Research Trends of ‘One Belt One Road’ in Korean Academic Circles

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ABSTRACT
This proposed work aims to understand the Korean Academic Circle (KAC)'s research trend on the “One Belt One Road” (OBOR) by employing a quantitative analysis of the recent research articles published by the KAC. To do so, this proposed research has used the well-known network analysis software, Ucinet 6, by which the papers on related topics are collected and filtered from Korea Citation Index. To perform the analytical selection, the proposed work has chosen 'keywords' as the core research object and performed analysis from transverse to longitudinal aspects, and from holistic to individual aspects, respectively; and from this, the KAC’s research trend on OBOR is derived. The present work has established that the KAC's attention is continuously increasing on OBOR and has sustainability. Centered on the OBOR, Korean researchers have spread their studies in various dimensions ranging from the issues like China’s political economy to Sino-Korea economic and trade exchanges, and so on. The KAC has even combined OBOR with Korea’s international development initiatives, which can help Korea benefit from active and sustainable cooperation with China. Moreover, the proposed work has found that Korean researchers have also actively expressed their growing attention, highlighted Korea’s interest, and showed concern about China hegemony and Sinocentrism in their recent documented research works.

Keywords: One Belt One Road, Korea citation index, Ucinet 6, keywords, research trends, Republic of Korea

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1. INTRODUCTION

In recent years, the United States (US) has realized that China’s rise has become its major geostrategic challenge in Asia (Bader, 2012). To expand its influences in North-East Asia, the Obama administration shifted its strategic center to Asia-Pacific and adopted some strategies to contain China, such as the Asia-Pacific rebalancing strategy, the New Silk Road, and the Trans-Pacific Partnership (TPP) Agreement. Although the outgoing Trump administration has canceled TPP, it instead proposed the Indo-Pacific strategy with Japan, India, and Australia and initiated the ‘trade war’ against China in 2018. On the other side, the Xi Jinping government proposed the “One Belt One Road” (OBOR) initiative which aimed to drive and expand international economic cooperation along with cultural and educational exchanges, to lead the development of free trade in surrounding countries, and to ‘West Out’ to break the strategic blockade of the US. OBOR attracted increasing attention from international society after it was proposed in 2013, and China gradually expanded cooperation with surrounding countries. By September 18, 2018, China signed 150 cooperation documents with 106 countries and 29 international organizations (Liu, 2018). Foreign countries’ media and netizens’ attention are increasing on the OBOR based on the media’s volume of published articles, reprinting articles as well as the volume of netizens’ posts, reprinting, and comments. Regionally, the Europe, America, and Asia regions show relatively higher attention to the OBOR. While considering individual countries, the US, the United Kingdom, Russia, India, Japan, and Korea show the highest attention on the OBOR (Zhu, 2017). As media and netizens’ attention to OBOR is continuously increasing, a simultaneous increase in attention about OBOR among academic circles has also been observed in recent years. Since foreign media and netizen attention mostly reflect their interest groups’ subjective will, the papers of foreign academic platforms (such as Web of Science) are generally based on the analysis of different fields of the OBOR from the perspective of scientific research. For example, one paper suggested building a new and sustainable Silk Road Economic Belt from international collaboration and enhancing education (Li, Qian, Howard, & Wu, 2015). On the contrary, one paper pointed out that the new Silk Road Economic Belt is a threat to the sustainable management of Central Asia’s transboundary water resources (Howard & Howard, 2016). Some researchers propose sustainable groundwater management in an agricultural plain (Chen, Wu, Qian, & Li, 2018) as well as the solutions of water and ecological security—dealing with hydroclimatic challenges (Chen, Li, Li, Deng, & Shen, 2016). Moreover, some studies have proposed a renewable and sustainable energy and development strategy in the Silk Road Economic Belt (Xu et al., 2017). Studies addressing the designed sustainable cold chains for long-range food distribution to build energy-effective corridors are also published (Gallo, Accorsi, Baruffaldi, & Manzini, 2017). Most of the papers on the Web of Science mainly focus on problems related to ecological and environmental protection and resource utilization, as well as problems of sustainable development in relevant industries which are involved in the construction of the OBOR in China and surrounding partnered countries. However, there is a void in terms of understanding the academic communities’ interest in OBOR. Thus, to fill the gap, unlike the documented literature, the proposed work aims to explore recent trends established by China’s immediate neighbor in East Asia, the Republic of Korea (ROK) in terms of academic research on the OBOR.

