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Measuring academic productivity in higher education: A bibliometric analysis of research output and scientific impact

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Abstract

This research presents a bibliometric analysis of academic productivity research in higher education from 2015 to 2025, based on 241 Scopus-indexed journal articles. Using VOSviewer and Biblioshiny, the analysis identifies influential papers, institutions, and countries, revealing that the United States and China are the most productive contributors, with strong international collaborations (23.65% co-authorship). The publication trend shows a steady increase, with no decline during the COVID-19 period, indicating the persistent relevance of this research area. Keyword mapping highlights five key research clusters: scientific productivity, research impact, efficiency measurement, human capital, and institutional factors. Despite advancements, gaps remain in the role of AI, digital transformation, and faculty well-being in academic productivity. Future research should focus on data-driven efficiency models and sustainability in higher education. This investigation offers helpful insights for policymakers and institutions aiming to enhance research productivity and collaboration in academia.

Keywords

Bibliometric, higher education, productivity

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Introduction

In the era of globalization and knowledge-based economies, higher education institutions (HEIs) have increasingly been recognized as key drivers of economic growth, innovation, and societal advancement (Aliane & Salim, 2023; Leijon et al., 2022; Tambovtsev & Rozhdestvenskaya, 2020). Consequently, the global academic landscape has witnessed heightened competition among universities to improve academic performance, research productivity, and scientific impact. This competitive environment has encouraged institutions to adopt comprehensive frameworks and strategies to enhance their research capabilities and scholarly output, critical indicators of institutional prestige, funding opportunities, and global rankings (Halmaghi et al., 2023; Rocconi & Boyd, 2022). Furthermore, measuring the productivity of higher education has become a focal point for stakeholders, including governments, policymakers, funding agencies, and academic leaders, to ensure optimal allocation of resources and to sustain academic excellence.

However, despite substantial investments and strategic initiatives, many institutions encounter challenges in accurately assessing and enhancing academic productivity (Işık et al., 2024; Liang & Chen, 2024). Academic productivity remains multifaceted and complex, encompassing various dimensions such as publication volume, citation counts, impact factor, collaboration networks, and research quality (Hulou et al., 2024; Stuebe et al., 2025). Problematically, many factors often influence these diverse dimensions, including funding availability, institutional culture, research infrastructure, and faculty development programs (Stuebe et al., 2025). Moreover, discrepancies in measuring productivity can lead to misunderstandings, ineffective policy decisions, and misallocation of resources, undermining institutional goals and overall academic quality. Consequently, there is a critical need for standardized, reliable, and comprehensive methods to assess academic productivity better to inform institutional practices and policy interventions.

In response to these challenges, bibliometric analysis emerges as a highly valuable and widely adopted approach to systematically evaluating research and scientific impact within higher education contexts (Ganga-Contreras et al., 2024; Ghaith et al., 2023). This methodological framework facilitates a more profound understanding of institutional research performance, the identification of influential scholars and research groups, and the evaluating of knowledge dissemination and collaboration patterns at national and global scales. Thus, bibliometric analysis offers a transparent, replicable, and data-driven approach that effectively captures the multidimensional nature of academic productivity.

This bibliometric analysis aims to systematically evaluate and visualize the trends, characteristics, and scientific impact of research output related to academic productivity in higher education from a global perspective. Specifically, this research addresses the following research questions: (1) Who are the most influential papers, institutions, and countries contributing to academic productivity research, and what collaboration patterns exist among them? (2) What are the prominent research trends and themes in academic productivity literature from 2015 to 2025? (3) What gaps and emerging directions can be identified for future research based on bibliometric insights?

Ultimately, this research contributes to academic discourse by providing a comprehensive bibliometric synthesis, highlighting significant developments, and offering

actionable insights for researchers, institutional leaders, and policymakers aiming to enhance academic productivity and scientific impact within the higher education sector.

Methodology

Research design

This research employed a bibliometric approach, a quantitative method commonly used to systematically map and analyze trends in scientific publications (Abbas et al., 2022; Ganga-Contreras et al., 2024). This approach allowed researchers to assess scientific productivity, identify research gaps, visualize relationships among authors, institutions, and keywords, and explore the scientific impact of academic research in a structured and objective manner (Tigre et al., 2023; Yoon & Chae, 2022). Specifically, this bibliometric analysis investigates research productivity in higher education, focusing on research outputs and their scientific impact from 2015 to 2025.

