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Bibliometric analysis of the Belt and Road initiative and economic development

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The Belt and Road Initiative (BRI), launched by China in 2013, has become a major driver of global economic and academic discourse, generating a rapidly expanding body of interdisciplinary research. However, systematic cross-database analyses that capture the knowledge structure and evolution of BRI related economic development research remain limited. To address this gap, this study conducts a comprehensive bibliometric analysis using data from the Web of Science and Scopus databases, covering publications up to 2025. Bibliometric tools were applied to examine publication trends, collaboration patterns, and thematic structures. The results reveal a three-stage evolutionary trajectory: an initial exploratory phase, a rapid expansion phase focused on infrastructure and trade, and a maturation phase characterized by increasing emphasis on sustainability, green development, and financial governance. China dominates the field in terms of output, citation impact, and international collaboration, while keyword analysis indicates a clear thematic shift toward sustainability and carbon-related issues. These findings provide a systematic overview of the research landscape and offer insights into emerging directions in BRI and economic development studies.

Keywords: *Bibliometric analysis, Belt and road initiative, Economic development, Research evolution.*

1. Introduction

Over the past few decades, globalization, technological advancements, and increasing cross-border cooperation have profoundly reshaped the landscape of international

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development research. Within this evolving context, economic development has remained a central and enduring theme in the social sciences, the emergence of large-scale international cooperation initiatives has introduced new dynamics into the study of global development.[1] Among these initiatives, the BRI, launched by China in 2013, has become one of the most influential drivers of global economic and academic discourse. [2-4] As a flagship framework for international cooperation, the BRI has developed into a pivotal platform for regional connectivity, transnational investment, and sustainable development, involving more than 140 participating countries. [5]

Against this background, the intersection between economic development and the BRI has given rise to a rapidly growing body of research. This body of literature spans diverse fields, including economics, management, international relations, and sustainability studies, and addresses a wide range of topics, such as infrastructure development, trade integration, poverty alleviation, institutional coordination, and global governance. [2, 6-12] Economic development provides a fundamental analytical lens for interpreting the multifaceted impacts of the BRI, including industrial upgrading, regional disparities, and long-term growth patterns. [13] Together, these interrelated themes constitute a critical domain for understanding contemporary international cooperation and development processes. [14]

Despite the expanding volume of research, existing bibliometric studies in this area exhibit several important limitations. In particular, there is a lack of systematic cross-database analyses that comprehensively capture the evolution, structure, and knowledge dynamics of research on economic development and the BRI. Moreover, given the inherently interdisciplinary nature of this research domain, there remains a need for a more structured and integrative synthesis that can identify major research themes, influential contributors, and emerging knowledge gaps. [15]

To address this gap, this study conducts a comprehensive bibliometric analysis of research on economic development and the BRI, drawing on data from two leading academic databases: the Web of Science (WOS) and Scopus. The dataset encompasses all relevant papers published up to the end of 2025, thus ensuring a complete and coherent temporal perspective. The core objectives of this study are threefold:

(1) To map the evolutionary trajectory of research on economic development and the BRI, including publication trends, disciplinary distribution, and key contributing institutions, and countries;

(2) To identify dominant thematic clusters, knowledge networks, and research frontiers in the field, shedding light on how scholarly attention has evolved across subtopics;

(3) To synthesize gaps in the existing literature and propose future research directions, providing actionable insights for scholars, policymakers, and practitioners engaged in BRI and international development studies.

The remaining sections are organized as follows: Section 2, "Literature Review," provides an overview of existing studies on economic development and the BRI. Section 3,

"Data and Methodology," details the data sources and econometric methods employed. Section 4, "Results and Discussion," presents the key findings from the bibliometric analysis. Finally, the concluding section summarizes the main insights and implications of the study.

2. Literature Review

2.1 *Economic Development*

Economic development has long been a central topic in the social sciences. A large body of literature has examined its determinants and impacts, including industrialization, urbanization, foreign direct investment (FDI), and international trade integration. [16-20] Building on these substantive studies, recent research has increasingly applied bibliometric approaches to analyze the intellectual structure and evolution of economic development research. Early bibliometric analyses focused primarily on publication outputs and citation performance, revealing the rapid expansion and increasing diversification of economic development research. [21-24] More recent studies have shifted toward examining thematic structures and intellectual dynamics through co-word analysis and co-citation networks, identifying major research streams such as globalization, sustainability, inequality, and institutional development. [25-28] These analyses reveal that economic development research has become increasingly interdisciplinary, integrating perspectives from environmental studies, innovation research, and public policy. [28]

Despite these advances, existing studies exhibit several limitations. First, many bibliometric analyses focus on broad thematic mapping while paying limited attention to the internal structure and evolutionary dynamics of specific research domains. Second, economic development research is often examined in isolation, without considering its interaction with other major research agendas. Building on this foundation, the present study incorporates economic development-related keywords, such as infrastructure development, economic growth, foreign direct investment, international trade, imports, and exports, to explore the thematic structure and evolution of this research field using bibliometric methods.

2.2 *The Belt and Road Initiative (BRI)*

Since its introduction in 2013, the BRI has emerged as one of the most influential global development initiatives of the 21st century. [29] The initiative is widely understood to build upon the critical role of infrastructure in fostering economic growth and regional integration. A rapidly growing body of bibliometric studies has analyzed the development of BRI-related research. A number of studies have analyzed the growth, structure, and thematic evolution of BRI-related research. [6, 29-32] These studies consistently show a sharp increase in publication output, accompanied by expanding international collaboration networks and increasing disciplinary diversity. [13, 29, 30, 33] Evidence from major databases such as the Web of Science indicates that BRI studies now span more than 100

academic disciplines, reflecting the highly interdisciplinary nature of this research domain. [30] Existing bibliometric analyses have examined publication trends, collaboration networks, and thematic clusters, identifying key research areas such as infrastructure investment, trade integration, and sustainable development. [34-36]

However, these studies also exhibit notable limitations. First, many analyses focus primarily on descriptive patterns, such as publication growth and keyword frequency, with limited attention to the deeper structure and evolution of knowledge networks. [37-40] Second, most studies rely on a single data source, which may constrain the comprehensiveness of the findings. Third, BRI-related research is often examined as a standalone domain, with insufficient attention to its connections with broader research themes such as economic development. [6, 29, 30]

2.3 *Research Gap and Contribution*

Based on the above review, several research gaps can be identified. First, although economic development and the BRI have both attracted substantial scholarly attention, existing bibliometric studies tend to examine these themes separately, lacking an integrated analytical framework to explore their interrelationship. Second, current studies primarily focus on descriptive indicators, such as publication trends and keyword frequencies, while paying limited attention to the structural relationships among research themes. Third, most analyses rely on a single bibliographic database, which may constrain the completeness and robustness of bibliometric findings.