It is well known that the ROK is an advocator of free trade in Asia and is actively devoted to globalization in terms of academic research and policy building. On one hand, Korea maintains a close relationship with China in economy and trade, and China has been the largest trade partner of Korea for a long time; on the other hand, Korea is an important strategic ally in Asia, and the alliance between Korea and the US has been the footstone of Korea’s foreign policies for ages. Thus, Korea occupies the strategic central position in the Sino-US game in Asia and has made good use of its position to gain not only national security but also important development space. Regarding the OBOR, although both Chinese and Korean governments pay high attention to it, they have not been able to realize consensus on formal cooperation. Such a hurdle is the result of complicated factors such as the US-Korea alliance, the persistent concern over North Korea, and setbacks in the Sino-Korea relationship caused by the THAAD issue in recent years. However, Korea is an important neighbor of China. Subjectively, both China and Korea have been actively working to grow further cooperation in various possible fields. Objectively, both countries have demands of enhancing mutual economy and trade relationships. For this reason, Korean society, so as the Korean Academic Circle (KAC), has been paying active attention to China’s OBOR. In recent years, a good amount of relevant literature has been published in this field, some successful academic seminars were conducted, and under the supervision of government and private agencies, active research is conducted in the relevant field. It can be expected that KAC’s literature achievements have their research trends. In this research, the KAC’s research trend on OBOR will be discussed extensively, and by doing so the proposed work aims to understand how the KAC’s relevant research efforts on OBOR...
are performed, and what kind of observation perspectives and interest demands these researchers have. Moreover, this research aims to academically deepen mutual understanding among Korea and China and other countries on the OBOR, and provide a practical guide to finding the academic factors to establish regional cooperation among these countries.

By classifying and organizing currently available literature, we have understood the availability of various statistical analysis methods of researching a specific academic circle or a specific academic platform. We found that the documented literature was mainly involved in performing steps such as the selection of data platforms, and the selection of research methods and of core research objects, which gave us important reference value. First, for the selection of data platforms, most papers chose databases like SCI (SCIE) and SSCI, or comprehensive search platforms like Web of Science (Glänzel & Schoepflin, 1999; Hou, Mao, Zhao, Du, & Zuo, 2015; Larsen & von Ins, 2010; Liao & Huang, 2014; Lou & Lin, 2012; Osca-Lluch, Velasco, López, & Haba, 2009). Moreover, some researchers applied Scopus, AHCI, or China National Knowledge Infrastructure (CNKI) as the research scope (Liang & Liu, 2018; Zhao & Zhang, 2011). Second, for the selection of research methods, most researchers adopted bibliometric analysis like Social Network Analysis (SNA) and CiteSpace (Chen, Liu, Luo, Webber, & Chen, 2016; Jiang, Hou, Shi, & Gui, 2017; Kim & Jang, 2018; Liang et al., 2017; Zhao & Zhang, 2011), while some other researchers comparatively adopted CiteSpace, HistCite, and VOSviewer to examine the usage, citation, and diffusion patterns of bibliometric mapping software (Pan, Yan, Cui, & Hua, 2018). Other than these methods, RefViz and Histcite were used for clustering analysis and time series analysis, respectively. Third, for the selection of the core research objectives, many researchers generally made concentrated analysis by choosing some specific factors rather than the whole objectives. After collecting raw data, most researchers chose keyword extraction, text mining, citation analysis or co-authorship, etc. as the core research objectives, and then applied bibliometric analysis (e.g., CiteSpace, HistCite, BibExcel, VOSviewer) to them. Furthermore, they implemented visualization to recognize correlations of these factors, in order to derive the common features of these raw data, such as the research trend, the new development, and other relevant features (Ding, Chowdhury, & Foo, 2001; Wang, He, Liu, Zhuang, & Hong, 2012; Wang, Wang, & Xu, 2013).

Current research has successfully addressed many unknown and unanswered questions, and also has provided important clues to subsequent research. In particular, the selection of data platforms, the selection of research methods, and core research objectives of the currently available literature have largely inspired the proposed research. However, related research on this current topic still has some shortcomings. First, the OBOR was proposed only about five years back, thus the documented research efforts to date on OBOR are still in the initial stage, which means a lack of ample amount of data in terms of the proper research achievements, and which still demands a bigger research scale. Second, the available documents lack research on the OBOR from the point of view of some academic circles as a whole. Finally, the existing researchers have not addressed

Fig. 1. Flowchart showing research flow. RISS, Research Information Sharing Service; NDSL, National Digital Science Library; WOS, Web of Science; JCR, Journal Citation Reports; KCI, Korea Citation Index.
the KAC's uniqueness and the importance of the sustainable research performed by KAC on the OBOR. By observing the shortcomings of the current literature and the significance of studying the KAC's research trend on the OBOR, this research aims to solve the following essential questions:

1. How did the KAC researchers perform OBOR related research?
2. What kind of research trends do these papers have?
3. What are their main focused attentions and what appealing interests do they express?

2. RESEARCH METHODOLOGY AND DATA ACQUISITION

The flowchart showing different stages of the proposed research flow is shown in Fig. 1. Detailed descriptions of each subsection of the flowchart are mentioned below.

2.1. Study Domain

As shown in Fig. 1, the initial blocks for the research flow are the study domain. The main study domain of this proposed research is set as the most representative academic platform, widely used by the KAC. When selecting the proposed study domain, the authors found that in addition to the widely used Research Information Sharing Service (RISS), the National Digital Science Library (NDSL) of Korea, National Assembly Library of Korea, National Library of Korea, Rinfo of Korea, and other databases/platforms can be well used for the valuable data extraction for the relevant topic.

