Knowledge Mapping of China's Income Gap between Urban and Rural Areas - Measurement Research Based on Co-Word Network

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Abstract: *In recent years, the issue of income gap between urban and rural areas has become one of the hot topics among our government departments and scholars. Researchers deal with this problem in different perspectives and different ways. However, the main research problems in this field; the core issue is not yet a systematic and in-depth induction, small amount of qualitative overviews, not particularly clear picture presented, it is not conducive to conduct follow-up studies in this area. So we use social network analysis mapping the income disparity between city hotspot knowledge and draw a larger relationship with the income gap to four keywords-financial development, urbanization, dual economic structure and labor transfer, and in-depth study of these four words, the divergence of associated keywords.*

Keywords: *The income gap between urban and rural areas; co-word network; knowledge mapping; quantitative study.*

1. INTRODUCTION

Since the reform and opening up started, great progress of economy has been made in China. Living standard of private citizens has greatly developed, while the income gap between urban and rural areas has gradually expanded. According to the latest data, the difference between the absolute value of urban and rural residents' per capita income was 7238.1 yuan in 2005, the difference reached 18059.2 yuan in 2013, with nearly 2.5 times increase. This phenomenon has a great influence on the quality of life and social stability and sustainable development of our country. So it is crucial to understand and handle the income gap of our country.

In recent years, scholars have paid more attention to the study of urban and rural income gap in China. In the general induction of literature research, CanmingYang and FujunZhao divided the literature of China's urban-rural income gap into three categories, including the methods and conclusions of the study of urban and rural income gap, the gap between urban and rural income gap and the cause of urban-rural income gap. Guanghui Song explored urban and rural income gap in three aspects, including the household registration, urban and rural per capita assets uneven, the rise in the relative price of agricultural and sideline products. Duanming Zhou and MinCai reviewed from the measurement of China's urban-rural income gap and its impact on the total income gap, the cause of urban-rural income gap, there is a lack of literature research. In the aspect of literature research by scientific measurement method, Yanhong Zhang used VAR model and impulse response function to explore the impact of China's financial development on the income gap between urban and rural areas. The results showed that the outflow of rural funds and the development of informal finance is not enough to pull the gap between urban and rural income. He suggested that reducing the income gap

between urban and rural areas needed to curb the outflow of rural funds and develop informal finance, and increase rural financial support to rural economic development. Li Cheng through the regression analysis of time series data from 1978 to 2011, drawn the impact of agricultural modernization on the income gap between urban and rural areas. Xuesong Li used vector auto regressive model to put the fiscal decentralization system, agricultural economic growth and urban-rural income gap in the framework of a unified logical analysis. The long-term equilibrium between urban and rural income gap, agricultural economic growth and fiscal decentralization is obtained. Suxia Bai used the Gene coefficient and its decomposition method, influence of 2000-2011 years of China's urban-rural income gap size and different sources of income to analyze the income gap between urban and rural areas, obtained the wage income causes the largest contribution to income gap between urban and rural areas and the second is transfer income. However household income as an important source of income for rural residents, the advantages of reducing the gap between urban and rural areas has gradually lost.

Through the research, scholars did a lot of work about research review and empirical research of the urban-rural income gap. Using literature tools to visualization analysis of the literature in the field is very rare. Therefore, the paper analysis is the key and hot topics of the urban-rural income gap by using the scientific method combining the literature in detail. Research objectives, generalize hot issues in this area of domestic research and research trends in the future. Provides reference for scholars studying on the urban-rural income gap.

2. METHOD

2.1. Social Network Analysis

Social Network Analysis originated from the Social Graph theory and Econometrics. The domestic academia started research in this area in the 1990s of the 20th century. There is a wide gap with foreign related fields. In recent years, the number of domestic articles using social analysis method is increasing. Qin Zhang and Xiurong Liu used social network analysis for visual analysis on the field of domestic knowledge management, and pointed out the weak link in the field of knowledge management in China. Yang Song used social network analysis, based on a specific tag of sina Weibo as a sample, combined with the user between the "attention" and "attention" relationship, build a user "mutual concern" network. It has certain feasibility. Zezhao Liu used metrology and social network analysis Bibexcel, Pajek as a tool for the research of international big data research topic and a total citation network analysis, revealed the characteristics of the current international big data research objectively.

