

内モンゴル自治区における資源型産業の地域集積に関する空間計量分析

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Spatial Econometric Analysis on Resource-based Industry Agglomeration in Inner Mongolia

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Abstract : With Inner Mongolia as an example, this paper analyzes the dynamic change of the layout of mining and manufacturing enterprises in 1999, 2005 and 2009 and the dynamic effect of resource endowment on industry agglomeration in Inner Mongolia with Geographic Information System (GIS). The Sinofin enterprise data is employed. The conclusions are as follows: First, the spatial agglomeration is positively related with the natural resource endowment. Second, resource endowment also produces positive influence on the manufacturing industry agglomeration in Inner Mongolia, but the effect is lower than the mining industry. Finally, the spatial spillover effect of the extractive industry is not obvious.

Keywords : Industrial agglomeration, GIS, Resource endowment

1. Introduction

Inner Mongolia Autonomous Region is rich in resources. Since 2002, her economic growth took the first place in China continuously, and has made remarkable achievement. The rapid economic growth of Inner Mongolia benefits from the advantaged natural resource endowment.

Inner Mongolia is rich in underground mineral that 120 kinds have been found, and 78 kinds are proved to have reserves. There are 42 kinds of mineral reserves, which are top 10, 22 out the top three, 7 ranks first in China. Especially coal reserves are extremely rich, which accumulative total proven reserves is the second in the whole country. Iron mineral reserves is No. 9,

dozen of nonferrous metal mineral resources proved reserves are in top 10 bits, 4 kinds of non-metallic mineral ranks first and 20 are in the top five in China. There are 128 orefields, and 19 of them are middle, large deposits mainly spreading over Bayannur Langshan-Chaertaishan, Ji'ning-Erenhot railway line, the northeast of Xilin Gol, the northern of Chifeng City and the northern of Hulun Buir. Rare earth resources are richly endowed by nature and enjoy high reputation at home and abroad.¹

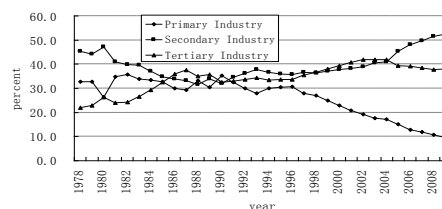


Figure 1 Composition of Gross Domestic Product (%)

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¹ http://www.dahe.cn/xwzx/zt/gnzt/lsnmg/zjcy/t20060725_589288.htm

The 10 years' rapid development of Inner Mongolia benefits from the growing up of resource-based industry. Since 1978, three times changes of industrial structure have happened in Inner Mongolia (see figure 1). As shown in figure 1: Before 1986, the secondary industry had the highest percentage of GDP in autonomous region; after 1999, the proportion of the secondary industry continued to rise, especially since 2005, the proportion of the secondary industry increased rapidly. The gap between primary and tertiary industries widened gradually. This paper focuses on the analysis of extractive and manufacturing industry in the secondary industry.

2. Literature review on resource endowment and industrial agglomeration

The development of industrial agglomeration theory experiences the following three stages.

2.1 The agglomeration based on the consideration of product supply. This school is pioneered by Webber (1929), Marshall (1890) and Hoover (1948). They thought that the position of enterprise depended on cost factor.

2.2 The agglomeration based on the consideration of product requirement. Since 1950s to the beginning of 1980s, there rose market school and industry relevance theory on industry cluster. They argue that industrial layout and site selection should get closer to the market and insist on the profit maximization principle, represented by Lösch (1954) and Isard (1956).

2.3 New industry cluster theory. Since 1980s, especially since the early 1990s, the cluster theory came into a golden period. The main idea include: Italy's new industrial zone theory, Innovation environment theory in Europe, new economic geography theory represented by

Paul Krugman, Porter's New competitive advantage theory and socio-economic network theory represented by Williamson et al.

Domestic scholars introduced the foreign cluster theory (Jun Yue, 2006; Xujuan Kuang, Zulin Shi, 2008), meanwhile, they analyzed the decision factors and features of Chinese industrial clusters (Jici Wang, 2001, 2010),

3. Dynamics agglomeration of natural resource-based enterprises and their integration

The enterprises concentration is determined by the natural resource endowment. The more affluent the natural resources are, the higher the number of enterprises is.

3.1 The location of mining enterprises

We will demonstrate the mining enterprises' location from the numbers, the employment per million output values, the average output value per enterprise, and the average profit of the enterprise. The enterprise cluster will be revealed by county across three years-the years of 1999, 2005 and 2009. See figures from figure 2 to figure 5.

Figure 2 shows us that most banners and counties in Inner Mongolia own the mining enterprises. However, the mining enterprises locate intensively in the areas, such as the banners from Erdos, Baotou and Hulunbeier, which are endowed with rich natural resources. Dynamically, compared to the years of 1999 and 2005, the enterprise numbers grow up greatly. Due to the expanding mining scale and the dedicated assets being employed, fewer labors are needed to produce one million output values, see figure 3.



