018.

In the previous research, the economy change of China in the past years was analyzed based on the demographic change. One of the basic conditions was that the one child policy was released in the year 1982, and before the 1982, there was no limitation. One child policy was unique for China, also for the world. It may bring pain to one or two specific generation, but this policy would provide a great economic benefit to the next several generations. So, for China, as well as the whole world, the one child policy was one of the most important population policies that ever released. (Potts, M., 2006. China's one child policy) However, in the year 2015, one child policy was abolished and two child policy came onto the stage, since the population situation and several population problems turned to affect the economy and environment in a bad way. There are few researches that focus on finding out how the two-child policy influence the future demographic change, and put it related to the economy growth. In this research, it will show that how population change in the next ten years because of the two-child policy and how it will affect the Chinese economic growth, considering the real GDP, real income, rate of return on installed capital and so on.

The main objective of this research aims to analyze how two-child policy influence the future demographic change in China and then how it is related to the economic factors to affect the future economy change in China. A simulation model and regression model will be used during the process. Data about how Chinese demographic change under different growing pattern will first be collected, also the economy factors. By doting the comparison on the economy factors between the situation under stable fertility and two-child policy, the conclusion obtained as two-child policy will influence most of the economy factors in a good way, and few

will be influenced negatively. In this research, how economy factors will be impacted by different age population will also be analyzed, by using the regression model.

After the rapid transformation from high fertility rate to low fertility rate, the main contradiction of China 's population is no longer the rapid growth, but the disappearance of population dividend, the near ultral-low fertility level, the aging population, the imbalance of sex ratio at birth and other issues. Based on above conditions, China's population policy need to be changed, and the two-child policy released. Same problem happened in Chinese economy due to the population condition. The two-child policy is timely and necessary for Chinese future economy developing. The policy has significance in relieving socio-economic pressure and promoting economic growth, for which it is not only a necessary premise but also a sufficient condition. (Zheng, B., 2016.)

This research is mainly to fill in the gap that how two-child policy, a brand new population policy in China, will affect Chinese economy factors. It will also help to build a theoretical prescience, which can expose both the advantage and disadvantage of two-child policy, economically. Proceed to the next step, some relative policies can be constituted to achieve a more stable developing economy environment in the future.

II. Literature Review and Hypothesis development

China is famous for its population and large market for several years. Since the one-child policy released, lots of research published, discussing the one-child policy and its influence. Economy was one of the main related topics. One-child policy can influence the economy in many ways, like the population amount, population structure, family structure, labor amount, aging problem, also marketing condition. However, four years ago, in 2015, the one-child policy had replaced by two-child policy. The curiosity came up as how the new population policy will influence China in the same aspects as the previous policy. There is no doubt that the new policy will have a totally different effect on Chinese labor condition and economy growth.

2.1 The trend of economy factors changes affected by demographic change

This research aims to show the effect in much more detail by analyzing the related data. The analyze will be in progress by simulating the future labor amount, population structure, gender ratio of China and put out scenarios about Chinese' future economy trend based on the previous known relationship between demographic change and economic trend. The population data includes total population amount, labor force. The economic factors include real GDP, real GDP per capital income, real income, real income per capital income, real production wage, rate of return on installed capital. There are several hypotheses based on the data collection.

One of the main hypotheses is that two-child policy will influence Chinese future economy factors in a relatively good way, which means most of the Chinese economy factors will be affected in a good way, and only few will be affected negatively.

To find out the changes of economy factors under two-child policy situation and stable fertility situation, this research follows four steps. First, analyze the previous data and draw the future trend. This step will collect data from 2015-2018, three years with two-child policy, and draw a future trend based on the previous known relationship between the demographic change and two child policy. Second, following the first step to analyze the economy situation and build

relationships between demographic change and economy factors. In the previous two steps, a simulation will be built to show the future trend of, no matter the population growth or the economy trend. Third, using the collected data to do the comparison between China with two child policy and China under other scenarios, which are stable fertility condition, low fertility condition. When discussing the economy trend, high age participation scenario can also be built. At last, draw a conclusion to sum up how two child policy influence Chinese economy trends in both domestic market and world economy environment.

2.2 Which group of population will affect each economy trend most

Digging out which age stage of population request acquire the amount of population in different age stage, and a regression model will run by relating the amount of three groups of population and the five economy factors. After the p value is checked if the regression model is accurate, a conclusion can be reached.

