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The Rise of Artificial Intelligence in International Trade: Trends and Scientific Mapping

Uğur Erdoğan [1]

Abstract

Artificial intelligence (AI) is increasingly being integrated into various processes within international trade, much like its growing applications across multiple disciplines and industries. From customs automation and supply chain optimization to trade finance and market analysis, artificial intelligence technologies are reshaping the global trade landscape. This rapid technological transformation has also triggered a notable rise in scholarly interest, reflected in the increasing number of academic publications addressing the convergence of artificial intelligence technologies and global trade practices in recent years. This study aims to systematically evaluate the evolving body of literature on this subject through a comprehensive bibliometric analysis. The analysis encompasses a total of 544 academic publications indexed in the Scopus database between the years 2010 and 2025. R Studio software was utilized to conduct the analysis, employing the Bibliometrix and Biblioshiny packages, which are widely recognized tools for science mapping and bibliometric evaluation. The study identifies the most prolific authors, journals, and institutions contributing to this growing research area, as well as the countries with the highest output and impact. In addition, keyword co-occurrence analysis is used to uncover thematic clusters and trends that dominate the literature. The findings reveal a sharp increase in academic output starting in 2017, marking a turning point in scholarly engagement with the topic. Central themes emerging from the literature include "artificial intelligence," "machine learning," "big data," "blockchain," and "supply chain management," indicating a strong convergence of technological innovation and global trade processes. Geographically, China, the United States, and India emerge as the leading contributors in terms of both publication volume and citation performance, suggesting significant research activity and policy relevance in these regions. Furthermore, international collaboration networks indicate a growing level of interdisciplinary and cross-border research cooperation in this field. Overall, this study offers a detailed scientific mapping of the intellectual landscape surrounding artificial intelligence and international trade. It provides valuable insights into emerging research fronts, influential contributors, and thematic developments, thereby serving as a reference point for scholars, policymakers, and industry practitioners interested in the strategic implications of artificial intelligence in global commerce.

Keywords: Artificial Intelligence, International Trade, Scientific Mapping, Bibliometric Analysis, R Studio

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[1] Asst. Prof. Dr., Selçuk University, Faculty of Economics and Administrative Sciences, International Trade and Finance, Konya, Türkiye, uerdogan@selcuk.edu.tr, ORCID: 0000-0001-8906-2977

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Uluslararası Ticarette Yapay Zekanın Yükselişi: Eğilimler ve Bilimsel Haritalama

Uğur Erdoğan [1]

Öz

Yapay zeka, diğer birçok disiplin ve sektörde olduğu gibi, uluslararası ticaretin çeşitli süreçlerine giderek daha fazla entegre olmaktadır. Gümrük otomasyonundan tedarik zinciri optimizasyonuna, ticaret finansmanından pazar analizine kadar pek çok alanda yapay zeka teknolojileri küresel ticaret yapısını yeniden şekillendirmektedir. Bu ortaya çıkan teknolojik dönüşüm, son yıllarda yapay zeka ile uluslararası ticaretin kesişiminde artan akademik yayın sayısıyla kendini gösteren dikkate değer bir bilimsel ilgi artışını da beraberinde getirmiştir. Bu çalışma, söz konusu alandaki gelişen literatürü sistematik bir şekilde değerlendirmeyi amaçlamakta ve kapsamlı bir bibliyometrik analiz sunmaktadır. Analiz kapsamında, 2010 ile 2025 yılları arasında Scopus veri tabanında yer alan toplam 544 akademik yayın incelenmiştir. Çalışmada analizler, bilimsel haritalama ve bibliyometrik değerlendirmelerde yaygın olarak kullanılan R Studio yazılımı ile Bibliometrix ve Biblioshiny paketleri aracılığıyla gerçekleştirilmiştir. Araştırma, bu hızla büyüyen alana katkı sağlayan en üretken yazarları, dergileri ve kurumları, ayrıca en yüksek yayın ve atıf sayısına sahip ülkeleri ortaya çıkarmaktadır. Bununla birlikte, anahtar kelime eş-görünüm analizleri aracılığıyla literatürde öne çıkan tematik kümeler ve eğilimler ortaya konulmuştur. Bulgular, 2017 yılından itibaren konuya yönelik akademik çalışmalarda önemli bir artış olduğunu ve bunun bilimsel ilginin yönü bağlamında önemli bir aşamayı temsil ettiğini göstermektedir. Literatürde öne çıkan başlıca temalar arasında "yapay zekâ", "makine öğrenmesi", "büyük veri", "blokzincir" ve "tedarik zinciri yönetimi" gibi kavramlar yer almakta; bu durum teknolojik yenilik ile küresel ticaret süreçleri arasındaki güçlü bir yakınsamaya işaret etmektedir. Coğrafi açıdan değerlendirildiğinde, Çin, Amerika Birleşik Devletleri ve Hindistan yayın sayısı ve atıf etkisi bakımından önde gelen ülkeler olarak görülmekte, bu durum da bölgelerde konuyla ilgili yoğun bir araştırma faaliyetinin ve politika ilgisinin bulunduğunu göstermektedir. Ayrıca, uluslararası iş birliği ağları, bu alanda artan disiplinlerarası ve sınır ötesi araştırma iş birliklerini ortaya çıkarmaktadır. Genel olarak bu çalışma, yapay zekâ ve uluslararası ticaret etkileşimlerine ilişkin literatürün ayrıntılı bir bilimsel haritalamasını sunmakta; ortaya çıkan araştırma eğilimleri, etkili katkı sağlayanlar ve tematik gelişmeler hakkında kapsamlı içgörüler sağlayarak, bu alandaki araştırmacılar, politika yapıcılar ve sektör profesyonelleri için önemli bir yol haritası sunmaktadır.

