

## Study on the characteristics of regional intergovernmental relationships network, based on the analysis of planning texts

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### Abstract

Many studies have been carried out to measure the complex inter-city networks by using multi-source data. However, few studies have considered the networks of concern that local governments have with each other. In this paper, we use text analysis and social network analysis to mine the texts of government plans of 41 cities in the Yangtze River Delta to construct a network of attention among cities. It is found that the network is characterised by overall polarisation and local flattening, and that the degree of attention to each city is not perfectly correlated with its economic and population size. The study concludes with recommendations for a regional planning platform that removes administrative and institutional barriers.

**Keywords:** regional planning, intergovernmental relations, text analysis, social network analysis, Yangtze River Delta (YRD)

### 1 Introduction

With the development of the region's integration, urban economic and social development is more affected by urban network. Many scholars have conducted research on the urban network in the Yangtze River Delta (YRD) and found that the network has become much closer in recent years. Existing researches mostly focus on the civilian connections between cities by using data such as people migration, investment or traffic flow, which reveals the laws in civilian connections. However, the cooperation and competence between local municipal governments has become more intense, too, there is still a lack of research from a governmental perspective, which hinders the knowledge of local governments' demands and limits the horizon of policy research. Using linkages extracted from planning texts of 41 cities in YRD as research data and social network analysis as research method, this paper aims to find out the pattern and characteristics of intergovernmental network and the elements that influence this situation, and puts forward planning suggestions for the development of regional integration.

### 2 Literature review

#### 2.1 Evolution of the regional urban network in YRD

The YRD megapolitan cluster is a region in China with a high level of economic and social development and a well-developed urban system, comprising three provinces (Jiangsu, Zhejiang and Anhui) and one municipality (Shanghai), with 41 cities, an area of more than 350,000 km<sup>2</sup>, a resident population of more than 230 million, and a total economic volume of 30 trillion yuan (Figure 1). The planning and practical research on the joint development of the YRD can be traced back to the proposal of the Shanghai Economic Zone in 1982, while since then progress has been made in joint cooperation meetings, the establishment of communication mechanisms, and the making of regional plans, etc. The integrated development of the YRD was upgraded to a national strategy in 2018, and the spatial scope was expanded from Shanghai and its neighbouring cities initially to three provinces and one municipality at present, and the release of the new policies in Pudong and Hongqiao in 2021 marked the entry into the new development stage. Overall, the collaborative planning of the YRD has roughly gone through

several stages, including Shanghai leading the neighbouring cities, collaboration at the provincial level, national strategy leading, and opening up of key areas leading.

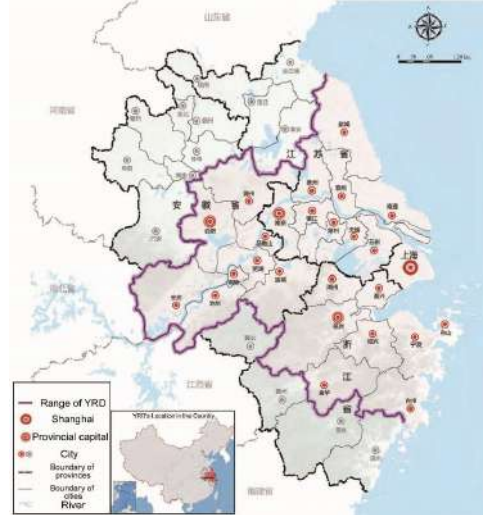


Figure 1 The scope the Yangtze River Delta megapolitan cluster

This process was initially driven by economic factors. With the implementation of fiscal reform policies in the 1990s, the subjectivity of cities in their own development has greatly increased. In terms of controlling and competing for resources, achieving economic stability and growth, and expanding the scale of benefits, local governments have indeed become special ‘quasi-market entities’ (Cen, 2006; Su et al., 2022; Qin et al., 2023), and therefore tend to be more specific and perceptive in the making of planning that involves their own interests, which may show a certain pattern of linkage among the collection of many individual cities. In recent years, inter-city cooperation has further expanded to ecological protection, science and technology, and social governance. Some scholars summarise it as the four stages of ‘preliminary proposal-spontaneous cooperation-integration system construction-national strategy’ (Cui, 2018), and some scholars point out that the two core demands and motivations for the integrated development of the YRD are national strategy and local development (Liu, Wang and Chen, 2020). Therefore, the development of the YRD city cluster is subject to both bottom-up and top-down forces.

