

Bibliometric analysis of internationalization trends in European higher education: Collaboration networks and the role of dual-degree programs

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ABSTRACT

Objective. To conduct a bibliometric analysis of the scientific production on the internationalization of European higher education, with particular emphasis on academic collaboration networks and the role of joint and dual-degree programs within the framework of the European Higher Education Area (EHEA).

Design/Methodology/Approach. A quantitative, descriptive, and exploratory approach was applied using data from the Scopus database (1991-2025). Records were processed with VOSviewer to identify patterns of co-authorship, international collaboration, and keyword co-occurrence. The analysis was structured around three axes: scientific productivity, collaboration networks, and thematic evolution, emphasizing curricular integration mechanisms associated with the Bologna Process.

Results/Discussion. A representative set of articles was identified, showing sustained growth in research on university internationalization, accompanied by a high density of transnational co-authorship led by universities from the United Kingdom, Germany, Spain, Italy, and France. The keyword co-occurrence maps reveal a conceptual core centered on higher education, internationalization, Bologna Process, and quality assurance, reflecting the consolidation of a mature cognitive structure based on cooperation, mobility, and academic quality.

Conclusions. The internationalization of European higher education has evolved from individual mobility to structured institutional cooperation, consolidating as a strategic process of academic integration and governance. Dual-degree programs represent its most advanced expression, articulating mobility, quality assurance, and curricular convergence under a transnational collaboration model that redefines the identity of the EHEA.

KEYWORDS: university internationalization; European higher education; academic collaboration; dual-degree programs; bibliometric analysis; Bologna Process.

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1. INTRODUCTION

THE INTERNATIONALIZATION of higher education has become one of the most significant and complex processes within the global university system over the past two decades (Joamets & Solarte-Vásquez, 2024; Nurbayev *et al.*, 2025). In Europe, this phenomenon has acquired a structured and multidimensional character, driven by policies and initiatives such as the Bologna Process (Jæger, 2023), the European Higher Education Area (EHEA), and Erasmus+ programs (Malet-Calvo, 2017), which have promoted academic mobility, inter-institutional cooperation, and the generation of shared knowledge (Luna *et al.*, 2023; Mitchell & Güvendir, 2023). These strategies not only strengthen the competitiveness of European universities but also foster a culture of openness, dialogue, and recognition of cultural diversity within the academic sphere.

Assessing the level of internationalization of a university requires considering several inter-related factors: participation in global research networks, the existence of joint academic programs, student and faculty mobility, international co-authorship in scientific production, and the degree of institutional openness to linguistic and cultural diversity (Marchisio Conte & Spinello, 2021). In this sense, internationalization is not limited to physical mobility or formal agreements but constitutes a comprehensive strategy for institutional transformation (Sierra-Huedo & Foucart, 2022). Its purpose is to expand the frontiers of knowledge, strengthen intercultural understanding, and train citizens capable of operating effectively in globalized contexts. When a student completes part of their studies abroad and returns, they not only acquire new academic and technological competencies but also cultural and ethical perspectives that enrich the educational environment of their home institution and promote the emulation of good practices (Bianchini, 2019).

From a comparative perspective, Europe offers a cooperative and regulated model of internationalization, based on curricular harmonization and institutional integration. In contrast, Anglo-Saxon systems tend to feature more competitive structures, with admission, funding, and international mobility policies that are less accessible and more focused on prestige

and attracting talent than on academic reciprocity (Chankseliani, 2018; Felder & Tamtik, 2023; Hegde, 2023). While North America is highly internationalized in terms of foreign student enrollment and research networks, its international efforts mainly aim to attract students rather than support bidirectional mobility or joint degree programs (Beliaeva & Frolova, 2021). In this European context, internationalization has expanded beyond individual mobility to include institutional cooperation, such as shared curricula and mutual recognition of qualifications.

In this context, dual-degree programs stand out as one of the most advanced results of this integrative process, combining academic mobility with curricular collaboration within the principles of the European Higher Education Area (EHEA). These programs allow students to earn degrees from institutions in different countries based on jointly established standards of quality and equivalence (Král'ová *et al.*, 2024). Beyond their academic contribution, dual-degree programs act as effective tools for cultural integration and the sharing of institutional best practices, while giving graduates an extra credential that enhances their professional standing and global identity (de Waard *et al.*, 2023). Consequently, they embody the institutional realization of the European cooperation model, strengthening the connection between mobility, quality assurance, and international governance in higher education (Gorylev *et al.*, 2017; Marcos *et al.*, 2024; Mussina *et al.*, 2025; Ospanova *et al.*, 2025).

