

Study of the Impact of Demographic Structure on Economic Disparities in the North-eastern Region

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Abstract

People are a key factor in driving economic growth, and the economy of the Northeast cannot develop without a large population. Changes in population structure will have an impact on economic growth, but in recent years, the Northeast region has problems such as population aging and population loss, which seriously affects the economic development of the Northeast region, and then affects the economic gap with the country. This paper uses provincial panel data from 2005 to 2021 to empirically analyse and establish a linear model, and through the results, we will understand the specific impact of different variables in the demographic structure on the economic gap of the Northeast region, and provide countermeasures and suggestions to mitigate this impact.

Keywords

Demographics; North-east; Economic Disparities.

1. Introduction

People are both the beginning and the end of the economy. Demographic change has always been present in the process of China's modernization and is profoundly affecting the pattern of social economic development. Therefore, it is an important task for China's modernization to scientifically understand and actively respond to demographic changes. As the frontier of opening up to the north, the Northeast region shoulders a special mission in the new era and has a strategic and important position. The unique location advantage of the Northeast region determines its economic development to be an important element of high-quality economic development in the new era. Population, as a basic element of regional development, and its structural changes determine the development pattern of the economy of the Northeast, but at present there are characteristics in the Northeast region such as a continuous decline in the population growth rate, rapid and large-scale aging of the population, a lower level of education of the population, and an outflow of labour force, for example, the data of the seventh population census show that the aging degree of the three Northeastern provinces of the Northeast are more than 15.5%, which is among the highest in the country. Although the situation of wide regional economic disparities has improved to a large extent in recent years, the existence of regional economic disparities still cannot be ignored in order to achieve higher quality development. From the level of economic development and trends, although the implementation of a series of policies to make the Northeast region's economy has achieved rapid growth, but there is still the problem of excessive economic disparities in the Northeast region. Then the population as an important factor in the economic growth of the Northeast, whether the evolution of the demographic structure of the Northeast region will further affect the economic gap in the Northeast region. Based on this question, this paper uses an econometric model to empirically test the impact of demographic change on the economic gap in the Northeast.

The possible innovation and contribution of this paper lies in the fact that few scholars have analysed and studied the factors affecting regional economic disparities from the perspective of demographic evolution, and most of them have explored them at the national or East-Middle-West level, while few scholars have studied them at the Northeast level. Based on the above reality, this paper does theoretical and empirical research on the relationship between the evolution of population structure on the economic gap between the Northeast provinces and the non-Northeast provinces, takes three provinces and regions in the Northeast (Heilongjiang, Jilin, Liaoning) for research, and examines its impact on the economic gap between the Northeast region and the national GDP per capita based on the perspective of population aging in terms of the content of the research, which enriches the content of the study of economic gap between the Northeast and the national economy per capita from the perspective of the structure of the population. national per capita economy in terms of economic gap content.

2. Mechanistic Analysis of the Demographic Impact on Economic Disparities in the Northeast

With reference to the practice of related scholars, this paper divides the demographic structure into three dimensions, namely, population aging, human capital and labour supply, and explores the mechanism that directly affects the economic gap between the Northeast and the national per capita under different demographic dimensions.

2.1. An Analytical Study of the Impact of Population Ageing on Economic Disparities in the North-eastern Provinces of China

