

Research on Cross-border M&A Networks in "One Belt One Road" Countries Based on SNA

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ABSTRACT

This paper constructs a cross-border M&A transaction network in the "One Belt One Road" countries, and explores the structural evolution characteristics of the network through social network analysis methods. The results show that the degree of closeness of M&A transactions between countries in the "One Belt One Road" cross-border M&A network has increased year by year, but there is still a lot of room for development as a whole; more developed economies are at the core of the network. The weaker economies have almost no influence in the network; the cross-border M&A activities in the sectors of Central and Eastern Europe and the Commonwealth of Independent States as the main body are relatively active. Southeast Asian countries have become popular areas for capital inflows in recent years. Western Asian countries are more scattered and difficult to form blocks; the M&A linkages between countries have gradually shown the "Matthew effect."

Keywords: *Social network analysis, "One Belt One Road", cross-border mergers and acquisitions network, network evolution*

1. INTRODUCTION

With the advancement of the "One Belt One Road" initiative, cross-border M&A, as a very effective way to achieve cross-border resource integration, are also an important form of international capacity cooperation. In the context of the "One Belt One Road" initiative, a large number of companies in various countries have undergone a large number of M&A within a period of time, forming a cross-border M&A network from a macro perspective. Therefore, systematic analysis of network structure characteristics has profound significance for resource allocation and capacity optimization in the international market.

Over the years, scholars have achieved a series of results in the fields of international business, strategic management and finance on cross-border M&A [1]. Early research mainly focused on the process, performance and risk of micro-individual companies [2]. However, as the scale of M&A between companies in various countries continues to expand, analyzing the cross-border M&A activities and economic demands of various countries from a macro perspective has become a new hot topic. Existing studies have found that the source countries of M&A are not only high-income countries

abroad, but from developing countries is also increasing rapidly [3]. Some scholars have studied the status and development trend of cross-border M&A in countries along the "One Belt One Road" from the perspective of industry structure [4].

Social network is a relatively stable network system composed of multiple individual members and connections between members [5]. At present, it has been applied in many fields of international relations, economic and trade cooperation network [6], global merger and acquisition network [7], etc. The advantages of SNA methods in portraying the association between micro-subjects from a macro perspective have been further demonstrated. Therefore, it is of great value to study the network structure of "One Belt One Road" cross-border M&A from a national perspective.

2. DATA SOURCE AND NETWORK CONSTRUCTION

2.1. Data Sources

This article extracts the cross-border M&A transaction records of 66 countries along the "One Belt One Road" including China from 2010 to 2018 from the

Zephyr database, and a total of 4938 valid records were obtained. The records include the M&A home country and the M&A host country of the companies participating in the cross-border M&A. Based on this, a country-based cross-border M&A network based on the “One Belt One Road” initiative will be constructed from 2010 to 2018, and the overall trend of “One Belt One Road” cross-border M&A will be depicted.

2.2. Cross-border M&A network construction

According to the description method of the network, this article records the country to which the merged company belongs as a node, and the merger relationship between countries constitutes the edge of the node in the network. Among them, the vector $V_i=[v_i](i=1,2,\dots,N)$ represents the country where the merger is initiated, and the vector $V_j=[v_j](j=1,2,\dots,N)$ represents the country of the target of the merger. The adjacency matrix $A=[a_{ij}](i=1,2,\dots,N; j=1,2,\dots,N)$ represents the M&A relationship between the two countries. If country i has an M&A transaction with country j , then $a_{ij}=1$, otherwise $a_{ij}=0$. Use the weighting matrix $W=[w_{ij}](i=1,2,\dots,N; j=1,2,\dots,N)$ to represent the frequency of mergers and acquisitions in country V_i to country V_j .

3. ANALYSIS OF THE OVERALL AND NODE CHARACTERISTICS OF THE CROSS-BORDER M&A NETWORK

3.1. Analysis of overall network characteristics

Table 1 lists the main structural indicators of the overall characteristics of the cross-border M&A network from 2010 to 2018. Among them, the changes of nodes and edges reflect the overall scale of the network showing a trend of rising first and then falling slightly. The scale of the network continued to grow before 2014, and the start of the “One Belt One Road” construction has made M&A contacts between countries more frequent. After 2014, affected by the de-globalization, the network scale began to fluctuate.