Anahtar Kelimeler: Yapay Zeka, Uluslararası Ticaret, Bilimsel Haritalama, Bibliyometrik Analiz, R Studio

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[1] Dr. Öğr. Üyesi, Selçuk Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, Uluslararası Ticaret ve Finansman, Konya, Türkiye, uerdogan@selcuk.edu.tr, ORCID: 0000-0001-8906-2977

Introduction

In recent years, the rapid advancement of digital technologies has brought artificial intelligence to the forefront of academic and policy discussions across multiple disciplines. Among these, international trade has emerged as a key area where artificial intelligence applications are increasingly utilized to improve operational efficiency, reduce costs, and support data-driven decision-making processes. Artificial intelligence encompasses a set of technologies that simulate human intelligence to perform tasks such as learning, reasoning, problem-solving, and language processing. These capabilities have the potential to transform traditional trade practices by enabling automation, enhancing risk management, improving demand forecasting, and optimizing supply chain operations.

As global trade becomes increasingly complex and interdependent, artificial intelligence-driven tools are being integrated into customs procedures, logistics networks, and market intelligence systems. This integration contributes to reducing transaction errors, enhancing regulatory compliance, and facilitating real-time analysis of market trends. Furthermore, artificial intelligence assists in overcoming language and cultural barriers in international communication, thereby expanding access to diverse markets. Given its potential, artificial intelligence is not only reshaping firm-level strategies but also prompting policymakers to reconsider existing trade frameworks and develop more adaptive and harmonized regulatory environments.

However, a key problem remains, as the existing body of research is fragmented and lacks a comprehensive mapping of intellectual development, thematic trends, and collaborative structures. This fragmentation limits the ability of both scholars and practitioners to fully understand how artificial intelligence can effectively address trade-related challenges such as high transaction costs, regulatory complexity, and communication barriers.

Possible solutions to this problem have been discussed in the literature. Some studies emphasize operational applications of artificial intelligence, such as demand forecasting, supply chain optimization, and logistics automation. Others underline governance-oriented solutions, highlighting the role of artificial intelligence in enhancing transparency, strengthening regulatory compliance, and minimizing risks. A further line of research stresses artificial intelligence's contribution to international collaboration by breaking down cultural and linguistic barriers in global trade.

Among these alternatives, bibliometric analysis emerges as the most effective solution for addressing the academic gap. Unlike firm-specific or sectoral case studies, bibliometric mapping provides a systematic and comprehensive overview of the intellectual landscape, allowing the identification of leading contributors, key themes, and emerging research directions. This holistic perspective enables a clearer understanding of how artificial intelligence is shaping international trade and guides future applications and policies in a more evidence-based manner.

The convergence of artificial intelligence and international trade constitutes an increasingly dynamic and growing area of academic inquiry. However, despite a growing number of studies, there remains a need for a comprehensive understanding of the intellectual structure, thematic evolution, and collaboration patterns within this domain. Bibliometric analysis offers an effective methodology to explore these dynamics

by quantitatively mapping scientific production, co-authorship networks, and thematic trends. By employing science mapping tools such as Bibliometrix and Biblioshiny within the R programming environment, this study aims to systematically analyze the academic landscape of artificial intelligence and international trade literature from 2010 to 2025. Through this approach, it seeks to identify key contributors, dominant topics, and emerging themes, offering valuable insights for both researchers and practitioners navigating this interdisciplinary field. In this context, the implementation of appropriate infrastructure and data privacy policies for artificial intelligence–based technologies is of critical importance for integrating these technologies into businesses (Caymaz & Ünsar, 2025).

In line with this research gap, previous bibliometric studies have attempted to explore the field. For example, Belu (2024) conducted a bibliometric analysis of studies on the use of artificial intelligence in international trade, covering the period from 2000 to 2024, based on data from the Scopus database. Similarly, Baran (2024) performed a bibliometric analysis on international trade and artificial intelligence, examining studies from 1984 to 2024 in Scopus. The results reveal that the number of studies in this field has increased rapidly in the international literature. In the present study, works published between 2010 and May 2025 are analyzed to address current developments in the international literature. The aim is to provide researchers and industry stakeholders with an up-to-date perspective on the use of artificial intelligence in international trade.

In the first section of the article, an extensive literature review is presented, covering studies from the international literature on international trade and artificial intelligence. The second section provides information on the research methodology and the data used, while the third section presents the research findings.

Literature Review

The concept of "artificial intelligence" was formally introduced in 1956 during a seminal research workshop at Dartmouth College in New Hampshire, where scholars convened to explore the possibility of designing machines capable of exhibiting human-like intelligence (McCarthy et al., 2019, p.12). At its core, artificial intelligence refers to a broad field of study aimed at replicating human cognitive functions—such as reasoning, learning, and decision-making—through computational techniques. As a scientific discipline, artificial intelligence seeks to develop methods that enable machines to tackle complex tasks by simulating human cognitive processes and problem-solving capabilities (Öymen, 2021, p.96).

Although the use of artificial intelligence in international trade is still in its early stages, it holds significant potential. Artificial intelligence has the capability to automate routine tasks such as data entry and document processing, thereby reducing the need for manual labor and allowing more time for strategic activities. By analyzing large volumes of data to detect patterns and trends that may not be immediately apparent to humans, artificial intelligence can support international businesses in making more informed decisions and mitigating risks. Moreover, artificial intelligence can enhance the accuracy of international trade processes, reduce errors, and increase the reliability of transactions.

Artificial intelligence significantly influences international trade by impacting various domains such as language processing, trade volume forecasting, productivity, economic development, trade management, ethical considerations, climate change efforts, and legal

frameworks. Therefore, comprehending and effectively responding to the implications of artificial intelligence on international trade is of vital significance for ensuring strategic adaptation and long-term competitiveness in the global economy (Arsenault & Kreps, 2022, p.11). The rapid advancement of artificial intelligence offers firms a range of new opportunities while also introducing certain challenges, and it plays a pivotal role in improving the quality of export products (Xu & Tian, 2025, p.9).