The first paper that used statistical analysis toolkit for Informatics, that developed by Qiyuan Liu who worked in Information Management System of Zhejiang University. This software can analyze data in CNKI, Wanfang and CSSCI.A series of transformation processes by the software, get frequency statistics and generate Co-occurrence Matrix. Second, use Netdraw which Integrated by Ucinet, and deal with the SATI co-occurrence matrices generated by the software, get the keywords network profiles.

2.2. Technical Term

At the time of Data Processing, there are some technical terms must use in the paper. Centrality is one of the most important and most commonly used conceptual tools. It measures the status of actors in the network and reflects actors' position advantage or difference in social network. Network centrality contains three common forms, such as Degree centrality, between centrality and Closeness centrality.

Degree centrality uses the number of nodes directly connected with it to measure the own communication skills of nodes in the network. If a node directly connected with many points, we say that the node has a high degree centrality. If a Point has a higher degree, it is in the center of the network and have the power.

Between centrality is another concept about center degree. It is the interval level between one nodes. In other words, it represents they are the "intermediary" of other nodes to what extent. Between centrality is measuring the ability to control other actors. These actors have the role of a bridge.

Closeness centrality is measured according to the tightness or distance between nodes in the network. If the distance between one node with other node is shorter, the closeness centrality of this node is higher.

2.3. K-core

K-core is a kind of condensed subgroups based on degree. If all points at least connect to the other K points in the graph, we call this subgraph K-cores. The k is different, so the K-core is also different. According to their own data and research purposes to determine the size of the K value, it finds a number of meaningful aggregation subgroups.

3. ANALYSIS ON THE NETWORK OF URBAN AND RURAL INCOME GAP KEYWORDS SOURCE JOURNAL ANALYSIS

**Table1.** *The source journals of the income gap between urban and rural areas*

frequency	journals	frequency	journals
22	Commercial Age	6	Economic Geography
21	Statistics and Decision	6	Business Research
14	Research Productivity	5	Economic Research
11	Anhui Agricultural Science	5	Quantitative Economics and
10	Economic System Reform		Technical Economics Research
10	Agricultural Technology Economy	5	Economic Problems
10	Economic Latitude and Longitude	5	Journal of Yunnan University of
10	Agricultural Economy		Finance and Economics
9	Science of Finance and Economics	5	Contemporary Economic Science
9	Journal of Shanxi University of	5	Financial Research
	Finance and Economics	5	Special Zone Economy
8	Financial Issues Research	5	Economic Theory and Economic
7	Exploration of Economic Problems		Management
7	Rural Economy	5	Urban Problem
7	Agricultural Economic Problems	4	Reform
7	Enterprise Economic Problems	4	Journal of Beijing Technology and
7	Contemporary Economy		Business University (social science
6	Population Resources and		edition)
	Environment in China		

In order to know the space distribution characteristics of this area, master core journals of this area, and provide evidence for literature management and collection, even more offer guidance and helps to scholars, we have to study the original journal of the thesis. Table 1 shows the name and frequency of journals. Then select the top 30 of the journals. We find that Commercial era, Statistics and Decision, Productivity Research, Agriculture Science of Anhui and Reform of the Economic System stand in

front of all the other journals. Therefore, these five journals put more effort on research of urban-rural income gap but with little frequency, meanwhile, this situation shows that research on urban-rural income gap is not universal.

