Status Quo of International Cooperation in Competitive Industries and Manufacturing in the Six Economic Corridors along the Belt and Road

Tang Yongchuan , Pan Yunhe, Zhang Xue, Huang Jiangjie

College of Computer Science and Technology, Zhejiang University, Hangzhou 310058, China

Abstract: The implementation of the Belt and Road initiative is shifting from planning to implementation; this in turn places a higher demand on international cooperation within China's manufacturing sector. Based on the 2016 statistics of the UN Comtrade Database, this paper focuses on the Belt and Road's six economic corridors, and uses the revealed comparative advantage index to comprehensively analyze comparative industries of participating countries. Meanwhile, the multidimensional scaling method is adopted to explore overall trade and manufacturing cooperation between China and these countries. Finally, based on the competitive industries and factor endowments of the countries in these six economic corridors, a direction of development, needed to realize high quality cooperation between China and countries participating in Belt and Road, is proposed.

Keywords: Belt and Road; manufacturing; six economic corridors; revealed comparative advantage index; multidimensional scaling

1 Introduction

The implementation of the Belt and Road initiative is a major measure driving China's opening-up and the top-down implementation of economic policy and diplomacy. The Belt and Road initiative is a Chinese program promoting global peace, cooperation, and common development [1]. Manufacturing is the mainstay of the national economy. Driven by the global production network and a new round of industrial, scientific, and technological revolution, China and the countries along the routes hope to promote sustainable economic development and achieve industrial revitalization by strengthening international cooperation in manufacturing. According to data from the Ministry of Commerce, Chinese foreign direct investment (FDI) in manufacturing industry in 2018 was 18.82 billion US dollars, accounting for 14.5% of total Chinese FDI; equipment manufacturing industry was 7.27 billion US dollars, accounting for 38.6% of manufacturing foreign investment. As part of the Belt and Road, manufacturing is an important component of international cooperation between China and other countries; this has also been an area of active research within the academic community. Several researchers have calculated the competitiveness of the manufacturing industry by utilizing indicators of industrial competitiveness; the prevailing

view is that China needs to and has the ability to build a global value chain, should expand the cooperation on production capacity, and promote common development with countries along the Belt and Road [2]. Some researchers have analyzed the industrial chain of China's manufacturing industry, along with the complementary advantages enjoyed by countries along the Belt and Road [3]. Through comparative and competitive advantage analyses, some researchers have empirically studied the status quo and trends of the competitiveness of China and that of countries along the Belt and Road; it is suggested that manufacturing is the main driving force promoting the international competitiveness of Chinese industry, and that it is the entry point for cooperation with countries participating in the Belt and Road initiative [4]. Based on the four-element theory of the Smile Curve, some experts expound on the factors driving the value of China's manufacturing industry in the Belt and Road region, and point out that China's manufacturing industry needs to a) focus on developing advanced technology (such as electronics and optics), b) focus on the manufacturing of content from "production" to "production service," and c) seek common development with the Belt and Road countries [5].

Based on international economic and trade data, combined with the revealed comparative advantage index and multidimensional scaling, this article analyzes the competitive industries and nature of cooperation in countries along the six major economic corridors. At the same time, this article proposes a direction of development for Chinese manufacturing towards high quality international cooperation.

2 The significance of the six economic corridors

Based on the areas of focus and geography of the Belt and Road initiative, China has proposed a "Six Corridors, Six Roads" framework for cooperation. The Six Corridors refer to 1) China and Pakistan, 2) the New Eurasian Continental Bridge, 3) China and the Indochina Peninsula (including the Philippines), 4) China–Central Asia–West Asia, 5) China–Mongolia–Russia, and 6) China, India, Bangladesh, and Myanmar.

It is of great importance to strengthen manufacturing cooperation in the six major economic corridors for the implementation of the Belt and Road initiative. The reasons include the following.

2.1 The six economic corridors are geographically compatible with the five directions of Belt and Road

The Silk Road Economic Belt has three major directions: one is from Northwest and Northeast China through Central Asia and Russia to the Baltics of Europe; the second is from Northwest China through Central Asia and West Asia to the Persian Gulf and the Mediterranean Sea; the third is from Southwest China through the Indochina Peninsula to the Indian Ocean.

The 21st-Century Maritime Silk Road has two major directions: one crosses the South China Sea from China's coastal ports, to the Indian Ocean through the Straits of Malacca, and then to Europe; the other crosses the South China Sea from China's coastal ports and extends to the South Pacific Ocean [6].

2.2 The six major economic corridors cooperate to produce demonstration effects

China has maintained a certain level of cooperation with ASEAN, European Union, and other regional intergovernmental organization member nations. This cooperation can demonstrate this to other countries along the Belt and Road; it can also enhance the recognition of and confidence in this initiative.

2.3 The cooperation of the six economic corridors is the main carrier of district policy

The Belt and Road initiative covers a wide geographical area, and there are differences between the complementarity of China's economic structure and the degree and extent of international cooperation. As countries within the six economic corridors have different development levels of manufacturing industry, they can accumulate experience through enhanced cooperation; this in turn can promote better and more meaningful international cooperation.

