Working Age Population and Regional Economic Growth in China

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Statement of Originality

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

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Abstract

This thesis examines the effects of changes in the working-age population on the regional economic growth of China, using provincial-level panel data from 1996 to 2015. The empirical model is based on the Solow's economic growth model, where the key determinants of economic growth are capital intensity per labour, savings rate, and population growth. The model is estimated using the fixed-effects estimator with Mundlak-device and the Arellano-Bond method to overcome the endogeneity of labour and population. The share of working age population growth and employment growth both have significant and positive effects on the economic growth. The empirical evidence supports the hypothesis that demographic factors are one of the key factors that could explain the differences in regional economic growth.

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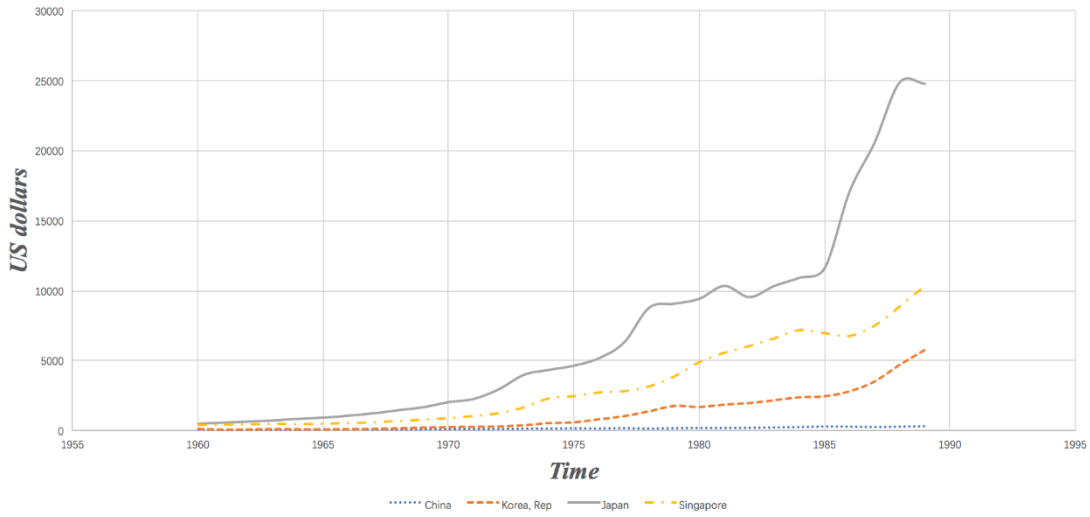
1. Introduction

Various factors could contribute to economic growth. Population expansion, capital accumulation and technology enhancement are widely accepted as the main components that stimulate the development of the global economy. Asian countries made an impressive economic performance, especially after World War II, which is referred to as the 'East Asian miracle'. From 1960s to 1980s, the income per capita of several major Asian countries achieved a remarkable leap. Figure 1 shows that from 1960 to 1989 Japan experienced an increase in income per capita by 50 times and

Figure 1, Change of total GDP



Singapore, whose income per capita is currently the highest among Asian countries, and South Korea which is the member of Four Asian Dragons, both picked up the upward steps in economic development during this period.

The Chinese civilization is one of the oldest civilizations of humanity, but as a country, its history is only a few decades[1]. The People's Republic of China was

[1] China in this article is referred to as People's Republic of China.

established in 1949 right after World War II. At that point, China was a country with 420 million people, but the income per capita was below 55 US dollars[2]. In the year of 2016, the income per capita has grown to 8,216 US dollars. This number has increased by almost 150 times in just 60 years. Currently, China is the second largest economy in the world. In 2015, China's GDP accounted for 15.5 present of the world's total GDP according to the International Monetary Fund (IMF). The international influence of China's economy is growing steadily. From 2011 to 2015, China's GDP grew at an average annual rate of 7.3 percent, while the global economic growth rate is only an average of 2.4 percent. The growth rate of Chinese economy ranks the first among the world's major developed and developing countries that is far more than that of the U.S, Japan and Germany. During the same period, China contributed more than 25 percent of the growth of the world economy that led the Chinese economy to be the world's most important engine for economic growth, especially after the global financial crisis happened in 2008. Meanwhile, China's territory is vast—with a land area of 9.6 million square kilometers. China has 27 provinces and 5 provincial-level cities. Different locations result in the differences in culture, climate and allocation of natural resources that could influence people's behaviour, local labour market and economic system. On the other hand, the imbalance of regional economic development has always been a concern of the Chinese government. In 2013, the local GDP of Guangdong province reached 1 trillion US dollars that surpassed the world's 16th largest economy Indonesia—whose

[2] The income per capita of China is 54 US dollars in 1952, source from National Bureau of Statistics of China.

national GDP is 0.8 trillion US dollars. However, the local GDP of Tibet is only 13.1 billion US dollars—equivalent to one seventieth of Guangdong's output. From the per capita point of view, income per capita of Tianjin, Beijing, Shanghai, Jiangsu, Inner Mongolia have exceeded the world average (per capita 10,600 US dollars) in 2013, while the income per capita of Guizhou province was only 3724 US dollars. The regional differentiation trend is apparent due to resource endowments, location conditions, the economic base and the industrial system, among which the economic growth of the eastern region has a steady progress, the growth of central region is slowing down and the growth of western region has declined significantly.

Towards the remarkable performance of Asian economy, Bloom and Finlay (2009) pointed out that several traditional factors could be recognized as key drivers for the rapid economic growth, including undertaken industrialization, trade openness, capital accumulation, government expenditure and the level of education. However, those factors may not fully explain the outcomes that happened in Asia. They argued that demographic change could be a missing factor in explaining the East Asian growth premium. We would like to explore whether demographic factors are also key factors for the economic development in China. During the past few decades, Chinese economy is commonly regarded to be benefited from demographic dividend. Demographic change could influence economic growth in various ways, including effects on labour supply, level of saving rate and improvement of technology as people from different age groups might not behave identically in economic activities.

More importantly, existing literatures which consider demographic factors are mainly focused on their effects on the national economic growth. In this article, we will reveal the potential correlation between the demographic factors and China's regional economic development. If it could be empirically proved that demographic factors have significant effects on economic growth at a provincial level, this study would have important policy implications which would allow the central authority to consider the differences in regional economic development from a new perspective other than concentrate too much on the conventional factors we mentioned above. More importantly, China has been on the track of accelerated population aging. This demographic change may trigger huge fiscal pressure due to rapidly increasing in health-related costs and pension compensations which raises the possibility of a pension gap that is predicted to capture over 20% of the government expenditure the year of 2050. Such a fiscal burden may drag on the economic growth rate of China.

We also will compare empirical evidences applying panel data from different estimations, including pooled OLS estimator, fixed effect estimator with Mundlak-device and the Arellano-Bond estimator. It can be expected that the demographic factors may have significant effects on the economic growth which is consistent with the existing literatures and the real situation of China's economic development. The article is designed as follows: in Section Two, relative literatures will be remarked, including studies on regional economic development in China and literatures that link demographic factors with economic growth; in Section Three,

patterns of both national and reginal economic development in China will be discussed, including the presentation of the latest Chinese demographic trends; the theoretical framework is introduced in Section Four; data descriptions and descriptive statistics will be shown in Section Five and comparison between different estimations, analysis and disucssions about the empirical evidence will be in Section Six. Conclusions, limitations of this article and recommendations for future research will come at last.

2. Literature Review

We will firstly review some of the literatures which are focused on China's regional economic development. The differences between regional economic development within a nation may have two potential effects on the overall development of the economy. On one hand, moderate differences can have positive effects on economic growth that regional differences are the basis of interregional competition and cooperation. Comparative advantage may not exist if there is no regional difference. Moreover, regional differences can be a kind of pressure for less developed regions, which can encourage these regions to catch up with the more developed areas that promote the rapid and efficient development of the national economy. On the other hand, excessive differences of regional economic development could have negative effects on the overall economic growth, which leads to issues as income inequality and trade disruption. Williamson (1965) used cross-country data of 24 countries from 1940 to 1961 and divided these countries into seven groups according to their income

levels to calculate the regional imbalances of the per capita income of each group. The results show that with the increase of the income level, the degree of interregional inequality is broadened at an early stage and reduced later, which appears as a '∩' shape. However, Hu and Wei (1995) argued that issues of differences of regional economic development cannot be solved by solely relying on the market's self-regulating mechanism. They suggested the Chinese government to conduct neutral macroeconomic policies towards issues on differences in regional economic development. They also stressed that the government should adopt a new benchmark that would set industry policy prior to regional policy. Ban, Li and Lu (2004) stated that the existing studies of the general regional differences only focused on macroeconomic indicators such as per capita GDP, per capita investment and per capita consumption. They pointed out in the empirical analysis of regional differences, it is also necessary to find out the reasons that cause regional differences. Policy makers may still face the problem that whether these differences are mainly interregional or intraregional, whether these differences are caused by different groups of people or similar groups of people. Based on their results, if China's regional development policy stays unchanged from 2000 to 2021, the regional development differences will gradually expand, which is similar to the trend from 1978 to 1999. They believe the differences of regional development are from three points: firstly, the difference between the three regions—East, Central and West—are the most prominent problem of regional economic disparity in China; secondly, the industrial decomposition shows that regional economic differences are mainly

reflected in the regional differences in industry; finally, regional differences are also mainly reflected in the differences between urban and rural income.

Human resource is an important input factor of economic growth. The development of population economics shows that the changes in demographic factors, including age structure and gender distributions, may be intrinsically linked to economic growth. One of the most controversial debates in population economics is about the relationship between population growth and economic growth. The mainstream opinions are categorized into three classes, population pessimists, population optimists and population neutralist. 'Population pessimists', proposed by Thomas Robert Malthus in his book 'An Essay on the Principle of Population', believes that population growth may bring pressures on food and other resources. Coale and Hoover (1958) stated that population growth might encroach the effects bought by capital accumulation and technology enhancement. Another school of thoughts stands for 'population optimists' which is opposite to the former opinion. They consider population growth as the catalyst for economic growth. When a huge population burdens food and other resources, technology tends to make larger improvements and capital may accumulate more than that before the population boom, both the influences would lead to economic expansion. The finding of 'population neutralist' is relatively surprising in regard to the existing debates. Several economists found that population growth has insignificant effects on the economic growth, no matter positive nor negative. They argue that not only the change in quantity of population

that influences the economic growth, the change of structure inside the population should get more attention, such as the trend of change in fertility rate and mortality rate, change in age structure and gender distribution. This issue has been examined by Kelley and Schmidt (1995). Though it has been recognized that population growth is insignificant to economic growth, they found a significant negative relationship between population growth and economic growth in 1980s based on a cross-country dataset during 1960s and 1970s. Their empirical result proved that effects of the components of population on the economic growth changed in the 1980s.

Figure 2, Demographic transition

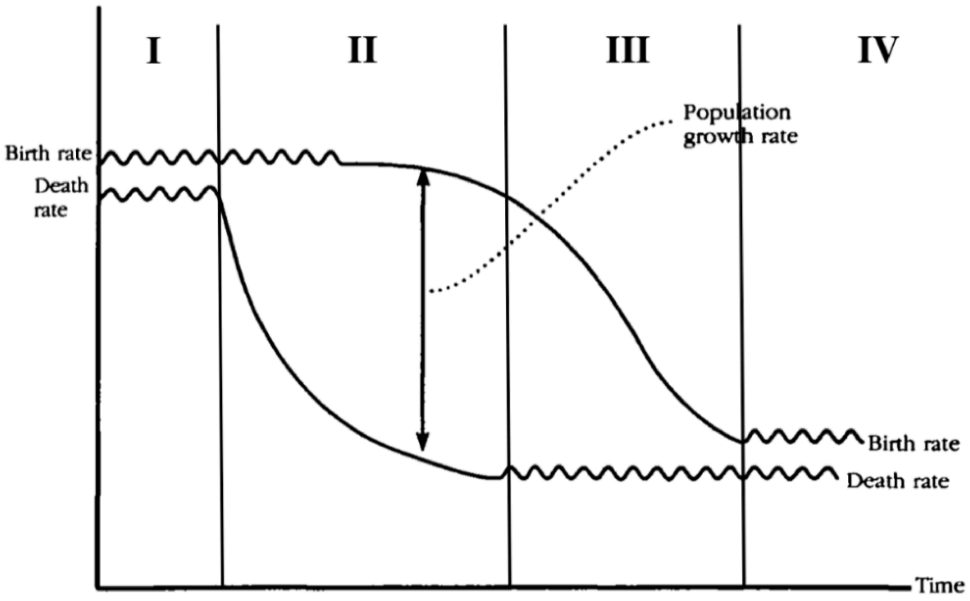


Figure 2 first appeared in the work of Bloom and Williamson (1998) that it explains how the components of population could change over time. In this figure, the process of demographic transition is divided into four steps. At the early stage of demographic transition, which is referred to Step I and II in Figure 2, death rate starts to fall while birth rate is relatively stable. This procedure may lead to two consequences. Firstly, population begins to increase. More importantly, the age structure is changing as well.