Building on this connection, a bibliometric approach provides an objective way to analyze how these dynamics are reflected in the scientific literature. By analyzing co-authorship networks, patterns of international collaboration, and keyword co-occurrence, it becomes possible to map the cognitive and cooperative structures that support European internationalization (Buckner *et al.*, 2023; Ghani *et al.*, 2022; Yin, 2022). Although several studies have examined academic mobility and global cooperation, few have specifically focused on Europe as a unified ecosystem of organized scientific collaboration. In particular, the scientific aspect of university internationalization, including components like dual-degree programs, has received less attention than its political or administrative dimensions.

Recent bibliometric studies have explored the internationalization of higher education (IoHE) as a complex and evolving process of global engagement. These studies have approached the topic from various geographic and methodological angles, revealing how institutional cooperation, student mobility, and sustainability influence higher education systems across different regions. For example, Dongab-Bajet & Santos (2025) carried out a global bibliometric mapping of 415 Scopus-indexed documents from 2015 to 2024. They identified five thematic clusters: policy frameworks, curriculum internationalization, language strategies, student mobility, and sustainability, closely connected to the goals of Sustainable Development Goal 4. Their analysis offered a comprehensive view of internationalization as a catalyst for inclusive and sustainable higher education worldwide.

At the regional level, Li & Mahadi (2024) performed a large-scale bibliometric review of 9,180 publications on internationalization trends between 2015 and 2024, emphasizing the increasing impact of digitalization, post-pandemic transformations, and intercultural inclusion in the higher education landscape. Similarly, Thi Thu Le *et al.* (2024) focused on Asia, analyzing 416 Scopus-indexed papers from 2003 to 2022, and revealed strong regional cooperation led by China, Japan, and South Korea, as well as the influence of national policies on institutional visibility and mobility. Complementing these perspectives, Erdem & Polat (2023) mapped 260 WoS-indexed studies on Turkish higher education between 1975 and 2021, uncovering four intellectual schools of thought, European higher education policy, global socio-political economics of IoHE, socio-cultural adaptation, and language studies, thereby illustrating the internal diversification of research even within a single national context.

From a broader temporal perspective, Kuzhabekova *et al.* (2015) analyzed 2,302 publications from 2002 to 2011 and found that, despite the global growth of IoHE research, collaboration networks remained largely confined within national boundaries, dominated by Western institutions. More recently, Ghani *et al.* (2022) expanded this discussion by identifying sustainability as a key driver of internationalization, emphasizing the interconnectedness

between transnational education and institutional performance. Collectively, these studies have advanced the understanding of IoHE as a global and multidimensional field; however, most focus on either global or regional scopes, without isolating Europe as a consolidated ecosystem of academic cooperation.

Building on this connection, a bibliometric approach provides an objective means to analyze how these dynamics are reflected in the scientific literature. Through the analysis of co-authorship networks, international collaboration patterns, and keyword co-occurrence, it is possible to map the cognitive and cooperative structures that underpin European internationalization (Buckner *et al.*, 2023; Ghani *et al.*, 2022). Although several studies have examined academic mobility and global cooperation, few have focused specifically on Europe as a consolidated ecosystem of structured scientific collaboration. In particular, the scientific dimension of university internationalization, and its manifestations such as dual-degree programs, have received less attention than its political or administrative aspects.

2. METHODOLOGY

2.1. Research design

This study employs a quantitative, descriptive, and exploratory approach, grounded in bibliometric analysis techniques, which aim to measure, visualize, and describe the evolution of scientific production related to the internationalization of European higher education (Ghani *et al.*, 2022). The methodological purpose is to map research trends, collaboration networks, and the cognitive structure of the field, with particular attention to the role of joint and dual-degree programs within the framework of the European Higher Education Area (Weber & Popescu, 2020).

The analysis is based on the two classical dimensions of bibliometrics proposed by Glänzel (2012): (1) the performance dimension, focused on evaluating scientific productivity, its temporal distribution, and the leading publication sources; and (2) the relational dimension, which examines the connectivity between authors, institutions, and countries through the analysis of co-authorship networks, institutional

collaboration, and keyword co-occurrence. This methodological design not only enables the quantification of academic production but also allows for the reconstruction of cooperation dynamics and thematic convergence patterns that underpin the process of university internationalization in Europe, providing an empirical and structural understanding of the field.

2.2. Data Source and Search Strategy

The data analyzed in this study were obtained exclusively from the Scopus database, selected for its broad multidisciplinary coverage, meta-data consistency, and international recognition as a reliable source for studies on higher education and science policy. The search was conducted in August 2025, covering the period from 1991 to 2025, with the aim of capturing the most recent publications related to university internationalization. Filters were applied to restrict the results to original research articles written in English, within the thematic areas of Social Sciences and Education, and explicitly focused on the European context.

The search strategies were designed using Boolean operators and adjusted to Scopus syntax to maximize precision and thematic relevance. The main query combined terms related

to the internationalization of European higher education, such as “higher education internationalization”, “European Higher Education Area”, “Bologna Process”, and “Erasmus+”. Complementary searches focused on academic collaboration and mobility, employing expressions such as “academic mobility”, “co-authorship networks”, and “research collaboration”. Additionally, a specific search was conducted on joint and dual-degree programs, using terms such as “dual degree”, “joint programs”, and “joint degree”.