To address these gaps, this study conducts a comprehensive bibliometric analysis by integrating data from both the Web of Science and Scopus. By focusing on the interaction between economic development and the BRI, this study aims to provide a more systematic understanding of the knowledge structure, thematic evolution, and research frontiers in this field.

3. Research Methodology

To achieve the objectives outlined in this analysis, the study employs bibliometric analysis. [41] Bibliometric analysis is valuable for depicting the historical development of a specific research area or topic. Additionally, this approach offers a more reliable and objective means of analysis, with the capacity to perform both basic and advanced assessments on large volumes of documentation. [42-45]

3.1 *Search Strategy*

The comprehensive search string for the keywords and proxy terms utilized in the Web of Science (WoS) database search is as follows: ((TI=("Belt and Road Initiative" OR "Belt and Road" OR "BRI" OR "One Belt One Road" OR "OBOR" OR "New Silk Road" OR "Silk Road Economic Belt" OR "21st Century Maritime Silk Road")) OR (AK=("Belt and Road Initiative" OR "Belt and Road" OR "BRI" OR "One Belt One Road" OR "OBOR" OR "New

Silk Road" OR "Silk Road Economic Belt" OR "21st Century Maritime Silk Road"))) AND ((TI=("Economic Development" OR "Economic Growth" OR "Economic Cooperation" OR "Economic Integration" OR "Trade" OR "International Trade" OR "Investment" OR "Foreign Direct Investment" OR "FDI" OR "Infrastructure Investment" OR "Regional Economy" OR "Economic Impact" OR "Economic Effect" OR "Economic Performance" OR "Socioeconomic Development")) OR (AK=("Economic Development" OR "Economic Growth" OR "Economic Cooperation" OR "Economic Integration" OR "Trade" OR "International Trade" OR "Investment" OR "Foreign Direct Investment" OR "FDI" OR "Infrastructure Investment" OR "Regional Economy" OR "Economic Impact" OR "Economic Effect" OR "Economic Performance" OR "Socioeconomic Development"))). For Scopus, the same set of search terms is used to ensure consistency, with only the field codes adjusted to match the Scopus database structure: TITLE for article titles and KEY for author keywords. This search strategy ensures comprehensive coverage of the two core research themes, economic development and the Belt and Road Initiative, while maintaining conceptual relevance and minimizing noise.

3.2 *Data Collection*

The data collection process was conducted in two stages using two major bibliographic databases: the WoS and Scopus.

In the first stage, the WoS was used as the primary data source due to its high-quality indexing standards and widespread use in bibliometric research. [46] The search was performed using the predefined search string across the Title and Author Keywords fields. The publication period was restricted to documents published end December 31, 2025, to ensure a comprehensive and up-to-date dataset. Additionally, document types were limited to articles and review papers to ensure academic rigor and comparability.

In the second stage, the Scopus database was used as a complementary source to enhance data coverage. Scopus provides broader journal coverage and includes additional publications that may not be indexed in WoS. The same search string and filtering criteria were applied to ensure consistency between the two datasets.

The search was conducted on April 5, 2026, resulting in a total of 2794 documents (1036 from the WoS and 1758 from Scopus) that used the specified keywords. Following data retrieval, records from both databases were exported for further processing and integration.

3.3 *Data Processing*

To ensure data quality and analytical reliability, a multi-step data processing procedure was implemented, guided by the principles of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework.

First, in the identification stage, records were retrieved from both WoS and Scopus using the predefined search strategy. Second, in the screening stage, only documents of research papers and reviews were retained (excluding other document types such as conference abstracts, letters, and editorials). Third, in the eligibility stage, a manual

screening process was conducted to remove records that were not directly relevant to the research topic. This included studies that mentioned keywords without substantive relevance to economic development or the Belt and Road Initiative. Fourth, duplicate records across the two databases were identified and removed. Duplicate detection was performed through a combination of automated matching and manual verification. Records were considered duplicates when at least two of the following fields matched: title, DOI, and first author name. In cases of inconsistency, priority was given to records with more complete bibliographic information.

Following cross-database deduplication, further manual thematic screening was conducted to eliminate irrelevant records. In total, 936 documents were removed during the cleaning process, leaving a final dataset of 1858 articles for bibliometric analysis.

3.4 *Data Analysis and Visualization Tools*

Data analysis and visualization in this study were conducted using Microsoft Excel (2019), RStudio (version 4.1.2), Biblioshiny, and VOSviewer (version 1.6.18).

4. Analysis and Results

4.1. *Primary Data Overview and Overall Growth Trends*

4.1.1. Primary Data Overview

A total of 1858 documents from 2014 to 2025 were retrieved from the WoS and Scopus databases. In terms of document types, Article accounts for the vast majority with 1789 publications, while Review totals 69. The dataset comprises publications authored by 4,538 researchers from 107 countries and regions worldwide. Documents are published in a total of 10 languages. English is the dominant publication language, accounting for 90.04% (1673 documents). Chinese ranks second (6.51%, 121 documents), reflecting localized research perspectives from China. Other languages (e.g., Russian, 2.48%; Spanish, 0.38%) account for a small proportion.

The retrieved literature covers 81 Web of Science subject categories, with Economics (27.32%, 283 records) as the core discipline, followed by Environmental Sciences (22.59%, 234 records) and Green & Sustainable Science Technology (12.84%, 133 records). This distribution confirms that BRI economic research is centered on economic studies, with a prominent focus on green development, environmental protection and sustainable transition. Additional key disciplines include International Relations, Area Studies, Business, Energy & Fuels, reflecting the interdisciplinary nature of BRI research spanning economics, environment, policy and regional studies. In parallel, when indexed in Scopus, the literature is distributed across 25 major subject areas, among which Social Sciences constitutes the largest proportion (25.70%, 878 records), succeeded by Environmental Science (17.13%, 585 records), Economics, Econometrics and Finance (14.67%, 501 records), and Energy (8.31%, 284 records), with other prominent subject areas encompassing Business, Management and Accounting, Engineering, Computer Science, and Earth and

Planetary Sciences, which further underscores the multidisciplinary characteristics of BRI research by integrating social sciences, economic analysis, environmental governance, energy research, and engineering applications, and consolidates the interdisciplinary and policy-oriented attributes of the field.

