

# WORKING PAPER

**International Competitiveness of Chinese and European Industries:  
An Empirical Analysis of 28 Manufacturing Sectors**

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# International Competitiveness of Chinese and European Industries: An Empirical Analysis of 28 Manufacturing Sectors<sup>1</sup>

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***Abstract:** While the trade friction between China and the US is a long-term and repetitive issue, deepening China-European industrial cooperation will fairly alleviate China's economic and trade pressure. On a basis of the UN Comtrade Database data, this article develops an empirical analysis of the status and trends of international competitiveness of 28 manufacturing sectors in China and European countries through analysing comparative advantages, complementarity and competitiveness. The authors draw a conclusion that Chinese and European industries have their own characteristics, but the industries of the two sides are more complimentary than competitive. Meanwhile, Chinese and European industries are presenting some new trends and features in the dynamic changes of the international competitiveness pattern. As the demand for cooperation on production capacity between China and Europe is rising, it is recommended to adjust policies to national conditions while promoting industrial cooperation between China and Europe, to highlight complementarity and avoid competitive measures, to keep an eye on development trend of industrial competitiveness and to initiate cooperation.*

***Keywords:** European industry; International Industrial Competitiveness; Comparative Advantage; Cooperation on Production Capacity*

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## I. Introduction and Literature Review

While the trade friction between China and the US is a long-term and repetitive issue, deepening China-European industrial cooperation will fairly alleviate China's economic and trade pressure. This is because Europe is a regional cluster of developed industrial economies and playing an important role in the global economy and technology. European industries are featured in starting early and with diversified categories, solid foundation and strong competitiveness. They have accumulated strong experience over the years and maintain an international leading position for a long time. Since the moment of China's reform and opening up, China-European industrial cooperation has produced great significance to China's industrial development. For instance, China introduced French technology in 1978 to build the Daya Bay nuclear power plant, and later on China and France jointly invested in the construction of Taishan Nuclear Power Plant by using French third-generation nuclear power technology. In 1984, Volkswagen entered Chinese market and opened a new cooperation model of Sino-foreign joint ventures; in 2018, BMW increased its investment in China, saying that it would increase its shareholding ratio from 50% to 75% and produce pure electric vehicles only in China. It is not difficult to find that Europe plays a key role in modernizing China's industries and promoting socioeconomic development. Sino-European industrial cooperation becomes a catalyst for adapting Chinese industries to the construction of global economy and embedding them into the global value chains. At the same time, Sino-European industrial cooperation injected motive force and vitality into China's efforts to improve international competitiveness of its industries. Due to the difference in factor endowments between China and Europe, some Chinese industries have rapidly formed scale, shaping international competitiveness and achieving an astonishing export growth. Through international trade, China and Europe have formed a complex inter-industry (intra-industry) cooperation network, meanwhile bilateral economic and trade volume is enormous. As of 2018, the bilateral trade volume between China and the EU reached US\$ 682.2 billion, with a year-on-year growth of 106%<sup>2</sup>.

With the gradual in-depth development of China-Europe economic and trade relations, traditional trade is far from being able to represent the full picture of China-Europe economic and trade relations. Since implementing two-way investment policy in 2014, China continuously increased its investment in Europe, and their cooperation demand for production capacity has been rising. China-Europe cooperation in third-party markets is also on the agenda. However, there are many European countries, and their national conditions and economic development vary from one to another. Different endowment advantages have caused differences in international competitiveness of different industries in these countries. In order to better adapt to the rapid development of China-Europe economic and trade relations, it's necessary to have a clearer overview of European industrial development and grasp their industrial advantages and core competitiveness. In doing so, the article provides constructive

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<sup>2</sup> UN Comtrade, <https://comtrade.un.org/>

suggestions for China's investment in Europe with a purpose of promoting China-European cooperation on production capacity and in the third-party markets.

For the countries, the level of industrial international competitiveness has a major impact on their industrial cooperation. On the one hand, the in-depth development of European integration has reshuffled the industries of European countries, and the flow of multinational companies and the shift of production capacity have accelerated the changes in the international competitiveness of European industries. On the other hand, China's domestic industrial transformation and upgrading have improved the upgrading and reshaping of the international competitiveness of various industries. Therefore, the current international competitiveness of Sino-European industries cannot be compared with what it used to be, and now it is worth redefining.

European Commission's report *European Innovation Scoreboard 2017*<sup>3</sup> has shown that EU industrial R&D investment accounts for 26% of the world industrial R&D investment, especially in the industries with comparative advantages, such as automobile manufacturing (44%) and aerospace (48%). The article, co-authored by economic Professor Schott from Yale University in the United States and others, developed a comparative study on the industrial competitiveness of China, the United States, Europe and Japan through employing the data of multinational companies and analysed the direction of China's international industrial cooperation.

Wei Long and Wang Lei (2016) used the Revealed Comparative Advantage Index (RCA Index) to compare the overlapping ratio of advantageous industries of China and the countries along the "Belt and Road" Initiative. Their research results have shown that the inter-industry and intra-industry complementarity between China and the countries along the "Belt and Road" are greater than the competitiveness. Zhao Dongqi and Sang Baichuan (2016) conducted an empirical study based on the current status and changing trends of 10 industrial sectors of China and the countries along the BRI initiative. The French Centre for Forward-looking Research and International Information (CEPII) issues research reports every year, using the RCA index to measure and analyse the international competitiveness of the industries of the EU and major global economies<sup>4</sup>.

This article aims to address the following subjects:

First, propose research methods to measure the international competitiveness of Chinese and European industries and provide scientific tools for long-term tracking of the dynamic evolution of the industries;

Second, measure the level of international competitiveness of various industries in China and European countries so as to identify industries with advantages and disadvantages in each country;

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<sup>3</sup> European Commission, *European Innovation Scoreboard 2017*, <http://iri.jrc.ec.europa.eu/scoreboard17.html>

<sup>4</sup> CEPII, [http://www2.cepii.fr/PDF\\_PUB/wp/2013/wp2013-20.pdf](http://www2.cepii.fr/PDF_PUB/wp/2013/wp2013-20.pdf)

Third, identify complementary and competitive industries of China and European countries on a basis of analysing the advantages and disadvantages of the industries of China and European countries via cross-sectional studies;

Fourth, grasp the evolutionary and developmental trend of the international competitiveness of the relevant industries in these countries on a basis of analysing the international competitiveness levels of various industries in China and European countries over the years via longitudinal studies.

## **II. Research methods, indicator selection and data specification**

### **(2.1) Research methods**

Due to the different statistical calibres regarding different countries' industries and the difficulty in obtaining the relevant data, scholars can only try to measure the international competitiveness of the country's industries through alternative methods. At the beginning stage, labour productivity was used as a substitute indicator of the industry's international competitiveness. With the development of international trade, scholars in the field of international economics believe that one country's industrial advantage will eventually be based on its export competitive advantage, and the country tries to achieve more exports in the related products. Mainstream studies regard the relative export level of the industries as an indicator of measuring their international competitiveness, and the measurement method for the international competitiveness of related export products has become the mainstream method of studying industries' international competitiveness. From the 1990s to the beginning of the 21st century, industrial statistical calibres developed with a diversified trend. There are several industrial classification systems, including specific standard industry classification system (SIC), factor intensive industry classification system, and technology classification industry classification system. By using different classification systems, products can reflect differences of specific industries, and manifest in different forms of industry classification. Thus, the analytical framework extends from the product level to the industry level.