Artificial intelligence has the potential to strengthen the demand forecasting capacities of international trade enterprises while also contributing to the improvement of customs procedures and logistics operations through data-driven and automated systems. It also contributes to market analysis and competitiveness, while supporting the overcoming of language barriers through translation Technologies (Şen & Gür, 2024, p.70). AI-powered route optimization stands out as one of the key areas where notable advancements have been made in international trade. Algorithms that take into account variables such as traffic density, weather conditions, and geopolitical risks contribute to reducing the duration and cost of logistics operations (Vaka, 2024, p.388). In this context, artificial intelligence offers a strategic advantage for international businesses, particularly those involved in the transportation of perishable goods or implementing just-in-time production and inventory management systems.

The advancement of international trade is closely linked to the widespread integration of artificial intelligence capabilities and the development and implementation of complementary innovations, particularly due to their potential to enhance supply chain efficiency. This integration can facilitate more streamlined and automated production, improve demand forecasting, and support more informed decisions regarding production locations. The application of artificial intelligence technology can also serve multiple policy objectives, such as optimizing logistics operations and reducing greenhouse gas emissions within supply chains (Tsolakis et al., 2022, p.4509). Therefore, by adopting artificial intelligence technologies, businesses can reduce production costs and enhance their ability to quickly adapt to shifts in consumer demand, thereby strengthening their competitive position in international trade.

The study conducted by Goldfarb et al. (2018) discusses the impact of artificial intelligence in the context of international trade. It emphasizes the critical role of data in artificial intelligence applications, highlighting that companies with access to larger and higher-quality datasets are able to make more accurate predictions. In this regard, firms such as Google and Microsoft are cited as examples, illustrating how access to superior data enables better forecasting and can create a positive feedback loop. The study also argues that strong economies of scale and knowledge externalities, stemming from the importance of data in artificial intelligence, play a significant role in shaping competitive dynamics.

The study by Achar (2019) focuses on China's efforts to develop its artificial intelligence sector and examines the implications of this technology for international trade. It highlights that the use of AI algorithms enables the identification of more accurate predictions and relationships. In light of disruptions to trade patterns caused by unexpected events such as trade wars and pandemics, the study explores how contextual artificial intelligence algorithms can be utilized. These algorithms, supported by the use of open government data, contribute to identifying economic factors associated with international trade transactions.

Tay (2021) examined the effects of artificial intelligence on international trade using data from 196 countries covering the period 2016–2019. The study focused on neural machine translation and the market dominance of domestic search engines, considering manufacturing trade, manufacturing exports, and manufacturing imports as separate variables. The findings indicate that artificial intelligence indicators have significant effects at the 1% level on manufacturing trade and imports, and at the 10% level on exports. Moreover, the expansion of accessible languages through neural machine learning is emphasized as reducing cross-country language barriers, thereby playing a facilitating role in increasing trade volume.

Metin and Tepe (2021) provide a bibliometric review of gravity model studies in international trade between 1980 and 2020 using data from Scopus and Web of Science. Their findings show that the United States, Germany and China are the leading contributors, while key journals such as the World Economy and the Journal of International Economics dominate the field, underscoring the central role of the gravity model in international trade research.

Jayathilaka (2022) empirically investigates the impact of a country's artificial intelligence capacity on its international trade performance, emphasizing the historical role of technology in shaping global commerce. Drawing on panel data from 150 countries between 2018 and 2021, based on the World Development Indicators (WDI) and the Government AI Readiness Index, the study applies Fixed Effects and Random Effects models. The findings reveal that a country's artificial intelligence capability exerts a significant and positive influence on its trade performance. Additionally, GDP and exchange rates positively influence trade volumes, while inflation and trade restrictions exert negative and significant effects. The study suggests that strengthening national artificial intelligence capacity can serve as a strategic lever to enhance trade performance. It further argues that artificial intelligence, by promoting productivity growth, may stimulate economic development and open new avenues for international trade. Nonetheless, the adoption of artificial intelligence technologies requires considerable financial investment, skilled human capital, and organizational transformation within global enterprises.

In the study conducted by Qui et al. (2023), the applications of artificial intelligence in supply chain processes are examined with a particular focus on information management and sustainability. The research discusses how artificial intelligence contributes to enhancing information management and achieving sustainability in supply chains, highlighting the benefits of these technologies, the challenges encountered, and the critical success factors. The findings suggest that artificial intelligence-driven sustainable supply chain models hold significant potential to improve the efficiency of logistics distribution in international trade. However, the effective implementation of these technologies requires careful consideration of information management practices, sustainability objectives, and the associated challenges.

Jones (2023) emphasizes that artificial intelligence is transforming international trade policies and highlights the need for the development of innovative and harmonized policy frameworks to manage this transformation effectively. In this context, it is crucial for policymakers to formulate flexible and inclusive trade policies that take into account the economic implications of artificial intelligence.

Jaloliddin (2023) highlights the critical role of strategic investments in digital technologies to fully harness the benefits of global trade and customs modernization. It offers comprehensive guidance for policymakers, industry leaders, and investors on how to effectively adapt to the dynamic digital landscape, capitalize on emerging opportunities, and address the potential challenges posed by the digital transformation of international trade and customs systems.

In the study by Khan (2024), the impact of artificial intelligence on international trade is examined, with a focus on the opportunities and challenges it presents for existing global legal frameworks. The research highlights that artificial intelligence offers significant potential in areas such as trade facilitation, increased efficiency, and the development of improved dispute resolution mechanisms. Conducted using a qualitative research methodology, the study emphasizes the necessity for policymakers to develop comprehensive strategies in data governance, intellectual property rights harmonization, and regulatory cooperation. It advocates for the construction of a more inclusive and resilient global trading system based on the fundamental principles of fairness and transparency.

