

Domestic Demand Growth in China: Analysis through a Demographic Approach

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ABSTRACT It is a universally acknowledged truth that China has been devoted to expanding domestic demand for years. However, its domestic demand is still insufficient. Based on the extended Diamond Overlapping Generations model, this paper builds the overall domestic demand model with detailed empirical tests, using provincial panel data of China between 1991 and 2011 to investigate the influence of demographic changes on domestic demand. Estimated results of the system GMM and threshold regression reveal that child dependency ratio has a significant positive impact on China's domestic demand, and this impact slightly weakens as the economy develops. On the other hand, elderly dependency ratio has a significant negative impact on China's domestic demand, and this negative impact strengthens as the economy develops. The final conclusion shows that the declining child dependency ratio and increasing elderly dependency ratio, as the new features of China's demographic structure, are detrimental to expanding domestic demand, leading to deficiency of domestic demand in China.

INTRODUCTION

China's demographic structure has been in a transition stage. The demographic transition theory indicates that population reproduction is divided into three main phases, namely, "high birthrate, high death rate and low growth rate" phase, "high birthrate, low death rate and high growth rate" phase and "low birthrate, low death rate and low growth rate" phase (Notestein 1945). China, as mentioned previously as being in the stage of demographic transition, is now in the third phase of the transition, and the problem of "declining birthrate" and "aging" arises gradually. As is shown in Figure 1, after the baby boom in the 1960s, the child dependency ratio declined annually, whereas elderly dependency ratio increases annually. The sixth census illustrates that the percentage of children under fourteen years of age is 16.60 percent. According to demographic standards, when the population between 0 and 14 years old accounts for between fifteen percent and eighteen percent of the whole popula-

tion, the society is termed to be a "declining birth rate" society, when the proportion is lower than fifteen percent, it is named an "ultra-declining birth rate" society. Therefore, China has become a "declining birthrate" society. On the other hand, the percentage of the old that are above 60 and 65 years old are 13.26 percent and 8.87 percent, respectively. The international standard for the classification of an "aging" society is that when the proportion of population that is or above 65 reaches seven percent. Thus, China has become an "aging" society. The coexistence of a "declining birthrate" and "aging" as a new feature would have a deep and long-lasting impact on China's development.

Since the reform and opening up in 1978, consumption, investment and export have been driving the sustained and rapid economic growth of China, and this has become a unique landscape in the world's economic development process. However, China's economic growth showed a downward trend since 2010. As is shown in Figure 2, Gross Domestic Product (GDP) growth rate of China declined continuously from the first quarter of 2010 to the first quarter of 2015. It is known to all that high importance is placed on the role of export in China's economic growth. Nevertheless, due to the weak global economic recovery, continuous slump in demand from international market gradually weakened comparative advantage

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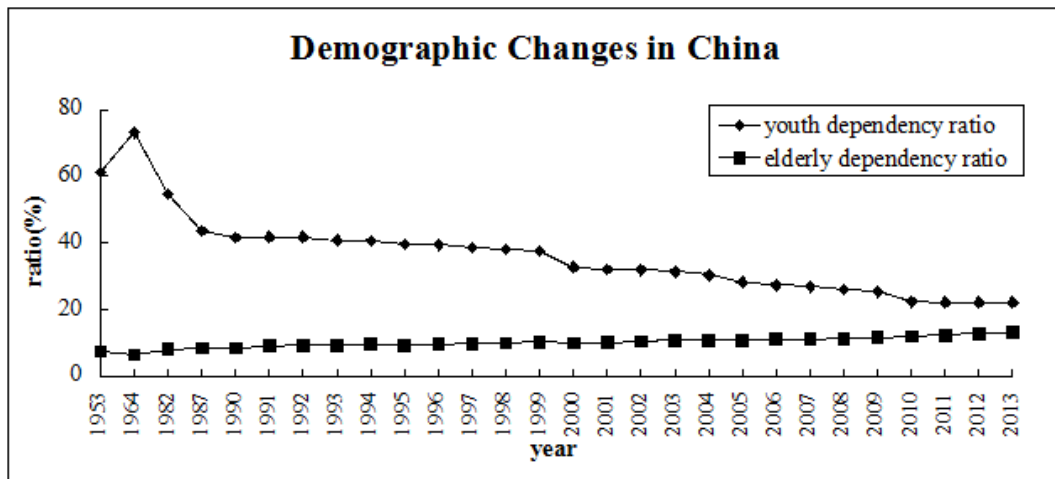


Fig.1. Demographic changes in China

Note: data of 1982, 1990, 2000 and 2010 are from those years' census, data of other years are inferred from the sample survey.

and escalated trade friction, thus, China's export reduces continuously. Under the constraint of falling export, expanding domestic demand becomes critical. Therefore, China should change its export-oriented economic development strategy, autonomously take advantage of its position as a big country, shift the potential of economic growth back home from abroad and implement an economic development strategy, which prioritizes domestic demand while making external demand supplemented, so that the downward pressure of the economy could be alleviated.

As a strategic policy, expanding domestic demand has been put forward by the Chinese government for many years. In order to deal with the impact of the Asian financial crisis in 1998, this strategy was put forward as a national policy for the first time. It was in the 16th CCP National Congress that this strategy was proposed as the basic principle of China's economic development and the must-adhere long-term economic growth strategic policy. Besides, it was proposed in the 17th CCP National Congress report again that China should insist on its policy of expanding domestic demand, especially those

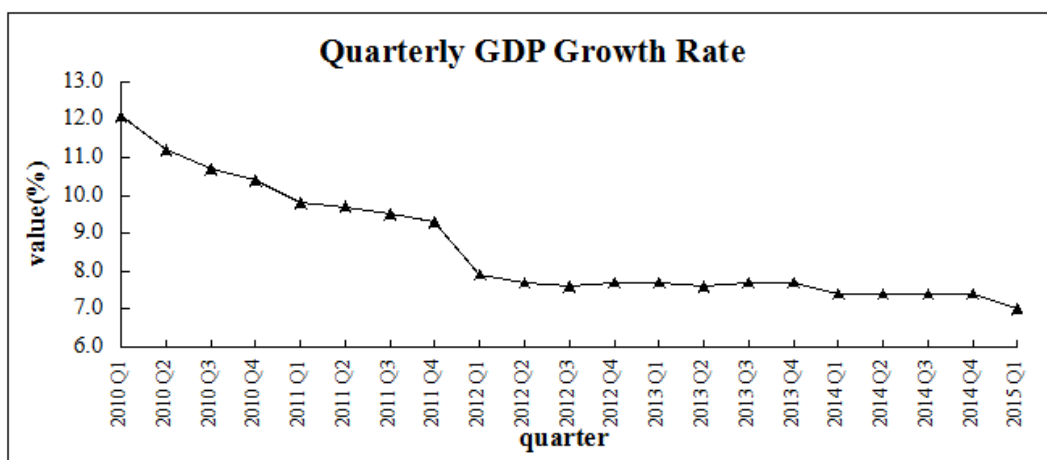


Fig. 2. Quarterly GDP Growth Rate of China since 2010

Data source: National Bureau of Statistics of P.R.China (<http://data.stats.gov.cn/workspace/index?m=hgjd>).

policies concerning consumption demand. When the global financial crisis broke out in 2008, the Chinese government introduced the Four Trillion Investment plan and a series of other stimulus measures to ensure rapid and timely expansion of domestic demand. Furthermore, the 18th CCP National Congress' report proposed that China should insist on the strategic basis of expanding domestic demand, speed up the establishment of long-term mechanism of expanding consumption demand, and expand domestic market size. The Chinese government implemented the strategic policy of expanding domestic demand for many years, however, for years, the domestic demand has still been insufficient and yet its progress and achievement has been insignificant. Questions on why is it so difficult to expand China's domestic demand, and reasons such as, Lin (2010) argued that it's the property right system, consisting of the excessive protection of capital property rights, imperfection of the labor property rights and the damaged land property rights, is the root cause for the insufficient domestic demand in China.

