Master Graduation Thesis

The Effects of Trade Exposure and Demographic Dividend on the Economic Growth —Empirical Evidence from China

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Summary and Abstract of the Paper

A hot topic which is debated by many scholars is the relationship of trade and economic growth with theoretical models and empirical researches. Basing on these theoretical literatures, in the following 25 years, scholars found various empirical evidences to investigate the effects of the trade openness on the economic growth rate. However these results are not consistent. Different scholars use various data and models to show the abundant and non-consistent results.

Although the relationship between trade and economic growth has been discussed in detail in the literature on endogenous growth, few studies explore the relationship between trade and economic growth, considering the demographic dividend. Or they just use index of the labor rate or dependency rate, instead of taking into account the quality effect of demographic dividend. Even, regression results do not satisfy the consistency. Among these studies, the interaction effects of trade and demographic dividend are also neglected. If the coefficient is significantly positive, trade exposure and demographic dividend have the moderating and complementary effects, while if the coefficient is significantly negative, trade exposure and demographic dividend have the substitution effect.

Basing on the existing literatures, ignoring the demographic dividend will lead to the endogenous problems, and serious endogenous problem can lead to bias in the regression model. In order to precisely explore the relationship between trade exposure and economic growth rate, demographic factors will be added into the empirical model.

In this paper, the panel data from 31 provinces from 1997 to 2015 is collected to analyze the effects of trade exposure and demographic dividend on the economic growth rate. The results show that trade exposure is significantly and positively related to the economic growth. Demographic dividend, its labor quantity and labor quality are all beneficial for the economic growth. Trade openness and demographic dividend have the substituting effects. Besides, there exist the invert "U" shape relationships for trade openness, demographic divined and economic growth rate.

Higher internal trade openness can also accelerate the economic growth. Internal trade is one method for allocating resources efficiently. Through this method, all production factors all over China can flow to regions in need, which in turn improves the regional economic growth. A good example, during the period of 1997-2005, the North-Eastern area (Hei Longjiang Province, Ji Lin Province and Liao Ning Province) was the center of producing steel, and the West-Northern are (Shanxi Province and so forth) was abundant for coals, which are the fuels for steel production. By internal trade, both areas got the higher economic growth rate in that period. By contrast, the lower internal trade openness may be harmful for the economic growth. Therefore, in order to promote the comprehensive economic growth, reducing the restriction of trade flow, modifying the "Hukou" for better development, promoting the traffic access and so forth, are good for the internal flow to drive the regional economic growth.

Demographic dividend is significantly related to the economic growth. First, the demographic dividend increases the supply of labor, increases savings and creates capital, thereby providing the supply side with the necessary inputs for economic production and promoting economic growth. Secondly, the demographic dividend has also increased the demand for consumption, investment, import and export, thereby stimulating the expansion of the scale of production and the expansion of the economy on the demand side.

Labor quantity structure is the main factor to promote the economic growth rate, which is coincided with the majority of the theoretical and empirical researches for

economic growth. In reality, immigration and population policies encouraging more births, will improve the local labor rate, which leads to the positive effects on economic growth. Japan and Canada are open to working population in their countries to reconcile or neutralize the negative effects of the aging problems.

Labor quality is significantly related to economic growth. The effect of labor quality is related to the productivity of labor. More education means more productivity on a certain extent. In fact, increasing the productivity of labor is an efficient method to ameliorate the economic growth. This is to say, entering the aging population at first does not mean the demographic dividend will disappear. Many Chinese scholars try to find the Lewis turning point.

The regression results display the significantly negative coefficient for the "open×open" (the quadratic item of trade openness) and "D× D" (the quadratic item of demographic dividend). At the first, economic growth is increasing as the increasing trade openness and demographic dividend. Then, the effects will slow down and decrease like Japan, USA and Canada. There are 2 reasons for the phenomena: ① The increasing basement for GDP calculation makes the growth rate decrease.② the marginal diminishing returns for trade openness

At the same time, empirical tests also show that in promoting inter-provincial growth, trade openness and demographic dividend integration are substitutes for each other, indicating that different provinces can selectively utilize the trade and population policies to develop regional economy based on their own actual conditions.

Many scholars discussed the substitution effects on the topic of trade. Professors from Cornell University, Vivek Suri and Duane Chapman showed that the trade substitutes for industrialization on the economic growth (1998). When analyzing the effects of domestic market and international market on economic growth, Chinese scholars Sheng Bin and Maoqilin analyze the substitution effects for the two markets in the economic growth (2011). After 1992, the policy of import and export

requirements was relaxed, and foreign investments were allowed, wholly or partially, to target the domestic market. This is one of the reasons why a substitution exists between FDI and trade on the GDP growth rate (Liu, X., Burridge, P., & Sinclair, P. J. 2002).

Under this structure, trade openness stands for the foreign market to a certain extent. The mode demographic dividend- higher labor quantity, higher consumption; higher labor quality, higher productivity, are beneficial for the domestic market. And the higher trade openness, higher economic benefits from trading, can promote the economic growth.

Among different regions in China, the effects of trade openness, demographic dividend and the decomposed effects of demographic dividend- labor quantity and labor quality have different effects on economic growth rate. Trade openness contributes the biggest part for east areas. East area is the center of trade openness and open-policy, which improve the Eastern area economic booming development. Demographic dividend is important in all areas. However, the effect of demographic dividend is stronger in West and East.

For the labor quantity, due to the depletion of resources, transformation of industrial structures, and political reasons, the North-East area is experiencing the net outflow of labor. It leads to the shortfall for labor in production and consumption markets, which in turn has the negative effects on North-Eastern economic growth rate. Comparing to all other three regions, labor quantity has the least important effect in Middle area. Middle area provides the majority of labor force for all over China all the time. The labor supply is over abundant in Middle. The effect of labor quantity has limited effect on local economic growth rate.

For the labor quality, the effect is strongest in West. Comparing to other regions, the labor quality in West is lowest. Improving the labor quality will increase the local economic growth rate. As a result, improvement in local education and professional training in West has the essential influence on western economic growth rate.

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Abstract

This paper intends to explore the effects of trade exposure and demographic dividend on the economic growth. The explanatory variables -GDP growth rate is analyzed specifically in the empirical and economic growth model. The analysis from 31 provinces in China from 1997-2017 shows that trade exposure is significantly and positively related to the economic growth. Demographic dividend, its decomposed effects - labor quantity and labor quality are all beneficial for the economic growth. Trade openness and demographic dividend have the substituting effects. Besides, there exist the invert "U" shape relationships for trade openness, demographic divined and economic growth rate.

Key words:
Trade exposure, demographic dividend, economic growth, instrumental variable

The Effects of Trade Exposure and Demographic Dividend on the Economic Growth- Empirical Evidence from China

1. Introduction

A hot topic which is debated by many scholars is the relationship of trade and economic growth with theoretical models and empirical researches. The most famous economic growth model is Solow growth accounting model developed by Solow (1957) to describe the economic growth model. Later, N. Gregory Mankiw and David Romer further adjusted the model and provided the empirical evidence for the Solow Growth model (1992).

Basing on these theoretical literatures, in the following 25 years, scholars found various empirical evidences to investigate the effects of the trade openness on the economic growth rate. However these results are not consistent. Different scholars use various data and models to show the abundant and non-consistent results.

Some scholars find the significant and positive relationship between trade and economic growth. Sachs and Warner(1995), Edwards(1998), Frankel and Romer(1999), Chengxiang, S (1999), Shen, Z (2001), Merale atl(2015), also confirm that trade can promote economic growth. Some scholars find no significant results, like Vamvakidis (2002); Ulaşan (2015) and Fenira (2015). Even some scholars find the negative relationship, like Rigobon and Rodrik (2005). The mixed and inconclusive results might be attributed to the omission of the role of labor quality and FDI in the trade-growth model (Yaya Keho, 2017), which one of them is the effect of demographic dividend. However, current researches have not investigated the decomposed effect-labor quality deeply.

According to the theoretical literatures and empirical evidences, when investigating the relationship between trade and economic growth, the majority of the scholars neglected the effects of demographic dividend. In the existing literature, there have been many articles discussing the relationship between population and economic

growth. To our knowledge, Leff (1969), in a seminal paper, discussed the impact of demographic dividends on savings rates. Since then, a large number of studies have begun to look at how the demographic structure affects economic growth from an international comparative perspective. For example, Bloom and Williamson (1998) found that population transition plays a crucial role in the "East Asian miracle" that began in the 1970s. Specifically, more than a third of the economic growth in East Asian countries should be attributed to its population dividend. In stark contrast, the economic failures in African countries are largely due to the sluggish population transition (Bloom, Canning and Sevilla, 2003; Bloom and Sachs, 1998).

Although the relationship between trade and economic growth has been discussed in detail in the literature on endogenous growth, few studies explore the relationship between trade and economic growth, considering the demographic dividend. Or they just use index of the labor rate or dependency rate, instead of taking into account the quality effect of demographic dividend. Even, regression results does not satisfy the consistency. Among these studies, the interaction effects of trade and demographic dividend are also neglected. If the coefficient is significantly positive, trade exposure and demographic dividend have the moderating and complementary effects, while if the coefficient is significantly negative, trade exposure and demographic dividend have the substitution effect.

Basing on the existing literatures, ignoring the demographic dividend will lead to the endogenous problems, and serious endogenous problem can lead to bias in the regression model. In order to precisely explore the relationship between trade exposure and economic growth rate, demographic factors will be added into the empirical model.