Data source and search strategy

The data used in this research were collected from Scopus, one of the most extensive and authoritative databases of peer-reviewed literature, providing comprehensive indexing of academic publications across various disciplines globally (Martín et al., 2020; Lukman et al., 2018). Scopus was chosen due to its extensive coverage, credibility, and reliability in indexing high-quality scientific publications, making it an ideal database for rigorous bibliometric analysis (Rejeb et al., 2023; Suyo-Vega et al., 2022). A structured search with specific keyword combinations was used to capture relevant publications accurately. The search query used was: Productivity AND (lectur* OR "higher education"). The keywords were applied to the 'Keyword' field within the Scopus search system, ensuring targeted retrieval of publications explicitly addressing academic productivity in higher education.

Inclusion and exclusion criteria

Initially, the search strategy yielded a total of 412 publications. Inclusion criteria were applied to ensure relevance and accuracy aligned with the research objectives. Specifically, the inclusion criteria set for this bibliometric analysis were:

- Publication Year: Articles published between 2015 and 2025 were included to provide a contemporary and timely perspective on research productivity.
- Publication Type: Only articles published in peer-reviewed journals were considered, thus excluding book chapters, conference proceedings, editorials, reviews, and other non-journal publications.
- Language: Publications had to be written exclusively in English to maintain consistency and clarity in analysis.

Applying these criteria, the final number of publications selected for analysis was reduced from 412 to 241 articles.

Data analysis tools

For bibliometric analysis, two primary software tools were utilized:

- VOSviewer: A bibliometric software program for visualizing and mapping bibliometric networks. VOSviewer was specifically utilized to visualize networks among authors, institutions, countries, and keywords to effectively identify patterns and relationships in the research area.
- Biblioshiny: A bibliometric analysis tool based on R, providing robust analytical capabilities to produce descriptive bibliometric indicators, including annual publication trends, citation analysis, thematic mapping, and comprehensive performance analysis of journals, authors, and institutions.

These analytical tools complement each other, ensuring visual and statistical representation of bibliometric findings, thus enabling in-depth interpretation and discussion.

Findings

Influential contributors

Before discussing the influential contributors in this study, which include the most highly cited articles and the countries with the highest number of publications, we first present an overview of the search results, as illustrated in Figure 1. The bibliometric analysis conducted in this research covered publications from 2015 to 2025, consisting of 241 journal articles sourced from 164 different academic journals. Seven hundred thirty-five authors contributed to these publications, with only 28 single articles authored. International co-authorship accounted for 23.65%, indicating considerable global collaboration within this research area. The average number of co-authors per article was approximately 3.24, highlighting a collaborative tendency in studies on academic productivity. These documents referenced 11,410 sources, and authors employed 849 unique keywords. Additionally, the average age of the cited documents was 4.4 years, and each document received an average of 13.49 citations, suggesting moderate scholarly impact and visibility within academic communities.

Figure 1. *Search result*

The data highlight important insights regarding the scholarly activity and collaborative nature of research on academic productivity in higher education. The average annual growth rate of 2.26% suggests a steady yet moderate increase in attention toward this research topic. The significant presence of international collaboration (23.65%) demonstrates global recognition of the issue, indicating that academic productivity is an area of interest across diverse

geographic contexts. Moreover, the relatively high average citations per document (13.49) reflect that articles in this area have a considerable impact within the scientific community, underscoring the importance and relevance of academic productivity studies in informing policy and practice in higher education. However, the relatively small proportion of single-authored articles (11.62%) compared to multi-authored ones indicates a strong preference for collaborative approaches, likely due to the interdisciplinary nature of productivity research and the complexity of factors involved.

To determine the most influential articles within this study, we conducted a citation analysis of 241 research articles related to the topic. This analysis identified the 10 most cited articles, which reflect the highest scholarly impact and serve as key references within the field. These highly cited works have significantly contributed to developing and directing research on this topic. A detailed summary of these influential publications is presented in Table 1 below.