While Wang (2014) pointed out that both, the distortion of consumption structure and household income stratification, are detrimental to expanding domestic demand in China. It is also believed that the distortion of factor price at the micro level affects both investment and consumption through price mechanism, which is the underlying reason for deficiency of domestic demand in China (Wang 2015). From the perspective of China's demographic changes, this paper analyzes the changes in China's domestic demand during the demographic structure transition. The second section is a literature review about the influence of demographic changes on domestic demand. The third section builds an individual consumption decision model and the overall domestic demand model based on the expanded Diamond Overlapping Generations model. The fourth section represents and empirical study and robustness check with data from the provincial panel of China between 1991 and 2011. The final section provides the conclusion and policy suggestions.

Literature Review

It is a pity that there are few literatures concerning the influence of demographic changes on domestic demand. Classical economics discussed the interrelationship between population and means of subsistence, and this is the proto-

type of study about influence of demographic changes on domestic demand. Karl Marx (1859) in "Introduction to a Contribution to a Critique of Political Economy" and Friedrich Engels (1884) in "The Origin of Family, the Private Property and the State" proposed two types of production theory. Their theory points out that population reproduction must be compatible with material reproduction, and population reproduction reacts to material reproduction with either acceleration or delayed action. These theories develop and enrich the historical materialism based on a people-oriented principle and have vital practical significance for policies controlling China's population growth. It is believed that there is always the trend that population growth would exceed substance production growth, and as a result, people would fall into a plight of poverty and misery (Malthus 1789). Malthus opposed Ricardo's labor value theory, and explained the economic crisis from the perspective of insufficient effective demand. He states that it is the consumer class, including priests, bureaucrats and landlords that pay for the capitalists' profits, which effectively avoids economic crisis caused by overproduction. Malthus's population theory is highly controversial because of the limitation of the times. However, it triggered people to deal with economic issues from the perspective of the population. Based on the facts that European countries were caught in an economic crisis in the 1930s and the population growth rate slowed down at the same time, a theory was suggested that population growth stimulates effective demand (Keynes 1937). This theory points out that population growth would inevitably lead to the increase of consumer population, thus stimulating the increase of consumption demand and expanding domestic demand. This theory has loopholes since it ignores that consumption population should have sufficient purchasing power otherwise they are merely a population. However, it has far reaching theoretical influence. Chinese scholars have been working on the influence of demographic changes on domestic demand since the Chinese government proposed the policy of expanding domestic demand. It stated that it is the insufficient purchasing power that directly leads to China's lack of effective domestic demand. Negative effects of a series of structural contradictions and imperfect institutions that closely related to consumption demand are the underlying causes of insuf-

ficient domestic demand. Besides, China's lack of effective demand does not result from low population growth rate caused by low birthrate (Peng 2001). Zhou (2014) argued that it is the shrinking demand for housing caused by high prices that lead to China's insufficient domestic demand, while Wei (2014) pointed out that the essence of insufficient domestic demand is insufficient consumption demand relative to surplus production. Yu (2009) studied the influence of demographic factors, namely population size, structure, distribution, quality and family size, on expanding domestic demand. He proposed that in order to achieve a positive-sum game between the population and economy, demographic problems and issues of expanding domestic demand should be solved altogether. These qualitative researches are of enlightening significance, however, they are all short of empirical evidence. It is worth noting that Li and Guo (2011) have done some empirical studies about the influence of population growth, demographic structure and urban-rural structure on China's domestic demand. They found out that population growth is not detrimental to expanding domestic demand, and the demographic structure significantly influences China's low consumption rate, and radical change of urban-rural structure strongly explains China's high investment rate. Their paper makes a convincing interpretation and provides theoretical guidance to develop policies to expand domestic demand for China. However, it merely sets up a regression equation, which takes the final consumption rate and investment rate as dependent variables without running regression and taking domestic demand as the dependent variable. Besides, it lacks a dynamic analysis of influence of demographic change on domestic demand.

Based on the above discussion, this paper's contributions are as follows. Firstly, the Diamond Overlapping Generations model is extended and the overall domestic demand model is built on the basis of the individual consumer decision-making model. Secondly, by making use of the overall domestic demand model, this paper dynamically interprets the whole process of demographic changes, and focuses on the variation law of domestic demand during the process. Thirdly, an empirical study is employed with domestic demand set as the dependent variable. Fourthly, based on threshold regression, this paper studies whether or not the child depen-

dency ratio or elderly dependency ratio has a mutated influence on domestic demand with the development of economy. The threshold regression could avoid both collinearity, which caused by the introduction of quadratic terms and subjective bias, which brought by artificial grouping. As a result, it helps reasonably judge the different influences of child dependency ratio and elderly dependency ratio on domestic demand as the economy develops.

Theoretical Model

1. Individual Consumer Decision-making Model

Based on the expanded Diamond OLG model, the life cycle of a representative individual is divided into four stages instead of two, namely, the child stage, youth labor stage, mature labor stage and old age of retirement, and $i = \{1, 2, 3, 4\}$ is used to represent an individual's four different stages of the life cycle, respectively. Child stage is represented with $i=1$, youth labor stage is represented with $i=2$, mature labor stage is represented with $i=3$ and old age of retirement is represented with $i=4$. Basic assumptions are set for the representative individuals:

1. The survival rate of representative individuals infinitely closes to 1, and the death of a representative individual denotes the end of the fourth stage of their life cycle.
2. Representative individuals merely conduct fertility in the second stage of their life cycle, that is, the youth labor stage. The initial birthrate of the youth labor stage is ϕ , and birthrates of other three stages are all 0.
3. When representative individuals are in their child stage, their consumption sources are all from their parents, who are in the second stage of the youth labor force. Besides, these individuals in their child stage do not make any substantive decisions.
4. Individuals in their second stage are given 1 unit of labor ability. They would spend some of their labor ability in looking after their children, and the rest ability in managing their work without elasticity. Their incomes could be used as consumption expenditure on children, their own consumption expenditure and savings as retirement pension. In period t , representative individuals in the second stage allo-

cate their labor ability to children raising and working. The researchers use λ to denote the ratio of ability allocated to child rearing. Therefore, $\lambda = \lambda(\varphi)$, $\lambda' > 0$ and $\lambda \leq 1$. At this time the remuneration of this 1 unit labor ability is ω , and the tax rate is tr , thus, tax paid is $tax'_2 = (1-\lambda)\omega tr$, and the disposable income of the youth labor is $Y'_2 = (1-\lambda)\omega(1-tr)$. The disposable income would be used both, for consumption and saving, and as a result, the savings of youth labor force would be $s'_2 = Y'_2 - c_1 - c_2$. Among them, c_1 denotes the consumption expenditure on children by the youth labor force, and c_2 denotes the consumption for themselves. Without loss of generality, the researcher assumes that $c_1 = c_1(\varphi)$, $c_1' > 0$, and $c_1'' < 0$.

5. Mature labor force use their 1 unit of labor ability all to work, and their disposable incomes are used as their own consumption expenditure or savings as retirement pension. Mature labor force, in the third stage provide their 1 unit labor ability without elasticity and earn an income of ω . They pay a tax of $tax'_3 = \omega tr$, and their savings are $s'_3 = \omega(1-tr) - c_3$, among which c_3 denotes consumption expenditure of mature labor on their own.
6. Representative individuals in the fourth stage no longer work, and their consumption expenditures are c_4 , which all comes from their previous savings. The saving of representative individuals in the fourth stage of period, t is the opposite number of the sum of former two period's savings.
7. For simplicity, the researcher does not consider intergenerational transfer of wealth, and therefore, the savings of representative individuals would be 0 when they die.
8. The utility function of representative individuals is $u(c_t) = \frac{c_t^{1-\sigma} - 1}{1-\sigma}$ and the maximization of consumer intertemporal utility is $\sum_{t=2}^4 \beta^{t-2} u(c_t)$.