The share of working-age people in the whole population tends to reduce. The reduction in mortality rate means that there will be more old people whose expenditure may need to be supported by the current working-age group which leads to the rise of old-age dependency rate. At the same time, birth rate remains at a high level, thus will bring more children to the world and the child-age dependency rate will also increase. These two changes are both potential threats to economic growth. Moving into the middle stage of demographic transition, which is Step III in Figure 2, the birth rate is gradually decreasing and the pace of population growth is slowing down. The share of working-age population begins to rise. Demographic transition brings positive shocks to economic growth during this period, and this step is referred to as the demographic dividend. The final step, which is Step IV in Figure 2, states that birth rate and death rate will remain stable at a lower level. Population expansion and age structure change will tend to be constant and the impacts of population growth on the economic growth will move to neutral.

Bloom and Williamson applied data from 78 Asian and non-Asian countries from 1965 to 1990 to check the link between demographic change and the East Asian miracle. They figured out that the demographic dynamic is one of the main factors that could determine economic growth. They also found that the demographic dynamic could explain the remaining parts of the miracle that the remarkable economic improvement East Asian countries experienced during this period. Bloom and Finlay (2009) extended Bloom and Williamson's (1998) data by setting up a

5-year panel dataset from 1960 to 2005 using country-level data of a global sample, which is 15 years longer than Bloom's previous work. In fact, the nature of economic growth between the two periods, 1960–1990 and 1990–2005, was very different. The Asian financial crisis occurred in 1997 and China started to step onto the main stage of the world economy during this period. Based on the new dataset, they found that demographic factor remains an important contributing factor to economic growth in East Asia and will continue to do so. They also predicted that a decline in the working-age share will tend to depress economic performance in this region. Peng (2008) forecasted the economic growth of China by applying a computable general equilibrium model and a given age profile during the twenty-first century. He pointed out that the demographic shift in China is rapid. The percentage of population above 65 years old will rise from 6.9 percent to 15.7 percent within thirty years, and will finally increase to one fifths of the total population which is 300 million. This prediction draws great attentions from not only the academic field, policy makers are also concerned about the negative effects on the growth path of China's economy brought by this great change in the age structure. Even though the recognition is still on the theoretical stage, Peng's work tries to cover the limitations of lacking quantitive measurement of age structure change on the growth rate of Chinese economy. He modified the People's Republic of China General Equilibrium Model (PRCGEM) to obtain the forecast simulation with a 10-year interval using the updated database in the year of 2000.

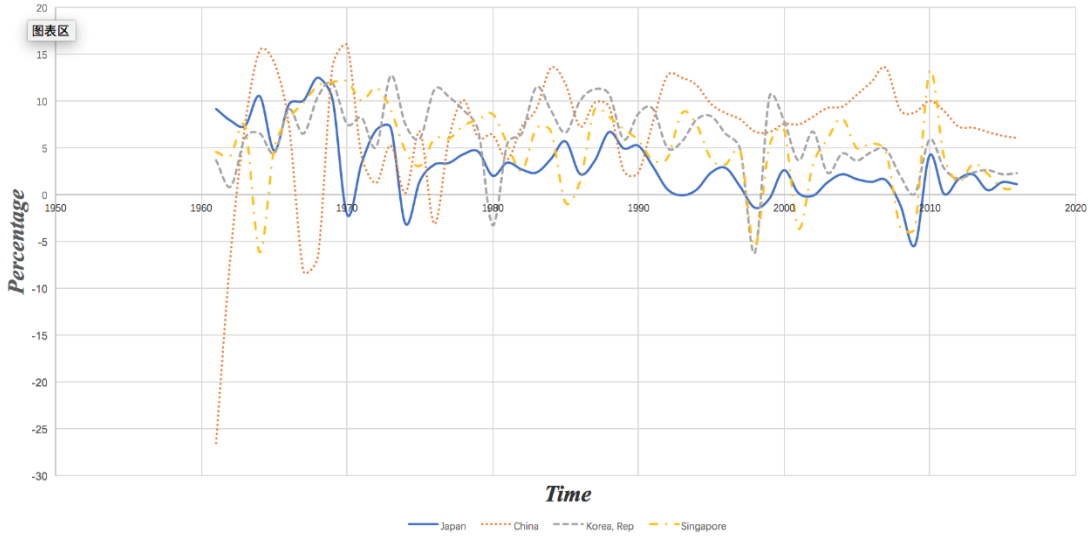
Different to some of the existing literatures which apply cross-country dataset, this article uses a within-country dataset and expands the study of impacts of demographic factors on regional economic growth to province-level. We also include key factors that can influence economic growth, such as level of openness, level of education, saving rate and government expenditure that have been studied in literatures mentioned above.

3. The Chinese Economy

i. Development Pace of Chinese Economy

It can be seen from Figure 3 that the average GDP per capita growth in China performs better than that of its neighbors after 1970s. However, due to a number of historical issues, China is not actually on the track of East Asian miracle. In fact, income per capita of China only increased from 54 US dollars to 229 US dollars during 1960s and 1970s, which is far from a miracle. The outbreak of the Chinese economy does not belong to this period and could be attributed to two main reasons.

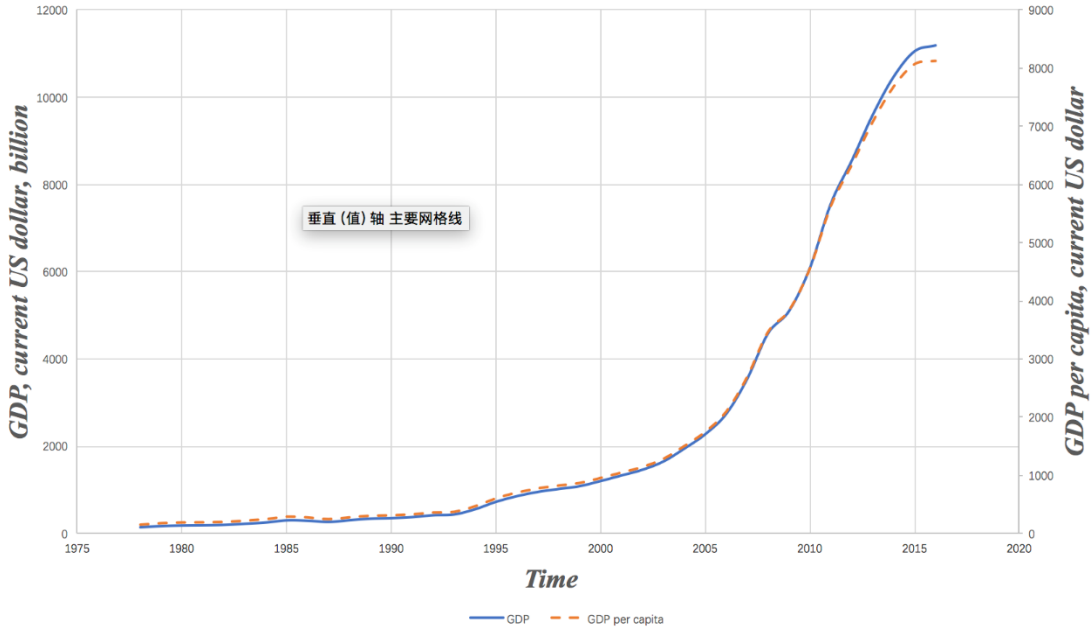
Figure 3, Growth rate of GDP per capita



Firstly, the demographic transition was still at the first two steps, which means population growth did not make significant contributions to the economic growth due to high dependency ratio. In 1950, the birth rate was 3.7 percent and death rate was 1.8 percent. These two ratios remained relatively stable until 1957 after when the mortality rate fell to around 1 percent while the fertility rate was still above 3 percent. After 1972, the birth rate started to decrease from 3.0 percent to about 1.9 percent in 1978. At the same time, the death rate remained at approximately 0.8 percent. The second reason is the form of market structure. In the first 30 years of the establishment of the new China, planned economy dominated the market system. As Bloom and Williamson (1998) suggested in their study in particularly, whether demographic dividend could bring positive impacts to economic development also dependents on the social, economic and political environment. Two historical events played as key factors that influence the economic development process in China and its population structure change.

The year 1978 was a big time for China because the Chinese Communist Party decided to conduct the Chinese economic reform which allowed China to transfer from planned economy into market economy. Right after this point, the economic growth of China picked up its pace which leads to an average of 9 percent growth rate annually. China experienced rapid economic expansion and became the second-largest economy just behind the United States. Figure 4 shows the change of China's GDP with the scale shown on the left-side vertical axis and change of China's GDP per capita with the scale depicted on the right-side vertical axis. China's GDP has reached 11,199 billion US dollars in 2016 which is more than 75 times than its GDP right after the economic reform in 1978. People's living standards improved significantly as well

Figure 4, GDP and GDP per capita of China

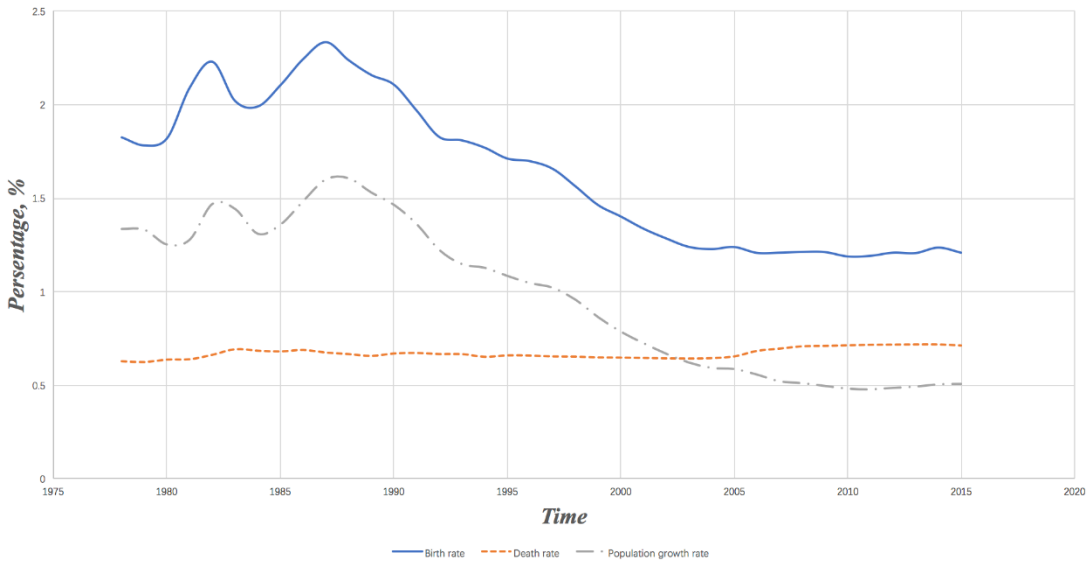


that the GDP per capita in China change from the bottom, which is 157 US dollars annually in 1978 to the top that is 8,123 US dollars in 2016.

In addition to the decision made on the national economy, the one-child policy, from

1980 to 2015, is the main policy intervention that largely affects China's demographic change. Before the policy was conducted, China's demographic transition was still at the early stage where the birth rate was greater than the death rate and the population was growing at a higher speed. It can be seen from Figure 5 that the overall trend of change in birth rate is downward despite of short-term fluctuations. After 2003, the birth rate gradually stabilized at around 1.2 percent. The change in death rate is smaller than the change in birth rate. From 1978 to 2016, the death rate has been floating between 0.62 percent to 0.72 percent that could also be shown in Figure 5. The demographic dividend happened after 1978, during which period the population

Figure 5, Birth rate, death rate and population growth rate



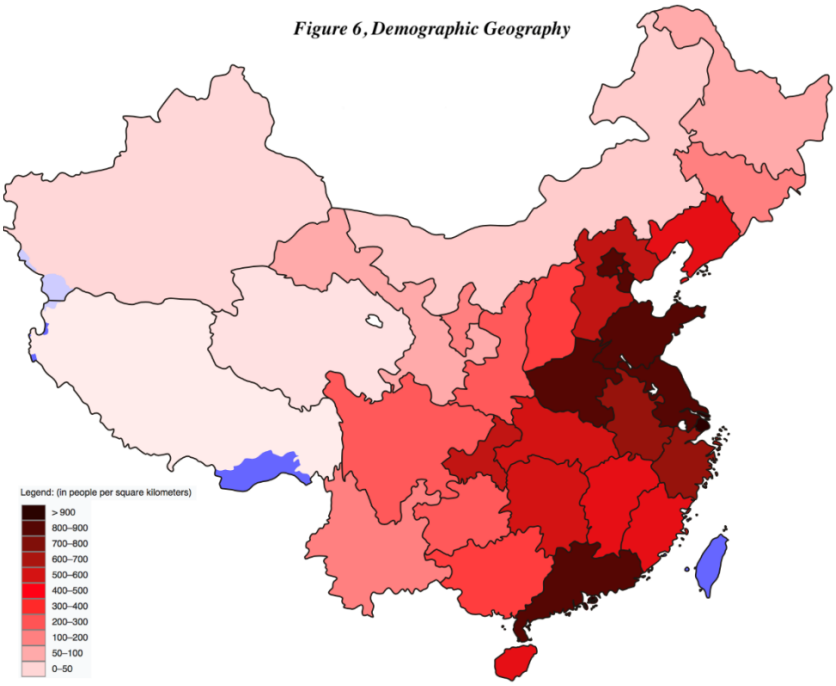
growth shot upward shocks to China's economy due to an increase in the working-age population. Along with the economic reform, this transition in demographic structure makes the huge population base an advantage of China, and they jointly promote China's economic performance.