In this paper, the panel data from 31 provinces from 1997 to 2015 is collected to analyze the effects of trade exposure and demographic dividend on the economic growth rate.

The rest of the paper is structured as following. The second section is about the literature view on this topic. The third section is related to the empirical construction, data and methodology. The forth section represents data results. The fifth section is

about the robustness test on the model. And the sixth section shows the conclusion and discussions.

This paper will examine the impact of the trade exposure and demographic dividend on economic growth based on the new measure of trade exposure and decomposed demographic dividend. This paper tries to make some contributions in the following aspects:

(1) In the past, the researchers only consider the trade openness (export and import) in the study of economic growth. As an improvement, this paper expands the measurement of trade into the internal (domestic) trade.

(2) Past researches pay little attention on the interaction of demographic dividend and trade openness on the relationship between trade and economic growth. And this paper will fill in the gap in this area.

(3) Chinese and international scholars seldom consider the effects of trade on the economic growth, considering the demographic dividend and regional differences. This paper will explore these relationships.

(4) Past researches just use the general linear regression to measure the effects of trade exposure and demographic dividend. However, there may be the invert "U" shape relationships for trade openness, demographic dividend and economic growth rate here. This paper will test the invert "U" shape relationships.

(5) In order to ensure the reliability of the conclusion, this research tests the robustness from different perspectives and compares the time-space differences of inter-provincial economic growth influenced by the trade exposure and demographic dividend from the sub-periods and sub-regions.

(6) Based on the regression results, inter-provincial economic growth has been structural factor decomposition, which has been the effects of demographic dividend – the labor quantity and labor quality on the economic growth.

2. Literature Review

2.1 Trade and Economic Growth

A hot topic which is debated by many scholars is the relationship of trade and economic growth with theoretical models and empirical researches. Solow growth accounting model developed by Solow (1957) is to describe the economic growth model. Later, N. Gregory Mankiw and David Romer further adjusted the model and provided the empirical evidence for the Solow Growth model (1992).

Basing on these theoretical literatures, in the following 25 years, scholars found various empirical evidences to investigate the effects of the trade openness on the economic growth rate. However these results are not consistent. Different scholars use various data and models to show the abundant and non-consistent results. The evidence from this literature is mixed and conflicting across methodologies and countries.

Papers by Bahmani-Oskooee and Niroomand (1999), Frankel and Romer (1999), Karras (2003), Yanikkaya (2003), Dollar and Kraay (2004), Freund and Bolaky (2008), Marelli and Signorelli (2011), Nowbutsing (2014) and Zarra-Nezhad, Hosseinpour, and Arman (2014) provide the evidence for the positive impact of trade on economic growth. Calderon et al. (2004) prove that openness has positive effects on growth in high income countries.

In contrast, Vamvakidis (2002) and Ulaşan (2015) find no support for the trade-led growth hypothesis. Even, trade has significant and negative effects on economic growth (Rigobon, Rodrik; 2005). Rassekh(2006) investigates the trade-growth evidence for 150 countries and finds that the effects of the trade on economic growth are stronger in lower income countries while the effects are weaker in higher income economies. And Fenira (2015) finds the fact that there is a weak relationship between trade openness and economic growth. Rodriguez and Rodrik (2001) reinvestigate critically the conclusion of previous cross-country studies and found the results that openness enhances growth are not robust. Therefore, for the

specified conditions in China, the deep research has the empirical and essential meanings.

Bin, S and Qilin, M (2011) based on provincial panel data from 1985 to 2008 in 30 provinces in China, finds that opening to the outside world is significant and positive for China's economic and interregional opening obviously impede the rapid economic growth of our country. Sakyi, Villaverde, and Maza (2015) provide evidence of positive bi-directional causal relationship between trade and economic growth for a sample of 115 developing countries. Were (2015) finds that trade exerts a positive effect on economic growth rate in developed and developing countries, but its effect is not significant for least developed countries like African countries.

2.2 Demographic Dividend and Economic Growth

The relationship between trade openness and economic growth has been extensively investigated yielding to mixed and inconclusive results. This might be attributed to the omission of the role of labor and population structure in the trade-growth model (Yaya.K, 2017), which are the effects of demographic dividend. Current researches have not investigated. Therefore, this paper will further explore the trade exposure on the economic development, considering the demographic dividend.

Leff (1969), in a seminal paper discussed the impact of demographic dividend on savings rates. Higgins (1998) considered the dynamic correlation between savings rates and current account surpluses and further examined the effect of demographic structure on the current account position. Since then, a large number of studies have begun to look at how the demographic structure affects economic growth from an international comparative perspective.

For example, Bloom and Williamson (1998) found that population transition plays a crucial role in the "East Asian miracle" that began in the 1970s. Specifically, more than a third of the economic growth in East Asian countries came from its population dividend. In stark contrast, the economic failures in African countries are largely due to the sluggish population transition (Bloom, Canning and Sevilla, 2002; Bloom and Sachs, 1998). Although the relationship between trade and economic

growth has been discussed in detail in the literature on endogenous growth, few studies explore the relationship between trade and economic growth, considering the demographic dividend.

2.3 Trade and Demographic Dividend in Economic Growth Model

The majority of scholars just use index of the labor rate or dependency rate, instead of taking into account the quality effect of demographic dividend. Among these studies, the interaction effects of trade and demographic dividend are also neglected. If the coefficient is significantly positive, trade exposure and demographic dividend have the moderating and complementary effects, while if the coefficient is significantly negative, trade exposure and demographic dividend have the substitution effect.

Considering the mixed results of trade and economic growth, without taking the demographic dividend into account, this paper will dig more to explore the effects of trade exposure and demographic dividend on the economic growth by using the empirical evidence from China.

3. Model, Data and Methodology

3.1 Specification of the Model

Considering the conventional growth literature, this paper specifies a growth equation introduced first by Solow (1956) and also the augmented version used by Mankiw et al. (1992). Economic growth (apprehended by the GDP growth rate) and the determinants of growth which vary across time and countries are represented in the equation below:

$$In(EG)_{tc} = \beta_0 + +\beta_1 trade_{tc} + \beta_2 DD_{tc} + \beta_3 trade_{tc} \times \beta_3 DD_{tc} + \beta_t Z_{tc} + \varphi_c + \omega_t + \vartheta_{it}$$

Where, t represents the year, c represents the province or municipality. Explanatory variables ln(EG) is for the economic growth, explanatory variables trade stands for the trade exposure. DD stands for demographic dividend. The control

variable Z stands for the other control variables. φ_c means the all unobserved factors which are not changed with the time. ω_t explains all unobserved factors which are not changed with the regions. ϑ_{it} is the error term.

Explained variable- economic growth is measured differently in reality. Solow (1956), Mankiw et al (1992) and many scholars use the GDP per capita to evaluate the economic growth. At the same time, some scholars use the GDP growth rate to measure the economic growth. This paper will use both GDP growth rate as the explained variable. GDP per capita growth rate will be used in the regression results as part of robust tests.

Explanatory variable- trade openness is mainly measured by the following function: $\text{trade openess} = \frac{import\ amouts+export\ amounts}{GDP}$.China is so big that the internal flow of trade can accelerate the efficiency of resources allocation. Comparing to previous research, this paper also consider the internal flow of trade. When researching the internal flow of trade in China, scholars choose the railway freight volume to measure the internal flow of trade in different regions .All in all, the specific trade exposure includes the trade openness ($\text{trade openess} = \frac{import\ amouts+export\ amounts}{GDP}$), import trade openness ($\text{import trade openess} = \frac{import\ amouts}{GDP}$), export trade openness ($\text{export trade openess} = \frac{emport\ amouts}{GDP}$) and internal trade openness ($\text{internal trade openess} = \frac{import\ amouts}{GDP}$).

The Slow-Swan growth model can be transferred to the function of demographic dividend (Zhao et al., 2012). Through this method, the effect of demographic dividend on economic growth can be split into two effects, including the effect of labor quantity structure (ℓ), and the labor quality effect (h) (Zhao et al., 2012). The labor quantity variable is the rate of the labor force to the sum of young and the old. The labor quality is the average education years

($\text{average years of education} = \frac{\text{(labor with primary school education}\times 6+\text{ junior }\times 12+\text{Senior }\times 16+\text{above senior}\times 16}{population\ above\ 6\ years\ old}$).

Some control variables are added into the empirical model. By referring the

recent 10 years studies in the economic growth topic, some control variables are added into the model. These control variables can be seen in the following table.

Control variables	**Variable Name**	**Equation**	**Reference**
government	Government spending on administration	Government spending/ GDP	Alexiou C (2009), Checherita-Westphal, C., & Rother, P. (2012) and so on
Traffic	Traffic convenience	(rail mileage + inland waterway mileage + grade highway mileage) / land area	Gyimah-Brempong, K. (2002); Brueckner, J. K. (2003); Kopits, E., & Cropper, M. (2005); Ameratunga, S.etal(2006)
Innovation	Innovation added	$number\ of\ patents_t - patents_{t-1}$	David, P. A. (1975); Wong, P. K., Ho, Y. P., & Autio, E. (2005).
FDI	Foreign investment penetration rate	FDI/ GDP	Carkovic, M. V., & Levine, R. (2002)

Jiuli, H and Kunwang,L and Ou,X, scholars from Nankai University, discussed the instrumental variable- foreign market access to explore the effects of export openness and regional market size on the economic growth (2006). Later, Bin S and Qilin Mao, by using the IV-GMM method with the same instrumental variable, found there were more strongly relationship between trade openness and economic growth （2011）. In order to precisely evaluate the effects of trade exposure on the regional economic growth, considering demographic dividend, the following part will include the instrumental variable (foreign market access, fma).

