

A Study of the Research Hot Topics and Visualization Analysis of Cross-border E-commerce in China

(Full Paper)

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ABSTRACT

With many incentive policies recently released, cross-border e-commerce has been highly concerned by all sectors of society. As an emerging research field, it has great research value. Applying SATI to the keywords in CSSCI papers relevant to CBEC from the CNKI periodical database, we undergo bibliometric and visualization study in terms of word frequency analysis. The visualization analysis reveals that: (1) hot topics in CBEC research fall into 4 areas: e-commerce and international business, government policy and supervision, cross-border logistics and cross-border e-commerce finance; (2) prospective research will focus on talent training, synergy, big data, import , customs supervision, etc.

Keywords: cross-border e-commerce, co-word analysis, social network analysis, hot topics

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INTRODUCTION

Cross-Border Electronic Commerce (CBEC) refers to a new type of shopping that transaction parties between different borders implement through e-commerce platforms (Lian & Cheng, 2016). It can mobilize every country's advantageous resources, reshape international industrial chain, at the same time, promote the transformation and upgrading of foreign trade, promote the development of small and medium-sized enterprises, internationalize their brand, and greatly enrich consumers' shopping choice, meet people's pursuit of lifestyle (Xu & Zhang, 2015). According to 2017-2018 China Cross-Border E-Commerce Market Research Report (iiMedia Research, 2018), cross-border e-commerce transactions in China reached 7.6 trillion yuan, and the number of users reached 65 million in 2017. In particular, with many incentive policies in recent years, cross-border e-commerce has been highly concerned by all sectors of society.

Furthermore, as an emerging research field in e-commerce research, it has great research value. At present, there are many valuable studies in cross-border e-commerce field conducted by the Chinese academic community. They discussed the status of cross-border e-commerce development, its influencing factors, existing problems, and suggestions for countermeasures. For example, Farhoomand et al. (2000) explored the main obstacles of cross-border e-commerce between Hong Kong and Finland; the study by Boyd et al. (2003) found that the US customs fees for e-commerce packaging were too high to hinder the development of import cross-border e-commerce, especially B2C cross-border e-commerce; Gomez-Herrera et al (2014) studied the dynamics and obstacles of the EU cross-border e-commerce; using a questionnaire , Yang et al. (2014) did a survey of the situation and existing problems of cross-border e-commerce applied by Chinese enterprises of different scales; Liu Jianguo et al. (2015) used the grounded theory method to analyze the influencing factors of cross-border e-commerce between China and Russia; Han and Tian (2016) used gravity model to study the cross-border e-commerce export volume of Shanghai Free Trade Zone from the aspects of tariff, logistics, network infrastructure and customs administrative efficiency with GDP, population and spatial distance as control variables; Kim et al. (2017) used regression models to study the impact of distance and express adoption on the EU cross-border e-commerce market. There are relatively few research on hot topics and development trends of cross-border e-commerce research, and the methods used in related research are mainly quantitative analysis. So we use bibliometrics and visualization analysis to analyze the cross-border e-commerce research in China based on the keywords.

The following section describes the research methods and data source, then we make word frequency analysis and social network analysis in section 3, analysis of the research hot topics and future trends of CBEC research in section 4, and a conclusion in section 5.

RESEARCH METHOD AND DATA SOURCE

A. Research Method

Academic achievements are mainly published in journals, and keywords are the main points and generalizations of their contents. Keywords in a long period of academic research can reflect the overall content and future research directions in a field (Zhang et al., 2016). Wang and Leng (2010) found that scholars in academic frontiers mostly use word analysis methods, such as word frequency analysis and co-word analysis.

High-frequency keywords (HFK) represent the problems to which researchers have paid attention over a period of time, i.e., research hotspots. The research object of co-word analysis is studied from keywords frequency to keywords co-occurrence frequency, and then to a combination of the both, using cluster analysis, social network analysis and strategic coordinates as a tool to explore further (Tang & Zhang, 2015). Co-word analysis is a bibliometrics that use pairs of keywords to identify the phenomenon of word co-occurrences, determine their relationships, reveal structure of the research field, outline research hot topics, and help us discover emerging research areas. Social network analysis is a method to study the characteristics and attributes of various relationships in complex networks composed of different nodes (high-frequency keywords in this research) (Fan et al., 2018). Through the social network analysis of co-occurrence keywords, the frontier areas of research can be visually revealed. This method is widely used in literature research in combination with co-word analysis (Fan et al., 2018).

