An Analysis of Population Polices in China

Eng Seng CHIA, Yan JIA, Chenxi LI, Yulu LI, Manbo LIAO, Xiaoqi, Zhang

National University of Singapore

1 Engineering Drive 2 S117576 Singapore

Tel: +65 65166431

Email: aaron_chia@nus.edu.sg

Abstract

This paper examines the impact of various population policies in China, in particular, how to increase the fertility rate and reduce the age dependency ratio. The investigation carried out involved the identification of relevant factors, the establishment of causal relationships between factors and the building of a causal loop diagram, and subsequent conversion into a stock and flow diagram for running simulations. Data collected were from newspapers, published reports, and official government websites. The results obtained from the simulations revealed that the newly implemented two-child policy would most likely be ineffective in alleviating the issue of ageing population in China. Sensitivity analysis carried out to identify potential points of intervention revealed two possible measures. Both measures were shown to be effective in increasing the Actual Fertility Rate, and also in slowing down the increase in Aged Dependency Ratio. Hence, it is recommended that the Chinese government introduce alternative measures, such as giving cash bonus to families that give birth to a second child, or implementing policies that reduce the cost of healthcare services, in order to ensure that its population is productive, and continues to be so in the future.

Introduction

1.1 Background Information

First implemented in 1980 and enforced at the provincial level by the "Population and Family Planning Commissions", China's one-child policy is one of the most extreme population growth control measures in world's history. Even before its implementation, fertility levels have dropped from about 5.8 children per woman to 2.8 in 1979, due to the government's less coercive efforts to encourage fewer births [1]. Three decades down the road, the effect of the policy in contributing to China's spectacular economic development is evident and it succeeded in slowing down the population growth in China further, cutting down the fertility rate from 2.8 in 1980 to 1.5 in 2010 [2]. The growth is primarily due to resources diverted to support economic growth rather than population.

However, only 35% of Chinese are subject to the one-child policy due to the numerous

exceptions to law. Exceptions are made to couples with "practical difficulties" such as cases in which the father is a disabled serviceman or who are both single children themselves. Other exceptions include rural families with their first-born being a girl and ethnic minorities due to their already limited population [3].

Despite the government's continuous attempt to adjust and loosen the enforcement level over time by allowing couples of certain categories to have more than one child, the costs associated with the policy are glaring and rising. Currently, China is facing challenges of a declining fertility rate, shrinking labor force, and a growing proportion of elderly with inadequate government or family support. The real fertility rate is however difficult to determine because of under-reporting of the number of children, and varying survey methodologies. A more convincing estimate would be 1.5 children per woman as cited by various sources [4]. If no changes are made to the current family planning policy, a slowdown in China's economic and social development due to a shortage in productive labor force seems impending. This necessitates a re-consideration of the population policies made by the Chinese government.

1.2 Motivation

In 2015, the Chinese government officially proposed the implementation of a two-child policy, that is, all couples would be allowed to have up to two children, with the intention to create a productive workforce in meeting current and future demands, so as to mitigate the problem of ageing population.

This paper attempts to investigate the impact of introducing the two-child policy, and to determine its effectiveness in alleviating the problem of ageing population in China. It hopes to provide more insights on how the Chinese government can adjust its policies to better address the issue of ageing population.

2 Problem Description

2.1 Key Assumptions

The analysis of China's population policy is based on the following assumptions:

1) Immigration and emigration are excluded from the analysis, since they constitute an insignificant part to the net change in China's population. China's net migration rate is -0.44 migrant(s) per 1000 population as reported in 2015 [5].
2) All residents are registered in *hukou* (Household Registration System), since all data available is based on the number of registered population.
3) Equal proportion of females and males constitutes the Mature Population.
4) Exchange rate between China RMB and US Dollars will be set at 1 US dollar to 6.5 RMB throughout the period of study.
5) The quality of education on fertility is not considered. It is assumed that more money spent on education leads to higher education which leads to lower fertility rates.
6) In the simulation of the two-child policy, it is assumed that all graphical functions obtained by historical data are valid for current trends.

2.2 Approaches

The investigation was carried out in three stages:

1) Using the One-Child Policy Model developed after rigorous research, a simulation investigating the effect of the one-child policy with a time span from 1980 to 2015 (35 years) was conducted. Validation of the model was carried out by comparing the simulation results with the official statistics for China's Total Population, and Aged Dependency Ratio (ratio of aged dependents - people above 64 - to the working-age population - those aged 15 to 64 [6]) during those years.

2) The study simulated, observed and analyzed the two-child policy's impact on China's demographic structure by looking specifically at the trend of Total Population, Actual Fertility Rate as well as Aged Dependency Ratio. The time span for this simulation constituted two parts, 1980 to 2015, and 2015 to 2050 (35 years) with 2015 being the year when the two-child policy was introduced into the model, and 35 years was the period for one generation to mature and have children. The effectiveness of the two-child policy in alleviating the issue of ageing population in China would be evaluated.

3) Sensitivity analysis was performed on two factors, namely, Percentage of GDP (Gross Domestic Product) invested in Education, and Average per Capita Income of Household, in an attempt to identify the more significant factor that contributes to the worsening situation of ageing population in China. Finally, based on the sensitive factors identified, other measures that the Chinese government might consider adopting to better mitigate the current problems would be proposed and tested.

3 Base Case Causal Loop

The causal loop depicted in Figure 1 shows how the Country's Desired Fertility Rate, the Aged Dependency Ratio and the Education Level of Population affect the Actual Fertility Rate.

When the Country's Desired Fertility Rate increases, Individual's Desired Fertility Rate will increase, causing the Actual Fertility Rate to increase. It can be seen from the diagram that as Actual Fertility Rate increases, Young Population will increase. This will lead to an increase in both Mature Population and Aged Population in the future. In a shorter period of study, more mature population will lead to reduced Aged Dependency Ratio and hence increase Individuals' Desired Fertility Rate through a reinforcing loop. More mature population will also lead to an increase in Labor Force and hence GDP. Higher GDP rises up the Education Level of Population and people become less willing to have more children. In a longer period of study, more Mature Population will lead to more Aged Population. This will cause an increase in Aged Dependency Ratio that can undo the reinforcing loop effects. Therefore, this calls for attention to find a balance between short term and long term effects.