4. MAP ANALYSIS OF KEYWORDS

We use key words to show the topic of the literature, and high frequency key words confirms the research hotspot of a certain area. In order to get key words of higher frequency clearly, use SATI to cut out a square matrix of 30*30, and generate co-occurrence matrix, then lead it in Ucinet, and use Netdraw which is generated by the software above to get the co-occurrence network graph which stands for high frequency key words of urban-rural income gap. Every spot in the network graph stand for the key word related to the urban-rural income gap, the size of spots stands for their centrality in the network, and distance between two spots shows intimate degree among the key words. Moreover, as figure 1 shows, with analysis of k-cores, distinguish of color and shape of different spots, we can get different groups. In figure1, red spots are larger and have a considerable quantity. They include urban-rural income gap, financial development, panel data, dual economic structure, urbanization, labor transfer and so on. Black square spots with a larger degree but a diffuse layout include co integration test, labor transfer, co-integration analysis and so on. Red up-triangle spots cover urban bias, income distribution, gene coefficient, and influence factors. Diffuse blue rhombus spots include human capital, financial expenditure structure, economic development and so on. Concentrated grey down-triangle spots include rural finance, VAR model, Theil index, fiscal decentralization, and industrial structure. But they are far away from key words of urban-rural income gap.
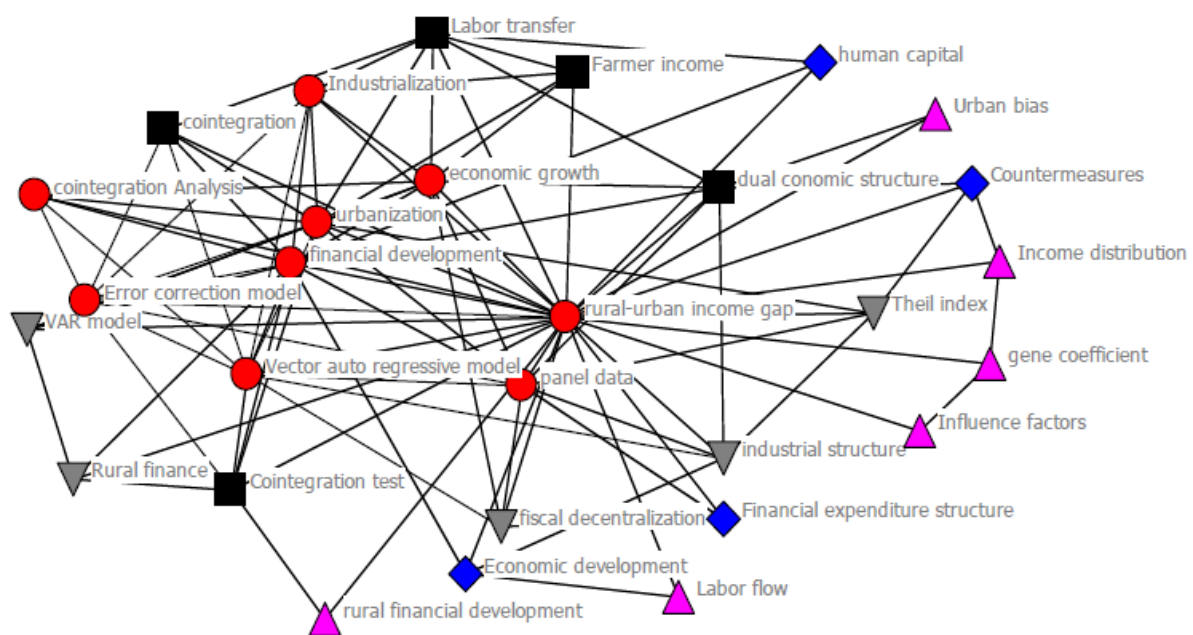
Fig1. *Map analysis of the income gap between urban and rural areas*

5. CENTRAL DEGREE ANALYSIS OF CORE KEYWORDS

Table 2 lists three keyword nodes of center values. According to the results of data processing, following conclusions be drawn:

The degree centrality of the rural-urban income gap, financial development and urbanization are higher. They are the hotspots in research of the income gap between urban and rural areas in China and attract most researchers' attention.

Table2. *Core keywords centrality measure*

serial number	Key words	degree	Keywords	betweenness	Keywords	closeness
1	rural-urban income gap	29	rural-urban income gap	226.563	rural-urban income gap	59
2	financial development	15	financial development	23.993	financial development	73
3	urbanization	13	urbanization	13.46	urbanization	75
4	economic growth	12	panel data	9.263	economic growth	76
5	panel data	11	economic growth	8.987	panel data	77
6	dual economic structure	9	dual economic structure	6.533	dual economic structure	79
7	Error correction model	9	co-integration test	4.361	Error correction model	79
8	Industrialization	8	labor force transfer	4.067	Industrialization	80
9	labor force transfer	8	industrial structure	3.367	labor force transfer	80
10	industrial structure	7	Error correction model	2.937	industrial structure	81
11	co-integration test	7	Industrialization	2.013	co-integration test	81

Explain: *due to space, only lists the top 12 data.*

The data of between centrality show that the betweenness of keywords such as rural-urban income gap, financial development, urbanization and panel data's are higher. And they have high ability to control resources, exist strong control to other keywords.

