

The Rise of Interlocking Directorates in China: Trends and Implications for Marketization

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ABSTRACT

This research examines interlocking directorates in China, with a specific focus on their geographic distribution and dynamic shifts. The primary objective of this study is to discern between central and peripheral regions within China and investigate how the degree of marketization relates to the significance of a city or province in the interlocking directorate network. The dataset encompasses 31 province-level administrative divisions in China. Over the sample period, there was a marked expansion of the interlocking directorate network in China, characterized by heightened interconnections between various cities and provinces. To differentiate between central and peripheral areas, a status indicator was developed, drawing on network centrality metrics and the aggregate count of public firms in each city or province. Regression findings reveal a direct correlation between centrality metrics and the marketization index of a city or province. This index encompasses factors such as government intervention, product market maturity stages, intermediary and factor market development, non-state-owned enterprise progress, and legal system advancement. With the escalation of marketization in China, there is a corresponding surge in information dissemination and affiliations among business firms.

Keywords: interlocking directorates, firms, centrality, marketization, geographic distribution

INTRODUCTION

Interlocking directorates refer to situations in which a director serves on the boards of two or more corporations simultaneously. These directorates create interpersonal networks that help corporations share resources and information, promote new business opportunities, and increase cohesion among corporate elites. Since the establishment of its two stock exchanges, the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE) in 1990, China's financial markets have experienced fast development. Interlocking directorate networks have also grown rapidly. In recent years, extensive literature has examined issues related to interlocking directorates. Numerous researchers have delved into the impact of interlocking directorates on corporate performance, as evidenced by a plethora of studies (Au et al. 2000; Chen et al. 2022; Farwis & Nazar 2019; Li et al. 2013; Li 2016; Peng et al. 2015; Phan et al. 2003; Teng et al. 2021). Concurrently, others have focused their attention on the structural intricacies and geographic attributes of interlocking directorates (Heemskerk et al. 2013; Kono et al. 1998; O'Hagan et al. 2002; Rice and Sempler 1993; Song et al. 2021). A comprehensive body of literature has explored interlocking directorates across diverse geographical landscapes, including the European Union (Heemskerk 2013; van Veen 2011), Brazil (de Sousa Barros 2021), and Singapore (Ong et al. 2003), among others. Notably, China's rapid economic growth has prompted an upsurge in research focusing on its interlocking directorate networks (Lin et al. 2009; Ren et al. 2009; Tang and Li 2017), thus further enriching the global discourse on this subject.

Tang and Li (2017) thoroughly examine the characteristics of interlocking directorates in China and make comparisons with 12 industrial countries/areas. They discuss density, centrality, clustering coefficient, distance, component, and structural holes in detail. Based on their research, the present paper adds to the literature by exploring the geographic distribution of interlocking directorates in China and their dynamic movements from 2000 to 2012. The sample includes all public companies in China's 31 province-level administrative divisions. To the best of the authors' knowledge, this paper is the first to investigate central and edge areas in China's interlocking directorate networks and provide insights into how the degree of marketization affects a city's/province's importance in the network.

Since 1978, the Chinese government has launched a series of domestic economic reforms. However, household income and degrees of marketization vary largely nationwide. For example, Guangdong Province achieved the highest GDP of \$904 billion and per capita GDP of \$8,569 in 2012, while the least developed province Xizang's GDP and per capita GDP were as low as \$11 billion and \$360, respectively. Under this circumstance, an indicator based on the city's/province's status in the interlocking directorate network is developed to differentiate central and edge areas. The purpose of this study is to examine the relationship between the centrality of cities/provinces in a network and various factors that may influence their centrality status. Specifically, the authors aim to prove that certain cities/provinces in the network will have higher levels of centrality, as measured by their degree, closeness, and betweenness, and that the total number of public firms in each city/province will be positively correlated with its centrality status. The present paper also hypothesizes that the level of marketization, represented by industrial composition, development of factor and product markets, government intervention, and maturity of the legal system will influence the centrality status of cities/provinces.