All variables are collected from the China Statistical Yearbook, China State Council Development Research Center, and People's Republic of China Central People's Government official website and Google Earth.

3.2 Descriptive Statistics

According to the official standards for various regions, East includes the Beijing,

Shanghai, Tianjin, Shandong, Jiangsu, Hebei, Zhejiang,Guaangdong, Hainan and Fujian areas. The Middle is made up with Shanxi, Anhui, Jiangxi, Henan, Hubei and Hunan areas. The West is from the combination of Sichuan, Chongqing, Guizhou, Yunnan, Xizang, Shanxi, Qinghai, Ningxia, Xinjiang, Guangxi and Neimenggu. The Northeast comes from the three provinces- Jilin, Heilongjiang and Liaoning provinces. All in all, the GDP growth rate in East is highest, then the Middle and finally the west. For the specific conditions for different years in various regions, the appendix can be referred for more details.

The descriptive statistics for major variables are shown in the Table 1 as following:

Table 1: Descriptive statistics of major variables

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP growth rate	589	0.136	0.065	-0.093	0.497
GDP	589	9961.733	11775.51	76.98	72812.55
GDP per capita growth rate	589	0.126	0.066	-0.104	0.445
GDP per capita	589	23957.43	21097.4	2215	107960.1
Industrial Production Growth rate	434	0.180	0.207	-0.663	0.779
Industrial Production	465	9532.840	15427.48	11.76	107680.7
Demographic Dividend	589	0.718	0.041	0.608	0.838
Youth	496	0.192	0.052	0.076	0.351
Old	496	0.086	0.020	0.040	0.164
Labor quantity	589	2.634	0.577	1.549	5.189
Labor quality	496	7.960	1.338	2.948	12.028
Trade openness	589	0.302	0.385	0.032	1.681
Import openness	589	0.146	0.230	0.004	1.344
Export openness	589	0.156	0.183	0.015	0.887
Internal trade	589	8.425	1.605	0	11.244
Government	589	6.783	1.216	3.515	9.459
Traffic	551	0.660	0.501	0.019	2.514
FDI openness	589	0.025	0.025	0.000	0.168
Innovation	589	6.194	2.899	0	11.730

As it can be seen from Table 1, the average GDP growth rate is 0.136, while the minim GDP growth rate is negative. For the trade openness, GDP growth rate, labor quantity and labor quality exist the big differences.

Table 2: The correlation coefficient matrix of the main variables

	GDP1	GDP2	GDP3	Demographic Dividend	youth	old	Labor quantity	Labor quality	Trade openness	Import openness	Export openness	Internal trade	government	traffic	FDI openness
GDP1	-														
GDP2	0.871*	-													
GDP3	0.718*	0.665*	-												
Demographic Dividend	0.297*	0.261*	0.224*	-											
Youth	-0.318*	-0.282*	-0.268*	-0.936*	-										
Old	0.238*	0.208*	0.257*	0.368*	-0.657*	-									
Labor quantity	0.297*	0.261*	0.224*	0.970*	-0.936*	0.368*	-								
Labor quality	0.322*	0.287*	0.262*	0.776*	-0.796*	0.458*	0.776*	-							
Trade openness	0.147*	0.037	0.143*	0.437*	-0.521*	0.464*	0.437*	0.488*	-						
Import openness	0.125*	0.041	0.119*	0.479*	-0.573*	0.503*	0.479*	0.538*	0.936*	-					
Export openness	0.109	-0.016	0.121*	0.309*	-0.395*	0.410*	0.309*	0.379*	0.927*	0.772*	-				
Internal trade	0.234*	0.265*	0.252*	0.398*	-0.362*	0.141*	0.398*	0.433*	-0.022	0.037	-0.077	-			
Government	0.404*	0.403*	0.339*	0.552*	-0.655*	0.593*	0.552*	0.595*	0.364*	0.403*	0.294*	0.501*			
Traffic	0.215*	0.168*	0.235*	0.284*	-0.473*	0.695*	0.284*	0.543*	0.508*	0.520*	0.495*	0.157*	0.671*	-	
FDI openness	0.016	-0.06	0.032	0.299*	-0.423*	0.499*	0.299*	0.465*	0.650*	0.645*	0.649*	-0.046	0.247*	0.515*	-
Innovation	0.234*	0.200*	0.186*	0.496*	-0.634*	0.659*	0.496*	0.545*	0.486*	0.510*	0.453*	0.324*	0.784*	0.713*	0.422*

Pearson's correlation coefficient * represents the 10% significance level respectively.

For the correlation among all variables, these relationships can be seen from Table2. Demographic dividend (0.297, p<0.1), Old rate (0.238, p<0.1), trade openness (0.147, p<0.1), internal trade (0.234, p<0.1), government spending on administration (0.404, p<0.1), traffic (0.215, p<0.1) and innovation (0.234, p<0.1) are all significantly and positively correlated to the GDP growth rate. For GDP per capita growth rate, demographic dividend (0.261, p<0.1), old rate (0.208, p<0.1), internal trade (0.265, p<0.1), government spending on administration (0.403, p<0.1), traffic (0.168, p<0.1) and innovation (0.200, p<0.1) all have the significantly positive effects.

For the decomposition effects of trade openness (export trade openness and import trade openness) and demographic dividend (labor quantity and labor quality), it displays that import trade openness (0.125, p<0.1), labor quantity (0.297, p<0.1) and labor quality (0.322, p<0.1) exert the positive correlations with GDP growth rate. Further, it shows there are positive and significant correlations between labor quantity (0.261, p<0.1), labor quality (0.287, p<0.1) and GDP per capita growth rate.

4. Empirical results and Analysis

4.1 The regression Results

Table 3: The Benchmark Regression for Trade, Demographic Dividend and Economic Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Accumulated GDP growth rate						GDP per capita growth rate		
	GDP1	GDP1	GDP1	GDP1	GDP1	GDP1	GDP2	GDP2	GDP2
Demographic Dividend	0.239***	0.685***					0.646***		
	(0.106)	(0.190)					(0.208)		
youth			-0.248***	-1.110***				-1.089***	
			(0.085)	(0.185)				(0.201)	
old					0.147**	0.277***			0.309***
					(0.227)	(0.329)			(0.357)
Trade openness	0.908***	0.757***	0.893***	0.682***	0.932***	0.796***	0.504***	0.428***	0.535***
	(0.025)	(0.027)	(0.025)	(0.026)	(0.025)	(0.028)	(0.029)	(0.029)	(0.030)
Internal trade		0.374*		0.392**		0.768***	0.302	0.308	0.685***
		(0.008)		(0.007)		(0.008)	(0.008)	(0.008)	(0.008)
Government		-0.538***		-0.889***		-0.400***	-0.483***	-0.838***	-0.382***

		(0.007)		(0.007)		(0.007)	(0.007)	(0.008)	(0.008)
traffic		0.042		0.087		0.050	0.099	0.144	0.111
		(0.016)		(0.015)		(0.016)	(0.017)	(0.017)	(0.018)
FDI Openness		0.239***		0.205***		0.009	0.236***	0.209***	0.010
		(0.204)		(0.190)		(0.200)	(0.223)	(0.208)	(0.217)
Innovation		0.134**		0.116*		0.116*	0.095	0.078	0.076
		(0.001)		(0.001)		(0.001)	(0.001)	(0.001)	(0.002)
_cons	-0.176**	-0.660***	0.147***	0.518***	0.049**	-0.112**	-0.650***	0.553***	-0.107*
	(0.076)	(0.112)	(0.019)	(0.092)	(0.020)	(0.052)	(0.123)	(0.101)	(0.056)
N	496	464	496	464	496	464	464	464	464
r2	0.103	0.182	0.104	0.221	0.088	0.133	0.126	0.169	0.087
F	26.489	13.595	26.745	17.392	22.216	9.372	8.832	12.457	5.845

Standardized beta coefficients; Standard errors in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

Table 3 displays the benchmark regression results among demographic dividend, trade exposure, all other control variables and economic growth with fixed effects. The (1) stands for the simplest regression result of demographic dividend and trade openness on economic growth. And it shows that the coefficients of demographic dividend and trade openness on GDP growth rate are 0.239 (se=0.106, p<0.01) and 0.908 (se=0.025, p<0.01). Then adding all control variables, (2) shows that the effect of demographic dividend is stronger (0.685, se=0.190, p<0.01), while the effect of trade openness is weaker (0.757, se=0.027, p<0.01). (3) and (4) are to investigate the influence of youth rate without and with all control variables. Column (3) shows the effects of youth rate (-0.248, se=0.085, p<0.01) and trade openness (0.893, se=0.025, p<0.01) on GDP growth rate without all control variables. Column (4) displays the relationship of youth rate (-1.110, se=0.185, p<0.01), trade openness (0.682, se=0.026, p<0.01), internal trade openness (0.392, se=0.007, p<0.01) and GDP growth rate by controlling all other variables. (5) and (6) are to investigate the influence of old rate without and with all control variables. Column (5) shows the effects of old rate (0.147, se=0.227, p<0.01) and trade openness (0.932, se=0.025, p<0.01) on GDP growth rate without all control variables. Column (6) displays the relationship of old rate (0.277, se=0.329, p<0.01), trade openness (0.796, se=0.028, p<0.01), internal trade openness (0.796, se=0.008, p<0.01) and GDP growth rate by controlling all other variables.