The amount of population in different age range, which are population aged between 0-17; 18-65 and population aged above 65 will be collected and simulated in this question. By using five economy factors, each economy factors will be used to build a regression model with the independent variables are three groups of population, divided based on the age. Stata, a professional statistical tool will be used to build regression model and collect related factors. The number of the co-efficiency and the positive or negative values of the co-efficiency will be focused on to do the analysis.

The hypothesis of this question is that all groups of population will affect Chinese economy in a good way, with a positive co-efficiency, but the impact of population aged above 65 can be less than the population aged between 0-17 and 18-65. The most effected group of population should be the population aged from 18-65.

III. Research Methodology

In this research, different methodologies will be used to analyze two different questions. For the first question, which is the trend of economy factors changes affected by demographic change, data collection and comparison are the most important parts. As for the question that which group of population will affect each economy trend most, five regression models will be built based on the data collected.

3.1 The trend of economy factors changes affected by demographic change

For the first question, two model are used to show the future trend of demographic change and economy change. The change of fertility rate is focused on due to the different population policy and under different scenarios, thus, how the economy factors change under different fertility rate will be the reflection of how two-child policy influence the economy situation. The data used in this research to find out the relationship between demographic change brought by two-child policy and economy factors change starts from the year 1997, in which year, China's economy began to bloom to the year 2030. The future twenty years data is simulated by two models. For the demographic model. The model was created by Tyers (2005) and Shi (2006). They created a complete demographic sub-model which was rearrange and reorganize within a dynamic numarical modle. Following this model, with the previous years' population growth trend known, which is provided by "Kuaiyi Data", the future demographic change under new population policy can be predicted.

As for the economic model, GTAP-dynamic model is used. GTAP-dynamic is the expand developed version of GTAP model to observe and analyze different dynamic behavior. GTAP-dynamic model organized all different kinds of special characteristic of the origin version of GTAP Model. Besides, it also includes other economic factors, such as many complex consumer demands and inter- sectoral factor mobility. Furthermore, the GTAP-dynamic model also built a brand new interact treatment of investment behavior and other accounting relations, as well as the economic trend. By using these two models and combining the data from these two models, it's convenient to find out how demographic change affect economic factors that are mentioned before in this research.

According to previous paper done by other researchers, it seems that demographic change and economy factors are interactive, in some ways. However, the effect of demographic change on economy factors is much more significant. The population growth can gender ratio can affect one country's labor force, also, economically, the market of this country can also be influenced due to the change of purchasing power. Each generation has its purchasing preference caused by its growing period and environment, which may lead the market. Different generation shares different amount of population, as well as different gender ratio, which may lead to aging problem after several years. On the other way, if the economy tends to collapse caused by aging problem or other population problems, then the country has to do the reflection and change the social and population policy. In the other word, demographic change affects economy and economy is a mirror that reflects population condition. In this research, it is possible that two-child policy affects economy factors and leads to a different result compared with the economy condition in the period of one-child policy.

This research is planned to analyze the previous data and draw the future trend, and in the same way to analyze the economy situation and build relationships between two-child policy and economy factors. Then a scenario will be built to show the future trend of, no matter the population growth or the economy trend. After above steps, collected data is used to do the comparison between China with two child policy and China under other scenarios to find out the difference influence between two population policies. Also, do the comparison between China with two child policy and other Asian countries and rest region of world.

Followed the methodology explained previously, the future population amount of China under different scenarios from 2000 to 2030 is simulated and shown in the following table.

Table 1: The Chinese population under alternative demographic scenarios, 2000-2030

Year	Stable fertility (Million)	Two-child policy (Million)
2000	1,253	1257
2010	1328	1369
2020	1369	1462
2030	1382	1536

Note: The stable fertility is the situation under one-child policy. The data is simulated by the model which was mentioned in the text previously.

According the fertility rate released by the State council of China, the fertility rate under one-child policy is approximately 1.80-1.90. When the policy turned to be the two-child policy, the fertility rate rises to approximately 1.90-2.30.

3.2 Which group of population will affect each economy trend most

There is also a model to analyze which group of population that will impact the five economy factors most. The groups are population aged between 0-17;18-65 and population aged above 65. A regression model will be built as:

$$Y=A_0+A_1X_1+A_2X_2+A_3X_3+E$$

In which, Population age 0-17=X1, Population age 18-64=X2, Population age above 65=X3 and Real investment=Y1, Real GDP=Y2, Real income per capital=Y3, Real production wage=Y4, The rate of return on installed capital=Y5. In this model, if the p value is less than 0.1, then it will be considered as it is accurate. So, five regression model in total will be built, aiming to find out which group of population impact them most.