Overall, this paper contributes to the literature of interlocking directorate networks by providing empirical evidence on the dynamics and geographical characteristics of these networks

in China, and by examining the role of marketization levels in shaping the network centrality of cities/provinces. The findings have implications for understanding the business environment in China, and for developing strategies for firms to access resources and expand their networks.

This paper is structured as follows. Section 1 discusses data and models. Section 2 develops the research hypothesis. Section 3 tests the hypothesis and presents results with discussions. Section 4 concludes.

DATA AND METHODS

The comprehensive information database is drawn from the Guotai Junan Securities, including individual board members and independent directors of all listed companies in China's two stock exchanges (SSE and SZSE) from 2000 to 2012. In the year 2000, China's two stock exchanges had 1108 public companies, a figure that rose to 2,492 by 2012. Between 2000 and 2012, the number of board members concurrently serving on multiple companies' boards surged from 964 to 7,225. The significant surge reflects the rapid growth of the financial market and stock market in China. The sample includes 31 province-level administrative divisions in China, including 22 provinces (Anhui, Fujian, Gansu, Guangdong, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, and Zhejiang), 4 municipalities cities/provinces (Beijing, Tianjin, Shanghai and Chongqing), and 5 autonomous regions (Guangxi, Inner Mongolia, Ningxia, Xizang, and Xinjiang). For simplicity, the present paper categorizes provinces and municipalities as 26 "provinces", and 5 autonomous regions are called "cities". Hong Kong, Macau, and Taiwan are beyond the discussion of this paper.

The present paper aims to achieve three research objectives. First, the authors seek to analyze the dynamic changes in interlocking directorate networks in China from 2000 to 2012. These networks comprise two node sets, namely, directors and companies, which are connected by shared board members.

Second, the present paper aims to evaluate the status of cities/provinces using social network theories and network centrality measurements. It is assumed that cities/provinces play different roles in China's interlocking directorate networks and that their network centrality can be measured using degree, closeness, and betweenness. Degree centrality refers to the number of links between a node and others, while closeness centrality measures the distance between a node and another in the network. Betweenness centrality describes the situation when a node is located between others and can connect or disconnect information diffusion in the network. Some cities/provinces in the network have higher degrees of centrality than others, as measured by their degree, closeness, and betweenness. The total number of public firms in each city/province is also expected to be positively correlated with its centrality status.

A status indicator is defined to involve all these information. This approach incorporates four variables, namely: 1) the number of public firms in the city/province, 2) degree centrality, 3) closeness centrality, and 4) betweenness centrality. Each variable holds equal weight in the analysis.

Status indicator

(The number of public firms in the city/province) × 25% + (degree centrality) × 25% + (closeness centrality) × 25% + (betweenness centrality) × 25%

Third, the regression model is used to examine relationship between centrality measurements and the marketization level of a city/province. The latter is represented by the marketization index that examines maturity of product, intermediary and factor markets, development of non-state-owned enterprises, government intervention, etc. Given the unique characteristics of China's socialist market economy, this paper follows the same methodology as used in Chen et al. (2021), incorporating five factors to build the marketization index.

Marketization index in China:

1. Government-market relationship
2. Development of non-state-owned enterprises
3. Product market development
4. Intermediary and factor market development
5. Market agency and legal system development

Hypothesis

Previous studies by Rice and Sempler (1993) and O'Hagan et al. (2002) have shown that Montreal and Calgary have become regional centers in Eastern and Western Canada, respectively, while Toronto has become a national center among interlocking firms in Canada due to its faster economic growth. In the US, New York City is the first-tier center, followed by Chicago as the second-tier center, and other regional centers as third-tier cities. Their findings show that degrees of marketization, industrial composition, locations of corporate headquarters, and maturity of networks are possible explanations of these phenomena.

The present paper will build on the previous studies to further explore the factors that influence the centrality of cities/provinces in a network. The hypothesis is developed as follows.

H: In China, the status and importance of a city/province in interlocking directorate networks is positively related to its degree of marketization.