Öztürk (2024) examines the transformative potential of artificial intelligence in the context of international trade, with a particular emphasis on trade process optimization, trade finance, and market access. Utilizing a qualitative multiple-case-study approach, the study explores how leading companies such as Alibaba, DHL, and Maersk use artificial intelligence to enhance operational efficiency, improve customer service, and support strategic decision-making. The findings demonstrate that artificial intelligence provides significant contributions in areas such as demand forecasting, logistics optimization, automated risk assessment, and targeted market analysis. The research underscores the necessity of establishing ethical frameworks, investing in reliable data infrastructures, and promoting international regulatory harmonization to ensure the effective integration of artificial intelligence into global trade systems.

Meltzer (2024) states that artificial intelligence will have a transformative impact on economic activities in Asia. However, the direction and magnitude of this impact depend on the regulatory approaches adopted for artificial intelligence and the structure of international trade policies. According to Meltzer, effective and harmonized regulations, together with geopolitical cooperation, are crucial for fully realizing the potential of artificial intelligence.

In the study conducted by Liu et al. (2025), the impact of corporate artificial intelligence development on the quality of export products is examined. The research reveals that the adoption of artificial intelligence technologies enables firms to optimize their production processes, enhance quality control mechanisms, and manufacture higher-quality products. These advancements contribute to gaining a competitive advantage in international markets and subsequently improve export performance. The article particularly emphasizes that the adoption of artificial intelligence technologies by firms in developing countries can positively influence their export success by enhancing product quality.

The study conducted by Vani Aggarwal and Nidhi Karwasra (2025) explores the relationship between digitalization and international trade by comparing insights generated through artificial intelligence (ChatGPT) with those derived from human intelligence. The findings indicate that artificial intelligence falls short in delivering

comprehensive and in-depth analyses in complex domains such as the intricate interaction between digitalization and global trade. The research highlights that while human intelligence remains adequate for conducting rigorous academic investigations, artificial intelligence should be regarded as an efficient yet ultimately limited auxiliary tool in such analytical processes.

Tüccaroğlu et al. (2025) examine the role of blockchain technology in enhancing international trade practices within politically divided and conflict-affected regions, with a particular focus on the case of Cyprus. The study emphasizes that blockchain's decentralized and immutable infrastructure significantly improves transparency, trust, and traceability among trading parties. By integrating blockchain into customs operations, payment systems, and supply chain tracking, the authors demonstrate its potential to reduce corruption and fraud, lower transaction costs, and accelerate negotiation processes. Their findings suggest that in regions hindered by political fragmentation and institutional challenges, blockchain can serve as a transformative tool for establishing more resilient and efficient trade systems.

Tao et al. (2025) argue that the rapid advancement of artificial intelligence is reshaping international trade and logistics by enhancing efficiency, lowering costs, and improving customer experience. Their study emphasizes how artificial intelligence applications such as big data analytics, machine learning and automation help overcome challenges like supply chain opacity and high transportation costs while also driving the digital transformation of global supply chains.

Research Methodology

Synthesizing previous research findings is one of the most crucial actions for advancing a specific field of study. In science mapping, bibliometric methods are employed to examine how disciplines, research areas, specialties, and individual articles are interrelated. Similar to geographic maps, a spatial representation of findings is generated (Zupic & Čater, 2015, p.429).

The term "bibliometrics" has two roots: "biblio" and "metrics" (Dilek, 2020). Bibliometric analysis is employed for various purposes, such as identifying trends in scientific research, uncovering collaboration patterns and research components, and exploring the current structure of a specific field within the existing literature. The data used in bibliometric analysis are both extensive in quantity and objective in nature. In this analytical method, criteria such as researchers' performance, the comparison of academic studies, the number of cited articles, the total number of citations, and the number of citations per author are examined (Karafakıoğlu, 2024).

The advantages of bibliometric analysis can be briefly summarized as follows (Donthu et al., 2021):

- It provides a comprehensive overview from a single source,
- Helps identify gaps in the existing knowledge,

• Facilitates the generation of new research ideas,

• Assists in positioning and strengthening the intended contributions to the field.

As of May 5, 2025, the data used in this study were obtained from the Scopus database through a search using the keywords "artificial intelligence" AND "international trade." The search was conducted within the abstract, title, and keywords fields, and was limited to documents published in or after 2010. The document types included in the search were journal articles, conference papers, books, and book chapters. This process yielded a total of 544 relevant publications.

Developed within the R programming environment, the tool exhibits high adaptability and modularity, allowing for seamless integration with a wide range of statistical R packages. This makes it especially suitable for bibliometric research, a field characterized by its rapid methodological advancements and evolving analytical demands (Aria & Cuccurullo, 2017, p.960).

The retrieved data were exported in csv format and analyzed using the Bibliometrix package within the R environment, a widely recognized tool for performing advanced bibliometric analyses. The graphical user interface Biblioshiny was utilized to process the data and generate visualizations that supported the exploration of publication patterns, citation structures, keyword co-occurrences, and thematic developments. The findings were presented through descriptive statistics, network maps, and thematic charts, allowing for a systematic interpretation of the research landscape.

Results and Discussion

As shown in Figure 1, an examination of the publications indexed in the Scopus database between 2010 and May 2025 in the field of artificial intelligence and international trade reveals that conference papers constitute the majority with 60.1%, followed by journal articles with 31.9%, book chapters with 6%, and books with 2%.