3 Analysis of competitive industries of countries in the six economic corridors

3.1 Theory and method

The revealed comparative advantage (RCA) is an index introduced by Béla Balassa and Mark Noland (1965).

The RCA is an index used in international economics for calculating the relative advantage or disadvantage of a certain country, in a certain class of goods or services, as evidenced by trade flows. RCA is the ratio between the export share of a given commodity or sector in a country and the export share of that commodity or industry in the global market, which is defined by:

$$\text{RCA}_{ij} = (X_{ij}/X_{it})/(X_{wj}/X_{wt}) \qquad （1）$$

X_{ij} is the export of Product j within Country i; X_{it} is the export of Country i to the world market during the period t; X_{wj} is the export of Product j in the world market; X_{wt} is the total export in the world market during the period t.

An RCA_{ij} value that is greater than 2.5 indicates that the country is very strongly competitive internationally. Values between 1.25 and 2.5 indicate a country is strongly competitive, values between 0.8 and 1.25 indicate a country is moderately competitive, and values less than 0.8 indicate a lack of competitiveness for a country.

Based on the UN Comtrade 2016 international trade data, we calculate and analyze the overall export structure of China and the countries along the Belt and Road (there were 73 as of the end of April 2018); we also determine and analyze the advantageous industrial categories of the countries in the six economic corridors [7]. According to the *Standard International Trade Classification (Revision 4)*, export products are classified into ten categories, numbered 0–9. In light of the resources required for production, Categories 0–4 are primary products, of which Categories 0 and 1 are the resource-intensive industries, Categories 2, 3, and 4 are energy-intensive industries, Categories 5–8 are industrial products, of which Categories 5 and 7 are capital- and technology-intensive industries, and Categories 6 and 8 are labor-intensive industries. Category 6, Category 7, and Category 8 belong to manufacturing (Table 1).

Table 1. Description of manufacturing related commodity categories

Commodity category	Product category
Category 6: Material classification	Unspecified leather and leather products; suede, unspecified rubber products; cork and wood products (except furniture); paper, cardboard, and pulp products; textile yarn (silk), fabric, and unspecified products; unspecified mineral products; steel, non-ferrous metals, unspecified metal products
Category 7: Machinery and transportation equipment	Power machinery and equipment; special industrial machinery; metal processing machinery; unspecified general industrial machinery and equipment and unspecified machine parts; office machines and automatic data processing equipment; telecommunications, recording and playback equipment; electrical machinery, devices, instruments, and unspecified electrical components; land vehicles and other transportation equipment
Category 8: Miscellaneous products	Prefabricated buildings; unspecified sanitary, waterways, heating and lighting equipment and accessories; furniture and parts thereof; bedding mattresses, mattress supports, upholstered and similarly filled furniture; travel gear, handbags, and similar containers; footwear for all types of clothing and apparel; unspecified professional, scientific and control instruments; unspecified photographic instruments and materials and optical products; unspecified miscellaneous articles

3.2 Analysis of overall competitive industries of countries along Belt and Road

We obtain the overall industrial structure of the Belt and Road countries (Fig. 1), according to the RCA index. In general, the overall level of manufacturing in countries along Belt and Road is relatively low; the manufacturing development advantage of most countries lies in labor and natural resources. In terms of the overall exports of these countries, the competitive advantage of industrial manufactured goods is less than that for primary products. Within the highly competitive ($\text{RCA}_{ij} \geq 2.5$) category, primary products account for 19% of the total, while industrial products account for only 3.5%. In the category of industrial manufactured goods, Categories 5 and 7 are capital- and technology-intensive industries, but their overall strength is relatively weak. Only 20 countries are competitive ($\text{RCA}_{ij} \geq 0.8$) in Category 5, and there are only 16 countries in Category 7. Compared with the above categories, countries along the Belt and Road have certain competitiveness in Categories 6 and 8, which are labor-intensive industries. In Category 6, 44 countries are competitive; there are 38 competitive countries in Category 8.
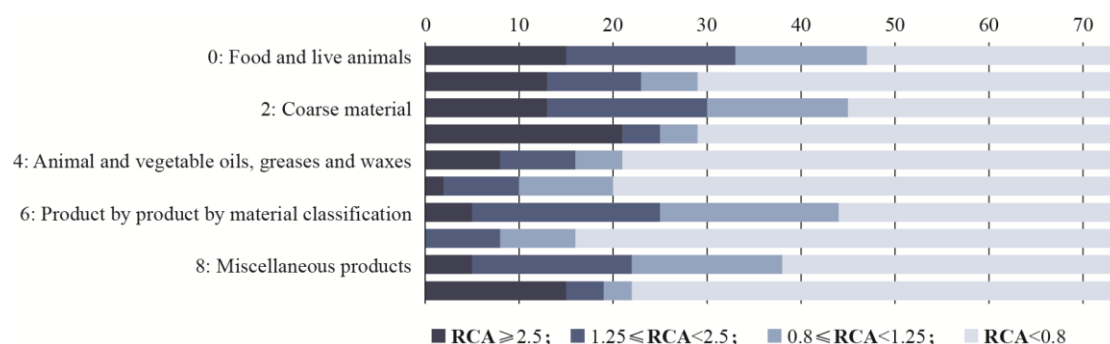
Fig 1. Overall export industrial structure of China along the Belt and Road.