RESULTS AND ANALYSIS

Using Pajek and Eviews, the dataset built in Section 1 is utilized to complete the three research objectives presented earlier. Figures 1 and 2 provide visual representations of the geographic characteristics of interlocking directorates in China in 2000 and 2012, respectively. Comparison between the two figures show that interlocking directorates in China have become more prominent with more connections among cities/provinces. Visually, some cities/provinces are more connected to others, as indicated in Figure 1 and Figure 2 (Appendix)

The findings are consistent with the hypothesis that some cities/provinces play more central roles in China's interlocking directorate networks. To further examine the centrality of different cities/provinces, the present paper calculates the degree, closeness, and betweenness centrality measures for each city/province. The results for 31 cities and provinces in China between 2000 and 2012 are presented in Table 1 – Table 3. The degree and closeness centrality measures range from 0 to 1, with 0 indicating no connections to other cities/provinces and 1 indicating connections to all others in the network. Betweenness, ranging from 0 to 1 too, measures the structurally advantaged position of a city/province when it is situated between

others. Generally, cities/provinces with higher centrality measures are considered more central and important in the network as indicated in Table 1, Table 2 and Table 3 (Appendix). All 31 cities/provinces had centrality measures greater than 0, indicating that there were no isolated cities/provinces. In 2012, Guangdong, Zhejiang, and Shanghai were found to be centrally located in interlocks in China with both degree and closeness equal to 1. This suggests that they were connected to all other cities/provinces through interlocking directorates. Beijing, Shandong, and Hebei also had degree and closeness measures that were highly close to 1 in 2012. The degree and closeness centrality measures of cities/provinces in China increased significantly between 2000 and 2012. For example, the degree centrality of Hebei rose from 0.200 in 2000 to 0.967 in 2012, the degree centrality of Zhejiang rose from 0.367 in 2000 to 1.000 in 2012, and the closeness of Henan rose from 0.588 in 2000 to 0.938 in 2012. Most cities/provinces' betweenness centrality decreased between 2000 and 2012, especially for more central ones. For example, the betweenness centrality of Beijing fell from 0.137 in 2000 to 0.010 in 2012, and that of Guangdong fell from 0.113 in 2000 to 0.012 in 2012. This suggests that central cities/provinces had smaller monopoly control over information exchange and that other cities/provinces gained more important status in a more mature network.

The present paper has devised a method for distinguishing between central and edge cities/provinces by utilizing three centrality measurements and analyzing the distribution of corporate headquarters. To achieve this, as stated earlier the authors have created a status indicator which ranks a city/province's level of centrality by considering several factors, such as the number of public firms located in the area, ease of information exchange, distance to other firms, and control over information diffusion.

A city/province is ranked higher with a greater status indicator. Cities/provinces that rank within the top 7 are deemed as central (Tier 1), while those ranked between 8-16 are semi-central (Tier 2). Those in the 17-25 range are considered semi-edge ((Tier 3), and those ranked 25-31 are considered edge (Tier 4). As of 2000, the central cities/provinces were Beijing, Guangdong, Shandong, Jiangsu, Shanghai, Hubei, and Sichuan, as they were at the center of interlocks in China. However, by 2012, Jiangsu and Hubei were replaced by Hebei and Zhejiang and were downgraded to semi-edge provinces. During this time, the rankings of Zhejiang, Hebei, and Guangxi rapidly increased. Detailed results are indicated in Table 4 (Appendix).

The relationship between the government and the market can be measured through various factors, including the level of government intervention, resource allocation by the market, and the size of government. The development of non-state-owned enterprises can be gauged by their total sales revenue, total investment, and number of employees. The level of merchandise market development is represented by the proportion of prices determined by market forces and the degree of local protectionism. The factor market development encompasses various elements, such as the development of financial capital markets, competition in the financial industry, labor mobility, and the degree of foreign direct investment. Finally, market agency and legal system development encompasses a broad range of factors, including intellectual property protection, the number of patent applications and their acceptance, consumer rights protection, and the protection of legal rights and interests of business firms. The marketization index and corresponding ranking for each city/province, along with its corresponding status indicator, are indicated in Table 5 (Appendix),