Relatively speaking, the classification under the Standard Industrial Classification System (SIC) is broad and cannot reflect the elements and technical characteristics of the industries. At the same time, as data sources are from statistical agencies in various countries, statistical calibres are inconsistent, which results in inaccurate research results. The factor intensity industry classification system makes a macro analysis of the industrial structure of products according to the factor endowments and divides industries into primary industries, resource-intensive industries, labour-intensive industries, capital-intensive industries, and technology-intensive industries<sup>5</sup>. Zhao Dongqi and Sang Baichuan divided international trade products into 10 sectors from 0 to 9 according to SITC REV 3. According to the

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<sup>5</sup> Lall S., Weiss J., Zhang J., The Sophistication of Exports: A New Trade Measure, World Development, 34(2), 222-237, 2006.

different sources of production factors: resource-intensive products are from sector 0-1, energy-intensive products from sectors 2 to 4, capital-intensive products from sectors 5 and 7, and labour-intensive products from sectors 6 and 8. However, this method is too simple and cannot adapt to the situation where the current global industrial division of labour has caused differences in industrial technology content.

This article refers to the classification method used in the articles of Italian scholars Tachella, Li Xiaoping and others from 2013 to 2015 and divides the products of Standard International Trade Classification (SITC) Revision 3 (SITC REV 3) into 28 industrial sectors (see Table 1). It not only reflects the characteristics of industrial factor endowments, but also reflects the different technological complexity between industries. In addition, in the context of different developments in global value chains, the finer the industry classification becomes, the more it can reflect the value chain status of different countries. In terms of analytical methods, this article aims to sort out the comparative advantages of China and the representative European countries with a purpose to objectively reflect the characteristics of the international competitiveness of China and Europe's industries and to find out the complementarity and competitiveness in China-European industrial cooperation. On a basis of the classification of 28 industrial sectors, the article analyses comparative advantages of the international competitiveness of Chinese and European industries by using the relative export advantage index (Revealed Comparative Advantage Index) of each industry; meanwhile, on a basis of the international competitiveness ranking of 28 industrial sectors in these countries, the article analyses the complementarity and competitiveness of the Chinese and European industries via cross-sectoral comparison.

**Table 1 The 28 industrial sectors according to the Standard International Trade Classification (SITC) Revision 3 (SITC REV 3)**

No.	Industry	Product No.
1	Food processing industry	011.012.016.017.022.023.024.025.034.035.037.042.045.046.047.048.054.056.058.059.061.062.071.073.075.081.091.098.411.421.422.431
2	Beverage industry	074.111.112
3	Tobacco Processing Industry	122
4	Textile industry	269.651.652.653.654.655.656.657.658.659
5	Clothing and other fibre products industry	841.842.843.844.845.846.848
6	Leather, fur and down Industry	611.612.613.831.851
7	Wood processing and bamboo, rattan and palm grass industry	633.634.635
8	Furniture industry	821
9	Paper and paper products industry	251.635.641

10	Reproduction of recording media in the printing industry	892
11	Culture, education and sporting goods industry	894.895.898
12	Petroleum processing and coking industry	325.334.335
13	Chemical raw materials and chemical products industry	232.511.512.513.514.515.516.522.523.524.525.531.532.533.551.553.554.562.571.572.573.574.575.579.591.592.593.597.598
14	Pharmaceutical industry	541.542
15	Chemical fibre industry	266.267
16	Rubber industry	621.625.629
17	Plastic industry	581.582.583.893
18	Non-metallic mining industry	661.662.663.664.665.666.667
19	Ferrous metal smelting and rolling processing industry	671.672.673.674.675.676.677.678.679
20	Non-ferrous metal smelting and rolling processing industry	681.682.683.684.685.686.687.689
21	Metal products industry	691.692.693.694.695.696.699.811.812
22	General machinery industry	711.712.713.714.716.718.731.733.735.737.741.742.743.744.745.746.747.748.749
23	Professional equipment industry	721.722.723.724.725.726.727.728.774.872.881.882.883
24	Transportation equipment industry	781.782.783.784.785.786.791.792.793
25	Electrical machinery and equipment industry	771.772.773.775.776.778.813
26	Electronic and communication equipment industry	752.761.762.763.764
27	Instrumentation and cultural office machinery	751.759.871.873.874.884.885
29	Other industries	891.896.897.899.931

Source: data from UN Comtrade Database. In terms of the classification, the article refers to Tacchella et al. (2013) and LI Xiaoping et al. (2015).

**Note:** Due to the inconsistent statistical calibres, the classification of export products in this article does not include special trading products, such as film & video, gold, works of art, metal currency, pets, etc.

## (2.2) Indicator selection

Relatively speaking, a country's factor endowment structure determines the relative labour productivity of its industries, and thus reflects the level of industries' international competitiveness. American economist Balassa wrote an article in 1965 and used the ratio of a country's export share in certain product to the world's average share of the product concerned to reflect the country's international competitiveness in that particular product, namely, the Revealed Comparative Advantage

Index RCA. According to the choice of industry classification system, the calculated RCA index can better reflect the international competitiveness level of various industries of a country or region. At present, this indicator is one of the most mature indicators in the international competitiveness analysis. Scholars have been using the RCA index to analyse practical issues, such as industrial complementarity and competitiveness, the status quo of international competitiveness, and changing trends<sup>6</sup>. When the RCA index is used to calculate the revealed comparative advantage index of country (i) or regional industry (j), the calculation formula is as follows:

$$RCA_{it}^j = \frac{x_{it}^j / X_{it,w}}{x_{wt}^j / X_{wt}} \quad (1)$$

Of which,  $RCA_{it}^j$  represents the revealed comparative advantage index of country (i) or regional industry (j) at the time of (t);  $x_{it}^j$  represents the total export value of country (i) or regional industry (j) at the time of (t);  $X_{it,w}$  represents the total export value of country (i) or region at the time of (t);  $x_{wt}^j$  represents the total world export value of industry (j) at the time of (t);  $X_{wt}$  represents the total value of world exports at the time of (t). In order to improve the accuracy of measuring the level of international competitiveness, this article defines ‘comparative advantage’ industry and ‘comparative disadvantage’ industry according to the number of the RCA index.

### (2.3) Data Specification

In order to ensure the objectivity of the research, this article uses the UN Comtrade Database as its data source, and the data collection covers all the data as of 2018. Regarding the country samples, the authors select major European industrial countries and the representative countries in the region. In addition to the three major European industrial countries (Britain, France and Germany), the article also includes countries with industrial characteristics (Switzerland, Belgium and Ireland), Nordic countries (Denmark, Finland, Sweden), Southern European countries (Italy, Greece, Spain and Portugal) and Central and Eastern European countries (Hungary, Czech Republic, Poland, Romania and Serbia). In total, 18 countries are selected as samples.

As this research covers many countries and industries, it is quite challenging to analyse all the international competitiveness characteristics of all these countries’ industries in actual research; besides, this analysis cannot cover all the details of each industry. Meanwhile, in combination with the research

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<sup>6</sup> Zhao Dongqi and Sang Baichuan, “International Capacity Cooperation under the ‘One Belt and One Road’ Initiative: An Empirical Analysis Based on the International Competitiveness of Industries”, *International Trade Issues*, Issue 10, 2016 (in Chinese).



purpose, this article mainly analyses two key issues:

First, to analyse the comparative advantages of the sample countries' industries in terms of the international competitiveness with an aim of figuring out the complementarity and competitiveness of Chinese and European industries in combination with the industry ranking of the countries;

Second, to analyse the international competitiveness evolution of Chinese and European industries and the new characteristics of Sino-European industrial cooperation by taking two representative industries in Chinese and European industrial development (the Electronic and Telecommunications Equipment Industry and the Transportation Equipment Industry) as examples and in combination with the dynamic changes of the comparative advantages of the countries concerned.

