

A Study on the Complementarity of Merchandise Trade between China and CEEC

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Abstract—This paper uses trade combination degree and trade complementarity index to analyze the trade relation between China and 16 Central and Eastern European countries in the period of 2008 to 2017. The analysis proves that during this time the goods trade between China and these countries had low reliance degree. But the trade showed strong complementarity in some industries. Textiles, Footwear and Headgear and Raw Hides, Skins, Leather and & Furs are the highest complementary industries. The capital and technology industries, Machinery and Electrical, Base Metals and Plastics and Rubbers, are also highly complementary and on the rise.

Keywords—central and eastern european countries; merchandise trade; trade complementarity

I. INTRODUCTION

Central and Eastern European Countries (CEEC) is a general concept. There is no uniform standard to define this area. Based on the classification standard of the United Nations and the World Bank, here in this article CEEC means the 16 countries in the central and eastern part of Europe, they are Poland, the Czech republic, Hungary, Romania, Slovakia, Slovenia, Bulgaria, Lithuania, Croatia, Latvia, Estonia, Serbia, Albania, Bosnia and Herzegovina, Macedonia and Montenegro. [1] In the year 2017, the total population of CEEC was 124.5 million, and the GDP was 1,539.4 billion US dollars, accounted for 2% of world GDP; the total value of international trade was 1,705.7 billion, also accounted for 2% of world trade. [2]

Since the 2008 economic crisis, world economic and trade growth continued to be in a state of depression, and all countries faced great difficulties in development. China and CEEC share similar levels of development and strong economic complementarity. [3] In order to promote economic growth, China and CEEC established the "16+1 cooperation" mechanism, and started the China-CEEC economic and trade forum for the first time in year 2011, China and 16 central and eastern European countries have been in Budapest and Warsaw held the first and second "China-Central and Eastern European Countries" Economic and Trade Forum", reached a consensus on strengthening bilateral economic and trade cooperation. This represented that China and Central and Eastern European countries have entered into a more advanced stage of trade cooperation. At the second forum, Premier Wen Jiabao proposed expansion Large-scale bilateral cooperation. [4] Then

the 8th forum was held in July 2018 in the capital of Bulgaria-Sofia. Ever since the 1st forum of 2011, China's trade with the 16 countries has grown at an average annual rate of 6.5%, reaching \$68 billion last year. Two-way investment has been developing steadily. China has invested nearly 10 billion US dollars, and the 16 countries have invested more than 1.4 billion US dollars in China.

In order to expand the scale of bilateral economic and trade cooperation, it has important practical significance to figure out the following questions: How do China and CEEC depend on each other in trade? Is there complementarity between the products of both parties? If there is, to what extent could the complementarity be mutual beneficial?

II. TRADE COMBINATION DEGREE BETWEEN CHINA AND CEEC

China strengthened its ties with CEEC in the early 2000s, bilateral trade increased fast since then, especially in the recent 10 years. In 2007, the trade value between the two sides was only 29 billion US dollars. In 2017, it reached 68 billion with an average annual growth rate of 8.8%, this is faster than the average 2.3% growth rate of global merchandise trade over the same period. In the same period, the foreign trade of the 16 CEEC experienced an average annual growth rate 2.6%, and that of China's foreign trade in goods was 6.5%. Total trade value between China and 16 CEEC and their growth rates in 2017 are shown in Table I below:

Bilateral trade has been growing fast but unbalanced for a long time, [5] with China's exports to CEEC more than three times as much as imports on the average. Trade balance has increased from 19.83 billion US dollars in 2007 to 30.99 billion in 2017. But we can see that the situation was getting better in the last 10 years. China's imports from CEEC increased much faster than exports. Imports in 2017 was 18.49 billion US dollars, four times the number of 2007, 4.74 billion US dollars. While exports doubled from 24.57 billion to 49.49 billion. See Fig. 1 for details.

