

# Formation of Scientific Knowledge on State Export Control Within the System of Public Administration of National Security

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## Abstract

Contemporary globalization processes, the growth of military-technical cooperation, and the proliferation of dual-use goods create unprecedented challenges for the system of state management of national security. State export control today is not only an instrument of regulatory policy, but also a key element in preventing the proliferation of weapons of mass destruction, terrorism, and illegal transfers of strategically important technologies.

Research into the development of scientific knowledge about state export control allows us to reveal the evolution of scientific approaches, identify conceptual gaps, and propose new models for integrating control mechanisms into national security strategy.

The author chose bibliometric analysis, which is an important method of modern research based on the quantitative study of bibliographic data. It allowed identifying trends in the development of scientific publications, assessing their quality, and identifying key changes in certain fields of knowledge. The use of a large data set and statistical methods ensured the objectivity of the results and created a basis for the formation of new scientific knowledge.

The results of the bibliometric analysis showed that over the past two decades, scientific research on export control issues has intensified significantly, which is associated with the escalation of hybrid threats, international conflicts, and the growing role of security regulation mechanisms. The systematic increase in publications in Scopus and Web of Science indicates the formation of an interdisciplinary direction that combines economic, political, and legal approaches. Geographical analysis demonstrates the leadership of the United States, the high activity of the EU and East Asian countries, and the development of transatlantic and interregional cooperation. Export control is considered not only in terms of security and non-proliferation of technologies, but also through the prism of global supply chains, economic stability, and innovation.

**Keywords:** state export control; national security; public administration; hybrid threats; international cooperation; regulatory policy; interdisciplinary research.

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## 1. Introduction

Bibliometric analysis is one of the key methods of modern scientific research, based on the quantitative study of the bibliographic characteristics of documents. This approach makes it possible to track trends and patterns in the development of document flow, carry out its qualitative assessment, and identify both positive and negative changes in certain fields of knowledge. A distinctive feature of bibliometrics is its reliance on large data sets, which ensures the use of statistical and mathematical methods to obtain objective results. This allows not only to track the dynamics of changes in the publishing or

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scientific spheres, but also to generate new knowledge through in-depth analysis of information. The flexibility of bibliometric approaches allows them to be used both for researching individual objects and for analyzing the relationships between them. That is why bibliometrics is considered an effective tool for studying modern information flows and is an important component of research into trends in the development of science and publishing [1].

The analysis of scientific publications in the field of export control is necessary because this topic is directly related to global and national security. In the context of growing hybrid threats and tightening international sanctions regimes, the issue of regulating the export of strategic goods and technologies is becoming particularly important. Studying scientific works allows us to trace which areas of research prevail and which aspects remain insufficiently explored.

## 2. Results and discussions

First, we will analyze the dynamics of the search query «export control» using Google Trends, which will allow us to determine public interest in export control issues around the world. This analysis is important because it allows us to track how attention to this issue has changed over time, which countries have shown the greatest interest, and which events may have caused an increase or decrease in interest.



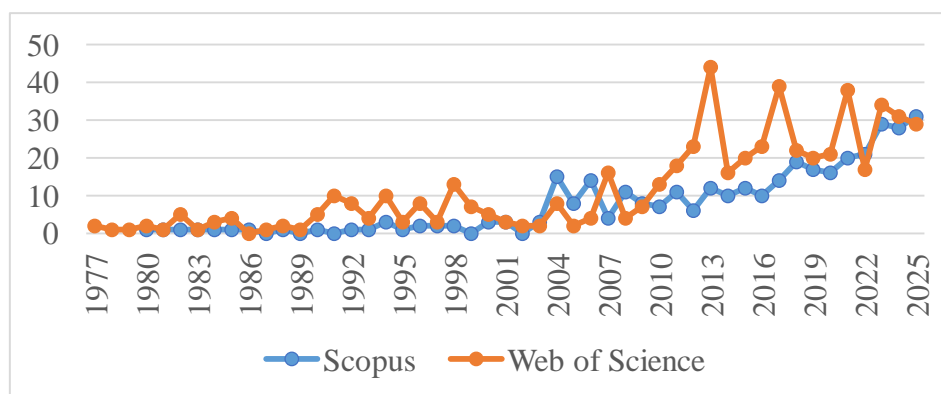
Source: compiled by the author using Google Trends tools

