

# Intergovernmental Relations Based on Bibliometrics of Policy: a Case Study of Zhongguancun National Innovation Demonstration Zone

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## Abstract

Increasingly complex public affairs gradually changes the traditional relationship between governments, that makes cooperation across different departments and levels become a development trend. This paper uses the bibliometrics of policy method to research the intergovernmental relations in Zhongguancun national innovation demonstration zone. The authors tried to combine policy cooperation network and policy reference network to present the intergovernmental relations on the zone. First, mapped the cooperation network of Zhongguancun policy-marking agencies in 2009-2015 to identify the core network nodes, and discussed the evolution of function of the core agencies in policy cooperation. At the same time, took the policy reference network as a supplementary to further analysis the reference relationship among core policy-making agencies. The results show that: jointly issued policy is the main form for vast majority of departments participating in the Zhongguancun governance which relatively fixed partners, however cross-level cooperation is less; administrative levels and functional fields of government departments can affect their function and the way how to work in the policy system. This research provides a new perspective of intergovernmental relations in regional development, and lets these relations more visual and findable.

**Keywords:** Intergovernmental Relations; Bibliometrics of Policy; Zhongguancun National Innovation Demonstration Zone; Policy-making agency

## 1. Introduction

The concept of international relations first appeared under United States federal system framework in the 1930s, which was proposed in response to the requirements of cross-regional public affairs cooperation among local self-governments (Zhang, 2009). Thereafter, other types of political system countries also continuously exposed public affairs which were difficult to deal with by a single or one level government department. That makes the cross-sectoral cooperation between the multi-sectoral developments become the development trend of modern public administration, and the intergovernmental relations is becoming more and more important (Sun, 2011). Since reform and opening, china's public affairs are increasingly complex, and the intergovernmental relations have undergone profound changes. In addition to the traditional power relations, across-level and cross-regional cooperations of government departments are becoming more and more frequent, including coordination between higher and lower governments and governments at the same level (Zhang and Bian, 2013). Intergovernment relations are usually embodied in the formulation and implementation of policy within the government system (Yang, 2015). When the boundaries of public affairs become increasingly blurred, government departments often need to take the form of a policy jointly issued to achieve better management results (Yang, 2015). The published policy documents reflects policy thinking and behavior imprints of policy-marking agencies in dealing with public affairs, and can show the policy process objectively and systematically (Huang and Zhang, 2015). It is an important basis for the visualization and the traceability of government behavior (Huang and Zhang, 2015). Therefore, the study of policy documents is an effective channel for understating intergovernmental relations.

The existing researches about the relationships between governments through policy study mainly from the following aspects: (1) Policy network theory as the representative, focus on interest game and coordination partnerships among policy stakeholders in the process of policy making, which generally takes a specific policy as an example, throughout the whole process from the policy issues to implementation (Suo et al., 2013). (2) Analysis the content of policy document, and formulate relevant measures indicators to quantificat it. After statisticising the core departments in policies, these studies expressed the synergy of policy-marking agencies as the ratio of policies issued individually and policies issued jointly, and found that the departments which promulgated the policy had already changed from single department to departmental union (Peng et al., 2008).

(3) Some studies used the network of policy-marking agencies in a certain field to reflect the cooperation relationship: Take the policy-marking agencies as the nodes, the joint policies as the connection, to draw the cooperation network chart, then measure and find core policy-marking agencies (Liu and Xu, 2012; Zhu and Cheng, 2014). These studies have confirmed the feasibility of the intergovernmental relations through policy research, from the beginning qualitative analysis to the subsequent large-scale quantitative analysis, and provide a theoretical framework for this paper. However, their main researches are based on a policy or policies in a particular field, and more inclined to policy itself. Now the china's economic development is frequently based on a particular region, and intergovernmental relations are very different in different areas. Therefore, on one hand this article mainly emphasize the study of inter-governmental relations, which examines the relations based on the policy-marking agencies; on the other hand, we will focus on the area, researching the network of inter-governmental relations in one region, in order to make up for theoretical deficiencies.

The national independent innovation demonstration zone is the importance region for policy experimentation to promote the ability of independent innovation and develop high technology industries (Xiong and Wei, 2016). With gradually rising of its amount and scale, it becomes an important way for China's innovation and regional development. Different from the traditional administrative and economic functional areas, its goal the development of science and technology innovation is more complicated, and requires the cooperation between different departments. In addition, crossing the administrative areas leads to the inter-departmental and cross-level cooperation more common. Zhongguancun national innovation demonstration zone ("Zhuangguancun zone", or "Z-Park") as the first independent innovation demonstration zone, is formed a more systematic pilot policy system, and attempts to establish a joint governance mechanism for cross-level and multi-department cooperation through setting up the zhongguancun innovation platforms. Its regional governments relations are not only representative, but also play an exemplary role of other innovation demonstration zones. So this paper selects Zhongguancun demonstration zone as the research object, using the bibliometrics of policy method to excavate the characteristics of intergovernmental relation network in it: what are the departments cooperate? And how do they collaborate? Then in order to offer new ideas for the study of regional intergovernmental relations, further to provides the reference significance for the development of national independent innovation demonstration zone.