The situation of bilateral trade could be reflected by Trade Combination Degree (TCD), The variable TCD_{ij} is a relatively comprehensive indicator to measure the mutual dependence of the two countries I and J in trade. [6] The formula for calculating TCD_{ij} is as follows:

$$TCD_{ij} = \frac{X_{ij} / X_i}{M_j / M_w}$$

X_{ij} is the export of country I to country J, X_i represents the total export of country I, and X_{ij}/X_i represents the ratio of the export of country I to country J to the total export of country I; M_j is the total import of country J, while M_w is the total import of the world. M_j/M_w represents the proportion of the total import of country J to the total import of the world. It actually represents the import capacity of country J. The formula shows the ratio of country I's exports to country J to country I's total exports, compared with the ratio of country J's total imports to the world's total imports. If TCD_{ij} is greater than or equal to 1, it means that there is a close relationship between country I and country J in trade. If TCD_{ij} is less than 1, it indicates that country I and country J are relatively estranged in trade. TCD is in fact an asymmetric indicator, that is $TCD_{ij} \neq TCD_{ji}$. TCD_{ij} reflects the degree of dependence of country I on country J in trade. Table II and Table III show the trade combination degree between China and CEEC, let I denotes China and J denotes CEEC.

TABLE I. MERCHANDISE TRADE AND ITS GROWTH RATE BETWEEN CHINA AND CEEC IN 2017

Country	Import and export (Million US dollars)	Percentage(%)	Growth rate (%)
Poland	21229.45	31.23	20.40
Czech Republic	12488.66	18.37	13.40
Hungary	10126.71	14.90	13.90
Romania	5602.21	8.24	14.20
Slovakia	5314.60	7.82	0.80
Slovenia	3383.17	4.98	25.00
Bulgaria	2137.70	3.14	29.80
Lithuania	1855.68	2.73	27.50
Croatia	1342.67	1.98	13.90
Latvia	1325.22	1.95	10.90
Estonia	1267.22	1.86	7.80
Serbia	757.17	1.11	27.30
Albania	650.24	0.96	2.30
Montenegro	199.12	0.29	41.30
Macedonia	164.48	0.24	20.20
Bosnia and Herzegovina	136.06	0.20	26.40
Total	67980.36	100	

^a. Source: Wind database and Uncomtrade database

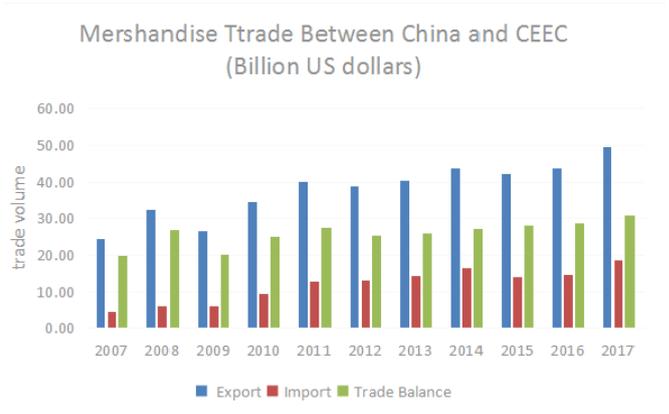


Fig. 1. Merchandise trade between China and CEEC.

TABLE II. TRADE COMBINATION DEGREE BETWEEN CHINA AND CEEC AS A WHOLE IN 2007-2017

Year	TCD_{ij}	TCD_{ji}
2008	0.45	0.13
2009	0.48	0.15
2010	0.5	0.17
2011	0.48	0.18
2012	0.46	0.19
2013	0.43	0.18
2014	0.42	0.2
2015	0.42	0.2
2016	0.45	0.21
2017	0.46	0.22

TABLE III. TRADE COMBINATION DEGREE BETWEEN CHINA AND 16 CEEC IN 2017

Country	TCD_{ij}	TCD_{ji}	Country	TCD_{ij}	TCD_{ji}
Poland	0.65	0.15	Latvia	0.58	0.13
Czech	0.43	0.2	Serbia	0.2	0.12
Slovakia	0.26	0.3	Croatia	0.38	0.11
Bulgaria	0.27	0.31	Slovenia	0.64	0.13
Hungary	0.46	0.35	Albania	0.62	0.85
Romania	0.35	0.25	Montenegro	0.4	1.55
Lithuania	0.39	0.08	Macedonia	0.08	0.15
Estonia	0.46	0.17	Bosnia and Herzegovina	0.06	0.09
Poland	0.65	0.15	Latvia	0.58	0.13
Czech	0.43	0.2	Serbia	0.2	0.12