Table 2: Amount of population of different age (Ten Million)

Population age0-14	Population age 15-64	Population age>65
22.736376	100.122104	12.088821
22.1123065	101.097232	12.441818
21.5057622	102.0654282	12.8074458
20.9175016	103.0093719	13.1831265
20.3438056	103.9272248	13.5689696
19.7864524	104.8246836	13.9674782
19.2456529	105.7054911	14.3774627
18.7188904	106.5602568	14.8008528
18.2065024	107.3885082	15.2349894
17.7074106	108.1911886	15.6814008
17.2217166	108.9740806	16.1470496
16.7524566	109.7410413	16.6165021
16.2929712	110.4825744	17.1044544
15.847854	111.195348	17.6053515
15.4130658	111.8846938	18.1222404
14.9923734	112.5626927	18.6549339
14.5799381	113.2072883	19.2027736
14.1824466	113.8319784	19.765575
13.7932388	114.4315854	20.3451758
13.413426	115.0104189	20.9431677

(Source:https://wk.baidu.com/view/cef98c4de45c3b3567ec8b98?pcf=2&from=singlemessage&isappinstalled=0)

Table 3 Economic effects of faster Chinese population growth to 2030

	Real investment	Real GDP	Real INCOME per capital	Real production wage	Rate of return on installed capital
2010 stable fertility	0.7	0.3	-1.1	-0.2	0.1
2010 two child policy	2.7	1.1	-3.6	-0.6	0.4
2020 stable fertility	2.9	1.5	-2.7	-0.6	0.2
2020 two child policy	8.8	4.7	-7.3	-1.9	0.6
2030 stable fertility	5.3	3.6	-4.4	-1.4	0.3
2030 two child policy	14.7	10.3	-11.0	-3.8	0.6

(Source: https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=3169)

Table 4 Economy factors change from year 2010 to 2030

	real income	Real GDP	Real production wage	Real Investment	Domestic excise tax
2010	410354.1	412119.3	10919	251683.8	6071.55
2011	483392.8	487940.2	13134	311485.1	6936.21
2012	537329	538580	14669	374694.7	7875.58
2013	588141.2	592963.2	16190	446294.1	8231.32
2014	642097.6	641280.6	17778	512020.7	8907.12
2015	683390.5	685992.9	19397	561999.8	10542.16
2016	737074	740060.8	21285	606465.7	10217.23
2017	820099.5	820754.3	22935	641238.4	10225.09
2018	896915.6	900309.5	25002	645675	10631.75
2019	994389.3	999343.5	27752.2	729612.8	11588.6
2020	1103772.2	1109271.3	30805.0	824462.4	12631.6
2021	1225187.1	1231291.2	34193.5	931642.5	13768.4
2022	1359957.7	1366733.2	37954.8	1052756.0	15007.6
2023	1509553.0	1517073.9	42129.8	1189614.3	16358.3
2024	1675603.9	1683952.0	46764.1	1344264.2	17830.5
2025	1859920.3	1869186.7	51908.2	1519018.5	19435.3
2026	2064511.5	2074797.2	57618.1	1716491.0	21184.4
2027	2291607.8	2303024.9	63956.0	1939634.8	23091.0
2028	2543684.7	2556357.7	70991.2	2191787.3	25169.2
2029	2823490.0	2837557.0	78800.2	2476719.6	27434.4
2030	3134073.9	3149688.3	87468.3	2798693.2	29903.5

Source: http://data.stats.gov.cn/easyquery.htm?cn=C019

By using the data listed in the table 2 and table 4, five regression model are built as: (see details in appendix)

Coef	Y1	Y2	Y3	Y4	Y5
X1	2.3 **	2.2 **	8.3 **	4.9 *	3.8 **
X2	1.6 **	1.6 **	5.6 **	3.2 **	2.4 **
X3	-0.62 *	-0.63 **	0.14 *	-0.47	-0.4 *

$Y1=2.3X1+1.6X2-0.62X3+E$

$Y2=2.2X1+1.6X2-0.63X3+E$

$Y3=8.3X1+5.6X2-0.14X3+E$

$Y4=4.9X1+3.2X2-0.47X3+E$

$Y5=3.8X1+2.4X2-0.4X3+E$

From the five regression models, it is obviously to see that all groups of age population have an impact. One exception is that population aged above 65 has no significant relationship with real production wage. It also can be seen that population aged from0-17 and 18-65 have a positive impact on these five economy factors, however, population that aged above 65 has a negative impact.