Columns (7), (8) and (9) show the regression results for GDP per capita growth rate.

4.2 The Decomposition Regression Results

In order to see the exact the effects of trade exposure on the economic growth, this paper adds the internal trade into the effects of trade exposure. Due to the basic function of trade openness, import trade openness and export trade openness are further added into the model to see their effects on the economic growth. For demographic dividend, considering the current research pays little attention on the labor quality, researching the two separate effects of labor quantity and labor quality on the economic growth is essential.

The decomposition regression results are as follows in Table 4, the first three columns, (1), (2) and (3) show the decomposition effects of labor quantity, labor quality and the combination of the two effects of demographic dividend. Labor quantity and labor quality are all significantly and positively related to the GDP growth rate. The columns (4), (5) and (6) are to explore the regressing relationships among decomposed effects of trade openness- export trade openness and import trade openness. The regression results explicit that import trade openness and import trade openness have the positive effects on GDP growth rate. In order to test whether the regression results are robust, GDP per capita growth rate is used as the independent variable. The results are consistent with the previous.

Table4: The Decomposition Effects among Trade, Demographic Dividend and Economic Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	GDP1	GDP1	GDP1	GDP1	GDP1	GDP1	GDP1	GDP2	GDP2	GDP2
Internal trade	0.436**	0.428**	0.374*	0.465**	0.341*	0.460**	0.333*	0.303	0.288	0.356*
	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
Import openness				0.822***		0.656***				0.442***
				(0.054)		(0.054)				(0.059)
Export openness					0.570***		0.481***		0.246*	
					(0.048)		(0.047)		(0.051)	
Trade openness	0.688***	0.636***	0.620***					0.371**		
	(0.027)	(0.027)	(0.027)					(0.029)		
Labor quantity	0.355***		0.234**			0.236**	0.238**	0.174	0.178	0.173

	(0.012)		(0.013)			(0.013)	(0.013)	(0.014)	(0.015)	(0.014)
Labor quality		0.601***	0.548***			0.533***	0.570***	0.550***	0.566***	0.535***
		(0.004)	(0.004)			(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Demographic dividend				0.694***	0.691***					
				(0.188)	(0.193)					
Government	-0.234*	-0.399***	-0.482***	-0.575***	-0.544***	-0.508***	-0.489***	-0.420***	-0.433***	-0.429***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)
Traffic	0.027	-0.005	-0.008	0.079	0.055	0.027	-0.004	0.051	0.064	0.065
	(0.015)	(0.015)	(0.015)	(0.015)	(0.016)	(0.015)	(0.016)	(0.017)	(0.017)	(0.017)
FDI openness	0.192**	0.078	0.130*	0.258***	0.242***	0.144*	0.130*	0.123	0.127	0.129
	(0.196)	(0.185)	(0.195)	(0.201)	(0.208)	(0.193)	(0.197)	(0.213)	(0.215)	(0.211)
Innovation	0.089	0.148**	0.150**	0.130**	0.146**	0.147**	0.159**	0.111*	0.119*	0.106*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
_cons	-0.095**	-0.160***	-0.166***	-0.691***	-0.649***	-0.699***	-0.703***	-0.157***	-0.183***	-0.178***
	(0.047)	(0.049)	(0.049)	(0.111)	(0.114)	(0.123)	(0.113)	(0.053)	(0.050)	(0.054)
N	551	464	464	464	464	464	464	464	464	464
r2	0.117	0.215	0.223	0.195	0.163	0.228	0.212	0.167	0.161	0.173
F	9.734	16.755	15.287	14.786	11.896	15.802	14.347	10.716	10.255	11.169

Standardized beta coefficients; Standard errors in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

For control variables, government spending on administration has negative effects on GDP growth rate and GDP per capita growth rate. Foreign direct investment penetration rate and innovation have the positive effects on GDP growth rate and GDP per capita growth rate. The old rate is positive related to the economic growth. And government spending on administration in China is significantly negative related to the economic growth.

4.3 The Quadratic & Interaction Items

Table 5: The Quadratic & Interaction Items Among Trade, Demographic Dividend and Economic Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	GDP1	GDP1	GDP1	GDP2	GDP1	GDP2	GDP1	GDP2
Demographic dividend	5.060***	0.654***	4.679***	5.626***	0.938***	0.948***		
	(2.434)	(0.190)	(2.433)	(2.642)	(0.236)	(0.257)		
Trade openness	0.789***	1.697***	1.640***	1.445***	3.814***	4.146***	2.871***	2.790***
	(0.027)	(0.068)	(0.068)	(0.074)	(0.197)	(0.214)	(0.088)	(0.096)
DD*DD	-4.401***		-4.045***	-5.039***				
	(1.692)		(1.690)	(1.835)				
Open*Open		-0.732***	-0.664**	-0.704**				

		(0.035)	(0.035)	(0.038)				
DD*Open					-3.106***	-3.701***		
					(0.264)	(0.287)		
Labor quantity							0.476***	0.470***
							(0.019)	(0.020)
Labor quality							0.778***	0.780***
							(0.006)	(0.006)
Labor quantity*open							-0.475	-0.627*
							(0.020)	(0.022)
Labor quality*open							-1.856***	-1.886***
							(0.010)	(0.011)
Internal trade	0.267	0.392*	0.292	0.197	0.292	0.205	0.265	0.180
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)	(0.008)
Government	-0.544***	-0.548***	-0.552***	-0.499***	-0.667***	-0.637***	-0.669***	-0.633***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)
Traffic	0.081	0.011	0.049	0.113	0.134	0.208	0.080	0.155
	(0.016)	(0.016)	(0.016)	(0.017)	(0.016)	(0.018)	(0.016)	(0.017)
FDI openness	0.262***	0.198**	0.223***	0.223***	0.143	0.121	0.005	-0.015
	(0.204)	(0.206)	(0.206)	(0.224)	(0.220)	(0.239)	(0.202)	(0.220)
Innovation	0.128**	0.128**	0.123**	0.082	0.137**	0.099	0.141**	0.102*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
_cons	-3.127***	-0.649***	-2.918***	-3.636***	-0.882***	-0.930***	-0.235***	-0.234***
	(0.864)	(0.112)	(0.863)	(0.937)	(0.136)	(0.148)	(0.050)	(0.055)
N	464	464	464	464	464	464	464	464
r2	0.197	0.196	0.209	0.163	0.197	0.148	0.264	0.216
F	13.136	12.988	12.489	9.208	13.104	9.273	15.235	11.720

Standardized beta coefficients; Standard errors in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

However, in order to investigate more details whether there exist the liner or nonlinear relationships for demographic dividend, trade openness and GDP growth rate, the quadratic method is used in the regression analysis. As it can be seen from the result, the significant and negative coefficient of DD*DD (the square of demographic dividend) shows the invert "U" shape for economic growth. For trade openness, there also exists the invert "U" shape for economic growth. For the interaction effects of demographic dividend and trade openness, demographic dividend and trade openness have the substitution effects on the economic growth. The decomposed interaction effects from demographic dividend (labor quantity and labor quality) are shown in columns (7) and (8). They also have the substitution effects with the trade openness.

5. Robustness Tests

The robustness test examines the robustness of evaluation methods and indicators interpretation ability, that is, when some parameters are changed, the evaluation methods and indicators still maintain a relatively consistent and stable explanation for the evaluation results. More popular methods is to change a particular parameter, repeated experiments to observe the empirical results with the parameters set changes, if you change the parameters set, the results showed signs and significance changed, indicating no robust, and need to find the problem lies.

5.1 Potential Endogenous Problems

The omission of certain non-observer factors that change over time and affect both independent variables and economic growth may also lead to endogenous problems. Severe endogeneity will lead to partial or non-consistent OLS estimation results. Therefore, in order to reduce the bias reverse causes, the endogenous problems of the above estimation model need to be dealt with.

In the following robust tests, the endogeneity from trade openness and demographic dividend are all taken into consideration. This paper uses the instrumental variable approach (IV) to solve endogenous problems. First, the foreign market access(fma) is regarded as a measure of trade openness and draw lessons from Huang Jiuliu, Li Kunwang (2006) and Bin Sheng, Qilin Mao（2011） from the inverse of the distance from the provincial capitals to the coastline and multiply by 100 as the overseas market proximity. $\mathrm{fam_i} = \begin{cases} 100 \times \mathrm{d_{ii}^{-1}} \\ 100 \times (\min \quad \mathrm{d_{ij}} + \mathrm{d_{jj}})^{-1}, \mathrm{i} \notin \mathrm{Y}, \mathrm{j} \in \mathrm{Y} \end{cases}$

Where, $\mathrm{d_{ii}}$ is the distance from the coastal provinces to the shoreline is its internal distance, while the distance from the mainland provinces to the coastline is its distance from the nearest coastal province plus its internal distance. And Y is a collection of coastal provinces

Fixed growth rate, which is the grow rate for demographic dividend in 1994, is

used for solving the endogeneity from the demographic dividend

After adding the instrumental variables into the regression model, demographic dividend, trade openness, the quadratic relationship and the interaction items are all proved through the regression results. The specific results are shown in Table 6.