### **III. Analysing comparative advantages of Chinese and European countries' industrial international competitiveness**

The relative export advantage index is also known as the revealed comparative advantage index. The relative export advantage index refers to the ratio of certain industry's share in the country's exports to the world's share of the industry in the total world trade. Through this ratio, it can reflect the difference between a country's export share of certain industry and the world export share of the industry concerned and thus demonstrates the comparative advantage level of the industry. According to the standard range of the RCA index divided by the Japan External Trade Organization, when  $RCA < 0.8$ , the industry's international competitiveness is weak and has comparative disadvantages; when  $0.8 \leq RCA < 1.25$ , the industry is basically at the world average level, and the advantages and disadvantages are not obvious; when  $1.25 \leq RCA < 2.5$ , the industry has strong international competitiveness; when  $RCA \geq 2.5$ , the industry has extremely strong international competitiveness. When  $RCA \geq 1.25$ , the industry is considered to have comparative advantages<sup>7</sup>.

It can be seen from **Table 2** that China's RCA index in the industrial sectors (No. 4, 5, 6, 7, 8, 11, 15, 17, 21, 25, 26 and 27) are greater than 1.25, which indicates that these Chinese industrial sectors have comparative advantages. Among them, the RCA values of industrial sectors (No. 4, 5, 6, 11 and 26) are all greater than 2.5, reflecting that China has extremely strong international competitiveness in these industries. The (No. 4, 5, 6, 11) industrial sectors are mainly labour-intensive industries represented by clothing and cultural and educational supplies, and the industrial sector No. 26 is Electronic and Telecommunications Equipment Industry.

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<sup>7</sup> Shen Guobing, "Revealed Comparative Advantage, Intra-Industry Trade, and Sino-US Bilateral Trade Balance", *Management World*, Issue 2, 2007 (in Chinese).

**Table 2: Revealed Comparative Advantage Index of Chinese and European countries' Industries in 2018**

Industry	China	UK	France	Germany	Switzerland	Belgium	Denmark	Finland	Sweden	Italy	Greece	Ireland	Spain	Portugal	Hungary	Czech R.	Poland	Romania	Serbia
1	0.41	0.71	1.17	0.75	0.38	1.36	2.72	0.36	0.94	1.03	2.45	1.56	1.94	1.27	0.94	0.51	1.81	0.49	1.83
2	0.24	3.08	4.79	0.63	0.97	1.15	1.38	0.44	0.80	2.61	1.12	1.67	2.05	2.79	0.46	0.50	0.64	0.29	1.75
3	0.17	0.17	0.22	1.56	1.00	0.95	1.17	0.02	0.94	0.85	5.81	0.02	0.31	5.39	0.76	2.90	8.19	6.19	8.54
4	2.75	0.52	0.52	0.55	0.20	0.78	0.62	0.21	0.35	1.37	0.91	0.07	0.80	2.02	0.46	0.88	0.70	1.20	0.77
5	2.97	0.82	0.96	0.63	0.29	0.92	1.86	0.21	0.54	1.97	1.01	0.09	1.90	2.49	0.29	0.57	1.03	1.74	1.69
6	2.57	0.61	1.64	0.56	0.35	1.44	0.65	0.23	0.31	3.58	0.53	0.14	1.20	3.13	0.80	0.73	0.78	2.06	1.95
7	1.36	0.20	0.88	0.89	0.23	0.96	1.27	3.58	1.11	0.77	0.45	0.55	1.16	5.88	1.19	1.40	3.59	3.92	2.34
8	2.45	0.66	0.52	0.81	0.19	0.39	2.25	0.24	1.27	2.09	0.25	0.14	0.71	3.01	1.03	2.30	4.87	3.25	2.71
9	0.57	0.56	1.01	1.05	0.30	0.90	0.71	12.7 5	6.04	0.92	0.49	0.12	1.06	3.71	0.75	0.89	1.96	0.77	2.24
10	0.75	3.45	1.23	1.37	0.62	1.07	1.34	0.71	0.94	1.09	0.98	0.42	1.18	0.59	0.69	2.70	3.15	0.69	1.66
11	2.84	0.96	0.74	0.73	0.15	0.50	1.09	0.26	0.70	0.53	1.08	0.53	0.72	0.34	0.62	2.77	1.65	0.32	0.32
12	0.34	0.70	0.48	0.27	0.05	1.69	0.61	2.02	1.39	0.79	7.97	0.14	1.26	1.70	0.36	0.22	0.48	0.81	0.46
13	0.70	1.05	1.54	1.16	1.22	2.39	0.89	0.61	0.79	0.90	0.72	3.73	1.17	0.69	0.89	0.54	0.91	0.36	0.83
14	0.19	2.16	1.76	1.67	6.88	3.04	3.75	0.34	1.53	1.54	1.20	8.16	1.08	0.56	1.36	0.41	0.57	0.34	0.46
15	1.48	0.37	0.29	0.36	0.05	2.15	2.76	0.04	0.00	0.30	0.20	1.51	0.88	3.22	0.07	0.62	0.17	1.63	0.04
16	1.09	0.67	1.29	1.30	0.17	0.88	0.31	0.96	0.80	1.12	0.16	0.08	1.42	2.85	2.67	2.49	2.70	4.34	5.72
17	1.32	0.92	1.06	0.09	0.64	1.05	1.22	0.94	0.97	1.49	1.28	0.43	0.94	1.92	1.21	1.44	2.03	0.87	2.11
18	1.03	0.66	0.59	0.61	0.70	2.40	0.63	0.42	0.32	1.22	0.94	0.21	1.25	1.73	0.78	0.86	1.01	0.27	0.61
19	1.00	0.51	1.11	0.81	0.23	1.63	0.45	2.25	1.82	1.57	0.99	0.06	1.12	1.06	0.52	0.97	0.93	1.40	1.78
20	0.53	1.23	0.60	0.91	0.65	0.81	0.30	1.99	1.08	0.89	3.66	0.04	1.14	0.30	0.40	0.37	1.29	0.70	2.49
21	1.48	0.77	0.89	1.41	0.70	0.75	1.45	0.83	1.18	1.69	0.70	0.31	1.26	1.87	1.04	2.25	2.20	1.32	1.48
22	0.95	1.67	1.30	1.65	0.86	0.65	1.70	1.26	1.53	2.04	0.32	0.31	0.92	0.79	1.94	1.42	1.17	1.30	1.08
23	0.68	0.88	0.87	1.53	0.97	0.98	1.23	2.44	1.05	1.62	0.22	1.25	0.43	0.35	0.56	0.84	0.62	0.43	0.41
24	0.41	1.52	1.80	1.92	0.17	1.08	0.35	0.85	1.28	0.94	0.09	0.48	1.83	1.08	1.58	1.97	1.28	1.61	0.82
25	1.47	0.41	0.61	0.82	0.31	0.25	0.42	0.53	0.51	0.51	0.28	0.57	0.43	0.59	1.35	1.11	0.85	1.60	0.98
26	3.00	0.47	0.33	0.48	0.10	0.26	0.45	0.26	0.90	0.19	0.41	0.51	0.15	0.47	1.49	1.99	0.92	0.28	0.14
27	1.65	0.85	0.60	0.93	1.93	0.26	0.68	0.47	0.56	0.54	0.23	0.60	0.23	0.50	1.14	0.64	0.37	0.88	0.22
28	0.43	1.52	1.00	1.09	1.83	0.86	0.80	2.10	1.13	0.78	0.49	1.18	1.16	0.14	0.23	0.17	0.24	0.69	0.58

Source: Data from UNI Comtrade Database, <https://comtrade.un.org/>; the RCA index is calculated by the author according to formula (1).