From the perspective of content analysis, this paper will use word frequency analysis, factor analysis and social network analysis to study the research hotspots of cross-border e-commerce. Then, through the time-term frequency evolution analysis, the evolution of hotspots will naturally emerge. Based on the co-word matrix and factor analysis, the clusters of research hotspots in cross-border e-commerce field will be obtained. Finally, the high-frequency keywords in the literature are analyzed by social network to explore the hotspots and development trends in cross-border e-commerce research in China.

B. Sources of Data

Chinese Social Sciences Citation Index (CSSCI), is a representative database used to retrieve papers and citations in Chinese humanities and social sciences. The data source for this study are papers from CSSCI journal in the CNKI periodical database. The search formula is “CSSCI Journal=Y and (Topic=Cross-Border E-Commerce or Topic=Cross-Border E-commerce) or (Title=Cross-Border E-Commerce or Title=Cross-Border E-Commerce)” (Exact Match)” on 2018 June 24th. As a result, 339 related papers were searched and then preprocessed with experts to eliminate irrelevant literature, and finally 308 papers were reserved (as shown in Tab.1). It can be seen that a significant increase has occurred in 2014. Since then, the research on cross-border e-commerce has grown fast, indicating that it gradually attract the attention of the academic community.

Further, we also searched for cross-border e-commerce research in international journals in Web of Science, in order to form a comparison between home and abroad. However, the number of searches is relatively small, and there are some differences in the definition of cross-border e-commerce (Chen & Yang, 2017; Giuffrida et al., 2017; Lian & Cheng, 2016). In view of this, this paper only analyzes the situation of domestic cross-border e-commerce research.

Table 1: CBEC related papers in CSSCI journals by year.

Year	2009	2011	2012	2014	2015	2016	2017	2018	Total
Number of papers	1	1	2	32	66	85	83	38	308

DATA ANALYSIS

Keywords involved in this study are 911 in total. Distribution characteristics of keywords frequency can reflect the extent of the research (Tao & Wang, 2017). The word frequency of CBEC is quite low, so the research is relatively decentralized. In order to avoid the influence of non-standard keyword naming in word frequency statistics, it is necessary to combine synonyms (Lu, 2016). Therefore, the keywords were merged by the research team. For example, "free trade trial zone" is replaced by "free trade zone".

A. Analysis of Word Frequency

(a) High-frequency Keyword

The frequency of keywords has reflected its development trend of research hotspots. High-frequency keyword shows the main research direction of CBEC. Top 25 high-frequency keywords (Freq >4) in cross-border e-commerce are shown in Tab. 2. Cross-border e-commerce was first mentioned in 2009. Since 2014, its frequency has been significantly higher than other keywords. Scholars have doubled their research every year. E-commerce, Belt and Road, Trade Facilitation, International Trade are hot topics in the field of cross-border e-commerce.

(b) Time-term Frequency Evolution Analysis

The time-high-frequency keywords evolution analysis helps us to reveal changes of research hotspots, and discover evolutionary defects. The cross-border e-commerce research on the time-HFK evolution network is shown in Fig. 1. CBEC is not put into this evolution map due to its significantly high-frequency. Time changes are sorted by the color of rainbow from red.

Table 2: Keywords of CBEC research (Top 25).

NO	Keyword	Freq	NO	Keyword	Freq
1	CBEC	188	14	Shanghai Free Trade Zone (SHFTZ)	6
2	E-commerce (EC)	32	15	China	6
3	Belt and Road(B & R)	32	16	Business Management	6

4	Finance	12	17	Financial and Monetary (F & M)	
5	Trade Facilitation	11	18	EC Platform	5
6	International Trade	10	19	Silk Road Economic Belt (SREB)	5
7	Overseas Warehouse	9	20	CBEC Platform	5
8	Cross-border logistics (CBL)	8	21	WTO	5
9	Big data	8	22	Logistics	5
10	FTZ	6	23	EC Logistics	5
11	development strategy	6	24	Internet	5
12	Company	6	25	Talent Training	5
13	New Normal	6			