Meanwhile, by connecting with the electronic library homepage of universities or other scientific research organizations, scholars can easily search and download papers from the Web of Science, JCR Incites, Refworks, JoVE, PQ Central, and other databases, as well as Science Direct, Wiley online, IEEE Xplore, DBpia and other electronic journals. Moreover, scholars can choose appropriate databases of other countries and languages.

For example, the CNKI and China Academic Journals (CAJ) are in the database lists of many Korean universities' electronic libraries. Therefore, Korean scholars can conveniently search Chinese literature and relevant works by Chinese scholars on the OBOR. However, among all the available research databases, RISS is the most widely used and appreciated by Korean scholars. It has the largest numbers of academic dissertations, academic research articles, public lecture notes, overseas academic journal articles, reports, and books. One of the RISS's outstanding features is that it covers all the journals from the Korea Citation Index (KCI) and Korean Scopus and SSCI journals. As it is well known that KCI is one of the important indices in the KAC, it represents the highest academic research level in Korea. Korean universities and relevant organizations all consider the number and quality of KCI papers as one of the important research ability evaluation indexes. KCI is also collected by the Web of Science because of its important position in the KAC. Foreign scholars can get access to KCI through the Web of Science to acquire various academic literature and recent research progress in the KAC. After listening to the valuable opinions of the relevant scholars on the OBOR, the proposed study set the KCI database in the Web of Science as the study domain for the proposed research. Here, the relevant scholars include scholars and researchers from Korean higher education institutions such as from universities, government laboratories, and self-financed institutions. One of the main reasons for selection of the Web of Science is the fact that for foreign scholars, the Web of Science provides easy and comprehensive access to KCI indexed works. It is important to note that the Web of Science includes KCI indexed papers, and Korean SSCI and Scopus papers; however, it excludes KAC's dissertations, public lectures, and books, and for the study domain of the proposed research, these are considered as of lesser academic importance. By choosing the journal articles as the study domain of the proposed research, all the authoritative journal articles about the OBOR in KAC will be downloaded, while other low academic level literatures will be avoided in the later sections.

2.2. Research Methodology

Once the study domain is selected, it is important to extract the relevant data from the study domain. As shown in Fig. 1, the methodology to extract the data using the literature available in the study domain is discussed in this section. After referring to various statistical analysis methods from related literature, some experimental operations were performed by using CiteSpace and Ucinet (SNA). The authors have found that although CiteSpace can extract English keywords from KCI, the derived results suffer from many language errors.

This is predominantly because most KCI papers are written in Korean accompanied by some Chinese and English articles, which implies that some of these papers do not have any English keywords at all. Furthermore, CiteSpace cannot automatically translate them into English, thus it may ultimately result in numerous visualization errors and poor aesthetic quality. The authors have also found that if one adopts Ucinet to extract the relevant data in KCI directly, keyword matrices can be produced automatically by BibExcel; however, it cannot recognize Korean
or Chinese and thereby will lead to missing keywords from the collected data. To protect the comprehensiveness and accuracy of this research, initially the basic data is extracted using Microsoft Office (MS) Excel; after data extraction and filtering, co-word pairs and non-binaryization co-word matrices were created. On the other hand, focusing on keyword extraction, Ucinet 6 is used to extract core-keywords, co-word networks, and keyword maps, etc. By doing so an intuitive display of the results in the way of network maps can be obtained to support deriving the research trend of the OBOR among KAC.

2.3. Data Filtering

As mentioned in the previous section the prime aim of the proposed research is to analyze the research trend of the OBOR in the KAC. If all the extracted data is analyzed, it will only be time and labor-consuming and will lead to complicated and divergent conclusions. Thus, as shown in Fig. 1, it is necessary to filter the data and extract factors that predominantly influence the conclusions. By referring to the relevant literature, and considering that Ucinet 6 can output intuitional and concise network maps, the proposed research will select article name, authors, journal name, affiliation, and publication information, etc. as the basic information, and will select 'keywords' as the key analysis factor.

On June 30, 2018, after establishing KCI database access through Web of Science, the authors entered 'One Belt One Road' and other relevant keywords as the search topic, and received 342 papers. For comprehensiveness of searching, Chinese, English, and Korean versions of relevant keywords (including abbreviation) were also entered into the online database. The input keywords and their sequence are as follows: One Belt One Road, The Belt and Road, Asian Infrastructure Investment Bank, the Silk Road Economic Belt, the 21st Century Maritime Silk Road, the Silk Road Fund, 일대일로, 一带一路, AIIB, 아시아인프라투자은행, and OBOR).

After that, the selected papers were filtered further. For data filtering the following steps have been adopted in the proposed research:

1. First, the initial timespan selected from 2013 to 2018 is re-selected according to the date of OBOR, and 266 results were obtained.
2. Second, according to language characteristics we performed selection. For example, OBOR's Korean translation is 일대일로, which can also mean 1VS1. So we filtered out these IVSI related results. To be specific, that is, 'the Belt and Road' also has the meaning of ‘one to one’ in Korean, so some papers containing one to one' keywords appear.