The smaller Closeness is the easier, it is co-occurrence other keywords. Therefore, list closeness centrality from small to large, and the smaller are rural-urban income gap, financial development, urbanization, economic growth and so on.

To do further processes for the data in table 2, filter out the "rural-urban income gap" the title contains, the "panel data", "error correction model" which the empirical studies included. Finally, select the most potential four keywords: financial development, urbanization, dual economic structure and labor transfer, as keywords to do further research.

6. MAP ANALYSIS OF SECONDARY KEYWORDS

Those core indexes calculate the differences of income gap of urban and rural and the structure of distribution in the relative field. In order to get more comprehensive information, according to the nature of knowledge map node, "A" node with high center degree and strong control ability is used as the key words, and establish a sub network for the center. To some extent, it represents the current urban and rural income gap. Continue to use SATI software and Ucinet software to integrate the Netdraw software to deal with the total current matrix, to intercept 30*30 matrix, mapping out the content of the knowledge map to display the urban and rural income gap research content and knowledge structure more comprehensive.

With the" financial development" regarded as the key words, as showing in figure 2, the number of red circular nodes is related more and more closely, the number of accounts for 70% of 30 key nodes. We can see that the "financial development" of the key words are mostly econometric methods, such as the Grainger causality test, VAR model, FDI, co-integration analysis, panel data, etc. This can be seen, the literature of the field of financial development is the empirical analysis of the method of measurement. But the red circles include the gap between urban and rural income, economic growth, financial structure, technological progress, industrial structure, regional finance and so on. These nodes keyword with the "financial development" correlation is deeper, and the influence is relatively large. Next is the black triangle node, the map has the income distribution and so on. Once again, the

key words, such as urbanization, financial innovation, these two key words tend to edge, and the financial development is weak, so the influence is also weak.
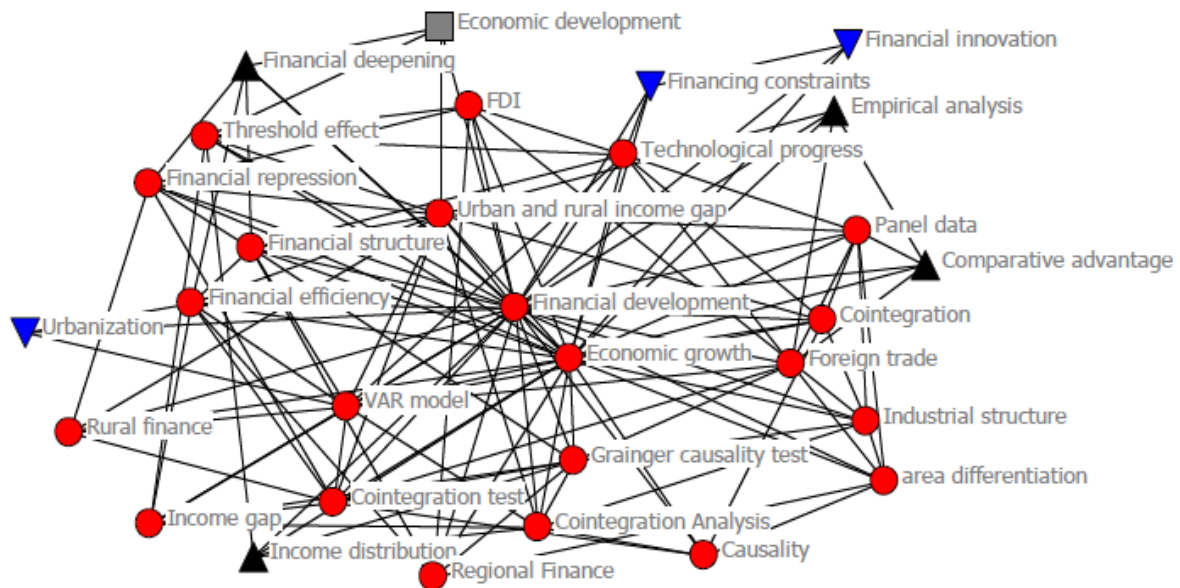