Regression results:

	Degree Centrality	Closeness Centrality	Betweenness Centrality	Central/edge Ranking
Marketization Index	0.06953*	0.0555*	0.0036*	-2.5796*
C	0.06178	0.26247*	-0.012	34.9309*
R-square	0.409	0.4556	0.1341	0.3357

*: significant at 1% level

The regression results indicate a significant positive correlation between the marketization index and the centrality measurements, including degree, closeness, and betweenness. This suggests that as China's degree of marketization increases, so does information diffusion and connections among business firms. Moreover, the significant negative correlation between the marketization index and the central/edge ranking suggests that cities/provinces with greater degrees of marketization are more central.

CONCLUSION

Interlocking directorate networks refer to two-mode networks that connect corporations through their shared board members. By applying social network theories, the present paper has classified 31 cities and provinces in China into central, semi-central, semi-edge, or edge areas in interlocking directorates, using a status indicator developed in this study. The findings reveal that regions with higher levels of marketization tend to be more central in the network. Between 2000 and 2012, two central provinces transitioned to semi-edge provinces, which aligns with their decreasing marketization. This research has practical implications for policy-making groups at various levels in China to understand the relationship between the development of different factors such as factors and merchandise markets, legal systems, and non-state-owned enterprises and the relative importance of a city or province in the national interlocking directorate networks. However, this research has some limitations that provide opportunities for future studies. For instance, it would be beneficial to expand this research to more recent periods.

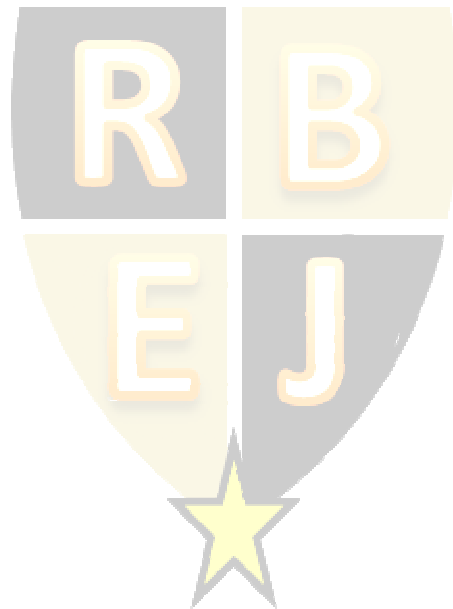
For future research, the authors are also interested in investigating the effect of political connections on the network centrality of cities/provinces. It is well-known that political connections are important for businesses to obtain resources, secure contracts, and avoid regulatory barriers. Therefore, it is reasonable to assume that politically connected cities/provinces have an advantage in the interlocking directorate networks. We will measure political connections by the number of high-ranking government officials who are also board members of public firms in each city/province.

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APPENDIX

Figure 1

City/province-based interlocking directorate network in China (2000)

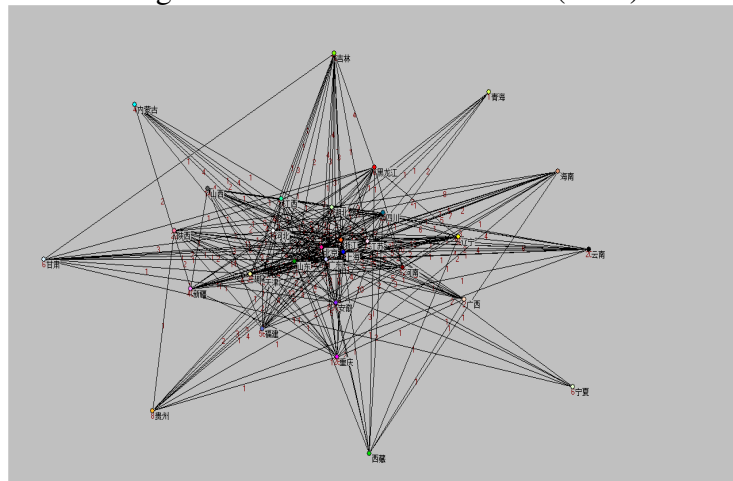


Figure 2

City/province-based interlocking directorate network in China (2012)