2.3. Definition of Search String

The search strategy was structured around three main queries applied to the Scopus database, each focusing on a distinct thematic axis of university internationalization: (1) the general dynamics of the process, (2) academic collaboration and mobility, and (3) joint and dual-degree programs. These searches were designed iteratively to ensure both precision and representativeness of the final corpus, taking into account the most relevant knowledge areas related to higher education. Table 1 provides a detailed summary of the search strings, applied filters, and the number of retrieved records in each case (adapted from Scopus, 2025).

Search objective	Query (Scopus syntax)	Applied filters	Records retrieved (n)
Internationalization of European higher education	TITLE-ABS-KEY ("higher education internationalization" OR "internationalisation of higher education" OR "university internationalization") AND TITLE-ABS-KEY ("Europe" OR "European Higher Education Area" OR "EHEA" OR "Bologna Process" OR "Erasmus+") AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English"))	Document type: Articles (Article); Language: English; Subject areas: Social Sciences, Education	104
Academic collaboration and mobility	TITLE-ABS-KEY ("academic mobility" OR "student exchange" OR "faculty mobility" OR "research collaboration" OR "co-authorship networks") AND TITLE-ABS-KEY ("higher education" OR "universities") AND TITLE-ABS-KEY ("Europe" OR "European universities") AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English"))	Document type: Articles (Article); Language: English; Subject areas: Social Sciences, Education	130
Joint and dual-degree programs	TITLE-ABS-KEY ("joint program*" OR "joint degree*" OR "transnational higher education" OR "international partnership" OR "collaborative education program*") AND ("Europe" OR "European universities" OR "Bologna Process") AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English"))	Document type: Articles (Article); Language: English; Subject areas: Social Sciences, Education	179

Table 1. Search string performed in Scopus.

The results show a representative and balanced corpus across the three analytical approaches. The search strings focused on general internationalization and academic collaboration make up the largest share of documents, confirming the central role and ongoing importance of these themes within the recent European scientific agenda. In contrast, the query related to joint and dual-degree programs, although smaller in volume, contributes a highly specialized subset of publications that highlight the curricular and quality-assurance aspects tied to institutional cooperation. This setup ensures consistency between the search design and the study's goals, providing a solid empirical basis for the following bibliometric analyses.

2.4. Data Processing and Normalization

The extracted records were verified and refined prior to analysis. Duplicates and non-relevant documents were removed through manual screening of titles and abstracts. Variations in the spelling of authors, institutions, and countries were standardized, and keywords were harmonized to account for British and American variants (e.g., internationalization/internationalisation). The data were initially organized in Microsoft Excel for cleaning and consolidation, and subsequently processed using VOSviewer (version 1.6.20), a software specialized in constructing and visualizing bibliometric networks. This environment enabled the development of co-authorship, country collaboration, and keyword co-occurrence analyses, applying standardized criteria for frequency and thematic association.

2.5. Bibliometric Indicators

The analysis was structured around three main axes. First, scientific productivity was evaluated in terms of the number of publications per year, growth trends, and the journals with the highest concentration of articles. Second, collaboration networks among authors, institutions, and countries were examined to identify patterns of scientific cooperation and geographical distribution. Finally, thematic clusters derived from keyword co-occurrence analysis were examined to identify emerging conceptual areas

related to university internationalization and dual-degree programs. This indicator structure allowed for a simultaneous assessment of productivity, connectivity, and cognitive organization within the field of study.

2.6. Network Visualization and Analysis

Visualizations were created using the association strength normalization algorithm in VOSviewer, which clusters nodes based on co-occurrence frequency and thematic similarity. Minimum thresholds were set at three occurrences for keywords, two shared co-authorships, and five documents per country or institution. The resulting maps were analyzed considering node density and proximity, enabling the identification of collaboration communities and key thematic clusters within the studied corpus.

2.7. Study Limitations

This study highlights limitations inherent in the bibliometric approach. Relying solely on Scopus may exclude relevant publications indexed in other databases such as Web of Science or Dimensions. Although the dataset covers the entire publication span available up to 2025, some significant studies might remain unindexed or be inconsistently classified across subject areas. Additionally, the quantitative nature of network analysis does not reflect the qualitative or theoretical depth of individual publications. However, the methodology used ensures replicability, transparency, and analytical rigor, providing a strong empirical perspective on the evolution of internationalization and academic cooperation in European higher education.