Fig2. *Map analysis of financial development*

As shown in Figure 3,"urbanization" as the key words, the number of red circular nodes is 76% in the 30 nodes. Industrialization, urban agglomeration, industrial structure, urban and rural integration, small town, sustainable development and so on are the hot spots around the city. In addition, although the black square nodes tend to edge, they relatively concentrated. So there is a certain value of research, such as labor transfer, social security, and new rural construction.
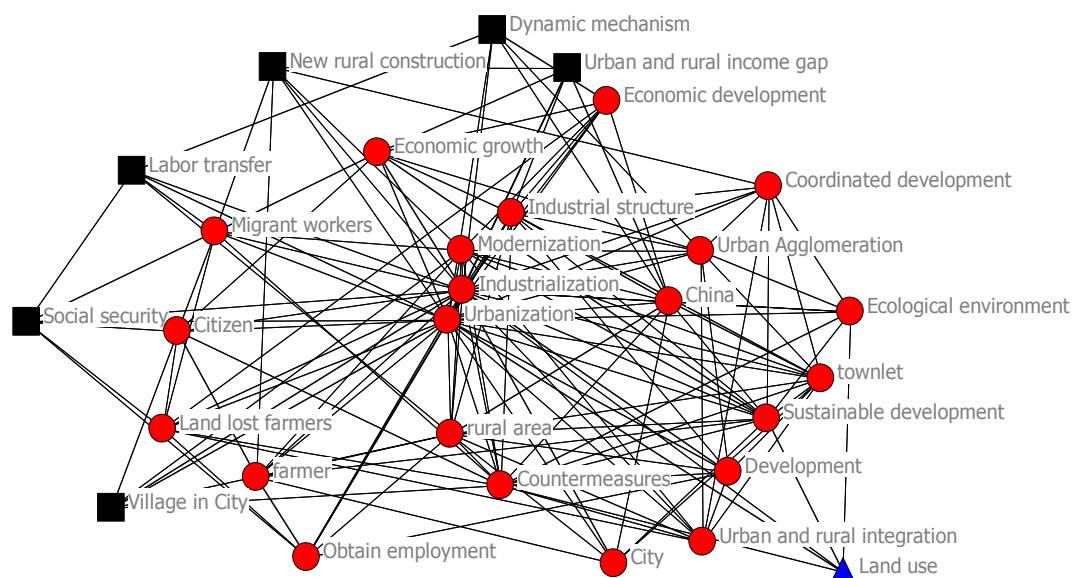

Fig3. *Map analysis of urbanization*

As shown in Figure 4, "dual economic structure" as the key words, the number of red circular nodes is 59% in the 30 nodes. Rural economy, industrial structure, economic development, agricultural sector, agricultural labor, surplus labor, urban and rural integration are the most associated nodes.
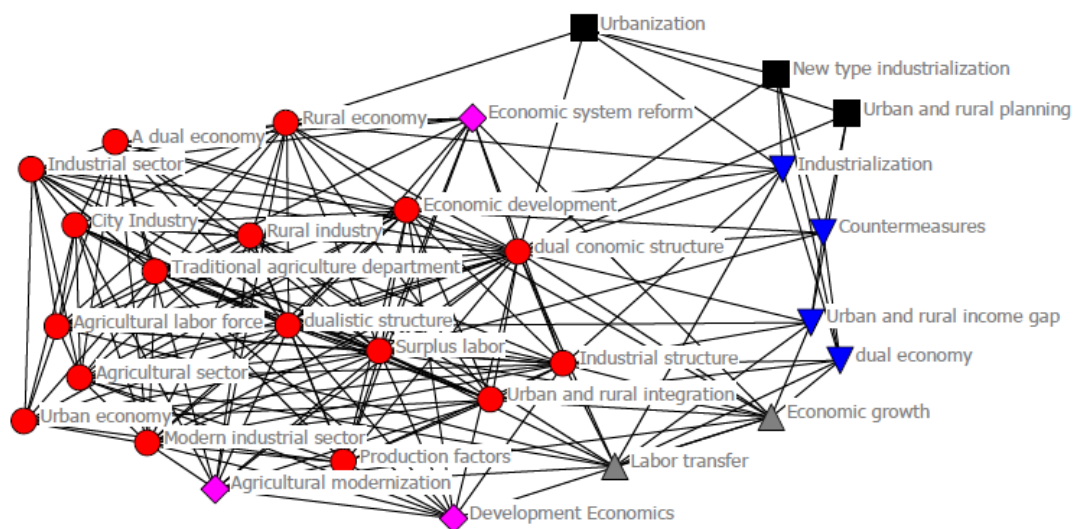
Fig4. *Map analysis of dual economic structure*

