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Research on Multi-Departmental Coordination Mechanism Based on Randomized Algorithm in Government Administration

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ABSTRACT
Giving full play to the vitality and autonomy of inter-governmental departments can improve the national governance system and enhance the modernized governance capacity. This paper conducts a relevant research on the coordination mechanism between multiple government departments. According to the network analysis method, the relationships of departments in different service items and fields are studied, and the causes of the problems of power distribution and coordination mechanism in the network of departmental relationships are explained, and the analysis of the influence mechanism of departmental coordination is completed by using the random forest algorithm. The analysis results show that the power of government departments in the fields of housing security, social insurance, labor, employment and entrepreneurship, public education, and health care is more concentrated, and the Ministry of Civil Affairs and the Ministry of Human Resources and Social Security have an active position in the coordination process. Cultural cognitive bias, imbalance of power and responsibility, lack of coordination system guarantee and insufficient support of coordination environment are the causes of problems in the coordination mechanism. In addition, ambiguous coordination responsibilities, imperfect institutionalized coordination and lack of supervision system are important factors affecting the multisectoral coordination mechanism.

Keywords: random forest algorithm; social network analysis; multisectoral coordination; administrative management

1. Introduction

With the deepening of political and economic reforms, different subjects with different interests have begun to show signs of following specific sectoral paths, competing for value and interest responses, and government departments have often become the stage for value competition and interest games

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among multiple subjects [1-3]. As a result, a wider range of policy conflicts and coordination problems between government departments have arisen. The problems of large-scale public policies such as difficult to produce, policy lag and policy deformation not only increase the cost of public policy making, but also seriously constrain the government's governance efficiency and credibility [4-6]. In order to better solve these policymaking problems, the complex process of interaction, communication, and consensus finding among government departments must be re-conceptualized and understood in the context of "coordination" [7].

The need for coordination in multisectoral decision-making is rooted in the interdependent but relatively independent structural relationships between government departments. Coordination in this context is a multilevel, ubiquitous relational concept that emphasizes the alignment of actions or decisions between interdependent actors to achieve a specific goal. Interdependence is an important structural condition in the process of coordinating decision-making across multiple government departments, and individual departments are not strong, but become strong only when they create dependencies [8-10]. However, because administrative events are often sudden and widespread, it is often difficult to obtain complete information about the event in the early stages of emergency response [11]. And the participating departments are often unable to know each other's resource information and other conditions in the process of consultation and mutual assistance, so in the process of emergency mission planning needs to be in the consideration of resource uncertainty [12-13]. Under the joint influence of these factors, it is very difficult but very important for all departments to coordinate the development and implementation of emergency task planning programs in an orderly manner, and a practical emergency task planning program directly affects the orderly development and successful completion of the emergency response work [14-16]. In this context, a stochastic algorithm is introduced to establish a multi-departmental governmental coordination mechanism under resource uncertainty, which provides a theoretical basis for formulating a scientific and reasonable emergency task planning scheme for administrative events.

Multiple government administrative departments can be regarded as a complex social network, so this paper starts from the social network analysis to study the interdepartmental coordination mechanism. The planning documents of M city are selected to analyze the departmental relationship, and the node centrality between the government departments of the city is analyzed through the node structure analysis method, and the network density and centripetal characteristics between the departments are calculated through the network structure analysis method. Combined with the results of social network analysis, the causes of problems in the coordination mechanism of multiple administrative departments were analyzed at four levels. Using the random forest algorithm to conduct regression analysis on the factors affecting the degree of interdepartmental coordination, the prediction accuracy of the analytical model on the degree of departmental coordination was examined separately, the importance ranking of the factors affecting the coordination status of the departments was conducted, and finally, a biased dependency analysis was conducted on a number of influencing factors.

2. Social network analysis for government administrations

2.1. Social network analysis

2.1.1. Nodal structure analysis method. Node structure evaluation indexes mainly include two indexes: node centrality and structural hole [17], the meaning of each index and the calculation process are as follows:

1) Node centrality. The centrality index shows what kind of position or how much power an individual or organization has in the social network, node centrality is one of the first contents explored and studied by scholars using social network analysis, and it is an important analysis index in social network analysis. Node centrality reflects the node's agglomeration and diffusion function, if a node

has the highest centrality, the node is likely to have the greatest rights, and has a strong agglomeration and diffusion function in the network. In directed network, the degree of each node can be divided into inflow degree and outflow degree, which explain whether the node is a departure point or a return point in the network, and the calculation formula is as follows:

$$\text{Inflow degree: } C_{AD,in}(i) = \sum_{j}^{n} r_{ij,in} \tag{1}$$

$$\text{Degree of outflow: } C_{AD,out}(i) = \sum_{j}^{n} r_{ij,out} \tag{2}$$

$$\text{Center Degree: } C_i = C_{AD,in}(i) + C_{AD,out}(i) \tag{3}$$

Where: r_{ij} represents the flow from node i to node j and n represents the number of nodes in the network.

2) Structural holes. There will be a break in the connection between nodes in the network, and the place where the connection is broken in the social network analysis method is called a "structural hole". If nodes B and C both generate a tourist flow with node A, but no direct tourist flow is formed between nodes B and C, then node A occupies a structural hole position in the network. When a node has more structural hole advantages in the government network, the node has irreplaceable location advantages and competitive advantages, and is less affected by the passenger flow of the surrounding nodes. "Effective scale" and "binding coefficient" are commonly used indicators for structural hole measurement, and the advantages and disadvantages of network nodes are judged by using "effective scale" and "binding coefficient".

