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Education and Economics: Two Decades of Research (2000–2020)

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ABSTRACT

The relationship between education and economics is well-established and has been extensively studied by numerous authors over time. However, bibliometric analyses combining these two concepts remain limited. This article aims to address this research gap. Using RStudio, documents published between 2000 and 2020 in the Web of Science database on the topics of education and economics were analyzed. The dataset included 8,635 publications over the two decades. The findings reveal intriguing trends in thematic evolution and international collaborations, providing valuable insights into the intersection of education and economics.

1. Introduction

Education serves as a fundamental driver of societal development, influencing various aspects that contribute to human well-being, either directly or indirectly. Similarly, the economy plays a vital role as a cornerstone of every nation's progress and development. The interplay between these two domains—education and the economy—has been a focal point of academic inquiry, with numerous studies investigating how one influences the other. Moreover, analyses examining the impact of different levels of education on economic outcomes have provided valuable insights into this relationship.

Education and the economy are interconnected forces that shape multiple sectors of activity and significantly impact overall societal well-being. This interconnectedness is evidenced by the breadth of research addressing the dynamics between these two domains, as well as the evolving themes explored by scholars over time.

Bibliometric analysis provides a powerful tool for understanding thematic trends, mapping the evolution of scholarly publications, and uncovering collaboration networks among researchers. In this regard, the article aims to conduct a bibliometric analysis of the education-economy nexus over the past 20 years. By doing so, it seeks to identify key trends, influential works, and collaboration patterns while addressing existing gaps in the literature.

2. Literature review

The relationship between education and economics is a vital and widely studied topic in academic research. Numerous authors have analyzed this connection from different perspectives, including Hanif and Arshed (2016), Benos and Zotou (2014), Barro (2013), Breton (2013), Aghion et al. (2009), Hanushek and Woessmann (2007), and Meulemeester and Rochat (1995).

Hanif and Arshed (2016), in their study titled "Relationship between School Education and Economic Growth: SAARC Countries," explore the impact of primary, secondary, and tertiary education on economic growth in SAARC nations. Using panel data analysis from 1990 to 2013, they find that secondary and tertiary education positively influence GDP, whereas primary education has a negative effect. Their results emphasize the need for SAARC countries to invest in higher education to enhance economic development.

Aghion et al. (2009) analyze how education investments influence economic growth across U.S. states. They distinguish between "high brow" education, fostering technological innovation, and "low brow" education, supporting technological imitation. Their findings suggest that investments in higher education are particularly beneficial for states closer to the technological frontier, while basic education is more impactful for states further behind, highlighting the importance of context-specific education policies.

Meulemeester and Rochat (1995) similarly emphasize the role of human capital in driving economic growth, underscoring the need for policy interventions to enhance education and achieve sustainable

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development. Benos and Zotou (2014) find that the effect of education on growth depends on factors like education spending, political measures, and data type, reflecting the complexity of the education-economy relationship.

Barro (2013) highlights the significant positive impact of secondary and higher-level male education on growth, as these workers complement technological advancements. Female primary education indirectly boosts growth by reducing fertility rates, but higher female education remains underutilized in many labor markets. His findings also point to the importance of education quality, measured through test scores in science, math, and reading, over mere years of schooling.

Breton (2013) demonstrates that education directly increases worker productivity and indirectly enhances physical capital productivity. In less-educated countries, education has higher marginal returns (over 50%) compared to more developed nations (around 10%). He stresses the importance of public investment in primary and secondary education, particularly in poorer countries, to achieve substantial economic returns.
While many studies focus on the relationship between education and economic growth, few adopt a bibliometric perspective. Agasisti and Petrenko (2022), in their bibliometric analysis "Higher Education and Economic Development: A Bibliometric Analysis 1985–2022," examine the evolving role of higher education in driving economic development. Their findings highlight key trends, influential publications, and the interdisciplinary nature of the field, underscoring the importance of continued research to inform policies and practices.

Given that existing studies often focus on higher education or specific aspects of the education-economy nexus, this study aims to address the gap by performing a bibliometric analysis of the broader relationship between education in general and economics. Using the Web of Science database, we explore trends and patterns to provide a comprehensive understanding of this critical relationship.

3. Methodology

This bibliometric analysis explores the intersection of "Education" and "Economics" using data collected from a comprehensive academic database - Web of Science.

To ensure the most relevant and high-quality results for the bibliometric analysis, an advanced search strategy was conducted in the Web of Science Core Collection. The query TS=("education" AND "economics") was used, targeting titles, abstracts, and keywords to capture documents that directly address the intersection of these two fields. The time frame was set from January 1, 2000, to January 1, 2020, to provide a comprehensive overview of two decades of research. The search focused on peer-reviewed articles, reviews, and conference proceedings, ensuring the inclusion of rigorously validated academic work. Only English-language publications were considered to maintain consistency in the analysis, and metadata such as authors, abstracts, keywords, affiliations, and funding information were exported for in-depth exploration.