## 2. Methods and materials

### 2.1 Research Methods

Bibliometrics of policy is a research method that migrates and innovates bibliometrics to policy documents analysis, which feasibility has been proved by scholars (Huang et al., 2015; Huang et al., 2014). Through the quantitative analysis of the structure of the policy documents, this method can reveal the theme content and development thread of the policy, the cooperation model of the policy subject and the structure and evolution of the policy system (Li et al., 2015). Bibliometrics of policy usually uses the social network analysis method to depict the policy cooperation relationship and the reference relations, to discover the role, the administrative influence and the network structure of the policy-marking agencies in the policy system, which provides a new perspective and framework for the research of intergovernmental relations.

Social network analysis is a quantitative research method for the social actors and their relations in the social network (Burt et al., 2013). It mainly includes "relational dimension" and "structural dimensions" two research orientations: the former pays attention to the distribution and change of the relationship among the actors; the latter focuses on the analyzing of the characteristics of the actors and their interrelationships (Shao et al., 2009). Social network analysis method usually regards actors as the nodes, and the connection between the nodes indicates the relation between the actors. The various relational structures are visualized by drawing the network diagram, and the quantitative relationship between nodes are reflected through density, centrality, degree distribution, clustering coefficient and other indexes (Li and Zhu, 2008).

This paper uses social network analysis method to analyze the cooperation network of policy-marking agencies as well as policy reference network of Zhongguancun demonstration zone. In the study of the policy-marking cooperation network, we take policy promulgated unit as a node, and the policy issued jointly between the units as the connection between the nodes, to show the existence of the collaboration relationship between the units; in the analysis of the policy-marking agencies reference relationship network, we regard a single policy as a node, the connection between the nodes indicates that there is a reference relations between two policies, then based on that relations to analyze the policy-marking agencies in the polices.

### 2.2 Data sources and processing

In this paper, the policy document data is limited to the policies of zhongguancun independent innovation

demonstration zone. It is obtained mainly through the following three steps: firstly, collect the policy documents including national, provincial and municipal level as well as demonstration area level policies in 2009-2015 from the official website of Z-Park; secondly, according to the contents of preliminary policy documents, search the reference policies and ineffective policies which are mentioned but not in the official website to supplement the preliminary policy data; thirdly, on the basis of the above two steps, list the policy documents directory, and sent a letter to the Zhongguancun Science Park Administrative Committee (AC Z-Park) to further confirm and supplement the policy directory. Accordingly, the policy document database of 144 effective documents from Z-Park is formed. This database includes the policy document title, number, promulgated time, valid period, policy-marking agencies, reference policies, and the full text.

Number the policies in the database, and extract policy-marking agencies, then standardize the name of policy-marking agencies to get each policy ID corresponding to the policy subject. After the statistics, there are 55 government agencies involved in the policies of Z-Park including the State Council (SC), the Ministry of Science and Technology (MOST), the Ministry of Finance (MOF), the Beijing Municipal People's Government (BJ GOV) and AC Z-Park, etc. According to existing research method to express the collaboration among policy-marking agencies (Zhong et al., 2009), we get a matrix of collaboration about Z-Park all the year and seven annual matrices of that from 2009 to 2015. The diagonal of matrices shows the number of policies issued by the corresponding department alone; the upper and lower triangular element represents the number of policies jointly issued by the two departments. Refer to the associated words of reference in policy documents to get all reference relations (Huang and Ren, 2015), and delete policies not in the policy database of Z-Park, then on this basis build a matrix of the reference relationship between sample policies. Since the reference relationship is a directivity relationship, therefore only the lower triangular element data is retained in the reference relation matrix. The matrix formed at this stage will be used as the original data of social network analysis to analyze the network structure and characteristics of Zhongguancun intergovernmental relationship network through ucinet 6.0 software.

### 3. Intergovernmental network of Z-Park based on policy cooperation

#### 3.1 Cooperation network diagram

Through visualization software, the map of intergovernmental cooperation network was drawn basing on the overall policy cooperation matrix of 2009 to 2015 as shown in figure 1. The larger the network node is in the map, the more cooperation relations with other departments it has. The thicker the connection is, the greater the frequency of the joint publication policy would be at the two ends of the line.