(3.1.1)

Among them, β denotes an individual's subjective discount rate. Based on these basic assumptions of representative individuals from (1) to (8), budget constraints of representative individuals' life cycle is,

$$c_1 + c_2 + \frac{c_3}{1+r} + \frac{c_4}{(1+r)^2} = (1-\lambda)\omega(1-tr) + \frac{\omega(1-tr)}{1+r} \quad (3.1.2)$$

Simultaneously, associate equation (3.1.1) with equation (3.1.2), and equilibrium expenditure function of a representative individual is obtained as follows:

$$c_2 = (1+r) \frac{\omega(1-tr)[2-\lambda+r(1-\lambda)] - c_1(1+r)}{(1+r)^2 + (1+r)^{\frac{1}{\sigma}} \beta^{\frac{1}{\sigma}} + (1+r)^{\frac{2}{\sigma}} \beta^{\frac{2}{\sigma}}} \quad (3.1.3)$$

$$c_3 = (1+r)^{\frac{1}{\sigma}} \beta^{\frac{1}{\sigma}} \frac{\omega(1-tr)[2-\lambda+r(1-\lambda)] - c_1(1+r)}{(1+r)^2 + (1+r)^{\frac{1}{\sigma}} \beta^{\frac{1}{\sigma}} + (1+r)^{\frac{2}{\sigma}} \beta^{\frac{2}{\sigma}}} \quad (3.1.4)$$

$$c_4 = (1+r)^{\frac{2}{\sigma}} \beta^{\frac{2}{\sigma}} \frac{\omega(1-tr)[2-\lambda+r(1-\lambda)] - c_1(1+r)}{(1+r)^2 + (1+r)^{\frac{1}{\sigma}} \beta^{\frac{1}{\sigma}} + (1+r)^{\frac{2}{\sigma}} \beta^{\frac{2}{\sigma}}} \quad (3.1.5)$$

Among them ω is the wage at equilibrium, and tr is the tax rate at equilibrium. Deriving stage consumption function with birthrate, the influence of changes of birthrate on consumption expenditure is obtained:

$$\frac{dc_1}{d\varphi} = c_1' > 0 \quad (3.1.6)$$

$$\frac{dc_2}{d\varphi} = \frac{\partial c_2}{\partial c_1} \frac{dc_1}{d\varphi} + \frac{\partial c_2}{\partial \lambda} \frac{d\lambda}{d\varphi} < 0 \quad (3.1.7)$$

$$\frac{dc_3}{d\varphi} = \frac{\partial c_3}{\partial c_1} \frac{dc_1}{d\varphi} + \frac{\partial c_3}{\partial \lambda} \frac{d\lambda}{d\varphi} < 0 \quad (3.1.8)$$

$$\frac{dc_4}{d\varphi} = \frac{\partial c_4}{\partial c_1} \frac{dc_1}{d\varphi} + \frac{\partial c_4}{\partial \lambda} \frac{d\lambda}{d\varphi} < 0 \quad (3.1.9)$$

The above four equations indicate that the increase in birthrate would increase consumption expenditure on children for second-stage representative individuals who act as caregivers. On the other hand, consumption for caregivers themselves would decrease in the second stage and even in the third and fourth stage of their life cycle.

Based on equation (3.1.3), equation (3.1.4) and equation (3.1.5), the optimal saving rates of representative individuals in every stage of life cycle can be worked out to:

$$s_2 = \omega(1-tr) - c_1 - (1+r) \frac{\omega(1-tr)[2-\lambda+r(1-\lambda)] - c_1(1+r)}{(1+r)^2 + (1+r)^{\frac{1}{\sigma}} \beta^{\frac{1}{\sigma}} + (1+r)^{\frac{2}{\sigma}} \beta^{\frac{2}{\sigma}}} \quad (3.1.10)$$

$$s_3 = \alpha(1-tr) - (1+r)^{\frac{1}{\sigma}} \beta^{\frac{1}{\sigma}} \frac{\frac{1}{\sigma} \alpha(1-tr)[2-\lambda+r(1-\lambda)] - c_1(1+r)}{(1+r)^2 + (1+r)^{\frac{1}{\sigma}} \beta^{\frac{1}{\sigma}} + (1+r)^{\frac{2}{\sigma}} \beta^{\frac{2}{\sigma}}} \quad (3.1.11)$$

$$s_4 = -(1+r)^{\frac{2+\sigma}{\sigma}} \beta^{\frac{2}{\sigma}} \frac{\omega(1-tr)[2-\lambda+r(1-\lambda)] - c_1(1+r)}{(1+r)^2 + (1+r)^{\frac{1}{\sigma}} \beta^{\frac{1}{\sigma}} + (1+r)^{\frac{2}{\sigma}} \beta^{\frac{2}{\sigma}}} \quad (3.1.12)$$

Deriving saving function with birthrate, the influence of birthrate changes on saving rates could be obtained as follows:

$$\frac{ds_2}{d\varphi} = \frac{\partial s_2}{\partial c_1} \frac{dc_1}{d\varphi} + \frac{\partial s_2}{\partial \lambda} \frac{d\lambda}{d\varphi} < 0 \quad (3.1.13)$$

$$\frac{ds_3}{d\varphi} = \frac{\partial s_3}{\partial c_1} \frac{dc_1}{d\varphi} + \frac{\partial s_3}{\partial \lambda} \frac{d\lambda}{d\varphi} > 0 \quad (3.1.14)$$

$$\frac{ds_4}{d\varphi} > 0 \quad (3.1.15)$$

The above three equations indicate that the increase of birthrate would decrease the saving rate of second-stage representative individuals and increase their saving rates in the third and fourth stages.

Based on equation (3.1.10), $S_2 = \omega(1-tr) - c_1 - c_2$. Derive the equation with φ on both sides of equal sign, $\frac{ds_2}{d\varphi} = -(\frac{dc_1}{d\varphi} + \frac{dc_2}{d\varphi})$ is obtained, and that is $\frac{dc_1}{d\varphi} + \frac{dc_2}{d\varphi} = -\frac{ds_2}{d\varphi}$. Based on equation (3.1.13), $\frac{ds_2}{d\varphi} < 0$. Therefore, . According to equation (3.1.6) and equation (3.1.7), $\frac{dc_1}{d\varphi} > 0$, $\frac{dc_2}{d\varphi} < 0$, the researcher further obtains:

$$\left| \frac{dc_1}{d\varphi} \right| > \left| \frac{dc_2}{d\varphi} \right| \quad (3.1.16)$$

Equation (3.1.16) indicates that as the birthrate rises, the increase in consumption expenditure on children is higher than the decrease in self-consumption expenditure, for second-stage representative individuals.

2. Overall Domestic Demand Model

Based on the basic assumptions of representative individuals, the researcher can assume with the whole society that:

1. Each stage population of the whole society in period t is indicated as vector $X^t = [x_1^t, x_2^t, x_3^t, x_4^t]^T$. As indicated previously, the initial birthrate is φ , thus the demographic structure of period can be expressed as the combination of vector and a 4x4 matrix:

$$X^{t+1} = \begin{bmatrix} x_1^{t+1} \\ x_2^{t+1} \\ x_3^{t+1} \\ x_4^{t+1} \end{bmatrix} = E \times X^t = \begin{bmatrix} \varphi & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} x_1^t \\ x_2^t \\ x_3^t \\ x_4^t \end{bmatrix} = \begin{bmatrix} \varphi x_1^t \\ x_1^t \\ x_2^t \\ x_3^t \end{bmatrix} \quad (3.2.1)$$

2. The production function of the whole society is the Cobb-Douglas production function, $Y^t = A^t (K^t)^\alpha (L^t)^{1-\alpha}$. For simplicity, depreciation is neglected, thus the capital stock is $K^{t+1} = K^t + I^t$. Among them, is the investment in period t . Labor supply of period t is $L^t = [0 \ 1 \ 1 \ 0] \times E^{t-1} \times x^{t-1}$. As a result, the optimal capital-labor ratio of the whole society depends on $r = A^t F_k(K^t, L^t) = \alpha A^t (k^t)^{\alpha-1}$ and, $\omega^t = A^t F_L(K^t, L^t) = (1-\alpha) A^t (k^t)^\alpha$ among which $k^t = K^t / L^t$ and it is the capital-labor ratio.
3. When period t children enter the society in period $t+1$ as youth labor force, labor market would invest them with a certain amount of capital. For simplicity, it is assumed that the individuals' capital stock would naturally deplete along with death. Therefore, investment for new youth labor force from period t to period $t+1$ is $I^{t+1} = k^{t+1} \varphi x_2^t$.