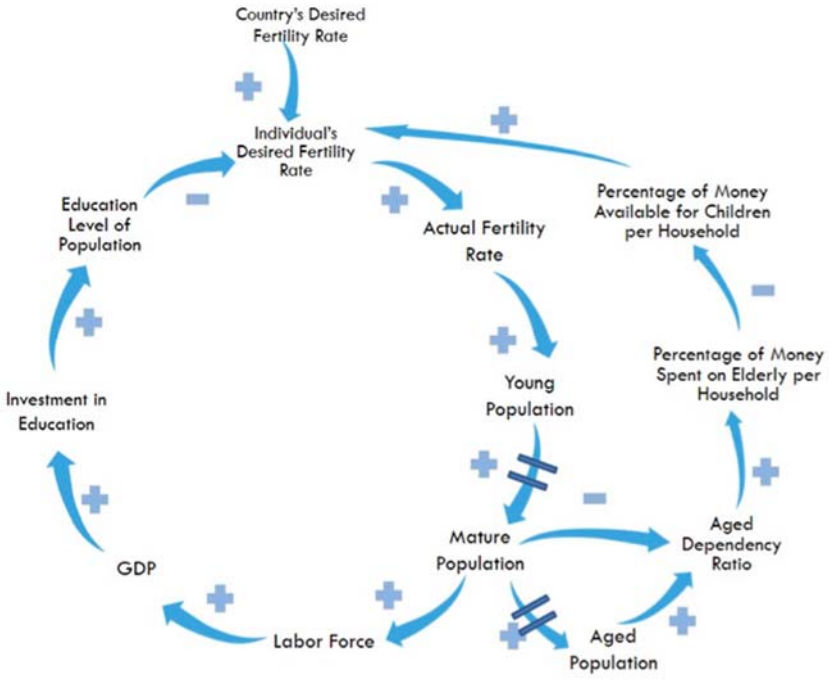

Figure 1 Causal Loop Diagram of Base Model

3.1 Feedback Loops

Three feedback loops were identified in the causal loop diagram. In this section, a detailed analysis of the relationships between different factors in each feedback loop is provided.

3.1.1 Education Level Erosion Loop

B1 is a balancing loop that highlights the relationship between the Education Level of Population and Individual's Desired Fertility Rate. As shown in the diagram, an increase in Actual Fertility Rate would lead to a rise in Young Population. With a delay of 14 years, this young population will become mature population. An increase in Mature Population will expand the Labor Force in the country, since more people are available for working. The country hence becomes more productive, and this leads to an increase in GDP.

Figure 2 Education Level Loop

With higher GDP, more money will be invested in education and this causes a rise in the Education Level of Population. Recent studies have noted that the more educated the population is, the less they are willing to have children [7]. Hence it will lead to a decrease in Individual's Desired Fertility Rate, and therefore lowers the Actual Fertility Rate. This generates a balancing effect on Actual Fertility Rate.

3.2.2 Aged Dependency Ratio Loop (Short Run)

Figure 3 is a reinforcing loop that illustrates the relationship between Aged Dependency Ratio and Individual's Desired Fertility Rate in the short run. As shown in the diagram, an increase in Actual Fertility Rate leads to a rise Young Population. With a delay of 14 years, this young population becomes mature population.

An increase in Mature Population decreases the Aged Dependency Ratio, since more mature people are available to support the aged population. A lower Aged Dependency Ratio will result in a smaller Percentage of Money Spent on Elderly per Household, leaving a larger Percentage of Money Available for Children per Household. Families are then more willing to have children, as they are more able to afford the costs of child-raising. This hence leads to an increase in Individual's Desired Fertility Rate as well as the Actual Fertility Rate.

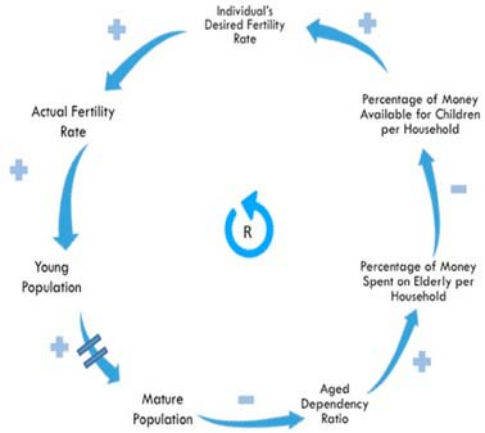

Figure 3 Aged Dependency Ratio Loop (Short Run)

3.3.3 Aged Dependency Ratio Loop (Long Run)

B2 in Figure 4 is a balancing loop that describes the relationship between Aged Dependency Ratio and Individual's Desired Fertility Rate in the long run. As shown in the diagram, an increase in Actual Fertility Rate will lead to a rise in Young Population. With a delay of 14 years, this young population will become mature population. With another delay of 51 years, the mature population will become aged population. Therefore, both Mature Population and Aged Population will increase in the long run. However, the growth rate in Mature Population is much lower than the growth rate in Aged

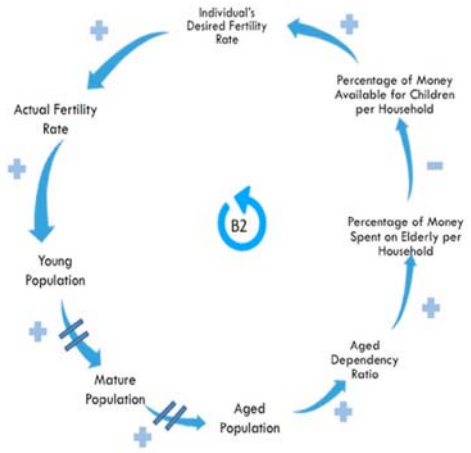

Figure 4 Aged Dependency Ratio Loop (Long Run)

Population is restricted due to the government's one-child policy. As a result, Aged Dependency Ratio will increase. A higher Aged Dependency Ratio will result in a larger Percentage of Money Spent on Elderly per Household, leaving a smaller Percentage of Money Available for Children per Household. Families are then less willing to have children, as they are now less able to afford the costs of child-raising. This hence leads to a decrease in Individual's Desired Fertility Rate as well as the Actual Fertility Rate, thus generating a balancing effect on the actual fertility rate in the long run.