Fig. 1. Dynamics of the search query «export control» worldwide: regional and temporal analysis (2004-2025)

The graph shows the dynamics of search activity for the query «export control» according to Google Trends from early 2004 to July 2025. At the initial stage, the level of interest was relatively high (25-50 points), but over time it gradually declined and stabilized within the range of 10-20 points during 2010-2020. This trend indicates a gradual decline in public attention to the topic during this period. The situation changed dramatically in 2023-2025, when there was a sharp increase in search activity, which is now reaching its peak. This indicates that the issue has become more relevant, that public and media interest has increased, and that there may be a connection with specific global or regional events.

The geographical distribution shows that the greatest interest in the query is recorded in Sri Lanka. High rates are also observed in Singapore and on the island of Saint Helena, while in Hong Kong and the United States, the level of interest is significantly lower. This confirms the specific regional concentration of the topic, which is of greatest concern to Asia and certain small territories. In 2025, the issue of export control will take on particular importance, primarily in the context of US foreign policy, which uses it as a strategic tool to maintain its position and influence on the policies of other states. At the same time, new legislation is being adopted in the US and compliance with regulations is being tightened for both businesses and academic institutions, creating the greatest pressure on international companies and research institutes in decades. Thus, it is the United States that shapes the global agenda in the field of export control, using it as an instrument of security, economic influence, and geopolitical dominance.

For further analysis, we used two scientometric databases, Scopus and Web of Science, which are the most authoritative sources for studying academic activity on a global scale. The use of these databases allows us not only to cover a wide range of publications from various disciplines, but also to conduct a comparative analysis of research dynamics in the field of export control. Particular attention was paid to the quantitative and qualitative parameters of publications, including the volume of documents, the dynamics of their growth, sectoral distribution, and typological structure. We searched for documents using the query «export control», which allowed us to focus on publications directly related to export control issues.



Source: constructed by the author

Fig. 2. Dynamics of scientific activity for the search term «export control» in the Scopus and Web of Science databases

Bibliometric analysis showed the dynamics of growth in interest in the topic of export control throughout the entire period. While scientific publications in the last decades of the 20th century were sporadic and unsystematic, there has been a significant increase in the number of studies since 2003. This is explained by the intensification of global security challenges and the activation of international politics.

The Web of Science has recorded a larger volume of materials (556 documents), which is associated with broader coverage of interdisciplinary research. At the same time, the dynamics of publications are wave-like, with pronounced peaks in 2013, 2017, and 2021, which coincides with phases of escalation of geopolitical crises.

Scopus covers a smaller array (353 documents), but shows a smoother and more stable increase in the number of publications. The growth after 2016 is particularly noticeable, and in 2020-2025 the number of studies stabilized at 25-30 per year. One of the first publications devoted to the study of export control issues, is a work by a group of authors, Gold C.L., Goodman S.E., and Walker B.G., which discusses the control of exports of computer technologies, both hardware and software, which is actively discussed in government and industrial circles. This article presents the initial recommendations of the Expert Group on Critical Computer Network Technologies for software export control, whose task was to assess critical technologies related to computer networks and provide recommendations for controlling the export of such technologies. Scientists emphasize that the development of a sensible export control policy for software remains a particularly difficult issue that concerns both the US government and industry [2].

In summary, it can be stated that both databases confirm a steady trend toward increased research in the field of export control. Next, we will analyze the documents by subject area.