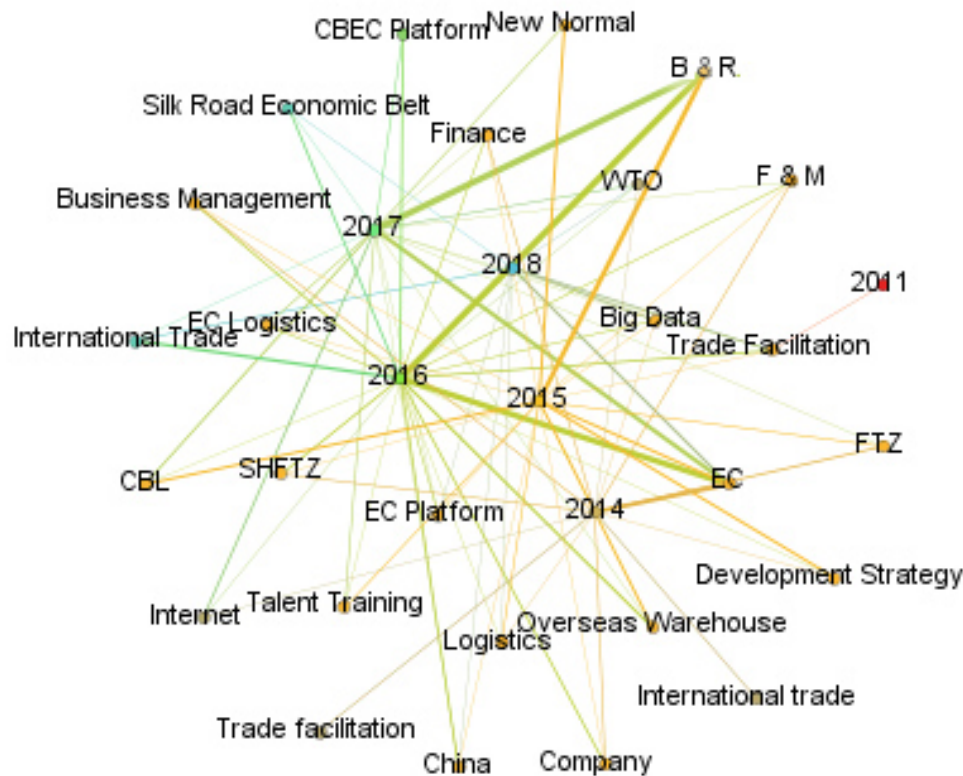


Figure 1: Time-HFK evolution in CBEC research.

There has been a focus on Trade Facilitation for six years. Though its intensity is not high, there is a trend of increasing attention in 2018. High-frequency keyword that emerged in 2014 was E-commerce. Cross-border e-commerce is a branch of e-commerce research. The early cross-border e-commerce research started from e-commerce, and mainly studied from the aspects of law, supervision and other feasibility aspects. In 2014, FTZ was a research hotspot; in 2015, B & R, Cross-border Logistics, New Normal, Overseas Warehouse, and Development Strategy were added into research hotspots. B & R was a research hotspot for three consecutive years. In 2016, the research on cross-border e-commerce has blossomed. The highlights are the studies of the SHFTZ, Silk Road Economic Belt, Business Management, and Cross-border E-commerce Platform and the number of studies for Big Data, Trade Facilitation has increased in 2018.

B. Factor Analysis

Since keywords such as Cross-border and Mode have no practical significance for this study, they are not analyzed in following study to avoid their influence (Bi, Zhao, & Qi, 2011). Through the keywords co-word analysis, the keywords of frequency above 2 is selected, so a total of 56 keywords are selected. And the Co-Occurrence Matrix (Similarity) is selected to generate the high frequency keywords matrix of 56*56. The word similarity coefficient matrix is shown in Table 3.