In terms of Britain, France and Germany, the UK's RCA index of industry sector No. 2 and No. 10 is greater than 2.5, which reflects that the UK has the strongest international competitiveness in

beverage industry<sup>8</sup> and printing industries, while the country's RCA index of the industrial sectors No. 14, No. 22, No. 24 and no. 28 is greater than 1.25, which means that the comparative advantages are mainly concentrated in the fields of medicine and machinery. France's RCA index of the No.2 industry sector is 4.79, which is the most competitive industry in Europe. In addition, France's RCA index of the industrial sectors (No. 6, No. 13, No. 14, No. 16, No. 22 and No. 24) are all greater than 1.25, showing that the country has strong international competitiveness in the fields of clothing, chemistry, medicine and machinery. The RCA indexes of the 28 German industrial sectors are all lower than 2.5, but there are more industrial sectors (No. 3, No. 10, No. 14, No. 16, No. 21, No. 22, No. 23 and No.24), whose RCA indexes are ranging between 1.25 and 2.5. This reflects that Germany's comparative advantage is not concentrated in one single industry, but it is featured in wide distribution and a diversified range of industries.

Industries in other European countries have their own unique advantages. For instance, Switzerland has obvious advantages in the fields of medicine and instrumentation (RCA values are 6.88 and 1.93 respectively); Belgium has strong international competitiveness in the fields of medicine, chemistry and non-metallic minerals (3.04, 2.39 and 2.4); Ireland has outstanding competitiveness in the fields of medicine and chemistry (8.16 and 3.73). Among the Nordic countries, Denmark has obvious advantages in food processing, medicine and chemistry sectors (2.72, 3.75 and 2.76), Finland in paper industry, steel and special equipment (12.75, 2.25 and 2.44), and Sweden in paper and steel industry (6.04 and 1.82). As for southern European countries, Italy has relatively strong international competitiveness in beverage industry (2.61) and comparative advantages in the furniture industry and general machinery (2.09 and 2.04); Greece has strong international competitiveness in oil processing, tobacco processing and non-ferrous metals (7.97, 5.81 and 3.66); Portugal's international competitiveness is concentrated in resource and labour-intensive industries, such as tobacco processing, beverages, clothing, wood, paper, printing and other industrial sectors with a relatively large RCA value; Spain is more competitive in food and machinery than Portugal. Central and Eastern European countries have strong international competitiveness in the rubber industry, tobacco processing, and furniture industry. At the national level, thanks to the large amount of direct investment as a result of international industrial division of labour, Hungary has obvious comparative advantages in rubber industry, machinery, transportation, electronics and telecommunications. In addition to the common advantages of Central and Eastern Europe, the Czech Republic has certain comparative advantages in transportation, electronics and telecommunication equipment fields; Poland in the fields of wood, printing, plastics and metal products; Romania in the fields of wood and leather; Serbia in the fields of wood, paper, plastics and non-ferrous metals.

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<sup>8</sup> As the OECD's statistics on the "beverage industry" sector include "alcoholic beverages", the beverage industry sector in this article covers alcoholic beverages (wine, spirits, etc.).

#### **IV. Industries in China and European Countries: Complementarity and Competitive Analysis of International Competitiveness**

Based on the conclusions in Table 2, this section conducts a horizontal comparative analysis of the comparative advantages of various industries in China and European countries. In the way of ranking the international competitiveness of 28 industrial sectors in various countries in 2018, it clearly demonstrates the industrial advantages and competitive characteristics of China and European countries.

Taking the ranking of the competitiveness of China's 28 industrial sectors as a reference, and ordering from the largest to the smallest RCA (Revealed Comparative Advantage) value of the 28 industrial sectors, the article lists the corresponding rankings of specific industries in European countries. As shown in Table 3, the first column refers to the level of competitiveness. Of Chinese industries. China's industrial sectors that are ranked in the top 12 are competitive and the industrial sectors that ranks from the 17th to 28th do not have competitive advantages and their competitiveness are actually descending. Starting from the second column, the numbers refer to the ranking number of the corresponding industries in these European countries. For example, the number of the second row and the second column indicates that the Electronic and Telecommunications Equipment Industry (industry sector No. 26), which ranks first in China's industrial international competitiveness, ranks 24th in the 28 UK industries, and it is a comparatively disadvantaged industry.

The RCA value of China's Electronic and Telecommunications Equipment Industry is 3, ranking first among 28 industry sectors (the second row of Table 3), and it is China's most internationally competitive industry. It is not difficult to find that among European countries, only Hungary and the Czech Republic have certain comparative advantages in the electronics and communication equipment industry (the RCA values are 1.49 and 1.99 respectively). Except for Sweden and Poland, whose RCA values rank at the world average level, the Electronic and Telecommunications Equipment Industries are at a significant disadvantage in other countries, especially in the United Kingdom, France, Germany, Belgium, Denmark, Finland, Italy, Spain, Portugal, Romania and Serbia, whose electronics and communications equipment industry competitiveness ranks behind 20th among the 28 industry sectors. The pharmaceutical industry is the 27th most competitive industry in China, and its RCA value is only slightly higher than that of the tobacco processing industry. However, the pharmaceutical industry has obvious advantages in some European countries. The pharmaceutical industries of Switzerland, Belgium, Denmark and Ireland rank first in all their competitiveness rankings. The pharmaceutical industry is second only to the transportation equipment industry in Germany, and ranks the third both in the United Kingdom and France. In addition, the pharmaceutical industry in Sweden, Hungary, Greece,

and Italy also has strong international competitiveness. But at the same time, the pharmaceutical industry in some European countries shows apparent comparative disadvantages. For example, the competitiveness of the pharmaceutical industry in Finland, Portugal, the Czech Republic, Poland, Romania and Serbia ranks behind the 20th.

**Table 3: Horizontal comparison of the international competitiveness of industries between China and European countries in 2018**