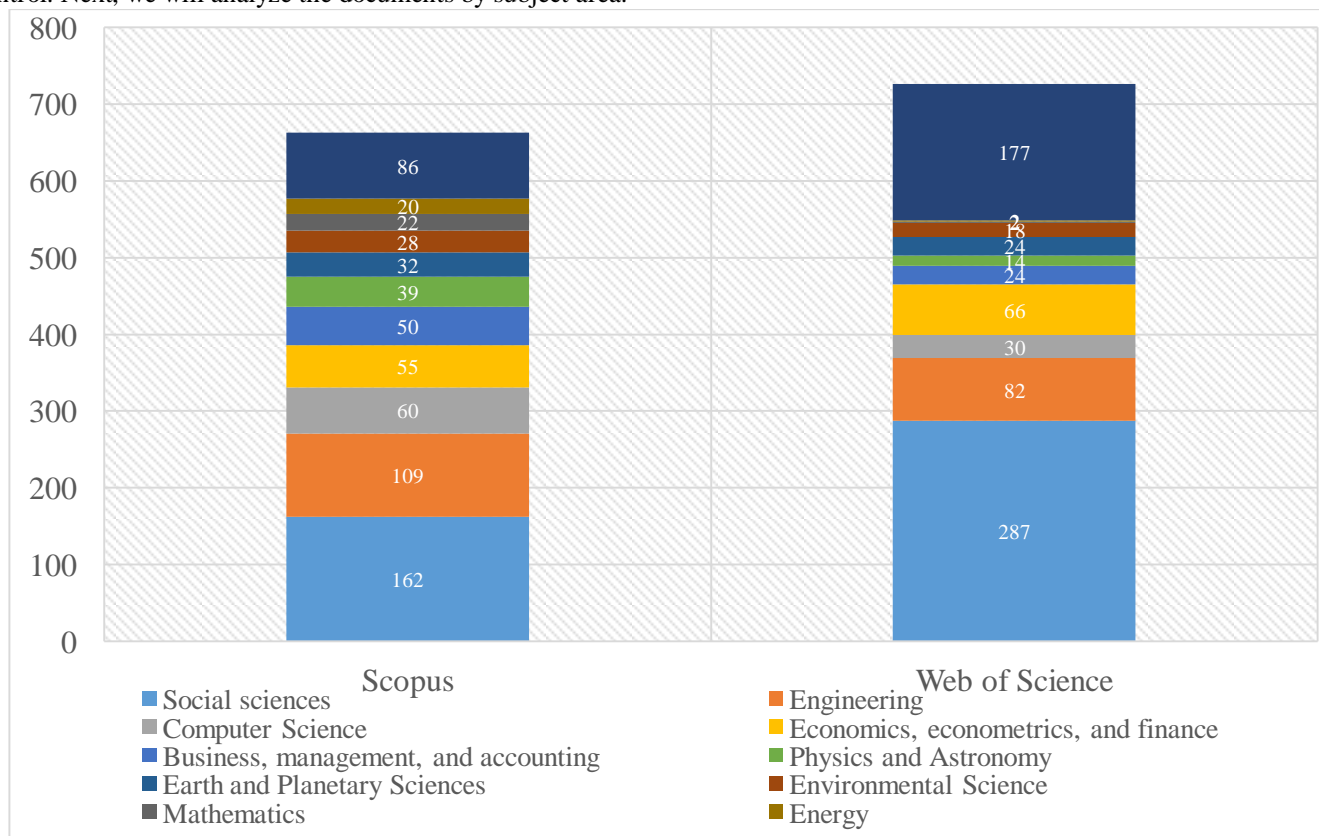


Fig. 3. Industry distribution of publications by search query «export control» in Scopus and Web of Science databases