As shown in Figure 5," Labor transfer" as the key words, the number of red circular nodes is 67% in the 30 nodes. The research hotspot in this field is the rural economy, migrant workers, agricultural industrialization, increase of farmers' income, human capital, new rural construction, etc.
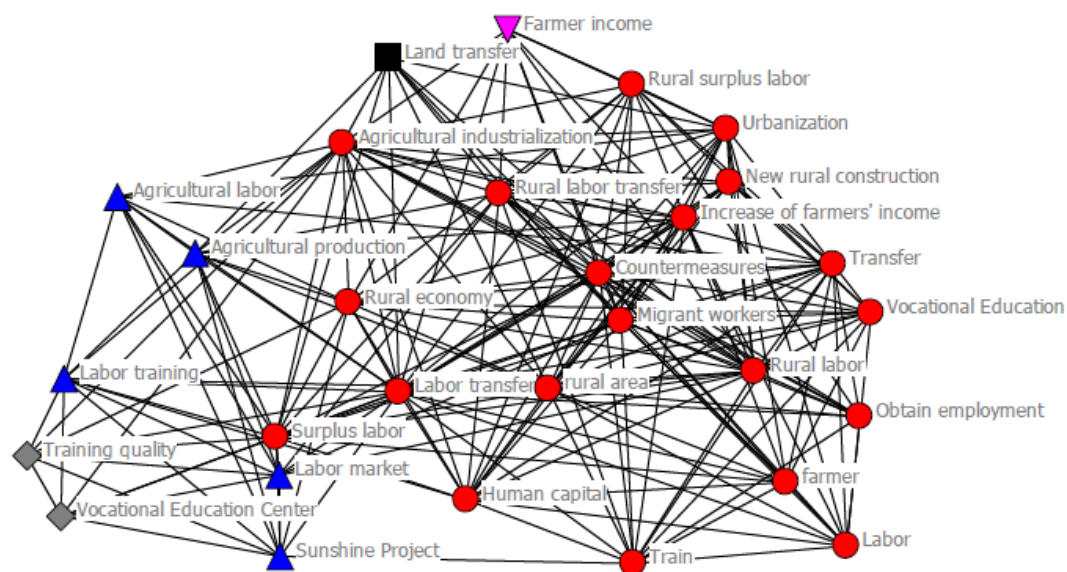
Fig5. *Map analysis of Labor transfer*

7. CONCLUSION

This paper use social network analysis method, studying the urban-rural income gap and the most of the key words, through the introduction of SATI to generate a co-word network matrix, and then use Ucinet and Netdraw for quantitative and visual analysis, draw the following conclusions.

First of all, through the analysis of key words, the paper finds that most of the researches on urban and rural income gap are published in the core of the economic class and the CSSCI journals, which the largest number of papers are published in the business times, statistics and decision-making and productivity research.

Second, through the analysis of the number of changes in the literature, the study of urban-rural income gap in 2013 after a rapid growth trend, which shows that in recent years, with the expansion

of urban and rural income gap, whether for government departments or academic circles, urban and rural income gap has been concerned more .

Third, through the analysis of the key words and the center of the city, we know that the income gap between urban and rural areas has four keywords: financial development, urbanization, two-dimensional economic structure and labor transfer. Through the analysis of the four key words of the highest degree of association, we get the following research framework.