Population ageing affects regional economic growth by affecting both the quantity and quality of labour supply, and regional economic disparities are the result of differences in the ability of different regions to grow their economies. Behind the increasing degree of population ageing is the negative growth of labour supply (Feyrer, 2007)^[1] (Feyrer, 2007), this labour supply and demand will bring about an increase in labour costs, lowering the rate of return on capital and leading to an inflow of foreign capital to regions with lower aging (ITO and TABATA, 2007)^[2] (ITO and TABATA, 2010). Opening up to the outside world not only helps to promote the rapid formation of the domestic and international double-cycle pattern, but also serves as the core motive force for sustained and rapid economic development. According to the theory of circular cumulative causation, the gradual expansion of the degree of openness to the outside world has brought advanced technology and high-end management experience to the Northeast, further accelerating the flow of factors from the affluent regions to the Northeast, that is, diffusion in the trajectory of "centre-periphery", generating circular cumulative growth in the peripheral region of the Northeast, and ultimately generating a "circular cumulative growth" in the peripheral region, that is, the Northeast. In other words, it is spreading in a "centre-periphery" trajectory, generating cyclical cumulative growth in the periphery, i.e., the Northeast, and eventually converging the two regions' economic development levels. The weakening of the terms of trade brought about by ageing will reduce the speed of circular accumulation. On the other hand, population ageing will affect the per capita economic gap between the Northeast and the country as a whole by affecting technological innovation. Most of the literature has shown that population ageing negatively affects technological innovation by reducing human capital accumulation and human capital stock (KUHN and HET)^[3,4] (KUHN and HETZE, 2007, BEHAGHEL and GREENAN, 2010). The theory of latecomer's advantage suggests that lagging regions can narrow the technological gap with developed regions through technological innovation and achieve rapid economic development. According to the theory of endogenous growth, technological progress can provide continuous power support for economic growth, improve the economic growth momentum of the Northeast region, and slowly catch up with the developed regions, narrowing the economic gap between the two.

Based on the above analysis, Hypothesis 1: Population ageing has widened the economic gap in the north-eastern provinces of the country.

2.2. An Analytical Study of the Impact of Human Capital on Economic Disparities in the North-eastern Provinces of China

Human capital is a key driver of economic growth. On the one hand, human capital promotes the benign development of technological innovation and provides key elements for technological progress. The higher the human capital, the more conducive to the exploration and research of knowledge, creating new knowledge, and directly promoting technological innovation and progress, while overflowing knowledge to low human capital groups, forming a human capital agglomeration area in the Northeast region, promoting the development of synergistic industries in the Northeast region, and further accelerating technological innovation in the Northeast region^[5] (Romer, 1990). On the other hand human capital promotes the significant increase of labour productivity, high human capital has received higher education, received good knowledge and skills training, and has a stronger ability to absorb new technologies, and can play a coordinating role in the production of personnel, which contributes to the increase of total factor productivity. If economically backward areas have high human capital, the easier it is to accept more advanced technology and information from developed regions, improve the speed of absorption of new technologies, transform technology into labour productivity, achieve high economic growth, and produce a catch-up effect, which ultimately promotes the convergence of regional economic development and reduces the economic gap between the Northeast region and other regions.

Based on the above analyses, hypothesis two is formulated: human capital narrows the economic gap in the north-eastern provinces of the country.

2.3. An Analytical Study of the Impact of Labour Supply on Economic Disparities in the North-eastern Provinces of China

Labour supply is an important factor affecting economic growth, and classical, neoclassical and new economic growth theories all agree that labour supply is an important factor driving economic growth. Due to the special characteristics of economic development, there is a cross-provincial outflow of labour in the Northeast. With the continuous development of the Northeast region's economy, the continuous improvement of infrastructure, and the increase of employment opportunities in Northeast cities, the outflow of labour continues to return to the secondary and tertiary industries, and gradually forms a population agglomeration effect in the towns and cities and promotes industrial urbanization, while the urbanization of the Northeast region's population and employment is further subdivided into industries, which will promote the upgrading of Northeast region's industrial structure and provide a continuous stream of power support to Northeast's economic growth, further narrowing the gap with other countries and regions. At the same time, the urbanization of population employment in the Northeast region further subdivides industries, thus promoting the upgrading of the industrial structure of the Northeast region, providing a constant source of power support for the economic growth of the Northeast region and further narrowing the economic gap with other regions.

Based on the above analysis, Hypothesis 3: Labour supply narrows the economic gap in the north-eastern provinces of the country.