3. RESULTS AND DISCUSSION

3.1. General Description of the Corpus

The bibliometric analysis identified a representative collection of studies published from 1991 to 2025 that explore the internationalization of European higher education from various angles, including institutional policy, academic cooperation, and curricular integration mechanisms. The total sample, which includes over

300 Scopus-indexed articles, shows that this field has become a well-established and intellectually rich research area.

The temporal evolution of publications reveals a steady and sustained increase in scientific output, with notable rises from the 2010s onward and publication peaks in 2015, 2019, and 2021 (Figure 1). These periods align with

the maturation of the European Higher Education Area (EHEA), the reforms related to the Bologna Process, and the reorganization of mobility strategies following the COVID-19 pandemic. The recent upward trend indicates that internationalization has shifted from a situational or managerial role to a fundamental part of European university policy.

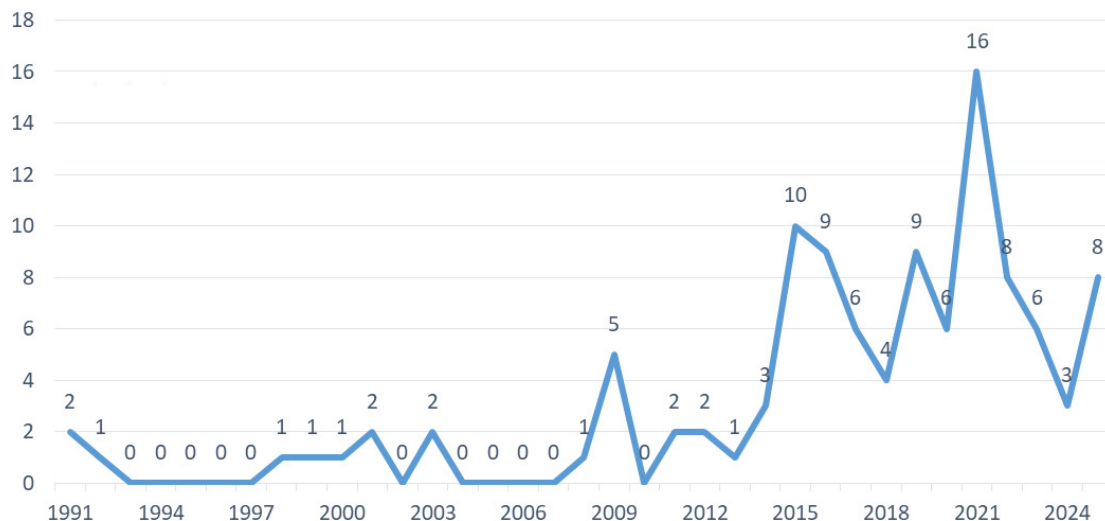


Figure 1. Annual scientific output on the internationalization of European higher education, 1991-2025.

The geographical distribution of author affiliations reveals a predominantly European landscape, marked by considerable internal diversity. The United Kingdom, Spain, Italy, Germany, and France emerge as the most active countries, followed by Portugal, Poland, the Netherlands,

and Sweden (Figure 2). However, the presence of authors affiliated with universities in the United States, South Africa, and Latin America indicates the existence of an intercontinental network of academic dialogue, within which Europe operates as a methodological and conceptual hub.

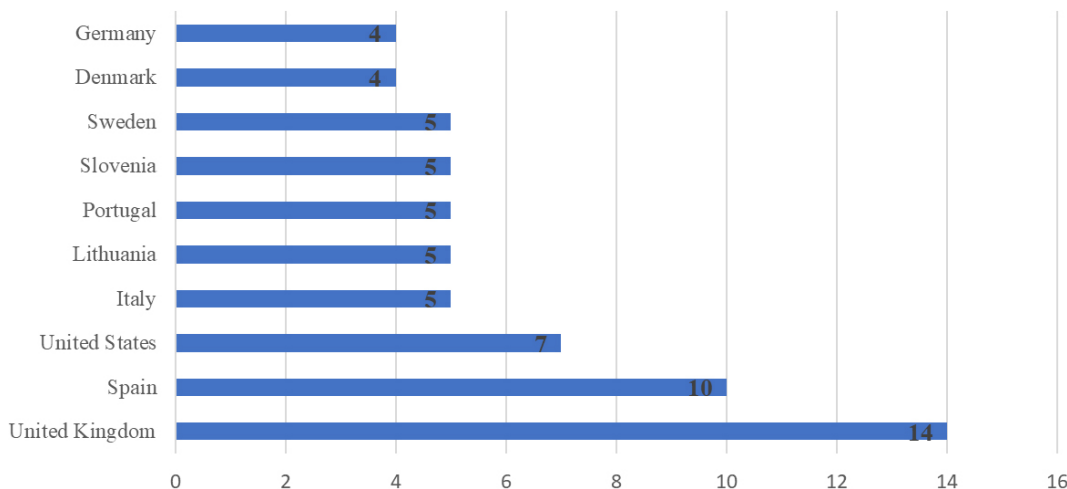


Figure 2. Geographical distribution of authors' affiliations in research on the internationalization of European higher education.