4 Policies and Analysis Based on Systemic Dynamics Model

4.1 One-Child Policy

Based on the causal loop established, a stock and flow diagram was built (Figure 5), to simulate the dynamic system that modeled the implementation of the one-child policy. The simulation is run for 35 years, from 1980 to 2015, which was the period the one-child policy was implemented in China.

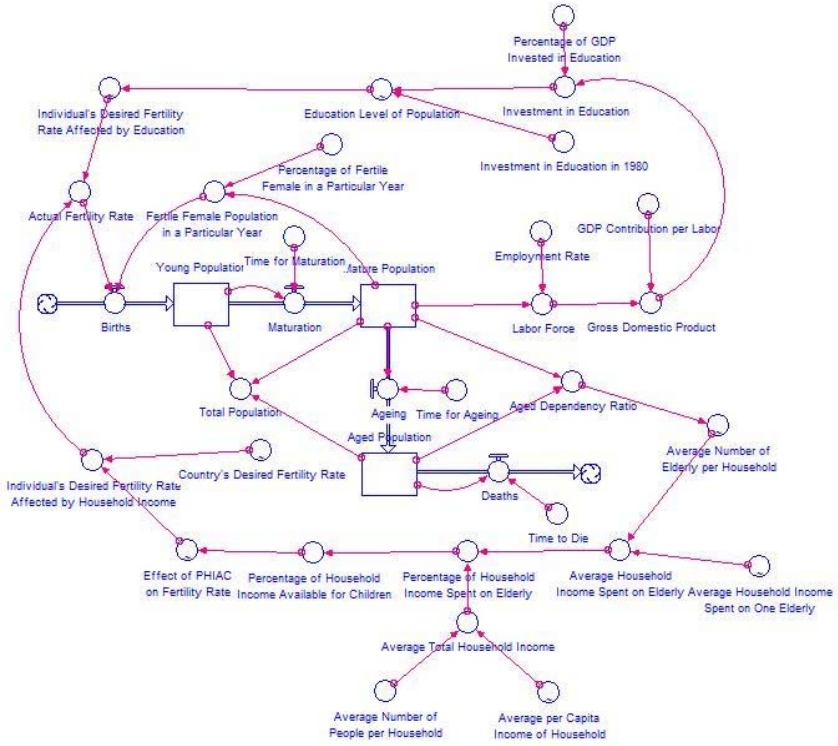

Figure 5 Stock and Flow Diagram

4.1.1 Model Description

The values used in the simulation can be found in Appendix A [8][9][10].

The following factors were defined with graphical functions obtained using historical data: Employment Rate [11], GDP Contribution per Labor [12], Average Number of Elderly per Household, Average Household Income Spent on One Elderly [13], Average per Capita Income of Household [14], and Percentage of GDP Invested in Education [15]. The graphical functions is found in Appendix A.

The following graphical functions were defined after thorough research and analysis, so as to best model the real situation.

Education level is defined on a scale of 0 to 1 as shown in Figure 6. The x-axis of the graph is the ratio of current Investment in Education to the Investment in Education in 1980. As the ratio increases, that is, investment in the education sector grows, the general Education Level of Population increases. The graph is concave in shape, as there exists a ceiling to the increase in education level, that is, the overall Education Level of Population cannot exceed certain limit (e.g. postgraduate level).

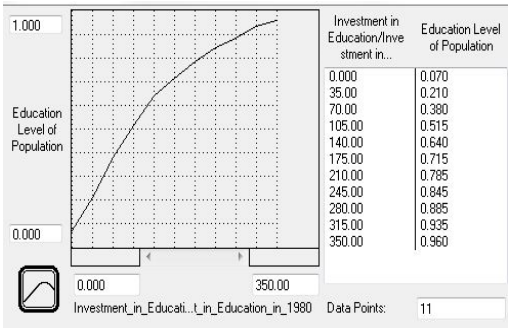

Figure 6 Education Level of Population

The relationship between Education Level of Population and Individual's Desired Fertility Rate Affected by Education is a negative linear one, and it was confirmed by research. As education level of an individual advances, the individual's desired fertility rate decreases from around 5 to below 1 in Figure 7 [16].

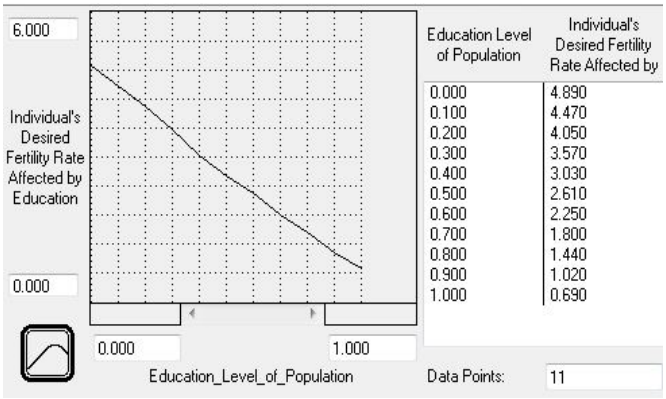

Figure 7 Individual's Desired Fertility Rate Affected by Education

The Effect of Percentage of Household Income Available for Children on Fertility Rate is defined on a scale of 0 to 2 (Figure 8). It is a multiplier for Country's Desired Fertility Rate, and the product of the two is Individual's Desired Fertility Rate Affected by Household Income. The rationale for the multiplication is that, having a sound economic foundation is the prerequisite for Chinese couples to turn the "want" to have a child into action [17]. It is thus the factor that either limits, or amplifies, the effect of Country's Desired Fertility Rate – a reflection of national population policy. With more available income for child-bearing, individuals are more willing to have children, the multiplier thus increases.