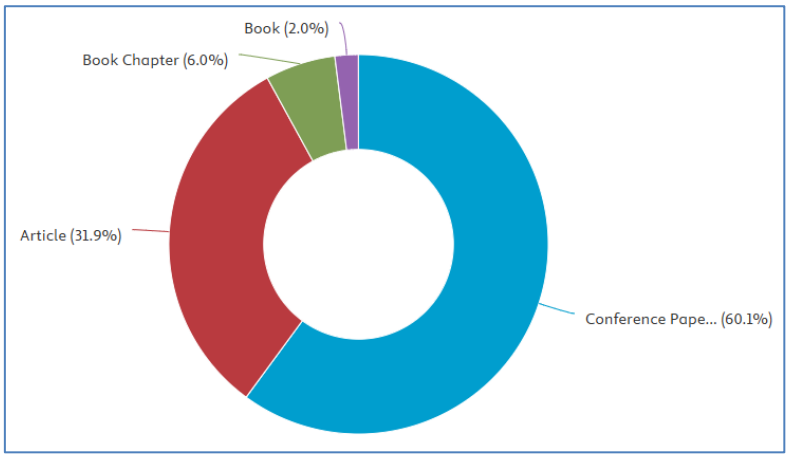

Figure 1. Distribution of Document Types on Artificial Intelligence and International Trade

Figure 2 illustrates the annual scientific production in the field of artificial intelligence and international trade from 2010 to May 2025. The data reveal a fluctuating trend in the early years, with a relatively modest number of publications between 2010 and 2016. A noticeable increase begins around 2017, marking the start of a sustained upward trajectory in research output. This growth becomes particularly pronounced between 2020 and 2024, with 2024 emerging as the most productive year, nearing 100 published documents. The significant rise during this period reflects a surge in scholarly interest likely driven by the global acceleration of digital transformation and increased adoption of AI technologies in trade-related processes. The sharp drop observed in 2025 can be attributed to the data collection cut-off in May and does not necessarily indicate a decline in academic interest. Instead, it is expected that the total number of publications for 2025 will continue to rise as the year progresses. Overall, this figure highlights a growing and sustained engagement with the intersection of AI and international trade within the academic community.

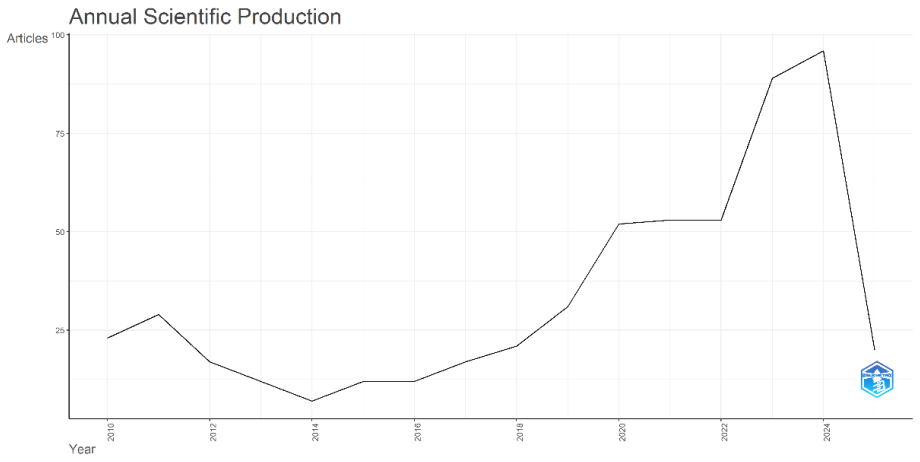

Figure 2. Annual Scientific Production

Figure 3 presents a word cloud generated from the most frequently used keywords by authors working in the field of artificial intelligence and international trade. This visual tool highlights the relative importance of each term by adjusting font size according to frequency, with larger fonts indicating more frequent usage. The central positioning and size of the term artificial intelligence underscore its foundational role in the scholarly discussion. Additionally, prominent keywords such as machine learning and international trade further illustrate the primary thematic focus of the literature analyzed.

Other frequently occurring terms such as big data, industry 4.0, e-commerce, blockchain, supply chain, and deep learning suggest a strong technological orientation in the field. These terms reflect the integration of emerging digital technologies into trade practices, and their recurrence underscores the interdisciplinary nature of the research landscape. The presence of concepts like sustainability, optimization, and decision support systems indicates that AI applications are being explored not only from a technological standpoint but also in relation to strategic and environmental considerations in global commerce. Overall, the word cloud highlights both the thematic concentration and the conceptual diversity present in the literature.

Figure 3. WordCloud by Author's Keywords

Figure 4 presents a keyword co-occurrence network, illustrating how frequently used terms in the literature on artificial intelligence and international trade are interlinked. The visualization is based on clustering algorithms that group keywords into thematic clusters, each represented by different colors. The size of the nodes corresponds to the frequency of each keyword, while the thickness of the connecting lines indicates the strength of co-occurrence between terms. The central position of artificial intelligence, international trade, and machine learning—highlighted with large, densely connected nodes—demonstrates their dominant and integrative role across multiple thematic areas. These core terms are frequently associated with other significant concepts such as blockchain, supply chain, sustainability, and big data, which form a dense and interconnected cluster. This indicates a strong thematic alignment between AI technologies and trade logistics, operational optimization, and digital transformation.

Peripheral clusters contain more specialized or emerging themes such as deep learning, digital economy, and translation technologies, suggesting evolving areas of inquiry. The presence of isolated or loosely connected nodes also points to nascent topics that may represent future directions for research. Overall, this network structure underscores the interdisciplinary and interconnected nature of the field, revealing both mature and developing research trajectories within the AI–international trade nexus.