Thus the filtering is done by reshaping the timespan and considering the expression of the same words with different names based on language variations. Finally, based on this, 190 effective papers are kept as the final entry. In the process of data filtering, it was found that language creates many errors in data acquisition. Most articles in KCI were written in Korean (with English abstract and keywords), and some articles were written in English and Chinese (and may not have English abstract and keywords). However, we chose English as the sole language and translated non-English data into English. Some papers failed to show keywords because of the system reasons, and they were viewed as invalid in the proposed research. The statistical information (some information omitted) of the final valid 190 papers are listed in Table 1.

It can be seen from Table 1 that among these 190 valid papers, the number of published papers has been increasing since 2014

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*(Supplementary data Attachment: raw data (replace).xls).
(as data in 2018 only covered January to June, we can only estimate rather than determine that the number of published papers in 2018 is smaller than that in 2017). From 2014 to 2017, the number of papers was increasing year by year and there were 17 papers published from January to June in 2018. In terms of affiliations, there are 34 papers sponsored by universities, 5 papers by research centers, and 22 papers by government agencies. Interestingly, there were still more than 50% of papers (114) without any sponsorship. In terms of language, 145 papers are written in Korean, 32 in English, and 13 in Chinese. Based on the research methods, most papers (147) are literature research and 11 papers are of the empirical research type.

3. RESULTS CENTERED ON KEYWORDS

This section adopted Ucinet 6 to analyze keywords from the transverse to longitudinal and from the holistic to individual aspects, aiming to recognize the research trend of OBOR in KAC. To be more specific, the first step was holistic and transverse research on core-keywords and co-word network maps; the second step was holistic and longitudinal research on the annual keyword maps; the final step was based on doing some specific core-keywords analysis. For better understanding, the whole process has been expressed using the flowchart shown in Fig. 2 with a detailed explanation in the following subsections.

3.1. The Establishment of Core-Key-Words

As mentioned above and shown in Fig. 2, the first step is to establish the core-keywords. The core-keywords refer to the keywords which occur most frequently and have the highest centrality in the papers. They are not only the concentrated reflections of research directions on the OBOR but also the major force to acquire the recent research trend. Determining and analyzing the core-keywords are conducive to grasping the research rules in KAC, and to promote further research development. There are many ways to obtain the core-keywords, such as the keywords’ frequency, the centrality of network nodes, and H index and secondary contribution intensity. Moreover, the core-keywords can be obtained by the frequencies of high-frequency words (Wei, 2006), core marginal structure (Borgatti & Everett, 2000), and degree centrality (Choi, Yi, & Lee, 2011). With reference to other scholars’ methods and as shown in Fig. 2, the present research work obtained the core-keywords by overall consideration of the keywords’ frequency, coreness, and centrality.

3.1.1. Keyword Frequency Statistics

The keyword frequency analysis can be explained using the following steps:

Step 1: First, a statistical analysis of high-frequency keywords in the selected 190 papers was performed, through which 749 keywords were obtained.

Step 2: Second, the synonyms of these keywords were integrated, leaving 601 keywords. Among them, 83 keywords’ frequency was 2 or more, while the remaining 518 keywords only occurred once. (Supplementary file attachments: replace.xls; keyword analysis (replace before and after).xls).

Step 3: Some researchers have proposed the concept of high-frequency words/keywords for the selection of keywords (Wei, 2006; Zhong & Li, 2008). However, the concept of high-frequency keywords is less significant because this research has only a small number of keywords. Therefore, the calculation method of the high-frequency words is rejected (Wei, 2006) (according to the calculation method \( n = \frac{-1 + \sqrt{1 + 8L}}{2} \). The boundary frequency of the high-frequency words in this research is 32). Since the keywords which only occurred once were almost useless to the research question in this research, more attention was paid to keywords with the frequency of 2 or more. After referring to other relevant literature (Chu & Guo, 2011), keywords with a frequency of 2 or higher were considered as high-frequency keywords and were finally chosen to perform further analysis.

![Fig. 2. Flowchart showing research flow.](http://www.jistap.org)
3.1.2. Coreness and Centrality of Core-Keywords

To find the coreness and the centrality of the core-keywords the proposed research adopted the following steps:

Step 1: First, the coreness of the keywords was quantified based on statistical analysis of the frequency of the keywords. The co-word pairs and the non-binarization co-word matrixes were constructed using MS Excel (Chu & Guo, 2011). Since the Border Area and Export failed to form co-word pairs, an 81\times81 matrix was produced. The binarized co-word matrix and symmetrized co-word matrix were constructed by Ucinet 6, and were realized through the path: Transform-Dichotomize and Transform-Symmetrize. Then the co-word pairs, non-binarization co-word matrix, binarization co-word matrix, symmetric co-word matrix, and binary symmetric co-word matrix were produced, in which the non-binarization co-word matrix is listed as follows in Table 2.