Assuming C^t denotes the population consumption in the t th stage of period t , the overall consumption of a representative country is $C^t = 0 + (C_1^t + C_2^t) + C_3^t + C_4^t$. Denoting the tax paid by

the population in the i th stage of period t with, TAX^t_i the overall tax revenue is $TAX^t = TAX^t_2 + TAX^t_3$. Government purchases are regarded as an exogenous variable in this paper, and it is denoted as G .

Giving the average capital allocation k , λ (φ) $C_i(\varphi)$, tax rate tr , wage ω at equilibrium, and fourth stage population x_4 , birthrate φ of the equilibrium could be worked out with the following formula $I^* + G = S^* + TAX^*$, and that is $kx_2 + G = s_2x_2 + s_3x_3 + s_4x_4 + tax_2x_2 + tax_3x_3$. Further simplified, the researcher obtains:

$$\begin{aligned} k\varphi^2x_4 + \bar{G} &= s_2\varphi^2x_4 + s_3\varphi x_4 + s_4x_4 \\ &+ tax_2\varphi^2x_4 + tax_3\varphi x_4 \\ &= s_2\varphi^2x_4 + s_3\varphi x_4 + s_4x_4 \\ &+ [1 - \lambda(\varphi)]\omega(tr)\varphi^2x_4 + \omega(tr)\varphi x_4 \end{aligned} \quad (3.2.2)$$

Among them, I^* , S^* , and TAX^* denote the investment, saving and tax revenue at the equilibrium, respectively.

Assuming the birthrate of a country in period $t+1$ increases from equilibrium's φ to ψ , the domestic demand (DD) of the country in period $t+1$ can be indicated as:

$$\begin{aligned} DD^{t+1} &= C^{t+1} + I^{t+1} + \bar{G} \\ &= \begin{bmatrix} 0 & c_1^{t+1} + c_2^{t+1} + k^{t+1} & c_3^{t+1} & c_4^{t+1} \end{bmatrix} \begin{bmatrix} \psi x_1^t \\ x_2^t \\ x_3^t \\ x_4^t \end{bmatrix} + \bar{G} \\ &= (c_1^{t+1} + c_2^{t+1} + k^{t+1})x_1^t + c_3^{t+1}x_2^t + c_4^{t+1}x_3^t + \bar{G} \end{aligned}$$

Since the birthrate of the country rises suddenly at period $t+1$, the number of children in that period would increase accordingly. Based on equation (3.1.6) and equation (3.1.7), a rise in birthrate would increase consumption expenditure on children (c_1^{t+1}), and the youth labor force would cut down their own consumption expenditure (c_2^{t+1}) at the same time. According to equation (3.1.16), the increase c_1^{t+1} in is greater than the decrease in c_2^{t+1} , thus $(c_1^{t+1} + c_2^{t+1})x_1^t > 0$, which denotes the increase of consumption demand of the whole country. However, the overall population increase in period $t+1$ owes to the increasing number of children other than labor force. Under the condition of unchanged population

of other three stages, the overall capital of the society remains the same. Hence, k^{t+1} remains the same. In the above equation, all other variables remain unchanged except c_1^{t+1} and c_2^{t+1} . As a result, the rise of birthrate in period $t+1$ would lead to the increase of current consumption demand, thus increasing the overall domestic demand.

Hypothesis 1: An increase in the child dependency ratio, owing to the rise of birthrate, would lead to more consumption on children, by the youth labor force. Though the consumption for the youth themselves decreases more or less, the overall consumption demand increases. Under the constraint of unchanged investment demand, the increase in a country's consumption demand would increase its domestic demand.

The rise in birthrate would result in an increasing percentage of youth labor in period $t+2$. At the same time, both child dependency ratio and elderly dependency ratio decrease, and the changes in the domestic demand are as follows:

$$\begin{aligned} DD^{t+2} &= C^{t+2} + I^{t+2} + \bar{G} \\ &= \begin{bmatrix} 0 & c_1^{t+2} + c_2^{t+2} + k^{t+2} & c_3^{t+2} & c_4^{t+2} \end{bmatrix} \begin{bmatrix} \varphi\psi x_1^t \\ \psi x_1^t \\ x_2^t \\ x_3^t \end{bmatrix} + \bar{G} \\ &= (c_1^{t+2} + c_2^{t+2} + k^{t+2})\varphi\psi x_1^t + c_3^{t+2}x_2^t + c_4^{t+2}x_3^t + \bar{G} \end{aligned}$$

A rising birthrate in period $t+1$ would cause a baby boom in the country, and these babies would become youth labor force capable of working in period $t+2$ entering the country's labor market. Compared with the equilibrium, the number of youth labor force increases by $(\psi - \varphi)x_1^t$. The baby boom has two significant influences on a country's domestic demand. Firstly, it would lead to an increase in the number of youth labor force compared with the equilibrium, and the corresponding market clearing capital should be provided to each of these newly-entered young labor force, which indicates the investment demand should increase by $k^{t+2}(\psi - \varphi)x_1^t$. Secondly, caregivers of the baby boom generation enter the third stage of the life cycle in period $t+2$. Since, $dc_3/d\varphi < 0$, the baby boom would lead to a cut-back on the consumption expenditure of the mature labor force in the third stage.

Hypothesis 2: A country's increasing proportion of youth labor force would cut down both,

child dependency ratio and elderly dependency ratio, which would promote the domestic investment demand but decrease the consumption demand of mature labor force. A country's domestic demand change depends on the sum of the rise in investment demand and the fall in consumption demand. Compared with the increase of youth labor force equipped with high capital in developed countries, the increase in youth labor force equipped with low capital in underdeveloped countries would be more likely to reduce domestic demand.

The rise in birthrate would increase the percentage of mature labor force in period $t+3$, and both child dependency ratio and elderly dependency ratio would decrease. The changes in domestic demand are as follows:

$$\begin{aligned} DD^{t+3} &= C^{t+3} + I^{t+3} + \bar{G} \\ &= \begin{bmatrix} 0 & c_1^{t+3} + c_2^{t+3} + k^{t+3} & c_3^{t+3} & c_4^{t+3} \end{bmatrix} \begin{bmatrix} \varphi^2 \psi x_1^t \\ \varphi \psi x_1^t \\ \psi x_1^t \\ x_1^t \end{bmatrix} + \bar{G} \\ &= (c_1^{t+3} + c_2^{t+3} + k^{t+3}) \varphi \psi x_1^t + c_3^{t+3} \psi x_1^t + c_4^{t+3} x_1^t + \bar{G} \end{aligned}$$

Among them, $(c_1^{t+3} + c_2^{t+3} + k^{t+3}) \varphi \psi x_1^t$ is the influence of the number of youth labor force on domestic demand in period $t+3$. Since the birthrate of $t+3$ returns to the equilibrium level, the consumption expenditure of youth labor force returns to equilibrium status as well. Under the condition that the capital per capita provided by the labor market remains the same, $(c_1^{t+3} + c_2^{t+3} + k^{t+3}) \varphi \psi x_1^t$ equals the influence of youth labor force on domestic demand in equilibrium. Because the number of mature labor force in period $t+3$ becomes ψx_1^t , which is increased by $(\psi - \varphi) x_1^t$ compared with the equilibrium level of birthrate, the rise in the number of mature labor force in period $t+3$ increases the whole country's consumption demand. At the same time, in period $t+3$, caregivers of the baby boom generation enter the fourth stage of the life cycle. Based on equation (3.1.9), caregivers of baby boom decrease their consumption expenditure in their fourth stage, thus reducing the consumption demand on the whole.

Hypothesis 3: The increase in the proportion of the mature labor force would result in the decrease of both child dependency ratio and elderly dependency ratio. At the same time, with the

investment demand remaining unchanged, consumption demand is determined both by the rise in consumption demand caused by the increase of mature labor force and the fall in consumption demand caused by caregivers of the baby boom generation entering fourth stage of life cycle. Compared with developed countries, whose pension system is relatively complete and thus would have less reduction in consumption demand in the fourth stage, the elderly in underdeveloped countries with less perfect pension system are more likely to reduce domestic demand.