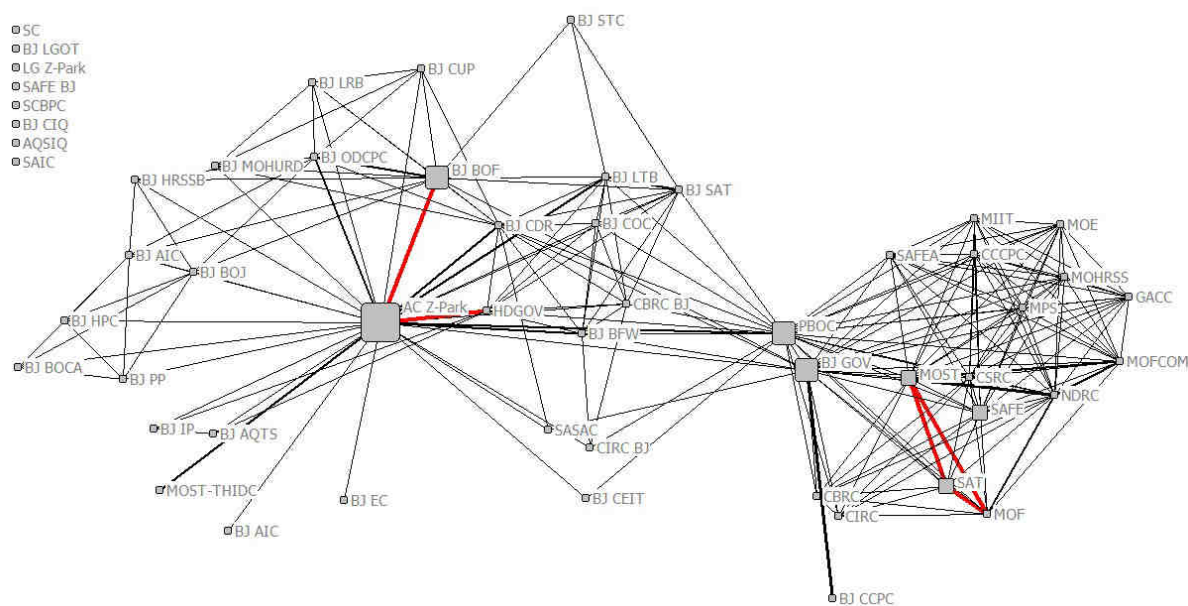


Figure 1. Policy Cooperation Network Diagram of Z-Park

Zhongguancun zone has formed a the governance network of national, provincial and municipal level as well as

the demonstration area level. And there are many departments in different fields joining in the cooperation, but across-level policy making is still not much. In fig. 1, it can be clearly seen that only eight departments such as SC and State Administration for Industry and Commerce (SAIC) are always as a separate policy-marker at the edge of the network among the 55 policy-marking agencies of Z-Park; Most of the other departments exercise their own responsibilities within the scope and power through jointly policy making with others, which verifies the conclusion of existing research on the Z-Park governance. Among them, AC Z-Park, BJ GOV, MOF, the State Administration of Taxation (SAT), National Development and Reform Commission (NDRC) and Ministry of Science and Technology (MOST) of the nodes are relatively large. They are the core agencies of policy cooperation in Z-Park. In the policy cooperation network, two levels of the state ministries and the Beijing municipal government sectors are parently formed. The BJ GOV and the People's Bank of China (PBOC) are the connection point connecting the two levels of departments. At the state level, the nodes of the MOF, SAT and MOST are largest, and the connection lines among them are thickest. It indicates that there are more frequent cooperations among the three agencies, and national level policies of Zhongguancun zone mainly comes from them. At the municipal level, AC Z-Park is the core network node.

### 3.2 Evolution of Cooperative Network Structure

In order to more clearly understand the evolution of intergovernmental relations in the Z-Park, this paper measures the network structure indicators based on the above network map and further analyzes the annual policy cooperation networks and their changes. The main network structure indicators of annual network maps are as shown in table 1. In tab 1, the number of sample and the size of network indicate respectively the total number of policies and the total number of policy-making agencies; the number of network relations and the frequency of network connection indicate how many kinds of policy cooperation relations among 55 agencies and the sum of the relations of them; the network density is that the total number of actual relationships divide by the theoretic maximum number of possible relationships in the network, to denote the degree of network looseness (Liu, 2009). The larger the density is, the closer the network will be.

Table 1. Annual policy cooperation network structure characteristics

	2009	2010	2011	2012	2013	2014	2015
number of sample	8	12	34	30	17	21	22
size of network	5	14	25	28	7	17	11
number of network relations	1	30	129	97	4	34	15
frequency of network connection	2	35	144	97	7	39	19
network density	0.20	0.38	0.48	0.26	0.33	0.28	0.35

In 2009, Z-Park has just approved to build demonstration zone. There are four of the eight policies issued by the SC and BJ GOV, which are fundamental policy for the construction of the innovation demonstration zone. This stage is the initial construction of Zhongguancun demonstration zone. Only five departments involved in the policies of Z-Park, with almost no joint policy marking. The entire network is in a very loose state. In 2010, in order to promote the construction of the Zhongguancun demonstration zone, the state has continuously enacted many preferential policies such as "R&D costs deduction", "employee education pre-tax deduction", "equity and dividend incentive" and etc.. Then the Beijing authorities also formulated the "zhongguancun demonstration zone management regulations" and other policies of supporting implementation including the budget management and talent introduction. As a result, the number of policy samples in this year has increased, and the number of involving government departments has been expanded to 14; the number of network relations, frequency of connections and network density have increased significantly. Z-Park formed a sub-network linked by the SAT, MOST and MOF and a local level sub-network with the core of AC Z-Park. But the national level and local level departments did not have related at this stage.