ii. Regional Economies of China, Demographic Geography & Economic

Geography

The figures below represent China's demographic geography and economic geography. Figure 6 shows that eastern coastal provinces are much more densely populated than the central and western interior[3]. The developed areas can attract more labour force to come due to better employment opportunities provided in these regions. The regional distribution of the population also reflects the regional differences in China's economic development which could be seen from Figure 7 below. Developed provinces and cities are mostly located along the eastern coast line

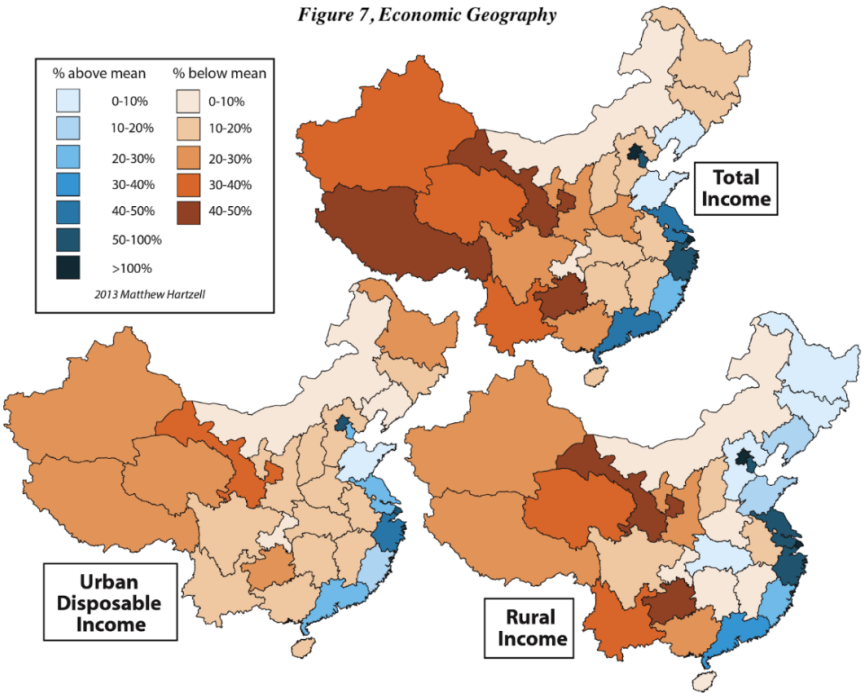
Figure 6, Demographic Geography



that are more likely to have higher income per capita and larger labour market; while less developed areas are mainly inland provinces and cities with lower income per capita hence lower economic growth. As a result, Eastern coastal provinces with large population density corresponds to a higher per capita income and economic

[3] The original data source is NBS of China, the original author of Figure 6 is TastyCakes on English Wikipedia, the author of this article added the legend for the figure.

Figure 7, Economic Geography

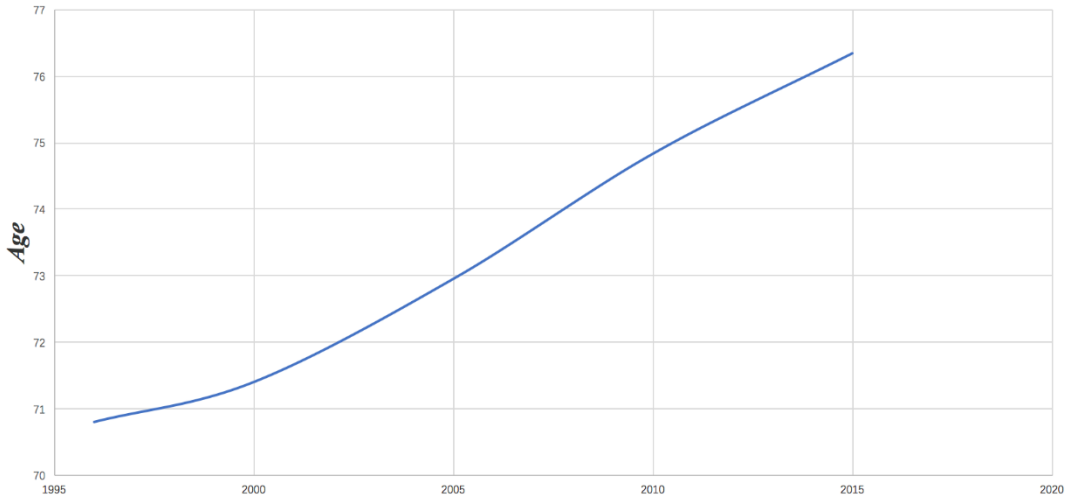


development level. All the landlocked provinces in China have a below average income per capita, while provinces who get access to coasts could enjoy higher economic growth.

iii. Trends of Demographic Changes in China, From 1996 to 2015

A brief statement about the demographic change from 1978 to 2016 has been descried in the previous section, we will focus on the latest demographic changes in details in this section, covering the period from 1996 to 2015. China has stepped into the range

Figure 8, Averge Life Expectancy



Time From 1996 to 2005
5-Year Interval Base

of middle income countries and the living standard of Chinese people has increased remarkably. As mentioned in the previous section, GDP per capita has risen from 132 US dollars to 8,123 US dollars within 50 years, which is more than 60 times. The extension of life expectancy is apparent as shown in Figure 8, which has increased by 7.8 percent during the last decade, from an average of 70.8 years old in 1996 to 76.34 years old in 2015.

Figure 9, Birth rate, death rate and population growth rate, 1996 to 2015

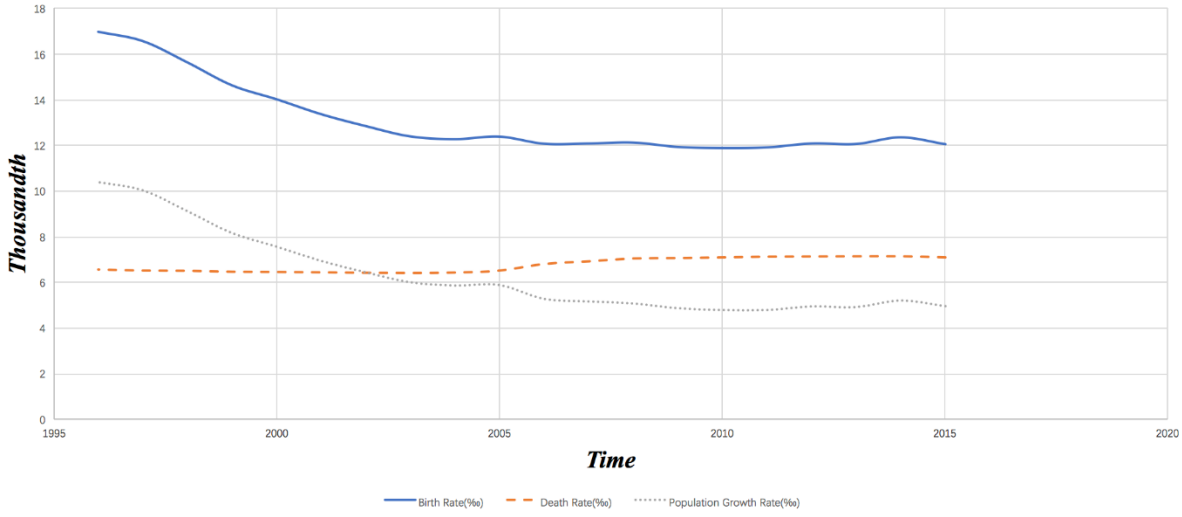
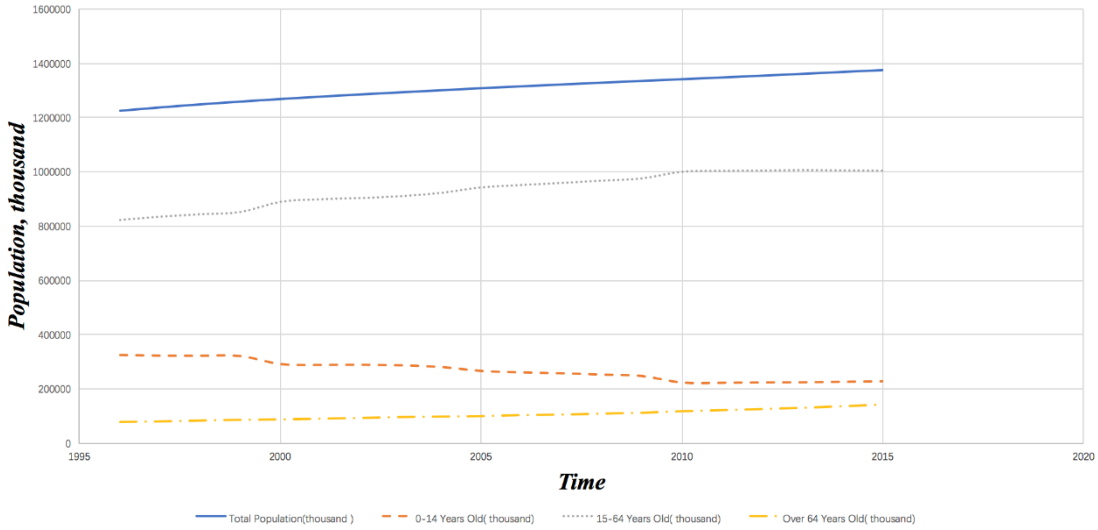


Figure 9 shows the trends of birth rate, death rate and population growth rate from

1996 to 2015, which is a part of Figure 5 for trends of birth rate, death rate and population growth rate from 1978 to 2016. Though the birth rate has been decreasing from 1.698 percent in 1996 to 1.207 percent in 2015, the mortality rate has grown from 0.659 percent to 0.711 percent during this 20-year period. The decrease of birth rate is around 29 percent, which is still larger than the increasing rate of mortality which at 0.84 percent. Both effects lead the change of population growth to the same direction, which results in a sharp decline in the population growth from 1.045 percent in 1996 to 0.496 percent in 2015. China lost more than half of its population growth rate during this 20 years.

Figure 10 divides the total population into different age groups, which could provide more information about the trend of demographic change. According to the figure, the working-age population, which is between 15 to 64 years old, grows in the same direction as population over 64 years old. It is notable, however, that the average

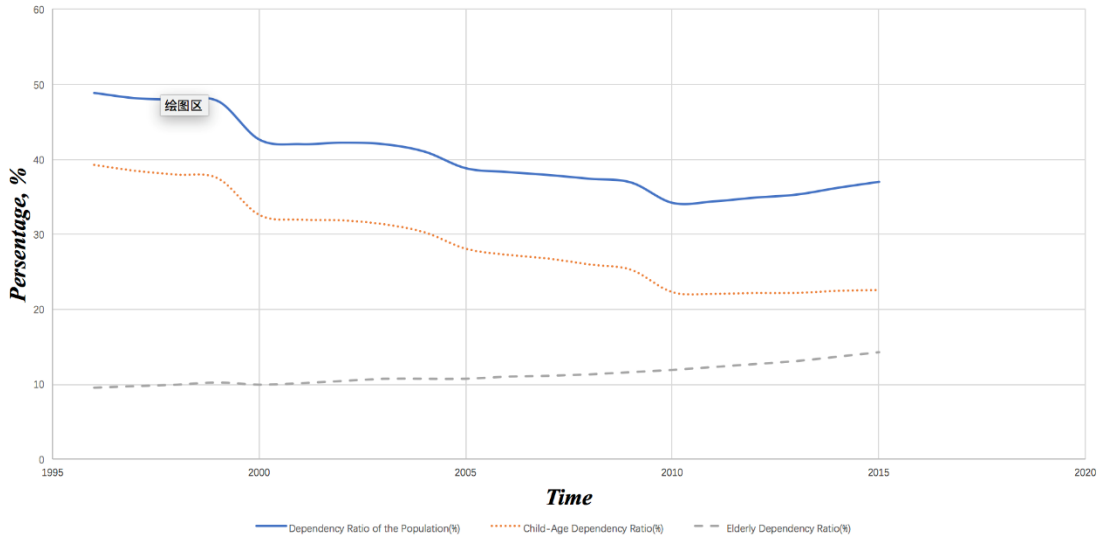
Figure 10, Age group population



growth rate of over-64-years-old age group is significant (approximately at 83 percent from 1996 to 2015), which triggers concerns from the public about the speed of population aging. It is even worse due to the decline in the birth rate. The population growth rate of the youth, age group between 0 to 14 years old is the only curve in the graph with a negative slope. From the last twenty years, the population of this age group has decreased from 0.32 billion to 0.22 billion despite that the downward trend slowed after 2010. Even though the working-age population is majority of the total population, this age group will move out of labour force over time, and fall into the retirement age group. There are insufficient substitutions to compensate for the loss of the labour force due to low fertility rate.