Source: UN Comtrade Database

In these countries along the Belt and Road, the degree of development in the manufacturing industry varies. For the sake of analysis, we classify countries according to the export industry structure as follows:

(1) A capital- and technology-intensive industry country: Category 7 is highly competitive ($2.5 > \mathbf{RCA}_{ij} \geq 1.25$)

(2) A labor-intensive industry country: Categories 6 and 8 are highly competitive ($\mathbf{RCA}_{ij} \geq 2.5$), and Category 7 is not competitive $\mathbf{RCA}_{ij} < 0.8$.

(3) A resource-dominant country: Category 3 is highly competitive ($\mathbf{RCA}_{ij} \geq 2.5$) and Category 7 is not competitive $\mathbf{RCA}_{ij} < 0.8$.

(4) An agriculture dominant country: Category 0 is highly competitive ($\mathbf{RCA}_{ij} \geq 2.5$) and Category 7 is not competitive $\mathbf{RCA}_{ij} < 0.8$.

3.3 Analysis of competitive industries of the countries along the six economic corridors

According to UN Comtrade 2016 statistical data [7], this section focuses on the analysis of the dominant industries in the six economic corridors; the results are as follows.

China is a capital- and technology-intensive industrial country and lacks export competitiveness in Category 0–4 primary products. In the Category 5–8 finished product industries, China has a certain degree of competitiveness. Among the categories, in Category 6 (manufacturing primarily through raw materials) China is moderately competitive, while Category 7 (machinery and transport equipment) and Category 8 (miscellaneous products) have strong international competitiveness. The strongest exports in Category 7 are office machines, data processing equipment, telecommunications, recording and playback equipment, household appliances, and so forth. The strongest exports in Category 8 are lighting equipment and accessories, textiles, footwear, toys, and stationery.

Pakistan is a labor-intensive industrial country in the China–Pakistan Economic Corridor (Table 2). The manufacturing industry is at a primary level. The competitiveness of export commodities is concentrated in Categories 0, 6, and 8; competitive exports include leather, textile materials, textile products, and construction materials. Pakistan lacks competitiveness in Category 7.

The China–Mongolia–Russia Economic Corridor involves two countries, Mongolia and Russia (Table 2). Mongolia is a resource-dominant country. The dominant industries are concentrated in primary products that are highly competitive in Categories 2, 3, and 9. The strongest exports are coal, animal raw materials (e.g., wool), iron, copper, and other base metals. Russia is also a resource-dominant country and is highly competitive in Category 3. The strongest exports are coal, crude oil, natural gas, and liquefied petroleum gas. At the same time, Russia is strong in Category 6; the strongest exports are steel, non-ferrous metals, and processed wood.

The Bangladesh–China–India–Myanmar Economic Corridor covers Bangladesh, India, and Myanmar (Table 2). Bangladesh is a labor-intensive industrial country and is highly competitive in Category 8. The strongest exports are textiles, clothing, and apparel. India has strong competition in Categories 0 and 6, and has certain advantages in high end manufacturing industries such as software and medicine.

The countries covered by the New Eurasian Continental Bridge Economic Corridor are primarily concentrated in Central and Eastern Europe. Central European countries have a high level of general manufacturing (Table 3) and are competitive in Categories 5 to 8 of industrial manufactured goods. The competitive exports of Central Europe in Category 7 are divided into two categories. One is for the automobile and auto parts industry, and the other is for industrial machinery and equipment, such as piston type internal combustion engines, distribution

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equipment, power equipment, etc. Eastern European countries have a higher comparative advantage in primary products of Categories 0–4 than for industrial manufactured goods of Categories 5–8. Other countries are labor-intensive industrial countries; their areas of competitiveness are mainly in Categories 0, 6, and 8. There are rubber products (including rubber tires), wood products (including paper and cardboard), textiles, building materials, and metal products.

Table 2. RCA index and competitiveness of countries along the China–Pakistan, China–Mongolia–Russia, Bangladesh–China–India–Myanmar Economic Corridor.