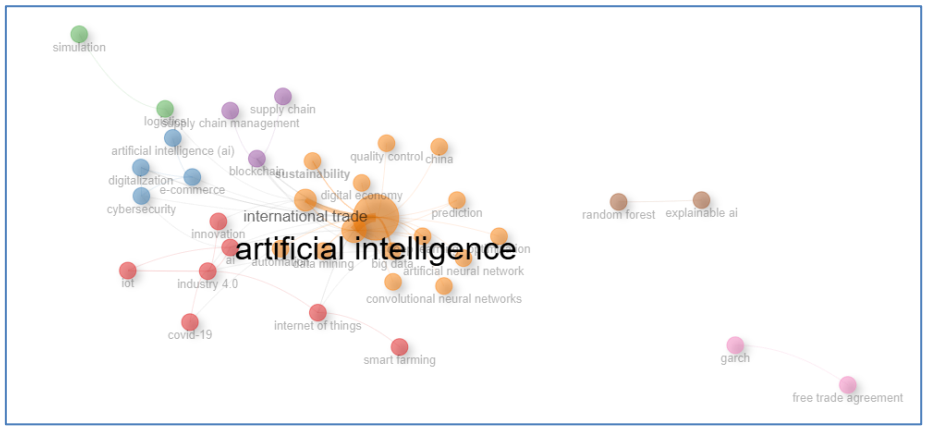

Figure 4. Authors' Keywords clusters

The trend map generated using R Studio illustrates the temporal evolution of key concepts within the intersection of artificial intelligence and international trade. As shown in the figure, terms such as *artificial intelligence*, *machine learning*, and *international trade* have gained significant academic attention, particularly from 2020 onward, highlighting the growing integration of AI technologies in global commerce. More recent terms like *e-commerce*, *supply chain management*, and *prediction* began to emerge prominently after 2022, likely influenced by the acceleration of digital transformation in the post-pandemic era. Technological concepts including *blockchain*, *deep learning*, *big data*, and *internet of things* have also seen increased usage since 2019, reflecting their relevance in modern trade and logistics systems. In contrast, earlier years—particularly between 2011 and 2017—were dominated by more traditional topics such as *logistics*, *decision support systems*, and *GARCH* models, suggesting a prior focus on operational and financial decision-making tools. The evolving frequency and emergence patterns of these terms reveal a dynamic shift in scholarly interest from conventional analytical approaches toward intelligent and technology-driven frameworks, underlining the interdisciplinary nature of current research in the field (Figure 5).

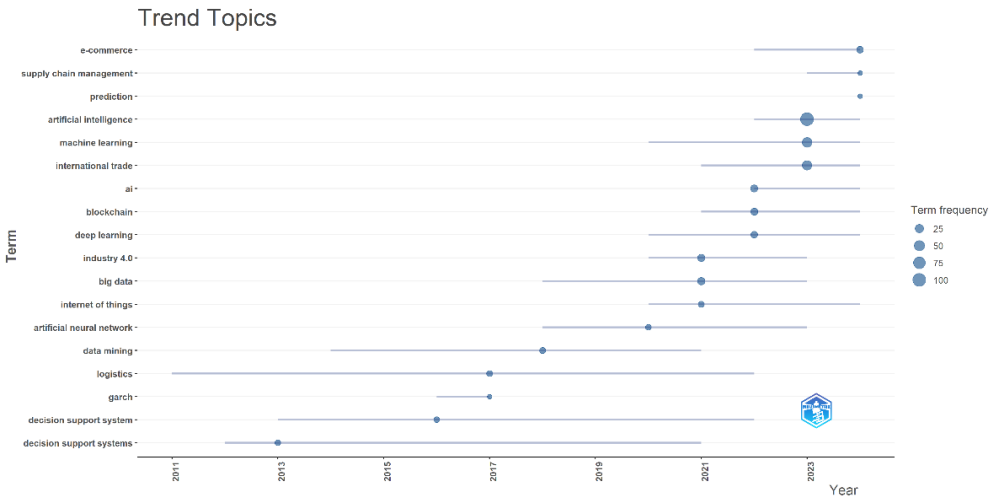

Figure 5. Trending Keywords Used by Authors

As shown in Figure 6, the term artificial intelligence (AI) stands out with a steep upward trend starting around 2020, surpassing all other terms in frequency and highlighting its growing relevance across multiple disciplines including international trade, logistics, and digital technologies. Similarly, international trade and machine learning also show a significant increase in occurrences, suggesting a multidisciplinary integration with AI-driven research. Other technological terms such as big data, blockchain, deep learning, e-commerce, and industry 4.0 exhibit moderate growth particularly after 2018, but remain secondary in comparison to AI-centric concepts. Overall, the chart emphasizes a research shift toward intelligent, data-driven approaches and the central role of AI in shaping contemporary scientific discourse.

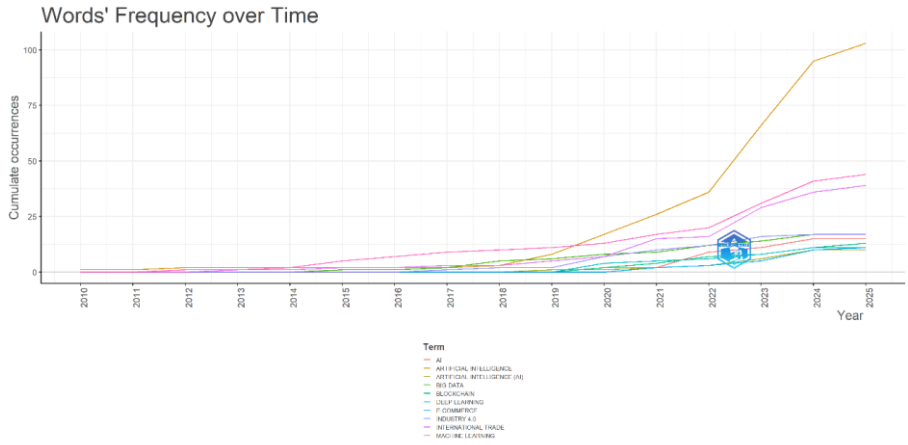

Figure 6. Keyword Trends in the Literature Over Time (2010–2025)

Figure 7 presents the most relevant authors in the field, determined by the number of academic publications they have contributed. This metric highlights the leading contributors to the literature on artificial intelligence and international trade, offering insights into the scholars who have had the greatest research output within this domain. According to the results, *Zhang, Jing* stands out as the most prolific contributor, having authored four publications within the scope of this study. Following closely, a group of authors including *Chang, Jui-Fang*, *Dormitorio, Teresa V.*, *Fedotova, Gilyan V.*, *Giambrone, Joseph J.*, *Tsai, Pei-Wei*, *Wang, Jun*, and *Yang, Li-Hui* have each contributed three documents. Additionally, *Al-Roubaie, Amer* and *Alonso, Ricardo S.* have each authored two publications. The prominence of these authors indicates their active engagement with topics related to artificial intelligence and international trade, suggesting that their work may form a substantial part of the core literature in this research domain. The distribution also reflects a relatively concentrated authorship pattern, where a limited number of researchers have made repeated contributions to the field.