This issue could also be reflected by the dependency ratio in Figure 11. Resulting from the increase of the population of the elderly, the elderly dependency ratio also jumped from 9.5 percent in 1996 to 14.4 percent in 2015, which is a 52 percent

Figure 11, Dependency ratio



increase. This means that currently, every 100 workers should share the responsibility for the social costs of nearly 15 retired people. The child-age dependency ratio is falling before 2010, which might be the combination effects of the one-child policy and rising costs of children. After 2010, however, the trend of child-age dependency ratio turns to be upward due to the birth rate picks up its growth to some extent. Therefore, the pressure of the working-age population has become even greater.

4. Theoretical Framework

The theoretical framework is developed from a neo-classical growth model that a province's (or city's) aggregate income is generated by the Cobb-Douglas production function with constant returns to scale,

$$Y_{it} = A_{it} K_{it}^{\alpha} L_{it}^{1-\alpha} \tag{1}$$

where Y is aggregate income, A is total factor productivity (TFP), K is capital stock, and L is the number of people who is employed. It also contains time variation 't' and cross section term 'i' which is to indicate regional effects. Then we convert the production function into to 'per labour' form under the assumption of constant return of scale by dividing both sides by L_{it}:

$$\frac{Y_{it}}{L_{it}} = A_{it} \left(\frac{K_{it}}{L_{it}}\right)^{\alpha} \tag{2}$$

Taking log of both sides gives

$$ln\left(\frac{Y_{it}}{L_{it}}\right) = lnA_{it} + \alpha \ln\left(\frac{K_{it}}{L_{it}}\right) \quad (3)$$

This expression shows that the output per worker is dependent on the total factor productivity and the capital intensity. Following Bloom and Finlay (2009), we assume that labour productivity $(\frac{Y}{L})$ converges to the steady state level[4] through the following dynamic relationship[5],

$$\Delta ln\left(\frac{Y_{it}}{L_{it}}\right) = \lambda\left[\ln\left(\frac{Y}{L}\right)^{*}_{it} - \ln\left(\frac{Y}{L}\right)_{i,0}\right] \quad (4)$$

where λ stands for the speed of convergence, $\ln(\frac{Y}{L})^{*}_{it}$ is the steady state level and $\ln(\frac{Y}{L})_{i,0}$ is the initial level. The steady state level of labour productivity $(\frac{Y}{L})^{*}_{it}$ is affected by various factors, including those affecting the TFP, such as saving rate, level of trade openness, education level and technological progress. Let vector X contains these factors. Then Equation 4 could be expressed as

$$\Delta ln\left(\frac{Y_{it}}{L_{it}}\right) = \lambda\left[X'_{it}\beta^{*} - \ln\left(\frac{Y}{L}\right)_{i,0}\right] \quad (5)$$

where β^{*} is the coefficient vector and $X^{'}_{it}\beta^{*}$ represents the log value of steady state output per worker. To analyze the effects of changes in the demographic factors, we explicitly distinguish employed people (L), labour force that is approximated by

[4] According to the Solow growth model, a steady state is defined as the long run equilibrium state of the economy where investment per worker just offsets the reductions in capital per worker due to depreciation and population growth so that the growth rate of capital stock per worker will equal to zero. Changes in saving rate and technological progress shift the production frontier, resulting in a change in the steady state.

[5] This is known as conditional convergence; see Bloom, Canning and Malaney (1999, Harvard CID Working Paper NO. 15, Page 38).

working-age population (W), and the whole population (P), and introduce them into the model using the following identity for output per capita:

$$\frac{Y_{it}}{P_{it}} = \frac{Y_{it}}{L_{it}} \frac{L_{it}}{W_{it}} \frac{W_{it}}{P_{it}} \tag{6}$$

where $\frac{L_{it}}{W_{it}}$ is employment rate, $\frac{W_{it}}{P_{it}}$ is share of working age population to the whole population[6]. Then economic growth rate, $\Delta ln\left(\frac{Y_{it}}{P_{it}}\right)$ can be decomposed into the growth rates of labour productivity, employment rate and participation rate, which is shown as below:

$$\Delta ln\left(\frac{Y_{it}}{p_{it}}\right) = \Delta ln\left(\frac{Y_{it}}{L_{it}}\right) + \Delta ln\left(\frac{L_{it}}{W_{it}}\right) + \Delta ln\left(\frac{W_{it}}{P_{it}}\right) \tag{7}$$

Substituting growth rate of labour productivity from Equation 5 yields:

$$\Delta ln\left(\frac{Y_{it}}{p_{it}}\right) = \lambda\left[X'_{it}\beta^* - \ln\left(\frac{Y}{L}\right)_{i,0}\right] + \Delta ln\left(\frac{L_{it}}{W_{it}}\right) + \Delta ln\left(\frac{W_{it}}{P_{it}}\right) \tag{8}$$

Finally, the econometric model for this theoretical relationship can be written as,

$$\Delta ln\left(\frac{Y_{it}}{p_{it}}\right) = X'_{it}\beta + \delta_1\left[\ln\left(\frac{Y}{L}\right)_{i,0}\right] + \delta_2 \Delta ln\left(\frac{L_{it}}{W_{it}}\right) + \delta_3 \Delta ln\left(\frac{W_{it}}{P_{it}}\right) + \epsilon_{it} \tag{9}$$

Theoretically, $\beta = \lambda\beta^*$, $\delta_1 = -\lambda$ and δ_2=δ_3=1. However, the estimates of δ_2 and δ_3 are expected to be much smaller than unity because they measure partial, namely *ceteris paribus*, effects. For example, a one-percent increase in employment rate (L/W), while other factors including capital stock (K) being held constant, would lead to an increase in per-capita income (Y/P) by less than one percent because it would reduce capital intensity (K/L), of which effect would offset against the positive effect

[6] Multicollinearity is not a problem as the individual coefficients are reasonably significantly estimated

of an increase in employment rate on per-capita income.

5. Descriptions of Data

The dataset applied in this article includes 28 provinces and 4 provincial-level cities, covering the period from 1996 to 2015. Hong Kong, Macao and Taiwan are excluded. The whole dataset contains different groups of variables that stand for various purposes. As mentioned in the theoretical framework, several variables that could impact the steady state of the economy, including capital formation, level of education, local government expenditure, level of openness and length of railways in operation[7] in the regression. The growth rate of working age population and the growth rate of employment rate belong to demographic factors, which are key variables for the current empirical analysis. In addition, a dummy variable, whether a specific province is landlocked, is set as geographic factor. Table 1 offers the full range of data descriptions. Due to restrictions of data resources, parts of the dataset need to be calculated based on information available, we will offer full explanations in the following sub-sections. The selection of the variables is based on previous studies, and these factors are widely studied and have been proved to have significant effects on the economic growth. Moreover, the availability of the data should also be considered.

[7] The railway transport is recognized as the most important mode of long-distance transportation in China. Railroad infrastructure is one of the main factors that determine the economic development in a specific province. It is generally expected that railway transport has positive effects on the economic growth.

i. Real GDP

The official data of GDP provided by National Bureau of Statistics of China (NBS of China) is in nominal terms. Real GDP is expressed as $\frac{nominal\ GDP}{GDP\ deflator} \times 100$, where the source of GDP deflator is from the World Bank. Nominal GDP is available on the provincial-level, but GDP deflator is only available for the national level. Hence, the national GDP deflator (base=2000) is used to convert all provincial-level nominal variables into real values. There is one issue that needs to be notified that Chongqing city belonged to Sichuan province until it became a provincial-level city in 1997[8]. Parts of the dataset of Chongqing in 1996 are stated as a component of Sichuan province, and hence it has been re-calculated by subtracting the data of Chongqing from that of Sichuan province.

ii. Capital Formation

Capital formation represents savings net of depreciation. That is,

$$K_{i,t+1} - K_{i,t} = sY_{i,t} - (\delta)K_{i,t}$$

The left-hand side of the equation states for the change of capital stock between time t and t+1 of province or city i; while the right-hand side of the equation represents the actual investment $sY_{i,t}$ net of depreciation $(\delta)K_{i,t}$. Capital stock increases when actual investment exceeds replacement investment (i.e. depreciation), and it shrinks when replacement investment prevails. According to the neoclassical growth theory,

[8] The plan of making Chongqing as a provincial-level city was decided in 1996. In March 1997, Chongqing officially became a municipality

which assumes a homogenous Cobb-Douglas production function, a steady state of economy is associated with a static level of capital intensity (i.e. K/L). The capital intensity is not only affected by a change in capital stock (the numerator), but also by a change in labour input (the denominator). Given a level of technology and productivity, a steady state of capital intensity, and hence a steady state of per-capita income, is reached when investment just compensates for the depreciation of capital and population growth. In the present model, changes in capital formation represent changes in investment and depreciation. Other factors that may have effects on the steady-state level of capital intensity (and hence income per capita) include those affecting TFP, such as technological progress, employment level and population size.

Table 1, Data Descriptions

Variable	*Description*	*Source*
Nominal GDP per capita	*Annual nominal GDP per capita, million CHY*	*NBS of China*
GDP deflator	*Annual GDP deflator, 2010 as the base year*	*World Band*
Real GDP per capita	*Annual real GDP per capita, million CHY*	***[9]
Growth rate of real GDP per capita	*Annual average change in the log of real GDP per capita*	***
Gross Capital Formation (GCF)	*Annual GCF, including fixed capital formation and change in inventories, million CHY*	*NBS of China*
Depreciation of fixed assets	*Annual depreciation of fixed assets, million CHY*	*NBS of China*
Landlocked	*Dummy = 1 if a province is landlocked, no access to coasts*	*NBS of China*
Total amount of imports and exports	*Annual total amount of imports and exports, million CHY*	*NBS of China*
Government expenditure	*Annual expenditure of local government, million CHY*	*NBS of China*
Length of railway in operation	*Total length of railway in operation in a specific province or city*	*NBS of China*
Trade openness	*Share of imports and exports to Real GDP*	***
Education level, high school degree	*Number of people who is holding high school degree, thousand people*	*NBS of China*
Education level, undergraduate degree	*Number of people who is holding undergraduate degree[10], thousand people*	*NBS of China*
Population	*Annual resident population, thousand people*	*NBS of China*

[9] *** stands for the data is calculated by the author, necessary steps of calculation are explained in this section.
[10] In China, undergraduate degree includes undergraduate courses and specialized courses.

Working-age population	*Annual population of the 15-to 64-year-old people, thousand people*	*NBS of China*
Population, employed people	*Annual population of employed people, thousand people*	*NBS of China*
Labor productivity	*Total real GDP to number of people employed,* $\frac{Y}{L}$	*NBS of China*
Employment rate	*Ratio of number of employed people to working-age population,* $\frac{L}{W}$	*NBS of China*
Participation rate	*Share of working-age population to the whole population,* $\frac{W}{P}$	*NBS of China*

NBS of China, Annual by province, http://data.stats.gov.cn/english/easyquery.htm?cn=E0103

World Bank, inflation, GDP deflator (annual %), China, http://data.worldbank.org/indicator/NY.GDP.DEFL.KD.ZG?locations=CN

iii. Working-age Population Statistics

NBS of China does not provide full statistics of data on working-age population. It is calculated based on the sample and sample rate. Statistical Yearbooks of 2016 published by China Statistics Press provides detailed explanations. Firstly, the national population census is conducted in the year ending with 0, which is 2000 and 2010 of the dataset of this article. Secondly, the national survey, which takes approximately 1 percent population sample, is conducted in the year ending with 5, including 2005 and 2015 of the dataset of this article. Thirdly, the sample surveys on population changes are carried out in the rest of the years which covers about 1 per thousand of the total population of the country. Finally, the sample survey on population change takes the whole nation as the population and each province, autonomous region or municipality as sub-populations and the stratified multi-stage systematic PPS cluster sampling scheme is used.

iv. Descriptions of Variables and Descriptive Statistics

The theoretical model developed in the previous section represents the relationship between the growth rate of income per capita, macroeconomic variables and demographic factors. For factors that could influence the steady state of the economy, we introduce the level of openness as the ratio of the total amount of local imports and exports over the local real GDP; the infrastructure indicator as the ratio of the length of railway in operation in a specific province or city over its population; the education indicator is classified into two parts, with the first one being the share of

population with undergraduate level degrees to the population above 14 years old; and the other one being the share of the population with high school level degrees to the population above 14 years old. Government expenditure is transformed into the ratio of government expenditure over the local real GDP and the capital formation is expressed as net capital formation as a ratio to the local real GDP. All the variables that are related to the change in inflation have been calculated into real terms. Moreover, as we apply the change of variables instead of level, the change variables are likely to be stationary. The full description of variables that are included in the regression can be found in Table 2 above, followed by the national descriptive statistics in Table 3. The average growth rate of income per capita from 1996 to 2015 is 9.3 percent, while the growth rate of employment rate and the growth rate of working age population share are 0.28