4.1.2. Overall Growth Trends

The dataset covers the period from 2014 to 2025, aligned with the launch of the BRI by the Chinese government. As illustrated in Figure 1, the number of publications exhibits a distinct phased growth trend. From 2014 to 2016, the research output remained at a low initial level, with only 2, 10, and 23 publications respectively, representing the exploratory stage of the field. Entering 2017, the volume began to surge rapidly, rising from 66 in 2017 to 196 in 2019, marking a phase of accelerated expansion in academic attention. Since 2020, the annual publications have stabilized at a high level of over 200, peaking at 268 in 2022, and maintaining a robust scale of over 220 in subsequent years.

This sustained high-growth trend directly reflects the large-scale implementation of BRI infrastructure projects, the continuous signing of multilateral cooperation agreements, and the deepening of regional economic integration in practice. [6, 47]

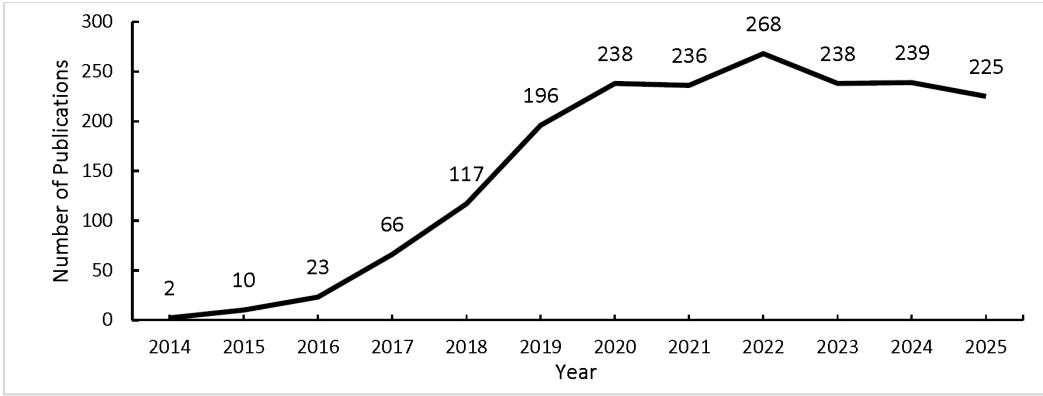

Figure 1

Annual scientific production

4.2. *Journal Sources and Core Agent Distribution*

4.2.1. Analysis of Journal Source Distribution

To identify the core publication outlets and intellectual structure of research on economic development and the BRI, a journal citation network was constructed using VOSviewer. This network is based on citation relationships among sources, where nodes represent journals and links indicate citation connections. The size of each node reflects publication volume, while link strength represents the intensity of citation relationships between journals.

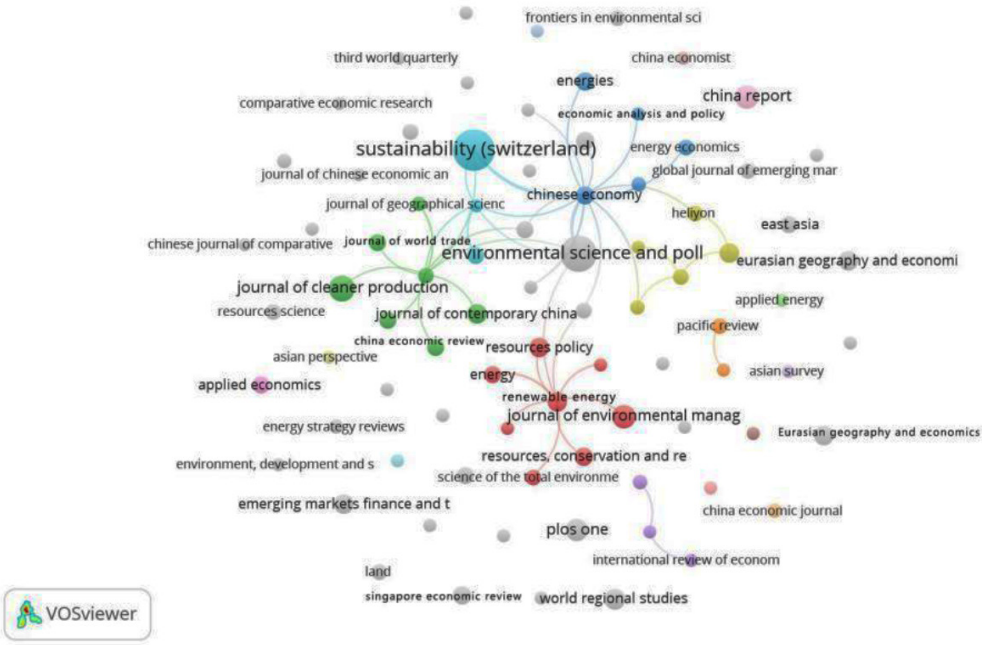

Figure 2

Journal co-citation network map

The results, presented in Figure 2, reveal that Sustainability (Switzerland) and Environmental Science and Pollution Research emerge as the most influential sources, characterized by both high publication output and strong citation linkages with other journals. Sustainability (Switzerland) shows the highest number of publications, which is partly attributable to its broad scope and high publication capacity. However, its central position in the citation network also confirms that it plays a substantive role in knowledge dissemination. In addition, journals such as Journal of Cleaner Production and Journal of Environmental Management also demonstrate high citation centrality, suggesting their significant role in disseminating research related to sustainable development, environmental governance, and policy-oriented aspects of economic development and the BRI. This reflects a shift in research focus from traditional economic growth toward sustainable and green development paradigms.

The citation network further reveals a clear clustering structure, indicating the presence of several major research domains. Environmental and Sustainability Cluster (Green cluster): focuses on sustainable development, resource efficiency, and environmental impacts of economic activities; Energy and Resource Economics Cluster (Red cluster): this cluster emphasizes energy transitions, resource management, and environmental-economic interactions; Economic and Policy Analysis Cluster (Blue cluster): Represented by journals

such as Economic Analysis and Policy, Emerging Markets Finance and Trade, and China Economic Review, this cluster reflects research grounded in economic theory, trade analysis, and policy evaluation; Regional and Area Studies Cluster (Yellow cluster): Journals such as Eurasian Geography and Economics, China Report, and World Regional Studies highlight the spatial and geopolitical dimensions of the BRI, including regional development and international cooperation. This clustering pattern demonstrates that the research field is inherently interdisciplinary, integrating environmental science, energy studies, economics, and regional studies.