In editorial terms, the publications are concentrated in high-impact journals that address higher education from comparative and governance-oriented perspectives, including the *Journal of Studies in International Education*, the *European Journal of Higher Education*, and the *European Journal of Education*. These outlets constitute the core academic platforms for disseminating European thought on internationalization, articulating empirical evidence with theoretical and critical analysis.

3.2. Scientific Collaboration Analysis

The analysis of authorship and affiliation networks reveals a robust, polycentric, and highly interconnected collaboration structure, composed of three main communities of researchers representing distinct thematic and geographic foci within the field of European higher education internationalization (Figure 3). The

network demonstrates the coexistence of consolidated regional hubs, centered in universities from Western and Northern Europe, alongside a growing intercontinental openness toward collaborations with institutions in the Americas and Africa. The dense and multidirectional links among nodes illustrate a research culture characterized by sustained co-authorship and collective knowledge production, with an average of more than three authors per article. Approximately one-third of the publications involve international co-authorship, confirming the transnational nature of the field and its reliance on collaborative networks that transcend institutional and national boundaries. Collectively, the observed structure suggests a mature scientific ecosystem, in which academic cooperation has become the principal driver of expansion and legitimization of knowledge on higher education internationalization in Europe.

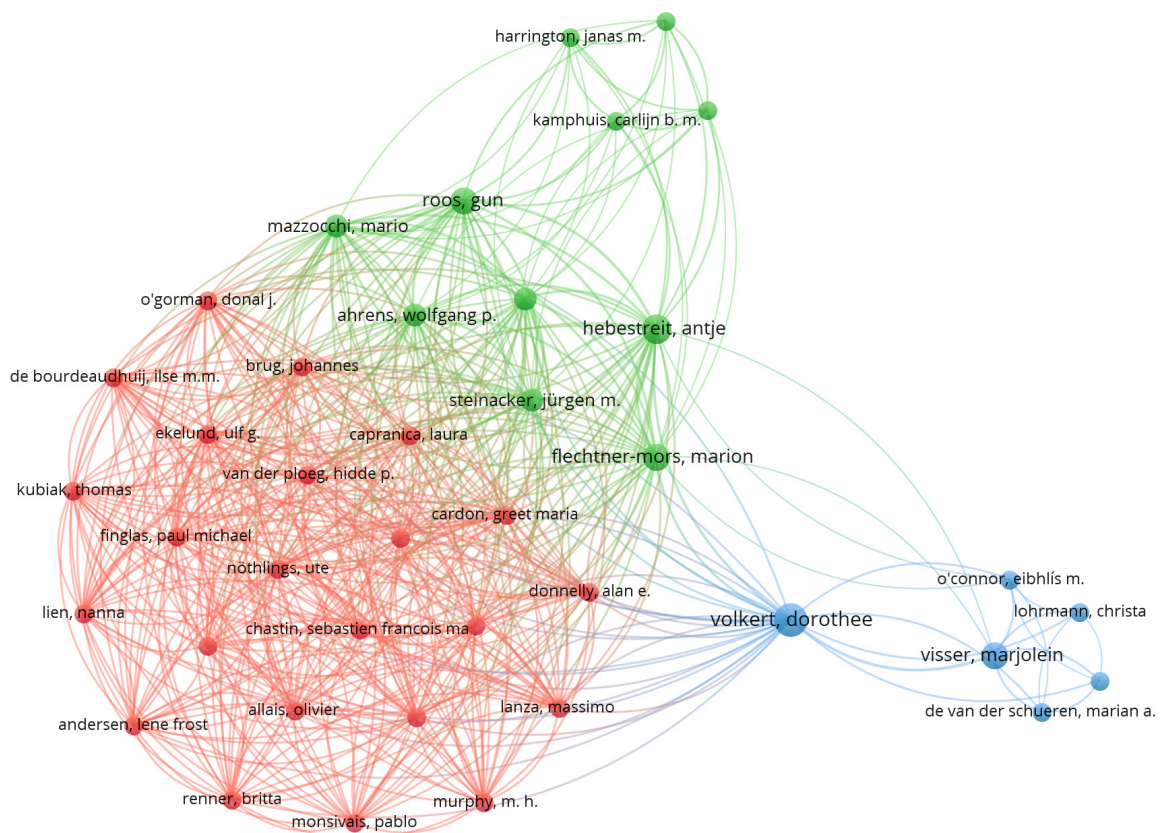


Figure 3. Co-authorship network in European higher education research on internationalization.

The country-level collaboration network shows a highly integrated setup within Europe, with the United Kingdom in a central role as the main transnational link in the research system on higher education internationalization (Figure 4). It is surrounded by Germany, Spain, Italy, and France, forming a dense continental core marked by mutual co-authorship and ongoing joint research projects. On the edges, bridge countries like the Netherlands, Portugal, Poland, and Sweden help sustain the

network's cohesion by connecting regional research groups. Meanwhile, the participation of the United States, Canada, China, and South Africa enhances the intercontinental scope of academic dialogue, strengthening Europe's position as a key methodological and conceptual reference point. From a topological view, the network shows a web-like, non-hierarchical pattern, based on horizontal cooperation and shared academic goals that cross national borders.

