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*Abstract: In this paper, we build an overlapping generation model to analyze how China's family planning policy affects the demographic structure and the dependency ratios. We also employ the Cointegration Test and Granger Causality Test to examine the relationship between Chinese population dependency ratios and the national savings rate, as well as the relationship between relative productivity differences and the national current account balance. We find that the family planning policy can be sustainable with respect to these metrics. The current account balance reflects the transfer of savings over time and space. We posit that the demographic structure determines the savings transfer over time, while the relative productivity difference determines the savings transfer across the space. This transfer does not change the total welfare calculated on a national or generational basis. Consequently, focusing on improving the consumption rate to boost the economy without consideration of demographic structure transition warrants further serious discussion. Similarly, too much attention to short-term current account surplus or deficit is not productive.*

*Keywords: Savings Rate, Current Account Balance, Demographic Structure, Family Planning Policy (10pt Times New Roman, Italics).*

**1. Introduction** According to Modigliani Life Cycle Hypothesis [1], people tend to save or dissave at different ages to smooth consumption their entire life spans. Thus, demographic structure should be regarded as an important variable in determining the savings rate. Following this strategy, scholars study the relationship between savings rates and demographic change, analyzing whether savings rates are a function of demographic change and then trying to estimate them. But the empirical findings are not consistent. For example, Modigliani and Cao [2] find an obvious cointegration relationship between the savings rate and the dependency ratio in China. They attribute China's high savings rate mainly to high growth and demographic change. However, Kraay [3] uses China's provincial panel data of household savings from 1978 to 1989 to find that the impact of the dependency ratio on savings was not statistically significant. Horioka and Wan [4] believe the impact of China's dependency ratio on the savings rate is only significant in a quarter of the sample. Zheng [5] divides the dependency ratio into youth dependency ratio and old-age dependency ratio.

The results show that the savings rate negatively correlates with the youth dependency ratio, and positively correlates with the old-age dependency ratio. Li et al. [6] conducts a similar analysis using China's provincial panel data, but the results are quite different. They find that the youth dependency ratio has a very small positive impact on savings, while the impact of old-age dependency ratio on both consumption and savings is not significant.

Actually, due to frequent population mobility and free transfer of social security account between provinces, the country's overall data is far more convincing than the provincial data in terms of the relationship between population and economic variables. Moreover, the provincial data might complicate the analysis.

Another common deficiency of the previous research is that China's external economic imbalance is not taken into account. Chen and Hu [7] make efforts to incorporate China's family planning policy into the Blanchard-Fischer inter-temporal model to relax the constant demographic structure hypothesis. They conclude that the current account surplus is the optimal target of China's external balance and prepares an aging population, but no empirical analysis is given in the paper.

In an open economy, savings can be divided into internal savings and external savings. The former refers to domestic savings and the latter is the current account surplus. Thus, if demographic structure is correlated with the savings rate, it might also be an important determinant of external equilibrium. Coale and Hoover [8] proposed the controversial hypothesis that a country's rising fertility rate and falling infant mortality rate will result in heavy youth dependency burden (youth dependency) on young families and young governments (his findings were partly based on the data from the large number of new governments established after World War II). Huge consumption leads to fewer savings. Thus, in order to finance the large-scale consumption and investment needed to recover their economies, they have to rely on foreign capital inflows, namely, foreign capital dependency, in the form of current account deficit. Asia is a typical example. But results from Goldberger [9] and Ram [10] do not support this hypothesis. Nearly 40 years later, Higgins and Williamson [11] test the hypothesis again with the Asian panel data. They find that increasing savings rates results from the falling youth dependency ratio over the past 30 years. Thus, external capital dependence in Asia will end and the region will begin to export capital in the form of current account surplus. However, the conclusion differs slightly across countries. For China, the surplus was completely under capital flows control in the sample period. In this case, the conclusion is not applicable.

We find that China's family planning policy can be sustainable. Relaxing the policy now or in the next few years might be unable to cope with the arrival of a peak of social maintenance. The demographic structure resulting from the family planning policy determines the savings rate, and is the price paid for China's future demographic

structure. From an inter-temporal perspective, the current account balance is just the transfer of savings over time and space. In this sense, China need not be too concerned about the current short-term current account surplus.