(1) Effective size: the effective size, i.e., the non-redundant portion of the network, measures the overall influence of the network nodes. The larger the effective size, the smaller the degree of duplication in the network, and the greater the possibility of the existence of structural holes:

$$ES_i = \sum_{j}^{n}\left(1 - \sum_{q}^{n} p_{iq} m_{jq}\right), q \neq i, j \tag{4}$$

Among them:

$$p_{iq} = \frac{\left(z_{iq} + z_{qi}\right)}{\sum_{j}^{n}\left(z_{ij} + z_{ji}\right)}, i \neq j \tag{5}$$

$$m_{jq} = \frac{\left(z_{iq} + z_{qi}\right)}{\max\left(z_{jk} + z_{kg}\right)}, j \neq k \tag{6}$$

Where: z_{iq} is the number of paths from node i to node q, p_{iq} is the proportional relationship of node q in node i, i.e., the number of paths between node i and node q divided by the number of all paths through node i. m_{jq} is the marginal strength between node j and node q, which is the number of paths between node j and node q divided by the maximum number of paths connecting node j to other nodes.

(2) Constraint coefficient: the constraint coefficient measures the extent to which a node is directly and indirectly dependent on other nodes, and it reaches a maximum value of 1 when j is the only contact for i, and a minimum value when there are no other indirect contacts between i and j. The larger the value, the stronger the constraint and the stronger the dependency. The constraint coefficient is used to identify the advantageous and disadvantageous nodes, the lower the coefficient, the more competitive advantage the node has. Its formula is:

$$CT_i = \sum_j^n \left(p_{ij} + \sum_q^n p_{iq} p_{qi} \right)^2, q \neq i, j \tag{7}$$

Where: p_{ij} and p_{iq} denote the proportionality relationship of node i in node j and node q respectively. p_{qi} is the proportional relationship that node q occupies in node i. The proportional relationship between nodes is calculated in the same way as Eq. (4).

2.1.2. Network structure analysis

1) Network Density. Network density refers to the ratio of the number of relationships that actually exist in the network to the number of relationships that may exist, and can be used to portray the denseness of the interconnections between nodes in the network. Network density takes values between 0 and 1. The larger the value, the higher the network density, indicating that there are more connections between the nodes in the network and the network is more effective [18]. $D = 1$ when the network is fully connected and vice versa, $D = 0$ when there is no connectivity in the network:

$$D = \frac{2E}{n(n-1)} \tag{8}$$

Where: E denotes the number of paths in the network and n is the total number of nodes in the network.

2) Central potential. The central potential is a measure of the degree of centrality of the entire network, which reflects the overall integration and consistency of the network. The larger the value, the stronger the central potential, the more unbalanced the distribution of network traffic, and the greater the possibility of the existence of core nodes. Its calculation formula is as follows:

$$C_D = \frac{\sum_{i=1}^{n} \left(C_{ADMAX} - C_{AD}(i) \right)}{n^2 - 3n + 2} \tag{9}$$

Where: $C_{AD}(i)$ represents the degree centrality of the node, C_{ADMAX} represents the maximum degree centrality and n is the total number of nodes in the network.

2.2. Social network analysis of the administration

2.2.1. Research methodology and data processing. Combined with the research questions and data characteristics, this paper applies SNA technology to quantitatively analyze the interdepartmental relationships in the policy text of the Public Service Equalization Plan issued by M City in 2023, and the specific analysis steps are as follows:

1) Coding the "lead responsible unit" in the list of basic public services, establishing the social network of inter-departmental relations and preparing the social network data file in DL format.

2) Apply UCINET software to analyze the social network data file prepared in the previous step and calculate the centrality, density and other variables of the social network of each responsible unit.

3) Based on the above analysis, identify the potential conflicts and coordination difficulties between departments in the equalization of basic public services in this municipal government.

2.2.2. Intersectoral relationship between service line level and domain level. After calculation by the UCINET software, the density of the social network of interdepartmental relations in each area is shown in Table 1. Overall, each of the 82 service items in the list of basic public services involves an average of 1.9806 responsible units. Among them, 36 items (43.9% of the total) involve 2 responsible units, 16 items (19.51% of the total) involve 3 responsible units, and 4 items (4.88%) involve 4 responsible units.

The mean values of the number of responsible units for service projects in different basic public service areas varied considerably. By inference, service projects in the areas of basic public services for persons with disabilities and basic public culture and sports should be more susceptible to coordination difficulties caused by inter-departmental conflicts than service projects in the areas of basic medical care and health care and basic labor, employment and entrepreneurship. However, the number of responsible units alone cannot reflect the overall situation of interdepartmental relations within a given field; for example, the mean value of responsible units per project in the fields of basic social insurance, basic labor, employment and entrepreneurship, and basic medical and health care (1.245, 1.5121, and 1.358) is lower than that in the field of basic housing security (1.7368), but the social network of interdepartmental relations reflects the fact that interdepartmental relations in the first three fields are intersectoral relationships are significantly more complex than the basic housing security domain.

Therefore, the overall situation of intersectoral relations at the domain level is better reflected by network density. The lower the network density, the lower the proportion of formal "lead → responsibility" relationships between sectors, and the lower the lack of formal institutional support for intersectoral coordination needs in basic public services. Since the current dominant model of intersectoral coordination in China is still "hierarchical vertical coordination based on authority", the lack of "authority support" from the formal system probably means that this area as a whole is more prone to coordination difficulties caused by intersectoral conflicts.

Table 1. Social network density between departments

Realm	Number of liability units	Mean of the service project liability units	Number of nodes	Total amount of connection	Network density
Basic public education	2	2.4896	2	13	1.6876
Basic housing protection	3	1.7368	3	4	1.3479
Basic social services	3	1.9927	3	13	1.2659
Basic labor and employment entrepreneurship	2	1.5121	2	5	0.6104
Basic public culture sports	7	2.6403	7	18	0.5189
Basic social insurance	5	1.245	5	4	0.4441
Basic health care	6	1.358	6	6	0.3378
The basic public service of the disabled	13	2.8704	13	19	0.0179
Overall	18	1.9806	18	82	0.7788

2.2.3 Distribution of power in intersectoral networks. Table 2 shows the results of calculating the central potential of the social network of intersectoral relations.