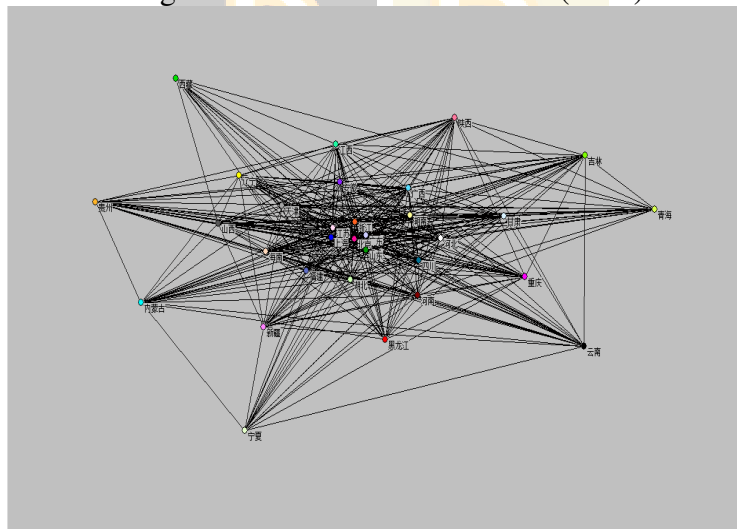


Table 1

Degree centrality

Province/City	Year												
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Beijing	0.8	0.9	0.9	0.967	0.967	0.933	0.933	1	0.967	0.967	0.967	1	0.967
Guangdong	0.8	0.767	0.9	0.933	0.9	0.9	0.9	0.967	1	0.867	0.933	0.9	1
Zhejiang	0.367	0.467	0.767	0.833	0.867	0.833	0.9	0.9	0.867	0.8	0.833	0.967	1
Shandong	0.567	0.7	0.767	0.833	0.867	0.933	0.933	0.9	0.867	0.9	0.9	0.833	0.967
Shanghai	0.767	0.9	0.9	0.9	0.9	0.867	0.933	0.867	0.9	0.867	0.9	0.833	1
Jiangsu	0.6	0.567	0.633	0.7	0.733	0.8	0.9	0.8	0.867	0.733	0.833	0.933	0.933
Hubei	0.567	0.5	0.733	0.733	0.867	0.7	0.733	0.667	0.7	0.7	0.867	0.9	0.9
Sichuan	0.5	0.6	0.733	0.867	0.867	0.8	0.767	0.667	0.7	0.667	0.733	0.767	0.933
Hebei	0.2	0.233	0.6	0.567	0.633	0.667	0.7	0.7	0.667	0.7	0.8	0.833	0.967
Hunan	0.333	0.4	0.567	0.667	0.7	0.667	0.7	0.633	0.633	0.467	0.567	0.8	0.9
Anhui	0.267	0.5	0.733	0.667	0.7	0.733	0.767	0.533	0.567	0.633	0.6	0.633	0.8
Tianjin	0.267	0.3	0.5	0.533	0.467	0.567	0.6	0.6	0.567	0.6	0.567	0.5	0.8
Henan	0.3	0.3	0.567	0.633	0.667	0.7	0.633	0.567	0.567	0.733	0.767	0.833	0.933
Chongqing	0.367	0.3	0.6	0.8	0.767	0.633	0.767	0.567	0.467	0.633	0.633	0.7	0.733
Jiangxi	0.167	0.167	0.233	0.567	0.433	0.433	0.533	0.6	0.6	0.6	0.633	0.6	0.8