China	UK	France	Germany	Switzerland	Belgium	Denmark	Finland	Sweden	Italy	Greece	Ireland	Spain	Portugal	Hungary	Czech R.	Poland	Romania	Serbia
<b>26</b>	<i>24</i>	<i>26</i>	<i>25</i>	<i>26</i>	<i>26</i>	<i>24</i>	<i>21</i>	<i>17</i>	<i>28</i>	<i>20</i>	<i>12</i>	<i>28</i>	<i>24</i>	<b>4</b>	<i>7</i>	<i>17</i>	<i>27</i>	<i>27</i>
<b>5</b>	<i>13</i>	<i>14</i>	<i>21</i>	<i>18</i>	<i>16</i>	<b>5</b>	<i>26</i>	<i>23</i>	<b>5</b>	<i>9</i>	<i>23</i>	<b>3</b>	<b>9</b>	<i>26</i>	<i>21</i>	<i>14</i>	<b>6</b>	<b>12</b>
<b>11</b>	<i>9</i>	<i>18</i>	<i>19</i>	<i>25</i>	<i>24</i>	<i>14</i>	<i>22</i>	<i>21</i>	<i>25</i>	<i>8</i>	<i>11</i>	<i>22</i>	<i>26</i>	<i>19</i>	<b>2</b>	<b>10</b>	<i>25</i>	<i>25</i>
<b>4</b>	<i>22</i>	<i>23</i>	<i>24</i>	<i>21</i>	<i>21</i>	<i>21</i>	<i>25</i>	<i>25</i>	<b>11</b>	<i>13</i>	<i>25</i>	<i>21</i>	<b>10</b>	<i>22</i>	<i>15</i>	<i>21</i>	<b>13</b>	<i>19</i>
<b>6</b>	<i>20</i>	<b>4</b>	<i>23</i>	<i>15</i>	<b>7</b>	<i>19</i>	<i>24</i>	<i>27</i>	<b>1</b>	<i>16</i>	<i>21</i>	<b>9</b>	<b>5</b>	<i>14</i>	<i>18</i>	<i>20</i>	<b>5</b>	<b>8</b>
<b>8</b>	<i>19</i>	<i>24</i>	<i>17</i>	<i>22</i>	<i>25</i>	<b>4</b>	<i>23</i>	<i>7</i>	<b>3</b>	<i>23</i>	<i>20</i>	<i>23</i>	<b>6</b>	<i>11</i>	<b>5</b>	<b>2</b>	<b>4</b>	<b>3</b>
<b>27</b>	<i>12</i>	<i>21</i>	<i>12</i>	<b>2</b>	<i>27</i>	<i>18</i>	<i>16</i>	<i>22</i>	<i>24</i>	<i>24</i>	<i>8</i>	<i>27</i>	<i>23</i>	<i>9</i>	<i>19</i>	<i>26</i>	<i>14</i>	<i>26</i>
<b>15</b>	<i>26</i>	<i>27</i>	<i>26</i>	<i>27</i>	<b>4</b>	<b>2</b>	<i>27</i>	<i>28</i>	<i>27</i>	<i>26</i>	<b>5</b>	<i>20</i>	<b>4</b>	<i>28</i>	<i>20</i>	<i>28</i>	<i>7</i>	<i>28</i>
<b>21</b>	<i>14</i>	<i>15</i>	<b>6</b>	<i>10</i>	<i>22</i>	<i>7</i>	<i>12</i>	<i>8</i>	<b>6</b>	<i>15</i>	<i>17</i>	<b>6</b>	<b>12</b>	<i>10</i>	<b>6</b>	<b>6</b>	<b>11</b>	<b>14</b>
<b>25</b>	<i>25</i>	<i>19</i>	<i>15</i>	<i>16</i>	<i>28</i>	<i>25</i>	<i>15</i>	<i>24</i>	<i>26</i>	<i>22</i>	<i>9</i>	<i>25</i>	<i>21</i>	<b>6</b>	<i>12</i>	<i>19</i>	<i>9</i>	<i>16</i>
<b>7</b>	<i>27</i>	<i>16</i>	<i>14</i>	<i>19</i>	<i>14</i>	<b>10</b>	<b>2</b>	<i>10</i>	<i>23</i>	<i>19</i>	<i>10</i>	<i>12</i>	<b>1</b>	<i>8</i>	<b>11</b>	<b>3</b>	<b>3</b>	<b>5</b>
<b>17</b>	<i>10</i>	<i>11</i>	<i>28</i>	<i>12</i>	<i>12</i>	<b>12</b>	<i>10</i>	<i>13</i>	<b>10</b>	<b>5</b>	<i>14</i>	<i>18</i>	<b>11</b>	<i>7</i>	<b>9</b>	<i>7</i>	<i>15</i>	<i>7</i>
<i>16</i>	<i>17</i>	<b>7</b>	<b>8</b>	<i>23</i>	<i>18</i>	<i>27</i>	<i>9</i>	<i>18</i>	<i>13</i>	<i>27</i>	<i>24</i>	<b>5</b>	<b>7</b>	<b>1</b>	<b>4</b>	<b>5</b>	<b>2</b>	<b>2</b>
<i>18</i>	<i>18</i>	<i>22</i>	<i>22</i>	<i>9</i>	<b>2</b>	<i>20</i>	<i>18</i>	<i>26</i>	<b>12</b>	<i>12</i>	<i>18</i>	<b>8</b>	<b>13</b>	<i>15</i>	<i>16</i>	<i>15</i>	<i>28</i>	<i>20</i>
<i>19</i>	<i>23</i>	<i>10</i>	<i>16</i>	<i>20</i>	<b>6</b>	<i>23</i>	<b>4</b>	<b>2</b>	<b>8</b>	<i>10</i>	<i>26</i>	<i>15</i>	<i>17</i>	<i>21</i>	<i>13</i>	<i>16</i>	<b>10</b>	<i>10</i>
<i>22</i>	<b>4</b>	<b>6</b>	<b>3</b>	<i>8</i>	<i>23</i>	<b>6</b>	<b>8</b>	<b>3</b>	<b>4</b>	<i>21</i>	<i>16</i>	<i>19</i>	<i>18</i>	<b>2</b>	<b>10</b>	<i>13</i>	<b>12</b>	<i>15</i>
<i>10</i>	<b>1</b>	<b>8</b>	<i>7</i>	<i>13</i>	<i>11</i>	<b>9</b>	<i>13</i>	<i>16</i>	<i>14</i>	<i>11</i>	<i>15</i>	<i>10</i>	<i>20</i>	<i>18</i>	<b>3</b>	<b>4</b>	<i>20</i>	<b>13</b>
<i>13</i>	<i>8</i>	<b>5</b>	<i>9</i>	<b>4</b>	<b>3</b>	<i>15</i>	<i>14</i>	<i>20</i>	<i>18</i>	<i>14</i>	<b>2</b>	<i>11</i>	<i>19</i>	<i>13</i>	<i>22</i>	<i>18</i>	<i>23</i>	<i>17</i>
<i>23</i>	<i>11</i>	<i>17</i>	<b>5</b>	<i>6</i>	<i>13</i>	<b>11</b>	<b>3</b>	<i>12</i>	<b>7</b>	<i>25</i>	<b>6</b>	<i>24</i>	<i>25</i>	<i>20</i>	<i>17</i>	<i>23</i>	<i>22</i>	<i>24</i>
<i>9</i>	<i>21</i>	<i>12</i>	<i>11</i>	<i>17</i>	<i>17</i>	<i>17</i>	<b>1</b>	<b>1</b>	<i>17</i>	<i>17</i>	<i>22</i>	<i>17</i>	<b>3</b>	<i>17</i>	<i>14</i>	<b>8</b>	<i>17</i>	<b>6</b>
<i>20</i>	<i>7</i>	<i>20</i>	<i>13</i>	<i>11</i>	<i>20</i>	<i>28</i>	<i>7</i>	<i>11</i>	<i>19</i>	<b>3</b>	<i>27</i>	<i>14</i>	<i>27</i>	<i>24</i>	<i>26</i>	<b>11</b>	<i>18</i>	<b>4</b>
<i>28</i>	<b>6</b>	<i>13</i>	<i>10</i>	<b>3</b>	<i>19</i>	<i>16</i>	<b>5</b>	<i>9</i>	<i>22</i>	<i>18</i>	<i>7</i>	<i>13</i>	<i>28</i>	<i>27</i>	<i>28</i>	<i>27</i>	<i>19</i>	<i>21</i>
<i>24</i>	<b>5</b>	<b>2</b>	<b>1</b>	<i>24</i>	<i>10</i>	<i>26</i>	<i>11</i>	<b>6</b>	<i>16</i>	<i>28</i>	<i>13</i>	<b>4</b>	<i>16</i>	<b>3</b>	<b>8</b>	<b>12</b>	<b>8</b>	<i>18</i>
<i>1</i>	<i>15</i>	<i>9</i>	<i>18</i>	<i>14</i>	<b>8</b>	<b>3</b>	<i>19</i>	<i>15</i>	<i>15</i>	<b>4</b>	<b>4</b>	<b>2</b>	<b>15</b>	<i>12</i>	<i>23</i>	<b>9</b>	<i>21</i>	<b>9</b>
<i>12</i>	<i>16</i>	<i>25</i>	<i>27</i>	<i>28</i>	<b>5</b>	<i>22</i>	<b>6</b>	<b>5</b>	<i>21</i>	<b>1</b>	<i>19</i>	<i>7</i>	<b>14</b>	<i>25</i>	<i>27</i>	<i>25</i>	<i>16</i>	<i>22</i>
<i>2</i>	<b>2</b>	<b>1</b>	<i>20</i>	<i>7</i>	<i>9</i>	<b>8</b>	<i>17</i>	<i>19</i>	<b>2</b>	<i>7</i>	<b>3</b>	<b>1</b>	<b>8</b>	<i>23</i>	<i>24</i>	<i>22</i>	<i>26</i>	<b>11</b>
<i>14</i>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<i>20</i>	<b>4</b>	<b>9</b>	<b>6</b>	<b>1</b>	<i>16</i>	<i>22</i>	<b>5</b>	<i>25</i>	<i>24</i>	<i>24</i>	<i>23</i>
<i>3</i>	<i>28</i>	<i>28</i>	<b>4</b>	<i>5</i>	<i>15</i>	<i>13</i>	<i>28</i>	<i>14</i>	<i>20</i>	<b>2</b>	<i>28</i>	<i>26</i>	<b>2</b>	<i>16</i>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>

Source: The same as Table 2.

