

The Contribution Rate of Thrice Industrial Agglomeration to Industrial Growth in Ningxia

—The Calculate Based on Cobb-Douglas Function

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ABSTRACT: On the basis of Cobb - Douglas function, using location entropy coefficient to construct model, analysis of thrice industrial agglomeration and industrial growth in Ningxia during 2005-2013. The results showed that thrice industrial agglomeration of Ningxia play a positive role in promoting industrial growth, but the contribution rate is very small, are close to zero. Thus conclude that industrial agglomeration is beneficial to industrial growth, the increase of the degree of industrial agglomeration can promote contribution rate to the growth of industry, but the size of the contribution more affected by the degree of industrial concentration in the process of dynamic change, not the cluster scale of a one or a few years.

Introduction

The perfection of market mechanism and the progress of science to promote the development of specialization and regional distribution of Thrice industrial, Make Thrice industrial showed a stronger connection, this universal phenomenon of industrial cluster in modernization of industry growth has aroused extensive attention of scholars. At present, many theoretical and empirical studies try to use different methods to reveal the role of "agglomeration economy". Previous research results are mostly have indicated that industrial agglomeration has a promoting effect on industry development, through industry cluster can effectively promote industrial growth. So, can we also find the positive externalities caused by industry agglomeration in the enterprise internally in Ningxia, which located in the remote western areas of China. And the positive influence will be affected by what factors? In this paper, using the thrice industrial date during 2004-2013 in Ningxia to explore, tries to find the answers.

Theoretical Basis

Although academic results are differences on the study of "agglomeration economy", but most economists agree that industrial agglomeration can improve the regional industrial competitiveness and economic competitiveness, in order to better explain the causes of this phenomenon, economists have long theoretical exploration. Among them, the growth pole theory and industrial cluster theory can better explain the influence of regional industrial agglomeration to industry growth. According to growth pole theory, we know that growth pole is a particular area with economies of scale, these regions through its own rapid growth of economic produces powerful role of radiation to the surrounding area, including polarization effect and diffusion effect. Potter put forward theory of industrial cluster in the basis of development and improvement of growth pole theory , this theory emphasizes the importance of knowledge, technology and other innovation

factors of production, point out that industry cluster can promote the form of those innovative elements within the industry, and then through the associated enterprises overflow or copycat effect makes the industry has competitive advantage. At the same time, Porter thinks within a cluster, the enterprise can be formed between upstream and downstream relationship, cooperation more effectively, improve the level of specialization, thereby enhancing the competitiveness, improve the development level of regional industry and accelerate the economic development.

In theory, specialization and cooperation are the effective ways to improve the level of industrial development; industrial agglomeration is conducive to concentrate elements such as labor, capital and technology in a particular region, thus accelerating the growth of related industries in the region. So, the research of Ningxia can verify these theories or not? If thrice industrial agglomeration in Ningxia do contribution to industry growth, how much the contribution degree? In this paper, under the guidance of the above theory to further explore.

Model Establishment and Index Selection

For this question, the most commonly used inspection method is the Cobb - Douglas production function. With the Cobb - Douglas production function to estimate agglomeration economy effect usually is divided into the following two specific ways: one is measured by constant term in the production function. Another is make the agglomeration level as a variable into the production function, analysis of agglomeration level index to reflect the size of agglomeration contribution to the production. This article based on the second approach, in reference to the model of Yanrong Wang, Congzheng Liu (2012), building the econometric model ^[1].

The Selection and Correction of Model

In the measurement of the contribution of industrial agglomeration to industrial growth, firstly, using Cobb-Douglas production function to establish the basic model:

$$Y = AK_t^\alpha L_t^\beta e^{\varepsilon_t} \quad (1)$$

Among them, Y_t 、 K_t 、 L_t represents industry output, capital input and labor input levels on a certain region in t year; A is total factor productivity level; α 、 β is output elasticity of capital and labor; e is random error term and other influence factors of industrial growth.

Set scale reward stays the same, that means $\alpha+\beta=1$, then divided by L_t on both sides of equation (1) at the same time, get:

$$\frac{Y_t}{L_t} = A \left(\frac{K_t}{L_t}\right)^\alpha e^{\varepsilon_t} \quad (2)$$

Among them, $\frac{Y_t}{L_t}$ represents the level of per capita output and per capita fixed capital stock on a certain region in t year; α is output elasticity coefficient of per capita capital stock. To explain the agglomeration effect, this article assumes thrice industrial growth is not only influenced by inputs, also under the influence of thrice industrial agglomeration degree, set:

$$e^{\varepsilon_t} = e^{\theta LQ_t + \lambda_t} \quad (3)$$

LQ_t represents an industry agglomeration degree in t year; θ as a parameter, λ_t is random error term. Then make equation (3) into equation (2), and take logarithm on both sides, can get a linear equation, is finally established econometric model in this paper:

$$\ln\left(\frac{Y_t}{L_t}\right) = \ln A + \alpha \ln\left(\frac{K_t}{L_t}\right) + \theta LQ_t + \lambda_t \quad (4)$$

The Selection of Indicators

Level of output (Y): the level of output in model (4) uses the real GDP of thrice industrial in the base period of 2002 to measure.