Shaanxi	0.367	0.333	0.4	0.5	0.467	0.433	0.433	0.5	0.467	0.433	0.6	0.733	0.867
Liaoning	0.4	0.633	0.6	0.6	0.567	0.533	0.6	0.5	0.5	0.433	0.6	0.567	0.867
Fujian	0.333	0.6	0.467	0.567	0.667	0.567	0.5	0.5	0.567	0.567	0.633	0.667	0.767
Xinjiang	0.367	0.467	0.533	0.633	0.733	0.6	0.567	0.5	0.5	0.433	0.467	0.4	0.767
Heilongjiang	0.3	0.467	0.5	0.5	0.5	0.5	0.433	0.5	0.433	0.4	0.5	0.533	0.7
Jilin	0.4	0.533	0.733	0.633	0.8	0.567	0.633	0.5	0.6	0.433	0.667	0.567	0.767
Shanxi	0.433	0.4	0.6	0.6	0.567	0.467	0.633	0.467	0.533	0.667	0.567	0.567	0.867
Hainan	0.367	0.467	0.433	0.5	0.5	0.467	0.5	0.433	0.667	0.667	0.633	0.467	0.8
Yunnan	0.333	0.333	0.367	0.533	0.6	0.533	0.533	0.433	0.533	0.533	0.6	0.5	0.767
Gansu	0.133	0.133	0.3	0.3	0.333	0.3	0.4	0.367	0.3	0.4	0.4	0.533	0.733
Guangxi	0.267	0.233	0.5	0.433	0.5	0.5	0.5	0.333	0.6	0.667	0.633	0.567	0.9
Guizhou	0.167	0.067	0.233	0.233	0.333	0.433	0.467	0.333	0.433	0.3	0.533	0.4	0.7
Xizang	0.267	0.167	0.167	0.233	0.2	0.167	0.267	0.3	0.2	0.1	0.367	0.367	0.467
Inner Mongolia	0.2	0.333	0.433	0.467	0.5	0.433	0.433	0.267	0.2	0.367	0.367	0.5	0.7
Qinghai	0.167	0.167	0.133	0.2	0.1	0.1	0.233	0.2	0.233	0.2	0.233	0.367	0.6
Ningxia	0.367	0.333	0.467	0.2	0.233	0.1	0.1	0.167	0.367	0.4	0.467	0.433	0.567