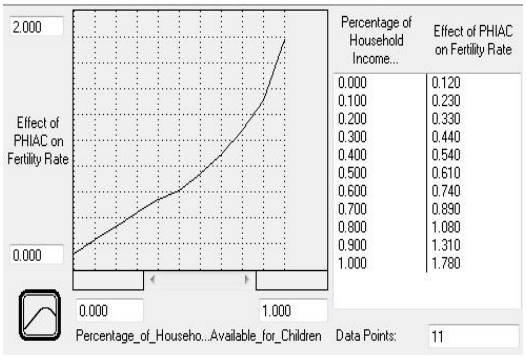

Figure 8 Effect of Percentage of Household Income Available for Children on Fertility Rate

The graph of China's Desired Fertility Rate is defined on a scale of 1 to 2 (Figure 9), and it is a reflection of the continuous adjustment and loosening of the one-child policy made by the Chinese government over 35 years.

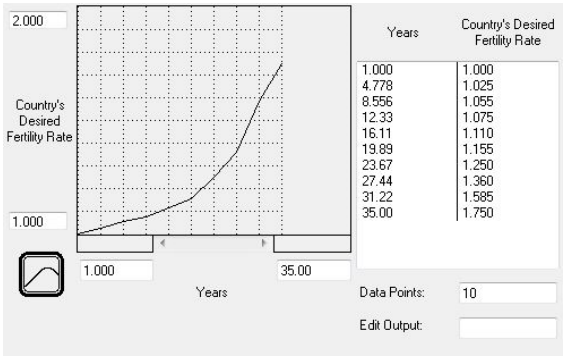

Figure 9 Country's Desired Fertility Rate

4.1.2 Result Analyses

Figure 10 shows Total Population and Aged Dependency Ratio obtained from the simulation. The simulation results reflected the effect of the one-child policy on China's demographic structure over a course of 35 years of its implementation. Validation of the model was carried out by comparing the simulation results with official data from the China Statistical Yearbook 2014 [18].

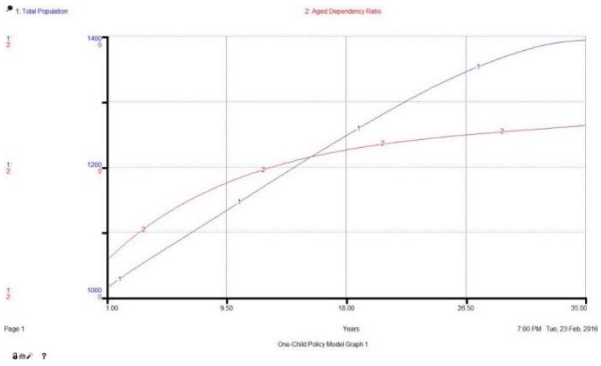

Figure 10 One-Child Policy Graph

In comparison, Figures 11 and 12 are graphs plotted using official data from the China Statistical Yearbook 2014 (note the difference in units and scale):

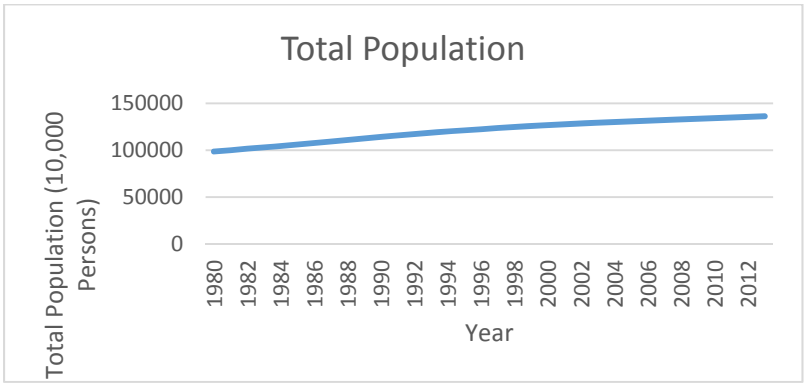

Figure 11 Official Data of Total Population

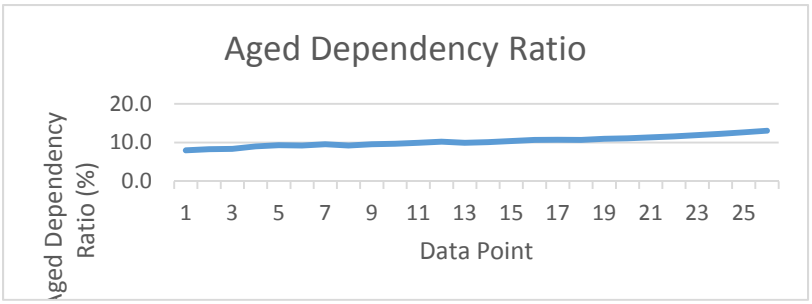

Figure 12 Official Data of Aged Dependency Ratio

It could be observed that the graphs of both Total Population and Aged dependency ratio obtained from the group's simulation followed similar patterns to that of the actual data.

Moreover, in terms of absolute values obtained from the simulation table (shown in Figure 13), Total Population obtained from the group's simulation is 1.390 billion people in 2013. The actual value from the China Statistical Yearbook 2014 is 1.361 billion people at the end of 2013. The difference between the two is a negligible 2.13%. This further testified that the model built is valid to a large extent.

31	0.18	1,386.18
32	0.18	1,390.22
33	0.18	1,392.80
34	0.18	1,394.23

Figure 13 Section of the Table from the One-Child Policy Model

4.2 Two-child Policy

Based on the validated model, the group incorporated the recently announced two-child policy into the dynamic system by extending the simulation time period from 35 years to 70 years. This initial model was used as the base case model. Since the two-child policy took

effect only after 2015, the simulation of the two-child policy was run for 35 years from 2015 to 2050, which was the period for one generation to mature and have children. The first part (first 35 years) of all graphical functions in this section has the same pattern as the graphical functions defined in Section 4.1 as the one-child policy has already happened with the impact on the society discussed earlier. The effect induced by the introduction of two-child policy would be reflected in the graphical function from the 35th year to the end of the study time.