Category	China	Pakistan	Russia	Mongolia	Bangladesh	India	Myanmar
0	0.33 D	2.53 A	0.78 D	0.27 D	0.29 D	1.48 B	3.11 A
1	0.16 D	0.09 D	0.47 D	0.07 D	0.28 D	0.46 D	0.25 D
2	0.18 D	0.77 D	1.28 B	11.12 A	0.22 D	0.94 C	1.63 A
3	0.05 D	0.05 D	6.03 A	3.50 A	0.00 D	0.04 D	6.22 A
4	0.04 D	0.42 D	1.43 B	0.04 D	0.05 D	0.64 D	0.02 D
5	0.47 D	0.29 D	0.58 D	0.01 D	0.03 D	1.34 B	0.02 D
6	1.21 C	3.11 A	1.42 B	0.18 D	0.39 D	2.18 B	0.46 D
7	1.33 B	0.04 D	0.16 D	0.07 D	0.01 D	0.44 D	0.13 D
8	1.87 B	2.59 A	0.13 D	0.08 D	7.25 A	1.18 C	1.63 B
9	0.07 D	0.16 D	0.31 D	11.24 A	0.00 D	0.22 D	0.00 D

Note: A: very highly competitive; B: highly competitive; C: competitive; D: lack of competitiveness.
0: food and live animals; 1: beverage and tobacco; 2: coarse materials; 3: fossil fuels, lubricants; 4: animal and vegetable oils, greases, and waxes; 5: chemicals; 6: product by product classification; 7: machinery and transportation equipment; 8: miscellaneous products; 9: uncategorized goods

Table 3. RCA Index and competitiveness of some countries along the New Eurasian Continental Bridge.

Category	Poland	Czech Republic	Slovakia	Austria	Hungary	Ukraine	Croatia
0	1.62 B	0.52 D	0.48 D	0.81 D	0.94 C	3.29 A	1.57 B
1	1.97 B	1.01 C	0.15 D	2.09 B	0.50 D	2.24 B	1.74 B
2	0.57 D	0.58 D	0.48 D	0.91 C	0.45 D	3.74 A	1.88 B
3	0.19 D	0.27 D	0.36 D	0.19 D	0.15 D	0.32 D	0.59 D
4	0.51 D	0.57 D	0.24 D	0.26 D	0.95 C	19.15 A	0.80 C
5	0.75 D	0.49 D	0.37 D	1.18 C	0.85 C	0.41 D	1.07 C
6	1.43 B	1.19 C	1.25 B	1.63 B	0.80 C	2.12 B	1.17 C
7	1.02 C	1.49 B	1.57 B	1.06 C	1.53 B	0.28 D	0.67 D
8	1.24 C	0.98 C	0.71 D	0.83 C	0.76 D	0.43 D	1.33 B
9	0.13 D	0.06 D	0.07 D	0.18 D	0.07 D	0.00 D	0.26 D

The China–Indochina Economic Corridor mainly covers Southeast Asia, and the level of development for the manufacturing sector in this region is relatively varied (Table 4). Laos, Myanmar, and Indonesia are competitive in primary products belonging to Categories 0–4; Myanmar is highly competitive in Category 0, while Myanmar, Laos, and Indonesia are extremely competitive in Category 3. Thailand, Malaysia, Singapore, Vietnam, and Cambodia are competitive in the industrial products of Categories 5–8. Of these countries, Singapore is highly competitive in Category 5. Thailand, Malaysia, and the Philippines are highly competitive in Category 7. The strongest Category 7 exports for the Philippines are integrated circuits, semiconductor devices, office machines, data processors, reader, recorders, video recorders, and reproducers. Cambodia is extremely competitive for miscellaneous products that are associated with Category 8, while Vietnam and Myanmar are highly competitive. The primary and dominant products in Southeast Asia and China have a high degree of coincidence.

The China–Central Asia–West Asia Economic Corridor is mainly related to Central Asia and West Asia. The manufacturing levels of the five Central Asian countries are generally lagging (Table 5); they have comparative advantages in the primary products of Categories 0–4, of which Kazakhstan and Turkmenistan are highly competitive in Category 3 for resource-sense countries. Uzbekistan and Tajikistan are labor-intensive industry

countries with export competitiveness in Category 6. Kyrgyzstan is an agriculture-dominant country. The West Asia region is currently the region with the richest oil reserves and with the largest output and the largest oil export volume in the world; however, the overall level of manufacturing is not high, and Category 7 does not have any competitive exports. The West Asian countries are highly competitive in Category 3, namely Iran, Saudi Arabia, and the United Arab Emirates. Some countries are competitive in Categories 0, 6, and 8, with Lebanon being highly competitive in Category 0.

Table 4. RCA Index and competitiveness of countries along the China–Indochina Peninsula Economic Corridor.