An analysis of the sectoral structure of publications showed that the largest share of research on export control issues belongs to **the social sciences**: 162 documents in Scopus and 287 in Web of Science. This highlights the interdisciplinary nature of the subject, as export control issues are considered in the context of law, politics, international relations, and security. The second most important field is **engineering**, which accounts for 109 publications in Scopus and 82 in Web of Science. It reflects the applied dimension of export control related to the regulation of access to dual-use technologies and equipment. **Computer science** also occupies an important place (60 in Scopus, 30 in WoS), which indicates an increased focus on cybersecurity and information technology protection. In the field of **economics and finance**, there are 55 publications in Scopus and 66 in WoS. Other fields (physics, mathematics, earth sciences, energy, environmental sciences) make up a smaller but important part of the publications. They focus on specific aspects: control of the proliferation of nuclear technologies, research in the field of energy and environmental safety.

In summary, it can be concluded that export control is an interdisciplinary field of research, where the leading positions belong to the social sciences, but technical and natural sciences also play a significant role.

One of the important documents devoted to the economic aspects of export control and global trade is a document that justifies the importance of economic assessment of policies related to geopolitical tensions and examines the economic consequences of two major policies related to global supply chains (GSC), Tariff War 1.0 and high-tech export controls, particularly from the perspective of third countries, including ASEAN member states. It finds that some countries have aggressively exploited the wave of supply chain reshuffling and benefited from trade diversion. The author emphasizes that it is difficult to predict what policies the second Trump administration will implement, but the dominant strategy for such countries is to use the positive effects to improve their positions in GSC. The authors of the document emphasize that even with increasing national security restrictions, middle-income countries have opportunities to cooperate with new industrialized and developing countries while retaining the benefits of participating in global supply chains [4].

Another work devoted to the analysis of contemporary challenges in international trade and export control is the article by B.Meng et al. Their work examines the relationship between the US and China and the impact of the trade war between them on the global economy through the prism of global value chains (GVCs). Against the backdrop of a global transition from hyperglobalization to slow transformation, the authors examine the relationship between the US and China in terms of cooperation, competition, and conflict. In addition, an extended computable general equilibrium (CGE) model of GVCs is used to identify the impact of the trade war. The main findings of the study indicate that economies are highly dependent on their position and level of participation in GVCs. Regions located upstream from China's GGE suffer greater losses, while high-tech exporters can benefit from trade diversion caused by US export controls to China, regardless of GGE positions. Researchers are also investigating the nature of the trade war between the US and China and the prospects for US-China relations in the GVC. [5]

Table 1

Distribution of documents by type for the search query «export control» in the Scopus and Web of Science databases

Document type	Scopus	Web of Science	Structure, %	
			Scopus	Web of Science
Article	196	404	55.5	72.7
Conference report	91	91	25.8	16.4
Book chapter	32	35	9.1	6.3
Review	21	34	5.9	3.1
Editorial	-	29	-	5.22
Short survey	8	-	2.3	-
Early access	-	8	-	1.44
News	-	5	-	0.89
Note	3	3	0.8	0.54
Book	2	2	0.6	0.36
Letter	-	2	-	0.36
Correction	-	1	-	0.18
Total	353	614	100	100

A comparative analysis of document types shows that **scientific articles** account for the largest share of research in the field of export control: 55.5% in Scopus and 72.7% in Web of Science. This indicates a high level of academic research on the subject and confirms that articles in peer-reviewed journals remain the main channel for disseminating scientific results in this field. The second most common form is **conference reports**, which account for 25.8% in Scopus and 16.4% in Web of Science. This difference is explained by the broader coverage of conference proceedings in Scopus. Conference materials reflect the dynamics of the formation of new ideas, rapid response to current challenges, and prompt discussion of export control issues in the scientific community. A smaller share is occupied by **book chapters** (9.1% in Scopus and 6.3% in WoS) and **reviews** (5.9% and 3.1%, respectively), which indicates a gradual accumulation of a theoretical and methodological base on this topic. At the same time, Web of Science contains a significant amount of **editorial material** (5.22%), which may indicate the attention of publishing platforms to the topicality of the subject in the form of expert commentary. Other types of documents (short surveys, books, notes, news, letters, corrections) are represented minimally, but their presence emphasizes the multi-channel dissemination of information on export control in scientific and public discourse.