Table 6: The basic regression of the empirical model by considering IV

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	GDP1 fam	GDP1 Fam	GDP1 Fam	GDP1 fam	GDP1 Fixed growth rate for DD	GDP3 Industrial output	GDP1 Fixed growth rate for DD	GDP3 Industrial output
Demographic dividend	0.738***	4.501***	0.790***		0.144***	0.170**	0.232	0.475**
	(0.195)	(2.506)	(0.223)		(0.011)	(0.060)	(0.034)	(0.198)
Trade openness	0.043*	1.791***	1.084	1.199***	0.918***	1.018***	2.416***	2.891***
	(1.106)	(4.504)	(11.566)	(3.834)	(0.028)	(0.125)	(0.075)	(0.333)
DD*DD		-3.783**					-0.052*	-0.420*
		(1.741)					(0.033)	(0.216)
Open*open		-2.870***					-1.071***	-1.583***
		(0.051)					(0.037)	(0.160)
DD*open			-1.049*				-0.174*	-0.194*
			(15.128)				(0.027)	(0.116)
Labor quantity				0.382**				
				(0.018)				
Labor quality				0.744***				
				(0.006)				
Labor quantity*open				-0.378				
				(0.870)				
Labor quality*open				-0.897**				
				(0.385)				
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	464	464	464	464	448	308	448	308
r2	0.173	0.184	0.175	0.244	0.142	0.291	0.172	0.340
F	2.646	2.765	2.586	3.710	9.762	16.016	8.493	13.928

Standardized beta coefficients; Standard errors in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

5.2 Robust Check across Regions

In order to test whether the different regions have the same results, this paper tests the main effects in the East, Middle, West and Northeast areas. The specific results are shown in Table 7. In all the areas, demographic dividend, trade openness, labor quantity and labor quality are all positive to the GDP growth rate. For the order of the effects, trade openness is the most important contributor to the regional economic growth rate. Then trade openness also contributes the majority of economic growth in Northeast area. Demographic dividend also has the strongest effects on eastern economic growth rate. Labor quality contributes the most important improvement for eastern economic growth rate, comparing to other places.

Table7: Robust Check Across Regions

	East		Middle		West		Northeast	
	GDP1	GDP1	GDP1	GDP1	GDP1	GDP1	GDP1	GDP1
Demographic Dividend	0.592***		0.305*		0.608***		0.362*	
	(0.214)		(0.484)		(0.415)		(0.730)	
Trade openness	1.070***	1.075***	0.475***	0.458***	0.186*	0.138	0.938***	0.999***
	(0.022)	(0.023)	(0.283)	(0.291)	(0.136)	(0.127)	(0.147)	(0.148)
Labor quantity		0.295*		0.175		0.171*		0.408*
		(0.014)		(0.040)		(0.036)		(0.041)
Labor quality		0.137*		0.175*		0.925***		0.164
		(0.005)		(0.011)		(0.009)		(0.015)
Control variables	YES	YES	YES	YES	YES	YES	YES	YES
N	144	144	96	96	176	176	48	48
r2	144	144	96	96	176	176	48	48
F	0.452	0.424	0.436	0.442	0.082	0.228	0.607	0.616

Standardized beta coefficients; Standard errors in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

5.3 Robust Check Using 2SLS and FGLS Methods

The first stage of the OLS method for approximating a simple equation requires only what we need, and does not need to find the corresponding value of error term. The second phase simply applies OLS to the right of the estimated equation, except that error term is not the original here. To sum up, the task of the first phase of the two-stage least-squares method is to generate a instrumental variable. The second

phase of the task is to obtain a consistent estimate of the structural parameters through a special form of instrumental variable method. A very natural idea is that if the instrumental variable for each endogenous explanatory variable in the model is chosen from the predecessor variables, then the most common form of instrumental variable is the linear combination of all the preceding variables in the model, that is, The approximate equation approximation can be used as a tool variable using indirect least squares. This solves the problem of the uniqueness and rationality of selecting a tool variable. The so-called reasonable means that the instrument variables and endogenous variables it represents the most relevant. In the method of 2SLS, demographic dividend growth rate for the lag one period is used as the instrumental variable to test the results.

FGLS is an improvement on linear least squares estimation by using an iterative relaxation algorithm. The linear least squares estimation is biased when the model error is correlated noise, which is, the estimation is biased. In this case, generalized least-squares estimation can obtain more accurate results.

Table8: Robust Check Using 2SLS and FGLS Methods

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	GDP1	GDP1	GDP1	GDP1	GDP2	GDP2	GDP2	GDP2
	Two-Stage Least Squares (2SLS) regression results				Explained variable is changed with Feasible generalized least squares method			
Demographic Dividend	0.575***		3.486***		0.393***		3.648**	
	(0.267)		(1.687)		(0.101)		(2.582)	
Trade openness	0.827***	0.398**	4.574***	2.443***	0.620***	0.532***	4.035***	2.627***
	(0.026)	(0.029)	(0.254)	(0.078)	(0.013)	(0.012)	(0.212)	(0.097)
Labor quantity		0.242**		0.452***		0.176***		0.457***
		(0.013)		(0.018)		(0.005)		(0.021)
Labor quality		0.569***		0.719***		0.330***		0.616***
		(0.004)		(0.005)		(0.002)		(0.006)
DD*DD			-1.916**		-0.945***	-0.408**	-2.857*	
			(0.823)		(0.003)	(0.002)	(1.816)	
DD*open			-3.230**				-2.435**	
			(0.356)				(0.271)	
Open*open			-0.758***				-0.773***	
			(0.030)				(0.036)	

Labor quantity*open				-0.128				-0.728*
				(0.020)				(0.022)
Labor quality*open				-1.770***				-1.482***
				(0.010)				(0.010)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
_cons	-0.715***	-0.314***	-2.675***	-0.404***	22.013***	9.521**	-2.747***	-0.367***
	(0.167)	(0.054)	(0.704)	(0.056)	(5.547)	(4.263)	(0.914)	(0.066)
N	405	463	405	463	464	464	464	464

Standardized beta coefficients; Standard errors in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

By the two methods and changed dependent variables, the results are consistent with the previous regression results. The increasing growth of demographic dividend and, internal trade and trade openness can promote the economic growth rate. For the decomposed effects of demographic dividend, labor quantity and labor quality both have the positive effects on economic growth rate. For the substitution effects, the robustness tests show the demographic dividend and trade openness can substitute for each other. All in all, the results are robust to obtain the previous conclusions.

6. Conclusion and Discussion

This paper makes contributions in the following parts:

(1) The higher internal (domestic) trade openness is beneficial for the economic growth. Under the condition of the uncertain trade, focusing on the domestic trade is also good for the economic growth.

(2) The demographic dividend and trade openness have the substitution effects on the economic growth. And this research fills in the gap in this area.

(3) By considering the trade exposure and demographic dividend, both of their decomposition effects are significantly and positively related to the economic growth.

(4) There exist the invert “U” shape for the relationships for the trade openness and economic growth, as well as for the demographic dividend and economic growth.

(5) There are many different effects of these independent variables on economic

growth rate.

Variables	Order of the effects
Trade openness	East> Northeast> Middle > West
Demographic dividend	West> East>Northeast>Middle
Labor quantity	Northeast> East>West
Labor quality	West > Middle>Northeast>East

The old rate is positive related to the economic growth. For the explanation, Andrew Mason and Tomoko Kinugasa raised the second demographic dividend in Japan due to its aging population. The old rate firstly raises the saving rate and increases the capital, which in turn stimulates Japanese economic growth for a certain period (2008). Both of these scholars (2007) also mentioned the aging phenomenon during the demographic period, prolonged life expectancy and capital deepening are all beneficial for the economic growth, although aging society in long run impedes the economic growth.

And government spending on administration in China is significantly and negatively related to the economic growth. The result shows that Chinese government is relatively efficient in promoting economic growth. When economic growth rate is lower, Chinese government spends more in that year. Due to the time lag, the effects of economic growth rate will display later. When economic is good, Chinese government spends less and interfere the markets less. During this process, economy in China is becoming improved with higher economic growth rate

6.1 Trade Exposure and Economic Growth.

Higher internal trade openness can also accelerate the economic growth. Internal trade is one method for allocating resources efficiently. Through this method, all production factors all over China can flow to regions in need, which in turn improves the regional economic growth. A good example, during the period of 1997-2005, the Northeastern area (Hei Longjiang Province, Ji Lin Province and Liao Ning Province) was the center of producing steel, and the West-Northern are (Shanxi Province and so

forth) was abundant for coals, which are the fuels for steel production. By internal trade, both areas got the higher economic growth rate in that period. By contrast, the lower internal trade openness may be harmful for the economic growth. Therefore, in order to promote the comprehensive economic growth, reducing the restriction of trade flow, modifying the “Hukou” for better development, promoting the traffic access and so forth, are good for the internal flow to drive the regional economic growth.

6.2 Demographic Dividend and Economic Growth

Demographic dividend is significantly related to the economic growth. First, the demographic dividend increases the supply of labor, increases savings and creates capital, thereby providing the supply side with the necessary inputs for economic production and promoting economic growth. Secondly, the demographic dividend has also increased the demand for consumption, investment, import and export, thereby stimulating the expansion of the scale of production and the expansion of the economy on the demand side.

Labor quantity structure is the main factor to promote the economic growth rate, which is coincided with the majority of the theoretical and empirical researches for economic growth. In reality, immigration and population policies encouraging more births, will improve the local labor rate, which leads to the positive effects on economic growth. Japan and Canada are open to working population in their countries to reconcile or neutralize the negative effects of the aging problems.

Labor quality is significantly related to economic growth. The effect of labor quality is related to the productivity of labor. More education means more productivity on a certain extent. In fact, increasing the productivity of labor is an efficient method to ameliorate the economic growth. This is to say, entering the aging population at first does not mean the demographic dividend will disappear. Many Chinese scholars try to find the Lewis turning point.