The rise in birthrate would cause an increase in the proportion of the elderly to the whole population when the baby boom generation reaches its fourth stage of life cycle, thus increasing the elderly dependency ratio, and the domestic demand would become as follows:

$$\begin{aligned} DD^{t+4} &= C^{t+4} + I^{t+4} + \bar{G} \\ &= \begin{bmatrix} 0 & c_1^{t+4} + c_2^{t+4} + k^{t+4} & c_3^{t+4} & c_4^{t+4} \end{bmatrix} \begin{bmatrix} \varphi^3 \psi x_1^t \\ \varphi^2 \psi x_1^t \\ \varphi \psi x_1^t \\ \psi x_1^t \end{bmatrix} + \bar{G} \\ &= (c_1^{t+4} + c_2^{t+4} + k^{t+4}) \varphi^2 \psi x_1^t + c_3^{t+4} \varphi \psi x_1^t + c_4^{t+4} \psi x_1^t + \bar{G} \end{aligned}$$

Since the birthrates of period $t+2$, $t+3$ and $t+4$ are equal to the birthrate of equilibrium level, $c_1^{t+4} + c_2^{t+4}$ and c_3^{t+4} would return to the equilibrium level consumption. Among them, $(c_1^{t+4} + c_2^{t+4} + k^{t+4}) \varphi^2 \psi x_1^t$ is the influence of the youth labor force on the country's domestic demand in period $t+4$, and it is equal to the equilibrium level. $c_3^{t+4} \varphi \psi x_1^t$ denotes the influence of mature labor force on the country's domestic demand in period $t+4$, and it equals to the equilibrium level as well. $c_4^{t+4} \psi x_1^t$ denotes the influence of baby boom generation on consumption demand when they enter the fourth stage of the life cycle in period $t+4$. Since the elderly increased by $(\psi - \varphi) x_1^t$ in the fourth stage, the consumption demand increased by $c_4^{t+4} (\psi - \varphi) x_1^t$. Furthermore, compared with equilibrium, the overall demographic structure of the $t+4$ period returns to the status of equilibrium stage, the number of people in all stages multiplied by ψ times respectively, and the overall population of the country multiplied by φ times.

Hypothesis 4: The increase of a country's elderly dependency ratio would promote its consumption demand, thereby causing a rise in domestic demand.

EMPIRICAL ANALYSIS AND ROBUSTNESS TEST

1. Model Setting

Based on the theoretical model, demographic changes take effect on domestic demand by affecting consumption demand and investment demand. Therefore, variables are selected mainly from two aspects. One is from demographic changes, including child dependency ratio, elderly dependency ratio, birthrate, death rate and population growth rate. Both birthrate and death rate are excluded from the empirical model, since they not only have a linear relationship with the population growth rate but also are highly correlated with child and elderly dependency ratio, which would cause multicollinearity. The other aspect concerns the control variables selection. Based on the Keynesian theory of consumption (1936) and a study by Li (2011), other control variables are selected, including per capita income, urban-rural income gap, economic growth rate and urbanization rate.

A country's domestic demand is determined by its final consumption demand and investment demand. Duesenberry (1949) claims in his relative income hypothesis that consumption behavior has an inertia effect, namely, a ratcheting effect of consumption habits. Investment demand is the adjustment of capital stock, and the adjustment decision is based on the assessment of the past capital stock. Therefore, investment behavior has an inertia influence as well. As a result, this paper argues that domestic demand has an inertia effect, and lagged dependent variables are added in the regression model as independent variables. When a model introduces a one period lagged dependent variable as an independent variable, the correlation test of sample residuals rejects the hypothesis that second-order autocorrelation coefficient of disturbance difference is 0. That is, it rejects the null hypothesis that there is no autocorrelation of disturbance. In order to solve the problem of disturbance autocorrelation, the researcher adds two periods lagged dependent variable in the model as independent variable.

In summary, the test model is set as:

$$\begin{aligned} \ln DD_t^i = & \alpha + \rho_1 \ln DD_{t-1}^i + \rho_2 \ln DD_{t-2}^i + \beta_1 YD_t^i \\ & + \beta_2 OD_t^i + \beta_3 PGR_t^i + \beta_4 \ln gdp_t^i + \beta_5 \ln IND_t^i \\ & + \beta_6 GR_t^i + \beta_7 TR_t^i + u_i + \varepsilon_t^i \end{aligned}$$

Among them, $i=1,2,3 \dots 29$, indicating observed sample areas, and $t=1991, 1992 \dots 2011$, indicating the observation time of sample area. DD_t^i , DD_{t-1}^i and DD_{t-2}^i denote the domestic demand of period t , $t-1$, and $t-2$, respectively. YD is child dependency ratio, OD is elderly dependency ratio, PGR denotes population growth rate, $\ln gdp$ denotes the natural logarithm of per capita income, IND indicates urban-rural income gap, GR denotes economic growth rate, TR is urbanization rate, u_i is the unobserved regional effect, and ε is the random disturbance term.

On the basis of Hypothesis 1 and Hypothesis 4, there exists a positive relationship between a country's domestic demand and the child dependency ratio or the elderly dependency ratio. According to Hypothesis 2 and Hypothesis 3, the increase in the proportion of either youth labor force or mature force would lead to a decrease in both child dependency ratio and elderly dependency ratio. As the largest underdeveloped country in the world, China has comparatively less capital and a more incomplete pension system than developed countries, thus it is more likely that China would be stuck in domestic demand deterioration. As a result, under normal circumstances, validation of Hypothesis 1 and 4 could indirectly prove Hypothesis 2 and Hypothesis 3.

2. Variables and Data Selection

The provincial panel data of China from 1991 to 2011 is selected as the research sample. Chongqing is excluded from the sample because it was set as the municipality in 1997, and previous data for it is missing. Xizang province is excluded as well, due to the serious lack of data. Data of all variables are from the China statistical yearbook (1992~2012), China compendium of statistics, China population and employment statistical yearbook and China national bureau of statistics. Detailed meaning, calculation basis and statistical description of each variable are listed in Table 1.

3. Dynamic Panel Data Model Estimation

Firstly, the first-difference GMM is used for parameter estimation, and the estimated results are listed in column (1) of Table 2. Considering that there may exist merely little correlation between IV of lags and endogenous variable of

Table 1: Meaning, calculation basis and statistical description of each variable

<i>Variable</i>	<i>Meaning</i>	<i>Calculation basis</i>	<i>Mean</i>	<i>SD</i>	<i>Maximum</i>	<i>Minimum</i>
<i>lnDD</i>	<i>Domestic Demand</i>	Natural logarithm of the sum of total household consumption, gross capital formation and total government purchase (one hundred million yuan)	7.98	1.20	10.76	4.54
<i>YD</i>	<i>Child Dependency Ratio</i>	The proportion of the number of youth between 0 and 14 to the number of labor population between 15 and 64 (%)	32.05	10.23	57.56	9.64
<i>OD</i>	<i>Elderly Dependency Ratio</i>	The proportion of the number of people over 65 to the number of labor population between 15 and 64 (%)	10.82	2.57	21.88	4.97
<i>PGR</i>	<i>Population Growth Rate</i>	Birthrate minus death rate (%)	7.10	3.96	17.00	-1.90
<i>TR</i>	<i>Urbanization Rate</i>	The proportion of urban population to the whole population (%)	42.58	16.70	94.18	15.85
<i>lngdp</i>	<i>Per capita income</i>	Natural logarithm of GDP per capita (yuan)	9.07	0.98	11.35	6.79
<i>IND</i>	<i>Urban-rural Income Gap</i>	Per capita income of urban residents divide per capita income of rural residents	2.82	0.64	4.76	1.25
<i>GR</i>	<i>Economic Growth Rate</i>	(This year GDP- last year GDP)/ last year GDP	11.73	3.13	26.2	-3.7

Note: Both the value of domestic demand and per capita income are large, thus we've occupied a smoothing process.

difference term, weak instrument problem might arise. Besides, the difference process omits the influence of non-time-varying parameters, and therefore the system GMM method is used to revise. It is pointed out by Arellano and Bover (1995), and Blundel and Bond (1998) that system GMM combines the difference GMM and level GMM, and it adds lagged difference variables as IVs of corresponding variables in the level equation. Estimated results of system GMM are shown in the column (2) of Table 2. Compared with the results shown in column (1), it could be concluded that the estimated results are robust. Normally, system GMM has higher estimation efficiency. Therefore, system GMM is adopted here for parameter estimation of this paper.