## **2. Demographic Structure Transition under the Family Planning Policy**

This paper will only consider the age structure of China's population. Modigliani [1] believes the savings rate might be correlated with age structure rather than other structures of population. Another consideration is that, due to natural disasters, political reason and family planning policy, China has experienced dramatic changes in age structure in recent decades. The dependency ratios are often taken as the substitute indicators of population age structure to measure the social burden of a country. The youth dependency ratio is the number of persons 0 to 14 years per one hundred persons 15 to 64 years. The old-age dependency ratio is the number of persons 65 years and over per one hundred persons 15 to 64 years. The total dependency ratio is the number of persons under age 15 plus persons aged 65 or older per one hundred persons 15 to 64. It is the sum of the youth dependency ratio and the old-age dependency ratio.

Now we present a multi-period overlapping generation model to analyze the impact of China's family planning policy on the demographic structure and consider the sustainability of the policy. We start with some assumptions. 1) We divide the life cycle into five age intervals, respectively, 0 - 14, 15 - 30, 31 - 45, 46 - 64 and 65 years old and over. Among them, No. 1 interval corresponds the numerator of youth dependency ratio; No. 5 interval corresponds the numerator of old-age dependency ratio; whereas the middle three intervals correspond the denominator of the dependency ratio (15 - 64) approximately. We treat it with five equal intervals in order to correspond with the dependency ratio, and more importantly, to keep consistent when every age interval grows older to the next interval.

2) We set 1982 as the starting year when China began to implement strict family planning policy, assuming two persons in every interval. 3) People tend to give birth when they are 30 years old. So the third interval will be the next generation of the first interval. 4) We define China's family planning policy as: first, one couple may only bear one child; second, if both husband and wife are the only child of their parents, they can have two children. Other policy details in different provinces and cities are ignored here. 5) The "relaxation" of the family planning policy means that even the parents who are not only children themselves still can have more than one child, and we assume they wish to have only two children.

In period 1, the family planning policy becomes effective. Youth population declines, the total dependency ratio drops to 50 from 67 with the denominator being constant. The population burden begins to relax. In period 2, the young and old populations do not change. But the youth population decreased in period 1 will reduce the labor force in period 2 correspondingly. Youth dependency ratio, old-age dependency ratio and total dependency ratio (60) were improved, but still lower than the original value 67. Both period 1 and 2 can be seen as demographic dividend periods resulting from the family planning policy.

At the beginning of period 3 (corresponding to 2013 approximately), China will face three options: 1) Keep family planning policy forever; 2) Relax the family planning policy from period 3; 3) Keep family planning policy till period 5, and then relax. In the first case, the couples who are both only children born in periods 1 and 2 can have two children in periods 3 and 4. Both young people and old people will keep constant, but the labor force continues to fall. The total dependency ratio will reach a peak value of 100.

The country will suffer significant increasing of the population burden. After entering period 5, children who are born in period 3 and are not only children, so they can have only one child again. Thus, the dependency ratio will repeat the cycle beginning from 1982. The population will decline dramatically and enjoy demographic dividends again.

In the second case, we suppose China begins to relax family-planning policy from period 3 or period 4. All couples can have two children, regardless of whether they themselves are only children or not. We have assumed that a couple wishes to have only two children. Actually, the couples who are born in period 1 are all only children. They already have the right to have two children, even if the policy is not relaxed. In other words, relaxing the family planning policy now would not help to avoid the coming peak. The demographic structure would be similar to that of the first case; the peak of dependency ratio will arrive in the 2040s in either case. From period 5, the demographic structure will be rebalanced, the total dependency ratio will return to the initial value of 67.

In the third case, the family planning will be kept in period 3 and period 4, and relaxed in period 5. This case is not different from the second case, except that the total dependency ratio will return to the initial value of 67 in period 7, rather than in period 5 as in the second case. A question may be whether the total population will decrease by 50% just as estimated in Table 1. This researcher believes it depends on the actual effect of the policy. Theoretically, if the policy is carried out as strictly as officially stated, women's total fertility rate would be one. But in fact, China had never reached this level. Total fertility remained at 2 or more during the first 10 years and dropped to 1.34, where it remained even in 2005. This also explains why the current population did not decrease at the scale estimated in Table 1.

Because of these similar reasons, the actual dependency ratios differ slightly from those in the model, though they share a common rule. The model can provide some ideas for policy, but specific policy decisions should be based on more accurate actual data.

## **3. Empirical Results**

To illustrate the impact of demographic structure on internal and external savings, we take the savings rate (SR), the investment rate (IR), the current account balance (NER) as the dependent variables, assuming all the current account balance are net exports of goods and services. They are all expressed by the percentage of GDP of the same year. We take the total dependency ratio (TDR), youth dependency ratio (YDR) and old-age dependency ratio (ODR) to

denote the population structure variables. GDP per capita growth rate represents productivity movement; the relative productivity increase (RPI) represents productivity growth differences between China and the world, denoted by per capita GDP growth rate; CRPI represents the relative productivity increase.