Table 2. Non-binarization co-word matrix of keywords (partial)

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<td></td>
<td></td>
</tr>
<tr>
<td>15 China-South Korea Relations</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ADB, Asia Development Bank; AHP, Analytic Hierarchy Process; AIIB, Asian Infrastructure Investment Bank.
(Supplementary file attachments: co-word pair+matrix.xls, 1 binaryzation.txt, 2 binarization symmetrization.txt, 3 non binaryzation symmetrization.txt).

Table 3. Keywords’ frequency, coreness, and centrality

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Frequency</th>
<th>Coreness</th>
<th>Centrality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Degree</td>
</tr>
<tr>
<td>OBOR</td>
<td>106</td>
<td>0.840</td>
<td>157</td>
</tr>
<tr>
<td>China</td>
<td>45</td>
<td>0.340</td>
<td>81</td>
</tr>
<tr>
<td>AIIB</td>
<td>33</td>
<td>0.246</td>
<td>61</td>
</tr>
<tr>
<td>Silk Road Economic Belt</td>
<td>11</td>
<td>0.127</td>
<td>26</td>
</tr>
<tr>
<td>Xi Jinping</td>
<td>10</td>
<td>0.065</td>
<td>17</td>
</tr>
<tr>
<td>21st Century Maritime Silk Road</td>
<td>9</td>
<td>0.077</td>
<td>15</td>
</tr>
<tr>
<td>Eurasia Initiative</td>
<td>9</td>
<td>0.088</td>
<td>8</td>
</tr>
<tr>
<td>TCR</td>
<td>2</td>
<td>0.034</td>
<td>6</td>
</tr>
<tr>
<td>Tourism Resource</td>
<td>2</td>
<td>0.001</td>
<td>1</td>
</tr>
<tr>
<td>Unification</td>
<td>2</td>
<td>0.000</td>
<td>1</td>
</tr>
</tbody>
</table>

OBOR, One Belt One Road; AIIB, Asian Infrastructure Investment Bank; TCR, Trans-China Railway.
Step 2: Second, core-keywords were further quantified by core-periphery structural analysis (Zou & Liu, 2016). The best representative work on core-periphery analysis was proposed by Borgatti and Everett (2000). In this work, the aim was to formalize the intuitive notion of a core-periphery structure and it suggests algorithms for detecting this structure, along with statistical tests for testing a priori hypotheses. Since the co-word matrix data of keywords are quantitative ones, the continuous model was chosen. In this model, each point has a certain ‘coreness’ value, which is decided as follows:

i) If two points have relatively high coreness, they have high values in the matrix, and then they are cores;

ii) If the coreness of one point is high, whereas the coreness of the other one is low, they have moderate values in the matrix, and then they are semi-periphery.

iii) If corenesses of both points are low, they have low values in the matrix, and then they are periphery.

The realizing path of core-periphery is the Network-Core/Periphery-Coreness.

Step 3: Third, the centrality of keywords was evaluated. Centrality is used to depict the point’s core position in the network, and has three kinds: degree, closeness, and betweenness (Zhang & Liu, 2011). All of these three types of centrality are absolute centrality. Based on the above analysis, the keywords’ frequency, coreness, and centrality are listed in Table 3.

3.1.3. Determination of Core-Keyword

The establishment of the core-keyword is conducive to node coloring, size setting, and relevant processing in the subsequent mapping process. Meanwhile, the classification of keywords into the core-keyword and ordinary keyword is beneficial to distinguish the core nodes (keywords) from other nodes and to analyze their relationships, which thus help to extract the research trend. The authors first ranked these keywords’ frequency, coreness, and centrality, and received three groups of ordinal numbers. Then, the Kendall correlation was adopted to analyze the correlation, whose results are as follows:

<table>
<thead>
<tr>
<th>Kendall tau_b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order of frequency</td>
</tr>
<tr>
<td>Correlation coefficient</td>
</tr>
<tr>
<td>Significance (twin tails)</td>
</tr>
<tr>
<td>N</td>
</tr>
</tbody>
</table>

It can be seen from Table 4 that there are significant correlations between two of the order of frequency, the order of coreness, and the order of centrality, indicating that the core-keywords determined by keywords’ frequency, core-periphery structure, and centrality are generally consistent. To better reflect the comprehensiveness and the validity of core-keywords, the first eight high-frequency words are determined to be the core-keywords. They are OBOR, China, AIIB, Silk Road Economic Belt, Eurasia Initiative, Xi Jinping, Chinese Dream, and 21st-Century Maritime Silk Road.

3.2. Co-Word Network Map

The authors have put the origin non-binarization symmetric co-word matrix into the Ucinet 6 software, and then adopted Netdraw to draw the co-word network map and core-keywords network map as shown in Fig. 3 (core-keywords were highlighted as red nodes in the figure).

It can be seen from Fig. 3 that papers on the OBOR in the KAC are centered on the keywords of the OBOR, and used China, AIIB, Silk Road Economic Belt, Eurasia Initiative, Xi Jinping and Chinese Dream, and 21st-Century Maritime Silk Road as core-keywords. The frequency of the OBOR is the highest at 106, which is absolutely a core-keyword. Moreover, the frequencies of China and AIIB are higher than 30. The One Belt (Silk road economic belt)’s frequency is slightly higher than that of the One Road (21st-century maritime silk road).