1) The out-centering potentials of basic housing security, basic social insurance, basic labor and employment, basic public education, and basic health care are all higher (>0.5), meaning that the first type of power (the dominant power of the "lead unit") is more concentrated in these five areas. In the other three areas, the first type of power is relatively decentralized. The out-centeredness of the basic public culture and sports domain is smaller than the in-centeredness, which means that the first type of power in this domain is less concentrated than the second type of power (the auxiliary power of the "responsible unit").

2) With the exception of the area of basic housing security, the incoming-centered potentials in all other areas are relatively low and most are lower than the outgoing-centered potentials in their own

areas, implying that the second type of power tends to be more diffuse in these areas relative to the first type of power.

3) It is worth noting that the out-center potential of the overall social network of inter-departmental relations is low (0.0568), which may be related to the need for different "lead units" in different fields due to professional differences, and the first type of power that is more concentrated in different fields is actually concentrated in different departments, thus "diluting" the out-center potential of the overall social network. However, the in-centered potential (0.1867), which is higher than the out-centered potential, implies that there may be sectors with greater “cross-cutting” auxiliary powers.

Table 2. The social network centralization of the interdepartmental relations

Realm	Centralization		The leading department of the list	The leading department of the mission
	Out	In		
Basic housing protection	1.0000	1.0000	Ministry of housing construction	Ministry of housing construction
Basic social insurance	0.7775	0.3358	Department of human resources and social security	Department of human resources and social security
Basic labor and employment entrepreneurship	0.6283	0.4266	Department of human resources and social security	Department of human resources and social security
Basic public education	0.5365	0.3496	Treasury Department	Ministry of education
Basic health care	0.5149	0.2948	Health board	Health board, Food and drug administration, Chinese medicine bureau
Basic social services	0.3740	0.3139	Ministry of civil affairs	Ministry of civil affairs
The basic public service of the disabled	0.3197	0.2334	Federation of disabilities, Ministry of civil affairs, Department of human resources and social security, Ministry of housing construction, Treasury Department	Federation of disabilities
Basic public culture sports	0.2222	0.3537	Ministry of culture, Radio and television administration, Sports bureau, Material bureau	Ministry of culture, Radio and television administration, Sports bureau, Material bureau
Overall	0.0568	0.1867	/	/

Table 3 shows the results of the core/edge analysis of the social network of intersectoral relations. In order to more intuitively represent the power distribution of nodes in the social network of interdepartmental relations in various fields, this paper draws a scatter plot of the responsible units with the center of the relative out degree as the horizontal axis and the center of the relative in degree as the vertical axis, and marks the results of the core/edge analysis in the plot, and the results are shown in Figure 1.

Overall, the Ministry of Finance is undoubtedly the “weighted department” in the basic public service list of responsible units. In the overall social network of interdepartmental relations, it has both high out-degree and in-degree centrality, and its in-degree centrality is higher than the out-degree centrality. The Ministry of Finance (MoF) tends to have the highest degree of inward centrality in the social network of intersectoral relations in all areas (except for basic public education and basic

public services for persons with disabilities). Departments such as the Ministry of Civil Affairs (CAD) and the Ministry of Human Resources and Social Security (HRSSD) have high outward centrality (>0.05). They are departments with dominant "cross-cutting" powers: the Ministry of Civil Affairs (CAD) in the area of basic social services, and the Ministry of Human Resources and Social Security (HRSSD) in the areas of basic labor, employment and entrepreneurship, and basic social insurance are core nodes with the highest centrality of out-degree in this area. These two departments also have some dominant power in the area of basic public services for people with disabilities. Under the conditions of given and limited attention and resources, the conflict between whether a sector allocates it to dominant or auxiliary power, and whether it allocates it to coordination with Sector A or Sector B, is likely to further lead to difficulties in intersectoral coordination. In addition, in terms of the overall distribution of sectoral powers, except for the Ministry of Finance, which is located in the upper-right corner, most sectors have a tendency to concentrate in the lower-left corner (with lower outward centrality and inward centrality), and the intersectoral coordination problems that may be caused by the polarization of powers also exist in the equalization of basic public services. From the viewpoint of the content of the Plan, the key tasks in each area and the service items in each area in the list of basic public services are actually unified, and the two are two dimensions of the overall plan for the equalization of basic public services, rather than two independent types of public affairs. Conflicting provisions in the Plan regarding the departments responsible for the list and the departments responsible for the tasks may lead to disagreement among the relevant departments in fulfilling their responsibilities for promoting the equalization of basic public services, which may lead to difficulties in inter-departmental coordination.

Table 3. The analysis of the core/edge analysis of the social network of the department

Dep.	Or.	Pe.	Lee.	Si.	Hc.	Ss.	Hp.	Pcs.	Psd.
TD	0.97	0.96	0.38	0.49	0.00	0.76	0.25	0.69	0.10
MCA	0.18					0.62			0.17
ME	0.06	0.24						0.00	0.00
DHRSS	0.03	0.07	0.91	0.82					0.12
RTAT	0.02							0.55	0.05
MHC	0.01						0.95		0.13
MC	0.01							0.44	0.05
HB	0.01			0.34	1.00	0.03			0.06
FD	0.00								0.96
SB	0.00							0.07	0.04
JD	0.00								
MB	0.00							0.03	
PB	0.00		0.16						
FDA	0.00				0.00				
IID	0.00				0.00				0.00
CB	0.00								
MA	0.00								0.04