^b. Source: Wind database and Uncomtrade database

It can be seen from the above 2 tables that: (1) Combination degree of goods trade between both parties is very low. From 2007 to 2017, the dependence degree of China on 16 CEEC was less than 0.5 in general (the average level of the world is 1); while the 16 CEEC depended on China in goods trade at a

degree less than 0.2. In the case of individual countries, in 2017, China was dependent on Poland the most with a degree of 0.65, followed by Slovenia's 0.64 and then Albania's 0.62. From the CEEC side, Montenegro has the highest trade dependence on China to a degree of 1.55, and the second highest was Albania's 0.85, the third was Hungary 0.35. This means that compared with other parts of the world, China and CEEC were not important trading partners to each except for Montenegro. (2) The dependence degree of China on 16 CEEC stayed relatively stable in the last 10 years, but the dependence degree of CEEC on China increased from 0.13 to 0.2. The gradual upward trend indicated that Chinese market was getting more and more important to central and eastern European countries. (3) Relatively lower dependence on trade reflects both sides' markets were not important to each other in the past, but it also reflects there is great potential for the development of bilateral trade in the future. Chinese market has huge market potential for CEEC especially in the current recession in Europe. To turn market potential into reality, we need to figure out the complementarity of bilateral trade in merchandise.

III. THE COMPLEMENTARITY OF MERCHANDISE TRADE BETWEEN CHINA AND CEEC

It is generally believed that if the major export products of country I coincide with the major import products of country J, the trade between the two countries will be complementary. [7] Economists use Trade Complementarity Index to measure the complementarity between two countries.[8] Based on the Trade Complementarity Index (C_{ij}) developed by Petet Drysdale in 1967, the formula for calculating C_{ij} is as follows:

$$C_{ij} = \sum_k C_{ij}^k \frac{X_w^k}{X_w} = \sum_k RCA_{xi}^k RCA_{mj}^k \cdot \frac{X_w^k}{X_w}$$

Where $C_{ij}^k = RCA_{xi}^k RCA_{mj}^k$, it is the trade complementary index of individual products K between country I and country J. RCA_{xi}^k represents the comparative advantage of country I as measured by exports, RCA_{mj}^k represents the comparative disadvantage of country J as measured by imports. They are calculated as follows:

$$RCA_{xi}^k = \frac{X_i^k / X_i}{X_w^k / X_w}$$

$$RCA_{mj}^k = \frac{M_j^k / M_j}{X_w^k / X_w}$$

X_i^k and X_w^k are respectively the export of product K of country I and the world; X_i and X_w are the total export of country I and the world; M_j^k is the import of product K of country J; M_j is the import of of country J. The larger the value of RCA_{xi}^k (RCA_{mj}^k), the stronger the comparative advantage (disadvantage) country I(J) has in product K. When both

RCA_{xi}^k and RCA_{mj}^k are of high value, it means country I has strong comparative advantage in product K and country J has strong comparative disadvantage in product K, therefore the two countries are strongly complementary in product K. The larger the value of $C_{ij}^k = RCA_{xi}^k RCA_{mj}^k$, the higher degree the complementarity between the two countries. Using the proportion of various products in world trade the weigh, the comprehensive trade complementarity index of the two countries (C_{ij}) can be obtained by summing up the single complementarity index. When $C_{ij} > 1$, it indicates that the two countries are highly complementary in trade, and The greater the value of C_{ij} , the more obvious the complementarity; When C_{ij} is less than 1, it indicates that the trade complementarity between the two countries is weak.

According to the formulas as well as the Harmonized Commodity Description and Coding System¹, I calculated the complementarity index between China and 16 central and eastern European countries. The results are shown in Table IV.

Form the data in above table we can draw the following conclusions: (1) the comprehensive trade complementarity between China and CEEC from 2013 to 2017 remained relatively stable, the index basically stayed above 1. It means there is a significant and stable trade complementarity between China and CEEC. (2) Trade complementarities between China and the 16 CEEC are unbalanced in different industries (or products). The index of 7 categories are lower than 1 and 8 categories are more than 1. There is very weak complementarity in Mineral Products, or almost no complementarity. Vegetable Products, Stone and Glass as well as Animal & Animal Products are not so complementary between China and CEEC. Textiles, Footwear and Headgear and Raw Hides, Skins, Leather and & Furs are the highest complementary industries. These are Labor intensive industries. The capital and technology industries, Machinery and Electrical, Base Metals and Plastics and Rubbers, are also highly complementary and on the rise in the last 5 years.