IV. Expected Results

In this part, this research will check if the results analyzed from the data will fit the hypothesis. The hypothesis of the first question is most five economy factors will be influenced positively, however, a few will be affected in a negative way. The hypothesis of the second question is that all groups of population will affect Chinese economy in a good way, with a positive co-efficiency, but the impact of population aged above 65 can be less than the population aged between 0-17 and 18-65. The most effected group of population should be the population aged from 18-65.

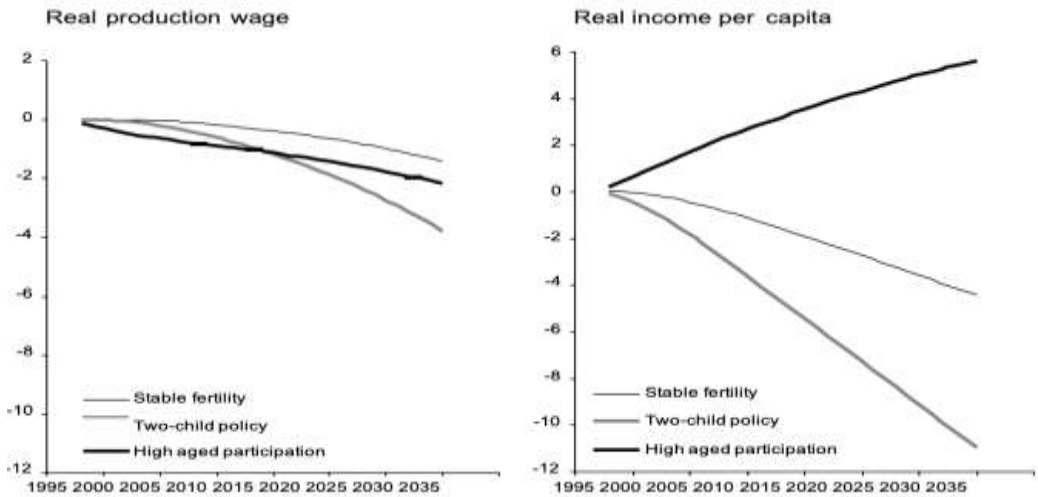
4.1The trend of economy factors changes affected by demographic change

By using the different fertility rate, this research mainly focused on the relative change of real investment, real GDP, real income per capital, real production wage and the rate of return on installed capital, which is shown in table 3

The data in the table 3 means the percentage departures of the two-child policy from the low-fertility baseline.

Compared with the original situation, the higher fertility rate does improve the return on installed capital in China, thus improving the level of investment. In turn, China's GDP is higher. However, the higher fertility rate slows down the growth of real wages and the real income per capital. To see the further influence, the figure below illustrates the corresponding dynamics of real production wages and real per capital income.

Figure 1 Real Production wage and Real income change under different scenarios



With the real production wage goes down, the real income per capital shows the same trend under the two-child policy. In the real income per capital chart, a much more evident gap appears between the stable fertility situation and two-child policy.

Though the real production wage and real income per capital decrease under the two-child policy, the rest of three economy factors that are used to do the analysis are affected in a positive way by the two-child policy, which support the hypothesis mentioned in the beginning part that two-child policy affects Chinese economy in a relatively positive way.

Since a simulation model is used in this research, one of the biggest problems is that the data after 2020 will not be completely accurate as the data before 2019. The figures and tables showing above can only reveal the future basic trend but not the exact data.

Another interesting trend is found from the last two chart, which shows the real production wage and real income per capital. The highest real production wage in under the stable fertility situation, however, the age population situation owns the highest real income per capital. This difference may be related to other economy policy and marketing environment.

4.2 Which group of population will affect each economy trend most

As for which group of age impact the economy factors most, by looking for the table 2, all groups of population have great of effect, except the relation between population aged above 65 and real production wage. Among the relationships between different groups of population and five economy factors, population aged from0-17 and 18-65 have a positive impact on these five economy factors, however, population that aged above 65 has a negative impact. So, the hypothesis that all groups of population have positive impact will not come into existence. Another result that will also be against hypothesis is that the population aged 0-17 has the greatest impact on the five factors.

The working age population refers to people age 18-64, which is not exactly equal to the actual employment population in the economy, but there is a positive correlation between the working age population and the actual labor input in the economy. The labor age population can be regarded as the existed labor input and the age of 0-17 can be regarded as potential labor force, the sum of these two groups of population, that is, the upper limit of the labor input in the

economy. Over 65 years old brings few work forces and purchasing power which means it has negative impact.