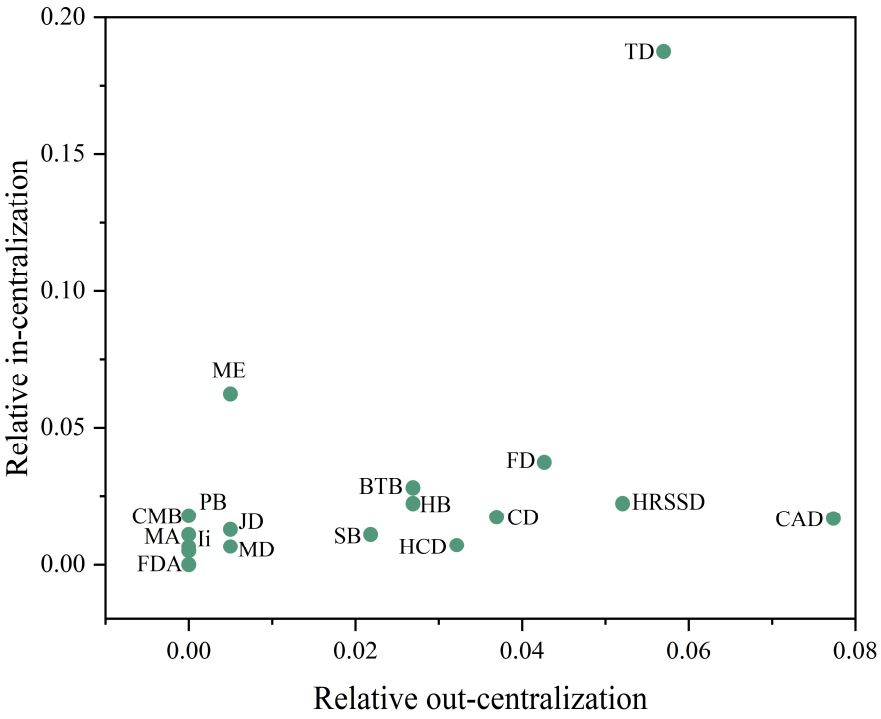

Fig. 1. The network node degree and core node of the interdepartmental relationship

3. Study on the causes of problems with multisectoral coordination mechanisms

3.1. Perceived bias in the culture of coordination in the government sector

3.1.1. Insufficient knowledge of the concept of overall coordination. The great difference in the level of equalization construction reflects the same lack of awareness of the concept of overall coordination. Horizontal level government departments to undertake the specific functions of government management or services, public service equalization planning implementation focused on achieving the objectives of this sector, the construction of public service equalization as a project to grasp, in the process of promoting the construction of more attention to the technical level or infrastructure and other intelligent projects to promote the concept of planning for public service equalization of the government departments in the public service equalization concept of cognition is not in place, stalling the public service equalization of the construction of the overall process of the M Municipality. The overall process of construction.

3.1.2. Excessive promotion of sectoral concepts. In the process of sectoral coordination, there is a more obvious inaction on the part of some departments in some construction projects. Some government departments are unwilling to share, formally share, and selectively share basic government data for the construction of public service equalization, as well as reluctant and uncooperative in cross-sectoral coordination and cooperation in the implementation of public service equalization planning. On the one hand, there is an overly strong departmental mindset. There is natural competition between departments under the hierarchical pyramid structure, and excessive competition is a manifestation of departmental thinking. On the other hand, the neglect of cooperation, in excessive competition at the expense of government public value attributes and the provision of public services. In essence, both are overly concerned with departmental interests and status, thus neglecting the public nature of government and the public interest of society.

3.1.3. Low perception of institutional trust awareness. In the implementation of the plan for equalization of public services in M city, the institutionalized single channel is difficult to meet the demand for coordination of policy implementation in government departments, and the effect of coordination is poor, and the non-institutionalized channel based on acquaintances and favors of the previous work unit has become an important guarantee to play the role of initiating the coordination and the implementation of the coordination plan. This implies that government departments are skeptical about the effectiveness of institutionalized channels, while at the same time believing that non-institutionalized channels centred on interpersonal trust are more capable of facilitating cross-sectoral coordination and generating results that are more favourable to their own departments, indicating limited trust in the institutionalized coordination system.

3.2. Imbalance of authority and responsibility in government sector coordination organizations

3.2.1. Ambiguous sectoral coordination responsibilities. The reason for the low efficiency of information and data collection in the city, the lack of coordination among government departments, and the poor coordination results is that the coordination responsibilities of government departments are vague. The Ministry of Industry and Information Technology (MIIT) considers itself to be the main department responsible for the construction of public service equalization, while other government departments believe that big data management, as a department at the same level, is also an executive department for the construction of public service equalization, which is not different from themselves, and that the coordination of the construction of public service equalization should be subject to the arrangement of the municipal government. This leads to the coordination of the promotion of public service equalization led by the big data management, the Ministry of Industry and Information Technology rightly believes that all departments should make every effort to cooperate, but there are many forms of cooperation between government departments, both positive and negative.

3.2.2. Inappropriate authority and responsibility of government departments. Overall, the total amount of funds earmarked for the equalization of public services in M city is insufficient, and sustained investment is limited. Scarcity of funds has led to fierce competition among departments, and the result of the competition shows the “Matthew effect”, with the advantageous departments of public service equalization construction obtaining more funds by virtue of the first-mover advantage of a good construction foundation, while other departments that are not yet in the early stages of intelligent construction can only pause or slow down the pace of construction due to the lack of funds. Secondly, there is a shortage of manpower, an exodus of professionals, and an insufficient number of talents to take up the responsibility of construction. Government departments bear direct responsibility for the construction of public service equalization, but different departments face, to varying degrees, the dilemma of insufficient funding and talent, which affects coordination and policy implementation.