4.2.1 Model description

The following graphical functions were modified as shown below, while keeping the rest of the model unchanged.

With the implementation of two-child policy in 2015, the Country's Desired Fertility Rate would increase and remained at 2 from the 35th year to the end in this simulation. No adjustment or loosening of this policy was assumed for the next 35 years, hence the shape of the graph remained flat (Figure 14).

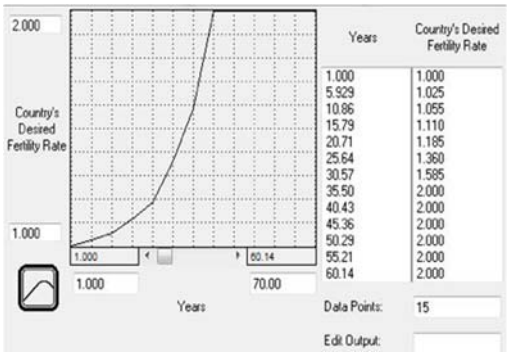

Figure 14 Country's Desired Fertility Rate

GDP Contribution per Labor increased in an increasing rate in the first 35 years and eventually converged in the long term as shown in Figure 15. This was also the prediction made by other researchers [19].

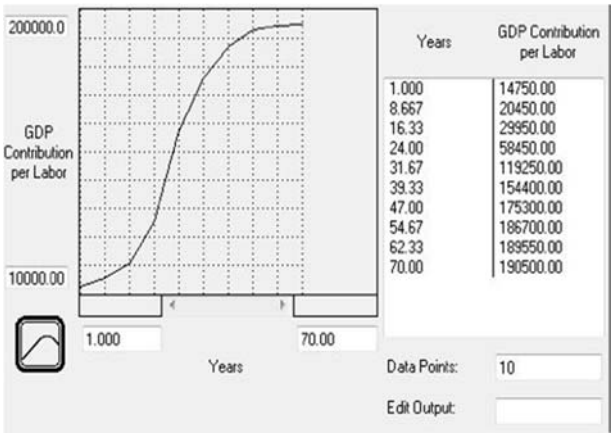

Figure 15 GDP Contribution per Labor

The Percentage Invested in Education over the next 35 years increased in a slower rate as compared to the first 35 years (Figure 16). Besides, it has a positive linear relationship with GDP Contribution per Labor, hence when GDP Contribution per Labor converges, it tends to converge as well.

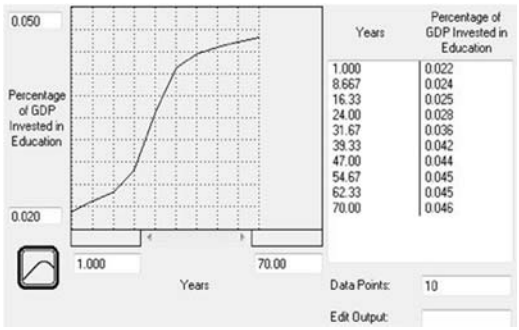

Figure 16 Percentage of GDP Invested in Education

In the long run, more people in China would be able to receive higher education and hence the Education Level of Population increased and eventually reached a maximum level that was defined as 1 as shown in Figure 17.

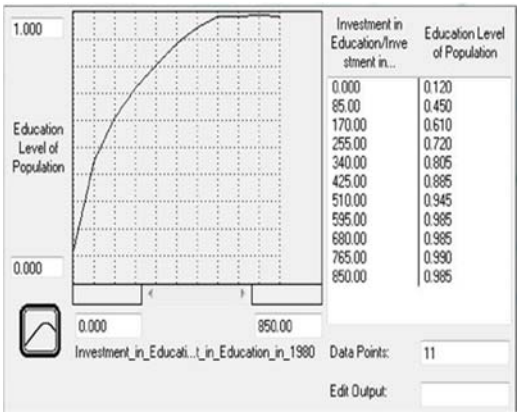

Figure 17 Education Level of Population

Employment rate in the first 35 years followed the same trend as defined by historical data in the previous section. It was projected to remain relatively constant in the next 35 years (Figure 18) by comparing unemployment rate projection results given by other researchers. They predicted the unemployment rate in China in 2020 to be 4.09% and claimed that it would stay relatively unchanged till 2050 [20].

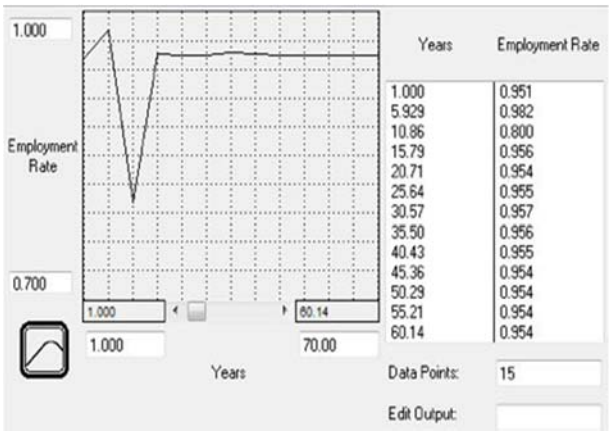

Figure 18 Employment Rate

The Average per Capita Income of Household followed the trend shown in the first 35 years and would increase almost linearly from the 35th year to the 70th year. Consequently, the Average Household Income Spent on One Elderly would also increase steadily in the next 35 years. The highest average household income per capita was set at 60,000 RMB per year and the maximum income spent on one elderly was set at 40,000 RMB per year. These were illustrated in Figures 19 and 20 respectively.