4.2.2. Analysis of Country and Region Distribution

For country-level analysis, a threshold of a minimum of 5 documents per country was applied. Among the 107 countries or regions involved in BRI-related economic development research, 52 met the threshold, and the final collaborative network consists of 49 nodes, 228 links, and a total link strength of 7554, divided into 9 distinct clusters. This indicates a highly globalized and interconnected research landscape centered on the BRI.

As shown in Figure 3, China dominates the field with an overwhelming advantage, contributing 1143 documents, 29977 citations, and the highest total link strength, serving as the absolute core node in the collaborative network. This reflects China's central role as the initiator of the BRI and the primary driver of academic research in this domain. Following China, the United States (148 documents, 4747 citations), the United Kingdom (107 documents, 3512 citations), and Pakistan (96 documents, 3485 citations) rank among

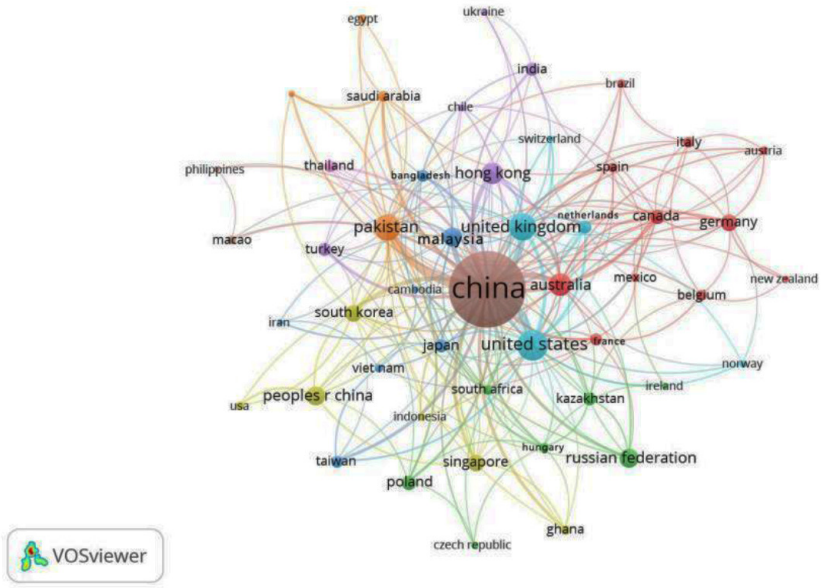

Figure 3

Country or region collaboration network map

the top contributors. Notably, Pakistan, as a key BRI partner country, demonstrates high research output and academic influence, while developed economies such as the US, UK, and Australia maintain significant engagement, reflecting the dual participation of both BRI member states and non-member developed countries in this research field.

The country co-occurrence network further reveals the collaborative structure. China forms the central hub with extensive cooperative links to all major clusters, connecting BRI partner countries in Asia , developed economies in Europe and North America, and other key nodes along the Belt and Road routes. This network structure highlights that BRI economic research is a truly global academic endeavor, characterized by a "China-led, multi-country participation" pattern, which aligns with the initiative's goal of promoting trans-regional economic cooperation and inclusive global development.

4.2.3. Analysis of Institutional Distribution

For institutional-level analysis, a threshold of a minimum of 10 documents per institution was applied. Among the 1,734 involved institutions, 53 met the threshold, and the institutional co-occurrence network consists of 53 nodes, 161 links, and a total link strength of 209, divided into 9 collaborative clusters (Figure 4). This indicates a relatively concentrated institutional participation and a clear collaborative network structure in BRI economic development research.

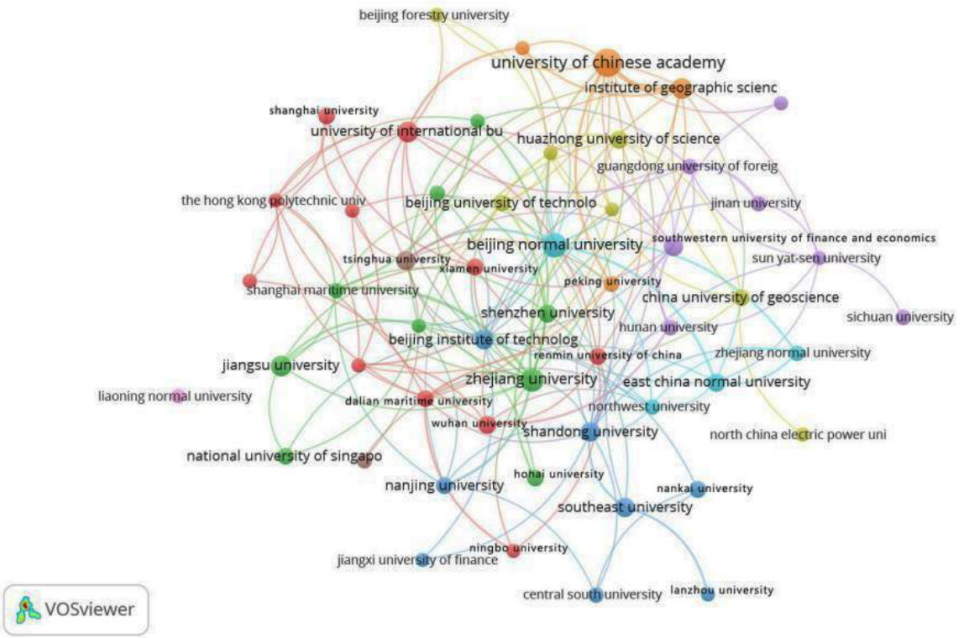

Figure 4

Institution collaboration network map

Chinese universities and research institutions dominate the core contributors, with the University of Chinese Academy of Sciences ranking first with 68 publications and 1,240 citations, followed by Beijing Normal University (44 publications, 985 citations) and Zhejiang University (39 publications, 1,892 citations). Jiangsu University achieves the highest total citations (2,158) among the top institutions, reflecting the high academic influence of its research outputs. The top-ranked institutions are mainly comprehensive universities and specialized economic or geographic research institutes in China, which not only demonstrates China's leading role in BRI economic research but also reflects the close alignment of institutional research strengths with the practical needs of the initiative.

The institutional collaboration network reveals that core institutions such as the University of Chinese Academy of Sciences, Beijing Normal University, and Zhejiang University form the central collaborative clusters, while other institutions are connected through secondary cooperative links. This institutional distribution also reflects the real-world geographic focus of BRI implementation, research institutions in eastern and coastal China are more active in BRI-related economic studies, consistent with China's regional advantages in policy research, international cooperation, and cross-border exchanges.