3. Research Design

3.1. Empirical Model Setting

Based on the previous analysis, this paper sets the following empirical model:

$$GN_{i,t} = \alpha + \beta_1 PS_{i,t} + \beta_2 \sum Z_{i,t} + \beta_3 \sum year + \beta_4 \sum prov + \varepsilon_{i,t}$$

Where i denotes the province region, t denotes the year, $PS_{i,t}$ is the population structure, and $GN_{i,t}$ denotes the economic disparity. $Z_{i,t}$ are the control variables, and in addition, $year$ and $prov$ denote the year and province fixed effects, which are used to control for the effects of time-variable factors and province-variable factors on the regional economic disparity.

3.2. Variable Description

3.2.1. Explained Variable

The difference between the per capita GDP of the Northeast region and the national per capita GDP is the explanatory variable of this paper, and some literatures directly use the per capita GDP instead. Although the difference in the level of development between regions can be seen from GDP per capita, there are certain problems due to the lack of a reference system. In this paper, we use the gap between the per capita GDP of the northeastern provinces and the national per capita GDP in the same period to measure the economic gap between the two, as follows: $GN = |\ln y_{i,t} - \ln \bar{y}_t|$, $y_{i,t}$ denotes the GDP per capita of the i northeastern province in year t , \bar{y}_t denotes the national GDP per capita in year t . This method is a more accurate measure of regional economic disparity than using GDP per capita directly.

3.2.2. Explanatory Variable

Demographic structure is the explanatory variable of this paper, which includes three dimensions: population ageing (aging), human capital (hucap) and labour supply (labl). The proportion of population aged 65 and above in the total population is used to measure the degree of population aging, the level of tertiary education per capita is used to measure human capital (the proportion of university-educated population), and the number of urban labour employment is used to measure labour supply.

3.2.3. Control Variable

The control variables include (1) the level of financial development (fd), (2) foreign direct investment (fdi), (3) the level of industrialisation (indus) and (4) the level of innovation (innova).

3.2.4. Data Sources

The source of the raw data for this paper comes from sources derived from the population census, the China Statistical Yearbook, the China Regional Economic Statistical Yearbook, and the statistical yearbooks of provinces, autonomous regions and municipalities. The descriptive statistics of the variables are listed in table 1, which shows that the level of economic disparity in the north-eastern region of China is large.

Table 1. Descriptive statistics of variables

variant	sample size	average value	(statistics) standard deviation	minimum value	median	maximum value
GN	51	0.202	0.156	0.002	0.164	0.661
aging1	51	11.574	3.175	6.920	11.212	18.131
hucap	51	0.021	0.004	0.014	0.021	0.032
labl	51	7.478	0.234	7.113	7.509	7.849
fd	51	2.662	0.888	1.627	2.476	4.786
fdi	51	0.023	0.021	0.003	0.015	0.076
indus	51	0.298	0.079	0.200	0.290	0.465
innova	51	8.891	0.878	7.162	8.959	10.149

4. Empirical Analysis

4.1. Return to Baseline

In order to test the actual effect of the impact of demographic structure on the economic gap in the Northeast, taking into account that the economic gap will be affected by time and regional factors, this paper selects a two-way fixed-effects model for testing. This paper conducted a benchmark regression for model (1). (The explanatory variables in columns (1)(2), (3)(4) and (5)(6) are population aging, human capital and labour supply respectively. As shown in Table 2, where columns (1), (3), and (5) are regressions without adding any control variables, and columns (2), (4), and (6) are regressions with the addition of control variables, the results of columns (1) and (2) show that the coefficient of population aging is significantly positive at the statistical level of 1%, i.e., the population aging widens the economic disparity of the northeastern provinces of China. (The results in column (3) (4) show that the coefficient of human capital is significantly positive, which means that human capital widens the economic gap in the northeastern provinces of China. (The results in column (5) (6) show that the coefficient of labour supply is negative and significant, which means that labour supply narrows the economic gap in the north-eastern provinces of China. For the control variables, the level of foreign trade and the level of development both widen the economic gap in the north-eastern provinces of China.