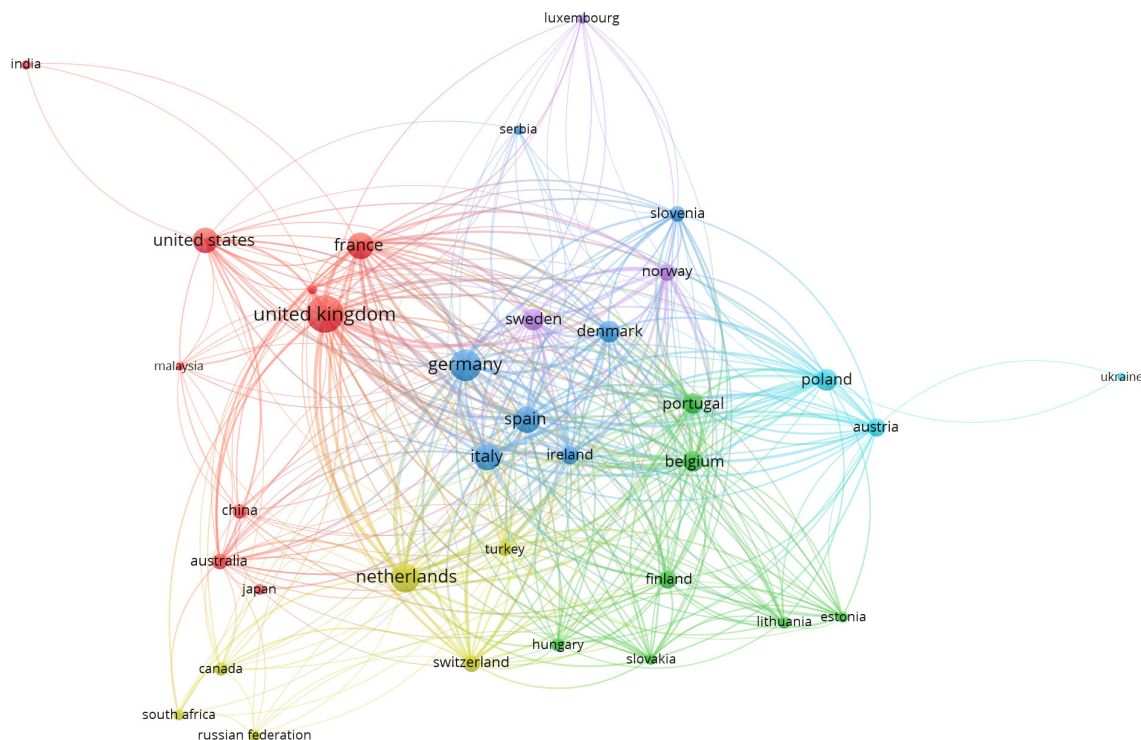


Figure 4. International co-authorship network among countries in European higher education research (VOSviewer visualization).

3.3. Thematic Analysis and Conceptual Evolution

The keyword co-occurrence map created in VOSviewer included 326 nodes (author keywords) and 1,485 links, with a total link strength of 4,932, and was automatically divided into five clusters (Figure 5). Each cluster represents a specific thematic subfield within the broader research on European higher-education internationalization. This co-occurrence map shows a complex semantic structure in which two distinct domains coexist: one directly related to the internationalization of European higher

education, and another with a biomedical and health focus, stemming from multidisciplinary publications indexed in Scopus. This overlap reflects the database's breadth and emphasizes the importance of careful interpretation, differentiating between terms that define the educational field and those that indicate interdisciplinary noise.

In the realm of higher education, the green-blue cluster groups the key terms that form the core of the European Higher Education Area (EHEA): higher education, internationalization, Bologna Process, education area, quality assurance, accreditation, curriculum,

collaboration, and universities. These concepts illustrate how internationalization has shifted from separate initiatives to an established framework of university governance focused on degree comparability, mobility, and quality convergence.

A light-blue cluster links expressions such as European Union, European universities, university sector, teaching, joint programs, and students. This group reflects the operational and cooperative aspects of the process: the integration of educational policies, shared teaching practices, and joint programs that demonstrate intra-European collaboration. Surrounding

these nodes are methodological terms like comparative study, quantitative analysis, and social network analysis, which suggest a growing empirical and analytical focus in the study of internationalization.

The large red cluster, centered on human health, represents a biomedical area outside the scope of this study. Its appearance results from terminological overlaps in Scopus metadata and does not reflect the cognitive structure of higher education research. Therefore, it is seen as interdisciplinary noise, inherent to the multidisciplinary nature of the database.

