

The evolution of manufacturing trade network structure of the Belt and Road

Jian Yang

Nanjing University of Science and Technology, China

*Corresponding author: Jian Yang, 2515475788@qq.com

Abstract

This paper makes research on evolution of trade network structure of "the Belt and Road" based on export data of national manufacturing industry from 2000 to 2014 with adoption of UCINET software and social network analysis method. Research has found out that the trade link of "the Belt and Road" national manufacturing industry is very close all the time.

Key words: "the Belt and Road" ; the social network method ; manufacturing; trade network

1 Introduction

In 2013, Chinese President Xi Jinping put forward a new model of international regional economic cooperation—"the Belt and Road"(B&R) strategy. China's manufacturing industry has always been the pride of the China. However, although China's manufacturing industry is developing at a high speed, it still stays at the lowest end of the industrial chain. Accelerating the building of the Belt and Road can help promote the economic prosperity of the countries along the Belt and Road and regional economic cooperation, strengthen exchanges and mutual learning between different civilizations, and promote world peace and development.

This paper explores the role and status of the countries in the manufacturing trade by deeply studying the structure evolution of the country's manufacturing trade. We want to analyze the changes in the status and make recommendations for China's manufacturing industry.

2 Research technique

2.1 Data sources

The trade data used in this paper is from the United Nations Commodity Trade Statistics Database (UNCOMTRADE).We select 66 key node countries on "B&R Road" and have choose manufacturing products export data in UNCOMTRADE from 2000 to 2014 with the

HS code in the corresponding. All data is converted into a unified format of the United Nations Census and Statistics Department in US dollars.

2.2 Social network analysis model

In this model, the manufacturing trade network on the "the Belt and Road" can be seen as a new type of export trade network, a collection of trade relations between countries and regions¹. According to the research needs, the data processing methods in this paper are divided into unauthorized trade network and weighted trade network.

3 "The Belt and Road " countries' manufacturing trade development status

East Asia and South Asia manufacturing exports accounted for the proportion of total exports are very high especially in East Asia up to 90%. This shows manufacturing is very important in the "the Belt and Road" countries. But the proportion of these countries exports to the global manufacturing exports is small. Because these countries are in developing and have little contribution to global trade. Another reason is the "B&R" countries' manufacturing are in low level. The added value is low, so the total output value of manufacturing is low. East Asia's high-tech exports accounted for the proportion of total exports is highest, still only 59%. We get two conclusions: Firstly, the "B&R" countries' contribution to the world economy is very small. Secondly, because of low value and low value-added, these countries' manufacturing trade exports are few.

4 An empirical analysis of the network structure of national manufacturing trade network

4.1 Network size

Network size refers to the number of countries in the trade network². The size of the trade network is 66. Using UCINET software to draw "B&R" countries visualization in 2000 and 2014 respectively .Network visualization structure can be seen in Figure1, Figure2.