Category	Vietnam	Laos	Cambodia	Thailand	Malaysia	Singapore	Indonesia	Philippines
0	1.26 B	2.33 B	0.59 D	1.67 B	0.47 D	0.36 D	1.12 C	0.84 C
1	0.14 D	6.09 A	0.18 D	0.85 C	0.48 D	1.43 B	0.79 D	0.61 D
2	0.55 D	5.36 A	0.49 D	1.08 C	0.72 D	0.30 D	2.22 B	1.07 C
3	0.20 D	3.20 A	0.00 D	0.09 D	1.16 C	0.16 D	2.77 A	0.20 D
4	0.11 D	0.02 D	0.16 D	0.24 D	9.44 A	0.41 D	19.85 A	2.90 A
5	0.12 D	0.39 D	0.07 D	0.71 D	0.57 D	1.77 B	0.58 D	0.18 D
6	0.63 D	0.73 D	0.23 D	0.85 C	0.57 D	0.36 D	1.02 C	0.38 D
7	1.22 D	0.25 D	0.14 D	1.27 B	1.30 B	1.03 C	0.41 D	1.74 B
8	2.47 B	0.61 D	5.92 A	0.77 D	0.85 C	0.77 D	1.19 C	0.82 C
9	0.00 D	2.34 B	4.41 A	1.27 B	0.14 D	1.21 C	1.11 C	0.87 C

Table 5. Countries along China-Central Asia-West Asia Economic Corridor RCA Index and Competitiveness Table.

Category	Kazakhstan	Kyrgyzstan	Tajikistan	Uzbekistan	Turkmenistan	Iran	United Arab Emirates	Lebanon	Turkey	Saudi Arabia
0	0.77 D	1.91 B	0.98 C	1.15 C	0.01 D	0.64 D	0.57 D	2.65 A	1.29 B	0.26 D
1	0.45 D	2.02 B	0.02 D	0.23 D	0.00 D	0.02 D	0.78 D	2.84 A	1.17 C	0.15 D
2	2.06 B	5.21 A	10.53 A	1.24 C	1.19 C	1.35 B	0.49 D	1.63 B	0.71 D	0.25 D
3	7.37 A	0.18 D	0.00 D	1.67 B	12.8 A	10.34 A	4.00 A	0.00 D	0.11 D	9.59 A
4	0.29 D	0.04 D	0.02 D	0.00 D	0.02 D	0.01 D	0.75 D	1.66 B	1.01 C	0.28 D
5	0.64 D	0.20 D	0.05 D	0.92 C	0.13 D	1.06 C	0.50 D	0.83 C	0.48 D	1.61 B
6	1.91 B	0.70 D	2.84 A	1.46 B	0.31 D	0.50 D	1.24 C	0.97 C	1.78 B	0.27 D
7	0.06 D	0.51 D	0.08 D	0.03 D	0.09 D	0.01 D	0.33 D	0.30 D	0.77 D	0.08 D
8	0.12 D	0.91 D	0.19 D	0.26 D	0.03 D	0.03 D	0.51 D	1.44 B	1.48 B	0.05 D
9	0.04 D	7.49 A	4.38 A	17.73 A	0.01 D	0.13 D	6.61 A	8.48 A	3.26 A	0.22 D

4 Analysis of overall trade and manufacturing cooperation between countries along the six economic corridors

4.1 Multidimensional scaling method

Multidimensional scaling (MDS) is a statistical research method that visualizes the degree of similarity between a set of samples across multiple dimensions while retaining the original relationships that exist between the samples [8]. Based on the UN Comtrade 2016 database, this paper uses MDS method to visualize the cooperation and relationships between countries that are part of the Belt and Road initiative. The total amount of trade between two countries is primarily used to define the degree of similarity; countries in the Belt and Road initiative are represented as points within a two-dimensional space, and the distance between any two given points represents the extent of trade between the two given countries. In order to reflect the trade relationship between countries in the two-dimensional scatter graph more intuitively, the probability density function of the entire scattered point set is obtained by using kernel density estimation, and the kernel function is Gaussian kernel function. The probability density is then visualized in the form of contours; the higher the peak of the contours, the closer the trade relationship.

This paper only analyzes the overall trade and manufacturing categories of 74 countries along the Belt and Road, including China, utilizing data collected until April 2018. This paper focuses on the analysis of Categories 6, 7, and 8, and generates a two-dimensional map that reflects the overall trade and manufacturing cooperation that exists between countries.

4.2 Overall trade and manufacturing cooperation in the six major economic corridors

Overall, the results of the MDS analysis of overall trade patterns in 2016 show a trend of accumulation, with an expanding circle of Belt and Road friends. China has had closer trade exchanges with most regions, and the close relationship between trade with various countries is highly correlated with geographical location, especially between China and South Korea (Fig. 2).