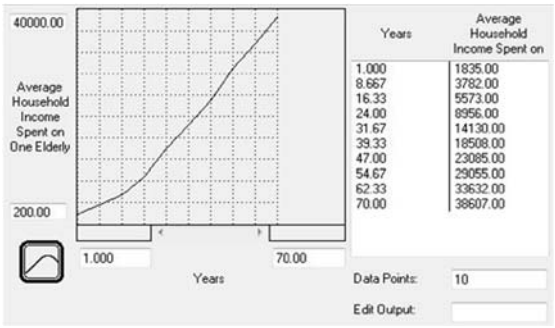

Figure 19 Average Household Income Spent on One Elderly

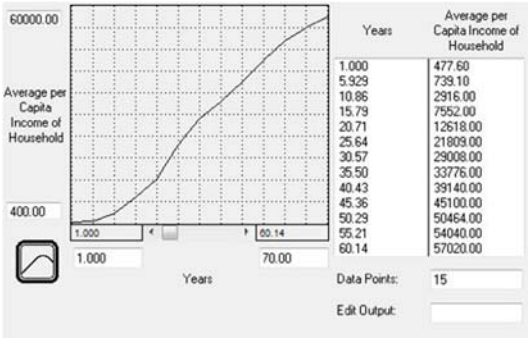

Figure 20 Average per Capita Income of Household

4.2.2 Result Analysis

The Two-Child Policy Graph 1 (Figure 21) showed the projected trend in Total Population and Aged Dependency Ratio given the introduction of the two-child policy. As seen from the graph, Total Population peaked before 2050 and started to decrease gradually afterwards. This predicted trend from the simulation was in line with the findings made by other academic research [21].

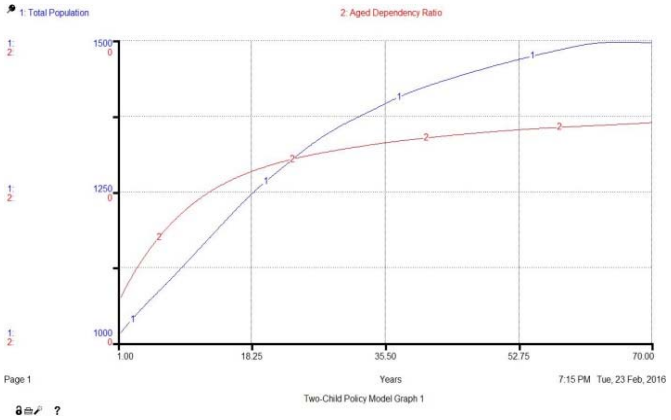

Figure 21 Two-Child Policy Graph 1

Hence, the results generated from the simulation were deemed to be valid to a large extent. As observed from the graph, Aged Dependency Ratio was still increasing even with the launch of the two-child policy, indicating that the policy has limited impact on alleviating the problem of ageing population (Figure 21).

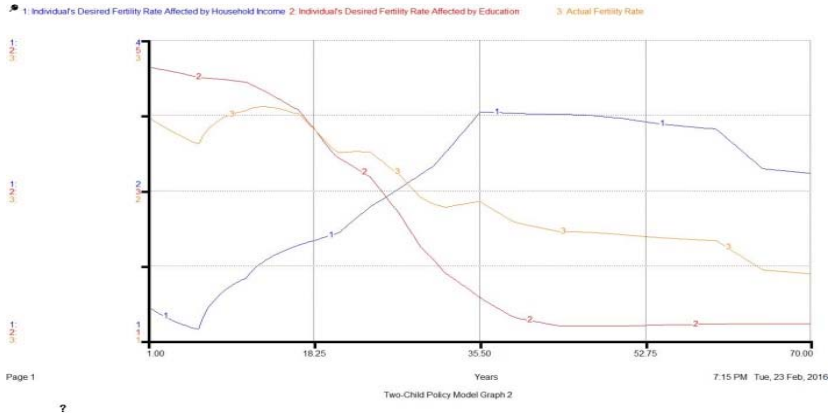

Figure 22 Two-Child Policy Graph 2

On top of that, the Country's Actual Fertility Rate stayed below the replacement level of 2.1, and decreased even further after the implementation of the two-child policy (Figure 22). As such, the simulation results revealed another issue that China would be facing - unsustainable level of fertility rate.

4.3 Sensitivity Analysis

4.3.1 Sensitivity Analysis on Percentage of GDP invested in Education

A sensitivity analysis on Percentage of GDP Invested in Education was performed by the group to observe the impact of varying education levels of population on the Actual Fertility Rate in the country. Six simulations were carried out, each with a new graphical function being defined for the Percentage of GDP Invested in Education. The variations took place in 2015, the year when the two-child policy was introduced. The scenario in each simulation is summarized in the table below (Table 1):

Table 1 Simulation Scenarios on Percentage of GDP invested in Education

Simulation	Scenario
1	Percentage of GDP Invested in Education decreases drastically after 2015, and continues to decrease thereafter.
2	Percentage of GDP Invested in Education follows a trend similar to that in the case for the two-child policy simulation, but with lower absolute values.
3 – 6	Percentage of GDP Invested in Education follows a trend similar to that in the case for the two-child policy simulation, but with higher absolute values.

The simulation results (Appendix B) showed that with drastically decreasing investments in the education sector (Simulation 1) there would be an obvious increase in Total Population. However, with increasing investments in the education sector (Simulations 2 to 6), the simulation results on the trends of Total Population showed no significant deviation from that in the base case, regardless of the degree of variation introduced in the Percentage of GDP Invested in Education. This might be due to the fact that the general education level was already saturated, and more investment in the education sector would not bring any significant change to the education level, and thus to Total Population. The Percentage of GDP Invested in Education was thus, a factor that would not be sensitive and hence likely to have little impact on the system.