In order to measure the development of urban networks in the YRD, many scholars have tried to analyse data from different sources, such as enterprise headquarters-branch data (Yang et al., 2021), intercity investment data (Li et al., 2024), Internet search index data (Li and Xiao, 2022), high-speed rail accessibility (Gao et al., 2019), location-based services (LBS) data (Cui et al., 2020), logistics data (Wang et al., 2018), patent cooperation data (Song and Kim, 2022), and so on. The above studies have used citizens, enterprises, vehicles, and other economically active individuals as research objects, suggesting that the civilian linkages of the YRD megapolitan cluster have formed a more complex multi-layered linkage network. Significant urban network externalities exist between Chinese cities and can influence urban economic growth (Huang, Hong and Ma, 2020; Zhang et al., 2020).

However, not many network studies have been carried out from the perspective of city governments, as data for quantitative studies are difficult to obtain. Compared to micro-actors and macro-regional planning, local governments at the meso-level represent local development aspirations and are more future-oriented, forward-looking and holistic. Local governments practice regional inter-city linkages and collaborative governance in a variety of ways, and this type of interaction among governments is called intergovernmental relationship. Competition and cooperation between local governments will influence the economic development of their cities, and these development intentions will be reflected in planning texts or policy documents that will guide the direction of development for a certain period in the future. It is therefore of value for in-depth research.

## **2.2 Research based on planning textual analysis**

Textual analysis refers to the process of going from the surface of a text to the deeper layers of it in order to discover the deeper meanings that cannot be grasped through ordinary reading. Indeed, a number of studies have used textual analysis of planning texts, for example to assess the quality of planning texts (Brody, 2003; Song, 2015) and to make comparisons between different plans (Du, Lu and Zhang, 2019).

The Five-Year Plan is a policy plan prepared every five years by all levels of government in China, now in its fourteenth five years, for the period 2021-2025, and is comparable in that all cities in China are required to prepare it and the text is similar in length. A city's Five-Year Plan is an important overarching plan that sets out a vision for the city's development over a period of time. A study of the planning texts of several cities reveals a pattern of linkages between the cities' wills. An important part of the five-year plan is the city's strategy for integration into regional development, including the establishment of cooperative links with other cities, making it a good source of data for the study.

## **3 Research methodology and results**

### **3.1 Research data and methods**

This paper uses the 14th Five-Year Plan texts of 41 cities in the YRD as research data, and the source is the government website of each city. The inter-city link data is extracted from the texts using Python. The research methods used are word frequency analysis and social network analysis (SNA). Word frequency statistics refers to counting the number of times a particular word or symbol appears in text or speech data, which is used to discover the regular features of the text content; social network analysis (SNA) is a method to further reveal the social relationships by analysing the network structure of individuals, social organisations and even social events. Specifically, if city B is mentioned N times in the planning text of city A, it is counted as N links from A to B in the link matrix. Thus, the constructed link matrix is directed. Indegree represents the degree to which cities receive attention and outdegree represents the degree to which cities pay attention to other cities. Cities with a high indegree receive more attention, and cities with a high outdegree are more willing to pay attention to other cities.

1,750 links between 41 cities in the YRD are extracted from the texts of their 14th five-year plans (Figure 2). The above link matrix was entered into Gephi to compute linkage network metrics and modularity analysis, and visualised using a geo-layout.



Figure 2 The Connection Network among Cities in YRD Based on the Text of the 14th Five-Year Plan

### 3.2 Whole network analysis

The modularity algorithm in Gephi, which is one of the methods for calculating network topology parameters, is used to divide the nodes into a module with approximate degrees. The results are shown in the figure, where different colours represent different modules, node size represents the degree of frequency of occurrence, and connecting arrows represent the direction of contact (Figure 3). The visualisation results show that core cities are more attractive, with Shanghai, Hefei, Nanjing and Hangzhou having the highest indegrees, all above 100, and the sum of the four cities' indegrees accounting for 65% of all cities, suggesting that even at the local government level, attention to other cities remains polarised. In terms of outdegree, the situation is flat, with the maximum value of 119 for Ma'anshan. Ranking the difference between indegree and outdegree in descending order, as shown in the figure, the cities that are not negative include Shanghai, Hefei, Nanjing, Hangzhou, Ningbo, Lianyungang, Suzhou (JS), Xuzhou, Zhoushan and Wenzhou (Figure 4), indicating that these cities in the Yangtze River Delta do not receive less attention than outward attention, indicating that their development has the characteristics of attracting other cities. It is worth noting that Lianyungang and Zhoushan are not the most prominent cities in terms of economic volume or political status, but after reviewing the planning text, it is found that the main reason for their attention is the harbour, suggesting that their access to the outside world is valued by other cities.