4.3. *Research Hotspots and Clusters Analysis*

4.3.1. Analysis of Keywords

To identify the core research themes in the field of BRI economic development, a keyword co-occurrence analysis was conducted with a minimum occurrence threshold of

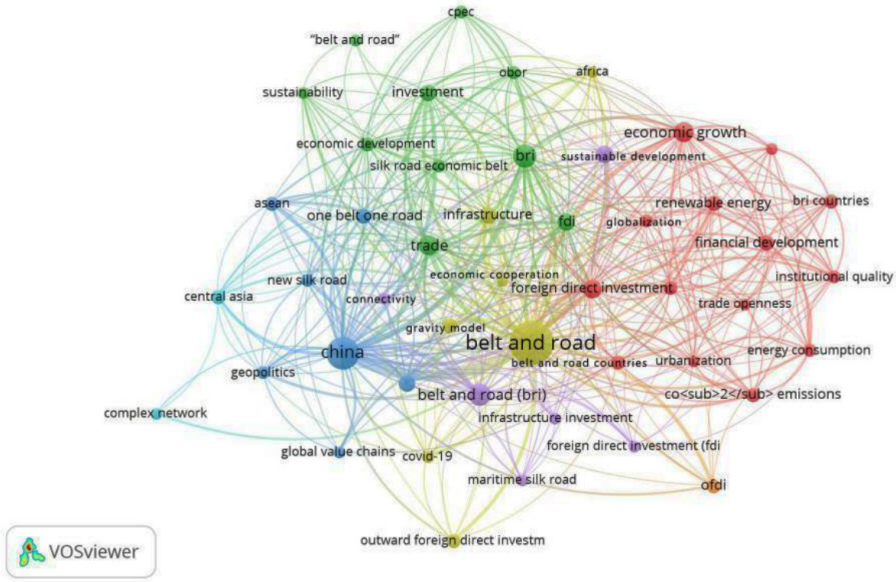

Figure 5

Keyword co-occurrence network

15, as shown in Figure 5. Among the 4,404 extracted keywords, 47 met the threshold, forming a co-occurrence network comprising 47 items, 7 clusters, 437 links, and a total link strength of 1,854. This network structure reveals a highly interconnected thematic landscape centered on the BRI.

As shown in the keyword ranking table, "belt and road" is the absolute core node with 847 occurrences and the highest total link strength, serving as the central hub connecting all thematic clusters. "China" (339 occurrences) follows closely, reflecting its central role as the initiator of the BRI in academic research. The top-ranked keywords further delineate the primary research directions: trade (86 occurrences), economic growth (79 occurrences), and foreign direct investment (FDI) (70 occurrences) constitute the foundational economic themes, focusing on the initiative's impacts on international trade, economic development, and cross-border investment, consistent with the findings of Khanal and Zhang [38]. Meanwhile, sustainable development (54 occurrences), renewable energy, and CO_2 emissions emerge as prominent emerging themes, highlighting the growing academic focus on green transition, low-carbon cooperation, and environmental sustainability in the context of the BRI (Figure 6). The representative keywords for each cluster are summarized in Table 1.

The strong interlinkages between core keywords and emerging themes further demonstrate that the BRI has become a comprehensive research platform that bridges economic development, environmental sustainability, and global governance, aligning with the initiative's practical evolution toward high-quality, green, and inclusive development.

4.3.2. Analysis of Clusters

Using the co-occurrence network of core research topics, this study identifies key thematic clusters and their structural properties. The overall network exhibits a clear modular structure, with a modularity score (Q) of 0.3656, which reflects a distinct division of knowledge domains within the BRI research landscape. Meanwhile, the mean silhouette score (S) of 0.7172 confirms that the identified clusters are highly distinguishable with clear boundaries between thematic groups. The keyword co-occurrence analysis identifies seven clusters that together delineate the intellectual structure of research on economic development and the BRI.

Cluster #0 (China) and Cluster #6 (Development Strategy) capture the geopolitical and institutional dimensions of the field. The prominence of terms such as geopolitics, international relations, and governance approach indicates that the BRI is widely conceptualized as a strategic framework for regional integration and global economic governance. [48-50] This perspective is further reinforced by the presence of infrastructure-oriented planning terms (e.g., railway corridor and input–output models), suggesting that large-scale development strategies and spatial coordination constitute a foundational layer of the research field. [51, 52]

The interaction between economic development and sustainability emerges as a central research focus. Cluster #1 (Belt and Road) is dominated by environmental and sustainability-

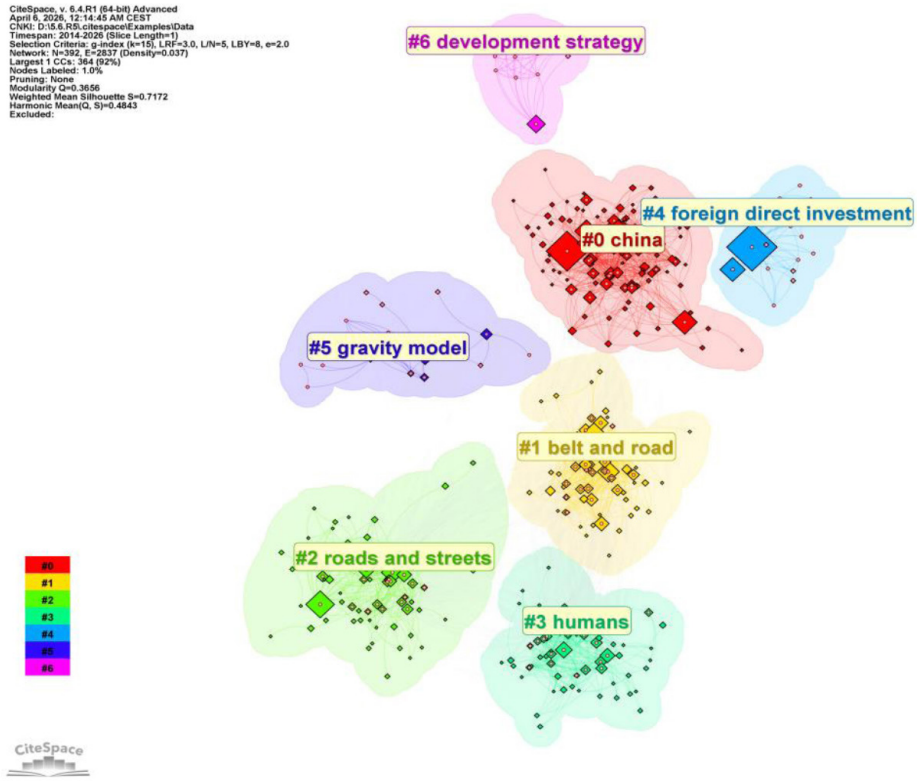

Figure 6

Keyword co-occurrence clustering map

related terms, including CO_2 emissions, renewable energy, and ecological footprint, reflecting a clear shift toward evaluating the environmental consequences of BRI-driven development. This thematic orientation is complemented by Cluster #4 (Foreign Direct Investment), which emphasizes the role of cross-border capital flows—particularly FDI and OFDI—in shaping economic integration among participating countries. [53-55] Together, these clusters indicate that contemporary research increasingly situates economic development within a broader framework that integrates investment dynamics with environmental constraints.