3.2.3. Retention of authority and waiver of responsibility by higher authorities. The Ministry of Industry and Information Technology (MIIT) was newly formed in the institutional reform as the main department in charge of the construction of equalization of public services, but the municipal government did not grant the corresponding coordinating power to MIIT, which has the responsibility of being the main department in the construction of equalization of public services, but does not have the power of organizing and controlling other departments. As a result, the Ministry of Industry and Information Technology convenes coordination meetings on the equalization of public services, either by inviting departments to participate in the form of a letter, or by applying upward to the municipal government for coordination on behalf of the municipal government. Secondly, the higher level government shirks the responsibility of coordination. It should not be overlooked that higher-level

departments still retain the power to coordinate, and this unbalanced configuration of full responsibility further increases the difficulty of government departmental coordination.

3.3. Lack of guarantees for a coordinated system of government departments

3.3.1. Inadequate institutionalized coordination among government departments. A search of public government documents and interviews revealed that the institutionalized way of coordinating government departments in the implementation of the Municipality's public service equalization plan was through joint departmental meetings, with neither the establishment of a special deliberative coordinating body, such as a special leading group, nor the use of departmental agreements, for example. A single institutionalized channel makes it difficult for government departments to reach an agreement on sharing information, building a platform, and facilitating cooperation.

3.3.2. Lack of a coordinated monitoring system for government departments. Different government departments display different attitudes towards coordination, and some government departments are able to "justify" the lack of departmental manpower by saying that they will carry out little or no coordination work; only a scientific and effective monitoring system can make it possible to ensure that the implementation of policies will not be distorted or go out of shape, and that they will be able to pass on the value of the objectives for which the policies were formulated. In terms of the utilization of supervision results, it mainly involves accountability and incentives. The results of supervision are usually reflected in accountability and incentives. The main body being held accountable is usually the department responsible for the construction of public service equalization subprojects, while the non-responsible departments are held accountable to a lesser extent, and the reason for their accountability is mainly for the results of the project construction rather than the communication and collaboration in the process of the construction of public service equalization. This leads to a bias between accountability and incentives; specifically, the "culprits" of lagging public service equalization may escape accountability, while the departments working on public service equalization are forced to be punished.

3.4. Insufficient support for a coordinated environment in the government sector

3.4.1. Insufficient participation of social agents in construction. M city has 55 colleges and universities and 75 research institutes above the provincial and ministerial level, which have cultivated and gathered a large number of talents, who have made important contributions to the development of Jiangsu province in their respective fields of specialization, but most of them are single-type talents, unable to meet the demand for compound talents in the construction of equalization of public services.A certain amount of financial funds has been allocated to the construction of public service equalization projects in M city, but the funds are insufficient to meet the demand for the construction of equalization of public services, thus the allocation of funds is skewed among different departments and projects. M city public service equalization project construction supporting certain financial funds, but this part of the funds is not enough to meet the needs of public service equalization construction, so the allocation of funds in different departments, different projects there are tilted, not only to further cause inter-departmental imbalance of resources, and the existing proportion of social capital participation is low, but also to stall the overall process of public service equalization construction.

3.4.2. Inadequate external supervision by social agents. Transparent government requires that all unclassified government actions should be actively subject to citizen oversight. However, social subjects are neither able to supervise nor capable of supervising. In terms of being unable to supervise, on the one hand, the coordination of government departments has not yet been included in the list of government information disclosure, and the disclosure of information on the coordination of

government departments is not a regular behavior of government information disclosure. On the other hand, with regard to the performance appraisal of government departments, the specific entries for public comment are drawn up by the government departments, and the public can only evaluate these established entries, and so far no department has included the effects of collaboration with other departments in the assessment of public comment.

4. Analysis of factors affecting multisectoral coordination based on random forest regression

4.1. Random Forest Regression Algorithm

4.1.1. CART decision tree. Decision tree algorithm is a classic machine learning algorithm, the random forest is used in the decision tree without pruning operation, so to understand the random forest to first understand the decision tree, the decision tree algorithm is essentially a binary tree in the data structure, which consists of the root node, the internal node, and the leaf nodes [19]. In the binary tree splitting process focuses on how to select the optimal features to be divided, this paper adopts the CART decision tree, constructed in the process of the Gini coefficient as a purity evaluation index, the splitting principle is that the node after the division of the purity of the node must be higher than the division of the node before the division, otherwise the node does not do the splitting operation, the Gini coefficient calculation process is as follows:

$$Gini(n) = 1 - \sum_{i=1}^{n} P_i^2 \tag{10}$$

$$Gini\left(n \mid M_i\right) = \sum_{i=1}^{n} \frac{\left|N_i\right|}{\left|N\right|} Gini\left(n_i\right) \tag{11}$$

where P_i denotes the probability that feature M_i occurs in dataset n, $Gini\left(n\right)$ denotes the Gini metric, and $Gini\left(n \mid M_i\right)$ denotes the conditional Gini coefficient for dataset n.

4.1.2. Overview of the Random Forest Regression Algorithm. Random Forest is a stochastic algorithm that integrates multiple decision trees together based on the idea of Bagging in integrated learning, and the basic unit is the classification regression tree. For the regression problem in this paper, each decision tree is a regressor, in the training phase, the random forest uses bootstrap sampling from the input training data set to collect a number of different sub-training sets to train different regression trees in turn, i.e., for each input sample, N tree will have N regression results, this approach increases the noise immunity of the final model prediction results and stability of the prediction stage In the prediction stage, the random forest averages the predictions of the internal N decision trees to get the final output, and this mechanism greatly improves the prediction accuracy of the model.

The two randomness in the random forest: sampling random and feature subset selection random, to ensure that the model to avoid falling into the overfitting problem to the greatest extent possible, and has a very good anti-noise ability, compared with some other algorithms show a great advantage.