In summary, it can be concluded that the main forms of scientific publications on export control issues are articles and conference reports, which provide both in-depth academic study of the topic and rapid dissemination of new knowledge. At the same time, differences in the structure of documents between Scopus and Web of Science are explained by different indexing policies and the specifics of source coverage.

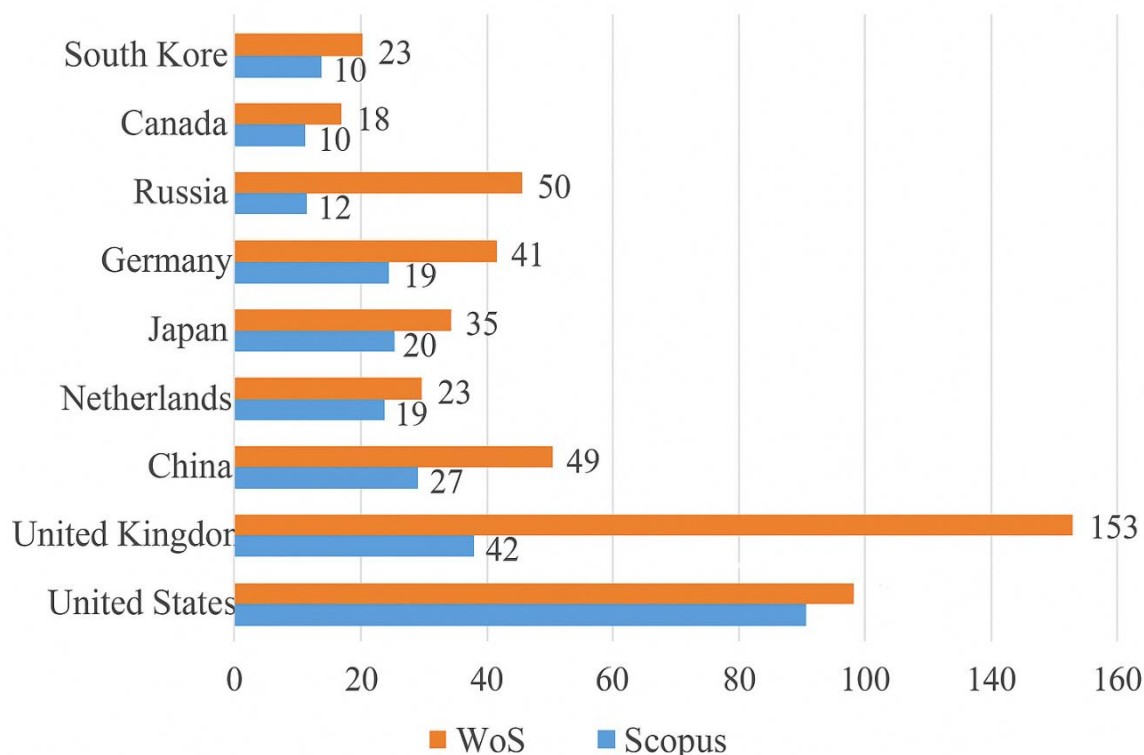


Fig. 4. Geographical distribution of publications by search query «export control» in Scopus and Web of Science