Labor input level (L): The laborer who have the ability to work and be able to transform the

ability for output can only as the elements of production, thus model (4) involved in labor input measured by the thrice industrial employment of calendar year.

Level of capital (K) : in theory, capital investment should be used capital flow to measure, but the existing statistical data have no capital flow, so most of the literature in the study make use of the capital stock to replace. This article also uses the capital stock accounts, using the perpetual inventory method converts the price in 2002, calculation formula is:

$$K_t = I_t + (1 - \delta)K_{t-1} \quad (5)$$

I_t is the gross fixed capital formation on an industry in t year, because of the gross fixed capital formation are unable to get data, and we can find the gross fixed assets investment, and the basic data source of the gross fixed capital formation is the gross fixed asset investment, so this article measured by thrice industrial fixed assets investment; δ is depreciation rate, there is no authoritative standards, 5% of the use of most of the literature in this paper. On the base of the capital stock in Ningxia, this paper use the date of the year of 2002 calculated by Xianxiang Xu in 2010 ,which look 1978 as base period for benchmark: the first industrial capital stock is 1.56 billion, the second industry capital stock is 15.7 billion, the third industry capital stock is 22.21 billion ^[2], and then calculated other years of capital stock according to the formula (5).

The degree of industrial agglomeration (LQ) : this article selects the location entropy to express the degree of industrial agglomeration. location entropy is the ratio of a share of a region's certain industries or products production in the whole country and the share of a region's certain indicator in the whole country , the greater location entropy of a industry in a area, suggests that the industry more concentrated in the area, location entropy calculation formula is:

$$LQ_{ij} = \frac{E_{ij}/\sum_i E_{ij}}{\sum_j E_{ij}/\sum_i \sum_j E_{ij}} \quad (6)$$

This paper calculated the degree of industrial agglomeration, so selected GDP as indicator .is the location entropy of i industry in j region; GDP of i industry in j region; is GDP in the whole of j region is GDP of i industry in the whole of country, is country's GDP.

The Results of The Analysis

Calculation of LQ

Base on LQ value calculation formula ,to calculate the LQ coefficient of thrice industrial in Ningxia during 2004-2013,and judging the change of Thrice industrial agglomeration in research time, the specific results are shown in table 1.

Table 1. The LQ Coefficient of Thrice Industrial in Ningxia

	the first industry	the second industry	the third industry
2004	1.05	1.13	0.84
2005	0.94	0.97	1.05
2006	0.98	1.01	0.99
2007	0.99	1.05	0.95
2008	0.93	1.07	0.94
2009	0.91	1.06	0.96
2010	0.94	1.05	0.96
2011	0.87	1.08	0.95
2012	0.85	1.09	0.94
2013	0.87	1.12	0.91

It can be seen from Table 1, Thrice industrial of Ningxia have appeared a certain degree of

agglomeration, but the degree and change process is not same. Among them, the degree of second industry agglomeration is highest, in addition to 2005, the LQ coefficient in the rest of the year were greater than 1, suggest that the second industry in Ningxia has more specialized production levels than the national average, there are additional agglomeration, the second industry is a specialized department of Ningxia. First industry agglomeration degree, although in individual years increased, but as a whole is declining, the LQ coefficient at a minimum of 0.85 in 2012, compared with the high of 1.05 in 2004, a drop of 0.2. Agglomeration degree of the third industry is in a state of stable, LQ coefficient rose to 1.05 in 2005, has been maintained at around 0.95, while the numerical slightly decreased, but the degree of decline is less than the first industry .

Model Estimation Results

After Calculated the LQ value, this paper make a regression analysis for model (4). Before the model estimates need to determine the appropriate regression method. firstly, this article through F statistic test judge that should adopt mixed regression model or the fixed effects model, the result shows that under 5% significance level, F statistic inspection reject the original hypothesis, namely doesn't use the mixed regression model. Then this article with Hausman test to compare the fixed effect model and random effects model, Hausman test P values are less than 5%, rejected a random effects model, by using the fixed effect model was finally determined. The return of the model results are shown in table 2.

Table 2. The Results of Regression

Independent variables	dependent variable: Ln(Y/L)		
	mixed regression modle	fixed effect model	random effects model
LQ	6.640 ^{***} (6.303)	3.430 ^{**} (2.062)	6.640 ^{***} (6.858)
Ln(K/L)	1.341 ^{***} (10.732)	1.140 ^{***} (4.637)	1.341 ^{***} (11.677)
C	-14.359 ^{***} (-11.083)	-9.856 ^{***} (-3.453)	-14.359 ^{***} (-12.059)
Adjusted-R ²	0.848	0.871	0.847
DW value	0.393	0.736	0.763
F-test		3.482 (0.046)	
Hausman-test			6.964 (0.031)

(Note: what in brackets under the correlation coefficient values is t test value; * * *,**respects rejected the original hypothesis under the significance level of 1%,or5%.)