Random forest is one of the integrated machine learning algorithms used for classification and regression, which runs robustly, can analyze data with complex nonlinear relationships, and can calculate the degree of importance of each variable to the model prediction, and the specific construction steps of the random forest regression model are as follows:

1) Input a set of samples with sample number N and feature number M, and use Bootstrap with put-back sampling to generate a training sample subset n_i of size b, make predictions with the unsampled samples, and evaluate their predictions with mean square error $\left(MSE\right)$.

2) Obtain a weak decision tree g_i by the categorical regression tree algorithm on the training sample subset k_i.
3) For each node of the tree, m feature attributes are randomly sampled, where $m = \sqrt{M}$, a feature with the highest variable importance is selected for splitting in m.
4) Determine whether the number i of the current tree satisfies $i \le ntree$, if so, repeat steps 1~3, and if not, stop the cycle.
5) Summarize all the regression trees generated into a random forest model $Uniform\left(\{g_i\}\right)$, and evaluate it by the coefficient of determination $\left(R^2\right)$ index to determine the prediction effect of the model. If the prediction effect is not good, adjust the parameters of the random forest modeling process (number of trees, number of leaf nodes) and continue modeling until the expected effect is achieved.

The formulas for the mean square error $\left(MSE\right)$ and the coefficient of determination $\left(R^2\right)$ are, respectively:

$$MSE = \frac{1}{N}\sum_{i}\left(x_{si} - x_{mi}\right) \tag{12}$$

$$R^2 = \frac{\sum_{i=1}^{n}\left(x_{mi} - x_m\right)^2\left(x_{si} - x_s\right)^2}{\sum_{i=1}^{n}\left(x_{mi} - x_m\right)^2\sum_{i=1}^{n}\left(x_{si} - x_s\right)^2} \tag{13}$$

where N is the number of samples, x_{mi} is the actual value, x_{si} is the predicted value, and x_m and x_s are the average of the actual and predicted values, respectively.

4.1.3. Importance of Random Forest Regression Features. In the construction process of the above random forest model, Bootstrap sampling is used, and each time about 1/3 of the samples will not be sampled, and the unsampled samples are called out-of-bag data (OOB), and the OOB is used as a validation set, and its error can be used as the generalization error of the random forest model G. Based on the OOB error analysis the significance metric of feature x_j is the importance of the OOB error feature for all decision trees x_j The average value of the difference between before and after random replacement, and its calculation process is shown as follows
1) Estimate the accuracy of each decision tree generated during the random forest modeling process using out-of-bag (OOB) data to obtain the corresponding mean square error $MSE_1, MSE_2 \cdots MSE_n$ for each decision tree.
2) Randomly add noise interference to the out-of-bag data OOB corresponding to each decision tree, and use the new out-of-bag data OOB after adding noise interference to test the prediction effect of the random forest model, and get the new mean square error matrix, as shown in Equation (14):

$$\begin{bmatrix} MSE_{11} & \cdots & MSE_{1n} \\ \vdots & \ddots & \vdots \\ MSE_{n1} & \cdots & MSE_{nn} \end{bmatrix} \tag{14}$$

3) The accuracy of each OOB after adding the noise interference is subtracted from the accuracy produced by the original OOB, and the results obtained after each subtraction are averaged and divided by the standard deviation to obtain the average reduction in the accuracy of the explanatory variables, i.e., the importance scores of the feature variables, calculated as shown in (15):

$$VI\left(x_j\right) = \frac{\frac{1}{ntree}\sum_{i}\left(\overline{MSE_i^j} - MSE_i^j\right)}{S_E} \tag{15}$$

Where: $ntree$ denotes the number of decision trees, S_E denotes the standard deviation, MSE_i^j denotes the error before random replacement of the ith tree for feature x_j, $\overline{MSE_i^j}$ denotes the error after random replacement of the ith tree for feature x_j, and $VI\left(x_j\right)$ denotes the feature importance score for feature x_j, with the larger value representing the greater influence on the dependent variable.In this paper, we use regression Random Forests to reveal which micro-organizational features are better able to account for the change in the ultrasonic longitudinal wave velocity.

4.2. Analysis of factors influencing multisectoral coordination

This paper empirically examines the factors influencing the degree of coordination of government departments using a random forest regression model.

4.2.1. Model training. In the research process, a portion of the samples were first selected from the original sample set by random sampling method. In the sampling process, the probability of each sample being selected was set to 70%, and the selected samples constituted the training set, while the unselected ones constituted the test set. Eventually, the training set consisted of 1485 samples and the validation set contained 640 samples. Subsequently, a random forest regression model was used to train the 1480 samples of the training set. The prediction of the test set using the model after the training was completed resulted in the predicted value of the discount rate. The smaller the error between the predicted value and the true value, the better the fit of the model. To improve the learning effectiveness of the model, it is necessary to ensure that the model contains a sufficient number of decision trees. Random forests improve performance by integrating multiple trees. However, there is a point of diminishing marginal utility where adding more trees may not significantly improve the performance of the model. In this paper, we set the number of decision trees to 500 after several experiments. At each non-leaf node, the subset size of feature attributes was set to 9.

After the training set was subjected to machine learning, the mean residual square (MSE) of this random forest regression was obtained to be 0.0103, and the root mean square error (RMSE) was 0.1018. The results show that the prediction error of the model is relatively small, the fitting accuracy is high, and the model results are basically credible.

4.2.2. Predictive testing. In the test set, sectoral coordination - the explanatory variable - was removed. The remaining observations are then predicted for the degree of sectoral coordination using the already trained model. Figure 2 shows the predicted values compared to the true values. By comparing the regression results of the test set with the actual true values of sectoral coordination, it can be seen that the high degree of overlap between the predicted value curves and the true value curves suggests that the model fit is high and the predictions are good.