Infrastructure and connectivity form a critical intermediary dimension linking macro-level strategy to economic outcomes. Cluster #2 (Roads and Streets), characterized by terms such as Silk Road Economic Belt and infrastructural development, highlights the central role of transport networks and spatial connectivity in facilitating trade and regional development. [56, 57] This cluster functions as a structural bridge within the knowledge system, translating strategic initiatives into measurable economic effects. [58]

Cluster #5 (Gravity Model) reflects the methodological consolidation of the field, where quantitative approaches, particularly gravity models and regression-based techniques, are

extensively employed to assess trade potential, logistics efficiency, and industrial development. [59, 60] This indicates a relatively stable empirical foundation underpinning the analysis of BRI-related economic processes. [61, 62]

In contrast, Cluster #3 (Humans) represents a relatively peripheral yet emerging thematic direction, incorporating elements such as public health and human development. [63, 64] Although less structurally integrated, this cluster suggests a gradual expansion of the research agenda toward social and human-centered dimensions of development. [65, 66]

Table 1

Keywords Clustering Table for Research

Cluster Number	Representative Keywords
#0China	China, geopolitics, infrastructural development, one belt, international relations, Eurasia, governance approach
#1Belt and Road	Belt and Road, CO_2 emissions, BRI countries, China, renewable energy, ecological footprint, sustainable development
#2Roads and streets	Roads and streets, Silk Road Economic Belt, economic development, China, Belt and Road
#3humans	Belt and Road, humans, sustainable development, economic development, disease control
#4foreign direct investment	Belt and Road, foreign direct investment, outward FDI, OFDI, BRI countries, investment
#5Gravity model	Gravity model, trade potential, industrial development, stepwise regression, international logistics, Belt and Road
#6Development strategy	Development strategy, railway corridor, water surplus, IO model, multiple distances, Belt and Road

Taken together, the clustering structure reveals a field characterized by strong interdisciplinarity and a clear evolution toward sustainability-oriented research. The integration of geopolitical analysis, economic mechanisms, environmental considerations, and quantitative modeling reflects an increasingly complex and interconnected knowledge system. At the same time, the emergence of human-centered themes indicates that future research may further extend beyond traditional economic and infrastructural concerns to incorporate broader dimensions of development.

4.3.3. Analysis of Highly Cited Documents

A citation analysis was conducted to evaluate the literature on economic development and the Belt and Road Initiative. [29] From a citation perspective, the article by Zhang et al. [68] ranks first, with 672 total citations and an average of 168 citations per year, indicating both high academic impact and rapid knowledge diffusion. The study focuses on the green development path of the BRI, examining how public expenditure and green finance jointly promote low-carbon growth. Similarly, studies by Muhammad et al. [69] and Yu [67] also

demonstrate strong citation performance, suggesting their foundational role in shaping subsequent research.

A ranking table of the top 10 most-cited articles by average citations per year has been compiled (Table 2) to assess their growth rate and quality. From a thematic standpoint, the most cited articles can be broadly categorized into three major research streams. First, a significant proportion of studies focus on the environment and economy nexus, examining issues such as carbon emissions, environmental quality, green finance, and sustainable development [68-71]. This indicates a strong and growing emphasis on integrating

Table 2

Most globally cited article

Rank	Authors	Title	Year	Cited by	Cites Per Year
1	Zhang D. et al.	Public spending and green economic growth in BRI region: Mediating role of green finance	2021	672	168.00
2	Muhammad S. et al.	Effect of urbanization and international trade on CO2 emissions across 65 belt and road initiative countries	2020	370	74.00
3	Yu H.	The motivation behind China's 'One Belt, One Road' initiatives and establishment of the Asian Infrastructure Investment Bank	2017	450	56.25
4	Wang C. et al.	Railway and road infrastructure in the Belt and Road Initiative countries: Estimating the impact of transport infrastructure on economic growth	2020	279	55.80
5	Wan C. et al.	Resilience in transportation systems: a systematic review and future directions	2018	384	54.86
6	An H. et al.	The role of technology innovation and people's connectivity in testing environmental Kuznets curve and pollution heaven hypotheses across the Belt and Road host countries: new evidence from Method of Moments Quantile Regression	2021	199	49.75
7	Liu Z. & Xin L.	Has China's Belt and Road Initiative promoted its green total factor productivity？——Evidence from primary provinces along the route	2019	277	46.17
8	Liu W. & Dunford M.	Inclusive globalization: unpacking China's Belt and Road Initiative	2016	401	44.56
9	Saud S. et al.	Impact of financial development and economic growth on environmental quality: an empirical analysis from Belt and Road Initiative (BRI) countries	2019	257	42.83
10	Rauf A. et al.	Testing EKC hypothesis with energy and sustainable development challenges: fresh evidence from Belt and Road Initiative economies	2018	219	31.29

environmental considerations into economic development within the BRI framework. Another cluster of highly cited studies centers on infrastructure development and economic growth, particularly the role of transportation systems and trade connectivity [72, 73]. These studies highlight the traditional development perspective of the BRI as a driver of regional integration and economic expansion. A number of influential contributions address the institutional and conceptual dimensions of the BRI, including its motivations, globalization implications, and policy frameworks [67, 74]. These works provide a macro-level understanding of the initiative and contribute to its theoretical grounding in the literature.

These findings suggest a clear evolution of research priorities in the field. Early studies primarily focused on conceptualizing the BRI and its strategic motivations, while more recent research increasingly emphasizes empirical analysis of its economic, environmental, and sustainability impacts [71]. This shift is consistent with the broader trends identified in keyword analyses, where sustainability, green development, and carbon governance have emerged as dominant topics.