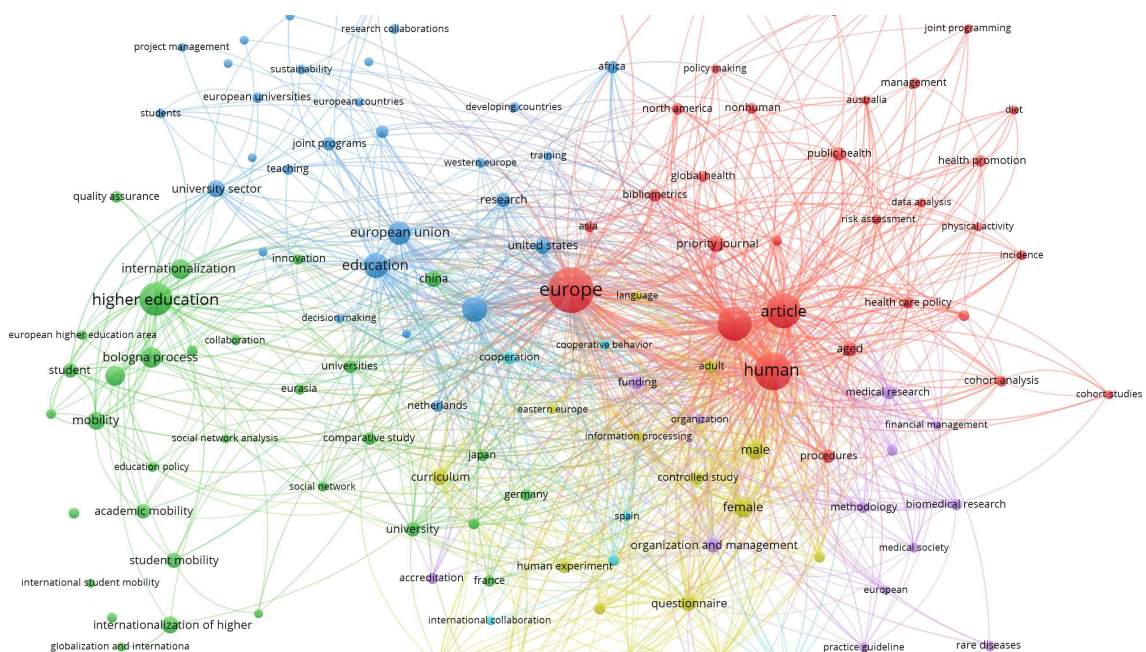


Figure 5. Co-occurrence network of keywords in European higher-education internationalization research.

Note: The map displays the co-occurrence relationships between author keywords (VOSviewer, minimum threshold = 3). Node size denotes keyword frequency; link thickness indicates co-occurrence strength. The green-blue cluster captures the conceptual and institutional core of the European Higher Education Area, whereas the red cluster represents biomedical terms outside the study's scope.

Taken together, the map demonstrates a mature and growing field where internationalization has become a fundamental part of organizational change. The appearance of new terms, such as internationalization at home, virtual exchange, and digital mobility, in publications after 2020 shows how the European system adapts to digitalization and post-pandemic challenges.

In summary, the thematic analysis confirms that the internationalization of European

higher education has shifted from mobility-focused approaches to an institutional model of structured collaboration, supported by quality assurance policies, governance structures, and curriculum convergence mechanisms. Terms such as joint programs, European universities, and collaboration form the core of the field, indicating a more advanced stage of academic integration. This conceptual shift naturally leads toward the programmatic and transnational aspects of the process, embodied in joint and

dual-degree programs, whose development is the most concrete expression of the European Higher Education project.

3.4. Dual-Degree and Transnational Education Focus

The thematic analysis of publications related to transnational education and dual-degree programs shows a cohesive conceptual core within the broader process of European higher education internationalization (Figure 6). The terms higher education, Bologna Process, internationalization/internationalisation, and quality assurance are closely connected with student mobility, Erasmus, academic mobility, and collaboration, forming a relational system in which mobility, institutional cooperation, and quality are the main pillars of the European Higher Education Area (EHEA). This semantic structure

demonstrates that dual-degree programs are not an isolated initiative but rather a practical extension of the organized mobility model, aimed at achieving curriculum convergence and mutual recognition of academic credentials among universities across different countries.

Furthermore, the link between joint programming, international cooperation, and the European Union emphasizes an increasingly transnational aspect, where academic collaboration is formalized through consortia and shared quality frameworks promoted by European policy tools. These findings confirm that joint and dual-degree programs are the most advanced stage of institutional internationalization, with European universities acting as co-creators of knowledge and certification. This helps establish a shared academic space rooted in collaboration, excellence, and intercultural integration.