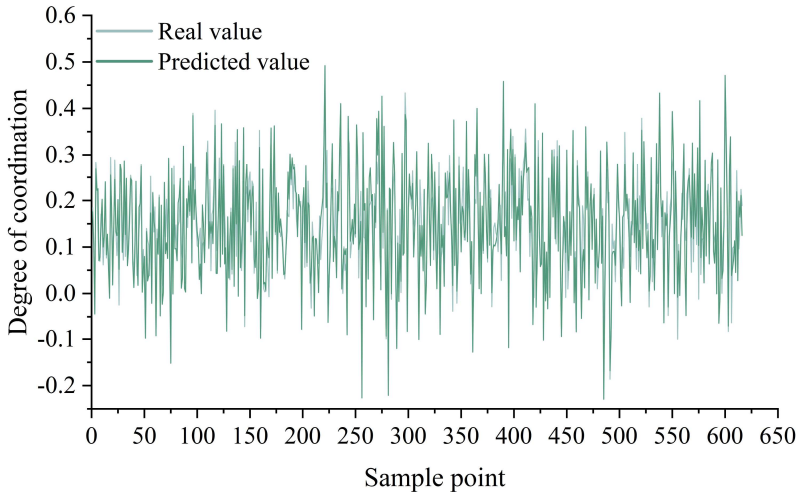

Fig. 2. The comparison of the predicted value and the real value

In order to assess the prediction accuracy of the model, this paper calculates the relative error between the predicted value and the true value, and the distribution of it (see Table 4). The results show that among all the samples, 374 samples have relative errors less than 10%, and this proportion is more than 60%. The proportion of samples with relative errors less than 20% is more than 80%. In addition, the mean absolute error (MAE) of the model is 8.16%. The Mean Absolute Percentage Error (MAPE) is 11.64%, and the accuracy of this random forest regression can be obtained as 88.48% using the 100%-MAPE value.

Table 4. The relative error distribution

Relative error	Frequency	Proportion	Accumulated proportion
[0,1%)	55	8.50%	8.50%
[1,5%)	219	33.93%	42.43%
[5,10%)	154	24.52%	66.95%
[10,20%)	129	20.03%	86.98%
[20,50%)	83	13.02%	100.00%

4.2.3. Order of importance of variables. All 10 explanatory variables were ranked in terms of variable importance according to the OOB importance score, and the results of the ranking are shown in Figure 3. The important indicators are ranked as follows: ambiguous coordination responsibility (A), imperfect institutionalized coordination (B), lack of supervision system (C), excessive promotion of the native concept (D), insufficient cognition of the coordination concept (E), inappropriate power and responsibility (F), insufficient participation in the construction of the social body (G), insufficient external supervision (H), retention of the power to abdicate the responsibility (I), and indifference to the awareness of institutional trust (J), and so on.

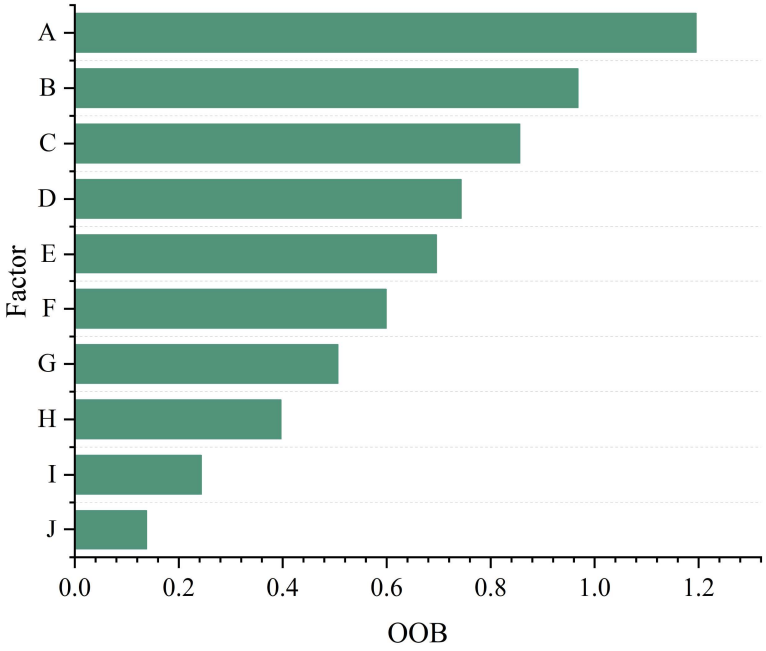

Fig. 3. Ranking of importance scores

4.2.4. Bias Dependency Analysis. The effect of several explanatory variables with high importance ratings on multisectoral coordination mechanisms is specifically examined below through a biased dependency analysis.

1) Degree of coordination responsibility ambiguity. The effect of the degree of coordination responsibility ambiguity on the change in the value of departmental coordination degree is shown in Figure 4. It can be seen that the higher the degree of coordination responsibility ambiguity, the lower the degree of coordination of multi-government departments. This indicates that the degree of fuzzy coordination responsibility has a certain impact on the coordination between departments in administration, and the more fuzzy the coordination responsibility is, the lower the degree of coordination between multi-departments is.