The results show that the changing trend of network density is consistent with the network size. However, the

Table 1 Main structural indicators of cross-border M&A networks from 2010 to 2018

Years	2010	2011	2012	2013	2014	2015	2016	2017	2018
Node	47	45	48	50	56	54	51	53	52
Side	472	469	465	557	664	483	628	578	540
Density	0.1098	0.1091	0.1082	0.1296	0.1548	0.1446	0.1462	0.1345	0.1356
Average path length	3.376	2.995	2.993	2.583	2.030	2.308	2.109	2.190	2.058
Clustering coefficient	0.226	0.214	0.301	0.337	0.373	0.370	0.423	0.410	0.374

density value is small, indicating that the M&A linkages between the “One Belt One Road” countries are not yet close enough, and there is still more room for development to promote M&A linkages between countries. The average path length decreased from 3.376 in 2010 to 2.030, indicating that the shortest path connecting two countries through M&A has dropped from 3.3 countries to 2 countries on average. This shows that M&A between countries are closely related. The clustering coefficient has the opposite trend, rising from 0.226 to the highest value of 0.423, indicating that as the “One Belt One Road” construction has shortened the investment distance between countries, international capacity cooperation has become more frequent.

3.2. Network node centrality analysis

In order to evaluate the relative position of individual countries in the process of promoting the efficiency improvement of the overall M&A network, this paper uses the "Centrality" method in social network analysis to analyse the status of M&A linkages between individual countries and other countries in the network. The specific analysis results are shown in the Table 2.

According to the results in Table 2, in terms of degree centrality, emerging market countries, led by the Czech Republic, Singapore, China, and Russia, have always been able to conduct M&A transactions with other countries in the network, and their status and influence in the network Larger. In terms of betweenness centrality, countries with high betweenness numbers are mainly concentrated in countries with high levels of economic development such as Singapore, Russia, the Czech Republic, China and Poland. It shows that the level of economic development determines the country's ability to control M&A resources. In terms of closeness centrality, emerging market economies have consistently ranked at the top in the past three years. Ukraine, which has a low labor cost, and the Czech Republic, which has a long industrial history, both rank in the top 10. This indirectly shows that the development of technology and human capital can help facilitate M&A and improve the efficiency of M&A.

Table 2 The top 15 countries ranked by cross-border M&A network centrality indicators

Rank	Degree centrality			Betweenness centrality			Closeness centrality		
	2010	2014	2018	2010	2014	2018	2010	2014	2018
1	RU	BG	CZ	CY	SG	PL	RU	BG	CZ
2	CY	RU	SG	SG	RU	SG	CN	CN	SG
3	CN	SG	CN	CZ	AE	CZ	AE	RU	PL
4	MY	PL	RU	AE	PL	AE	TR	PL	AE
5	SG	AE	AE	RU	CZ	RU	PL	TR	RU
6	CZ	RO	IN	MY	IN	IN	IN	CZ	CN
7	AE	CZ	PL	IN	UA	TH	UA	RS	CY
8	PL	TR	MY	CN	CN	CY	BG	UA	IN
9	IN	CY	CY	SA	TR	CN	RO	IN	UA
10	LT	SK	TH	LT	SK	MY	CZ	AE	SI
11	UA	CN	UA	UA	CY	RS	HU	HU	RO
12	HU	IN	RS	HU	TH	UA	ID	RO	HU
13	TR	MY	EE	BG	HR	SI	RO	SG	KW
14	PS	UA	SK	TR	SI	EE	AZ	HR	RS
15	LV	GR	ID	EE	ID	HU	GE	ID	TH

On the whole, Asian countries such as India and the UAE and EU countries such as Bulgaria and Cyprus are also relatively high in the rankings of various indicators. Countries such as Nepal, Montenegro, and Palestine have almost no influence on the Internet. Therefore, it is urgent to accelerate economic development and strengthen their active role in international capacity cooperation.

4. ANALYSIS OF NETWORK BLOCK MODEL OF CROSS-BORDER M&A

Block model analysis was first proposed by scholars such as White [8]. It is a method of dividing each point into "Blocks" based on structural information, which can analyze the status and role of nodes in the network. Therefore, according to the transaction characteristics of the cross-border M&A network in the "One Belt One Road" countries, this article divides the countries along the route, and strengthens the status of the country in the M&A network by studying the correlation between the inflow and outflow of M&A capital between the sectors. Recognize with the role. This article divides the cross-border M&A network in 2014, and 2018 into four sections. And referring to the segmentation method of Wasserman et al.[9], Zhong Zhaohui et al.[10], etc., the sector is divided into four sectors: Two-way, Inward, Outward and Isolated.