Specifically, in the China–Pakistan Economic Corridor, China and Pakistan have formed a relatively close cooperative relationship. In the New Eurasian Continental Bridge Economic Corridor, trade is relatively close, and most countries in Central and Eastern Europe have begun to gather. In the China–Indochina Peninsula Economic Corridor, there is an obvious trend with China gathering with Malaysia, Indonesia, Singapore, and some Southeast Asian countries; it can also be seen however that Vietnam, Cambodia, Myanmar, the Philippines, and other Southeast Asian countries are not close enough. In the Bangladesh–China–India–Myanmar Economic Corridor, China and India have tended to gather; Bangladesh and Myanmar, which have low economic levels, have limited trade relations with China and India. The China–Central Asia–West Asia Economic Corridor has not yet formed close trade relationships; this is manifested through the low closeness of Central Asia and West Asia, as well as the low clossness with China. In the China–Mongolian–Russia Economic Corridor, China has a strong trade relationship with Russia, but Mongolia has not yet formed a close trade relationship in the economic corridor.
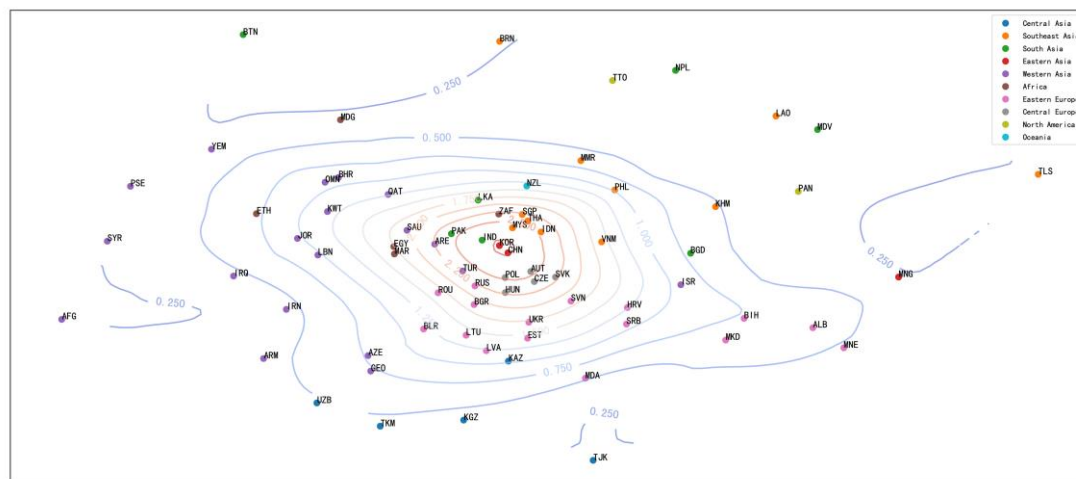

Fig 2. Results of MDS analysis of overall trade data for 2016.

Note: CHN: China; KOR: Korea; MNG: Mongolia; VNM: Vietnam; LAO: Laos; KHM: Cambodia; THA: Thailand; MMR: Myanmar; MYS: Malaysia; SGP: Singapore; IDN: Indonesia; BRN: Brunei; PHL: The Philippines; TLS: Timor-Leste; NPL: Nepal; BTN: Bhutan; IND: India; PAK: Pakistan; BGD: Bangladesh; LKA: Sri Lanka; MDV: Maldives; KAZ: Kazakhstan; KGZ: Kyrgyzstan; TJK: Tajikistan; UZB: Uzbekistan; TKM: Turkmenistan; IRN: Iran; IRQ: Iraq; AZE: Azerbaijan; GEO: Georgia; ARM: Armenia; TUR: Turkey; SYR: Syria; JOR: Jordan; ISR: Israel; PSE: Palestine; SAU: Saudi Arabia; BHR: Bahrain; QAT: Qatar; YEM: Yemen; OMN: Oman; ARE: United Arab Emirates; KWT: Kuwait; LBN: Lebanon; AFG: Afghanistan; EGY: Egypt; MAR: Morocco; ZAF: South Africa; ETH: Ethiopia; MDG: Madagascar; RUS: Russia; EST: Estonia; LVA: Latvia; LTU: Lithuania; BLR: Belarus; UKR: Ukraine; MDA: Moldova; SRB: Serbia; HRV: Croatia; SVN: Slovenia; AUT: Austria; MNE: Montenegro; MKD: Macedonia; BIH: Bosnia and Herzegovina; ALB: Albania; ROU: Romania BGR: Bulgaria; POL: Poland; CZE: Czech; SVK: Slovakia; HUN: Hungary; PAN: Panama; NZL: New Zealand.

4.2.1 Cooperation in Category 7 of the six major economic corridors

Category 7, i.e., machinery and transport equipment, is the main category of manufacturing in the *Standard International Trade Classification*; it is also an important basis for measuring the level of manufacturing in a country. In the MDS analysis chart for Category 7 (Fig. 3), countries show a trend of agglomeration to China. In some countries, the trade relationship of machinery and transport equipment is very close: this is embodied in China, India, South Korea, Turkey, Central and Eastern Europe, and in some countries in Southeast Asia. From the standpoint of economic corridors, trade cooperation between China and Central Europe, most Eastern European countries of the New Eurasian Continental Bridge, and some Southeast Asian countries in the China–Indochina Peninsula Economic Corridor are closely convergent in trade cooperation. However, the China–Central Asia–South Asia, China–Mongolia–Russia, Bangladesh–China–India–Myanmar, and China–Pakistan economic