It is worth noting that there is a positive relationship between urban-rural income gap and domestic demand, and this seems to be contrary to common sense. In order to further figure out the relationship between urban-rural income gap and domestic demand, the squared urban-rural income gap is added into the model for re-estimation. The estimated results are listed in column (3) of Table 2, and it shows that there is an inverted U-shape relationship between urban-rural income gap and domestic demand. Besides,

the correlation test is done for all sample residuals, and the result shows that there exists first-order but no second-order serial correlation with residuals after difference. Therefore, there is no serial correlation with the error term of the original model, and system GMM is suitable for estimation. The p value of the Sargan test, which is used to test the validity of additional instrumental variables, is 0.9993, so it proves that the IV set is jointly effective. Considering that too many instrumental variables would affect test effectiveness and the large sample property of system GMM, the number of IV is controlled, and the indicator is reported in "Instruments" row of Table 2. The p value of Wald test, which is the result of model significance test, is 0.0000, indicating the overall significance of the model.

According to the estimated results in Table 2, the empirical analyses are as follows.

1. Child dependency ratio has a positive relationship with domestic demand. It is suggested by Hypothesis 1 that the increase in child dependency ratio would lead to a rise in consumption demand, thus promoting domestic demand. Therefore, the test result suits expectation. The conclusion indicates that, as a basic national policy, family planning successfully

Table 2: Estimated results of Dynamic Panel Model

<i>Independent variable</i>	(1) <i>DIF-GMM, Linear</i>	(2) <i>SYS-GMM, Linear</i>	<i>Independent variable</i>	(3) <i>SYS-GMM, Nonlinear</i>
lnDD(-1)	0.54175*** (19.50)	0.90906*** (23.33)	lnDD(-1)	0.90203*** (19.55)
lnDD(-2)	-0.17170*** (-13.38)	-0.14750*** (-6.58)	lnDD(-2)	-0.16106*** (-7.61)
YD	0.00226*** (4.30)	0.00432*** (5.80)	YD	0.00418*** (5.74)
OD	-0.00902*** (-8.52)	-0.01159*** (-8.45)	OD	-0.01146*** (-9.23)
PGR	0.00047 (0.30)	0.00632*** (2.64)	PGR	0.00485* (1.85)
TR	0.00148*** (5.63)	0.00142*** (4.34)	TR	0.00091*** (2.68)
lngdp	0.68471*** (24.75)	0.28498*** (7.88)	lngdp	0.30774*** (6.73)
IND	0.03913*** (6.83)	0.06907*** (8.54)	IND	0.22309*** (3.50)
			IND^2	-0.02707** (-2.47)
GR	0.00576*** (8.42)	0.01349*** (15.38)	GR	0.01308*** (15.10)
Constant	-1.32865*** (-11.11)	-1.04202*** (-10.53)	Constant	-1.25184*** (-8.84)
Sargan test	0.9352	0.9995	Sargan test	0.9998
AR(1)	0.0134	0.0005	AR(1)	0.0005
AR(2)	0.3237	0.3001	AR(2)	0.5149
Instruments	44	63	Instruments	64
Wald test	0.0000	0.0000	Wald test	0.0000
N	472	501	N	501

Note: (1) ***, **, * indicate rejecting the null hypothesis at 1percent, 5percent and 10percent significance level, respectively. Table 5 and 6 below, the same. (2) Z statistics is in parentheses. Table 5 and 6 below, the same (3) The row value of Sagan test, AR(1), AR(2), and Wald test is the corresponding p value. Table 5 and 6 below, the same (4) The row value of Instruments is the number of instrumental variable. Table 5 and 6 below, the same

accomplishes the policy objective of controlling China's population growth. However, the "declining birthrate" suppresses China's domestic demand to some degree. The main reasons may be as follows. Firstly, the cutback on the birthrate would bring down the current rearing fees to some extent, thus giving rise to a fall in family consumption demand and further suppressing the domestic demand. Secondly, though the number of siblings decreases, considering that China's real estate bubble continues to simmer and the rising house price rises persistently, parents are intended to cut down consumption in order to avoid their children from becoming the slaves of house. Therefore, savings for the purpose of buying houses in the future are increased and domestic demand is decreased. Thirdly, with increasingly fierce social competition, the pursuit for a higher degree becomes a trend in China, and at the same time children rearing time be-

comes longer. Thence, in order to save money for children's higher education tuition fees, savings are increased and domestic demand is decreased. Fourthly, with the background of the cutback in the number of children, Chinese parents are more cautious in consumption and they have to increase their savings for old age consumption, resulting in not so prosperous domestic demand either. Noting that this is compatible with the household saving-demand model¹(Samuelson 1958).

2. Elderly dependency ratio has a negative relationship with domestic demand. According to Hypothesis 4, the increase in elderly dependency ratio would lead to a rise in consumption demand, thus increasing the domestic demand. However, the estimated results are not consistent with this hypothesis, stating that the "aging" problem would deteriorate the domestic demand issues in China. This may result from

China's special national conditions. Firstly, these investigated elderly are above 65 years old and they are austere, though they may have some pensions and receive support from their children. In fact, they do not spend much thus making little contribution to the expansion of consumption demand. Since they were born in the early days during the foundation of the People's Republic of China, during which time people lacked materials and were suffering from a hard life, they still remained austere as life seemed easier. As a result, they hold back average consumption of Chinese residents and inhibit the increase in domestic demand. Secondly, it may be the income gap between retired civil servants and retired enterprise workers that caused the decrease in China's overall consumption, thus suppressing the domestic demand. Since the Chinese government implements "Dual Track" retirement pension system under which retire civil servants get ninety percent of their full salaries before retirement as their pension while enterprise workers get merely thirty percent. Thirdly, precautionary savings are very high in China, which result in the decrease of consumption demand. As one of the world's most populous developing countries, China's social pension system is imperfect. Coupled with a series of reforms, such as health reform, education reform and housing reform, uncertainty of the future further increases. All of these contribute to high precautionary savings and thus inhibit domestic demand. Fifthly, the increase in bequest motive savings could bring down domestic demand. With an artificially high price of the house, in order to save money for their children to achieve a better life, the elderly in China are hurrying with constraining their consumption, therefore decreasing the domestic demand. It is worth noting that the absolute value of the coefficient of elderly dependency ratio is twice as much as child dependency ratio one and this seems to be counterintuitive. This may be because, currently, children under 14 years old accept free nine-year compulsory education in China, and the education expenses are provided by the government rather than the household. On the other hand, the pension system for the elderly aged 65 and above is imperfect, and therefore, precautionary savings significantly reduces consumption demand.

3. Moderate population growth is beneficial to the increase in domestic demand, and this is consistent with the theory of Keynes (1937) that

the increase in population would stimulate effective demand. However, Keynes's effective demand theory ignores a basic fact that consumer population should have purchasing power otherwise they would not benefit domestic demand. With the development of the economy, per capita income in China continues to increase, and the purchasing power of residents rises at the same time. Population growth will inevitably increase the amount of consumer population, and at the same time stimulate effective demand.

4. Urbanization has a positive influence on expanding domestic demand, and population urbanization is the breakthrough and engine of expanding domestic demand. This is compatible with the "new urbanization development strategy" of the Chinese government. In the process of urbanization and the process of orderly transforming the peasant into the townspeople, the increasing demand of both housing and urban infrastructure construction ignites tremendous investment demand, thence stimulating domestic demand. On the other hand, urban population is no longer substance self-sufficient, so consumption demand increases rapidly with increase in urban population. All these things contribute to the expanding of domestic demand. Therefore, urbanization effectively increases investment demand combining consumption demand.