6.3 Invert U Shape of Trade Openness and Demographic Dividend

The regression results display the significantly negative coefficient for the "open×open" (the quadratic item of trade openness) and "D× D" (the quadratic item of demographic dividend). At the first, economic growth is increasing as the increasing trade openness and demographic dividend. Then, the effects will slow down and decrease like Japan, USA and Canada. There are 2 reasons for the phenomena: ① The increasing basement for GDP calculation makes the growth rate decrease.② the marginal diminishing returns for trade openness

6.4 The Substituting Effects

At the same time, empirical tests also show that in promoting inter-provincial growth, trade openness and demographic dividend integration are substitutes for each other, indicating that different provinces can selectively utilize the trade and population policies to develop regional economy based on their own actual conditions.

Many scholars discussed the substitution effects on the topic of trade. Professors from Cornell University, Vivek Suri and Duane Chapman showed that the trade substitutes for industrialization on the economic growth (1998). When analyzing the effects of domestic market and international market on economic growth, Chinese scholars Sheng Bin and Maoqilin analyze the substitution effects for the two markets in the economic growth (2011). After 1992, the policy of import and export requirements was relaxed, and foreign investments were allowed, wholly or partially, to target the domestic market. This is one of the reasons why a substitution exists between FDI and trade on the GDP growth rate (Liu, X., Burridge, P., & Sinclair, P. J. 2002).

Under this structure, trade openness stands for the foreign market to a certain extent. The mode demographic dividend- higher labor quantity, higher consumption; higher labor quality, higher productivity, are beneficial for the domestic market. And the higher trade openness, higher economic benefits from trading, can promote the

economic growth.

The substituting effects can be explained by the following results. It caters for the economic development in China. Before the open-policy in China with the lower trade openness, increasing the demographic dividend boosted the economic growth in China. The increasing labor rate stimulated the production and consumption. However, with the increasing trade openness, the stimulating results are decreasing, because at that time, trade openness is becoming the main factor to facilitate the economic growth. Then, at the third stage, in the higher trade openness area, demographic dividend is becoming the impediment factor for the economic growth, like Beijing, Shanghai and other places. These places with higher rent, administration costs and relatively lower wage, emphasis more on the high efficient production and labor. And these higher openness trade areas have limited resources which cannot bear too much labor. More labor, especially lower productivity labor, reduces the local technology level and productivity, which in turn deteriorate the local economic growth.

6.5 The Regional difference

Among different regions in China, the effects of trade openness, demographic dividend and the decomposed effects of demographic dividend- labor quantity and labor quality have different effects on economic growth rate. Trade openness contributes the biggest part for east areas. East area is the center of trade openness and open-policy, which improve the Eastern area economic booming development. Demographic dividend is important in all areas. However, the effect of demographic dividend is stronger in West and East.

For the labor quantity, due to the depletion of resources, transformation of industrial structures, and political reasons, the Northeast area is experiencing the net outflow of labor. It leads to the shortfall for labor in production and consumption markets, which in turn has the negative effects on Northeastern economic growth rate. Comparing to all other three regions, labor quantity has the least important effect in Middle area. Middle area provides the majority of labor force for all over China all

the time. The labor supply is over abundant in Middle. The effect of labor quantity has limited effect on local economic growth rate.

For the labor quality, the effect is strongest in West. Comparing to other regions, the labor quality in West is lowest. Improving the labor quality will increase the local economic growth rate. As a result, improvement in local education and professional training in West has the essential influence on western economic growth rate.

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Appendix

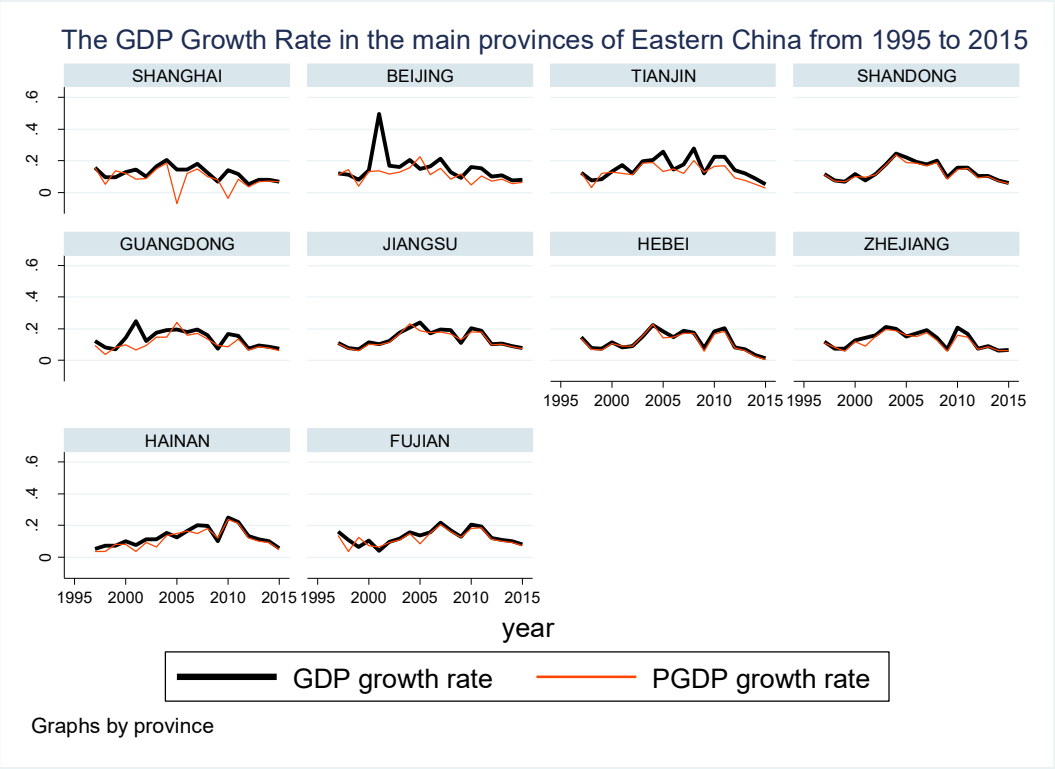
The mean and variance of the GDP growth rate in various regions

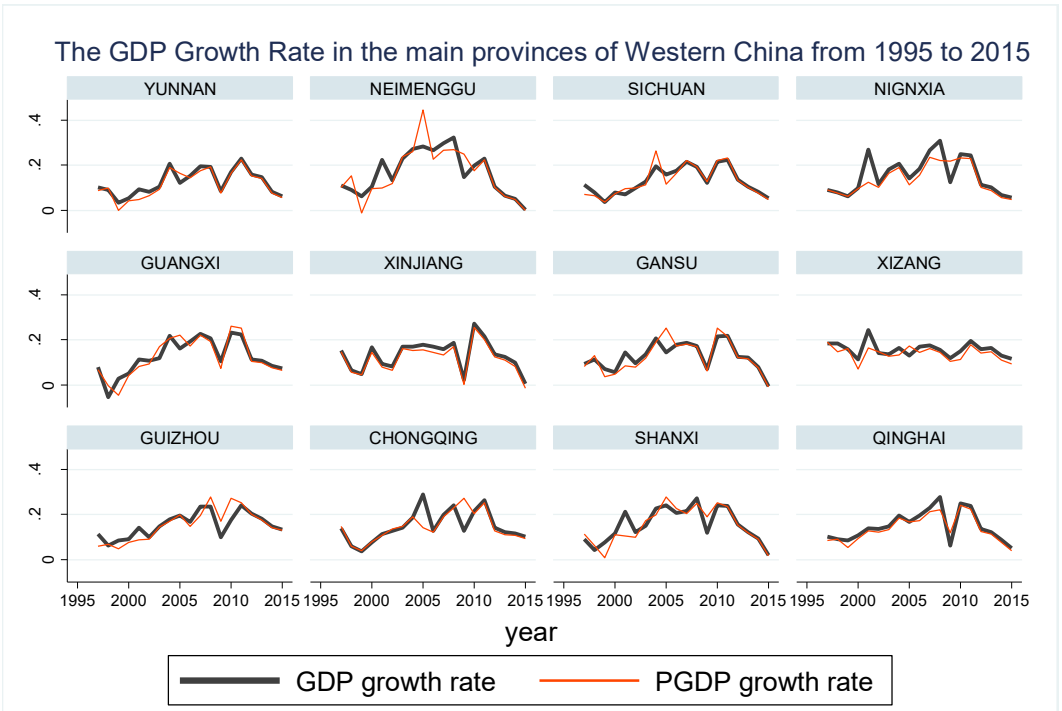
	Eastern		Middle		Western		Northeastern	
	mean	Std.	Mean	Std.	Mean	Std.	Mean	Std.
1997	0.123	0.031	0.135	0.016	0.114	0.030	0.105	0.023
1998	0.086	0.015	0.071	0.011	0.075	0.055	0.078	0.033
1999	0.076	0.009	0.028	0.043	0.065	0.036	0.056	0.029
2000	0.121	0.014	0.083	0.041	0.092	0.033	0.111	0.018
2001	0.158	0.133	0.069	0.105	0.154	0.066	0.095	0.063
2002	0.121	0.025	0.103	0.027	0.111	0.021	0.088	0.018
2003	0.164	0.031	0.146	0.042	0.149	0.033	0.116	0.017
2004	0.199	0.028	0.223	0.025	0.202	0.029	0.152	0.035
2005	0.180	0.046	0.177	0.037	0.184	0.057	0.175	0.027
2006	0.163	0.016	0.162	0.016	0.182	0.034	0.155	0.027
2007	0.194	0.014	0.218	0.013	0.216	0.039	0.193	0.047
2008	0.177	0.045	0.209	0.009	0.230	0.055	0.204	0.029
2009	0.094	0.022	0.099	0.052	0.100	0.035	0.093	0.053
2010	0.189	0.034	0.226	0.022	0.215	0.036	0.204	0.012
2011	0.178	0.034	0.220	0.027	0.230	0.017	0.212	0.008
2012	0.098	0.028	0.111	0.021	0.140	0.026	0.112	0.021
2013	0.100	0.016	0.098	0.028	0.123	0.030	0.081	0.022
2014	0.080	0.020	0.078	0.036	0.093	0.026	0.050	0.009
2015	0.063	0.020	0.055	0.028	0.056	0.045	0.008	0.010