corridors have not yet established close cooperative relationships under this category.
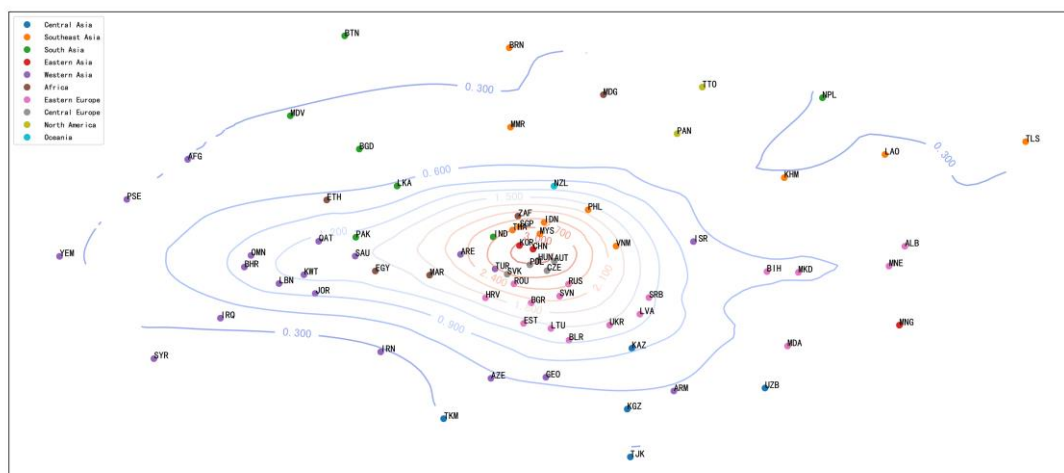

Fig 3. Results of MDS analysis of Category 7 trade data for 2016.

4.2.2 Trade cooperation in Categories 6 and 8 of the six major economic corridors

Categories 6 and 8 involve a variety of labor-intensive industrial products; this is an important measure of the development level of a country's light industry. Compared with the results of the Category 6 MDS analysis, the results of the Category 8 MDS analysis show a trend of relative aggregation (Figs. 4 and 5). In Category 6 (i.e., finished products by raw materials), India, China, and South Korea are the largest gathering centers. China and some Southeast Asian countries of the China–Indochina Peninsula Economic Corridor (such as Indonesia, Thailand, Vietnam, Malaysia, and Singapore), Central European countries of the New Eurasian Continental Bridge Economic Corridor, a few Eastern European countries (such as Russia, Romania, Bulgaria, and Slovenia), and Pakistan show a relatively close cooperative relationship. In the China–Central Asia–West Asia Economic Corridor, some Western Asian countries, such as Oman, Bahrain, Lebanon, Kuwait, Jordan, and Qatar show a state of gathering. In Category 8 (i.e., miscellaneous products), South Korea and China are the largest gathering centers, and Southeast Asian countries such as Malaysia, Singapore, Thailand, and Indonesia in the China–Indochina Peninsula Economic Corridor have had close trade exchanges. In the New Eurasian Continental Bridge Economic Corridor, Poland, Austria, Czech Republic, Turkey, Slovakia, Romania, Hungary, and Russia have relatively close trade in products of this category.
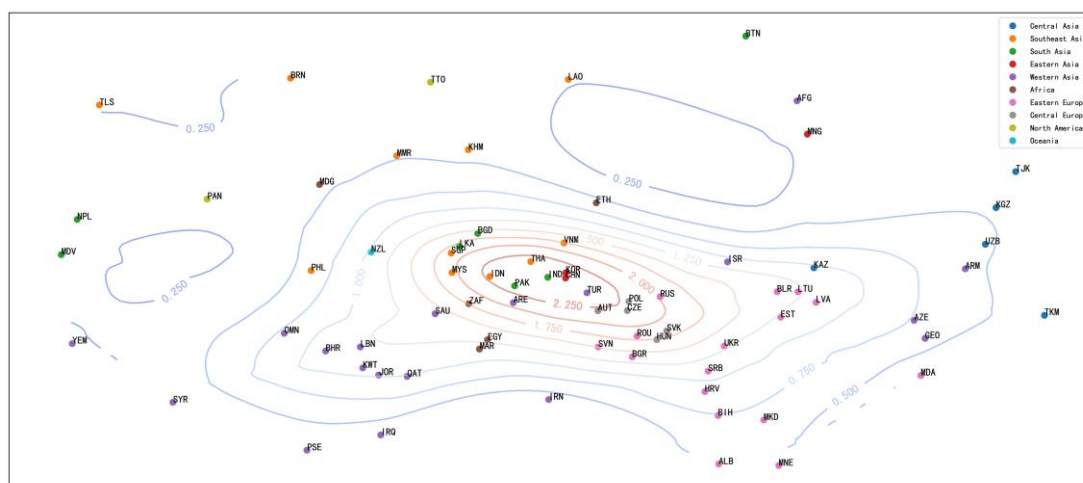