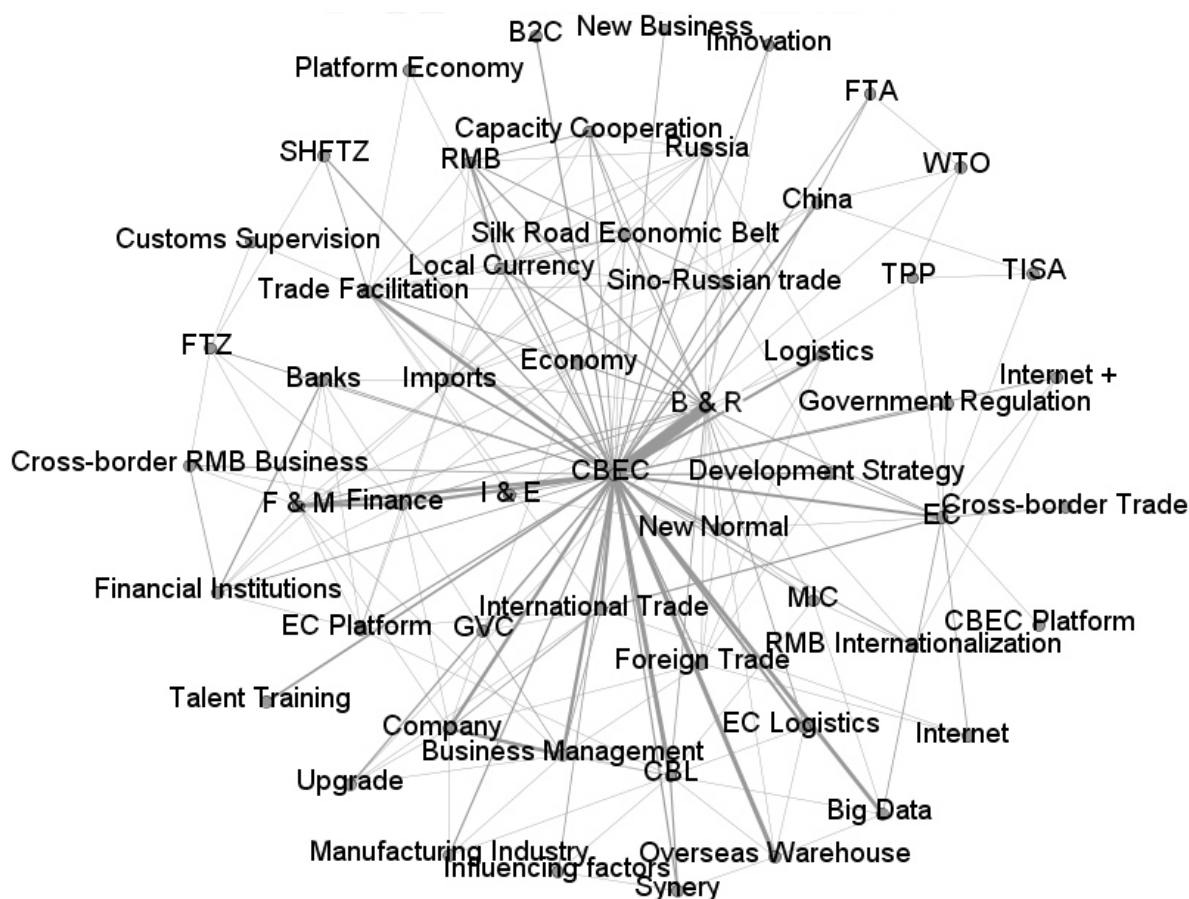
Factor analysis is to study the internal dependencies between variables, and use a few abstract variables (factors) to reflect the main information. In the factor analysis, the 56*56 coefficient correlation matrix is tested for KMO and Bartlett sphericity by SPSS. Due to the small number of samples or the low correlation between keywords, the result is not a positive definite matrix, and the KMO value cannot be obtained. The interpretation variance of 28 factors reached 0.6889, so it was not ideal. Therefore, the content of this study is more scattered and not suitable for cluster analysis.

Table 3: Correlation coefficient matrix (partially displayed).

	E-commerce	Belt and Road	Trade Facilitation	International Trade	Overseas Warehouse	Cross-border logistics	Big data	...
E-commerce	1	0.0039	0	0.0281	0	0	0.0156	...
Belt and Road	0.0039	1	0.0114	0.0031	0.0035	0.0156	0	...
Trade Facilitation	0	0.0114	1	0.0091	0	0	0	...
International Trade	0.0281	0.0031	0.0091	1	0	0	0	...
Overseas Warehouse	0	0.0035	0	0	1	0.0139	0.0139	...
Cross-border logistics	0	0.0156	0	0	0.0139	1	0.0156	...
Big data	0.0156	0	0	0	0.0139	0.0156	1	...
...