Table 2 shows that Ln(K/L) and LQ coefficient is 1.140 and 3.430, all is positive, and significant under 1% significance level, prove that LQ, Ln (K/L) were positively correlated relationship with Y. Adjusted-R² of the modle is 0.871, the DW value is 0.736, shows that the fit of the model of the whole is better, and there is no spurious regression, regression result is credible.

According to the results of the model, we can get equation between industrial agglomeration and industrial growth:

$$\text{LnY} = -9.856 + 1.140\text{LnK} - 0.140\text{LnL} + 3.430\text{LQ} + \mu \quad (7)$$

Make the derivative of time t to (7), get equation (8), then transform equation (8) to equation (9), and join the random error term, get a equation of computing industry growth rate:

$$=1.140-0.140+3.430 \quad (8)$$

$$=1.140-0.140+ (3.430LQ) +\mu \quad (9)$$

Among them, is industry growth rate; is capital growth rate; is labor growth rate; is the growth rate of industrial agglomeration; μ represents other influence factors of industrial growth.

Equation (9) shows that thrice industrial agglomeration has a positive effect on industrial growth, industrial agglomeration every 1% growth, related industry will grow 6.640 LQ percentage points. The size of the contribution rate is determined by the degree of industrial agglomeration and industrial agglomeration growth rate, the greater degree of agglomeration and growth rate of a year, the greater contribution rate. And the contribution rate of plus or minus is determined by agglomeration growth rate.

The Contribution Rate of Thrice Industrial Agglomeration to Industrial Growth

According to the industry growth rate equation, this paper calculated the contribution rate of the thrice industrial agglomeration to industry growth in Ningxia, calculated result as shown in table 3.

Table 3 The Contribution Rate

	the first industry	the second industry	the third industry
2005	-0.343	-0.462	0.888
2006	0.131	0.149	-0.175
2007	0.037	0.127	-0.135
2008	-0.197	0.077	-0.026
2009	-0.069	-0.032	0.055
2010	0.106	-0.029	0.008
2011	-0.210	0.100	-0.055
2012	-0.083	0.054	-0.018
2013	0.074	0.105	-0.096
average annual contribution	-0.062	0.010	0.050

It can be seen from Table 3, the average annual contribution rate of thrice industrial agglomeration to industry growth in Ningxia are close to zero. the contribution rate of the smallest, is the first industry is -0.062, the biggest contribution of the third industry is only 0.050, and the contribution rate of first industrial is negative, the main cause of this result may be that first industry agglomeration level revealed a certain degree of decline, led to the first industry agglomeration growth in most years are negative state. The contribution rate of second industry and third industry agglomeration to industry growth is positive, but the basic remain stable, shows that the second industry and third industry agglomeration did not play a proper role to industry growth. At the same time, despite the fact that the second industry is specialized departments in Ningxia, the LQ coefficient is greater than the third industry, but the fluctuation of the third industry agglomeration's contribution rate is bigger than the second industry, the corresponding, the average contribution rate of third industry agglomeration to industry growth is greater than the second industry, which proves that, the size of contribution rate of industrial agglomeration to industry growth is not only associated with the degree of agglomeration, is also closely related to the rate of change of agglomeration degree.

In theory, industrial agglomeration has strong promoting effect to industry growth, but in this paper's empirical testing process, found the contribution rate is very small in Ningxia. This showed that thrice industrial agglomeration degree was not significantly enhanced in Ningxia, leading to regional industry correlation effect is bad, not give full play to the industrial agglomeration effect,

the main factor of drive thrice industrial growth in Ningxia is invest a lot of labor and capital factors.

Summary

This paper introduced industrial agglomeration factor to Cobb - Douglas function, constructed an econometric model, and used thrice industrial relevant data in Ningxia during 2004-2013 as an example, calculated the contribution rate of thrice industrial agglomeration to industrial growth. The results showed that there is a positive correlation relationship between industrial agglomeration and industrial growth , industrial agglomeration can promote industrial growth, but the contribution rate is very small, close to zero. This shows that, although the degree of agglomeration is the key factor to affect the contribution rate of industrial agglomeration to industrial growth, but the contribution rate more embodies in the change of the agglomeration degree of growth. Therefore, continuously strengthen the relationship between the economic subject, gradually improve industrial agglomeration degree, is of great significance to promote Ningxia industry growth. Ningxia should be focusing on how to keep the stable increasing on the degree of industrial agglomeration, is more important than the pursuit of a certain years expansion of industrial aggregation degree.

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