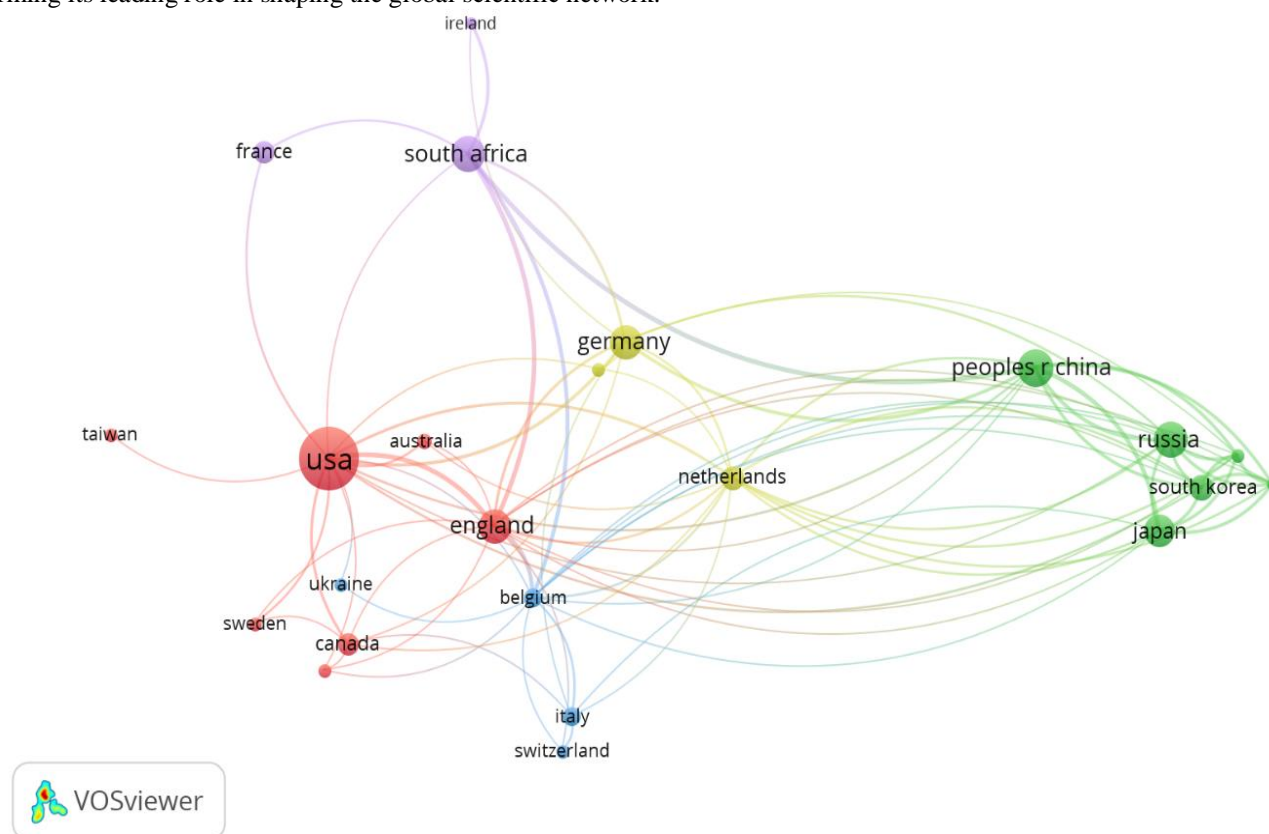
An analysis of the geographical distribution of publications shows that **the United States** plays a leading role in research on export control issues. According to Scopus, the US accounts for 112 publications, and according to Web of Science, 153, which significantly exceeds the figures for other countries. European countries also occupy high positions: **the United Kingdom (29 in Scopus, 42 in WoS)**, **Germany (19 and 41, respectively)**, and **the Netherlands (23 and 19)**. This highlights the importance of the European context in scientific research on export control, driven by integration into the EU's common security policy and sanctions regimes. Among Asian countries, the leaders are **China (27 in Scopus, 49 in WoS)**, **Japan (20 and 35)** and **South Korea (10 and 23)**. Their activity is explained by their significant technological potential and involvement in international processes of control over strategic goods and dual-use technologies. In Web of Science, the leaders also include South Africa with 44 publications, France with 19, and Belgium and Italy with 13 publications each. Ukraine has only 5 publications in **Scopus** and 6 in **WoS**.