Figure 2 Enterprise numbers across years

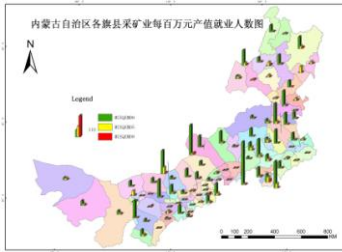


Figure 3 Employment number/million output by county across years

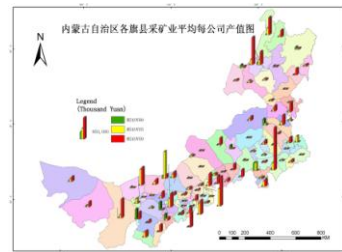


Figure 4 Average output value across years

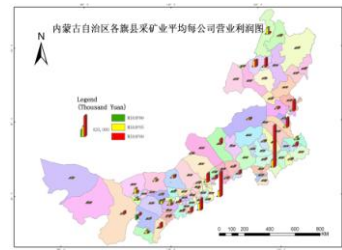


Figure 5 Average profit/enterprise by county across years

Figure 4 and figure 5 tell us that both the average output value per company and the average operating profit per company are increasing across years.

3.2 The location of manufacturing enterprises

We will also demonstrate the manufacturing enterprises' location from the numbers, the employment per million output values, the average output value per

enterprise, and the average profit of the enterprise. The enterprise cluster will be also revealed by county across three years-the years of 1999, 2005 and 2009. See figures from figure 6 to figure 9.

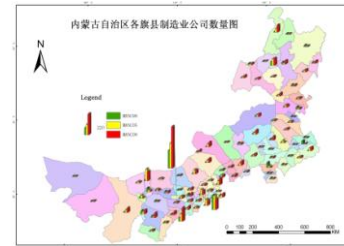


Figure 6 Enterprise numbers across years

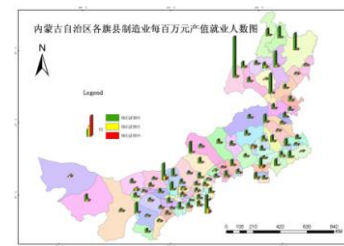


Figure 7 Employment number/million output by county across years

Figure 6 shows us that most banners and counties in Inner Mongolia also own the manufacturing enterprises. Similarly, the manufacturing enterprises locate intensively in the areas, such as the banners from Erdos, Baotou and Hulunbeier, which are endowed with rich natural resources. But differently from the mining enterprise location, especially from the year 2005 to 2009, the growth rate of enterprise numbers is lower than the mining enterprises. Similar with the mining enterprises, fewer labors are needed to produce one million output values, although the magnitude is less than the mining, see figure 7.

Figure 8 tells us that the average output value per company is increasing across years, especially during the period of 1999 and 2005. Figure 9 shows that the average operating profit per company is increasing across years.

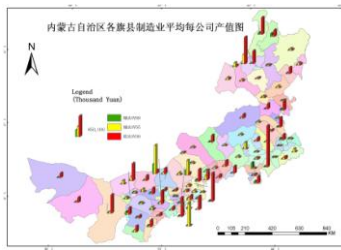


Figure 8 Average output value across years

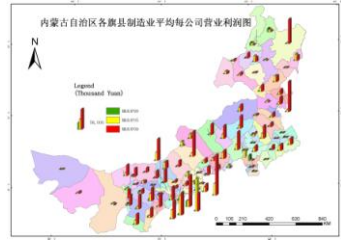


Figure 9 Average profit/enterprise by county across years

3.3 Integration of mining and manufacturing enterprises

By comparing the dynamics of mining and manufacturing enterprises, we conclude that the locations are consistent. This means that both mining enterprises and partial manufacturing enterprises depend on the natural endowment.

4. Results and discussions

Using Sinofin enterprise data, we analyze the dynamic (years of 1999, 2005 and 2009) location of both mining and manufacturing enterprises at the county level. The results are as following.

Firstly, the natural resource endowment helps to promote the economic development in Inner Mongolia.

Secondly, both mining and manufacturing enterprises are located in the resource affluent areas. However, the positive correlation coefficient is higher for the former.

Thirdly, the spatial spillover effect for the mining industry is relatively weak. This means that mining enterprise only has limited effect to booming the regional development.

Fourthly, during the period of 1999 to 2009, the mining and manufacturing enterprise numbers increase greatly. In the meantime, their production efficiency was remarkably improved. As a result, the resource-based industry has only a limited effect on the employment.

This paper demonstrates the spatial location of mining and manufacturing enterprises across time, namely, the years of 1999, 2005 and 2009. It doesn't concern the interaction among different industries. The manufacturing enterprises consist of 40 sub-industries, a further research is definitely required. Due to the inconsistency of the data, the listed companies are excluded in the analysis. All of the problems are to be resolved in our further research.

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