C. Social Network Analysis

Social network analysis can show the implicit knowledge structure behind the research field and systematically present the overall framework of papers (Gao & Jia, 2016). We draw a HFK co-occurrence network (as shown in Fig. 2) by Gephi to study network properties, keyword co-occurrence and research hotspots. The keyword is used as a point, and a connection line indicates that there is a co-occurrence relationship between two keywords, and the thickness of lines represents the frequency of co-occurrence.



Note: Global value chain (GVC), Free Trade Agreement(FTA), Imports and Exports(I & E).
Figure 1: Co-occurrence network of CBEC.

As can be seen from Fig. 2, B & R, Trade Facilitation, E-commerce, and Cross-border Logistics are the research hotspots in the field of CBEC, with many keywords co-occurring. Among them, B & R is a hot issue for China’s cross-border e-commerce research. Due to frequent cross-border e-commerce policies in China, terms directly co-occurred with CBEC are B & R, Internet +, Silk Road Economic Belt, and New Normal. In addition, there are high-frequency words about customs special supervision zone, such as SHFTZ, FTZ. Keywords related to trade agreements such as FTA, TPP, TISA and WTO. These trade negotiation rules are currently the focus of China’s research on CBEC. Moreover, other keywords such as International Trade, Foreign Trade, Sino-Russian Trade, Imports and Exports, Cross-border Trade, and Imports are all about international business

(IB), which is the difference from foreign research. Cross-border e-commerce and logistics are inseparable. Research on Cross-border Logistics is relatively high. Logistics, Cross-border Logistics, Overseas Warehouses, and Synergy are all connected to CBEC. The financial industry has received more attention in the cross-border e-commerce sector. Connections between Finance, F & M, and CBEC are stronger. There are also Financial Institutions, Banks, Cross-border RMB Businesses, RMB and Local Currency. Although B2C, Talent Training, Big Data, Overseas Warehouses, and Synergy are at the edge, they are closely related to core keywords. Over the time, their contacts will gradually strengthen and marginal keywords may become core keywords. In addition, Talent Cultivation, B2C, and New Business only coexist directly with CBEC, and are not linked to other high-frequency keywords. Their links are not very strong, so research alike will be more in the future work.

HOT TOPICS AND TRENDS IN CBEC RESEARCH

Through keyword statistics (Tab. 2) and visualization analysis (Fig. 1 and 2), we found that current cross-border e-commerce research in China has formed following four research hot topics.

A. Topic 1: E-commerce and International Business

HFK: International Trade, WTO, E-commerce Platform, Cross-border E-commerce Platform, Internet, Company, and Enterprise Management. It can be seen from Fig. 1 that E-commerce has been the main keyword for CBEC research for many years. From Fig. 2, International Trade, E-commerce and Company are connected with multiple keywords, and there are other terms like B2C and Platform Economy. Just as cross-border e-commerce is considered to be a product of the combination of international trade and e-commerce (Chen & Yang, 2017). Due to the lack of comprehensive statistical data on CBEC, scholars prefer to use international trade data as a proxy. Most Chinese scholars believe that cross-border e-commerce is the internationalization of e-commerce and the electronicization of international trade, including B2B, B2C, and other models. There are many small and medium-sized enterprises (SMEs) in China, but their power is insufficient. The development of the Internet has reduced the information cost of enterprises, promoted the sales and promotion of products. The development of cross-border e-commerce has brought opportunities for SMEs to go global, promoted international brands, and accelerated the transformation and upgrading of foreign trade companies. Representative papers: Liu et al. (2015) proposed a Sino-Russian CBEC public service platform integrating administration, industry, university, and research to realize the digitalization of foreign trade management, electronization of cross-border business, and intelligentization of customs clearance services. Zhao & Yang (2014) built a cross-border e-commerce capability identification model for SMEs based on the TOE framework from international marketing, international e-payment, e-customs clearance, and cross-border e-commerce logistics aspects. Chen and Liu (2014) constructed a structural equation model about cross-border e-commerce adoption by infrastructure readiness, perceived earnings, perceived external pressure, policy and legal support, and scale of adjustment enterprises, and found that SMEs lack funds and technology support, while large companies are more looking forward to policy and legal support.