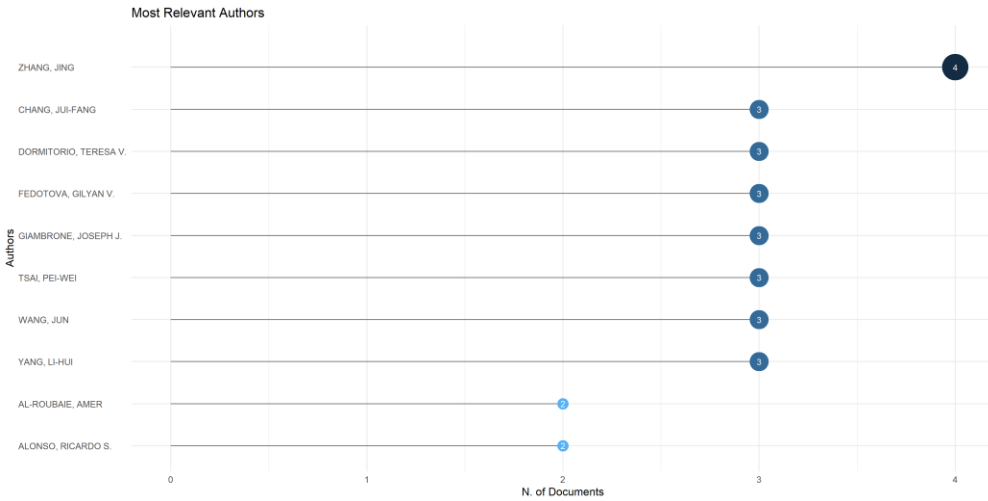

Figure 7. Most Relevant Authors

Figure 8 illustrates the distribution of corresponding authors by country, distinguishing between *Single Country Publications* (SCP) and *Multiple Country Publications* (MCP). The data reveal that China is the leading country in terms of publication volume, with a particularly high number of SCPs, indicating a strong domestic research output in the field of artificial intelligence and international trade. India and the United States follow, also showing a balance between national and international collaborations. Countries such as Spain, Italy, Australia, and Germany demonstrate a noticeable level of MCPs, suggesting a more globally integrated research approach. Türkiye also appears among the top contributing countries, primarily through single-country studies. The presence of a wide range of countries—including those from Asia, Europe, North America, and the Middle East—highlights the global interest in this interdisciplinary field. Moreover, the

mix of SCP and MCP across nations underscores the growing trend of international collaboration, which is essential for advancing research on complex global topics such as AI-driven trade systems.

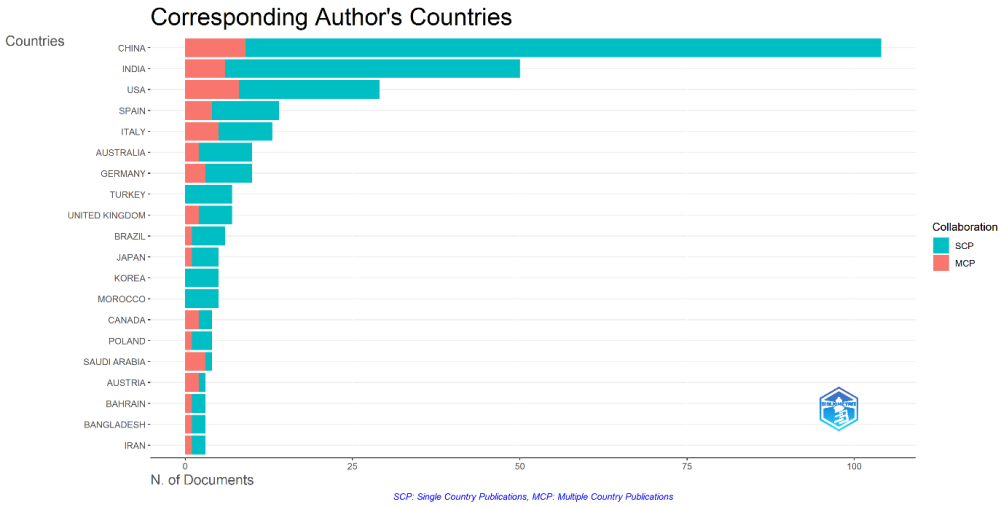

Figure 8. Corresponding Authors and Collaboration Types

Figure 9 presents the global collaboration map among countries involved in research related to artificial intelligence and international trade. The map visualizes international co-authorship links, with darker lines representing stronger collaborative ties. It is evident that China, the United States, India, and several European countries serve as central hubs in international scientific cooperation, forming dense networks of collaboration across continents. China, in particular, demonstrates strong bilateral partnerships with both Western and Asian countries, reflecting its strategic engagement in global AI and trade research. The visible connections also highlight the role of countries like Australia, Germany, Spain, and Türkiye in contributing to transnational research initiatives. The widespread nature of these collaborations underscores the inherently global character of contemporary research in this field, where complex challenges and innovations benefit from cross-border expertise and diverse institutional contributions.