Overall, the structure of publications confirms that the main scientific contribution to research on export control issues is made by the US, leading European countries, and East Asia. This reflects the geopolitical distribution of influence in the field of international security and control mechanisms for strategic goods.

Analyzing various documents, it can be seen that a significant part of the publications is devoted to the policies of two major powers—the United States and China. In their article, scholars Shrivastava M. and Jash A. examine the evolution of technological rivalry between the United States and China from Trump's first term to the Biden administration and explore the effectiveness of US export control measures. To highlight the changing relevance of traditional instruments of economic governance, such as export controls, the researchers examine technological rivalry through three key objectives. First, they analyze how the dynamics of hegemonic competition between the US and China have evolved, particularly given their economic and military dependence on Taiwan's semiconductor industry. Second, they examine the state of China's semiconductor sector and assess how US export control policy is changing the Chinese chip industry. Third, the authors evaluate the effectiveness of US sanctions against China, identifying four key ways in which Chinese chip manufacturers have managed to circumvent these measures. The article argues that America's «narrow angle» strategy is increasingly proving misguided, as US policy has inadvertently accelerated China's drive for domestic innovation in high-tech sectors. This trend exposes a structural flaw in the traditional geo-economic strategy of export control, as global supply chains appear less controllable by US-led policies. This reflects a broader strategic reorientation with deeper implications for global power dynamics [6].

The figure shows a map of scientific cooperation between countries in the field of export control research, constructed using **VOSviewer**. The largest node is occupied by **the US**, which is the undisputed world leader in research and publications

on export control. The US actively cooperates with **England, Canada, Australia, Germany, France, and Ukraine**, confirming its leading role in shaping the global scientific network.



Source: constructed by the author using the VOSviewer tool based on data from the Web of Science database

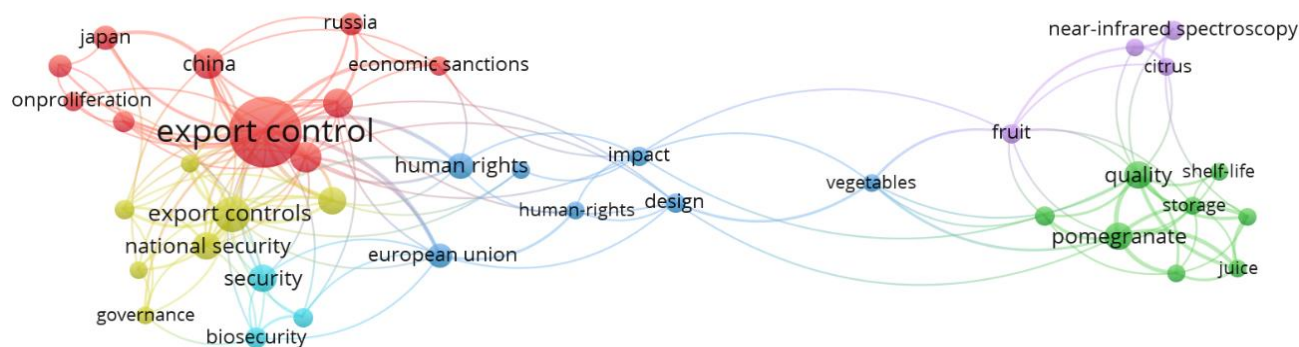
Fig. 5. International cooperation in export control research: bibliometric visualization of co-authorship

The second most important group is the East Asian countries: **China, Japan, and South Korea**, which cooperate closely with each other. This cluster reflects the regional concentration of scientific interests in the field of strategic technologies and security. European countries—**Germany, the Netherlands, Italy, Belgium, and Switzerland**—form a separate bloc that combines both intra-European research and ties with the US and China. Of particular note is the activity of **the United Kingdom**, which acts as a bridge between the North American and European scientific communities.