To enhance the analysis, additional filters were applied, including research areas (education, economics, and social sciences) and document types. Citation metrics, including usage counts, highly cited papers, and hot papers, were retrieved to evaluate the academic impact of the publications. Exported data included details on funding sources, publisher information, and open access status, enabling a detailed understanding of dissemination and financial patterns. These criteria ensured a focused and thematically relevant dataset, laying a robust foundation for uncovering trends, thematic clusters, and collaboration networks within the field of education and economics.

A total of 8,635 documents from 4,160 unique sources were analyzed (see Fig. 1), encompassing research articles, reviews, and conference proceedings. The keywords "Education" and "Economics" were used to refine the dataset, which also included 19,243 authors, highlighting the scale and diversity of the academic output in this field.

The analysis was conducted using the bibliometrix R package, leveraging its robust functionalities for bibliometric evaluation. Descriptive analysis focused on key metrics such as the annual growth rate of 7.05%, co-authorship trends (average of 2.59 co-authors per document), and the extent of international collaboration (14.42%). Additionally, a citation analysis revealed an average of 17.42 citations per document, indicating the impact of this body of research. Keyword analysis of 18,079 terms provided insights into thematic trends, while the 244,302 references cited in these documents allowed for an understanding of the field's foundational literature.

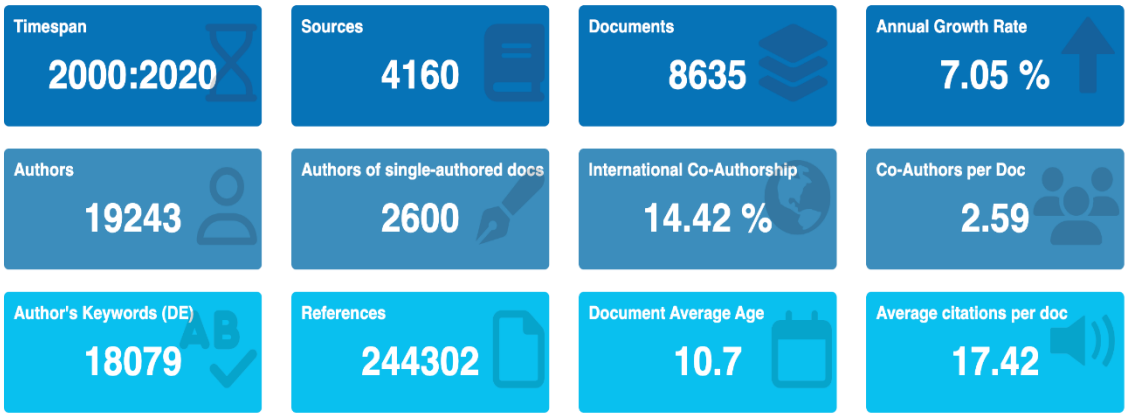

Figure 1. Main information

Source: Author's own computation

4. Findings and Discussion

4.1 Evolution of scientific production and average citations

The annual scientific production in the field of education and economics has shown a clear upward trend from 2000 to 2019. The graph indicates steady growth in the number of articles published per year, reflecting an increasing academic interest and investment in this interdisciplinary area.

From 2000 to approximately 2008, there is a gradual increase in publications, suggesting a growing but modest engagement with the topic. Post-2008, there is a marked acceleration in the number of articles, which could be attributed to the global financial crisis and its impact on education and economics, sparking more research and discussions. The peak around 2018–2019 demonstrates the height of scholarly activity, possibly fueled by emerging global challenges such as education reforms, technological advancements, and economic sustainability.

The sudden drop in 2020 is notable and likely reflects disruptions caused by the COVID-19 pandemic, which affected research activities, publication timelines, and academic priorities worldwide. This decline may also indicate a temporary shift in focus to pandemic-related issues, diverting attention from the usual research agendas.

This trend suggests that the field of education and economics is dynamic and closely tied to global economic and social events, making it a critical area of study with fluctuating academic engagement.