In 2011 zhongguancun setted up a innovation platforms and inter-ministerial coordination group to deal with special things in special ways and connect the departments across the level for joint examination and approval. This year relevant ministries issued six importance policies about disposition right and usufruct of S&T achievements, tax pilot of innovation and entrepreneurship, equity incentive, management of the scientific research project funds, the recognition of hi-tech enterprises and the construction of the national over-the-counter market, to promote the overall construction of the Z-Park. Therefore the policy samples in this year reached 34, which involved 25 departments. The network number and the connection requency are highest, and network

density reached 0.48. It indicates that policy output in this year is larger, and many of them are jointly issued by departments. The network structure of relationship among government departments are close. But in 2012 under the framework of national policy "1+6", Z-park polices are more specific and executive polices. So although there are many policies and departments involved, the relation number, connection frequency and network density are smaller. On the basis of the innovation platform, Z-park gradually presented the cross-level policy making network. These two years are the mature stage of Zhongguancun demonstration zone policy framework. Cooperation relations among governments are frequent.

With the continuous development of the Z-Park, the preliminary basic framework of policies can not completely cover the development of the demonstration zone. In addition, the pilot period of original pilot policy are nearly expired. Therefore, on the basis of the existing policies, national level government departments again issued a series of policies called "new four" and "new new four" in 2013-2015, to supplement or continue the existing policy framework. Beijing municipal level and demonstration zone itself also marked some policies around national ministries, to further enrich and perfect them. Affected by the policy cycle, in thees three years, the number of samples, the network size, relation number and the frequency of connection are decreased compared with the prior year, but the network density is not reduced to a great extent. This shows that the structure of the policy cooperation relation network at this stage are relatively stable; most of the government departments are still through the policies of joint publication participating in Zhongguancun governance, and mainly give priority to the Beijing municipal and Z-Park anciecies.

### 3.3 Analysis of node Centrality

Node centricty is a quantitative analysis of the individual power in the network, to express how a node is in the network of relations and what kind of power it has. According to different calculation criteria, centricty includes three types:degree centricty, betweenness centricty and closeness centricty. Degree centricty of a node is divided into absolute centricty and relative centricty. The former refers to the number of nodes directly connected with it, while the latter is its standardized form. The higher the value is, the stronger the degree centricty will be. For policy-making agencies, it indicators the number of other agencies that are jointly issuing policies with them. Betweenness centricty of a node depicts the extent of "located in the middle" among other nodes. If a actor is located in a shortcut between two nodes in the network, and this relationship is more, it means the anchor is in a more important position. The higher this index in the policy cooperation network is, the greater possibility of policy cooperation with other agencies woud be. Closeness centricty represents the sum of the shortest path distance of a node and other nodes. The smaller the closeness centricty is, the closer to the core of the network a node will be. Since the measurement of closeness centricty must be in a fully connected network, and it has no real meaning for the centricty of policy-making agencies. So this paper only uses the value of degree centricty and betweenness centricty to describe the centricty of policy-making agencies. And with the total number of policies issued by it as a reference, analyze the position of government departments in the policy cooperation network. Part of the data are shown in the table 2.