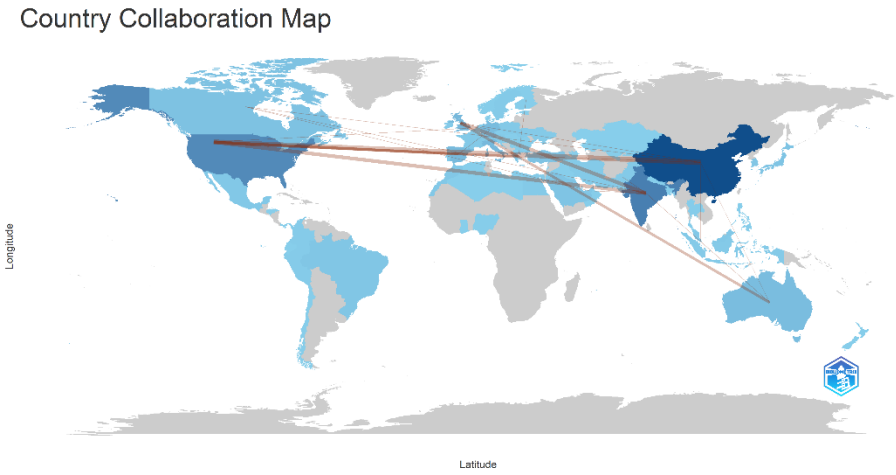

Figure 9. Country Collaboration Map

Figure 10 illustrates the most cited countries in the field of artificial intelligence and international trade research, based on the total number of citations received. The data indicate that China leads significantly with 794 citations, followed by the United States (676 citations) and Japan (643 citations). These results highlight the global impact and scholarly influence of research outputs originating from these countries. India and Spain also demonstrate considerable citation counts, reflecting their growing contributions to the field.

Notably, Türkiy appears in the top ten with 130 citations, indicating a visible but more modest influence in terms of citation impact compared to the leading countries. Other countries such as Germany, Italy, Saudi Arabia, and Belgium round out the list with varying degrees of citation recognition. The distribution suggests that while a few countries dominate in terms of academic influence, there is a broader international presence contributing valuable insights to the development of this interdisciplinary research area.

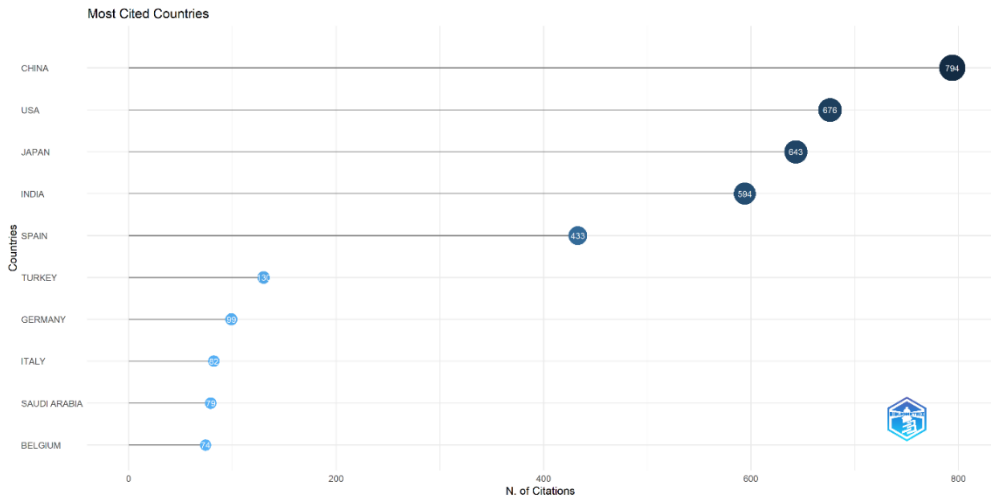

Figure 10. Most Cited Countries in AI and International Trade Research

Conclusion

The findings of this study provide a comprehensive overview of the intellectual landscape surrounding artificial intelligence and international trade, revealing significant growth in academic interest, particularly in the post-2017 period. The bibliometric analysis highlights artificial intelligence, machine learning, and international trade as the most frequently addressed concepts, underscoring the deepening integration of artificial intelligence technologies within trade-related research. The increasing prominence of keywords such as e-commerce, supply chain management, and blockchain further reflects the diversification and technological expansion of the field.

Author and country-level analyses indicate a concentrated yet globally dispersed research structure. Scholars from China, the United States, and India have emerged as major contributors, both in terms of volume and citation impact. Additionally, the presence of international collaborations and the distribution of corresponding authors across diverse geographic regions underscore the global relevance and interdisciplinary nature of the topic. The co-authorship and collaboration maps emphasize the importance of cross-border knowledge exchange in advancing the field.

This study also provides valuable methodological implications by demonstrating the utility of R-based tools in conducting advanced bibliometric analyses. The ability to integrate these tools with other statistical packages ensures flexibility and scalability, making them particularly suitable for dynamic and evolving fields such as artificial intelligence and international trade.

In terms of contributions, this study not only maps the intellectual structure of the artificial intelligence –international trade nexus but also identifies key thematic clusters, leading contributors, and emerging research directions. By doing so, it offers both theoretical contributions to the academic literature and practical insights for policymakers and industry stakeholders navigating digital transformation in trade.

Nevertheless, the study has certain limitations. First, it relies exclusively on publications indexed in the Scopus database, which may omit relevant studies from other databases. Second, bibliometric methods capture quantitative patterns but cannot fully explain the qualitative depth of debates, challenges, and policy implications in this field. These limitations suggest caution in generalizing the findings.

Future research is recommended to adopt a multi-database approach and combine bibliometric mapping with systematic literature reviews or case studies for a more holistic perspective. Scholars could also investigate sector-specific applications of artificial intelligence in trade, such as logistics, customs, and digital platforms, to better understand practical implications. Moreover, exploring the ethical, socio-economic, and geopolitical dimensions of artificial intelligence adoption in trade systems will enrich the debate.

In conclusion, the intersection of artificial intelligence and international trade constitutes a fertile ground for future research. Scholars are encouraged to further investigate the socio-economic, ethical, and geopolitical implications of artificial intelligence adoption in trade systems. Moreover, policymakers and industry stakeholders should work collaboratively to develop inclusive and forward-looking frameworks that ensure the sustainable and equitable integration of artificial intelligence technologies into global trade practices.

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Benzerlik Taraması	Yapıldı – Ithenticate
Etik Bildirim	itobiad@itobiad.com
Çıkar Çatışması	Çıkar çatışması beyan edilmemiştir.
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