From Figure 6, it can be concluded that, the hot spots in the research field of urban and rural income gap are the financial development, the urbanization, the dual economic structure and the transfer of labor force. Related to financial development, including regional finance, economic growth, financial structure, technological progress and industrial structure; the research of urbanization includes industrial structure, industrialization, urban agglomeration, urban and rural integration, sustainable development and small towns. The research on the economic structure of the two-dimensional includes the industrial structure, economic development, the surplus labor force, the urban and rural integration and the agricultural sector; The main focus of the research on the transfer of labor force in the labor surplus, agricultural industrialization, rural economy, human capital and urbanization. Through the study it is found that in the areas of research and urban and rural income gap directly related to the research, there are some cross keywords, for example, the industrial structure, the remaining labor and urban and rural integration, etc.
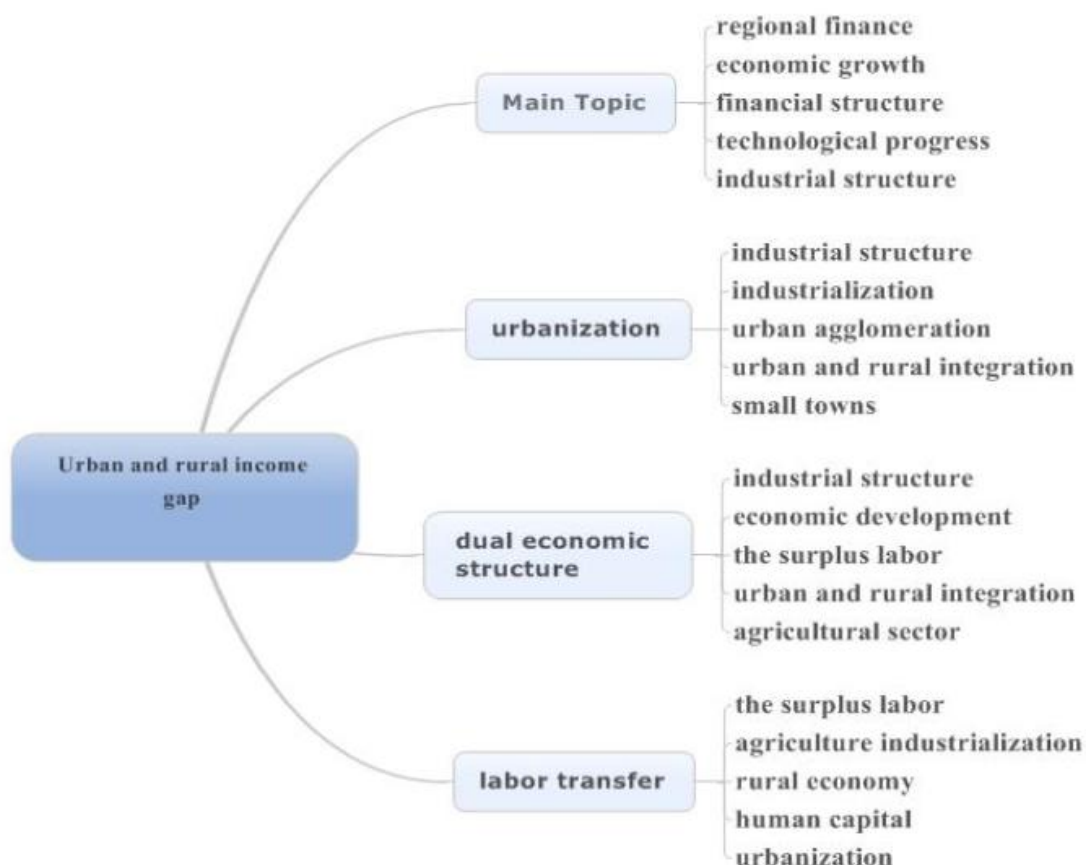
Fig6. *The framework of the study on urban and rural income gap*

In this paper, the social network analysis method is used to analyze the papers published in important journals in recent years, in order to draw some Conclusions. First, standardization research on related fields of urban and rural income gap should be done. For example, establish a unified framework for economic analysis of the relationship between urban and rural income gap and economic development,

institutional reform and policy. Second, when doing research on labor transfer, should be taken into account the time, system and labor market changes, track and validate it. Third, at present, the research on the income gap between urban and rural areas in China only stays in the present situation, and there is no unified income distribution model. So it will be a research direction in the future. Finally, domestic research is more at home level; it should be widely carried out in the study of the difference between urban and rural income gap, through the comparison and analysis between foreign related researches. Especially with the transition economies, reveal the different effects of different systems.

This paper summarizes the academic literature on urban and rural income gap, and it is hoped to provide some reference for the government departments or scholars for future researches. But the basic data of the research in this paper mainly come from the domestic important academic journals, it is neither related to foreign related research literature, nor related to the government and the relevant laws and regulations and policies. So, there are some limitations, hoped to be improved in the future researches.

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