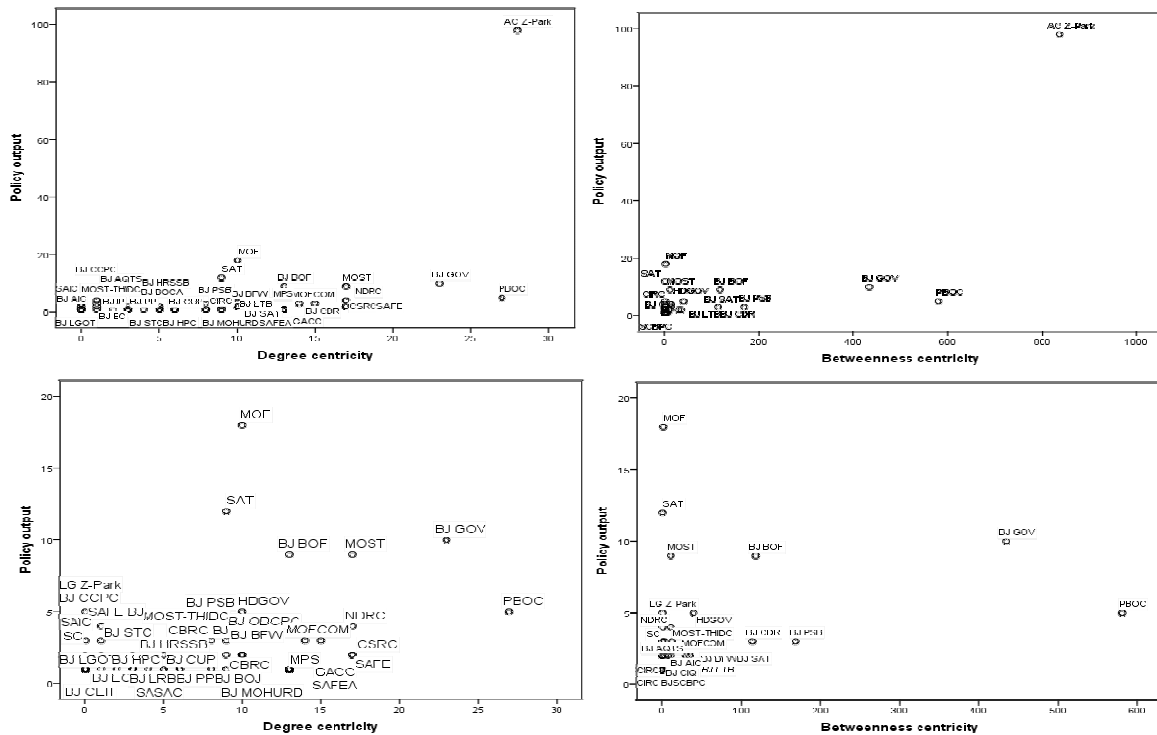
Table 2. The top 10 agencies of centricty and policy number in 2009-2015

Agency	Degree centricty	Agency	Betweenness centricty	Agency	Policy number
AC Z-Park	28	AC Z-Park	838.245	AC Z-Park	98
PBOC	27	PBOC	580.785	MOF	18
BJ GOV	23	BJ GOV	434.482	SAT	12
MOST	17	BJ PSB	168.050	BJ GOV	10
SAFE	17	BJ BOF	117.301	BJ BOF	9
CSRC	17	BJ CDR	113.333	MOST	9
NDRC	17	HDGOV	38.933	HDGOV	5
BJ CDR	15	BJ SAT	33.712	LG Z-Park	5
MOFCOM	14	BJ LTB	29.287	PBOC	5
MOHRSS	13	BJ ODCPC	12.000	NDRC	4

In table 2, the highest degree centricty is AC Z-Park, PBOC and the BJ GOV. They are directly related with 28,



27 and 23 nodes in the policy cooperation network. It is found that the variance of degree centrality among all agencies is 6.8, and only about 14.6% of the institutions in this index is 0. It indicates that the vast majority of government departments involved in Zhongguancun policy system having policy cooperation. The top three agencies of highest betweenness centrality is among in accordance with degree centrality. But in this index the value of AC Z-Park has absolute advantages than others, which shows that the AC Z-Park plays the core role of mediation in Zhongguancun demonstration zone policy system. The numerical variance of betweenness centrality among all agencies is calculated to be 146.5, and the gap between various government departments are large. 89% agencies are less than 100 in this value; Betweenness centrality of 60% agencies is 0. It shows that a small number of government departments in Zhongguancun zone has more ability to control resources. Comparing the top 10 agencies of degree centrality and betweenness centrality, the common ground is that AC Z-Park, PBOC and the BJ GOV are the three institutions of highest value. But the other top ten agencies are very



difference: national level government departments have a better performance in degree centrality, while municipal level departments occupy more quantity in top ten of betweenness centrality .

Figure 2. Centricity And Policy Output

Combine policy output and centrality of nodes in the policy collaboration network to form a two-dimensional matrix in figure 2. It can be clearly seen that AC Z-Park has a high centrality and policy output in the policy collaboration network, which means it has absolute advantage than other agencies. And the core role of AC Z-Park in policy cooperation network is in keeping with its role as the main administrative agency of policy formulation and implementation in reality in Z-Park. The MOF and SAT, etc. are in the quadrant with high-level policy output but low centrality; State Administration of Foreign Exchange (SAFE), MOF, China Securities Regulatory Commission(CSRC) and PBOC are in the high centrality but low policy output; The BJ GOV, MOST, Beijing Municipal Bureau of Finance(BJ MOF), etc. have high-level centrality and policy output; other agencies like the SC, SAIC and Beijing Entry-Exit Inspection and Quarantine Bureau(BJ CIQ) are in the quadrant with low policy output and low centrality. From the above distribution, some conclusions of Zhongguancun innovation demonstration zone policy system can be drawn. (1)Government departments in higher administrative level or more professional field generally has lower centrality especially betweenness centrality, and mainly enact policies alone. (2)Whether at the national level or the municipal level, agencies in tax revenue or finance fields have more policy output. Pilot policies of innovation demonstration zone tend to loosen the innovation activities from institutional obstacle though fiscal policy in a long period of time. (3)The centrality of departments of talent development such as the Central Committee of the Communist Party of China (CCCCP) and Beijing Municipal Public Security Bureau(BJ PSB) is larger, which is due to that under Chinese administration system, talents policies involve many different departments in charge, and need the support of all

departments jointly to push.