B. Topic 2: Government Policy and Regulation

HFK: B & R, Trade Facilitation, FTZ, New Normal, SHFTZ, and Silk Road Economic Belt. As can be seen from Fig. 1, B & R and Trade Facilitation have been hot spots for cross-border e-commerce research for many years. In Fig. 2, we can see that the strength between B & R, Trade Facilitation and CBEC are high, and there are other keywords such as TPP, WTO, TISA and FTA. As a big manufacturing country, China attaches great importance to cross-border e-commerce as a new mode of trade. Policies are considered to be an important factor in promoting the development of CBEC in China. Belt & Road, Internet Plus, Mass Entrepreneurship and Innovation and Made in China 2025 are important policies related to CBEC proposed by the Chinese government. Characteristics of CBEC is small-batch, multi-frequency, so how to coordinate the quantity, quality and speed become a vital issue to improve management capabilities of regulatory authorities to achieve rapid clearance (Li & Chen, 2015). At present, China has established special customs supervision areas such as free trade zones and comprehensive bonded zones, exploring new regulatory methods to facilitate cross-border trade, promote supervision and logistics, and reduce the tax burden on companies. The Shanghai Free Trade Zone, as a representative of the first try, has made more explorations. It has achieved division of labor and integration based on the perspective of the platform to further improve service levels. Representative literature: Hu et al. (2017) comprehensively combed the risk factors of customs supervision, and used Bayesian networks to establish a comprehensive risk model for CBEC customs supervision. Sun (2015) Summarized the valuable experience of the Shanghai Free Trade Zone, mainly including regulatory reform and innovation system, tariff collection and forms of goods flow. Wang (2015) realized that based on the platform perspective, achieving division of labor and integration, the service function is more perfect, and it resulted in many new trade formats, such as cross-border e-commerce, high value-added service trade, offshore trade, etc.

C. Topic 3: Cross-border E-commerce Finance

HFK: Finance and F & M. From Fig. 2, we can see that they have become a clear triangle with CBEC, indicating that they have a strong degree of co-occurrence. Besides that, there are keywords like Cross-border RMB Business, RMB Internationalization, RMB, Local Currency, Financial Institution, and Banks. Cross-border finance is constituted of financing and payment. Cross-border payment is an important part of the realization of CBEC, and also a direct obstacle (Zhao & Yang, 2014). Cross-border payment security can cause credit risk, and credit risk can affect cross-border payments (Liu, 2016). Cross-border e-commerce must establish a sound cross-border e-commerce credit system for healthy development. Due to many countries and various types of data, there are different statistical scales and legal standards, so collecting and sorting of credit evaluation data is really difficult, but some scholars have started tentative research. With the in-depth development of Sino-foreign trade, the increase in China's total economy, the internationalization of the RMB is accelerating and it is possible

to settle in RMB in the future. Representative literature: Zhao & Zhu (2015) conducted a quantitative study of third-party cross-border in combination with SWOT framework and analytic hierarchy process (AHP), and they believe that cross-border e-payment has become an emerging business for third-party payment institutions to expand e-commerce business and occupy the payment market. Zhou & Yu (2016) summarized two payment modes of cross-border e-commerce and their risks: the commercial bank remittance model and the Internet payment mode in which third-party payment institutions participate. Liu (2016) constructed a cross-border e-commerce credit evaluation system in the context of big data from the perspective of third-party data such as customs clearance records, e-commerce platform data such as product service quality, and user trajectory data and so on.