Table 2. Regression results

	(1)	(2)	(3)	(4)	(5)	(6)
	GN	GN	GN	GN	GN	GN
aging1	1.6412***	1.0341***				
	(0.2256)	(0.2922)				
hucap			51.4094**	95.1284***		
			(20.5107)	(18.5411)		
labl					-1.7256***	-0.7766**
					(0.2919)	(0.3439)
fd		-0.0807		0.0696		-0.1018
		(0.0843)		(0.0568)		(0.0882)
fdi		3.2674**		2.8584***		3.3585*
		(1.5672)		(0.9535)		(1.7251)
indus		-0.2537		-2.0785***		-0.5755**
		(0.2791)		(0.2687)		(0.2622)
innova		0.0512		0.0005		0.1165
		(0.0972)		(0.0609)		(0.0969)
_cons	-11.6950***	-7.5274***	-0.7932**	-1.0605**	12.3658***	5.0881**
	(1.6155)	(2.1954)	(0.3321)	(0.4409)	(2.0856)	(2.4012)
industry	yes	yes	yes	yes	yes	yes
year	yes	yes	yes	yes	yes	yes
R2	0.8133	0.9055	0.6039	0.9476	0.7515	0.8864
N	51	51	51	51	51	51

4.2. Robustness Check

Generally speaking the methods of robustness testing are replacing variables, changing instrumental variables, expanding or reducing samples, changing measurement methods and so on. In this paper, we use expanding sample for robustness test, that is, we do the robustness

test under adding Gansu province data. The results are shown in 3. With the addition of the sample provinces, the coefficients of population aging and human capital are still significantly positive, and the coefficient of labour supply is still negative. This shows that the model constructed in this paper is robust.

Table 3. Robustness test

	(1)	(2)	(3)
	GN	GN	GN
aging1	0.1242***		
	(0.0171)		
hucap		71.4814***	
		(18.1069)	
labl			-0.6627***
			(0.2423)
fd	0.0693	0.0683	-0.0316
	(0.0533)	(0.0499)	(0.0492)
fdi	6.1169***	3.4721***	4.4029***
	(1.3632)	(1.0038)	(1.3094)
indus	-0.9633***	-1.6062***	-0.5669*
	(0.1893)	(0.3901)	(0.3033)
innova	0.0001	-0.1347	-0.0536
	(0.0789)	(0.0841)	(0.0887)
_cons	-0.7908	0.1520	5.3402***
	(0.5055)	(0.5435)	(1.9188)
industry	yes	yes	yes
year	yes	yes	yes
R2	0.9490	0.9208	0.9174
N	68	68	68

5. Conclusion

This paper uses provincial panel data from 2005 to 2021 for empirical analyses to verify hypotheses I and III. The reason for the lack of support for hypothesis II may be due to the fact that population aging in the Northeast region has a crowding-out effect on human capital and reduces the expenditure on family education, while at the same time resulting in an increase in the pressure on public pension expenditures, which in turn crowds out the public education expenditures. Based on the above conclusions, the following policy insights can be obtained: (1) Appropriately expand the scale of human capital investment in the Northeast, improve the education level of the rural labour force, and achieve the transformation of the secondary demographic dividend. (2) In response to the aging of the population, improve the level of technological progress in the Northeast to make up for the shortage of labour brought about by the aging of the population, and at the same time actively take advantage of the development opportunities brought about by the aging of the population, and develop "sunset industries" that have great market demand. (3) In response to the loss of labour, improve the quality of cities in the Northeast, strengthen the importation of talents from the Northeast, implement generous treatment, and attract more young people to return to Northeast for employment by formulating more favourable policies and providing better development opportunities.

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