Table 2. Variable Description

Variable name	*Description*
growthIPC	***growth rate of income per capita***
logIMEX	***log value of*** $\frac{total\ amount\ of\ imports\ and\ exports}{local\ real\ GDP}$
logRWP	***log value of*** $\frac{length\ of\ railway\ in\ operation\ in\ a\ speific\ province}{total\ population\ in\ this\ province}$
logGR	***log value of*** $\frac{number\ of\ people\ holding\ undergradue\ level\ degree}{population\ over\ 14\ years\ old}$
logHI	***log value of*** $\frac{number\ of\ people\ holding\ high\ school\ level\ degree}{population\ over\ 14\ years\ old}$
logIPL_ini	***the initial log value of labour productivity,*** $\frac{Y}{L}$
logGOV	***log value of*** $\frac{government\ expenditure\ in\ real\ terms}{local\ real\ GDP}$
logCF	***log value of*** $\frac{gross\ capital\ fomation-depreciation\ on\ capital}{real\ GDP}$***,*** ***the numerator is also in real terms***
Land	***dummy variable whether a specific province or city is landlocked. equals to 1 is the province or city is landlocked, equals to 0 otherwise***
growthWAS	***growth rate of working-age population*** $\frac{W}{P}$
gorwthER	***growth rate of employment rate*** $\frac{L}{W}$

percent and 0.52 percent respectively. The province-level descriptive statistics are put in the appendix. We note that during these two decades, Inner Mongolia has experienced the highest average growth rate of income per capita which is around 12.5 percent annually. It is surprising to find that Shanghai ranks the last in economic growth, which is less than 6 percent. According to the Solow growth model, a developed area like Shanghai that could have a smaller growth rate than that of a less developed area like Inner Mongolia. Guangdong has the highest average growth rate of working age population share, which is 1.5 percent annually, while Shandong's growth rate of working age population share is only 0.2 percent annually. As for the growth rate of employment rate, Henan takes the first place whose average annual

Table 3, Descriptive statistics

Variable	*Mean*	*Std. Dev.*
growthIPC	***.0933262***	***.0394443***
growthER	***.002819***	***.040504***
growthWAS	***.0052445***	***.0285036***
Landlocked	***.6451613***	***.4788507***
logIMEX	***-1.968289***	***1.045253***
logIPL_ini	***2.72832***	***.5008379***
logYL	***3.548118***	***.7072401***
logGR	***-2.812132***	***1.028656***
logHI	***-2.153834***	***.4465429***
logCF	***-1.008418***	***.3695962***
logGOV	***-1.80162***	***.5770834***
logRWP	***-2.747738***	***.885038***

growth rate of employment is 1.4 percent. More than 9 provinces or cities have experienced negative growth rate in employment rate, which are Shan'xi[11], Tianjin, Shanxi[12], Shanghai, Chongqing, Qinghai, Guangdong, Jiangsu and Gansu.

6. Empirical Results and Discussions

i. Pooled OLS Estimation

We firstly report the pooled OLS estimation result as a benchmark against which improvement in the consistency of the estimates of more sophisticated models can be measured. The regression model is given by,

[11] Shan'xi is '山西' province.
[12] Shanxi is '陕西' province.

$$growthIPC_{i,t} = \alpha_1 logIMEX_{i,t} + \alpha_2 logGR_{i,t} + \alpha_3 logHI_{i,t} + \alpha_4 logCF_{i,t}$$
$$+ \alpha_5 logGOV_{i,t} + \alpha_6 logRWP_{i,t} + \theta_1 logIPL\_ini_i + \theta_2 Lnad_i$$
$$+ \gamma_1 growthER_{i,t} + \gamma_2 growthWAS_{i,t} + \epsilon_{i,t}$$

In the regression model above, α_i are the parameters for time-variant macroeconomic variables, θ_i are the parameters for time-invariant macroeconomic variables, and γ_i are the parameters for time-variant demographic variables. Table 4 shows the result that growth rate of employment rate and growth rate of working age population have significantly positive effects on the economic growth. The openness level, the share of population with high school level degrees to the whole population and the capital formation also have positive and significant influences on the economic growth. It is unexpected to see the indicator of higher education level, which is the share of population with undergraduate level degrees to the whole population, has a significant but adverse effect on the economic growth. However, the pooled OLS estimator may ignore any potential individual specific effects. If there are fixed effects, the pooled OLS estimator would be inconsistent.

Table 4, Pooled OLS estimator

Dependent Variable: growthIPC	*Coef.*	*Std. Err.*	*t*	*P>t*
growthER	*.1932785*	*.0543114*	*3.56*	*0.000*
growthWAS	*.2125854*	*.0769224*	*2.76*	*0.006*
logIMEX	*.0107278*	*.0032144*	*3.34*	*0.001*
logGR	*-.0137173*	*.0021598*	*-6.35*	*0.000*
logHI	*.0321237*	*.0061847*	*5.19*	*0.000*
logIPL_ini	*-.0411067*	*.0071153*	*-5.78*	*0.000*
Land	*-.0090583*	*.004678*	*-1.94*	*0.053*
logCF	*.0214607*	*.0053875*	*3.98*	*0.000*
logGOV	*-.0136191*	*.0051527*	*-2.64*	*0.008*
logRWP	*.0033167*	*.0026418*	*1.26*	*0.210*
_cons	*.2642073*	*.0280941*	*9.40*	*0.000*

Then we turn to fixed-effects or random-effects estimator as the dataset is set to be panel data. Panel data models acknowledge that different units behave differently by adding an individual heterogeneity term for each cross-sectional unit. Two panel data models account for individual heterogeneity in two different ways. The first model is fixed-effects model and it leads to consistent estimation of the coefficients even if the heterogeneity term and some of the explanatory variables are correlated. The second model is the random-effects model, which is valid only if the heterogeneity term and the explanatory variables are not correlated. As most of the explanatory variables in the present model, such as education and openness, are likely to be correlated with provincial heterogeneity, we employ the fixed-effects model. Table 5 reports the Hausman specification test result, which shows that the random-effects model is

invalid and hence the fixed-effects model should be used.

Table 5, Fixed Effect VS. Random Effect

Test: Ho: difference in coefficients not systematic

chi2(10) = (b-B)'[(V_b-V_B) ^ (-1)] (b-B)

= 50.63

Prob>chi2 = 0.0000

ii. Estimation of the Fixed-Effects Model using the Mundlak Approach

The usual fixed-effects estimator is known to be inconsistent if some variables (eg. the initial level of output per worker) are not strictly exogenous. This bias is known as the Nickell (1981) bias. We use the method introduced by Mundlak (1978) to overcome this problem. According to the approach, group means of time-varying explanatory variables are added to control for the fixed effects, and then the model is estimated as a pooled model. These group mean variables are listed in Table 6.[13]

[13] Bloom and Finlay (2009) also use a similar approach, in which they use time-invariant variables to control for fixed effects.

Table 6: Group-Mean Variables

Variable name	*Description*
meanIMEX	***group mean of logIMEX***
meanGOV	***group mean of logGOV***
meanRWP	***group mean of logRWP***
meanGR	***group mean of logGR***
meanHI	***group mean of log HI***
meanWAS	***group mean of growthWAS***
meanER	***group mean of growthER***
meanCF	***groupf mean o logCF***

The estimation results are shown in Table 7. The growth rate of working age population and the growth rate of employment rate both have positive and significant effects on the growth rate of the income per capita. This result is consistent with Bloom and Finlay's work (2009). Influences from all the other variables have not changed much except for the geographic factor, that is, the dummy variable for landlocked, for which the sign of the coefficient alters from negative in the pooled

Table 7, Mumdlak-device Estimation, 1996 to 2015

Dependent Variable: growthIPC	*Coef.*	*Std. Err.*	*t*	*P>t*
logIMEX	**.0178031**	**.0053474**	**3.33**	**0.001**
logGR	**-.012718**	**.0026971**	**-4.72**	**0.000**
logHI	**.0398048**	**.0112162**	**3.55**	**0.000**
logCF	**.0192507**	**.0070089**	**2.75**	**0.006**
logGOV	**-.0319717**	**.0111044**	**-2.88**	**0.004**
logRWP	**.0076621**	**.0095**	**0.81**	**0.420**
growthER	**.1995717**	**.0557304**	**3.58**	**0.000**
growthWAS	**.2141827**	**.0778556**	**2.75**	**0.006**
Land	**.000437**	**.0057586**	**0.08**	**0.940**
logIPL_ini	**-.0441224**	**.010562**	**-4.18**	**0.000**
meanIMEX	**-.013673**	**.0080361**	**-1.70**	**0.089**
meanGR	**.0271093**	**.0129945**	**2.09**	**0.037**
meanHI	**-.0290264**	**.0195245**	**-1.49**	**0.138**
meanCF	**.0036551**	**.0127273**	**0.29**	**0.774**
meanGOV	**.0235581**	**.0132387**	**1.78**	**0.076**
meanRWP	**-.0088456**	**.0098866**	**-0.89**	**0.371**
meanWAS	**.2433449**	**.9001647**	**0.27**	**0.787**
meanER	**.2681308**	**.3269**	**0.82**	**0.412**
_cons	**.2857152**	**.0568015**	**5.03**	**0.000**

estimation to positive in Table 7. However, the estimates are insignificant in both cases. The similarity between the pooled estimates and the Mundlak-device fixed-effects estimates imply that heterogeneity is not that significant in the present data.

iii. The Arellano-Bond Estimation and Discussions

An important issue that has not been considered in the above two estimation methods is endogeneity of employment rate and participation rate. These two variables are highly likely to be affected by economic growth through the effect of economic activity on demand for labour and inter-provincial migration of workers. We employ the Arellano and Bond (1991) approach that estimates the model using the generalised method of moment (GMM) estimator with all lagged values of exogenous explanatory variables as instruments. In addition to lagged exogenous explanatory variables, we include the variables in the table below as additional instruments. These variables are likely to have effect on employment rate and participation rate, but unlikely to be affected by current economic activity, making them valid instruments. By applying

Table 8, instrumental variables

Variable name	*Variable explanation*
logFsize	*log value of average family size*
logMarried	*log value of share of married population to whole population*[14]
lagBirth	*lag 1 of log value of birth rate for each province*

the Arellano-Bond approach of using lagged explanatory variables as instruments to the GMM estimator, we can obtain asymptotically efficient and consistent estimates.

[14] Married population involves the first married population and re-married population.

Table 9, Durbin–Wu–Hausman test

Tests of endogeneity

Ho: variables are exogenous

Durbin (score) chi2(4) = 38.8294 (p = 0.0000)

Wu-Hausman F (4,557) = 9.9913 (p = 0.0000)

Table 9 reports the Durbin-Wu-Hausman test statistic for endogeneity, which allows for heteroscedasticity. The null hypothesis is that the four variables that are related to employment are exogenous. The p-value indicates that the null hypothesis should be rejected at the usual level of significance, and hence the growth rate of working age population, the growth rate of employment rate, and their group mean variables are jointly endogenous.

Table 10, Tests of overidentifying restrictions:

Sargan (score) chi2(2) = 2.4954 (p = 0.2872)

Basmann chi2(2) = 2.41545 (p = 0.2989)

The validity of the instrumental variables has been tested using the Sargan's over identifying restrictions test, of which test result is provided in Table 10. The p-value of the Sargan test is higher than 20 percent, implying that the null hypothesis cannot be rejected even at 20% and hence the instrumental variables are exogenous.

Table 11 reports the results of the Arellano-Bond estimation. This result is believed to be the most reliable result among the estimators that have been considered in the present study, and hence this set of results are discussed in depth in the following sections. The Arellano-Bond approach is relevant for the model in this article because

the variables are measured as changes and most of the variables are likely to be closely correlated with their historical values. Comparison will also be provided between Arellano-Bond estimator and robust fixed effect with Mundlak-device estimator.

Table 11, Arellano-Bond panel-data estimation

Dependent Variable: growthIPC	*Coef.*	*Std. Err.*	*t*	*P>t*
growthER	*.1954454*	*.0726546*	*2.69*	*0.007*
growthWAS	*.2157145*	*.0839553*	*2.57*	*0.010*
logIMEX	*.014742*	*.0049061*	*3.00*	*0.003*
logGR	*-.0139968*	*.0021975*	*-6.37*	*0.000*
logHI	*.0286374*	*.0061548*	*4.65*	*0.000*
logIPL_ini	*-.0516154*	*.0115465*	*-4.47*	*0.000*
Land	*-.0115461*	*.0062196*	*-1.86*	*0.063*
logCF	*.0247838*	*.0105228*	*2.36*	*0.019*
logGOV	*-.022624*	*.0084788*	*-2.67*	*0.008*
logRWP	*.0050495*	*.0058432*	*0.86*	*0.387*
_cons	*.2853896*	*.0470477*	*6.07*	*0.000*

a). Demographic Factors, Working Age Population and Employment Rate

We will now concentrate on the effects caused by the changes in demographic structure. The coefficient of initial level of labour productivity, $\frac{Y}{L}$, is negative 0.52. The sign of this coefficient is consistent with our theoretical framework. Roughly 5 percent of the deviation from the steady state level of the initial level of output per labour is corrected each year. Bloom and Finlay (2009) estimated the impacts of

demographic change on the economic growth using a similar theoretical framework with the initial value of working age population and the initial value of employment rate as explanatory variables and preferred to consider the population growth and the labour growth as time variant variables. In contrast to their regression model, we include time variant demographic factors that allows working age population and employment rate to change over time.