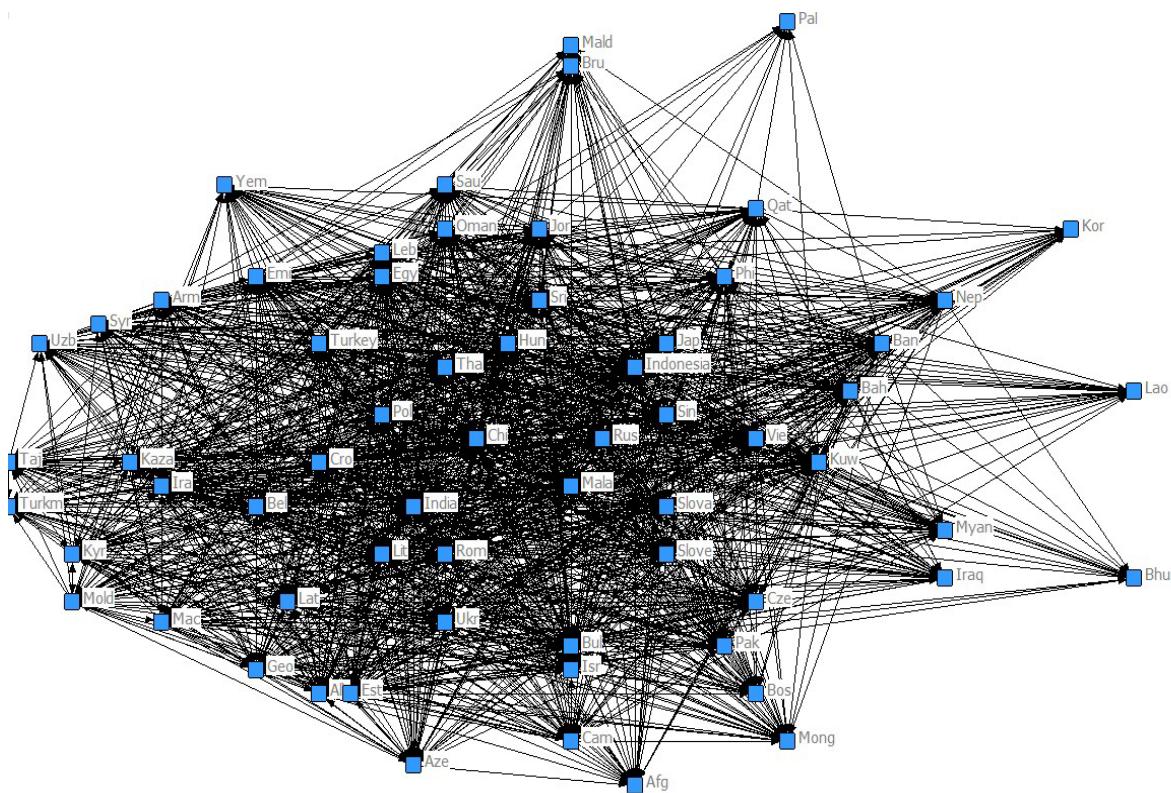


Fig 1-2000 trade network visualization

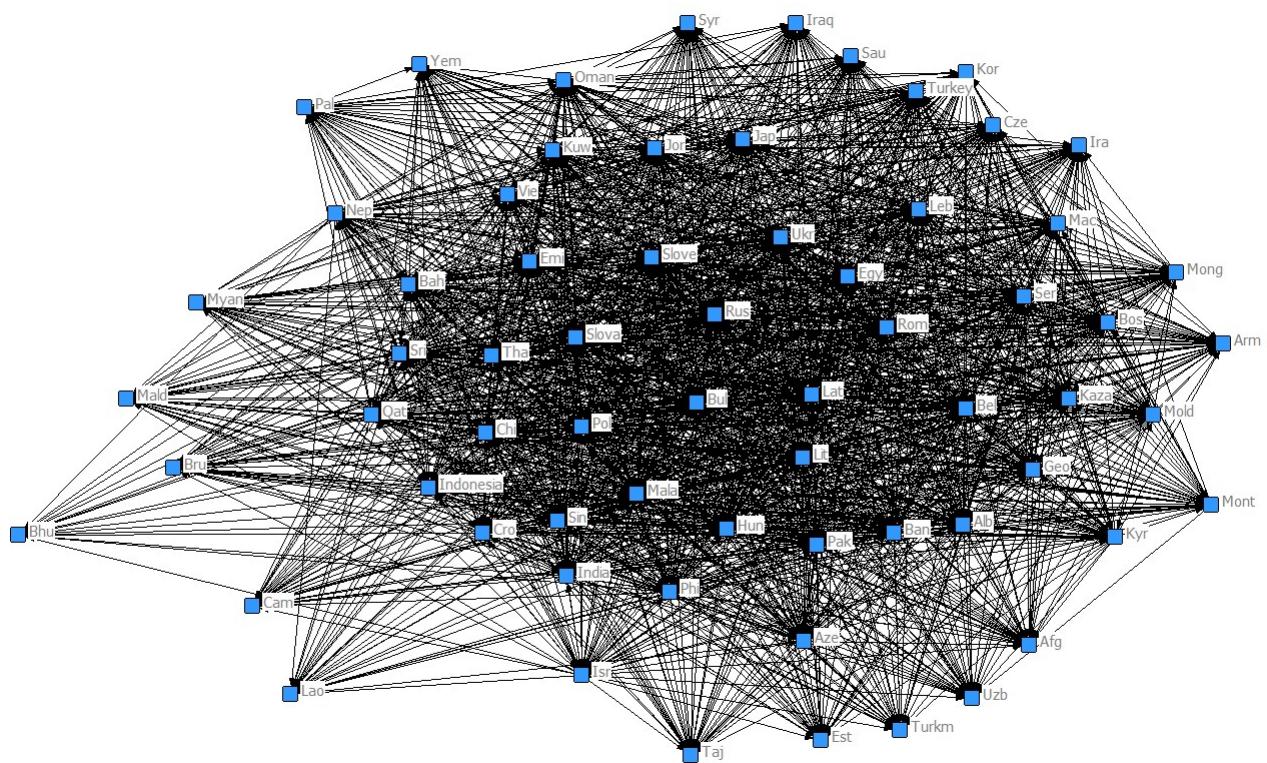


Fig 2- 2014 trade network visualization

4.2 Network density analysis

Table 1 2000-2014 “the Belt and Road “ trade network density analysis

time	2000	2001	2002	2003	2004	2005	...	2011	2012	2013	2014
density	0.55	0.54	0.56	0.61	0.81	0.82	...	0.65	0.64	0.66	0.61

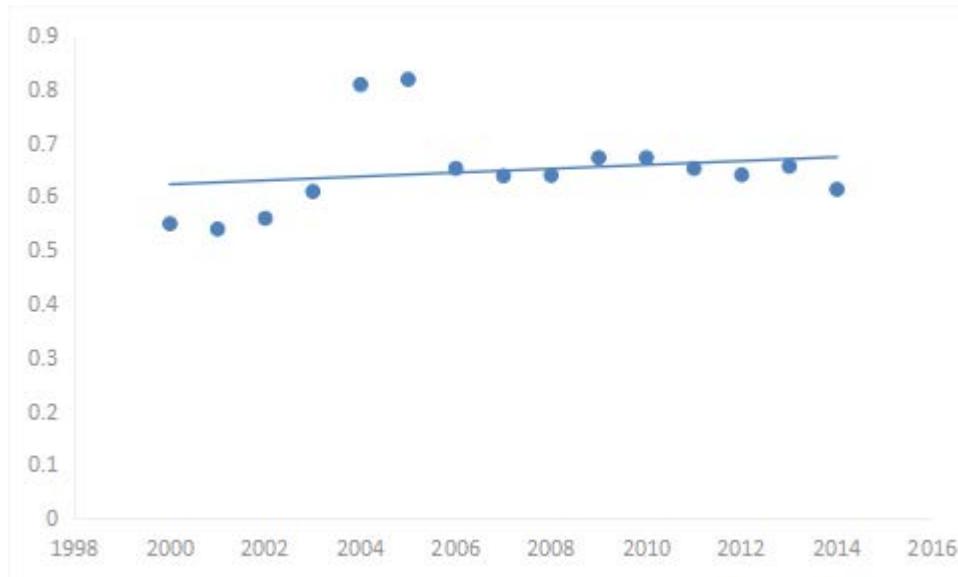


Fig 3- Network density scatter from 2000 to 2014

In Table1 and Figure3 the density of the trade network varies from 0.549 to 0.613 in 2000-2014. On a whole, the evolution of density is on the rise. The density of trade network is high all the time and fluctuates around 0.6 over 10 years. The average shortest distance of network is continuously decreasing.

4.3 Cohesive subgroup analysis

Cohesive subgroup is a small group of nodes whose nodes have direct and closely connected nodes³. Cohesive subgroup analysis is using the iterative correlation convergence method to find out the number of cohesive subgroups and member states in the trade network⁴. Analysis of the relationship between the subgroups can help us to understand the trade network and their development better.