We can also take a look at the trade relationship between China and Czech in the last 5 years.

Table V shows that the complementarity between China and Czech is consistent with that between China and CEEC in almost all the industries. Textiles, Footwear and Headgear and Machinery and Electrical are the top 3 industries with high complementarity. This indicates that the trade between China and Czech has very similar model with that between China and CEEC.

¹ Harmonized Commodity Description and Coding System, or simply the Harmonized System, are a standardized international system to classify globally traded products. There are 21 distinct sections that split into 96 chapters. This paper combined some sections and divided the 96 chapter into 15 categories, chapter 98 and 99 are included in miscellaneous.

TABLE IV. THE COMPLEMENTARITY INDEX BETWEEN CHINA AND CEEC IN 2013-2017

Category	2013	2014	2015	2016	2017
Animal & Animal Products 01-05	0.53	0.5	0.46	0.49	0.55
Vegetable Products 06-15	0.26	0.25	0.26	0.3	0.34
Foodstuffs 16-24	0.59	0.55	0.51	0.53	0.64
Mineral Products 25-27	0.07	0.07	0.09	0.1	0.11
Chemicals & Allied Industries 28-38	0.53	0.55	0.51	0.53	0.65
Plastics and Rubbers 39-40	1.46	1.45	1.38	1.47	1.71
Raw Hides, Skins, Leather and & Furs 41-43	3.14	3.04	2.9	3.22	3.86
Wood & Wood Products 44-49	1.04	1.05	1.06	1.11	1.22
Textiles 50-63	3.78	3.92	3.32	3.66	4.36
Footwear and Headgear 64-67	4.37	4.61	3.85	3.83	4.23
Stone and Glass 68-71	0.31	0.45	0.3	0.24	0.32
Base Metals 72-83	1.67	1.77	1.79	1.91	2.15
Machinery and Electrical 84-85	1.95	1.86	1.76	1.71	2.03
Transportation 86-89	0.56	0.56	0.53	0.49	0.62
Miscellaneous 90-99	1.09	1.1	1	1.09	1.52
Comprehensive Index(C_{ij})	1.08	1.09	1.07	1.1	1.19

TABLE V. THE COMPLEMENTARITY INDEX BETWEEN CHINA AND CZECH IN 2013-2017

Category	2013	2014	2015	2016	2017
Animal & Animal Products 01-05	0.35	0.32	0.30	0.30	0.34
Vegetable Products 06-15	0.17	0.16	0.18	0.20	0.22
Foodstuffs 16-24	0.41	0.36	0.33	0.34	0.42
Mineral Products 25-27	0.04	0.04	0.06	0.06	0.07
Chemicals & Allied Industries 28-38	0.41	0.43	0.38	0.39	0.48
Plastics and Rubbers 39-40	1.42	1.40	1.33	1.38	1.65
Raw Hides, Skins, Leather and & Furs 41-43	1.92	1.85	1.84	1.94	2.54
Wood & Wood Products 44-49	0.85	0.81	0.80	0.85	0.94
Textiles 50-63	2.76	2.75	2.30	2.61	3.27
Footwear and Headgear 64-67	3.02	3.28	2.76	2.97	3.49
Stone and Glass 68-71	0.32	0.43	0.25	0.20	0.28
Base Metals 72-83	1.76	1.79	1.82	1.88	2.12
Machinery and Electrical 84-85	2.17	2.10	2.00	1.88	2.38
Transportation 86-89	0.47	0.49	0.46	0.43	0.57
Miscellaneous 90-99	0.95	0.93	0.89	0.94	1.27

IV. CONCLUSIONS

Trade between China and 16 central and eastern European countries is still relatively small, but the trade structure is highly complementary to each other, especially in labor intensive and capital-technology intensive industries, which would be a advantage and huge potential for for future economic integration and trade expansion. Strengthen economic and trade cooperation between China and CEEC will benefit the economic development and the improvement of

social welfare of both parties. To improve and enhance China's economic and trade relations with central and eastern European countries, it is necessary to resolve the long-standing problem: China's long-term trade surplus with Central and Eastern European countries. Last, the trade complementarity between China and CEEC is mainly primary mutual complementation between industries and intra-industry complementation lacking a closer cooperation relationship. Therefore, China and CEEC should actively encourage their respective enterprises to carry out deeper economic cooperation and further expand their investment to other countries.

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