**South Africa and Ireland** form a separate cluster, cooperating mainly with France and the US. The existence of such ties confirms that the issue of export control goes beyond the traditional centers of scientific research and is gradually encompassing a broader international context.

Thus, the cooperation map shows **the dominance of the US**, the activity of EU and East Asian countries, and the formation of transatlantic and interregional scientific ties. This underscores the global nature of the topic of export control, which integrates political, economic, and technological dimensions in the international research space.

Another important work is an article that examines the positive impact of US export controls on the innovative activity of firms in Chinese business groups. Using annual microdata for the period 2010-2022, the authors analyze the response of companies indirectly affected by the US list of organizations. The results show that such firms demonstrate an increase in innovation activity, especially if they are analogues of companies on the «blacklist» or occupy higher positions in the production chain. This is because suppliers are forced to initiate their own innovation processes in order to remain competitive. The study also reveals that after the introduction of sanctions, business groups redistribute capital and human resources in favor of companies that have been indirectly affected by export controls. This internal dynamic creates an «internal innovation market» effect, where innovations spread through inter-firm industrial interaction and resource redistribution. At the same time, the authors emphasize that there is no overall increase in the innovative activity of the business group as a whole, which refutes the hypothesis of a universal strengthening of innovation. Further analysis shows that export controls significantly improve the productivity of firms, illustrating the positive effect of product market segmentation. Overall, this study shows that export controls stimulate the transfer of innovation within Chinese business groups and accelerate the technological gap with the United States [3].



Source: constructed by the author using the VOSviewer tool based on data from the Web of Science database

Fig. 6. Clustering of key concepts in export control studies

The figure shows a map of keywords from scientific publications. The visualization reflects the main clusters of concepts that form different areas of research on export control issues. At the center of the map is the key concept of «export control», which is the largest node and forms the core of scientific discourse. It is closely related to categories such as «economic sanctions», «nonproliferation», «national security», «security», «governance», and «biosecurity», which emphasizes the interdisciplinary nature of the topic and its connection to political, security, and legal aspects. Countries (such as the US, China, and Japan) that are associated with the formation and practical application of export control mechanisms play a significant role.

The second major cluster consists of concepts related to human rights and the activities of the European Union. Here, we can see the interconnection between export control and international legal standards, as well as the impact of sanctions on international relations. The third cluster is applied and technological in nature, focusing on concepts related to food and agricultural products: «vegetables», «fruit», «pomegranate», «citrus», «storage», «quality», «shelf-life». Their appearance indicates an expansion of the scope of export control, particularly in food and agricultural security.

Thus, the map shows that research on export control is developing in several directions: security and politics (sanctions, non-proliferation, national security), law (human rights, EU policy), and economics (control in the areas of food, agricultural security, and biosecurity). This confirms the interdisciplinary nature of the issue and its significance for various fields of science and practice.

### 3. Conclusions and prospects for further research in this area

Summarizing the results of the bibliometric analysis, we can conclude that research in the field of export control has become particularly relevant in the last two decades, which is directly related to the intensification of hybrid threats, international conflicts, and the growing role of regulatory mechanisms in the field of security. The simultaneous growth in the number of publications in the Scopus and Web of Science databases indicates the formation of a comprehensive interdisciplinary research direction that combines economic, political, and legal aspects. The geographical distribution and visualization of international cooperation indicate the dominance of **the United States**, significant activity by the countries of the European Union and East Asia, and the formation of transatlantic and interregional scientific ties. An analysis of key concepts shows that export control is considered not only in the context of **security and non-proliferation of technologies**, but also in the context of **global supply chains, food and economic security, and innovation processes**.

In summary, it can be concluded that export control is becoming a **central focus of contemporary scientific research**, integrating issues of international security, economic policy, and technological development. The results of the analysis reflect the growing interest of the scientific community in this issue, which correlates with current global challenges and forms the basis for further interdisciplinary research.

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