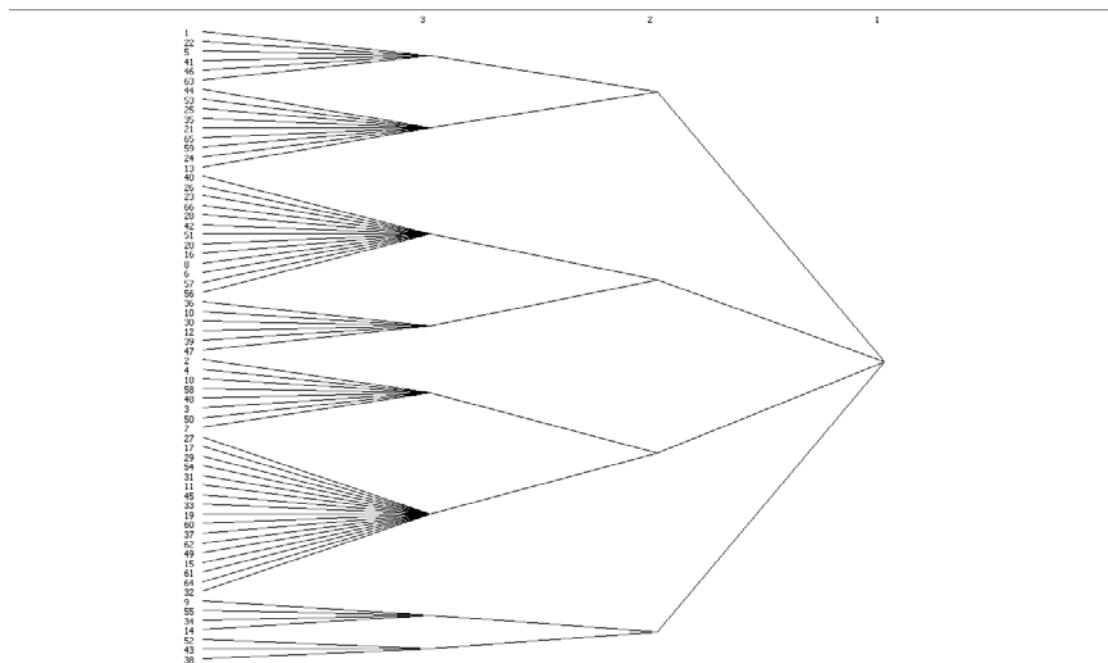


Fig 4 - "The Belt and Road "national manufacturing cluster in 2000

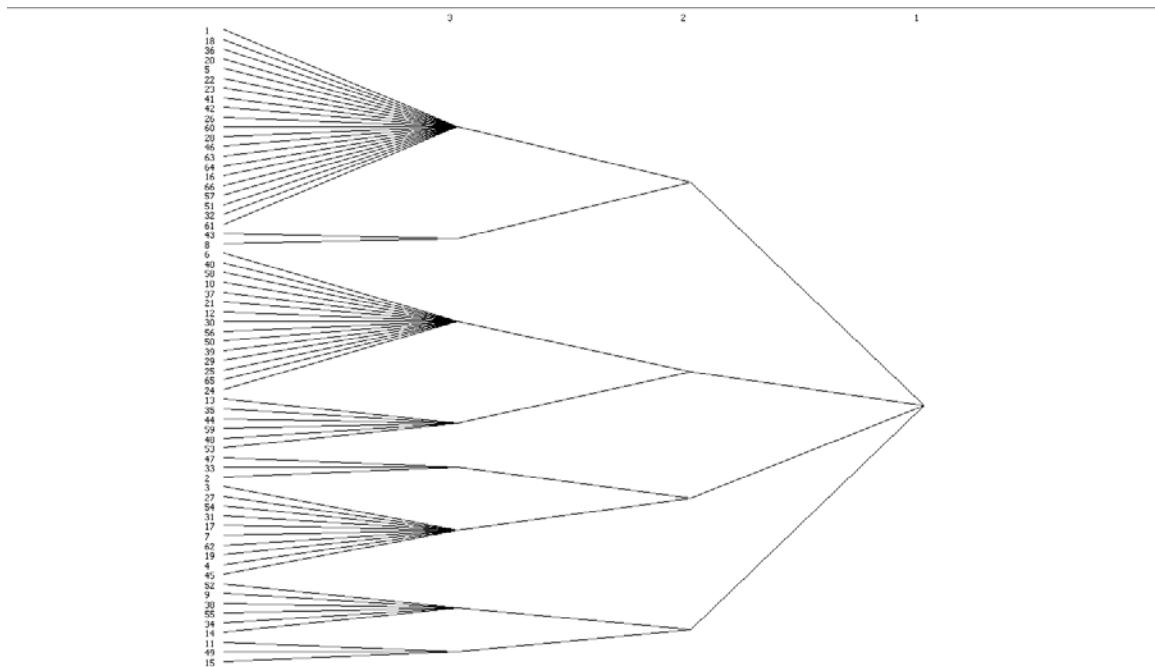


Fig 5 - "The Belt and Road " manufacturing cluster in 2014

We can see result in Fig4 and Fig5. The distribution of condensed subgroups mostly follows the geographical distribution. For example, subgroup1and subgroup2 are composed of West Asia,North Africa,South Asia and other countries. Subgroup3 and subgroup4 are composed of Southeast Asian countries. Subgroup5 is composed of the CIS countries. Subgroup6,7,8 are composed of 16 countries of Eastern Europe. By 2014, there was no big change. Some new subgroups replace subgroup1. Between 2000 and 2014, there are eight cohesive subgroups in trade network but the quantity of big cohesive subgroups is decreasing. China, Malaysia,

Thailand and Singapore are separated from original subgroup and form into a new cohesive subgroup.

4.4 Edge - core structure analysis

The edge-core structure refers to the structure with several factors, the center is closely connected, and the periphery is sparse and dispersed. In this paper, put the weighted trade data into UCINET6.0, we can calculate the core degree of each country in each year. Table 2 gives the 2000 trade network in the core of the country.

Table 2-Core and marginal countries in 2000 and 2014

	2000	2014
Core degree>0.5	10	7
0.1<Core degree≤0.5	5	9
Core degree≤0.1	51	50

Compared to 2000, "the Belt and Road" countries' trade participation has been greatly improved. Although the number of core countries has been reduced, but China's core degree rose from 0.652 to 0.765. On the one hand, China's core status is consolidated deeply. On the other hand, the core radiation of other countries is weakening. Japan, Malaysia, Thailand, the core role is no longer obvious. But more countries have changed to Semi-Periphery areas from the edge region and began to participate in the "the Belt and Road" national manufacturing trade network.

5 Conclusions

In this paper, the social network analysis method is used to analyze the evolution of the network structure based on the export trade. This paper has the following conclusions:

(1) Overall density of the national manufacturing trade network is stable and the average shortest distance is decreasing. During the period 2000 to 2014, the "the Belt and Road" countries have maintained a close manufacturing trade link. Because of the national oil prices turbulence in 2006, the density has a brief decline. After 2006, "the Belt and Road" national manufacturing trade network density has been maintained at 0.6 or more. China, Malaysia, Thailand, Singapore have a high core degree, are the center countries of the trade network. China's core degree is the highest which indicating that China has always served as center countries of "the Belt and Road" national manufacturing trade network.

(2) The whole center degree of national manufacturing trade network was rising linearly. During the period 2000 to 2014, the concentration trend of the entire manufacturing trade

network is on the rise. The center countries of the manufacturing trade network are increasing. The network structure becomes more closely.

(3) In 2000, there were eight subgroups and the distribution of subgroups followed the geographical distribution. In 2014, there were still eight subgroups in the trade network. Some new subgroups replace the original subgroups, and some large subgroups merger small groups. Among those subgroups, China, Malaysia, Thailand, Singapore are out from their original subgroups and become a new subgroups. Although the number of subgroups did not change, the number of large subgroups decreased. More countries went into small subgroups in the trade network. The convergence of the network is enhanced and the internal structure tends to be closer.

References

1. *Liu Jian*. Study on evolution of international crude oil trading pattern based on social network [J]. International Trade Issues,**12**(2013) 48-57
2. *Garlaschelli D,Loffredo M I*. Structure and evolution of the world trade Network,[J]. Physical A: Statistical Mechanics and its Applications,**355** (2005) 138-144.
3. *Fagiloog, Reyesj, Schiavos*,On the topological properties the world Trade web:A weighted network analysis,[J].Physical A:Statistical Mechanics and its Applications, 387 (2008) 3868-3873.
4. *Serranom A,Boguna M*, Topology of the world trade web,[J].Physical Review E ,**68** (2003) 49-64.