4.3.2 Sensitivity Analysis on Average per Capita Income of Household

A sensitivity analysis was performed on Average Per Capita Income of Household by varying the graphical functions. The scenario in each simulation is summarized in the Table 2 below:

Table 2 Simulation Scenarios on Average per Capita Income of Household

Simulation	Scenario
1	Average per Capita Income of Household increases slowly since 2015, and it increases at a decreasing rate. The income reaches 36,000 RMB in 2050.
2	Average per Capita Income of Household increases slowly since 2015, and it increases at a decreasing rate. The income reaches around 42,000 RMB in 2050.

3	Average per Capita Income of Household increases since 2015. It reaches 60,000 RMB in the year 2045 and stays at that level till 2050.
4	Average per Capita Income of Household increases significantly since 2015, the rate of increase decreases over time, and the income reaches 70,000 RMB in 2050.
5	Average per Capita Income of Household increases very rapidly since 2015. It reaches 70,000 RMB in 2035 and stays at that level till 2050.
6	Average per Capita Income of Household increases significantly since 2015, and it increases at a decreasing rate. The income reaches 80,000 RMB in 2050.

The simulation results (Appendix B) showed that with significant amount of increase in Average per Capita Income of Household, there would be an obvious increase in the size of Total Population. The higher the household income, the greater the increase in population size. As such, Average per Capita Income of Household is a sensitive factor in this system.

4.4 Policy Recommendations

After the Chinese government announced the introduction of the two-child policy, critics suggested that economic factors are the main concerns for families to have a second child [21]. From the sensitivity analysis carried out in Section 4.3, it was also found out that Average per Capita Income of Household is a more sensitive factor affecting the actual fertility rate of population in this system, as compared to Percentage of GDP Invested in Education. Hence the next step was to focus on designing and introducing policies that would reduce the cost of child-raising in China. There are two possible measures that aim firstly, to ease the pressing problem of low Actual Fertility Rate, and secondly, to slow down the rise in Aged Dependency Ratio in China. The two measures are giving cash bonus to families that give birth to a second child and introducing a healthcare scheme that aims to cut down the cost of healthcare in China. To validate the effectiveness of these policies, the two measures were incorporated into the two-child policy model, one after the other, while keeping the other factors unchanged.

4.4.1 Cash Bonus

One proposal is for the Chinese government to give cash incentives to families that give birth to a second child. The cash bonus may include:

- A one-time-off cash bonus of 10,000 RMB.
- Annual family bonus of 20,000 RMB to support the second child's living expenses.

The policy was introduced into the model as an additional converter named Cash Bonus, which is an input to Average Total Household Income.

As seen from the simulation tables obtained (Appendix C), the implementation of the cash bonus policy successfully increased the projected Total Population in 2050 from 1,496 million to 1,510 million. In addition, the policy also lead to a slight increase in the Actual

Fertility Rate from 1.44 (without cash bonus) to 1.50 (with cash bonus) in year 2050. However, the policy showed limited effect on slowing down the increase in Aged Dependency Ratio, as the ratio remained relatively unchanged.

4.4.2 Healthcare Scheme

Since the elderly is prone to diseases, a large amount of household income is spent on covering their healthcare expenses [22]. It was proposed that the Chinese government introduce a healthcare scheme that aims to cut down the cost of healthcare in China, so as to indirectly increase the household income that is available for children. Some possible measures under this scheme include providing subsidies for health care services, waiving the medical bills for certain medicines, and expanding the medical insurance coverage. The policy manifested itself in the form of a new graphical function for Average Household Income Spent on One Elderly (Figure 23), with a decreased slope as compared to that in the base case, taking effect from the 35th year.

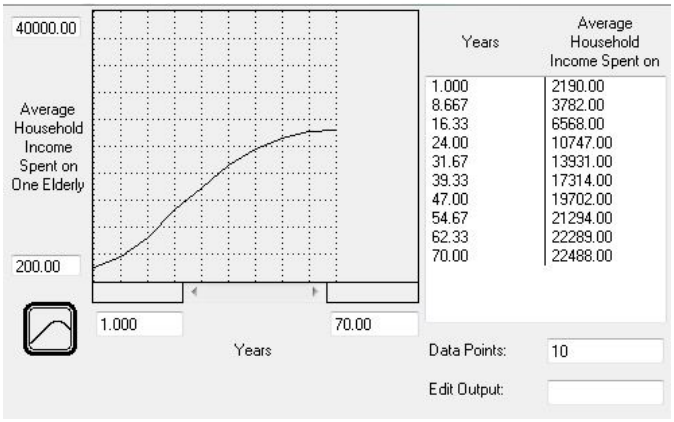

Figure 23 Income Spent on One Elderly with the Introduction of Healthcare Scheme

As seen from the simulation tables obtained (Appendix C), the implementation of the policy significantly increased the Actual Fertility Rate from 1.44 (without the Healthcare Scheme) to 1.60 (with the Healthcare Scheme) in 2050. Moreover, the scheme successfully slowed down the increase in Aged Dependency Ratio from the 35th year to the 70th year.

5 Conclusion

A dynamic model was designed to realistically translate the circumstances pertaining to the population policies in China, and offered analysis on the effectiveness of the various state policies in addressing the problems of low fertility rate and ageing population. The results obtained from the group's simulation on the base case model revealed that the newly implemented two-child policy would most likely be ineffective in alleviating the pressing issue of ageing population. Through performing sensitivity analysis, the group identified that Average per Capita Income of Household is a sensitive factor in the systemic model. Based on this finding, two other measures were recommended. Both measures, giving cash bonus and introducing a healthcare scheme that reduces the household income spent on elderly, were shown to be effective in increasing the Actual Fertility Rate, and also in slowing down

the increase in the Aged Dependency Ratio. The Chinese government may wish to consider introducing these measures. However, the Chinese government also needs to watch out for the efficacy of these measures. With the rising affluence of its citizens, the suggested monetary bonuses or health care relief may not be sufficient to induce Chinese to have more children. Moreover, if people becomes more materialistic and values quality of life over children, such recommendations may actually backfire. Hence the Chinese government will need to calibrate its policies based on expectations of its people.