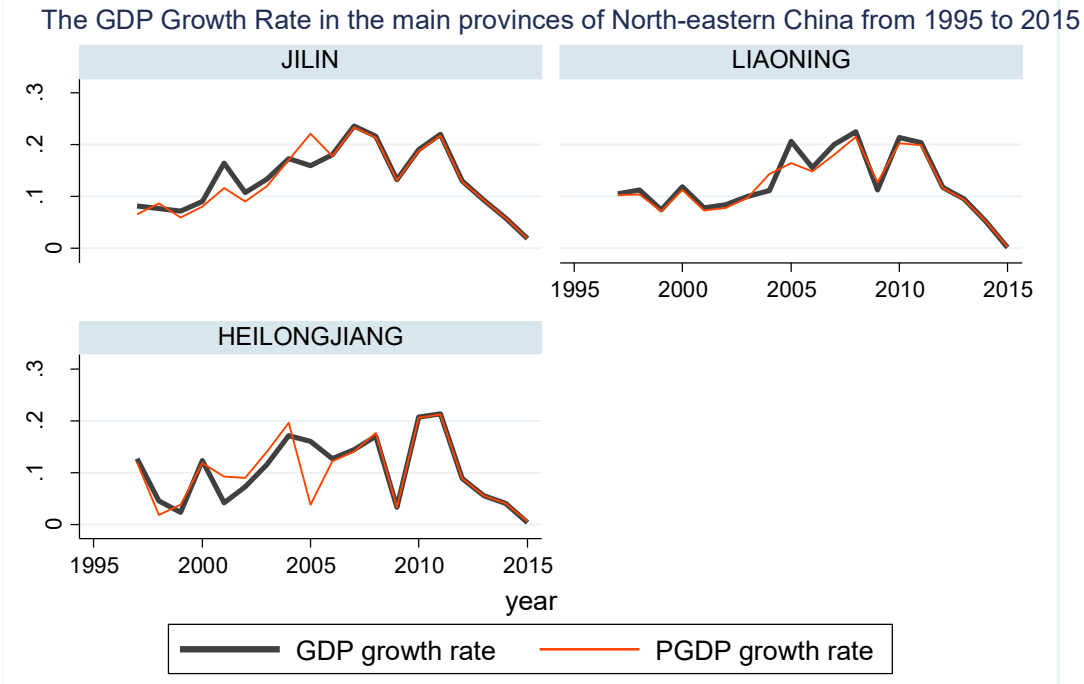
The mean and variance of the GDP per capita growth rate in various regions

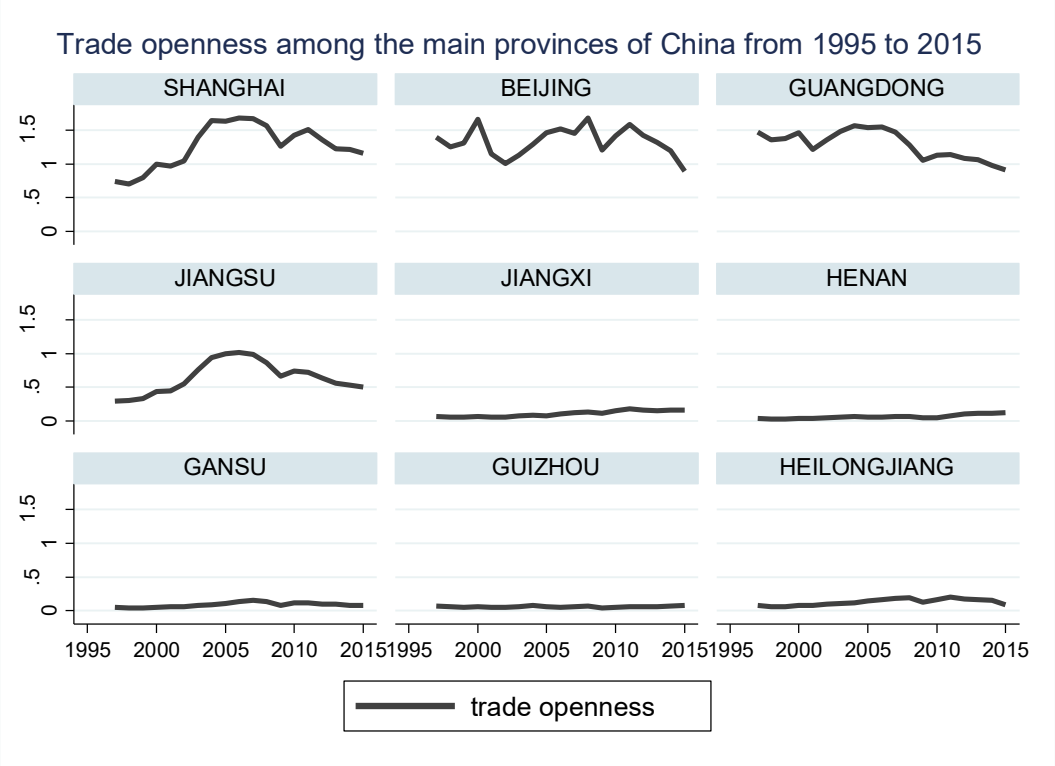
	Eastern		Middle		Western		Northeastern	
	Mean	Std.	Mean	Std.	Mean	Std.	Mean	Std.
1997	0.113	0.032	0.124	0.017	0.103	0.039	0.096	0.028
1998	0.064	0.033	0.007	0.062	0.084	0.044	0.070	0.046
1999	0.084	0.033	0.081	0.101	0.036	0.051	0.057	0.017
2000	0.106	0.019	0.080	0.034	0.081	0.030	0.104	0.021
2001	0.088	0.029	0.077	0.010	0.100	0.029	0.093	0.022
2002	0.106	0.019	0.099	0.024	0.101	0.026	0.086	0.007
2003	0.147	0.039	0.146	0.045	0.149	0.038	0.120	0.021
2004	0.185	0.038	0.214	0.029	0.193	0.038	0.170	0.027
2005	0.144	0.088	0.178	0.099	0.202	0.091	0.141	0.093
2006	0.151	0.022	0.153	0.016	0.166	0.032	0.149	0.028
2007	0.164	0.023	0.200	0.017	0.200	0.036	0.185	0.046
2008	0.152	0.039	0.206	0.020	0.211	0.041	0.201	0.022
2009	0.100	0.028	0.120	0.054	0.138	0.082	0.097	0.056

2010	0.134	0.080	0.225	0.028	0.220	0.048	0.199	0.009
2011	0.155	0.039	0.210	0.023	0.227	0.021	0.209	0.010
2012	0.084	0.026	0.107	0.021	0.132	0.028	0.111	0.021
2013	0.086	0.015	0.093	0.028	0.115	0.029	0.081	0.022
2014	0.069	0.020	0.073	0.036	0.085	0.025	0.050	0.009
2015	0.054	0.022	0.049	0.028	0.047	0.045	0.009	0.008




The GDP Growth Rate in the main provinces of Western China from 1995 to 2015
YUNNAN
NEIMENGGU
SICHUAN
NIGNXIA
GUANGXI
XINJIANG
GANSU
XIZANG
GUIZHOU
CHONGQING
SHANXI
QINGHAI
0
.2
.4
1995
2000
2005
2010
2015
year
GDP growth rate
PGDP growth rate
Graphs by province