5. There is an inverted U-shape relationship between urban-rural income gap and domestic demand. A possible explanation is that as the income gap is small and situated in a moderate range, a widening gap would benefit domestic demand. This may have some correlation with China's specific social background. The consumption demand for substance from rural residents is small, since the rural economy is self-sufficient. However, urban residents are not self-sufficient, and their demand for substance is comparatively high. Therefore, within a certain range, the increase in the income gap would increase the consumption demand and then promote domestic demand. Nevertheless, as the income gap further expands, marginal propensity of urban residents to consume is diminishing while rural residents have no sufficient purchasing power. As a result, the overall consumption demand as well as the domestic demand is on the decline, and this is compatible with research findings of Liu (2013) and Chen (2010)².

6. A rise in income per capita and a regional economic growth both have a positive influence on domestic demand expanding. A rise in either income per capita or regional economic growth would stimulate consumption demand and domestic demand. Though the floor of the banking lending rate has been cancelled in China, deposit interest cap is still in service. Under the condition of comparatively low interest rate, either the increase of income per capital or the rise in GNI would increase the investment demand, thence promoting domestic demand.

4. Threshold Effect

The estimated results show that both child dependency ratio and elderly dependency ratio significantly affect China's domestic demand. However, it is unknown whether these two effects have structural change or not. The next step is to test the threshold effect of child dependency ratio and elderly dependency ratio on domestic demand. Income, as the source of investment and consumption, is vital to benefit domestic demand. According to Keynes' (1936) theory of diminishing marginal consumption propensity, under different income constraints, the average propensities are different. Therefore, the proportion of regional GDP per capita to nation-

al GDP per capita (denoted as y) is chosen to act as threshold scalar. After obtaining the F-statistics, p value, which corresponds to F-statistics of each threshold assumption, is achieved by 500 times threshold bootstrap. As illustrated in Table 3, there exist both double threshold and single threshold. According to the threshold estimation in Table 4, the influence of child dependency ratio on domestic demand is divided into three sections, namely underdeveloped area ($pgdp \leq 0.631$), moderately developed area ($0.631 < pgdp \leq 0.867$) and developed area ($pgdp > 0.867$). Influence of elderly dependency ratio on domestic demand is divided in to two sections accordingly, namely, normal area ($pgdp \leq 2.701$) and highly developed area ($pgdp > 2.701$).

Estimated results of threshold regression are shown in Table 5 of model (4) and model (5). According to model (4), the positive influence of child dependency ratio on domestic demand is diminishing with the development of the economy. Possible explanation is that with underdeveloped region, the income level is so low that the proportion of children raising fees to household daily expenses is extremely high. Therefore, the increase of child dependency ratio could significantly boost domestic demand in that region. However, with the development of the economy, the boosting effect diminishes. In accordance

Table 3: Test of Threshold Number

Variable	Model	Critical value					
		F-Statistics	P Value	BS Times	1%	5%	10%
Child Dependency Ratio (YD)	Single Threshold	27.445*	0.062	500	48.054	30.360	17.775
	Double Threshold	21.015**	0.016	500	23.743	11.791	6.162
	Triple Threshold	9.874	0.102	500	27.152	13.354	9.933
Elderly Dependency Ratio (OD)	Single Threshold	55.862*	0.072	500	89.240	65.316	50.733
	Double Threshold	37.525	0.114	500	68.610	49.118	39.002
	Triple Threshold	15.356	0.224	500	38.410	27.643	23.473

Table 4: Threshold estimated value and confidence interval

Variable		Threshold estimated value			95% confidence interval	
Child Dependency Ratio (YD)	Single Threshold Model	0.849	0.623	1.563		
	Double Threshold Model					
	Ito1	0.631	0.620	2.664		
	Ito2	0.867	0.837	1.547		
	Triple Threshold Model	1.563	1.237	2.664		
	Single Threshold Model	2.701	2.664	2.720		
Elderly Dependency Ratio (OD)	Double Threshold Model					
	Ito1	0.794	0.776	0.801		
	Ito2	2.701	2.554	2.720		
	Triple Threshold Model	0.684	0.660	1.331		

Table 5: Estimated results of threshold regression

<i>Independent variable</i>	<i>(4)</i> <i>SYS-GMM</i>	<i>Independent variable</i>	<i>(5)</i> <i>SYS-GMM</i>
lnDD(-1)	0.8899*** (18.47)	lnDD(-1)	0.8851*** (18.55)
lnDD(-2)	-0.1617*** (-7.62)	lnDD(-2)	-0.1568*** (-7.35)
OD	-0.0112*** (-9.09)	YD	0.0039*** (5.27)
PGR	0.0048 (1.77)	PGR	0.0041 (1.57)
TR	0.0008* (2.28)	TR	0.0009* (2.52)
lngdp	0.3212*** (6.79)	lngdp	0.3152*** (6.90)
IND	0.2283** (3.15)	IND	0.2158** (3.00)
IND^2	-0.0282* (-2.31)	IND^2	-0.0267* (-2.21)
GR	0.0129*** (11.20)	GR	0.0129*** (12.14)
T1_YD	0.0041*** (4.69)	T1_OD	-0.0097*** (-7.00)
T2_YD	0.0039*** (3.98)	T2_OD	-0.0141*** (-6.53)
T3_YD	0.0038*** (3.63)		
Constant	-1.2667*** (-7.89)	Constant	-1.2006*** (-8.07)
Sargan test	1.0000	Sargan test	0.9998
AR(1)	0.0006	AR(1)	0.0005
AR(2)	0.5725	AR(2)	0.4034
Instruments	83	Instruments	65
Wald test	0.0000	Wald test	0.0000
N	501	N	501

with model (5), the negative effect of elderly dependency ratio on domestic demand strengthens as the development of economy. The explanation may be that as the economy develops, people's income and the average saving rate of the elderly increase accordingly. As a result, the inhibitory effect of the elderly dependency ratio on consumption becomes increasingly apparent, thus leading to a growing negative impact on domestic demand.

5. Robustness Test

In order to test the robustness of the measurement model, the following approaches are taken. Firstly, quantile regression is taken. In order to eliminate the influence of potential outliers on estimated results, unusual sample values are excluded and quantile regression with model 3 is performed. The detailed method is to eliminate samples whose child dependency ratio or

elderly dependency ratio is either higher than its ninety-five percent quantile value or lower than its five percent quantile value and regress again with model (6) and model (7). Secondly, method of replacing indicator is applied. Model (8) is obtained with the replacement of both child dependency ratio with the proportion of child under 14 to the whole population (represented with YR) and the replacement of the elderly dependency ratio with the proportion of the elderly aged 65 and above to the whole population (represented with OR). Thirdly, policy interference is introduced in model (9). Faced with Asian Financial Crisis, policies of expanding domestic demand, such as issuing bonds on a large-scale and accelerating infrastructure construction, were released in the second half of 1998. In response to the Global Financial Crisis, the Four Trillion Investment plan and a series of other policies were conducted to expand domestic demand in 2008. Therefore, dummy variables of year