Topic 4: Cross-border Logistics

HFk: Overseas Warehouses, Cross-border Logistics, Logistics, and E-commerce Logistics. As can be seen from Fig. 1, the topic of CBEC research hotspot has entered the field of view of researchers in 2014 and has been growing rapidly. In Fig. 2, terms such as Cross-border Logistics, E-commerce Logistics, Overseas Warehouse, and Synergy, among which E-commerce Logistics, Cross-border Logistics, and CBEC constitute a clear triangle. Cross-border e-commerce is closely related to cross-border logistics (Zhang & Guo, 2016), one to solve information communication online and one to address entity flows offline to complement each other. Postal parcels, overseas warehouses, international logistics lines, international express delivery, and domestic logistics are the main ways to achieve cross-border logistics (Gao & Jia, 2016). Overseas warehouse research is a new direction. Establishing overseas warehouses can help solve problems such as transit time and legal conflicts. The overseas warehouse model can be divided into Amazonian FBA model, export enterprise self-built warehouse model, and third-party overseas warehouse service model. In addition, there are border warehouses and port warehouses, which can effectively improve company's supply chain capabilities, and realize cross-border logistics localization. Representative literature: Gao & Jia (2016) studied the supply chain risk of cross-border e-commerce companies by structural equation model (SEM) to investigate CBEC companies' internet marketing, cross-border logistics, customs clearance, e-payment, laws and regulations risks. Tao & Wang (2017) used system dynamics (SD) to study the functional linkage between industrial parks and logistics parks, and found that logistics parks would strengthen value-added services and supporting services, weakening the construction of basic service functions. Using the supply-demand matching theory, Zheng et al. (2016) constructed an index system model for mutual evaluation between cross-border e-commerce enterprises and platforms based on the perspective of knowledge service.

D. Future Research Trends

Through the above time-HFK analysis and social network analysis (Fig. 1 and 2), the future research trends of CBEC in China are as follows:

- (a) Cross-border e-commerce talent training. Talent cultivation is a high-frequency keyword in the field of CBEC. Although it is at the edge of the co-occurrence network, it is directly linked. However, talent cultivation do not link to other high-frequency keywords. Future work will strengthen this research with other keywords. Talents in CBEC need a wide range of knowledge, professional competence, and master international trade, e-commerce, marketing, logistics, computer technology, and foreign languages. How to cultivate comprehensive talents that can meet the need has become a difficult problem for enterprises, universities and government.
- (b) Synergy in CBEC. Although Synergy is at the edge, it is closely linked with CBEC and Cross-border Logistics. Many scholars have proposed collaborative ideas, such as regional collaboration and industry collaboration. The most mentioned is the collaboration between cross-border e-commerce and logistics. In the future, it will focus more on coordinated supervision among countries, such as laws and taxation.
- (c) Big data research. Nowadays cross-border e-commerce research is no longer limited to traditional methods such as questionnaires and interviews. It can achieve real-time and dynamic research by crawling network data. Internet has accelerated the globalization of consumption. Although there are political and cultural differences, with the support of new technologies, consumers' purchasing decisions and experiences, corporates' marketing and pricing capabilities, and government's credit management and supervision levels in CBEC environment will greatly improve.
- (d) Import CBEC research. Although Import is not a high-frequency word, it is connected to multiple keywords in the co-occurrence network as shown in Fig. 2. With the increase of people's consumption level and the development of CBEC, China, as the largest CBEC consumer source country, has a huge potential and is worth further research.
- (e) Customs supervision. Customs supervision is an important part of the CBEC process (Tao & Wang, 2017), but it is still at the edge of the co-occurrence network and it does not directly co-exist with CBEC.

CONCLUSIONS AND PROSPECTS

This paper shows the overall research structure of cross-border e-commerce in China by visualization analysis. Through high-frequency keyword analysis and social network analysis, we can comprehensively and deeply grasps the research hotspots and future trends in this field. The results reveal that: (a) the research hotspots of cross-border e-commerce in China can be summarized into four major research hot topics, e-commerce and international business, government policy and regulation, cross-border e-commerce finance and cross-border logistics; (b) cross-border e-commerce talent training, synergy, big data, import CBEC, and customs supervision research are becoming the future direction of research in this area. In future work, we will further conduct a comparative analysis of the entire cross-border e-commerce research from both domestic and international perspectives, and then further explore its cultural differences between East and West.

ACKNOWLEDGEMENT

Cross-border e-commerce (CBEC) is the future trend of cross-border trade. Although China is at the forefront of CBEC development, its transaction volume is still not satisfactory. This work is supported by National Social Science Fund (No. 16XGL014) of the National Planning Office of Philosophy and Social Science in China. It helps with further study on factors influencing the development of CBEC industry in China from the macro-environment perspective, which may lead up to a proposed model based on business ecosystem theory under a conceptual PEST framework. Authors are sincerely grateful to the anonymous reviewers and the editors for valuable comments and suggestions.

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