Table 2

Closeness centrality

Year Province/City	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Beijing	0.789	0.857	0.909	0.968	0.968	0.938	0.938	1	0.968	0.967	0.968	1	0.968
Guangdong	0.789	0.769	0.909	0.938	0.909	0.909	0.909	0.968	1	0.867	0.938	0.909	1
Zhejiang	0.577	0.625	0.811	0.857	0.882	0.857	0.909	0.909	0.882	0.8	0.857	0.968	1
Shandong	0.652	0.732	0.811	0.857	0.882	0.938	0.938	0.909	0.882	0.9	0.909	0.857	0.968
Shanghai	0.769	0.857	0.909	0.909	0.909	0.882	0.938	0.882	0.909	0.867	0.909	0.857	1
Jiangsu	0.682	0.667	0.732	0.769	0.789	0.833	0.909	0.833	0.882	0.733	0.857	0.938	0.938
Hubei	0.667	0.638	0.789	0.789	0.882	0.769	0.789	0.75	0.769	0.7	0.882	0.909	0.909
Sichuan	0.638	0.682	0.789	0.882	0.882	0.833	0.811	0.75	0.769	0.667	0.789	0.811	0.938
Hebei	0.545	0.545	0.714	0.698	0.732	0.75	0.769	0.769	0.75	0.7	0.833	0.857	0.968
Hunan	0.577	0.6	0.698	0.75	0.769	0.75	0.769	0.732	0.732	0.467	0.698	0.833	0.909
Anhui	0.545	0.638	0.789	0.75	0.769	0.789	0.811	0.682	0.698	0.633	0.714	0.732	0.833
Tianjin	0.536	0.566	0.667	0.682	0.652	0.698	0.714	0.714	0.698	0.6	0.698	0.667	0.833
Henan	0.588	0.588	0.698	0.732	0.75	0.769	0.732	0.698	0.698	0.733	0.811	0.857	0.938
Chongqing	0.566	0.545	0.714	0.833	0.811	0.732	0.811	0.698	0.652	0.633	0.732	0.769	0.789
Jiangxi	0.536	0.526	0.556	0.698	0.638	0.638	0.682	0.714	0.714	0.6	0.732	0.714	0.833
Shaanxi	0.588	0.577	0.625	0.667	0.652	0.638	0.638	0.667	0.652	0.433	0.714	0.789	0.882
Liaoning	0.6	0.698	0.714	0.714	0.698	0.682	0.714	0.667	0.667	0.433	0.714	0.698	0.882
Fujian	0.556	0.682	0.652	0.698	0.75	0.698	0.667	0.667	0.698	0.567	0.732	0.75	0.811
Xinjiang	0.577	0.625	0.682	0.732	0.789	0.714	0.698	0.667	0.667	0.433	0.652	0.625	0.811
Heilongjiang	0.545	0.625	0.667	0.667	0.667	0.667	0.638	0.667	0.638	0.4	0.667	0.682	0.769
Jilin	0.588	0.652	0.789	0.732	0.833	0.698	0.732	0.667	0.714	0.433	0.75	0.698	0.811
Shanxi	0.612	0.588	0.714	0.714	0.698	0.652	0.732	0.652	0.682	0.667	0.698	0.698	0.882
Hainan	0.577	0.625	0.638	0.667	0.667	0.652	0.667	0.638	0.75	0.667	0.732	0.652	0.833
Yunnan	0.6	0.577	0.6	0.682	0.714	0.682	0.682	0.638	0.682	0.533	0.714	0.667	0.811
Gansu	0.5	0.517	0.588	0.588	0.6	0.588	0.625	0.612	0.588	0.4	0.625	0.682	0.789
Guangxi	0.536	0.517	0.667	0.638	0.667	0.667	0.667	0.6	0.714	0.667	0.732	0.698	0.909
Guizhou	0.545	0.448	0.566	0.566	0.6	0.638	0.652	0.6	0.638	0.3	0.682	0.625	0.769
Xizang	0.526	0.508	0.545	0.566	0.556	0.545	0.577	0.588	0.556	0.1	0.612	0.612	0.652
Inner Mongolia	0.526	0.556	0.638	0.652	0.667	0.638	0.638	0.577	0.556	0.367	0.612	0.667	0.769
Qinghai	0.435	0.476	0.517	0.556	0.526	0.517	0.556	0.556	0.566	0.2	0.566	0.612	0.714
Ningxia	0.588	0.566	0.652	0.556	0.566	0.517	0.517	0.545	0.612	0.4	0.652	0.638	0.698