5.1 Limitations

There are several limitations in this model:

1. Since most of the variables used in the stock and flow diagram were graphical functions, the build-in sensitivity analysis function was not used. Hence, sensitivity analysis was done manually by manipulating the graphical functions. Inaccuracy might have been introduced into the system.
2. The duration for simulation, which was 70 years, might be too short to observe significant changes in the demographic structure in China. Hence, the simulation results, in particular, the trends and values of Total Population, Actual Fertility Rate, and Aged Dependency Ratio might not be accurate indicators of the true effect of various population policies being introduced.
3. The statistics for graphical functions, such as Average per Capita Income of Household and Percentage of GDP invested in Education, from the year 2015 to the year 2050, were values projected based on current trends. Their values might not coincide with that in reality and hence the simulation results might not accurately reflect the future situation.
4. In proposing the measures, it is not known whether the Chinese government has sufficient funds to implement these policies. As such, to ensure the feasibility of the proposed policies, these policies should be implemented with careful and appropriate government budgeting.

Despite the above mentioned limitations, this paper offers a relatively comprehensive investigation of the effects of various population policies in China. In addition, its analysis and policy recommendations provide new insights to relevant stakeholders.

References

[1] F. Wang. 2015. Tales of the unexpected. Retrieved February 23, 2016, from http://www.economist.com/news/china/21657416-china-has-relaxed-its-one-child-policy-yet-parents-are-not-rushing-have-second-tales.

[2] F. Wang, Y. Cai, B. C. Gu. 2013. Population, Policy, and Politics: How Will History Judge China's One-Child Policy? The Population Council, Inc., China.

[3] A. Tsintolas. 2015. China's one Child Policy-Exception. Retrieved February 25, 2016, from http://alexatsintolas.weebly.com/exceptions.html.

[4] M. Hvistendahl. 2011. Declining Chinese Birth Rate Could Doom One-Child Policy. *Retrieved February 25, 2016, from* http://news.sciencemag.org/2011/04/declining-chinese-birth-rate-could-doom-one-child-policy.

[5] Central Intelligence Agency. 2015. The World Factbook. Retrieved March 1, 2016, from https://www.cia.gov/library/publications/the-worldfactbook/rankorder/2112rank.html

[6] The World Bank. 2015. Age dependency ratio, old (% of working-age population). Retrieved March 1, 2016, from http://data.worldbank.org/indicator/SP.POP.DPND.OL.

[7] B. Fitzgerald. Education Leads to Lower Fertility and Increased Prosperity. Retrieved March 2, 2016, from http://www.earth-policy.org/data_highlights/2011/highlights13.

[8] 2012.*我国不孕不育症发生率约占生育年龄妇女15%-20%*. Retrieved March 5, 2016, from http://acwf.people.com.cn/n/2012/0924/c99038-19090752.html.

[9] 2014. *Population and Its Composition*. China Statistical Yearbook 2014. National Bureau of Statistics of China. Retrieved March 5, 2016, from http://www.stats.gov.cn/tjsj/ndsj/2014/indexeh.htm.

[10] 2013.*中国对教育的投入是多少* . Retrieved March 5, 2016, from http://zhidao.baidu.com/link?url=ew00KBnFtTqY1H0KJK58UlZEyZuvX_kV39HaPRN7evJM1mESAkKk-txi3QeXlEXjIs5X6la7s_5gjWkqKW4wua.

[11] *China Unemployment Rate.* YCHARTS. Retrieved March 5, 2016, from https://ycharts.com/indicators/china_unemployment_rate_annual.

[12] *GDP Per Person Employed*. The World Bank. Retrieved March 9, 2016, from http://data.worldbank.org/indicator/SL.GDP.PCAP.EM.KD?page=6.

[13] L. P. Xu *et al*. 2011. Measuring the Living Costs and Standard Consumption Coefficient of Senior Citizens in China. Population & Development. Vol. 17, No. 13, 2011. Retrieved March 9, 2016, from http://www.docin.com/p-1248212971.html.

[14] 2015. *中国历年城乡居民家庭人均收入和指数统计(1978-2013)*. Retrieved March 9, 2016, from http://wenku.baidu.com/link?url=vonHq52Q8P3KMpELLgEyYLRmyvQsJRVmGyAQUIS1U-AaQbJhSuMkbl7a23IgF0MafDyaXyAMfgHOS9anxQ4vnaTc9T4SMrGlo4tJxKvYNrO.

[15] 2013. *中国对教育的投入是多少* [Online]. Retrieved March 10, 2016, from http://zhidao.baidu.com/link?url=ew00KBnFtTqY1H0KJK58UlZEyZuvX_kV39HaPRN7evJM1mESAkKk-txi3QeXlEXjIs5X6la7s_5gjWkqKW4wua.

[16] 2011. *Education Leads to Lower Fertility and Increased Prosperity.* Earth Policy Institute. Retrieved March 10, 2016, from http://www.earth-policy.org/data_highlights/2011/highlights13.

[17] 2010. *Chinese Struggle with Cost of Raising Children*. CHINADAILY. Retrieved March 10, 2016, from http://www.chinadaily.com.cn/china/2010-09/18/content_11321185.htm.

[18] Retrieved March 10, 2016, from http://www.stats.gov.cn/tjsj/ndsj/2014/indexeh.htm.

[19] 2015. ECONOMICS. China GDP Per Capita. Retrieved March 11, 2016, from http://ieconomics.com/china-gdp-per-capita-forecast.

[20] 2015. Trading Economics, China Unemployment Rate Forecast. Retrieved March 15, 2016, from http://www.tradingeconomics.com/china/unemployment-rate/forecast.

[21] M.D. Wuff. 2012. Population Pyramids of the World from 1950 to 2100. Retrieved March 15, 2016, from http://populationpyramid.net/china/2050/.

[22] K. Holliday. 2013. Will China's relaxation of its one-child policy lead to a baby boom? CNBC. Retrieved March 17, 2016, from http://www.cnbc.com/2013/11/18/will-chinas-relaxation-of-its-one-child-policy-lead-to-a-baby-boom.html.