Table 1. *Most cited document*

No	Author	Title	Number of citations
1	Chen et al. (2023)	Artificial Intelligence (AI) Student Assistants in the Classroom: Designing Chatbots to Support Student Success	218
2	Che and Zhang (2018)	Human Capital, Technology Adoption and Firm Performance: Impacts of China's Higher Education Expansion in the Late 1990s	154
3	Mohd Rahim et al. (2022)	AI-Based Chatbots Adoption Model for Higher-Education Institutions: A Hybrid PLS-SEM-Neural Network Modelling Approach	123
4	Kwiek (2016)	The European research elite: a cross-national study of highly productive academics in 11 countries	120
5	Upadhyaya & Vrinda (2021)	Impact of technostress on academic productivity of university students	119
6	Lacka et al. (2021)	Can digital technologies improve students' efficiency? Exploring the role of Virtual Learning Environment and Social Media use in Higher Education	108
7	Cattaneo et al. (2016)	Performance-based funding and university research productivity: the moderating effect of university legitimacy	77
8	Leišytė (2016)	New public management and research productivity – a precarious state of affairs of academic work in the Netherlands	75
9	Meseguer-Sánchez et al. (2020)	Examining the Research Evolution on the Socio-Economic and Environmental Dimensions of University Social Responsibility	74
10	Afrianty et al. (2022)	Working from home effectiveness during Covid-19: Evidence from university staff in Indonesia	60

Table 1 shows the top ten most-cited documents related to academic productivity in higher education within the dataset analyzed. The most cited publication is by Chen et al. (2023), receiving 218 citations, highlighting significant interest in AI-driven student support systems. Following closely is Che and Zhang (2018), with 154 citations, emphasizing the impact of human capital and technology adoption on educational outcomes. Studies focusing on digital technologies and productivity (e.g., Mohd Rahim et al., 2022; Lacka et al., 2021) demonstrate growing scholarly attention toward technological innovation as a crucial driver of academic productivity. The variation of topics from technostress to public management and research funding indicates the multifaceted nature of factors influencing productivity in higher education. This citation distribution confirms not only the interdisciplinary characteristic of the field but also suggests a clear scholarly preference toward research integrating technology, policy implications, and organizational effectiveness in universities.

Furthermore, to identify the countries with the highest publication productivity in the study area, the researchers present the top 10 countries with the most significant research publications. These countries firmly commit to advancing scholarship on the topic and play a central role in shaping the global research landscape. A detailed overview of their contributions is provided in Figure 2 below.

Figure 2. *Most productive country*

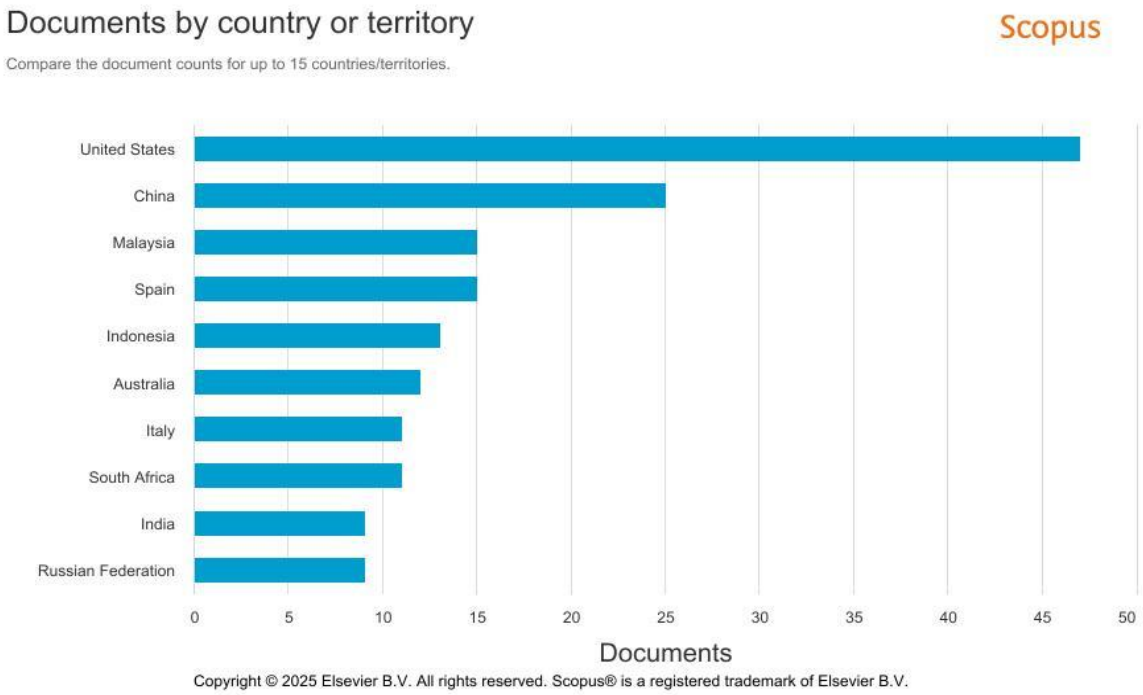


Figure 2 above illustrates the most productive countries in academic research on productivity in higher education, based on Scopus-indexed publications. The United States is the most prolific country, producing the most documents, followed by China, which demonstrates vigorous research in this field. Malaysia, Spain, and Indonesia emerge as notable contributors,