The growth rate of the proportion of working age population has a positive and significant effect on the growth rate of income per capita. In light of Bloom and Finlay's (2009) result, where they find a positive effect of labour force (W) growth and a negative effect of population (P) growth, the positive sign for the growth rate of the proportion of working-age population (W/P) implies that the positive effect of working-age population growth dominates the negative effect of population growth. The coefficient of the growth of employment rate is 0.19 that is slightly smaller than that of working age population growth. Employment rate growth also has significantly upward influences on economic growth. Bloom and Finlay believe that the impact of labour force growth on economic growth is positive and significant. As a fact, the growth of employment rate $\frac{L}{W}$, both the numerator and denominator could offer positive and significant effects on economic growth. Hence, the positive coefficient for the change rate of employment rate implies that the positive effect of employment (L) is larger than the positive effect of labour force (W).

Cai (1999) tried to find the contribution ratio of input factors to economic growth in China from 1978 to 1998. During this period, China annually enjoyed an average 9.8 percent growth rate of total GDP. Among all the input factors, the physical capital could explain 28 percent of the total growth rate, the number of labour force could explain 24 percent of the total economic growth, the labour force transformation could contribute 21 percent to the growth and human capital accounted for 24 percent. Cai believed all those input factors could benefit from demographic dividend and make large contributions to the economic growth in China. This result is also supported by Bloom and Finlay's work where they believe that the working-age share and the labour force growth could help to explain the superior growth performance of East Asian countries and effects from demographic factors could still last for extra periods. More importantly, our results can expand the effects of demographic factors on economic growth to a provincial level. The differences in regional economic development cannot be fully explained by factors like saving rate, education level and local government income and expenditures alone. The demographic structure is also different across provinces and cities that regions with higher growth rate of working age population and higher growth rate of employment rate can generally generate a higher economic growth rate.

However, there are issues that must be considered. The first one is the current status of the labour market in China. The issue of imbalance between the demand and supply of China's labour market has been existing for years. One of the potential

evidences might be the correlation between education and economic growth which will be evaluated in detailed in the following section. A Large number of working age population could not be transferred into employed labour force efficiently. The competition between university graduates and other surplus labour force is intensive. In the absence of employment opportunities, the pressure of labour market is represented by the increasing of unemployment rate. The second issue that is faced by policy makers in China is the fact of gradually diminishing demographic dividends. Bloom and Finlay believed that the change of demographic factors and economic growth positively correlated in that a decline in the working-age share will tend to depress economic performance. According to the forecast by China Population and Development Research Center, the share of working age population to the whole population has been relatively stable since 2006, and started to fall after 2010, which is approximately in line with the period of slowdown of Chinese economic growth. As for the level of the working age population which remains stable since 2011, but it will also begin to decline after 2022. After that point, the aging process may be accelerated and contributions of population change to economic growth will shift from the demographic dividend stage to the population debt stage. This break point of demographic change might happen earlier than the public expects. It is necessary to figure out solutions to keep the efficient part of demographic change. Furthermore, a vicious cycle might be formed due to unbalanced regional economic development and the loss of talent. The working age population may flow from less developed provinces or cites to developed areas. According to our empirical evidence, we can

predict the economy in less developed regions will be harmed if their share of working age population and employment rate decline. Towards these concerns, the 2016 China Labour Market Development Report points out that gender dividend and education dividend have been raised as potential substitutions for the conventional demographic dividend. It is a trend in China that the participation rate for female labour force is increasing sharply. The average education level of the female labour force has topped the average education level of the male labour force. For the next generation of economic growth in China, the labour market would like to attract more female labour force which makes gender dividend the next contribution point. Moreover, education level will transfer from quantity-emphasized to quality-emphasized.

b). The Level of Openness

The level of openness is measured by the ratio of the total amount of imports plus exports to local real GDP. The estimation of its coefficient shows that it has a positive and significant effect on the economic growth. The level of openness is always an important factor that stimulates the development of economy in China. This positively significant effect is available not only in Arellano-Bond estimation, fixed effect estimator with Mundlak-device also states positive and significant impacts of openness on the economic growth. The coefficient of openness in Arellano-Bond estimation is smaller than that in the fixed effect model with Mundlak-device. This result is consistent with existing literatures. Bloom and Finlay's (2009) article shows

trade openness is an important factor under different regressions that it contributes significantly to economic growth. Yanikkaya (2002) also figured out two groups of trade openness measurements, one is trade volumes and the other one is trade shares, export shares, and import shares in GDP. Both measurements offer similar results that the association between trade openness and economic growth is positive and significant. The Chinese economy is export oriented to some extent. Exports and imports recorded their peak value in 2006, accounting for 37 percent and 28 percent of total national GDP respectively. The labour cost in China is much lower than that of developed countries and China could take advantages from exporting with competitive prices. Joining the World Trade Organization in 2001 is a milestone in the development of China's foreign trade. As a member of the WTO, China is conducive to further expansion of exports and attract foreign investment. Moreover, China will enjoy the most favored nation's treatment. This will not only allow China to experience the benefits of expanding markets for 'Made in China' products in other countries and regions, discriminations from major trading powers against China might be eliminated gradually which will make China more competitive in international trading than that in the past. In 2010, China's total amount of exports has reached nearly 6 times than that in 2001. This leads China to the world's largest exporter and the second largest importer. More importantly, higher level of openness could help China to speed up the adjustment and optimization of domestic industrial structure, which is an important and urgent task of China's economic development. Joining the WTO will create a favorable environment for the implementation of this strategic task.

Under a better environment for international trading, less developed areas, especially landlocked areas could overcome their disadvantages in locations and benefit from larger markets. Based on these facts, we would expect trade openness continually contributing to economic growth in China in the following several decades.

c). Indicators of Education

Education is the main method to achieve human capital accumulation, which is one of the main resources of economic growth besides to physical capital. Education indicator used in this regression analysis has been divided into two levels, the share of population with high school level to population over 14 years old and the share of population with undergraduate level to population over 14 years old. Level of education is commonly recognized as a positive contributor towards economic growth in the long run. However, the results are quite surprising. Share of population with high school level degrees to population above 14-years-old has a significant and positive effect on the growth rate of income per capita, while higher education level, the share of population with undergraduate level degrees to population above 14-years-old degree, has a significant and negative effect on the growth rate of income per capita. The fixed-effects model with Mundlak-device estimator also shows that higher education level has a negative and significant impact on economic growth. The coefficients in these two regressions are almost the same. Though the result is unexpected, it is consistent with the work of Krueger and Lindahl (2001). Krueger and Lindahl analyzed the return of education on economic growth using a

cross-country dataset. They divide these countries into three categories based on education level. Education could contribute positive returns only for countries with low initial level of education. They also figured out a '∩' shape relationship between the education level and the economic growth. The average break point of the education level is 8.4 years for OECD countries. Once past this point, the marginal years of education will tend to depress the growth rate of economy. One potential reason that may lead to this result might be the expansion of enrollment to universities in China during the past two decades. In 1999, the Chinese government started to expand the university enrollment based on four main purposes: to stimulate domestic demand, to motive consumption activities, to promote economic growth and to ease employment pressure. However, this plan brings several opposite effects to the economic growth. Firstly, the lack of faculty leads to a sharp decline in the teaching quality and more than half of the universities over the whole country may face the issue of shortage in funds. From 1998 to 2005, the average number of enrolled students has increased by 4.2 times while the average number of teachers has increased by only twice. Secondly, since the first batch of university graduates who were influenced by the expansion plan entered the labour market in 2003, the issue of the employment of college students became a public concern. As we discussed in Section a), this group of labour force belongs to the working age population, but they cannot be transferred into employed labour force easily. In 2016, the number of university graduates reached 7.65 million people but the labour market is unable to meet such a huge need on employment. Enrollment expansion policy distorts the

supply and demand system in the labour market towards university graduates, which directly leads to the decline of college students' employment rate and wage rate, hence the lower employment rate will harm the economic growth. Attitudes should not be changed that education should have positive influences on economic growth in the long run, but from the evidences in literatures and the view of points of policy issues, the result represents in this article should also be reasonable.

In addition to the demographic factors that have been discussed in the previous section, the Chinese education system could also reflect differences in regional economic development in two aspects. Firstly, the quality of university in developed areas is much higher than that of underdeveloped areas. The quality may refer to teaching quality, hardware quality and the opportunities for graduates in the labour market. Even the number of universities in less developed provinces or cites is much smaller than that in developed regions. Secondly, university admission standards are not identical national wide, which means that candidates from some of the provinces or cites could enter the same university with a lower than average marks. The existence of educational discrimination makes it impossible for all candidates to enjoy equal access to higher education. This issue could have two formations but results in one consequence. Educational migrations, the group of people who move from developed areas with higher university entrance standard to less developed provinces or cites with lower university entrance standard, will erode the limited opportunities for local residences to get access to higher level of education which could harm the

reserves of human resources in less developed areas. More seriously, lower university entrance standard is not only applied to less developed areas, but candidates from several developed provinces or cites, such as the capital city Beijing, can also enjoy this advantage. Beijing has the largest number of universities among all the cities in China and local candidates can still benefit from lower university entrance standard. Difference in the reserve of human resources will directly lead to difference in regional economic development.

d). Capital Formation

Both the Arellano-Bond estimation and the fixed-effects model with Mundlak-device present that capital formation could significant affect economic growth in a positive way. Till 2015, the share of gross capital formation to total GDP was approximately 47 percent, which means that capital formation contributes nearly half of the GDP of China. Capital formation and investment may be the most controversial parts among the factors which could affect economic growth in China. Chow (1990) pointed out the Solow growth model could explain economic growth in China from 1952 to 1980 without technology influence. He attributed capital formation as one of the key roles in the Chinese development of economy during this period. J. Zhang (2002) evaluated capital formation using more recent datasets. He argued that the growth rate of capital formation and the growth rate of the economy presents a significantly trend of divergence, though the fact that the high level of investment is the main source of China's economic growth could not be denied. Excessive investment and excessive

regional competition decline the effectiveness of market operation in China. He also believed that inefficient capital formation could strengthen the inefficient allocation of financial resources that might incur negative impacts on the persistence of economic growth. Bloom and Finlay (2009) also found positive relationship between capital stock with economic growth, but insignificant under the comprehensive instrumental variable estimation.

e). Government Spending

Government expenditure currently accounts for around 13 percent of China's GDP. Table 11 shows that government spending has significant impacts on the growth rate of income per capita. However, these effects are negative, and the results are consistent with the results from fixed effect estimator with Mundlak-device. It is commonly believed that increase in the size of the government could hurt economic growth. Growing government spending could result in the 'crowding out' effect and its debt will be repaid by the public. Barro (1991) revealed the correlation between economic growth with various factors of 98 countries from 1960 to 1985 and found that economic growth is inversely related to the share of government consumption to the total GDP.

f). Infrastructure Indicator

The infrastructure indicator, length of railway in operation per person, has a positive and insignificant effect on economic growth. The coefficient is slightly larger in the

fixed effect estimator with the Mundlak-device but with a smaller significant effect. The railway transport is recognized as the most important mode of long-distance transportation in China. Chinese railway network ranks the 2nd longest in the world and the 1st if counted by railway in operation. Till 2015, China had approximately 120 thousand kilometers of railways and has the long-term plan to expand the length to 250 thousand kilometers before 2050. Moreover, China owns the longest high-speed rail (HSR) network that is 19 thousand kilometers. In 2014, railways in China had delivered more than 2 billion passenger trips that made Chinese railways among the busiest in the world. Especially the development of HSR network brings various of opportunities to provinces and cites along the railway line, including infrastructure construction and improvement of equipment manufacturing industries. It is reasonable to expect growing contributions from railway transport to Chinese economic growth. To speed up railway construction, especially railway constructions in the central and western regions of China could help less developed areas to achieve higher economic growth, hence reduce the imbalance in regional economic development.

g). Geographic Factor, Dummy Variable of Landlocked

In addition to the demographic factors, the regression model also contains a dummy variable of landlocked to present as the geographic factor. The result is different under different estimations. The fixed effect estimator with the Mundlak-device with demographic factors tells that location has a positive effect on economic growth but it is insignificant. In the work of Bloom and Finlay (2009), they also found landlocked