The Gross Domestic Product (GDP) in China expanded 2.20 percent in the third quarter of 2013 over the previous quarter. GDP Growth Rate in China is reported by the National Bureau of Statistics of China. In China, the growth rate in GDP measures the change in the seasonally adjusted value of the goods and services produced by the Chinese economy during the quarter. China's economy is the second largest in the world after the United States. A major component supporting China's rapid economic growth has been exports growth.

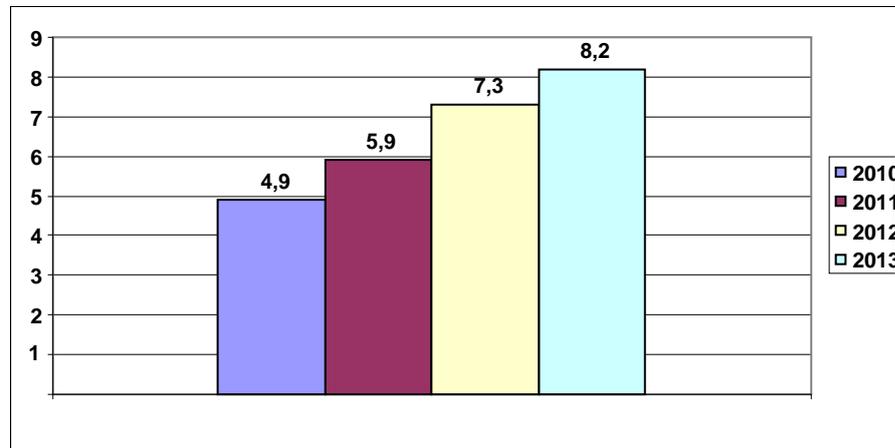


Figure 1. China GDP growth rate in 2010-2013 [10]

Today China gives a start to the new policy in industry, foreseeing a transition from extensive expansion of production to intensive development of economy key industries. Large companies are displacing production of old plants and technologies and open new hi-tech productions. Now communist Party of China intends to reduce dependence of country economy on investments and heavy industries [5].

In 2014 the economy is on a gentle downward trend as a new generation of leaders shifts focus from low - value - added exports and government stimulus to self - sustaining consumer demand. A range of fiscal and social reforms were expected from the Communist Party plenum in late 2014. The government will put money into consumers' pockets through redistributive tax measures and wage increases, and by settling more people in cities. Political leaders will bear down on official corruption and environmental degradation [5, 6, 11].

#### 4. Conclusions

In this paper, we build an overlapping generation model to analyze how the family planning policy affects demographic structure and the dependency ratios. We also employ the Cointegration and Granger Causality Tests to explore the relation between population dependency ratios and the savings rate as well as the relationship between relative productivity differences and the current account balance. The main findings are summarized as follows.

First, the existing family planning policy can be sustainable. Under the family planning policy, the dependency ratios will decline to the bottom line in parallel with the demographic dividend, and then increase to a peak

After a period of difficulty, the dependency ratio will rebalance to a low level together with a low total population. From the perspective of dependency ratios, relaxing the policy now or in the next few years may be unable to cope with the arrival of the peak of social maintenance.

Meanwhile, an unchanged policy would be helpful to obtain a desired total population. Whether China should relax the policy in the 2040s depends on the level of opulation desired at that time.

Second, the demographic structure represented by the dependency ratios determines the savings rate. An important explanation for China's high savings rate in recent years is the decline of the total dependency ratio and subsequent demographic dividend resulting from the family planning policy. The impact of the old-age dependency ratio on the savings rate is opposite to that of the youth dependency ratio. However, the impact of the latter is larger than the former. From a policy perspective if current savings are needed for future consumption raising consumption to boost China's economy is questionable. The high savings rate now is the price paid for China's future demographic structure. Third, from an inter-temporal perspective, the current account balance is just the transfer of savings over time and space. Demographic structure determines savings transfers over time, while the relative productivity difference determines savings transfers across space. Both kinds of transfer do not change the total welfare calculated on a national or generational basis. Specifically speaking, the relative productivity determines the "spill-over" of current account surplus, while the demographic structure determines the "return" of the current account deficit. In the long run, China will use current savings for the arrival of the peak dependency ratio. Also, China's productivity increases relative to the rest of the world will become smaller. In this sense, we need not be too concerned about the current short-term current account surplus.

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