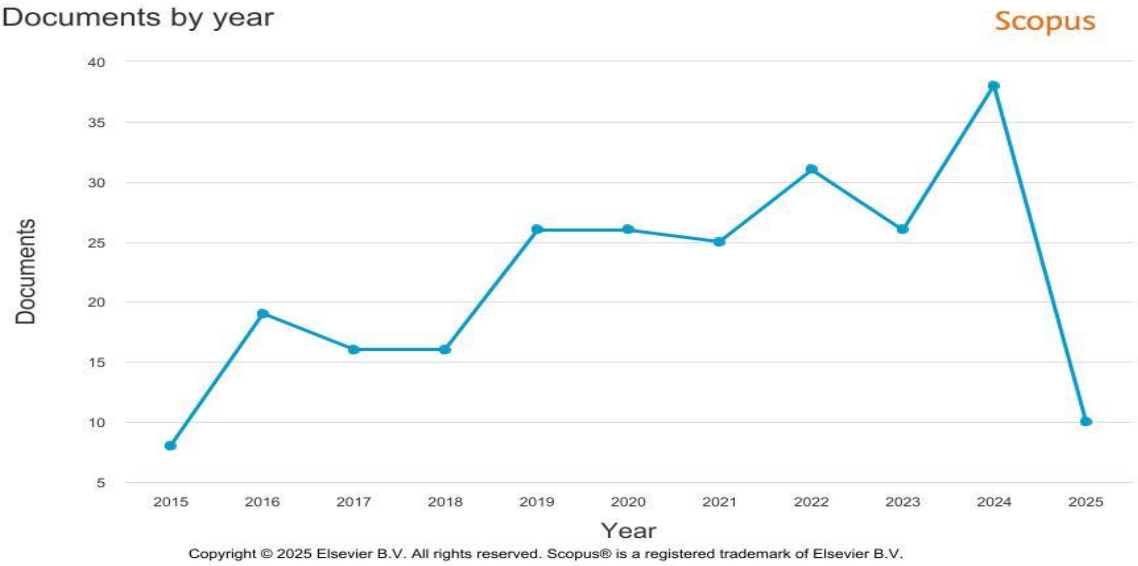
indicating growing academic engagement from developed and developing nations. Australia, Italy, South Africa, India, and Russia contribute significantly, reflecting the global interest in studying academic productivity. The dominance of the US and China suggests their substantial investments in higher education research and policy. On the other hand, as the researchers mentioned, the most cited article is in Table 1. Chen et al. (2023).

Chen et al. (2023) originated from the United States, while Che and Zhang (2018) originated from China. The presence of countries like Malaysia and Indonesia highlights the increasing scholarly output from emerging academic hubs. This distribution suggests that academic productivity research is a globally relevant topic, with contributions from both Western and non-Western countries, fostering diverse perspectives and approaches.

Research trends and themes

Figure 2 illustrates the publication trend of research on academic productivity in higher education from 2015 to 2025. The number of documents published annually shows a general upward trend, with some fluctuations. The initial years (2015–2018) saw a steady increase, followed by a significant rise in 2019. The number of publications remained relatively stable between 2019 and 2021 before experiencing another increase in 2022. A peak is observed in 2024, marking the highest publication count in the dataset. However, the sharp decline in 2025 can be attributed to incomplete data for that year, because the data search process was carried out in March 2025.