Table 6: Robustness Test

<i>Independent variable</i>	<i>(3) SYS-GMM</i>	<i>(6) SYS-GMM</i>	<i>(7) SYS-GMM</i>	<i>Independent variable</i>	<i>(8) SYS-GMM</i>
lnDD(-1)	0.90203*** (19.55)	1.20274*** (23.46)	1.11140*** (15.46)	lnDD(-1)	0.90017*** (20.04)
lnDD(-2)	-0.16106*** (-7.61)	-0.29530*** (-9.54)	-0.20967*** (-5.44)	lnDD(-2)	-0.16052*** (-7.73)
YD	0.00418*** (5.74)	0.00312*** (3.18)	0.00558*** (5.84)	YR	0.00560*** (4.00)
OD	-0.01146*** (-9.23)	-0.01820*** (-11.97)	-0.01249*** (-7.37)	OR	-0.01556*** (-8.23)
PGR	0.00485* (1.85)	0.00164 (0.69)	-0.00188 (-1.08)	PGR	0.00594** (2.25)
TR	0.00091*** (2.68)	0.00288*** (7.36)	0.00109** (2.38)	TR	0.00091*** (2.74)
lngdp	0.30774*** (6.73)	0.10034** (2.53)	0.13291*** (2.75)	lngdp	0.30898*** (6.97)
IND	0.22309*** (3.50)	0.25386*** (4.22)	0.31749*** (3.50)	IND	0.23219*** (3.62)
IND^2	-0.02707** (-2.47)	-0.03723*** (-3.32)	-0.04936*** (-3.09)	IND^2	-0.02876*** (-2.60)
GR	0.01308*** (15.10)	0.01750*** (14.56)	0.01556*** (13.06)	GR	0.01316*** (15.66)
Constant	-1.25184*** (-8.84)	-0.70268*** (-4.91)	-1.05388*** (-5.44)	Constant	-1.27036*** (-8.60)
Sargan test	0.9998	0.9995	1.0000	Sargan test	0.9998
AR(1)	0.0005	0.0002	0.0023	AR(1)	0.0005
AR(2)	0.5149	0.1887	0.3388	AR(2)	0.4871
Instruments	64	64	81	Instruments	64
Wald test	0.0000	0.0000	0.0000	Wald test	0.0000
N	501	452	416	N	501
<i>Independent variable</i>	<i>(9) SYS-GMM</i>	<i>Independent variable</i>	<i>(10) SYS-GMM</i>	<i>Independent variable</i>	<i>(11) SYS-GMM</i>
lnDD(-1)	0.93234*** (20.57)	lnC(-1)	0.79248*** (13.69)	lnI(-1)	0.84506*** (11.35)
lnDD(-2)	-0.18427*** (-8.65)	lnC(-2)	-0.10755*** (-3.54)	lnI(-2)	-0.18568*** (-4.51)
YD	0.00388*** (4.55)	YD	0.00382*** (3.43)	YD	0.00291*** (2.89)
OD	-0.01111*** (-8.43)	OD	-0.01785*** (-9.44)	OD	-0.00035 (-0.18)
PGR	0.00584** (2.10)	PGR	0.00237 (1.11)	PGR	0.00628*** (2.68)
TR	0.00093*** (2.64)	TR	0.00045 (0.73)	TR	0.00126** (2.21)
lngdp	0.29896*** (6.72)	lngdp	0.33656*** (9.12)	lngdp	0.42893*** (6.58)
IND	0.28919*** (3.06)	IND	0.27516*** (3.69)	IND	-0.00476 (-0.03)
IND^2	-0.03683** (-2.31)	IND^2	-0.02790** (-2.22)	IND^2	-0.00103 (-0.04)
GR	0.01227*** (11.90)	GR	0.00331*** (3.47)	GR	0.02274*** (16.65)
Year 1998	0.01097*** (2.74)				
Year 2009	-0.01538*** (-3.05)	Year 2009	-0.02974*** (-5.38)	Year 2009	0.01746 (1.58)
Constant	-1.32724*** (-7.23)	Constant	-1.20261*** (-6.80)	Constant	-1.77871*** (-5.12)
Sargan test	0.9999	Sargan test	0.9999	Sargan test	0.9998
AR(1)	0.0010	AR(1)	0.0029	AR(1)	0.0094
AR(2)	0.5120	AR(2)	0.1058	AR(2)	0.3801
Instruments	66	Instruments	65	Instruments	65
Wald test	0.0000	Wald test	0.0000	Wald test	0.0000
N	501	N	501	N	501

1998 and 2009³ are introduced into the model for re-estimation. Results are listed in column (9) of Table 6.

To facilitate comparison, the researcher introduces model (3) into Table 6. Compare both model (6) and model (7) with model (3) respectively, and estimation results are also robust with the elimination of potential outliers. Compare model (8) with model (3), it is found out that the value and the significance of estimated coefficients roughly remain the same with the replacing of indicators. So the estimated results are relatively stable. Comparing model (9) with model (3), the significance and value of all coefficients remain the same after adopting year 1998 and 2009 as dummy variables. Therefore, the estimated results are highly robust. However, it is a surprise that the Four Trillion Investment plan and other policies aimed at expanding domestic demand in 2008 that carried out by the Chinese government play a significantly negative role. In order to further explore the reasons, total consumption and total investment are adopted respectively as the dependent variables in estimation, and the estimated results are listed in column (10) and column (11) of Table 6. According to the estimated results, the effect of the Four Trillion Investment plan and other policies on expanding domestic demand in 2008 on total investment is not significant. It is true that the Four Trillion Investment plan has a positive employment effect (Yin 2010), and it contributes to poverty alleviation (Guo 2015). However, due to the fact that most of the investment went to state-owned enterprises, the expanding of which tends to have a strong crowding out effect on private economy, thus leading to a sharp decline in private investment and total investment (Qiu 2013). Moreover, the series of domestic demand expanding policies in 2008 had a significant negative effect on total consumption. To some extent, this is due to the fact that the economic depression at that time was caused by the recession in the manufacturing sector, and the crowding out effect caused by the vast majority of investment flowing to state-owned enterprises depressed the private manufacturing heavily, thus the citizens' spending power decreased at the same time.

CONCLUSION

Based on the extended Diamond Overlapping Generations model, this paper studies the influence

of demographic changes on domestic demand and runs empirical tests with Chinese provincial panel data from 1991 to 2011. According to the results, child dependency ratio has a significant positive impact on China's domestic demand, and this impact slightly weakens with the development of economy. On the other hand, based on China's specific national conditions, elderly dependency ratio has a significant negative impact on domestic demand, and this negative impact strengthens as the economy develops. Final conclusion shows that either the declining child dependency ratio or the increasing elderly dependency ratio is detrimental to domestic demand expanding, and demographic change is an important factor that affects domestic demand.

RECOMMENDATIONS

Test results of robustness check aimed at policy interference denote that government bailout is not an efficient way to expand domestic demand. Therefore, the focus of domestic demand expanding should rest on policy guidance rather than direct policy interference.

Firstly, actively adjusting the demographic structure is a right choice that assesses the current situation and keeps pace with the times. The estimated results show that it is the new features of demographic structure, which mainly concern the coexistence of the "declining birthrate" and "aging" that lead to the insufficient domestic demand. It is predicted by United Nations that China's aging problem would become more serious in the coming decades, and this would be more and more detrimental to its domestic demand expansion. Therefore, under the economic, social, resource and environmental constraints, it is better for policymakers to shift from strict control of population growth to the allowance of moderate population growth. Constantly adjusting and improving the "family plan policy" would be beneficial to improve demographic structure, thus expanding domestic demand. There is no doubt that reconsideration should be given to "family plan policy", which has been in execution for 30 years, since the country is facing new demography and development environments.

Secondly, in order to fully release purchasing power of the elderly population, the pension system should be further improved in China. In accordance with the conclusion, an imperfect

pension system together with the family planning policy urges the increase of precautionary savings of the elder in China, thus deteriorating domestic demand. As a result, the Chinese government should further expand the coverage of the pension system and improve its security level accordingly.

Thirdly, strengthen policy support and promote urbanization continuously. Based on the conclusion, the improvement of urbanization would promote investment demand and stimulate consumption demand at the same time. The current urbanization rate in China is just over fifty percent, which is far less than developed countries' eighty percent. Thence, continuously promoting urbanization would provide lasting endogenous power to expand domestic demand in China.

NOTES

1. In accordance with Samuelson's household saving-demand model, there is a substitute relationship between the number of children and the amount of savings of a family, and children can be regarded as the substitute of savings. When there are merely few children in a family, the saving rate would increase for parents' old ages.
2. According to Liu's research, at one percent significance level, there is an inverted U-shape relationship between urban-rural income gap and consumption demand. According to Chen's research, since the mid-1990s, the rural-urban income gap has influenced domestic demand periodically. The expansion of the rural-urban income gap promoted consumption demand before 1998, while it suppressed consumption demand after 2003.
3. In reaction to the Asian financial crisis, the Chinese government introduced large-scale bonds issuance policy and other policies to accelerate infrastructure construction immediately in the second half of 1998, therefore, 1998 is selected as the dummy variable. In response to the world financial crisis, the Chinese government launched the Four Trillion Investment plan and a series of other domestic demand expanding policies in December 2008. Considering the lag effect of policy, year 2009 is selected as the dummy variable.

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