Among these three different groups of population, the population age between 0-17 has the greatest impact on these five economy factors, which means that the potential labor with education has a significant meaning for Chinese economy growth. The population aged from 0-17, in some way, decide the future economy trend and lead the economy growth. The population aged between 17-65, theoretically speaking, should be the most effected group, however, because of this research collect data from 2020-2030,so this group of population has a little amount of people that was born after the two-child population put into force. However, the population aged from 0-17 is the group that affected by the two-child policy. So, due to the demographic change that took by the two-child policy, the population aged from 0-17 has the most impact on these five economy factors, rather than the group aged among 17-65.

V. Theoretical contribution

Population means a lot for a country, in this research, the economy relative influence is mainly focused on. Due to the population policy was changed in China society, finding out the following influence on Chinese economy is the research main purpose. In this research, a relative scientific simulating model is used to draw a future trend of the economy developing. The finding may be used on the theoretical prescience.

This research can show an approximate trend of future developing. As the aging problem becoming more and more serious. China had to change the population policy. If this kind of problem can be predicted in much more detail, then it can be prevented in some ways. Same as the economy area. Two-child policy is a big change for Chinese' society, thus economy has to be reflected in a relative way.

In the finding of this research, the influence on some of the economy factors have been shown. The finding can be used to make the corresponding policy and make the two-child policy have less negative influence to reach a much more stable economy environment.

VI. Conclusion

So far, China's economic growth depends on relatively abundant productive labor and an increasingly secure investment environment. However, in the next decade, China's labor force is likely to start to shrink, which will make its economy different from other Asian developing countries with relatively abundant labor force. This expectation is confirmed in this chapter. A new global population model is used, which is combined with the GTAP dynamic global economic model. In the GTAP dynamic global economic model, regional households are age-dependent and gender classification. China's shift to a two-child policy will boost its gross domestic product, which is expected to grow by about a tenth in 2030. However, this will slow down the growth rate of real per capita income and reduce the expected level by one tenth in 2030.

If China's participation rate of aging gradually rises to 2030, close to the interest rate level observed by Japan at present, almost the same GDP growth performance can be achieved. Taking the very low participation rate of the elderly in China by Asian standards into account, there is considerable room for this growth as the level of life expectancy at 60 years of age and the proportion of workers in the private sector continue to grow. If the increase in employment of the elderly is considered to be sufficient to enrich life and offset the decrease in leisure time,

then the research results show that the growth of per capital real income in this case is higher than the growth that may be achieved through the policy driven increase in fertility. High fertility not only reduces the growth of per capital income, but also has great uncertainty about the effectiveness of the birth policy in low fertility countries.

The purpose of this research aims to find out how the population policy which was changed from one-child policy to two-child policy may influence the future Chinese economy in some factors, and which groups of age population affect the five economy factors most. One of the limitations of this research is that the data is collected from the simulating model, which could be not totally accurate, and the other environment factors are not considered, such as the world market change, nature disaster, and other policy may be released in the future.

China should also attach importance to turn the potential labor, which is the population age between 0-17, into the real labor force in the market. Education and skills training are two essential way. Only if the potential labor is educated well and has the requisite professional skills that the market will accept them and turn them into the real labor that will bring a positive effect to Chinese future economy development. As for the population aged above 65, China should perfect its pension policy to active the purchasing power of this group of population.

6.1 limitation

About the limitation of this research, it can be concluded into three points, which are: Only five economy factors are included in this research. The research may not show the complete trend of Chinese economy in the future ten years; The data used are collected from the simulation model. The research cannot show the accurate trend of Chinese economy. It only provides a rough trend; Only future ten years have studied. The trend is not long-term discussed

6.2 Reliability and Validity

Since population has always been an important part in economy developing, the relation that this research build between demographic change and economy factors share a strong internal validity. The simulation model used in this research is built based on more than 50 years data collection. During this period, China changed its population policy twice and demographic change is included in the simulation model. So this model can reflect the demographic change under two-child policy in future in a relatively accurate way, which also reflect that the data collected based on this model has a reliable external validity.

6.3 Further Research

The further research could consider more about the variability and put more factors in the research finding. On the other hand, due to the uncertainty of the data collected from the simulation model. A better model may be built to use in this kind of research. After ten or twenty years, the finding of this research can be authenticated or overthrew. At that time, a further research with the same purpose can discuss about which steps of this research or the simulating model went wrong and build a correct one based on the true situation at that time.

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