Figure 3. *Publication trend*

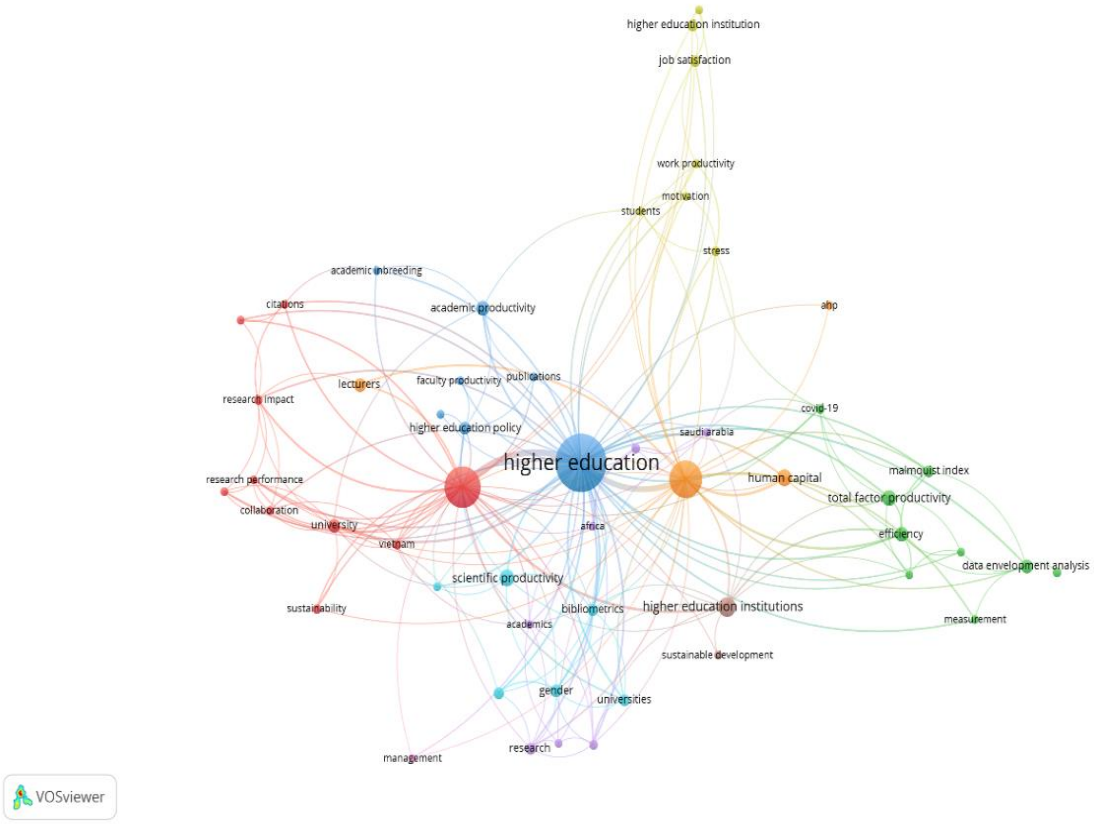


The trend indicates a growing academic interest in productivity in higher education, with a notable increase in publications over the years. There is no apparent decline during the COVID-19 pandemic (2020–2021). Instead, publication output remained stable, indicating

that research in this field received significant attention even amidst global disruptions (Siani, 2024; Tang, 2023). This suggests that higher education productivity remained a critical topic during the pandemic, possibly due to shifts in academic work structures, remote learning, and institutional adaptations to new educational environments. The increasing trend of post-pandemics further signifies that discussions on academic productivity have become even more relevant, likely driven by evolving challenges and policy changes in higher education institutions worldwide.

To further explore the underlying research themes within this field, we employed VOSviewer to conduct a network visualization analysis (Hamidah et al., 2020; van Eck & Waltman, 2010). This tool enabled us to map the research output into clusters of related topics, thereby revealing the intellectual structure and thematic focus areas within the literature (Suherman et al., 2023). The resulting visualization illustrates key terms' relationships and co-occurrence patterns, offering helpful details about dominant and emerging themes. The network visualization is presented in Figure 3 below.

Figure 4. *Research network visualization*



The network visualization above highlights key research themes and their interconnections in academic productivity within higher education. The central and most dominant node, "higher education," suggests that this is the primary research focus, with various related terms

branching out. The visualization illustrates strong linkages between productivity-related topics such as academic productivity, scientific productivity, research impact, and higher education policy, indicating a significant scholarly interest in evaluating performance and impact within the academic sector. The presence of human capital, efficiency, sustainability, and collaboration suggests that discussions on productivity are not solely limited to publication output but also encompass broader institutional, policy, and workforce-related dimensions. The network structure shows clusters of related terms, highlighting interdisciplinary and cross-thematic collaborations in this research domain.