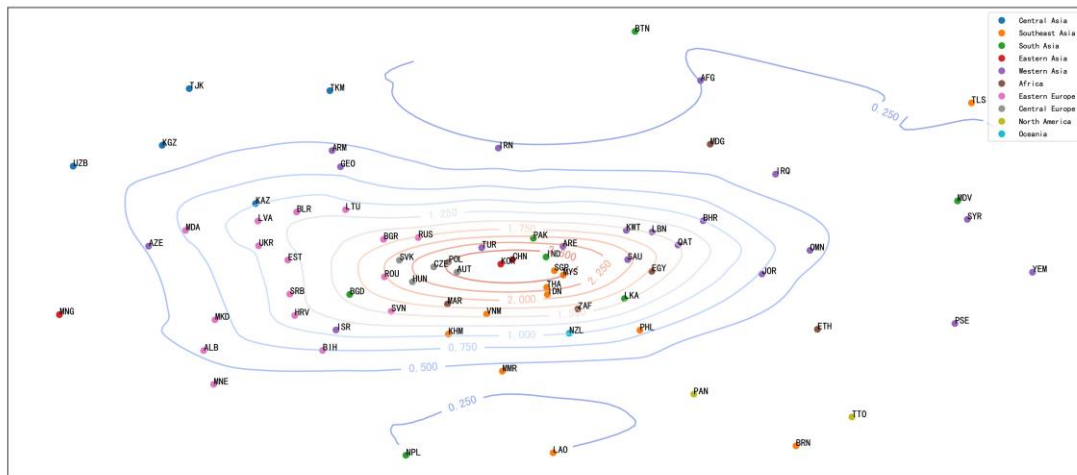**Fig 4.** Results of MDS analysis of Category 6 trade data for 2016.

Fig 5. Results of MDS analysis of Category 8 trade data for 2016.

5 The deepening direction of manufacturing cooperation along the six economic corridors

5.1 For the New Eurasian Continental Bridge, China–Indochina Peninsula, China–Central Asia–West Asia economic corridors, giving full play to regional advantages and carrying out international cooperation

At present, in the economic corridor covering a wide area, the New Eurasian Continental Bridge and the China–Indochina Peninsula are relatively close trade links, while China–Central Asia–West Asia has not formed a close trade relationship.

The level of manufacturing of countries along the New Eurasian Continental Bridge is relatively high; the competitive industries of China and Central Europe can complement each other. China and these countries have strong potential for cooperation in the manufacturing of automobiles and industrial machinery. Therefore, international cooperation in manufacturing in this region should be based on these high value-added and capital-intensive technologies. For example, China will further increase R&D and assembly production cooperation with the automobile industry of the Central European region.

The level of manufacturing development of Southeast Asian countries along the China–Indochina Economic Corridor is relatively wide. Singapore, Malaysia, and Thailand have certain advantageous industries in capital- and technology-intensive industries, while Vietnam, Laos, and Cambodia have relatively low manufacturing levels and advantageous industries within the primary products and labor-intensive industries. China should give full play to the industrial advantages of various countries. When cooperating with labor-intensive and agriculture-dominant countries, China should increase investment in industries with an advantage in primary products to upgrade manufacturing. For capital- and technology-intensive countries, China can strengthen industrial chain coordination to promote the development of related supporting industries and manufacturing technologies.

There are many countries along the China–Central Asia–West Asia Economic Corridor; the competitive industries are still mainly concentrated on energy resources. Therefore, the China–Central Asia–West Asia Economic Corridor can gradually be promoted in stages, steps, and levels [9]. Typical countries with complementary elements and endowments are selected for manufacturing cooperation; complementary advantages and common development can form a demonstration effect.

5.2 For China–Pakistan, Bangladesh–China–India–Myanmar, China–Mongolia–Russia economic corridors, focusing on international cooperation in leading industries

China and Pakistan have always been strategically friendly and cooperative. Pakistan's advantageous industries are concentrated in the labor-intensive textile and garment industry. Pakistan also has a cheap labor force. China has rich development experience and technology; the textile and garment industry can become a key area of cooperation with Pakistan.

Among the countries along the Bangladesh–China–India–Myanmar Economic Corridor, India has certain advantages in some service industries and in pharmaceuticals. India also has strong scientific and technological

research and development capabilities. In addition to labor-intensive industries, China and India have a larger
sphere of cooperation in areas of high tech such as information technology and electronics. Cooperating with
Myanmar and Bangladesh, China should pay close attention to the development of advantageous industries such as
textiles, clothing, and furniture, and should carry out cooperation in these areas of manufacturing.

In the China–Mongolia–Russia Economic Corridor, manufacturing cooperation should develop to a more
diversified and deeper level. With respect to Russia, it is necessary to not only deepen cooperation in resources and
energy, it is also necessary to actively strengthen manufacturing cooperation in fields that are related to heavy
industry. With respect to Mongolia, Mongolia's advantageous industries are in basic raw materials such as wool
and minerals; Mongolia can expand manufacturing cooperation in the fields of processing of mineral products and
wool.

6 Conclusion

The implementation of the Belt and Road initiative is gradually transforming from concept to action and from
vision to reality. China should select for cooperation key regions and countries along the six economic corridors
that are the framework of the Belt and Road, understand each countries' extent of industrialization and the
comparative advantages of their respective manufacturing industries, and promote high quality international
cooperation that is mutually beneficial and win–win.

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