#### 4. Intergovernmental relations based on the policy reference network of Z-Park

In the last section, the collaboration network of policy-making agencies was used to reflect the interaction between government departments, which drew the core departments and cooperative relations between them to some extent. However bound by China's administrative management system, some departments in higher administrative level or more specific field may rarely and difficultly collaborate with others, which caused that the policy output and frequency of cooperation can not fully reflect their influence in Z-Park and relation with other agencies. Because the reference relationship between policies could express the foundation and source of policy making, and reflect the inheritance of policy intentions. Therefore, on the basis of policy cooperation network, we will further discuss the reference network of policies in Z-Park .

##### 4.1 Policy reference network diagram

Use ucinet 6.0 software to visualization analysis the policy reference matrix of Z-Park in 2009 to 2010, and the results as shown in figure 3 below. There are 98 policies of Z-Park having reference relationship, accounting for 68% of the total. It can be seen from the relation network in figure 3 that: as a whole, the policy reference network of Z-Park is a star network with multi-center, and has some scattered reference network around it; most national level policies are at the center of the network as a source and basis of other policies, and sometimes nodes in their secondary network are also cited by others; most of the provincial and municipal level policies almost reference the national policies and are referenced by policies of demonstration zone level meanwhile, as the connection between the two kinds of nodes; Z-Park level policies are largely maked on the basis of national and provincial level policies. These network relations reflect the policy making system of Z-Park in the whole still follow the current policy system of China: national ministries enact oriented meta policies; and the content of policies from the provincial departments to agencies of Z-Park is more and more towards implementation; a policy in general selects the higher level or the same level policies for referencing.

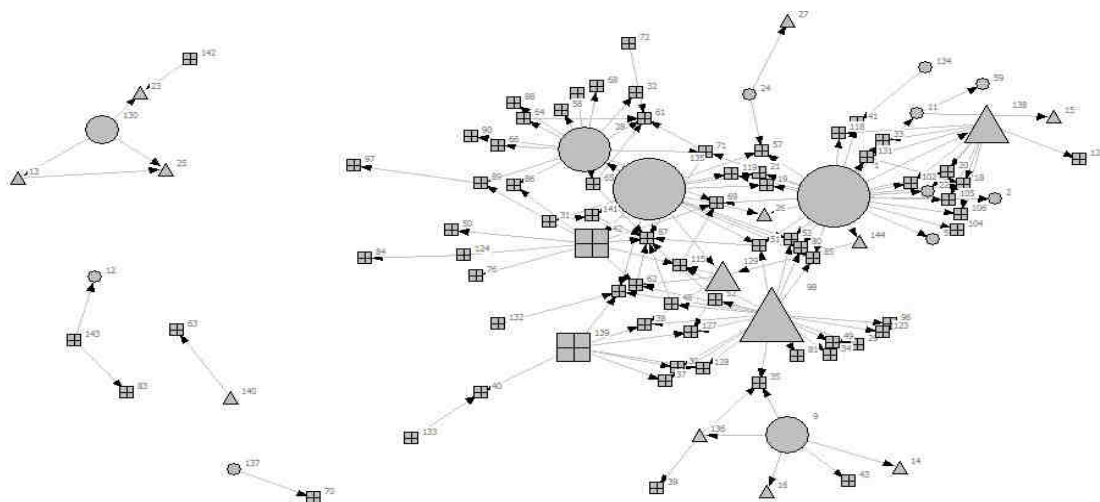


Figure 3. Policy Reference Network of Zhongguancun Demonstration Zone

1.in this figure,the arrow represents a reference Relation between policies On both sides of it,and the policy in the arrow tip is based on the policy on the other side;2.the circular Nodes, triangular Nodes and four squares Nodes respectively represent the state policies, provincial level policies and Z-Park level policies,and the size of nodes indicates how much the frequency is as the reference policy by other;3.The number on the node represents the policy uniform code in the policy database.

##### 4.2 Centricity of policy reference relation network

Policy reference relationship is a directed network, in which the node centricity is measured by outdegree and indegree. The outdegree reflects the source of policy, representing the extent that a policy as the basis of policy making by other policies; indegree reflects the end-result of the policy, indicating the number of reference policies for one policy, that is, how many policy document is the basis for making this policy. In Z-Park policy reference system, policy documents with high outdegree but no indegree are in the core, as the basis for other policy-making; policies having no outdegree but high indegree are at the bottom of the reference network, as the

implementation of other policies; policies without outdegree and indegree are located on the edge of the reference network, and have no cross-referenced relationship which other policies in the Zhongguancun policy system; the policy documents having outdegree as well as indegree are at sub-core status of the network, both as cited policy documents for the first kind policies, but also as the reference policies for the second kind, which a bridge and intermediary role.