<table>
<thead>
<tr>
<th>Table 4. Kendall correlation analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order of frequency</td>
</tr>
<tr>
<td>Correlation coefficient</td>
</tr>
<tr>
<td>Significance (twin tails)</td>
</tr>
<tr>
<td>N</td>
</tr>
</tbody>
</table>

A negative sign means the data represents a negative correlation, and there is no sign before the data for a positive correlation. The significance level is reflected by the ** after the correlation coefficient. * reflects significance below 0.05 and ** reflects significance below 0.01. Meanwhile, the significance of 0.000 does not reflect zero; however, it means that the specific data are lower than 0.001. Data in this table only keep three decimal places.

(Supplementary file attachments: analysis.sav, output of correlation analysis.doc).
Fig. 3. Co-word network map.

Fig. 4. Co-word network maps of annual keywords.
(Supplementary file attachments: 2014-2018 co-word matrix (longitudinal analysis, core-periphery analysis 2014-2018.txt))
According to the classification of the core-keywords and other high-frequency keywords in Fig. 3, these keywords can be roughly classified into several groups, which are: OBOR, territorial scope, state relations, China, Korea, and Sino-Korea. Among them, the OBOR group focused on AIIB, Silk Road economic belt, 21st-century maritime silk road, and China-Mongolia-Russia economic corridor (CMREC). The territorial scope group covered Central Asia, East Asia, Eurasia, etc. The state relations group mainly emphasized China-US relations, China-South Korea relations, and China-Russia relations. Furthermore, the China group mainly involved Xi Jinping, the Chinese dream, New type of major power relationship, Hegemony, RMB internationalization, China rising, Sino-centrism, and Maritime power, whereas the Korea group mainly involved Eurasia Initiative, International logistics, and Balance diplomacy. In particular, the Sino-Korea group mainly discussed Rail, China-South Korea relations, Economic cooperation, logistics, THAAD, Core-interest, Economic Integration, and Free Trade Agreement (FTA).

### 3.3 Annual Keyword Map Analysis

The above sections highlight a holistic lateral analysis of the OBOR in the KAC. In the following text, the longitudinal analysis of the OBOR in KAC will be implemented based on ‘year’ aiming to find out the annual trend changes. Since there are several methods to analyze the keywords, such as including frequency, coreness, and centrality, and the results of these methods are generally close to one another, the authors have selected the data gained from the core-periphery structural analysis to perform the annual keyword map analysis. In practical operation, the authors have found that the correlation coefficient between the data in the overall co-word matrix and data in the ideal core-peripheral structure was 0.858, and every year’s correlation coefficient between the data co-word matrix of high-frequency words and the corresponding networks ranged from 0.697 to 0.797. Since these correlation coefficients are large, it can be recognized that these networks are close to ideal core-periphery structures. In this section, keywords with a coreness value higher than 0.1 are set as core-keywords (red nodes), while keywords with coreness values between 0.01-0.1 are set as semi-periphery keywords, and those lower than 0.01 are peripheral keywords. Moreover, to highlight the effect, 0.2 and 0.02 were used as two boundaries of the core-periphery for literature in the year 2018 (Liu, 2004; Zou & Liu, 2016). The corresponding co-word network map of annual keywords is shown in Fig. 4.

By combining the relevant paper titles and keywords during these five years, it can be seen from Fig. 4 that the research in KAC showed different scales and contents every year. In 2014, there were limited research efforts of the OBOR in KAC, because the OBOR was just proposed in 2013, as a result of which keywords were so limited as to form a certain scale of the social network but dispersed. Moreover, the research contents were relatively simple. Most of the associated studies focused on the domestic and foreign affairs of China. However, Park Geun-hye’s visit to China in 2013 and Xi Jinping’s visit to Korea in 2014 as well as the foundation of AIIB in 2014 stimulated the enthusiasm of KAC to study China and the OBOR. Accordingly, the number of relevant papers in 2015 increased significantly. The social network of keywords formed an evident core-peripheral structure. Relevant papers began to center around OBOR, AIIB, and China, which showed richer content compared with those in 2014. Excepting the domestic and foreign affairs of China, these papers also spread on studies in middle Asia and East Asia and even involved state relations. Moreover, research on the correlation between the Eurasia Initiative and the OBOR came up in the papers. Attention to international economic cooperation (especially between China and Korea) and political diplomacy increased. The network map in 2016 further expanded. Since then more and more papers have centered on keywords like the OBOR. The core-peripheral structure became more obvious. On the one hand, research on international politics and economy deepened continuously; on the other hand, Sino-Korea cooperation (Eurasia Initiative became a core-keyword) deepened, and researchers paid more and more attention to logistics, core-interest, and RMB internationalization. In 2017, many big issues influenced relevant papers, including the Korea-China FTA which took effect in 2015, the Korean national political situation, which had considerable changes at the end of 2016, and China’s hosting of the OBOR summit forum in 2017. Hence, the number of KAC papers on OBOR reached the maximum in 2017, and the research atmosphere was the most active. It can be seen from the 2017 map that three obvious cores (OBOR, China, and AIIB) had formed, while peripheral keywords decreased. Related research works began to discuss deeper contents, covering CMREC, Rail, China-Pakistan economic corridor (CPEC), etc. Moreover, many keywords which are weakly related to the OBOR, such as Asia development bank (ADB), Greater Mekong subregion (GMS), and TPP, even appeared. However, from the map of 2018, we can see the total number of studies on OBOR decreased (although statistical data in this study only covered 6 months of 2018). The reason was because of factors such as the THAAD issue, political change by the inauguration of the President Moon Jae-in administration, and the nuclear missile tests by North Korea. Therefore, the research enthusiasm...
Fig. 5. Individual core-keywords network maps.
of KAC on the OBOR and the AIIB decreased. Instead, more attention was shifted to the THAAD issue, Sino-centrism, hegemony, and North Korea.