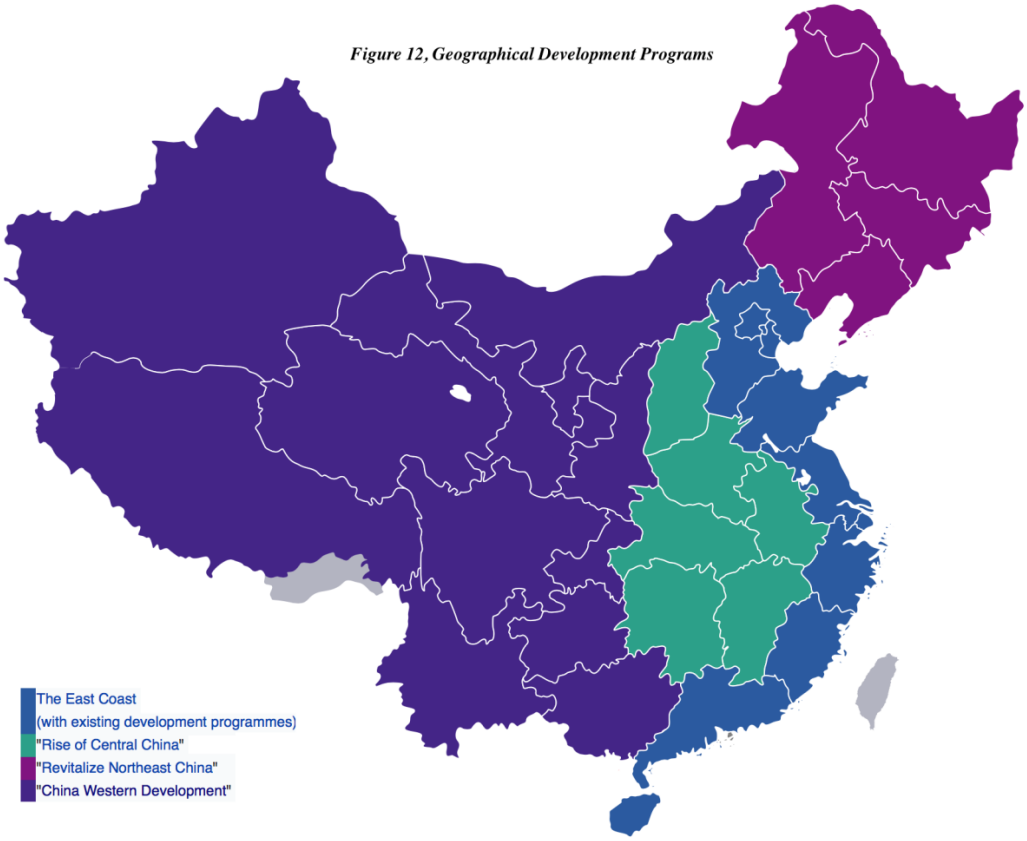
location may have a positive impact on economic growth. However, their regional dummy becomes insignificant when they control for demographic variables which leads to the conclusion differences in working-age share and labour force growth could be key factors that help to explain the superior growth performance of East Asian countries. On the contrary, the result from the Arellano-Bond estimator shows the geographic dummy variable has negative and significant influences which is consistent with some existing literatures that are focused on geographic factors. MacKellar, Wörgötter and Wörz (2000) confirmed the hypothesis that landlocked countries may experience slower economic growth based on their empirical evidence. They also pointed out that landlocked countries should have protections in international trade.

The Chinese government attaches great importance to the economic development of inland provinces. It is commonly accepted that the southeast coastal provinces can achieve a higher economic growth due to their advantaged location. The landlocked region of China contains 6 provinces—including Gansu, Guizhou, Qinghai, Shanxi, Sichuan and Yunnan, 5 autonomous regions[15]—including Guangxi, Inner Mongolia, Ningxia, Tiber and Xinjiang and one provincial level city, Chongqing. This region covers 71.4% of mainland China's land area, but only 28.8 percent of its population till 2002, and 19.9 percent of China's total economic output till 2015. This is also another evidence which could reflect the importance of demographic factor in

[15] Autonomous region is a first-level administrative divisions of China, same level with Chinese province. An autonomous region is a minority entity which has a higher population of a specific group of minority ethnic.

contributing to economic growth. As we discussed on the basis of Figure 6 and Figure 7 in Section 3, a huge population from this region has moved to developed areas that increases the working age population and labour force in southeast provinces significantly, which creates a solid foundation for the remarkable economic growth in these provinces. But for the western region, the effects from geographical and

Figure 12, Geographical Development Programs



demographic disadvantages are superimposed on each other, seriously damaging the local economic development. In 2000, the Chinese government decided to conduct the plan named China Western Development. This plan is expected to reduce the imbalance of reginal economic development and is intended to provide financial subsidies for the western provinces, combining with the lower labour cost in the local labour market to help this region to achieve higher economic growth. It could also

revealed from Figure 12 that the Chinese government has formulated different plans based on individual characteristics of different locations.

7. Concluding Remark and Limitations

Traditional input factors could not explain the full story of economic growth, especially after the East Asian Miracle that several East Asian countries have experienced remarkable output growth during 1970s to 1990s. It is believed that demographic factors might be the missing key point. As the country with the largest population in the world, we expect Chinese economic development to be significantly affected by demographic factors, not only at the national level, but also at provincial level. In this article, we apply provincial-level panel data to estimate various factors, which could influence the economic growth of China by developing a neo-classical growth model and including time variant demographic variables. We have also compared the results from different estimation techniques, including pooled OLS estimator, fixed effect estimator with the Mundlak-device and the Arellano-Bond estimator. Based on the results from the robust Arellano-Bond estimator and the fixed effect estimator with the Mundlak-device, the share of working age population growth and employment growth both have significant and positive effects on the economic growth. The empirical evidence supports the hypothesis that demographic factors are one of the key factors that could explain the differences in regional economic growth that provinces or cities with higher growth rate of working age population and

employment rate generally experiencing higher economic growth. This finding is consistent with several representative studies in the literature.

In addition to the demographic factors, we also provide explanations for some critical macroeconomic indicators. It is found that the level of openness, the basic education level, the capital formation and the length of the railway in operation are positively associated with economic growth, while higher education level, government expenditure and the geographic dummy variable for landlocked location have negative effects on economic growth. These results are in line with the current economic development situation in China.

This article has several potential contributions to this field. Firstly, the dataset has been updated to the latest, covering the past two decades from 1996 to 2015. Secondly, instead of applying cross-country data that is widely used in literatures, provincial-level data is examined here. Thirdly, the demographic factor is taken into consideration and we expand its effect to regional economic growth. However, there are still limitations due to various reasons. Firstly, we cannot include variables that directly reflect technology progress in China due to limitations on data resources. With the rise of numbers of high-tech enterprises, China tends to combine the original population advantage with the development in the technology industry. The Chinese government, both the central government and the local government, is increasing investment into research and development sectors. It is reasonable to expect the

change of technologies could provide more information about the economic growth trend in China. Secondly, due to internal and external shocks, including change in national policy and international situations, we would expect potential existence of structure instability during the past decades between economic growth and all the factors mentioned above. It will be a new avenue for research in the future to break down a 20-year period into more detailed time intervals to explore these structure change.

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9. Appendix

Anhui

Variable	Obs	Mean	Std. Dev.
growthIPC	19	.0986544	.031952
growthER	19	.0115216	.0403501
growthWAS	19	.0042426	.0313782
Landlocked	20	1	0
logIMEX	20	-2.321641	.4376548
logGR	20	-3.123747	.9804793
logHI	20	-2.402372	.2490362
logIPL_ini	20	2.287405	0
logCF	20	-1.160931	.1891113
logGOV	20	-1.888624	.3450875
logRWP	20	-3.156425	.2199568

Beijing

Variable	Obs	Mean	Std. Dev.
growthIPC	19	.0801395	.0448837
growthER	19	.0009765	.0645584
growthWAS	19	.0036453	.0335042
Landlocked	20	1	0
logIMEX	20	.0575425	.3083275
logGR	20	-1.325214	.6803701
logHI	20	-1.531572	.1424776
logIPL_ini	20	3.726666	0
logCF	20	-1.07695	.202053
logGOV	20	-1.816108	.2230588
logRWP	20	-2.63093	.1548269

Chongqing

Variable	Obs	Mean	Std. Dev.
growthIPC	19	.1038705	.0267855
growthER	19	-.0039408	.0467552
growthWAS	19	.0026687	.0349536
Landlocked	20	1	0
logIMEX	20	-2.313542	.790407
logGR	20	-3.008016	.970594
logHI	20	-2.237957	.2428902
logIPL_ini	20	2.46162	0
logCF	20	-1.022077	.306131
logGOV	20	-1.920656	.4510415
logRWP	20	-3.356115	.4301792

Fujian

Variable	Obs	Mean	Std. Dev.
growthIPC	19	.089455	.023004
growthER	19	.0135753	.0350263
growthWAS	19	.0078621	.0252559
Landlocked	20	0	0
logIMEX	20	-.8463439	.2445063
logGR	20	-2.908463	.9296366
logHI	20	-2.161677	.1926254
logIPL_ini	20	3.173184	0
logCF	20	-.9841313	.2061677
logGOV	20	-2.285905	.2101527
logRWP	20	-3.060909	.2942653

Gansu				*Guangdong*			
Variable	*Obs*	*Mean*	*Std. Dev.*	*Variable*	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.0899757*	*.0344831*	growthIPC	*19*	*.0750142*	*.0395412*
growthER	*19*	*-.0077414*	*.0241117*	growthER	*19*	*-.0048199*	*.0814827*
growthWAS	*19*	*.0060453*	*.0225539*	growthWAS	*19*	*.015236*	*.070602*
Landlocked	*20*	*1*	*0*	Landlocked	*20*	*0*	*0*
logIMEX	*20*	*-2.73188*	*.5914608*	logIMEX	*20*	*.0428087*	*.1631075*
logGR	*20*	*-3.041843*	*.9272325*	logGR	*20*	*-2.866739*	*.8591668*
logHI	*20*	*-2.193845*	*.1516878*	logHI	*20*	*-1.989697*	*.2753198*
logIPL_ini	*20*	*1.985005*	*0*	logIPL_ini	*20*	*3.359397*	*0*
logCF	*20*	*-1.108149*	*.2165601*	logCF	*20*	*-1.504084*	*.1668582*
logGOV	*20*	*-1.411255*	*.3854467*	logGOV	*20*	*-2.206264*	*.1680297*
logRWP	*20*	*-2.327823*	*.1278897*	logRWP	*20*	*-3.697381*	*.3052446*

Guangxi				*Guizhou*			
Variable	*Obs*	*Mean*	*Std. Dev.*	*Variable*	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.0938638*	*.0478445*	growthIPC	*19*	*.1188765*	*.0404266*
growthER	*19*	*.0038198*	*.0494808*	growthER	*19*	*.0050549*	*.0671894*
growthWAS	*19*	*.0034502*	*.0274694*	growthWAS	*19*	*.0031192*	*.0423736*
Landlocked	*20*	*0*	*0*	Landlocked	*20*	*1*	*0*
logIMEX	*20*	*-2.376259*	*.4662897*	logIMEX	*20*	*-3.049237*	*.3123764*
logGR	*20*	*-3.321645*	*1.059153*	logGR	*20*	*-3.204257*	*.8741545*
logHI	*20*	*-2.352637*	*.2299689*	logHI	*20*	*-2.680562*	*.185787*
logIPL_ini	*20*	*2.37655*	*0*	logIPL_ini	*20*	*1.827179*	*0*
logCF	*20*	*-.9932423*	*.4612953*	logCF	*20*	*-.961043*	*.2054371*
logGOV	*20*	*-1.822977*	*.3022866*	logGOV	*20*	*-1.339832*	*.3455393*
logRWP	*20*	*-2.777948*	*.2213688*	logRWP	*20*	*-2.946479*	*.175765*

Hainan

Variable	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.0811046*	*.0292424*
growthER	*19*	*.007507*	*.0330305*
growthWAS	*19*	*.0087623*	*.0162601*
Landlocked	*20*	*0*	*0*
logIMEX	*20*	*-1.505004*	*.3131022*
logGR	*20*	*-2.920755*	*.8314614*
logHI	*20*	*-2.034319*	*.2036903*
logIPL_ini	*20*	*2.885968*	*0*
logCF	*20*	*-1.013918*	*.2513399*
logGOV	*20*	*-1.660478*	*.4069528*
logRWP	*20*	*-3.189992*	*.5372768*

Hebei

Variable	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.0803838*	*.034657*
growthER	*19*	*.0025016*	*.0188771*
growthWAS	*19*	*.0035136*	*.0158344*
Landlocked	*20*	*0*	*0*
logIMEX	*20*	*-2.371041*	*.3940021*
logGR	*20*	*-3.059839*	*.8453302*
logHI	*20*	*-2.17843*	*.1369069*
logIPL_ini	*20*	*2.774949*	*0*
logCF	*20*	*-1.021066*	*.1834132*
logGOV	*20*	*-2.23203*	*.3085404*
logRWP	*20*	*-2.660435*	*.1263819*

Heilongjiang

Variable	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.0695081*	*.033554*
growthER	*19*	*.009633*	*.0329942*
growthWAS	*19*	*.0039203*	*.01451*
Landlocked	*20*	*1*	*0*
logIMEX	*20*	*-2.318932*	*.5701408*
logGR	*20*	*-2.68394*	*.7845413*
logHI	*20*	*-1.971967*	*.1008846*
logIPL_ini	*20*	*3.149512*	*0*
logCF	*20*	*-1.253388*	*.4118728*
logGOV	*20*	*-1.839878*	*.3423728*
logRWP	*20*	*-1.905389*	*.0462833*