Measuring results of centrality in the reference network indicate that: (1) Policy focus. Policies in the core of the reference relation network is basically focused on the overall construction of Z-Park, development planning and the use of funds, etc. Among them, "Approval on the consent and supportment of the construction of National Independent innovation demonstration zone in Zhongguancun science park by state council" ([2009]Reference No. 28), "administration of special funds for the development of Zhongguancun National Independent Innovation Demonstration Zone" ([2011]Reference No. 2858)", and "Approval on Development Programming Outline of Zhongguancun National Independent Innovation Demonstration Zone (2011-2020)" ([2011]Reference No.12) have the highest NrmOutDeg, and are significantly higher than other policy documents.it reveals that these three policies are the core sources and Basis policies of Z-Park.(2) policy-making agencies: the top 3 policies of NrmOutDeg are made by the SC, BJ BOF, AC Z-Park and etc; there are 16 policies having outdegree but no indegree centrality, and half of them are from national government agencies, and 25% policies are made by Beijing municipal departments or AC Z-Park; policies with indegree but no outdegree centrality take up about 63%, among them over 74% issued by AC Z-Park alone. The top 5 policies of NrmOutDeg in Policy Reference Network of Z-Park and their making agencies are shown in table 3.

Table 3. Top 5 Policies of NrmOutDeg in policy reference network of Z-Park

ID	NrmOutDeg	Policy Name	Policy-making agency
1	18.881	Approval about the consent and supportment of the construction of National Independent innovation demonstration zone in Zhongguancun science park ([2009]Reference No. 28)	SC
98	14.685	administration of special funds for the development of Zhongguancun National Independent Innovation Demonstration Zone([2011]Reference No. 2858)	BJ BOF;AC Z-Park
135	10.49	Approval on Development Programming Outline of Zhongguancun National Independent Innovation Demonstration Zone(2011-2020)([2011]Reference No. 12)	SC
28	9.79	Suggestions on the construction of national innovation center for S.& T. Finance in Zhongguancun Sciene Park([2012]Reference No.23)	NDRC, MOST, MOF, CSRC, CIRC, SAFE, BJ GOV
138	6.993	Some suggestions on the construction of zhuanguancun Independent innovation demonstration zone by Beijing Municipal Committee of the CPC BJ CCPC, BJ GOV and Beijing Municipal People's Government([2009]Reference No. 11)	

#### 4.3 Relations among policy-making agencies under the reference network

For further reflecting the relationship among the government departments under policy reference network, and finding out the core policy-making agencies based on it, the policy documents with over 1 centrality are selected to extract the corresponding policy-making agencies. And one by one, calculate the values of three indicators each for every agency: the total number of policy by the government; the number of policies which is reference to; the sum total of outdegree from all policies it marked. The number of policies to be referenced divided by the total number of policies can be called the reference proportion of policy. The higher reference proportion shows that the government department plays a more guiding role in the construction of Z-Park, otherwise is more likely to be a department of specific implementation. The outdegree of a policy in reference network divided by the number of policies to be referenced is named average outdegree of policy, to express the average times of reference of policies made by one agency. The higher this value is, the department will play more core role in Z-Park policy reference relationship network.

Combining reference proportion with average outdegree, the distribution of all government departments is



formed as shown in the figure 4. In the figure longitudinal and horizontal lines respectively represent the average of the corresponding indexes, and divide the entire graph into four quadrants: (1) In the upper right quadrant the government departments are higher than the mean value of all departments in these two indicators, including the SC and CBRC four national level government departments, becoming the more guiding and influential sectors in the Zhongguancun policy system. (2) In the lower left quadrant government departments including AC Z-Park, MOF and so on are below the average in the two indicators. They have more specific and direct role of policies in Zhongguancun. Among them AC Z-Park with the lowest value conforms to its positioning as the directly management department of Z-Park in reality. (3) The BJ BOF, SAT and National Development and Reform Commission(NDRC) are in the upper left quadrant, whose policy average outdegree are greater than the mean but the reference proportion is far less than mean. It explains that they not only can provide direct support policies but also has a strong influence on the other policies. (4)Policies of the government departments in the bottom right quadrant are basically as the referenced policy, but the scope of its influence is very narrow. Therefore in the policy reference network of Zhongguancun innovation demonstration zone, the SC is in the absolute core position, and policies marked by national ministries could be guiding significance for the whole zone .