Note: The normal numbers in the table indicate that the industries have comparative advantages, and the italicized numbers indicate comparative disadvantages.

In general, there is a certain degree of complementarity between the industries of China and European countries. On the one hand, among the top 12 industrial sectors with comparative advantages of China, the RCA values of the corresponding industrial sectors in European countries are generally small and their competitiveness ranks low, such as the instruments, apparatuses and office machinery sector (industrial sector No. 27). Only in Switzerland the instruments, apparatuses and office machinery sector have strong international competitiveness and ranks the second, while other European countries do not have a competitive advantage. Regarding the electrical machinery and equipment industry (industrial sector No. 25), only a few Central and Eastern European countries (Hungary and Romania) have comparative advantages, and other countries are in face of much less competitiveness. On the other hand, regarding the following 12 industrial sectors, where China is relatively disadvantaged, European countries have a relatively larger RCA values and rank high in competitiveness. For example, the beverage industry (industry sector No. 2) that ranks third from the bottom in China has much stronger international competitiveness in European countries except Germany, some Nordic countries, and Central and Eastern European countries. In particular, the beverage industry ranks first according to its competitiveness in France and Spain. In summary, the complementary space for the international competitiveness of industries in China and European countries is mainly characterized by “complementarity in the industries” (China’s advantages and partner countries’ disadvantages, or partner countries’ advantages and China’s disadvantages). The “potential competition” industries where both China and Europe have advantages are those areas where friction should be avoided in international cooperation. When it comes to the specific industrial fields, the table 3 can clearly show which European countries have large complementary space and sufficient potential for cooperation and which countries may have potential competitive relations with China.

## **V. The dynamic evolution of international competitiveness of Chinese and European industries**

With the deepening of economic globalization, labour division in international industries has intensified, and transnational companies have realized the transfer of production capacity via the form of direct investment. During this period, the advantageous industries of advanced economies have been transferred to other regions due to the cost and strategy motives, and the global situation of industrial competitiveness has been reshaped. On the one hand, the transfer of production capacity has reshuffled the dominant industries of European countries; on the other hand, the dynamic changes in the European industrial structure are of great significance to analysing the changing trends of the industrial structure of China and Europe and to deepening Sino-European economic and trade cooperation. Due to space limitation, this article takes the Electronic and Telecommunications Equipment Industry and the Transportation Equipment Industry as examples to analyse the dynamic change path of the international

competitiveness of the industries in China and European countries and to shed light on future development trends. It is worth noting that these two industries are becoming more and more important in Central and Eastern European region.

### **(1) Take the Electronic and Telecommunications Equipment Industry as an example**

Europe has the earliest start and solid foundation in the Electronic and Telecommunications Equipment Industry, with Nokia and Ericsson being the two most representatives of the transnational companies. At the end of the 1990s, with the development and growth of a number of information communication and electronic equipment manufacturers such as Nokia, Finland became one of the world's information and communication powers from a country with an underdeveloped information and communication industry<sup>9</sup>. Swedish companies represented by Ericsson<sup>10</sup> have been leading the global wireless communication standards. Thanks to their mastery of many advanced technologies in the field of information and communication, Sweden became the world's first country with a commercial 4G network in 2019<sup>11</sup>.

As shown in **Table 1**, the RCA values of telecommunication equipment in Finland and Sweden in 1999 were 5.48 and 4.67 respectively, which means these two countries have extremely strong international competitiveness. Meanwhile, the RCA value of China's telecommunication equipment is 1.31, which has just established a comparative advantage, and the RCA value of Hungary is only 0.6, which signals a comparative disadvantage<sup>12</sup>.

Since 1999, the output value of the Hungarian Electronic and Telecommunications Equipment Industry has increased by about 10% annually, and its export growth has far exceeded the growth rate of the economy and other sectors. On the one hand, either based on the proportion of consumption in GDP or based on average personal consumption, Hungary has the highest consumption in the Central and Eastern Europe Information and Communication Technology (ICT) market, accounting for about 20% of the entire Central and Eastern Europe, and its market demand is strong; on the other hand, Hungary has a traditional advantage in this sector. Neumann Janos, Tivadar Puskds (the father of

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<sup>9</sup> Economic and Commercial Counsellor's Office of the Embassy of the People's Republic of China in Finland, <http://fi.mofcom.gov.cn/aarticle/ddgk/zwdili/200807/20080705685652.html>

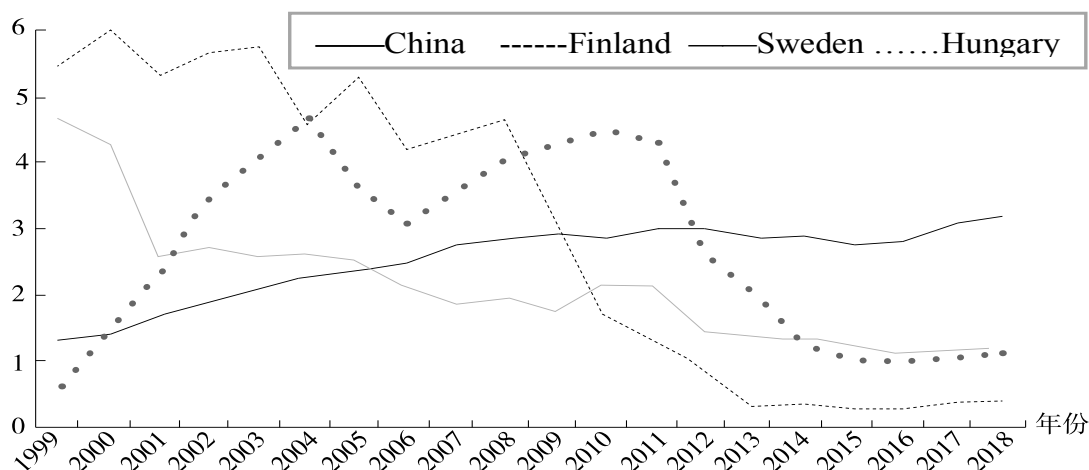
<sup>10</sup> Ericsson Annual Company Annual Report 2018, <https://www.ericsson.com/assets/local/investors/documents/2018/ericsson-annual-report-2018-en.pdf>

<sup>11</sup> Ministry of Commerce of the People's Republic of China, <http://www.mofcom.gov.cn/aarticle/i/dxfw/jlyd/201012/20101207296122.html>

<sup>12</sup> The Electronics and Telecommunication Equipment Industry involves many product categories. Based on the current 5G infrastructure network construction of "Huawei", Nokia, Ericsson and other communication equipment companies, the article takes the communication equipment (of the Electronics and Communication Equipment Industry) as a sample to do the analysis in order to ensure the analytical accuracy and achieve some results with practical significance.

telephone exchanges), Charles Slmonyi (Microsoft development manager) and KohnKem6ny (the developer of the BASIC language) are all Hungarians. The outstanding scientific and technological talents and innovative capability are the key to the rise of the Hungarian Electronic and Telecommunications Equipment Industry.