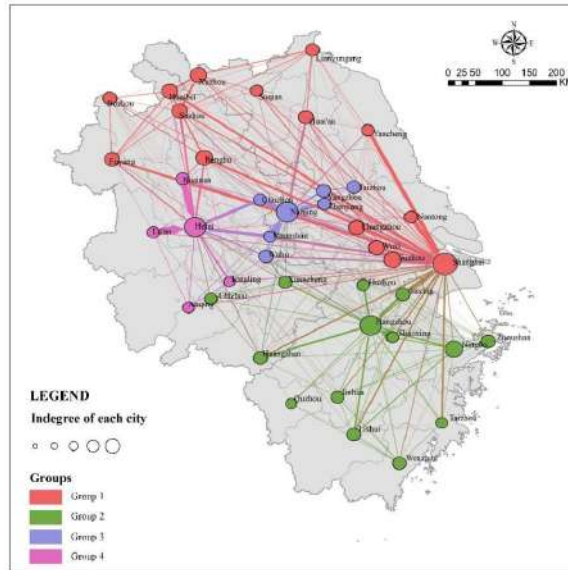


Figure 3 The 4 Groups Found by SNA

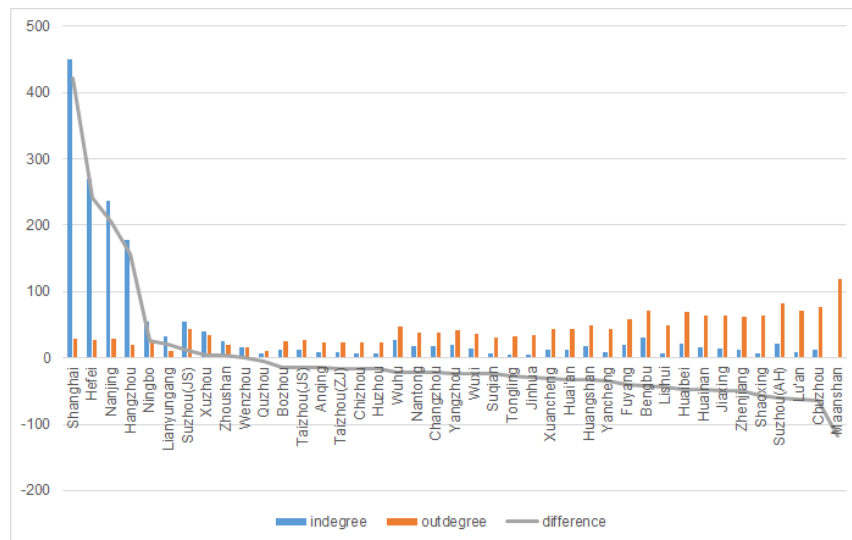


Figure 4 Difference Between Indegree and Outdegree

The results of the modularity algorithm analysis show that the 41 cities are divided into 4 modules: 15 cities led by Shanghai, 7 cities led by Nanjing, 5 cities led by Hefei and 14 cities led by Hangzhou. It can be seen that Shanghai is the core city of the YRD metropolitan cluster, and all the cities mention Shanghai in their plans; Shanghai's sphere of influence covers southern and northern Jiangsu and northern Anhui; Hefei and Nanjing's sphere of influence



the incoming cities are rich in resources and development advantages in terms of science and technology, trade and commerce, high education, transportation, medical care and so on, and the outgoing cities actively dock with them. In the case of incoming cities, the content of docking mainly includes industrial investment, infrastructure, public services and so on.

The innovation of this study lies in the fact that the use of planning texts from local governments in the region to some extent fills the gap in the visualisation of intergovernmental relations, and facilitates the consideration of the willingness of local governments to develop in the formulation of regional planning. The study also explores the factors that influence the formation of the network of linkages, and finds that economic volume is not the only reason for linkages with other cities, providing suggestions for the integrated development of cities in the region.

It is therefore recommended that city governments should be guided by the concept of openness in removing administrative and institutional barriers. The analysis of the planning text concluded that the relationship between cities is a meso-level perspective and that it is necessary to take into account the characteristics of specific cities and think about how they can undertake and integrate macro-strategic arrangements and how to improve synergies in the development of different places, such as the possibility of forming a multi-level regional planning platform based on the linkage of intercity development.

#### **4.2 Outlooks**

However, this study has its limitations. First, urban planning is usually only one aspect of urban development, and the cooperative and competitive relationships between cities are influenced by many factors, such as geographical location, level of economic development and political environment. Therefore, it is difficult to reflect the comprehensive relationship between cities simply by extracting linkages from urban planning texts. Second, extracting linkages through urban planning is also not comprehensive, because cooperative relationships between cities are also carried out through other forms of cooperation agreements, meetings, and so on. Some scholars have also used web crawlers to obtain data, and this study provides a comparable data source and method. In order to analyse the relationships between cities more comprehensively, the introduction of other data and methods for a comprehensive study can be considered in the future, leading to more valuable conclusions.

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