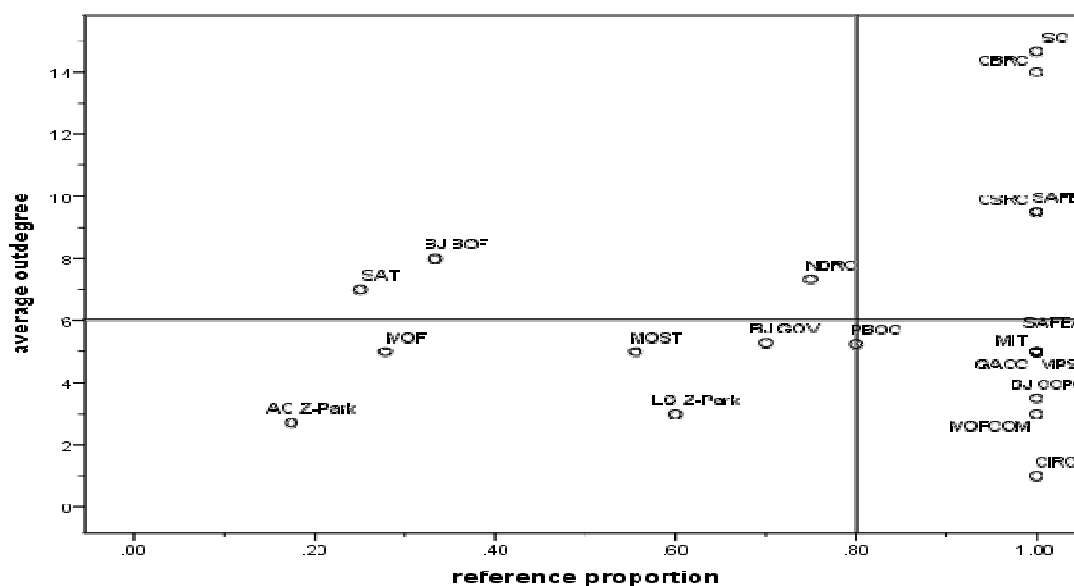


Figure 4. The Reference proportion and average outdegree of policy-marking agencies

## 5. Conclusions

Through analyzing the relation of policy-making agencies in policy cooperation and policy reference network of Zhongguancun innovation demonstration zone in 2009-2015, the following conclusions can be seen:

(1) Inter-departmental cooperation has become a trend of Z-Park. On the one hand, over 85% policy-making agencies of zhongguancun policy system have cooperative relationship with others, of which nearly 90% departments make policies completely in the form of joint publication. Cross-departmental cooperation has become the main form of government policy-making in Z-Park. Combined policy output and centrality of policy cooperation network, we can see that AC Z-Park, BJ GOV, MOST and BJ BOF ect. are the core policy makers in the Z-Park policy cooperation network. On the other hand, while the construction of the zhongguancun innovation platform has promoted the cross-level and cross-sectoral policy cooperation, but from the time series point of view. Government departments involved in cooperation and cooperation network density are not increasing year by year, but change as the policy cycle itself, thus form a stable and orderly policy system and cooperation network. The main features of the changes are: to begin with, pilot policies are issued by the national ministries, then provincial and municipal make policies to support from the provincial and municipal level with concrete management measures for the implementation; policies at different levels show a complementary tendency, which means the secondary policies can be enriched and improved on the basis of superior policies, constantly update original policies with the passage of time and the development of economy.

(2) Function fields and administrative levels affect the way departments work in Z-Park policy system. In function field, finance, taxation, talent development, intellectual property, and supporting services are the main

content of the Zhongguancun policies, therefore government departments involved in the relevant functional field accounted for the vast majority in the policy cooperation network. Due to the existing financial and personnel management system, the formulation of relevant policies requires the authorization and implementation of multiple departments. So some departments relating to these fields such as CCCPC, Ministry of Public Security(MPS), PBOC, and SAFE must usually unite others to make policies and these policies always involve more departments than other policies, which causes these agencies having a very high centrality but low policy output. But the departments with more special and relatively independent function like General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China(AQSIQ) are often in the form of independent. From the administrative level, because of the highest administrative level, the SC is given priority to make policies separately as the main reference policies of other government departments, thus it becomes the most core of policy reference network in Z-Park; national ministries have higher policy outdegree compared to the municipal government departments ; Although AC Z-Park is the core agency of the policy cooperation network, but its policy reference proportion and average outdegree are at a low level. So it plays the role of policy coordination and implementation.

Taking Zhongguancun national innovation demonstration zone as an example, this study attempts to explore the relationship between the different levels and different fields government departments in regional development with the help of policy cooperation and policy reference networks, and has found existing state and change trend of international relations in Z-Park, providing a beneficial experience for regional development and inter-governmental relations research. In future researches, the author intends to select several China's innovation demonstration zones with different management mode as the research sample. Through comparative study method, explore the different performance of these zones in policy cooperation, and find the key factors.

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