**Table 1: The dynamic changes of the international industrial competitiveness of Chinese and European Electronic and Telecommunications Equipment Industry from 1999 to 2018**



**图 1 1999 ~ 2018 年中欧电子及通信设备业国际产业竞争力动态变化**

Source: The same as Table 2

Note: The number is 764 according to SITC REV3 standards.

With transnational companies such as Nokia and Ericsson transferring part of their production capacity, R&D centres, and service centres to Hungary, the international competitiveness of the Hungarian communication industry was significantly improved during the period from 1999 to 2004. The RCA value increased from 0.6 to 4.67. In 2004, its level of international competitiveness surpassed that of Finland. Subsequently, due to the gradual loss of competitiveness of Nokia’s mobile phones, its operations in Hungary became difficult, and then the international competitiveness of the Hungarian communication industry experienced a short-term decline. Since 2006, transnational service industry outsourcing started to become popular. Hungary has relied on the advantages of scientific and technological talents of the Central and Eastern European region. Transnational companies, such as “NEC”, “BTO”, “IBM”, “Getronics” and “Cognizant” and so forth set up the departments of network services, outsourcing, technical support and others in Hungary, which once again promoted the development of the Hungarian communication industry. From 2008 to 2011, its RCA value has remained above 4.0. However, since 2012, due to the weak international demand, transnational companies faced difficulties in their operations and began to lay off a large number of employees and



even close their factories in Hungary. Thus, their international competitiveness began to decline sharply. As of 2018, the international industrial competitiveness of Hungary's communication industry was close to that of Sweden and was at the world average level, but its advantage is not conspicuous as before.

Generally, at the early stage of the European Telecommunications Industry, Finland and Sweden had the strongest international competitiveness, and then began to continuously decline. During the period from 1999 to 2012, the local competitiveness descended mainly due to the international labour division and the transfer of production capacity; during the period from 2012 to 2018, it was mainly the weak international demand that has led to a continuous decline in operating income<sup>13</sup>. During this period, part of the production capacity and R&D work was transferred to Hungary, which drove the continuous development of the Hungarian Telecommunications Industry, but its international competitiveness failed to maintain the momentum of sustained development and eventually the industry lost its comparative advantage. During this period, relying on the accumulation of competitiveness of transnational companies, such as "Huawei", "ZTE" and others from the Telecommunications Industry, China's Telecommunications Industry has continuously developed. China's RCA value has increased from 1.31 in 1999 to 3 in 2018, and its international competitiveness has maintained the world's leading position. From the perspective of international market share, China's communication industry's share of global exports has increased from 4.64% in 1999 to 44.15% in 2018.

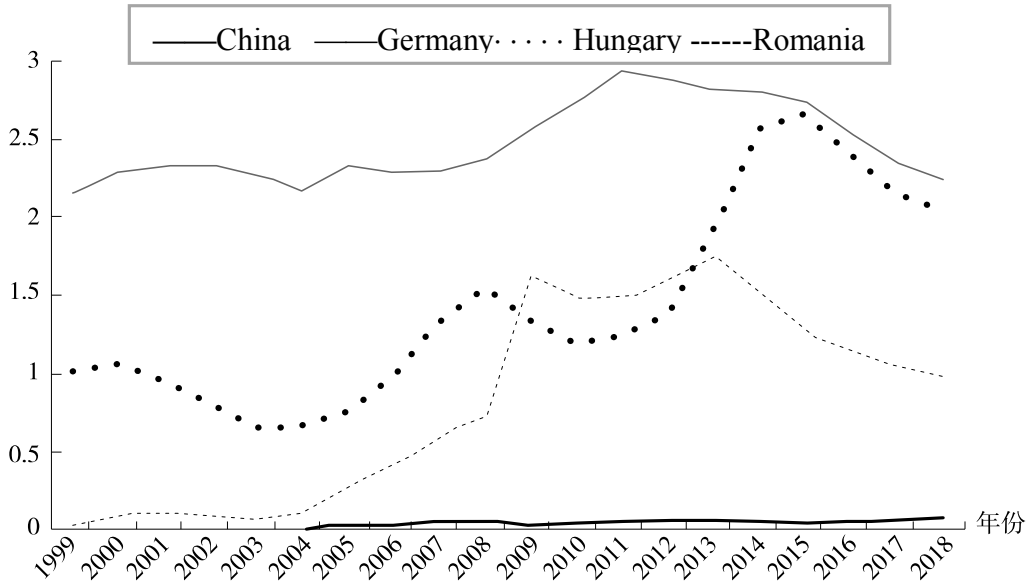
The Transportation Equipment Industry involves many product categories. For the purpose of achieving the accuracy and applicability of the research, this article uses automobiles as a representative to analyse the development trajectory of the international competitiveness of the Sino-European automobile industry. The automobile industry has been a field where Europe traditionally holds advantages. In particular, after a centurial accumulation of technology and experience, the cars manufactured in Germany are world-renowned in terms of R&D and design, manufacturing process, product quality and experience, etc. As shown in Figure 2, from 1999 to 2018, the RCA value of the German automotive industry has always been above 2.15 and reached the highest point of competitiveness in 2011 (2.93). After that, it began to decline slowly due to the weak international market demand. As of 2018, its RCA value kept stable at 2.35, and the industry still maintains a very strong level of international competitiveness. The dynamic changes in international competitiveness have shown that the German automobile industry is characterized by a solid foundation, stable development and long-term leadership. However, it's worthy of paying attention to the downward fluctuation of competitiveness in recent years.

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<sup>13</sup> Nokia Annual Company Annual Report, [https://www.nokia.com/sites/default/files/files/nokia\\_20f17\\_full\\_web\\_1.pdf](https://www.nokia.com/sites/default/files/files/nokia_20f17_full_web_1.pdf)

## (2) Take the Transportation Equipment Industry as an example

**Figure 2: The dynamic changes in the international industrial competitiveness of Chinese and European Transportation Equipment Industry from 1999 to 2018**



**图 2 1999 ~ 2018 年中欧交通运输设备业国际产业竞争力动态变化**

Source: The same as Table 2

Note: The standardized number is 781 according to SITC REV.3.

In the early stage of the research sample (i.e., in 1999), the international competitiveness of the German automobile industry had reached the world's leading level and the RCA value was 2.15, while the RCA value of China during the corresponding period was only 0.0014 (that is, 0.14% of the world average level). The difference between two countries was very huge. Romania faced the same situation of China's automobile industry. In 1999, Romania's RCA value of the automobile industry was only 0.02 due to the late start of the country's industrial development. Hungary, another representative country in Central and Eastern Europe, had a history in developing automotive industry and the advantage of skilled workers, and thus in 1999 the RCA value was 1.01, which was the world average level. Around 2000, with the integration of Europe, manufacturers represented by Germany shifted their production capacity to Central and Eastern Europe, which has obvious geographical advantages and abundant human resources. In view of this, Hungary and Romania have absorbed a large amount of investment in the automotive industry.