Henan

Variable	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.0959462*	*.0435872*
growthER	*19*	*.0144337*	*.0312936*
growthWAS	*19*	*.0033772*	*.0170219*
Landlocked	*20*	*1*	*0*
logIMEX	*20*	*-3.014726*	*.6245828*
logGR	*20*	*-3.121989*	*.8562151*
logHI	*20*	*-2.187232*	*.2039237*
logIPL_ini	*20*	*2.485926*	*0*
logCF	*20*	*-.89547*	*.3496948*
logGOV	*20*	*-2.157036*	*.3114454*
logRWP	*20*	*-3.159117*	*.1721306*

Hubei				*Hunan*			
Variable	*Obs*	*Mean*	*Std. Dev.*	*Variable*	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.1057993*	*.0280694*	growthIPC	*19*	*.100905*	*.0348196*
growthER	*19*	*.0004721*	*.0294398*	growthER	*19*	*.0013069*	*.0269316*
growthWAS	*19*	*.0061645*	*.0374675*	growthWAS	*19*	*.0028353*	*.0137603*
Landlocked	*20*	*1*	*0*	Landlocked	*20*	*1*	*0*
logIMEX	*20*	*-2.544428*	*.3424672*	logIMEX	*20*	*-2.946362*	*.2982475*
logGR	*20*	*-2.702307*	*.8722874*	logGR	*20*	*-2.968322*	*.8719802*
logHI	*20*	*-1.952238*	*.2009411*	logHI	*20*	*-2.044729*	*.1867151*
logIPL_ini	*20*	*2.459414*	*0*	logIPL_ini	*20*	*2.4051*	*0*
logCF	*20*	*-1.007412*	*.1667834*	logCF	*20*	*-1.245693*	*.4111218*
logGOV	*20*	*-2.043548*	*.2742511*	logGOV	*20*	*-2.007666*	*.2859355*
logRWP	*20*	*-3.045725*	*.2344563*	logRWP	*20*	*-3.038698*	*.1879423*

Inner Mongolia				*Jiangsu*			
Variable	*Obs*	*Mean*	*Std. Dev.*	*Variable*	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.1254174*	*.0668294*	growthIPC	*19*	*.0986726*	*.0274758*
growthER	*19*	*.0090902*	*.039355*	growthER	*19*	*-.0048942*	*.0161008*
growthWAS	*19*	*.0053772*	*.0142775*	growthWAS	*19*	*.0033725*	*.0146844*
Landlocked	*20*	*1*	*0*	Landlocked	*20*	*0*	*0*
logIMEX	*20*	*-2.806442*	*.2247298*	logIMEX	*20*	*-.7234058*	*.5528926*
logGR	*20*	*-2.630791*	*.8362162*	logGR	*20*	*-2.687777*	*.9168732*
logHI	*20*	*-1.977882*	*.1095753*	logHI	*20*	*-1.986218*	*.1459107*
logIPL_ini	*20*	*2.714254*	*0*	logIPL_ini	*20*	*3.043507*	*0*
logCF	*20*	*-.7594988*	*.3963182*	logCF	*20*	*-1.070535*	*.0718229*
logGOV	*20*	*-1.725737*	*.1889513*	logGOV	*20*	*-2.394357*	*.3089596*
logRWP	*20*	*-1.213068*	*.2195714*	logRWP	*20*	*-3.940277*	*.4009048*

Jiangxi				*Jilin*			
Variable	*Obs*	*Mean*	*Std. Dev.*	*Variable*	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.1001037*	*.0284115*	growthIPC	*19*	*.0959678*	*.0343109*
growthER	*19*	*.0028047*	*.0244822*	growthER	*19*	*.0033911*	*.0355221*
growthWAS	*19*	*.0034746*	*.0211207*	growthWAS	*19*	*.003178*	*.0166051*
Landlocked	*20*	*1*	*0*	Landlocked	*20*	*1*	*0*
logIMEX	*20*	*-2.508888*	*.6360914*	logIMEX	*20*	*-2.251834*	*.2907744*
logGR	*20*	*-3.055178*	*.9427553*	logGR	*20*	*-2.57511*	*.7316443*
logHI	*20*	*-2.129855*	*.2800156*	logHI	*20*	*-1.834843*	*.0862913*
logIPL_ini	*20*	*2.32773*	*0*	logIPL_ini	*20*	*2.79857*	*0*
logCF	*20*	*-1.186641*	*.2579556*	logCF	*20*	*-.9645849*	*.4962792*
logGOV	*20*	*-1.862915*	*.3341588*	logGOV	*20*	*-1.791615*	*.2217809*
logRWP	*20*	*-2.811688*	*.1356042*	logRWP	*20*	*-1.953447*	*.0932685*

Liaoning				*Ningxia*			
Variable	*Obs*	*Mean*	*Std. Dev.*	*Variable*	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.0874774*	*.0366164*	growthIPC	*19*	*.1032637*	*.0409371*
growthER	*19*	*.0033572*	*.0341821*	growthER	*19*	*.0014719*	*.0231456*
growthWAS	*19*	*.0030194*	*.0161935*	growthWAS	*19*	*.0063125*	*.0163032*
Landlocked	*20*	*0*	*0*	Landlocked	*20*	*1*	*0*
logIMEX	*20*	*-1.330634*	*.2032413*	logIMEX	*20*	*-2.513142*	*.2907736*
logGR	*20*	*-2.327055*	*.8068706*	logGR	*20*	*-2.705226*	*.8278445*
logHI	*20*	*-2.011553*	*.1119142*	logHI	*20*	*-2.186197*	*.1240286*
logIPL_ini	*20*	*3.170604*	*0*	logIPL_ini	*20*	*2.539672*	*0*
logCF	*20*	*-1.223561*	*.501655*	logCF	*20*	*-.5500654*	*.3471867*
logGOV	*20*	*-1.956922*	*.2225055*	logGOV	*20*	*-1.339325*	*.2942691*
logRWP	*20*	*-2.309346*	*.1065659*	logRWP	*20*	*-1.866602*	*.1714003*

Qinghai

Variable	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.1015292*	*.0360106*
growthER	*19*	*-.004729*	*.0202406*
growthWAS	*19*	*.0051585*	*.0165504*
Landlocked	*20*	*1*	*0*
logIMEX	*20*	*-3.166259*	*.2757516*
logGR	*20*	*-2.848946*	*.8710666*
logHI	*20*	*-2.371087*	*.1799226*
logIPL_ini	*20*	*2.362017*	*0*
logCF	*20*	*-.5707502*	*.3315463*
logGOV	*20*	*-1.035449*	*.4118874*
logRWP	*20*	*-1.319986*	*.2288297*

Shan'xi

Variable	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.0874063*	*.0582698*
growthER	*19*	*-.0019896*	*.0374431*
growthWAS	*19*	*.0083844*	*.0339721*
Landlocked	*20*	*1*	*0*
logIMEX	*20*	*-2.630294*	*.3494008*
logGR	*20*	*-2.760291*	*.8275651*
logHI	*20*	*-2.028903*	*.2090137*
logIPL_ini	*20*	*2.620486*	*0*
logCF	*20*	*-1.041072*	*.1535113*
logGOV	*20*	*-.9429156*	*.2262016*
logRWP	*20*	*-2.297195*	*.172962*

Shandong

Variable	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.0934753*	*.0337239*
growthER	*19*	*.0036626*	*.0120278*
growthWAS	*19*	*.0026457*	*.0130783*
Landlocked	*20*	*0*	*0*
logIMEX	*20*	*-1.447792*	*.3525797*
logGR	*20*	*-2.959296*	*.9779706*
logHI	*20*	*-2.12357*	*.2138004*
logIPL_ini	*20*	*2.847878*	*0*
logCF	*20*	*-1.164965*	*.1787705*
logGOV	*20*	*-2.518494*	*.1284454*
logRWP	*20*	*-5.632974*	*.2501492*

Shanghai

Variable	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.0571392*	*.0349209*
growthER	*19*	*-.0038672*	*.0881255*
growthWAS	*19*	*.005633*	*.0578943*
Landlocked	*20*	*0*	*0*
logIMEX	*20*	*-.0148602*	*.4616476*
logGR	*20*	*-1.708759*	*.6985609*
logHI	*20*	*-1.518356*	*.1318125*
logIPL_ini	*20*	*3.975143*	*0*
logCF	*20*	*-.9284378*	*.2926763*
logGOV	*20*	*-2.56506*	*.4357244*
logRWP	*20*	*-1.810226*	*.0869917*

Shanxi				*Sichuan*			
Variable	*Obs*	*Mean*	*Std. Dev.*	*Variable*	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.1156848*	*.0408892*	growthIPC	*19*	*.1014589*	*.0293462*
growthER	*19*	*-.0025452*	*.0235214*	growthER	*19*	*.0030841*	*.038619*
growthWAS	*19*	*.0074935*	*.0176053*	growthWAS	*19*	*.0030271*	*.0397459*
Landlocked	*20*	*1*	*0*	Landlocked	*20*	*1*	*0*
logIMEX	*20*	*-2.595816*	*.1861734*	logIMEX	*20*	*-2.555995*	*.59038*
logGR	*20*	*-2.660285*	*.8772787*	logGR	*20*	*-3.059905*	*.9130132*
logHI	*20*	*-1.981173*	*.1914898*	logHI	*20*	*-2.342389*	*.1835724*
logIPL_ini	*20*	*2.350982*	*0*	logIPL_ini	*20*	*2.25262*	*0*
logCF	*20*	*-.948217*	*.2704526*	logCF	*20*	*-1.112991*	*.1467613*
logGOV	*20*	*-1.749117*	*.271329*	logGOV	*20*	*-1.832425*	*.3830021*
logRWP	*20*	*-2.415422*	*.178555*	logRWP	*20*	*-3.283329*	*.1698977*

Tianjin				*Tibet*			
Variable	*Obs*	*Mean*	*Std. Dev.*	*Variable*	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.0908391*	*.0391485*	growthIPC	*19*	*.1065394*	*.0324392*
growthER	*19*	*-.0021633*	*.036106*	growthER	*19*	*.0140589*	*.0409072*
growthWAS	*19*	*.0067945*	*.0220081*	growthWAS	*19*	*.0087913*	*.0316533*
Landlocked	*20*	*0*	*0*	Landlocked	*20*	*1*	*0*
logIMEX	*20*	*-.4947323*	*.2414765*	logIMEX	*20*	*-2.406858*	*.6095983*
logGR	*20*	*-1.976909*	*.7924744*	logGR	*20*	*-4.498389*	*1.485518*
logHI	*20*	*-1.603787*	*.1470627*	logHI	*20*	*-3.724727*	*.7135452*
logIPL_ini	*20*	*3.514166*	*0*	logIPL_ini	*20*	*2.135626*	*0*
logCF	*20*	*-.8196247*	*.2784567*	logCF	*20*	*-.8450125*	*.7588211*
logGOV	*20*	*-2.034688*	*.2113481*	logGOV	*20*	*-.2023354*	*.3579249*
logRWP	*20*	*-2.738293*	*.072401*	logRWP	*10*	*-1.669456*	*.1765413*

Xinjiang

Variable	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.079696*	*.043468*
growthER	*19*	*.0088319*	*.0496402*
growthWAS	*19*	*.004555*	*.0292391*
Landlocked	*20*	*1*	*0*
logIMEX	*20*	*-1.933933*	*.553975*
logGR	*20*	*-2.359148*	*.7030071*
logHI	*20*	*-2.154649*	*.1143903*
logIPL_ini	*20*	*3.005155*	*0*
logCF	*20*	*-.8119353*	*.2854381*
logGOV	*20*	*-1.496557*	*.3959805*
logRWP	*20*	*-1.879729*	*.2648764*

Yunan

Variable	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.0811022*	*.0308869*
growthER	*19*	*.0011948*	*.0209077*
growthWAS	*19*	*.0064634*	*.0211542*
Landlocked	*20*	*1*	*0*
logIMEX	*20*	*-2.469298*	*.4283619*
logGR	*20*	*-3.423583*	*.9953817*
logHI	*20*	*-2.723974*	*.2441826*
logIPL_ini	*20*	*2.36471*	*0*
logCF	*20*	*-.9164682*	*.4465995*
logGOV	*20*	*-1.385522*	*.2390839*
logRWP	*20*	*-2.963532*	*.0994623*

Zhejiang

Variable	*Obs*	*Mean*	*Std. Dev.*
growthIPC	*19*	*.0838435*	*.0307152*
growthER	*19*	*.0023291*	*.0306669*
growthWAS	*19*	*.0040552*	*.0199087*
Landlocked	*20*	*0*	*0*
logIMEX	*20*	*-.9277243*	*.533433*
logGR	*20*	*-2.682354*	*.9899597*
logHI	*20*	*-2.150476*	*.1484857*
logIPL_ini	*20*	*3.196931*	*0*
logCF	*20*	*-1.099053*	*.0886376*
logGOV	*20*	*-2.384519*	*.3108701*
logRWP	*20*	*-3.582797*	*.2379482*