

Spatial analysis of city network characteristics on internet information flow in Beijing-Tianjin-Hebei urban agglomeration, China

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The conventional methods of analyzing city networks are mostly based on the economic or demographic statistics, which are often criticized for data missing and lack of relational data that can indicate the connections between cities. Meanwhile, another upcoming difficulties is how to make a quantitative distinct expression of the strengthened interaction and interdependence between cities with the advent of globalization, information and developed communication network.

In this paper, qualitative and quantitative research are made to study the network relationship between cities through the construction of intercity information flow network under the background of regionalization and the networking information. Internet searching indexes from the main searching engines in China like Baidu's Index, 360's so Index and Sina's Weibo Index are used as a quantitative method to construct the regional urban information flow network, reflecting the exposure rates of selected keyword from most Chinese users on the Internet and visualizing the intercity relationship, and analyze the city network characteristics and influencing factors of one of the three "growth pole" areas in China — "Beijing-Tianjin-Hebei" urban agglomeration, which was preliminarily built up as pilot trenchant since the early period of the Republic of China with clear hierarchy and close links to the business of urban network system and used to be one of the fast-developing regions in the modern history of China's urbanization but now seems to have encountered the bottleneck of economic development comparatively.

The analytical process can be divided into three steps. First, based on the urban information flow, a city network is constructed to analyze the spatial characteristics of Beijing-Tianjin-Hebei urban agglomeration. Second, the urban spatial network hierarchy distribution is conducted to 4 layers by clustering analysis of Natural Breaks(Jenks) in ArcGIS after calculating the Network Attention, the Gross city information and the Relative Attention (Xiong Lifang et al, 2013). Third, based on the grading of city network, a correlation analysis between population, GDP, urban industrial structure and urban information flow is conducted through statistical software(SPSS).

The results of the research are divided into two part on the spatial hierarchy distribution characteristics and the main affecting factors respectively:

First, the hierarchy distribution characteristics of urban network of Beijing-Tianjin-Hebei appear to be “bipolar nucleated”, centripetal, and unbalanced. Meanwhile, the urban population, the economic development, and urban industrial structure have significant impacts on urban network structure. Specifically, the strongest intercity link is exclusively between 2 cities——Beijing and Tianjin——twice more than other cities’, which shapes the form of “bipolar nucleated” and are greatly related with the imbalance of regional economic level and urban network structure. Additionally, the centripetal structure of urban network hierarchy is obvious one-centered with nearly all info-flow directed from other cities to Beijing, which made up a huge information flow volume to the central city. This kind of center-periphery centripetal structure has relatively fewer intercity links, where nearly all the intercity connectivities have to be conducted between cities of different scale through the central city. Comprehensively, the total information flow of central cities are tremendous, the proportion of gross information flow of the 5 cities in the first two layers are up to 64.54%, while the 5 cities in the third layer is 23.56%, and the 4 cities in the fourth layer only 11.79%, which indicates the severe polarization phenomenon of the urban network.

Second, the interaction relationships between cities and formation pattern mechanisms of urban network are both important factors affecting the research of urban network space. The correlation analysis of the information flow data with population, GDP, and industrial structure (proportion of first, second and third

industries) of 13 cities in the Beijing-Tianjin-Hebei region in 2015 shows that the relevance between population, GDP, the city industry structure and information flow is quite significant, while the gross production of the third industry has the most significant correlation with the urban information flow :

1. Population scale and urban network hierarchy are quite anastomosing.
2. In the same period, the more active the economic vitality is, the greater the flow of information will be created by these economic activities, which received more attention and have greater influence, and are more likely to step into a higher level and a more central position of the urban network.
3. The correlation between the tertiary industry GDP and gross urban information flow is most significant.

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