Relying on Hungary's tradition of developing automobile industry and geographical location advantages, transnational automobile companies have successively entered Hungary to set up factories since the 1990s. At first, General Motors, Japan Suzuki, Daimler, Audi and other companies mainly produced auto parts in Hungary. Products such as engines, cylinder heads and gearboxes were export-

oriented, and half of them were sold to Germany. During this period, the export value was relatively low, which made the international competitiveness growth of Hungary's automobile industry slow. Starting from 2004, Suzuki Hungary, Mercedes-Benz Hungary and Audi Hungary have been established successively in Hungary for the purpose of vehicle production. In doing so, vehicle plants can assemble vehicles and achieve the name of “Made in Hungary” before exporting. The rise of the processing and manufacturing of complete vehicles in Hungary makes the export value of complete vehicles calculated under Hungary, accelerating the improvement of the international competitiveness of its automobile industry. In particular, Audi is mass-produced in Hungary and has become Hungary's largest tax source and exporter. The maximum RCA value of the Hungarian automobile industry (2.66) occurred in 2015, which was slightly lower than the level of Germany (2.74) in the same period, showing a tendency to catch up and surpass the latter. Later on, due to the weak demand in the international automobile market, the international competitiveness of the German and Hungarian automobile industries began to decline sharply since 2016. But, the decline in Hungary was significantly greater than that of Germany, indicating that the approach that embeds processing and manufacturing process into the global value chain has the weaknesses of unstable and fluctuating competitiveness of the automobile industry.

In Romania, since 1990, many foreign companies, including Mercedes, Audi, Hyundai, Volvo, Toyota, Peugeot and others, have opened branches<sup>14</sup>, but they were small in scale and mainly met the Romanian domestic market. Thus, the international competitiveness of the Romanian automobile industry was relatively weak. By 1999, the RCA value was only 0.02. In 1999, the French Renault Group acquired Dacia automobile plant from the Romanian government, and its total investment for Dacia has reached 2.3 billion euros from 2000 to 2018. In addition, Ford's vehicle assembly plant in Romania started its production in 2012, which has greatly increased Romania's production and export volume. From 1999 to 2013, the RCA value of Romania's automobile industry maintained an upward tendency with the continuous expansion of foreign capital. In 2013, its RCA value was 1.75, which was the period when its international competitiveness was the highest. Since 2014, its competitiveness has declined significantly. As of 2018, the RCA value has dropped to 1.03, and is barely able to maintain the world average level.

As of 2018, the RCA value of China's auto industry was only 0.07, that is, the international competitiveness of China's auto industry was only 7% of the world average level. There is a big gap between the two countries. There are two specific reasons: First, the global auto industry was still dominated by Europe, the United States, Japan and South Korea, and the competitiveness of Chinese automakers is limited; second, although China's auto production is high, the products mostly serve the domestic market. Meanwhile, its international competitiveness, which is an important motive of exporting, was not improved.

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<sup>14</sup> Economic and Commercial Counsellor's Office of the Embassy of the People's Republic of China in Romania, <http://ro.mofcom.gov.cn/article/jmdy/201811/20181102803337.shtml>

To sum up, the development of the European automobile industry is led by developed countries such as Germany, and its early competitiveness was from Western European developed countries. With the eastward expansion of the European Union and the in-depth development of European integration, developed countries have gradually shifted their production capacity to the Central and Eastern European countries with relatively good conditions. The Central and Eastern European countries have absorbed production capacity and embedded them in the value chain by processing and manufacturing. This explained the sudden rise of international competitiveness of the automobile industries of Hungary, Romania and other countries in the past twenty years.

Nevertheless, international demand has been weak in recent years. The international competitiveness of the German automobile industry has continued to decline since 2013. The recession has gradually spread from the upstream to the downstream of the industrial value chain. The international competitiveness of the Hungarian and Romanian auto industries began to decline in 2014 and 2016 respectively, and their decreasing rate is greater than that of Germany.

## **VI. Conclusions and Policy Recommendations**

### **(6.1) Main conclusions**

First, Chinese and European industries have their own characteristics when it comes to the international competitiveness. China has strong international competitiveness in labour-intensive industries represented by clothing and stationary supplies as well as electronics and communication equipment industries. The situation in European countries varies from one to another. Among Britain, France and Germany, the British beverage industry and printing industry have the strongest international competitiveness, and its comparative advantages are mainly concentrated in the fields of medicine and machinery; the French beverage industry is the most competitive among European countries, and France has comparatively strong international competitiveness in clothing, chemistry, medicine and machinery; Germany's competitiveness is concentrated in the fields of machinery and transportation equipment. Industries of other European countries have their own unique advantages. For instance, Switzerland is strong in medicine and instrumentation; Belgium in medicine, chemistry and non-metallic minerals; Ireland in medicine and chemistry; Denmark in food processing, medicine and chemistry; Finland in paper industry, steel and special equipment; Sweden in paper industry and steel industry; Italy in beverage industry, furniture industry and general machinery; Greece in petroleum processing, tobacco processing, non-ferrous metals; Portugal in tobacco processing, beverage industry, clothing, wood; Spain in food and machinery; Central and Eastern European countries in rubber industry, tobacco processing and furniture industry.

Second, the industrial complementarity between China and European countries is greater than the competitiveness. On the one hand, the top 12 industrial sectors with comparative advantages in China

rank low in competitiveness order of European countries; on the other hand, the least competitive 12 industrial sectors in China rank high in the competitiveness order of European countries. Regarding the specific industries, the space for complementarity between China and Europe is greater than that for competition, and there is a huge potential for cooperation.

Third, there are new trends in the dynamic changes of the international competitiveness situation of Chinese and European industries. Take the communication equipment industry as an example. In the early days, Finland and Sweden had the strongest international competitiveness. From 1999 to 2018, part of the production capacity and R&D was transferred to Hungary, which drove the sustainable development of the Hungarian communication industry, but its international competitiveness failed to maintain a sustained development momentum. During this period, relying on the accumulation of competitiveness of transnational companies in the communication industry such as “Huawei” and “ZTE”, China’s communication industry has continuously developed and its international competitiveness has reached the world’s leading level. Take the automobile manufacturing industry as an example. At the early stage, the international competitiveness was concentrated in developed countries of Western Europe such as Germany. With the eastward expansion of the EU and the in-depth development of European integration, the international competitiveness of the industry is advancing by leaps and bounds. However, in recent years, international demand has been weak. The international competitiveness of the German automobile industry has continuously declined, and the Central and Eastern European countries’ industries have also declined afterwards, but the declining rate is higher than that of Germany.

## **(6.2) Policy Recommendations**

With the continuous development of China-European bilateral relations, trade in the past can no longer represent the full picture of China-European economic and trade relations. China's investment in Europe continues to increase, and the demand for China-European cooperation in production capacity is also rising. In order to better adapt to the rapid development tendency of China-European economic and trade relations, the European industry is analysed from the perspective of industrial international competitiveness to shed light upon the path of their industrial development, and to understand the advantages and disadvantages of the Chinese and European industries and the complementarity, and then the article proposes some constructive recommendations for China’s investment in Europe and for China-European industrial cooperation.

**First**, China-European industrial cooperation takes into consideration the characteristics of each country’s industry, “to implement policies in accordance with the country’s industrial characteristic”. European countries are very different in terms of factor endowment, and the international competitiveness of industries also differs from one to another. When it comes to the issue of industrial docking, it is advisable to identify the country's advantageous industries, to pinpoint the status of the

global value chain, and to combine the needs of China's economic development and industrial transformation and upgrading, so as to make good and full use of European industries.

**Second**, China-European industrial cooperation should highlight complementarity and avoid competition. Regarding the Chinese and European industries with complementary advantages, it is advisable to carry out all-round docking in light of the actual needs of each country so that the cooperation can fully mobilize the enthusiasm of participants for mutual benefit and win-win results. For the industries where there may be "potential competition", cooperation partners should make response plans in advance and try to avoid economic and trade frictions.

**Third**, pay close attention to the development trend of European industrial competitiveness and strive for exercising cooperation initiative. At present, economic globalization is facing various challenges, trade protectionism is rising, global market demand is slowing, and the uncertainty of fluctuations in the international competitiveness of various industries of China and Europe is increasing. It is recommended to pay close attention to the changing trends of the industrial competitiveness of all these countries: strive for initiating cooperation on the one hand and stop losses in time on the other hand.

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