4.4 *Research Theme Evolution and Future Development Trends*

4.4.1. Temporal Evolution of Research Themes

To further trace the dynamic evolution of research themes, this study constructs a timeline clustering network based on the keyword co-occurrence matrix, mapping the life cycle of thematic clusters and the temporal shifts of core keywords over the 2014–2025 period (Figure 7). The results reveal a clear three-stage evolutionary trajectory, closely

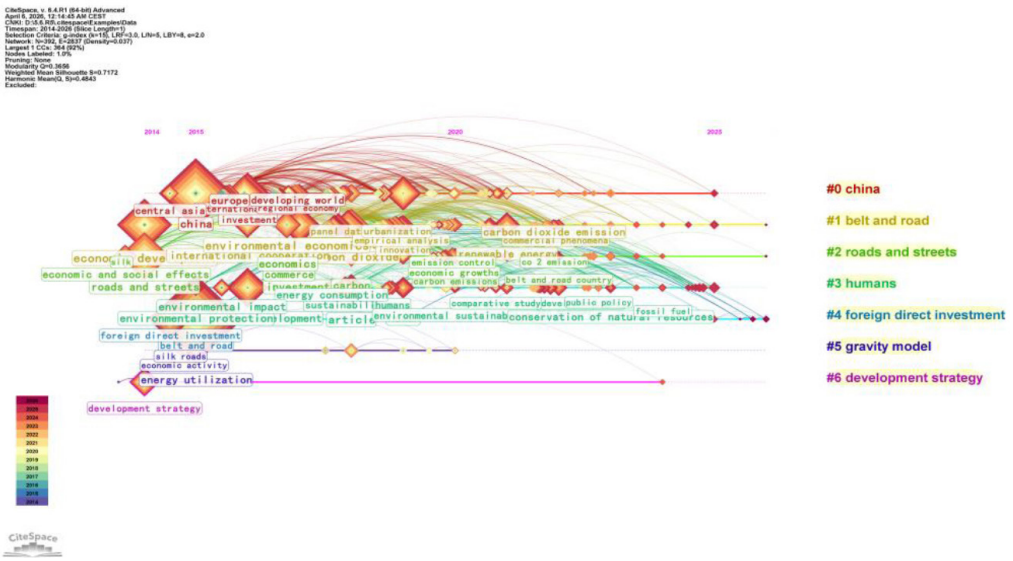

Figure 7

Timeline map of research topic evolution

aligned with the practical progression of the BRI, reflecting the gradual maturation and increasing complexity of the research field.

In the initial stage (2014–2016), research was primarily conceptual and exploratory. The field was dominated by Cluster #6 (Development Strategy) and Cluster #5 (Gravity Model), with early keywords such as development strategy and economic effects emerging immediately after the launch of the BRI [74]. These studies focused on interpreting the policy framework and estimating potential economic impacts. The rapid emergence of the gravity model as a core methodological tool in 2016 indicates an early effort to quantify trade effects. However, the relatively short life cycle of these clusters suggests that foundational consensus regarding the conceptual scope and basic economic implications of the BRI was quickly established.

In the expansion stage (2017–2020), the research focus shifted toward implementation and structural impacts, paralleling the large-scale rollout of infrastructure projects. Clusters #0 (China, Geopolitics and Infrastructure Governance) and #2 (Roads and Streets, Silk Road Economic Belt) became dominant. Within Cluster #0, a clear transition is observed from infrastructural development and regional focus[67] (e.g., Central Asia) toward geopolitics and cross-border governance, indicating a shift from descriptive analysis to institutional and strategic evaluation. Meanwhile, Cluster #2 reflects the centrality of connectivity and infrastructure, with early emphasis on transport networks gradually incorporating environmental impact[73] and environmental economics[70]. This signals the initial integration of sustainability considerations into infrastructure-centered research[75]. These clusters exhibit strong continuity, forming the structural backbone of the field during this period.

In the maturation stage (2021–2025), the research agenda expands into a more diversified and multi-dimensional framework. Three emerging clusters represent the new frontiers of the field. Cluster #1 (Environmental Sustainability) shows a clear evolution from CO_2 emissions and ecological footprint toward renewable energy and carbon neutrality, reflecting a transition from impact assessment to solution-oriented research in line with global sustainability agendas[76]. Cluster #3 (Human-centered and Public Health Research) emerges in response to the COVID-19 pandemic, with keywords such as disease control indicating a shift toward social resilience and transnational public health governance [77]. Cluster #4 (Foreign Direct Investment and Financial Sustainability), as the most recent frontier, highlights increasing attention to outward FDI, investment risk, and financial stability, reflecting concerns over the long-term viability of BRI investments in a post-pandemic context [78].

Taken together, the timeline analysis demonstrates that the evolution of research on economic development and the BRI is strongly coupled with real-world policy and implementation dynamics. The field has progressed from conceptual exploration to infrastructure-driven analysis and, more recently, to a comprehensive framework integrating environmental, social, and financial dimensions [65, 79]. More importantly, the temporal patterns also point to several emerging research trajectories. First, the increasing prominence of sustainability-related keywords suggests that future research will likely

move beyond environmental impact assessment toward integrated frameworks that link economic development with carbon governance and green finance [80]. Second, the rise of human-centered and public health themes indicates a gradual reorientation of the field toward inclusive and resilience-oriented development paradigms [81]. Third, the growing emphasis on financial risk and investment efficiency implies that the governance of capital flows and the sustainability of large-scale infrastructure financing will become a central concern in subsequent studies [82].

4.4.2. Burst Term Analysis and Research Frontiers Identification

To further capture the temporal dynamics and emerging research frontiers, keyword burst detection was conducted using CiteSpace for the period 2014–2025. A total of 39 burst keywords were identified (Table 3), reflecting significant shifts in research attention over time.