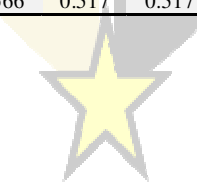


Table 3

Betweenness centrality

Province/City	Year												
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Beijing	0.137	0.137	0.041	0.057	0.046	0.06	0.054	0.08	0.056	0.094	0.034	0.04	0.01
Guangdong	0.113	0.078	0.05	0.043	0.032	0.039	0.029	0.064	0.07	0.043	0.038	0.027	0.012
Zhejiang	0.001	0.004	0.019	0.02	0.023	0.02	0.035	0.044	0.03	0.024	0.025	0.034	0.012
Shandong	0.046	0.042	0.03	0.036	0.031	0.06	0.054	0.04	0.031	0.033	0.026	0.018	0.01
Shanghai	0.116	0.117	0.06	0.051	0.056	0.048	0.034	0.035	0.035	0.03	0.024	0.021	0.012
Jiangsu	0.043	0.032	0.013	0.009	0.009	0.021	0.03	0.034	0.037	0.015	0.016	0.028	0.007
Hubei	0.035	0.026	0.024	0.017	0.024	0.014	0.012	0.021	0.013	0.018	0.024	0.029	0.008
Sichuan	0.015	0.015	0.042	0.043	0.047	0.044	0.021	0.013	0.018	0.008	0.013	0.015	0.009
Hebei	0.005	0.006	0.006	0.005	0.005	0.009	0.013	0.016	0.018	0.019	0.016	0.022	0.011
Hunan	0.004	0.006	0.006	0.007	0.009	0.009	0.009	0.015	0.013	0.004	0.011	0.017	0.007
Anhui	0.003	0.024	0.026	0.008	0.009	0.016	0.019	0.01	0.009	0.017	0.006	0.004	0.003
Tianjin	0.002	0	0.005	0.005	0.002	0.006	0.011	0.013	0.009	0.011	0.006	0.003	0.006
Henan	0.015	0.005	0.012	0.012	0.013	0.011	0.005	0.009	0.006	0.019	0.012	0.019	0.008
Chongqing	0.014	0.007	0.032	0.035	0.029	0.027	0.021	0.012	0.003	0.011	0.009	0.012	0.003
Jiangxi	0.002	0.002	0	0.006	0.002	0.002	0.003	0.008	0.006	0.017	0.015	0.005	0.005
Shaanxi	0.031	0.001	0.003	0.003	0.001	0.002	0.001	0.01	0.005	0.005	0.012	0.014	0.006
Liaoning	0.011	0.045	0.022	0.011	0.003	0.002	0.008	0.005	0.009	0.003	0.008	0.006	0.006
Fujian	0.01	0.028	0.007	0.003	0.008	0.005	0.002	0.004	0.005	0.008	0.011	0.01	0.007
Xinjiang	0.014	0.024	0.006	0.008	0.009	0.006	0.004	0.005	0.008	0.004	0.003	0.003	0.004
Heilongjiang	0.004	0.015	0.006	0.008	0.006	0.015	0.012	0.009	0.007	0.014	0.004	0.005	0.003
Jilin	0.007	0.015	0.022	0.015	0.024	0.009	0.01	0.004	0.01	0.004	0.008	0.002	0.003
Shanxi	0.041	0.012	0.022	0.008	0.006	0.005	0.007	0.004	0.008	0.012	0.007	0.006	0.007
Hainan	0.028	0.043	0.016	0.012	0.007	0.006	0.005	0.005	0.01	0.009	0.008	0.001	0.004
Yunnan	0.015	0.001	0.002	0.006	0.007	0.006	0.004	0.003	0.005	0.004	0.007	0.004	0.004
Gansu	0	0.002	0.001	0.001	0.001	0.001	0.002	0.005	0.002	0.003	0.003	0.008	0.004
Guangxi	0.007	0.002	0.007	0.004	0.005	0.006	0.006	0.002	0.012	0.012	0.01	0.004	0.005
Guizhou	0.003	0	0.001	0	0.001	0.002	0.003	0.002	0.003	0.001	0.005	0.002	0.003
Xizang	0.007	0	0	0.001	0	0	0.001	0.002	0.001	0.001	0.005	0.003	0.001
Inner Mongolia	0.002	0.003	0.003	0.002	0.001	0.002	0.002	0	0	0	0.003	0.004	0.003
Qinghai	0.002	0.002	0.001	0.001	0	0	0	0	0.001	0.005	0.002	0.002	0.003
Ningxia	0.031	0.016	0.005	0	0	0	0	0.001	0.007	0.01	0.013	0.004	0.001

Table 4

Status indicator and tiers

Table with columns for Year (2000-2012) and rows for various provinces/cities (Beijing, Guangdong, Zhejiang, etc.), showing indicator and tier values for each year.

*: It is the indicator to identify central and edge cities/provinces.

** : The tier represents the status of a city/province. For example, tier 1 includes the most important cities/provinces, and tier 4 includes the most distant cities/provinces in the interlocking directorate network.

Table 5

Marketization index and rankings

Table with columns for Year (2000-2009) and rows for various provinces/cities (Beijing, Guangdong, Zhejiang, etc.), showing marketization index and ranking values for each year.

*: It is the marketization index.

** : It is the ranking of cities/provinces according to their marketization degree. Number 1 is the city/province with the highest degree of marketization.

***: It is the ranking of cities/provinces according to their central/edge indicator. Number 1 is the most central city/province in the interlocking directorate network.