From the visualization, we can identify distinct research clusters representing different thematic areas:

a. Blue Cluster (Higher Education & Scientific Productivity)
   This cluster revolves around higher education, scientific productivity, bibliometrics, and universities, indicating studies focused on measuring and assessing academic productivity using bibliometric approaches.
b. Red Cluster (Academic Productivity & Research Impact)
   This cluster includes terms like "academic productivity," "citations," "lecturers," "collaboration," and "research performance," highlighting studies on individual and institutional productivity metrics, citation impact, and collaborative research efforts.
c. Green Cluster (Efficiency & Measurement Methods)
   This cluster contains keywords such as efficiency, total factor productivity, data envelopment analysis, and measurement, reflecting research that applies quantitative approaches to assess academic efficiency and performance.
d. Orange Cluster (Human Capital & Institutional Factors)
   This cluster features terms such as "human capital," "job satisfaction," "work productivity," and "motivation," indicating research on workforce-related aspects of academic productivity, including faculty development and well-being.
e. Yellow Cluster (COVID-19 & Productivity Challenges)
   This cluster contains keywords like "COVID-19," "stress," and "students," suggesting research focusing on the impact of the pandemic on academic productivity, mental well-being, and institutional adjustments.

Each cluster represents a unique yet interconnected aspect of academic productivity research, demonstrating a multidimensional approach in studying higher education efficiency, impact, and challenges.

Future research recommendations

Based on the findings and analysis that have been discussed previously. Future research should explore the impact of digital transformation on academic productivity in higher education. The current research mapping highlights strong connections between higher education, scientific productivity, and collaboration, yet the role of digitalization in enhancing academic performance remains underexplored. Investigating the influence of artificial intelligence (AI), data analytics, and digital research tools on faculty productivity could provide valuable insights. Studies could examine how e-learning platforms, AI-driven academic assistants, and digital collaboration tools contribute to research efficiency, publication output,

and interdisciplinary networking. Comparative research across different regions could also reveal disparities in digital adoption and its effectiveness in improving academic productivity.

Another promising research avenue involves analyzing the role of human capital and work productivity in academic performance. Network visualization shows strong linkages between human capital, job satisfaction, and work productivity, indicating that institutional policies and faculty well-being play crucial roles in research output. Future studies could focus on how faculty motivation, workload distribution, and stress management impact productivity, particularly in different educational systems worldwide. Additionally, an in-depth investigation into the effects of remote work, tenure policies, and institutional support programs could provide valuable policy recommendations for universities seeking to enhance faculty performance while maintaining well-being and job satisfaction.

Lastly, future research should explore efficiency and sustainability in higher education institutions. The research network suggests that efficiency, sustainability, and data envelopment analysis are key topics related to academic productivity, yet further exploration is needed. Studies could apply quantitative efficiency measurement techniques such as Data Envelopment Analysis (DEA) and machine learning models to assess how universities manage their resources to optimize research outcomes. Furthermore, research could investigate how sustainable academic policies, such as green campus initiatives, open-access research dissemination, and ethical research funding models, contribute to long-term institutional productivity. Understanding these relationships could help universities develop more efficient, sustainable, and impactful academic environments.

Discussion

The measurement of academic productivity in higher education has increasingly become a subject of theoretical and practical concern, especially in the last five years, when global challenges and institutional transformations have reshaped expectations of universities. Central to this discussion is the recognition that productivity in academic settings cannot be reduced to simplistic counts of publications; rather, it is a multidimensional construct that reflects research quality, scientific impact, human capital development, and societal contributions. Several theoretical perspectives provide a foundation for understanding these complexities.

A dominant framework remains the human capital theory, which posits that investment in education and training enhances the productivity of individuals and institutions. Recent empirical studies have reaffirmed that higher education is one of the most significant drivers of human capital accumulation and national productivity (Sain, 2023; Wang & Liu, 2011). In this sense, academic productivity is not merely an outcome of individual faculty research but a reflection of the institutional role in building capabilities that spill over into economic growth, innovation, and social mobility. This resonates with Becker's classical formulations, but contemporary applications increasingly focus on how higher education systems contribute to societal well-being and sustainable development.

Alongside human capital theory, the firm's resource-based view (RBV) has been adapted to the context of higher education. Much like organizations in the private sector, universities compete for scarce resources such as funding, faculty talent, and infrastructure. According to the RBV, productivity depends on effectively mobilizing these resources to generate outputs

of enduring value. Recent studies highlight how the strategic management of academic resources, including digital technologies and research collaborations, can enhance higher education institutions' efficiency and visibility (Çelik, 2024; Kokkinopoulou et al., 2025). This framework shifts attention away from outputs toward the processes and capabilities that enable sustained academic performance.