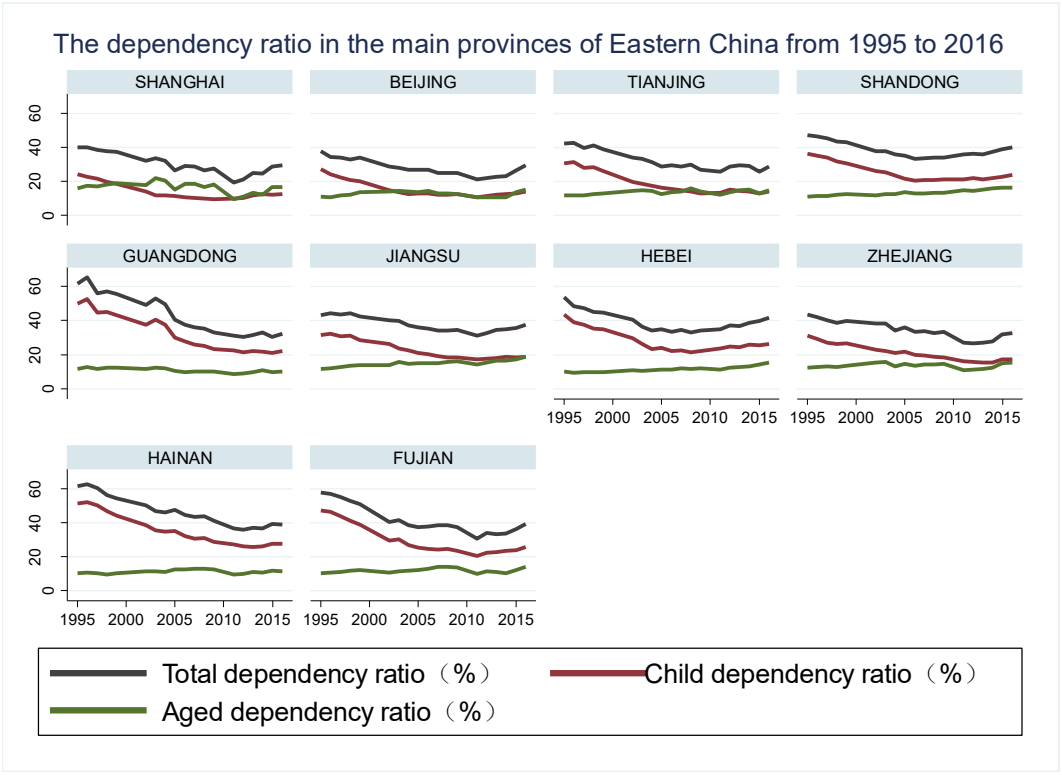

The GDP Growth Rate in the main provinces of North-eastern China from 1995 to 2015
JILIN
LIAONING
HEILONGJIANG
0
.1
.2
.3
1995
2000
2005
2010
2015
year
GDP growth rate
PGDP growth rate
Graphs by province

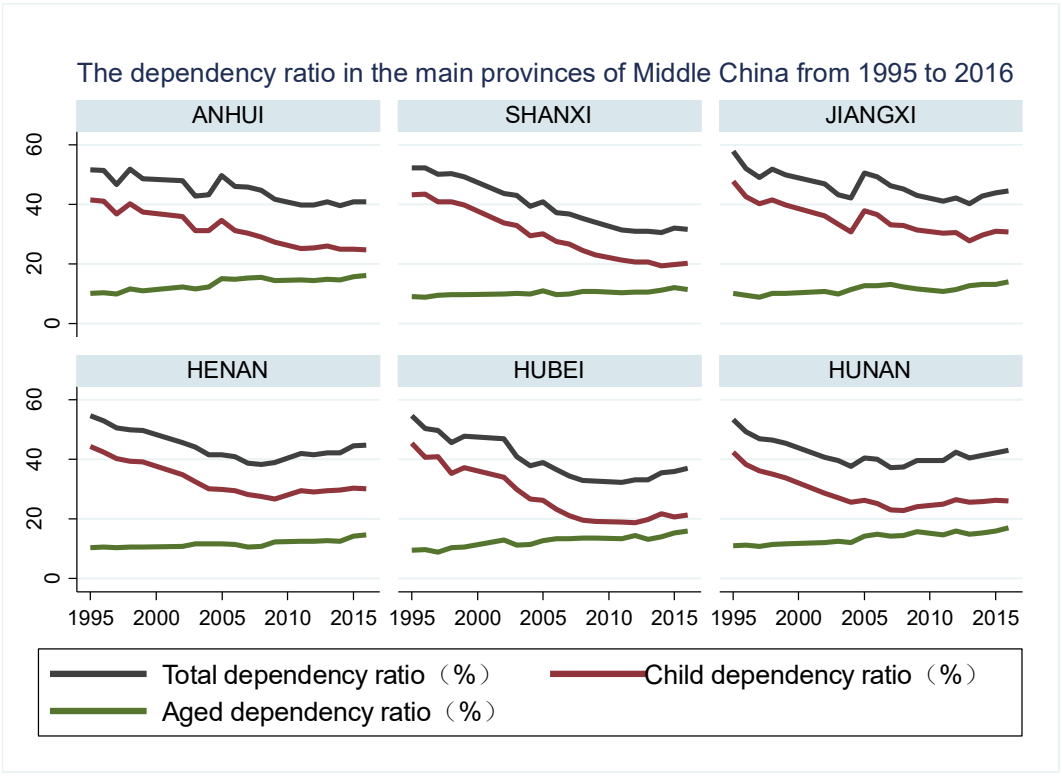


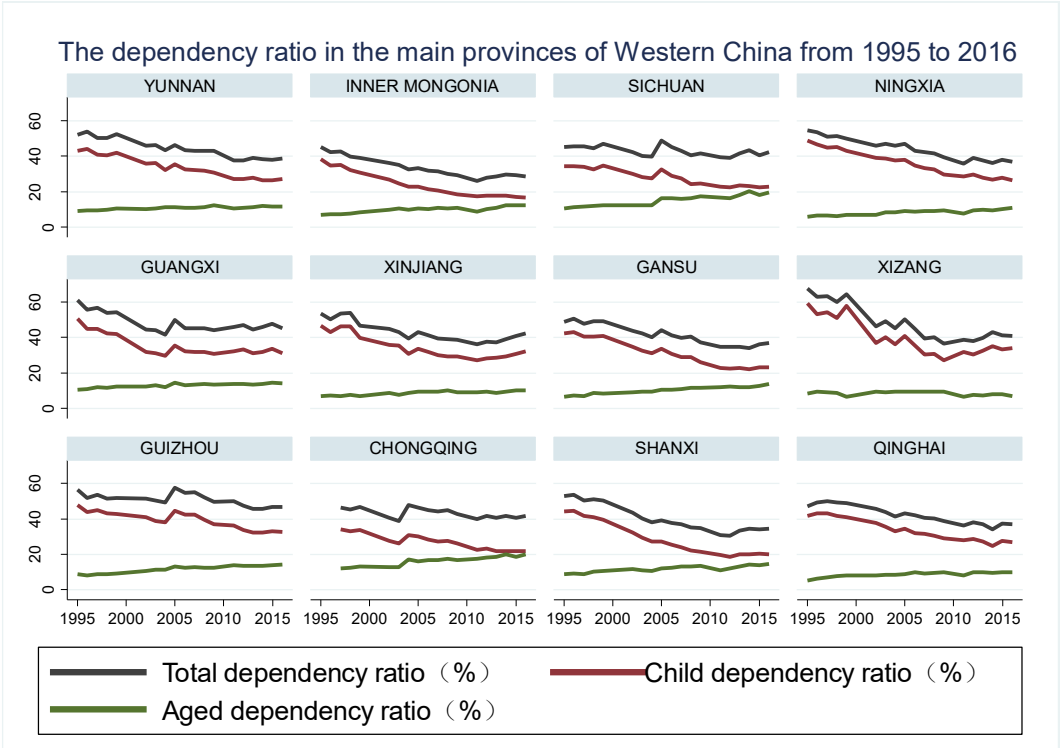
Average trade openness of all provinces in China from 1995 to 2015

province	Region	Trade Openness	Import Openness	Export Openness
BEIJING	East	1.333	1.035	0.298
JIANGSU	East	0.648	0.277	0.370
TIANJIN	East	0.766	0.391	0.375
HAINAN	East	0.266	0.170	0.097
SHANGHAI	East	1.261	0.658	0.603
FUJIAN	East	0.516	0.191	0.325
ZHEJIANG	East	0.515	0.145	0.371
GUANGDONG	East	1.287	0.556	0.731
SHANDONG	East	0.288	0.120	0.169
HEBEI	East	0.115	0.042	0.073
HUBEI	Middle	0.093	0.040	0.052
SHANXI	Middle	0.090	0.035	0.055
HUNAN	Middle	0.063	0.024	0.040
JIANGXI	Middle	0.107	0.035	0.073
HENAN	Middle	0.065	0.025	0.040
ANHUI	Middle	0.121	0.049	0.072
GUIZHOU	West	0.058	0.019	0.039
SICHUAN	West	0.099	0.039	0.060
CHONGQING	West	0.150	0.055	0.095

QINGHAI	West	0.052	0.014	0.039
XIZANG	West	0.118	0.026	0.091
XINJIANG	West	0.191	0.056	0.135
NINGXIA	West	0.104	0.028	0.076
GUANGXI	West	0.116	0.046	0.069
INNER MONGOLIA	West	0.078	0.047	0.031
GANSU	West	0.087	0.048	0.039
SHANXI	West	0.090	0.037	0.053
YUNNAN	West	0.104	0.042	0.062
HEILONGJIANG	Northeast	0.128	0.059	0.069
LIAONING	Northeast	0.321	0.139	0.182
JILIN	Northeast	0.129	0.084	0.045




The dependency ratio in the main provinces of Middle China from 1995 to 2016
ANHUI
SHANXI
JIANGXI
HENAN
HUBEI
HUNAN
0
20
40
60
1995
2000
2005
2010
2015
Total dependency ratio（%）
Child dependency ratio（%）
Aged dependency ratio（%）


The dependency ratio in the main provinces of Western China from 1995 to 2016
YUNNAN
INNER MONGONIA
SICHUAN
NINGXIA
GUANGXI
XINJIANG
GANSU
XIZANG
GUIZHOU
CHONGQING
SHANXI
QINGHAI
0
20
40
60
1995
2000
2005
2010
2015
Total dependency ratio（%）
Child dependency ratio（%）
Aged dependency ratio（%）

The dependency ratio in the main provinces of North-eastern China from 1995 to 2016