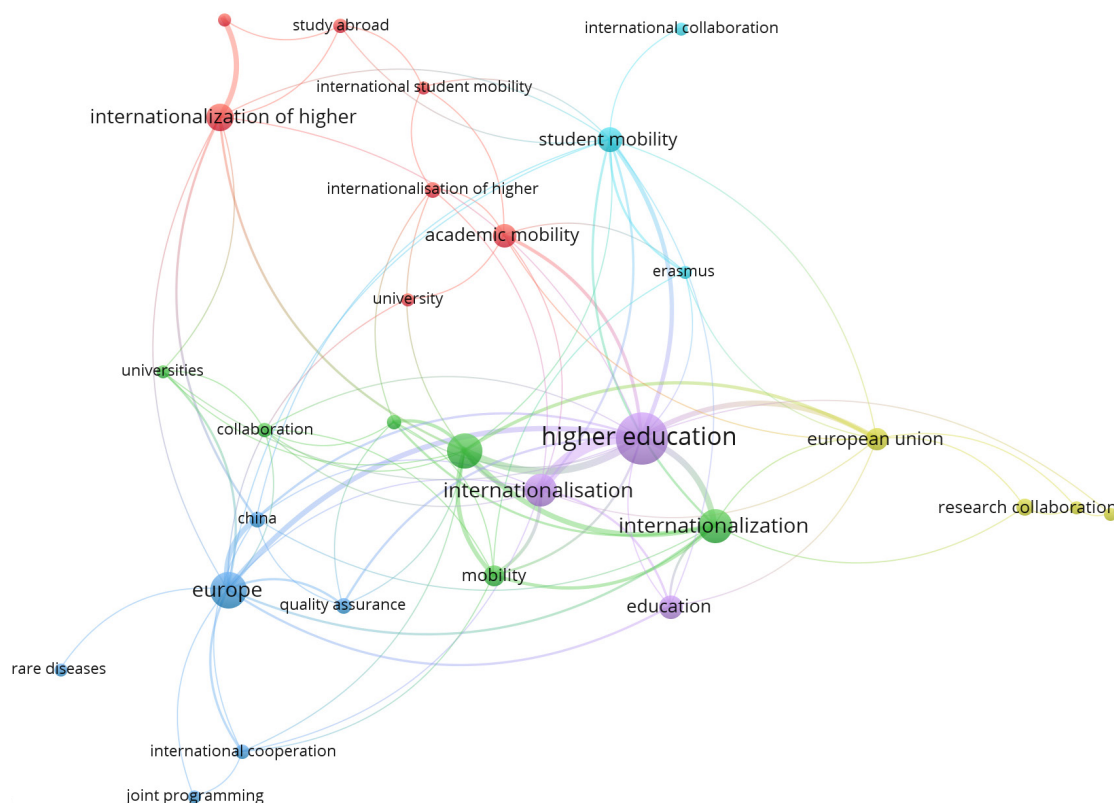


Figure 6. Co-occurrence network of keywords related to joint and dual degree programs in European higher-education research. Note. The map displays the co-occurrence relationships between keywords associated with internationalization, cooperation, and joint programming (VOSviewer, minimum threshold = 2). Node size indicates keyword frequency; link thickness represents co-occurrence strength. The centrality of higher education, the Bologna Process, and internationalization highlights the convergence of mobility, quality assurance, and institutional cooperation within the European Higher Education Area.

4. CONCLUSIONS

The bibliometric analysis confirms that the internationalization of European higher education has developed into a mature and structurally integrated field, marked by dense collaboration networks, a well-established thematic structure, and a clearer institutional focus. Over the past twenty years, research on this process has shifted from purely descriptive approaches centered on mobility to include aspects related to governance, quality assurance, and curriculum convergence, aligning with the long-term goals of the European Higher Education Area (EHEA). The consistent increase in scientific output, along with the dominance of internationally co-authored publications, indicates a stable academic ecosystem rooted in the co-production of knowledge and the strengthening of a shared European epistemic community.

At the conceptual level, the results demonstrate that joint and dual-degree programs represent the most advanced expression of institutional internationalization, as they integrate student mobility, quality frameworks, and cross-border academic cooperation. These initiatives transform cooperation from a policy aspiration into an operational practice that redefines the structure and identity of European higher education. The convergence of terms such as Bologna Process, quality assurance, and international cooperation reflects the consolidation of a European model of transnational academic collaboration, grounded in mutual trust, reciprocity, and the harmonization of standards.

Future studies should deepen this analysis by incorporating qualitative evidence on institutional experiences and policy implementation, in order to better understand the social, cultural, and governance implications of an increasingly interconnected academic space.

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Conflict of interest

The authors declare that there are no conflicts of interest in this work.

Contribution statement

Conceptualization, writing -original draft; writing - review and editing: Bayan Nurgaliyeva, Yermek Komekbayev.

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Validation, visualization: Aigerim Ospanova.

Statement of data consent

The data generated during the study have been included in the article. 

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