Based on the above analysis, the authors can provide the following observations:

i) First, it can be observed clearly from the above five network maps that the number of nodes and number of lines increased year by year, accompanied by the increasing network densities. This reflected that research works on the OBOR in the KAC from 2014-2018 experienced a sustainable developing process.

ii) Second, research on the OBOR in the KAC was dispersed in 2014, without explicit core-peripheral structure in the network map. However, more research works centered at core-keywords like the OBOR, China, and AIIB (the frequency sum of these three core-keywords was in the interval of 11.5-20%) were reported from 2015, and this trend sustained significantly. The core-peripheral structure has become more obvious. In particular, the frequency sum of semi-peripheral keywords was maintained in the interval of 78.3-88.5%. This revealed that research topics on the OBOR became increasingly explicit and the core-peripheral structure became clearer as time passed.

iii) Third, new keywords were proposed every year. For example, country (or territorial scope) group keywords increased from ‘China’ in 2014 to ‘Sino-Korean, Northeast Asia, Asia and Europe, and America’ (not to say cities of these countries). Research fields expanded from domestic political and economic issues to more aspects like international cooperation, and cultural and educational exchanges. In other words, sustainably, the research depth of the OBOR in KAC increased, the research scope expanded, and the research quality improved.

iv) Finally, real-time tracking analysis on research works of the OBOR in KAC was implemented and these research works are influenced significantly by situation developments. Many new keywords’ appearance combined with the OBOR’s development process, Sino-Korea communication progress, and the two countries’ political diplomacy changes. The number of corresponding research works was also influenced by the Sino-Korea relationship directly.

3.4. Individual Keyword Map Analysis

Despite the above analysis, this research suggested that it is necessary to analyze individual keyword network maps to obtain deeper information. In this section, high-frequency words (frequency≥4) are chosen as core-keywords (red nodes are keywords with a frequency of 4 or higher, while blue nodes are lower than 4). Meanwhile, some non-core-keywords were selected for analysis.

From Fig. 5 we can see first that the OBOR-centered network map reflects that research works based on the OBOR are the most extensive and deepest. Other closest keywords to the ‘OBOR’ included ‘Xi Jinping,’ ‘Silk Road economic belt,’ ‘Eurasia Initiative,’ and ‘Rail.’ This proves that the KAC pays attention to combine its international development initiatives to seek ways for common development. Second, the China-centered network map reflects that the KAC has some expectations of the economic cooperation with China, such as the cooperation with China in the Eurasia Initiative. However, scholars still have some worries about China’s ‘Hegemony.’ Third, by comparing the ‘Silk Road economic belt’ and the ‘21st-century maritime silk road’ centered network maps, it is found that the ‘Silk Road economic belt’ centered network map attracted more research attention compared with the ‘21st-century maritime silk road.’ The KAC believes that Korea can access East Asian and the Central Asian countries like Kazakhstan through the Silk Road economic belt, and to develop infrastructure in a third country (region) to facilitate economic cooperation and influence the Eurasian economic union. However, in terms of the 21st-century maritime silk road, although it can influence fields like tourism resources, scholars worried about the South China Sea territorial issue, Sino-centrism, and so on. Fourth, the Eurasia Initiative-centered network map reflects that Korea hopes to realize economic integration with Northeast Asia and Eurasia through cooperation in international logistics and rail. Finally, from a contrast analysis on keyword network maps centered at China-US relations, China-South Korea relations, and China-Russia relations, the results demonstrated that KAC agreed China-US relations and China-Korea relations can influence each other. Both relations are influenced by the OBOR, THAAD, and TPP. However, these factors did not influence China-Russian relations.