Table 3

Research keyword burst table

Keywords	Strength	Begin	End	2014 - 2025
silk road economic belt	8.23	2016	2019	
economic relations	8.06	2016	2021	
transportation	7.93	2016	2017	
economic integration	6.53	2016	2019	
international relations	3.58	2016	2018	
foreign policy	2.96	2016	2019	
one belt one road	11.41	2017	2019	
regional planning	5.55	2017	2020	
free trade	5.23	2017	2019	
regional economy	5.17	2017	2019	
road construction	8.18	2018	2020	
new silk road	5.57	2018	2021	
maritime silk road	5.47	2018	2019	
trade flow	3.68	2018	2021	
political economy	6.58	2019	2021	
economic conditions	3.46	2019	2021	
trade policy	3.46	2019	2021	
infrastructure investment	4.15	2020	2022	
numerical model	3.56	2020	2021	
bilateral agreement	3.42	2020	2021	
institutional quality	3.03	2020	2022	

environmental impact assessment	3.01	2020	2021	
central and eastern europe	2.63	2020	2021	
trade performance	5.69	2021	2022	
complex networks	3.17	2021	2023	
bri countries	3.08	2021	2023	
internationality	2.99	2021	2023	
commercial phenomena	4.33	2022	2025	
renewable energy	4.01	2022	2023	
natural resource	3.55	2022	2023	
environmental degradation	3.31	2022	2025	
co2 emission	3.05	2022	2025	
green economy	7.06	2023	2025	
bilateral trade	4.59	2023	2025	
foreign direct investment	4.59	2023	2025	
industrialization	3.42	2023	2025	
energy	3.42	2023	2025	
public policy	2.95	2023	2025	
renewable energy consumption	2.83	2023	2025	

In the early stage (2016–2018), burst keywords were predominantly associated with the conceptualization and geopolitical framing of the BRI. High-intensity terms such as Silk Road Economic Belt (strength=8.23), economic relations (8.06), and economic integration (6.53) indicate that early research focused on defining the scope of the initiative and examining its implications for regional cooperation and international economic linkages. Simultaneously, keywords such as international relations and foreign policy suggest that the BRI was initially interpreted through a geopolitical lens, emphasizing its role in reshaping global and regional governance structures.

During the subsequent period (2018–2021), the research focus shifted toward infrastructure development and trade mechanisms, reflecting the transition from conceptual exploration to practical implementation. Burst terms such as road construction, trade flow, and regional planning highlight the centrality of physical connectivity and spatial economic integration. At the same time, the emergence of keywords such as political economy, trade policy, and institutional quality suggests a growing concern with the institutional and regulatory conditions underpinning BRI-related economic activities. Notably, the appearance of environmental impact assessment during this period indicates the early incorporation of environmental considerations into infrastructure-centered research.

In the most recent stage (2022–2025), the burst keywords exhibit a pronounced shift toward sustainability, energy transition, and economic resilience. High-intensity emerging

terms such as green economy (7.06), CO_2 emissions, environmental degradation, and renewable energy consumption reflect the increasing alignment of BRI research with global climate and sustainability agendas. Concurrently, economic and financial dimensions have re-emerged in a more nuanced form, as evidenced by keywords such as foreign direct investment, bilateral trade, and industrialization, indicating a renewed focus on the quality and sustainability of economic growth.

The most recent burst patterns point to several emerging research directions. First, the strong and sustained presence of sustainability-related keywords suggests that future research will increasingly focus on the integration of economic development with environmental governance, particularly in the context of carbon neutrality and green transformation. Second, the resurgence of investment- and trade-related terms, coupled with growing attention to institutional quality and public policy, indicates that the governance of cross-border capital flows and the institutional foundations of cooperation will become critical areas of inquiry. Third, the diversification of burst themes toward energy, environment, and policy domains implies that the research field is moving toward a more holistic and system-oriented analytical framework.

5. Conclusions

This study presents a systematic bibliometric analysis of research on economic development under the BRI, using publications indexed in the Web of Science and Scopus databases from 2014 to 2025. By combining keyword co-occurrence, clustering analysis, timeline visualization, and burst detection, this research reveals the knowledge structure, evolutionary trajectory, and emerging frontiers of a rapidly expanding interdisciplinary field.

The findings confirm that BRI and economic research has experienced a clear and continuous evolution over the past decade. Early studies focused primarily on conceptual interpretation and preliminary assessments of the initiative's potential economic effects. As the BRI moved toward large-scale implementation, research attention shifted to infrastructure connectivity, trade facilitation, and regional economic integration. In recent years, the field has further matured into a multi-dimensional framework that integrates economic performance, environmental sustainability, energy transition, and institutional governance. This progression reflects a fundamental shift from a narrow focus on quantitative growth toward a more holistic perspective that balances economic, ecological, and institutional dimensions.

Notably, the global distribution of research contributions reveals a highly concentrated yet internationally collaborative landscape. China emerges as the dominant contributor in terms of publication output, institutional influence, and research collaboration, underscoring its central role as the initiator and primary driver of BRI practices and academic inquiry. Meanwhile, significant participation from the United States, the United Kingdom, and other developed economies, together with intensive engagement from key BRI partner countries, reflects the initiative's broad global appeal and transnational

research network. Top-tier universities and research institutions in China form the core intellectual backbone of the field, with dense collaborative ties that reinforce the interdisciplinary and cross-regional nature of BRI studies.

Methodologically, this study enhances the reliability and comprehensiveness of existing literature by integrating two major academic databases and employing a suite of complementary bibliometric tools. The timeline and burst analyses enable a dynamic interpretation of shifting research priorities, allowing the field's evolution to be contextualized alongside real-world policy and project developments.

Several limitations should be acknowledged. First, the dataset is restricted to English-language publications indexed in WoS and Scopus, potentially excluding valuable insights from Chinese-language databases. Second, as a macro-level bibliometric review, this study does not provide in-depth qualitative assessment of theoretical mechanisms or policy effects.

Future research may expand the analytical scope by incorporating Chinese-language databases to achieve a more complete representation of the global knowledge landscape. Additional qualitative and comparative case studies could also deepen understanding of the causal mechanisms and policy implications of BRI-related economic development. Looking ahead, green growth, investment sustainability, institutional coordination, and inclusive development are expected to remain the most influential themes, guiding the next phase of theoretical advancement and empirical exploration in this globally significant field.

Author Contributions

Conceptualization, Rundong Luo; methodology, Xiaoman Shen and Hafiz Muhammad Shoaib; software, Xiaoman Shen; validation, Xiaoman Shen and Kaiyue Sa; formal analysis, Rundong Luo; investigation, Rundong Luo; resources, Rundong Luo; data curation, Xiaoman Shen; writing—original draft preparation, Xiaoman Shen and Hafiz Muhammad Shoaib; writing—review and editing, Rundong Luo and Xiaoman Shen; visualization, Xiaoman Shen; supervision, Kaiyue Sa; project administration, Kaiyue Sa; funding acquisition, Kaiyue Sa. All authors have read and agreed to the published version of the manuscript.

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Declaration of conflicting interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

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Ethical approval and informed consent statements

Not applicable.

Data Availability Statement

The data supporting this study's findings are openly available.

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