Another influential approach is institutional theory, which emphasizes how external norms, policies, and legitimacy pressures shape academic behavior. In many systems, productivity is measured through performance-based funding models, accreditation requirements, or global ranking criteria. This theoretical lens explains why universities often converge toward similar publication and citation practices across different cultural and economic contexts. Institutional theory also helps to account for the phenomenon of "publish or perish," where conformity to external evaluation systems can create unintended consequences, such as prioritizing quantity over quality (Bedoya-Gonzales et al., 2024). Recent literature suggests that while institutional pressures can drive improvements in measurable productivity, they also risk narrowing academic agendas and discouraging risk-taking research.

The theory of academic capitalism further enriches the debate by framing productivity within the dynamics of marketization. Universities today operate in increasingly competitive environments where knowledge production is tied to funding opportunities, partnerships with industry, and global reputation. Research productivity, therefore, is not only an academic concern but also a strategic asset that shapes institutional prestige and financial sustainability. Recent analyses demonstrate how universities leverage research impact metrics to strengthen their positions in global rankings, attract international students, and secure partnerships (Aristovnik et al., 2023). While this may improve visibility and resources, it also raises normative questions about balancing academic autonomy and market imperatives.

A recent addition to the theoretical landscape is the sustainability perspective, which situates academic productivity within the broader agenda of the United Nations' Sustainable Development Goals (SDGs). Universities are increasingly evaluated not just on their ability to generate research outputs, but also on their contributions to solving pressing societal problems. This shift is evident in how productivity is linked to sustainable development, environmental impact, and social equity (Leal Filho et al., 2019; Sain, 2023). This perspective challenges the traditional bibliometric focus and calls for more holistic frameworks that recognize the role of higher education in advancing global public goods.

Finally, the resilience and adaptability perspective became prominent after the COVID-19 pandemic. Theories of organizational resilience suggest that productivity should also be measured by the capacity of institutions to adapt under crises, maintaining continuity in teaching and research while innovating in methods and delivery. The pandemic revealed that academic productivity is vulnerable to external shocks and that universities can rapidly reorient toward digital platforms and interdisciplinary collaboration (Aristovnik et al., 2023; Myers et al., 2020). This highlights the need to incorporate adaptability and flexibility into conceptual productivity models.

These theoretical perspectives demonstrate that academic productivity in higher education is a multifaceted construct shaped by individual, institutional, and systemic dynamics. Human capital theory explains the developmental value of higher education; the resource-based view emphasizes capabilities and resources; institutional theory highlights

external norms and legitimacy; academic capitalism underscores the role of market forces; sustainability perspectives connect productivity to societal outcomes; and resilience theory stresses adaptability in times of disruption. Each of these frameworks provides unique insights. They collectively suggest that productivity must be assessed not solely in terms of bibliometric outputs but as part of a complex ecosystem where universities serve as generators of knowledge, engines of human capital, and agents of social transformation.

Conclusion and Recommendations

This bibliometric analysis provides a comprehensive overview of academic productivity research in higher education from 2015 to 2025, highlighting influential contributions, research trends, and future directions. The most influential papers include Chen et al. (2023), Che and Zhang (2018), and Mohd Rahim et al. (2022), while the most productive countries are the United States, China, Malaysia, Spain, and Indonesia, with strong international collaborations (23.65%). The publication trend shows a steady increase, particularly in 2019, 2022, and 2024, and no decline during COVID-19, indicating continued relevance despite global disruptions. Research mapping using VOS viewer reveals key themes such as higher education and scientific productivity, academic research impact, efficiency measurement, human capital, and COVID-19 challenges, suggesting an interdisciplinary approach to productivity studies. However, gaps remain in understanding the role of artificial intelligence, data analytics, and digital transformation in academic performance and the impact of human capital, faculty well-being, and institutional policies on research productivity. Future studies should explore efficiency and sustainability in higher education management using advanced methodologies like Data Envelopment Analysis (DEA) and machine learning to optimize institutional performance. Addressing these gaps offers valuable insights for policymakers and academic institutions striving to enhance productivity while fostering a sustainable and collaborative academic environment.

Disclosure statement

The authors declared no potential conflicts of interest.

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