4. DISCUSSION AND CONCLUSIONS

4.1. Discussion

The “One Belt One Road” is a development strategy adopted by the Xi Jinping government involving infrastructure development and investments in Asia, Europe, and other continents. Subsequently, the Chinese government threw great efforts into promoting its design and development, which also attracted extensive attention from international society. Not only media and netizens in the world began to be concerned about
the OBOR, however; many countries’ academic circles have also published various associated papers. Among these countries, Korea has its features. It is close to China geographically and is an important neighbor. It has meanwhile not yet reached a cooperation agreement with China on the OBOR. Nevertheless, the Korean economy depends highly on the trade relation with China, and Korea has paid high attention to the OBOR development. The KAC is relatively difficult for foreign researchers to access because of language barriers. Few papers discussed how the OBOR was researched in the KAC, not to mention the research trend.

To analyze how the KAC researched the OBOR and what the research trend is, and what kind of concerns and interest appeals they have, this research performed a SNA on the KAC by using the Ucinet 6 software, and adopted ‘keywords’ as the core research object. The research processes are as follows:

i) First, basic data were collected and filtered, and the keywords were put in order according to their frequency, coreness, and centrality, and then the core-keywords were picked out through the Kendall correlation coefficient.

ii) Second, the produced non-binarization symmetric co-word matrix was inputted into the Ucinet software, and co-word network maps of keywords were drawn by Netdraw, which were used in the holistic transverse analysis.

iii) Third, a longitudinal contrast analysis on yearly keywords network maps from 2014-2018 was executed. Finally, some core-keywords network maps that can express the research trend were analyzed individually.

Through the above-mentioned analysis, the authors could find some results as follows:

i) First, a total of 190 papers related to OBOR were published on KCI. These papers are centered on the OBOR and other core-keywords such as China, AIIB, Silk Road Economic Belt, Eurasia Initiative, Xi Jinping, Chinese Dream, and 21st-Century Maritime Silk Road. The research territorial scope of these papers is mainly concentrated in Central Asia, East Asia, and Eurasia. These papers’ OBOR-related topics can be divided into several groups, including the territorial scope, state relations, China, Korea, and Sino-Korea.

ii) Second, the KAC’s research enthusiasm on the OBOR has sustainably increased. Research efforts were relatively dispersed in 2014, and could not form an explicit core-periphery structure map. However, from 2015 relevant research has focused on keywords like OBOR, China, and AIIB, and the research directions became more and more explicit; with these developments, the core-periphery structures became clearer. Thus, the quantity of these papers gradually increased and research depth also deepened. All of the KAC papers were combined with the OBOR’s development, and they are not only influenced by international situation changes but also reflected these changes.

iii) Finally, the KAC also paid attention to combine the OBOR with Korea’s international development initiatives (e.g., Eurasia Initiative) to search for a way of mutual development. It hopes to dock with the OBOR to realize economic cooperation with China in fields like international logistics and rail; however, it has worries about China’s ‘Hegemony.’ Through the the Silk Road economic belt, Korea can get access to East Asia and countries in Central Asia (e.g., Kazakhstan) and develop cooperation with third countries (regions) in fields like infrastructure. For the 21st-century maritime silk road, although the KAC believes it can influence fields like tourism resources, Korea worries about the South China Sea territorial issue and Sinocentrism.

Despite extensive literature reviews and data collection, this study still has the following limitations:

i) Because of the language specificity of the KCI papers, CiteSpace is inapplicable for its visualization analysis, which resulted in the inadequate visualization effect.

ii) The SNA mainly depends on keywords; however, it fails to make full utilization of the references, abstracts, paper titles, and affiliations of these papers. Making full use of these data is what authors are planning to perform in future research.

iii) Because of the limited space, the non-binarization symmetric co-word matrix was not displayed; also, Tables 1, 2, and 3 were partly displayed.

iv) Finally, the OBOR so far has a short period since its proposal (five years), and there are time delays from writing papers to publishing, resulting in the shorter actual research period (4 years). Therefore, continuous attention shall be paid to the KAC’s OBOR papers to gain longer, objective, and scientific analysis results.

4.2. Conclusions

One of the main findings of the proposed research is that research efforts on the OBOR in the KAC are sustainable and the research enthusiasm is gradually increasing. Centered on the OBOR, Korean scholars have extended research contents into China’s politics and economy, and Sino-Korean economic
and trade exchanges. Korean scholars can investigate various aspects of the OBOR and combine them with international situation changes. The KAC's research quality has improved to a certain level and the research depth has deepened as well. Another significant finding is that the KAC can combine the OBOR and Korea's international development initiatives (e.g., Eurasia Initiative) to search for a way of gaining benefits from the cooperation. The third finding is that Korean scholars expressed their concerns and benefit appeal as well as worries about China hegemony, Sinocentrism, etc. The authors believe that this study can help global scholars to understand the KAC's research trend on the OBOR. It is expected to not only lay a foundation for further studies in relevant research fields but also provide an analysis method to help scholars and scientific organizations understand the KAC's research dynamics and interest concerns.

SUPPLEMENTAL MATERIALS

Supplemental materials are available from https://osf.io/by72h/

REFERENCES


Larsen, P. O., & von Ins, M. (2010). The rate of growth in scientific publication and the decline in coverage provided by Science Citation Index. Scientometrics, 84(3), 575-603.