See Table 3 for the results of sector division. It can be seen that the number of countries in the sector is gradually disparity, indicating that the trend of sector integration is more obvious. In addition, each sector group at each stage includes countries with high, middle-

high, middle-low, and low-income levels, it can be seen that the income level is not the main factor in the formation of the M&A sector.

This paper also calculated the expected and actual internal relationship ratios of the four major cross-border M&A networks and the ratio of M&A issued and received to further understand the role and status of the sectors. The results are shown in Table 4. Specifically, the relationship structure between Central and Eastern Europe and the Commonwealth of Independent States countries is relatively stable. The internal M&A of the sectors with countries in the two regions as the main Two-way or Internal sector. Southeast Asia is also relatively stable, and its countries mainly engaged in cross-border M&A with other sector countries in 2014, which is an export-oriented sector. However, in 2018, it changed from the outflow of to the inflow. West Asia is relatively loose and difficult to be within the plate. The "Lumps" of the member states of the sector in 2014 and 2018 were gradually becoming apparent. In 2018, China, Singapore, India, and the Czech Republic, Russia, Poland and other countries belonged to the same sector, and the central indicators of these countries were all ranked in the top ten, reflecting the significant strengthening of transaction links between major cross-border M&A. There was a certain "Matthew effect" in the M&A of the "One Belt One Road" countries. And some countries, such as Turkmenistan, Nepal, Bhutan, and Yemen, all have weak economic foundations and backward national development levels, and they have always been in isolated areas of the network.

Table 3 Segmentation of cross-border M&A networks

2014	Sector One	RU, CY, HU, AE, AZ, AL, BN, GR, HR, IL, IQ, JO, SI, SK, SY, EE, OM, PK, PL, TR, LB
	Sector Two	BG, BY, CZ, AM, BA, LT, LV, MD, RO, MK, KG, UA, KZ, RS, SG, UZ
	Sector Three	CN, MY, EG, IN, SA, KH, KW, ID, PH, LK, TH, MM, VN, BH, QA
	Sector Four	AF, BD, BT, MG, TJ, TM, MV, PS, YE, GE, MN, IR, NP, LA
2018	Sector One	BG, BY, CY, CZ, EE, AE, AM, GE, GR, HU, LT, LV, MD, MK, RO, RS, RU, PL, SI, SK, UA
	Sector Two	CN, SG, TH, TR, BD, BN, EG, HR, ID, IL, IN, KH, KZ, LK, MM, MN, MY, NP, PH, PK, SA, UZ, VN
	Sector Three	AL, AZ, BA, BH, KW, LA, OM, QA
	Sector Four	AF, BT, IQ, IR, JO, KG, LB, MG, MV, PS, SY, TJ, TM, YE

Table 4 Types of various sectors of the “One Belt One Road” cross-border M&A network

Years	Section	Expected internal relationship	Actual internal relationship	Capital outflow to inflow	Section type
2014	One	30.77%	75.63%	0.14	Inward
	Two	23.08%	17.91%	1.88	Outward
	Three	21.54%	20.83%	3.91	Outward
	Four	20.00%	0.00%	0.00	Isolated
2018	One	30.77%	91.84%	1.54	Two-way
	Two	33.85%	93.75%	0.86	Inward
	Three	10.77%	50.00%	0.43	Inward
	Four	20.00%	0.00%	0.00	Isolated

5. CONCLUSION

Based on the SNA method, this paper constructs a cross-border M&A network in the “One Belt One Road” countries, studies the characteristics of the network from different angles, and draws the following conclusions:

The degree of closeness of M&A transactions between countries in the “One Belt One Road” cross-border M&A network has increased year by year, but there is still a lot of room for development as a whole; more developed economies are at the core of the network. The weaker economies have almost no influence in the network; the cross-border M&A activities in the sectors of Central and Eastern Europe and the Commonwealth of Independent States as the main body are relatively active. Southeast Asian countries have become popular areas for capital inflows in recent years. Western Asian countries are more scattered and difficult to form blocks; the M&A

linkages between countries have gradually shown the "Matthew effect."

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