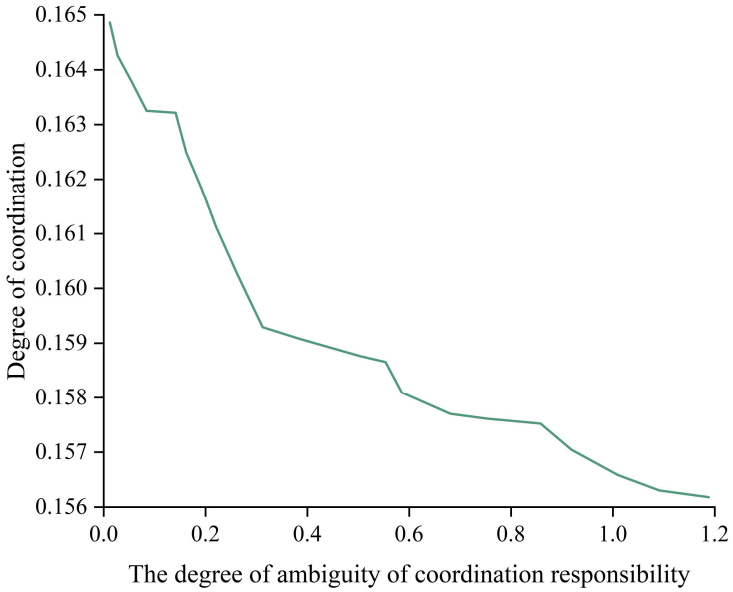

Fig. 4. The impact of fuzzy degree on coordination

2) Institutionalization of sectoral coordination. The effect of the degree of institutionalization of departmental coordination on the degree of multi-departmental coordination is shown in Figure 5. The results show that the degree of institutionalization of departmental coordination has a positive correlation with the degree of coordination of multi-government departments, indicating that the more standardized the communication and exchange between government departments, the degree of coordination between multi-departments will also increase.

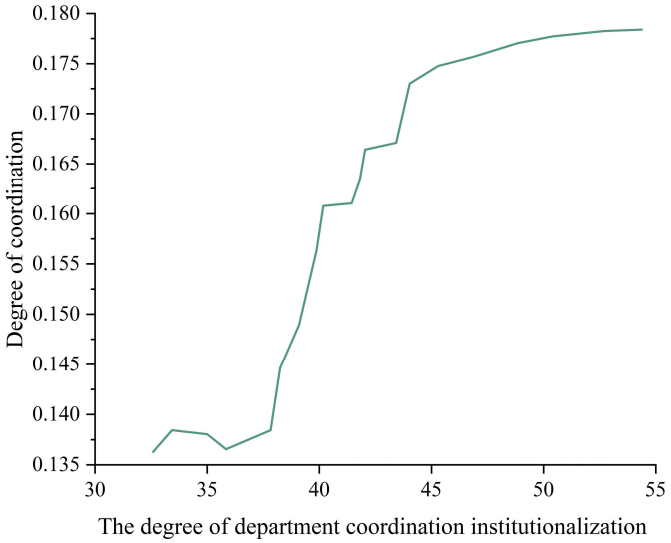

Fig. 5. The impact of coordinated institutionalization on coordination

3) Institutionalization of supervision. The bias of the degree of oversight institutionalization on the degree of government sector coordination is shown in Figure 6. As the degree of supervision institutionalization increases, the degree of government sector coordination rises. The rise in the degree of government sector coordination levels off when the scale increases to around 3.5. Institutionalization of supervision is the second most important variable, suggesting that institutionalized supervision of government coordination is an important component of, and has a positive effect on, enhancing multisectoral coordination.

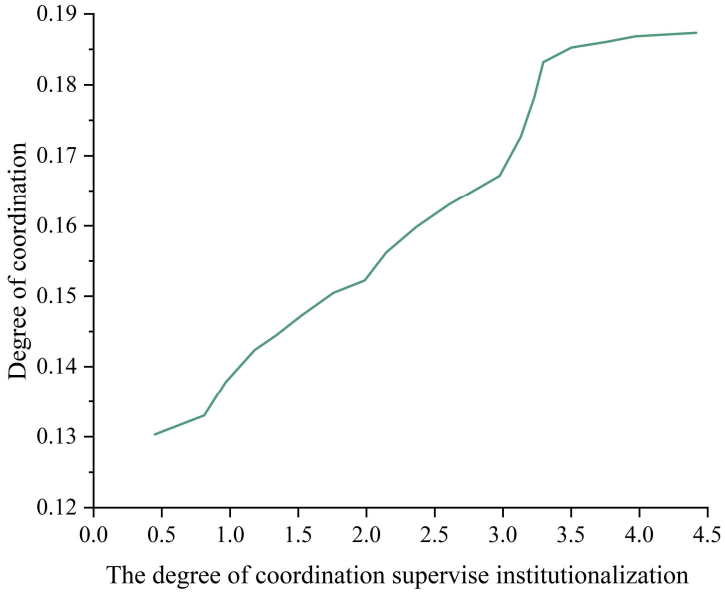

Fig. 6. The impact of supervision system on coordination

5. Conclusion

This paper mainly uses network analysis method and random forest algorithm to analyze the power distribution relationship and the causes of coordination mechanism in the process of departmental coordination in administration. It is found that the power of government departments in the fields of housing security, social insurance, labor, employment and entrepreneurship, public education, and health care is more concentrated. Departments such as the Ministry of Civil Affairs and the Ministry of Human Resources and Social Security have a high degree of out-degree centrality, indicating that such departments take the initiative in the process of inter-departmental coordination. The main factors that lead to coordination problems among government departments are: cultural cognitive bias, imbalance of power and responsibility, lack of coordination system guarantee and insufficient support of coordination environment. The method of this paper can better predict the degree of government coordination (MSE=0.0103, RMSE=0.1018). The ambiguity of coordination responsibility, imperfect institutionalized coordination, lack of monitoring system and the significant impact on the degree of interdepartmental coordination also have an important effect.

The shortcomings of this paper are mainly:

1) The selected government materials failed to cover some difficult areas of government coordination.
2) The quantitative analysis of the text is only informative and cannot replace in-depth qualitative analysis. The above shortcomings will have to be addressed in future research.

About the Author

Yongliang Xia was born in Zhoukou, Henan, China, in 1981. He obtained a Master's degree from Guangxi Normal University in China. He currently studying at the Graduate School of Central Philippine University. His main research direction is Public Service Management and Public Policy.

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