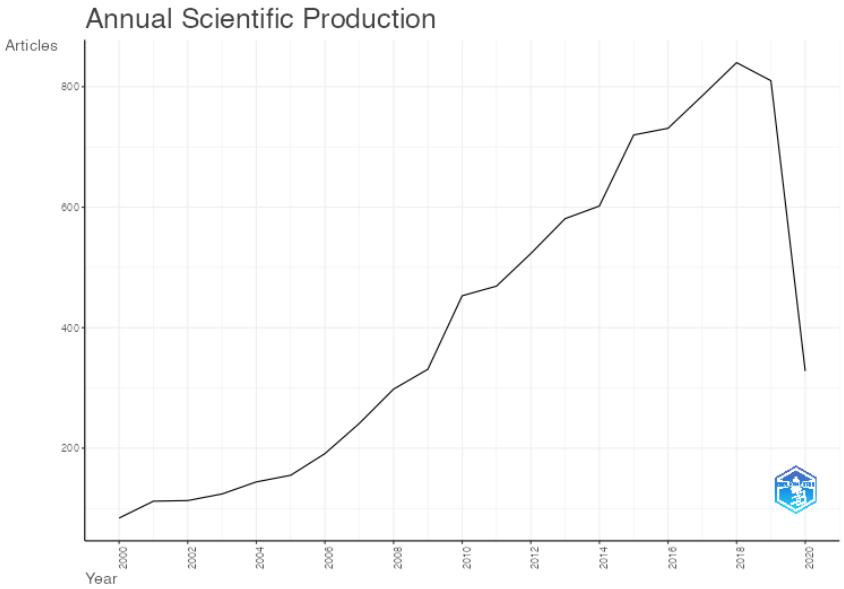

Figure 2. Annual Scientific Production

Source: Author's own computation

The analysis of annual scientific production and average citations per year (see Fig. 2) reveals an interesting relationship between the quantity of research output and its impact in terms of citations. From 2000 to 2019, the scientific production in the field of education and economics shows a steady increase, particularly

accelerating after 2008. This growth indicates a rising interest in the field, likely driven by global events such as the financial crisis, which brought attention to the economic dimensions of education.

However, the average citations per year exhibit fluctuations that do not directly correlate with the growth in production. For example, while production steadily rises, citations peak and dip in irregular patterns, suggesting that not all publications achieve high impact. Peaks in citations may coincide with influential works or landmark studies that receive broader recognition, whereas dips could reflect periods where a larger number of less-cited studies dilute the overall average. Additionally, the decline in citations around 2020 might be due to the delayed impact of recent publications, as citation accumulation often takes time.

This disparity highlights that while the volume of research in education and economics is increasing, the citation impact is influenced by the quality, relevance, and timeliness of specific publications rather than the sheer quantity of output. These findings suggest that promoting impactful research and fostering collaborations could help bridge the gap between production and citation impact.

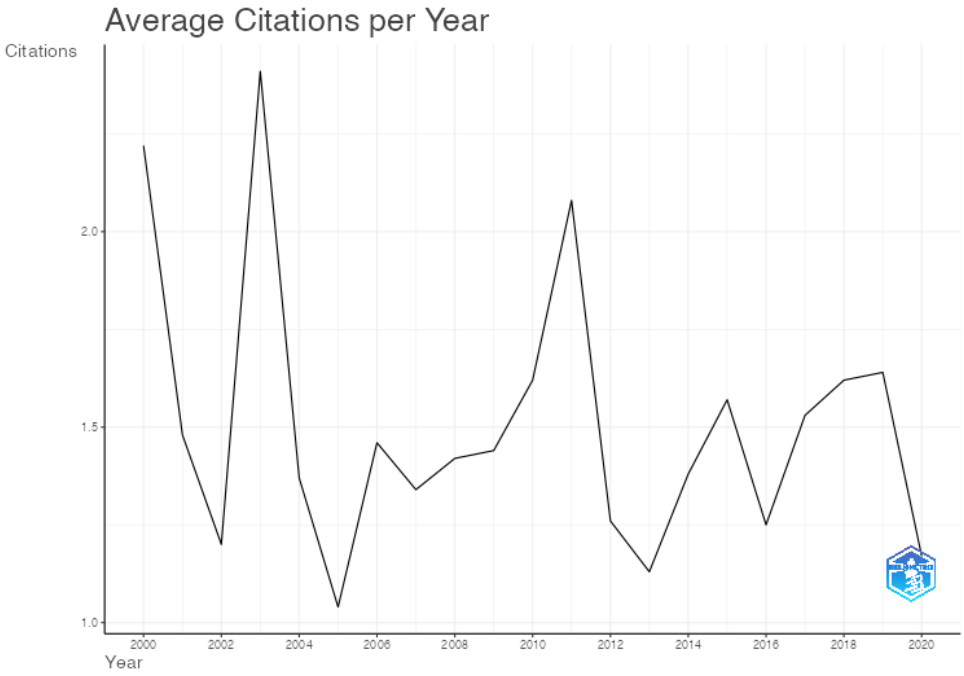

Figure 3. Average Citations per Year

Source: Author's own computation

4.2 Network analysis between countries

The analysis of corresponding authors' countries (Fig. 4) reveals significant insights into the collaboration dynamics within the field of education and economics. The United States dominates scientific production, with the highest number of documents authored by corresponding authors, primarily through single-country publications (SCPs). This indicates a strong domestic focus in the U.S., where research efforts are largely conducted within national institutions rather than through international collaboration.

The United Kingdom ranks second, with a notable balance between single-country publications and multiple-country publications (MCPs). This reflects the UK's active engagement in international collaborations, likely due to its global academic ties and participation in cross-border research initiatives. Other countries such as China, Russia, and Germany also exhibit substantial contributions, although their focus is more heavily skewed towards SCPs, suggesting that much of their research is conducted independently within their national boundaries.

Interestingly, smaller countries like Romania, the Czech Republic, and Croatia are represented in the data, although with fewer publications. These countries show a higher proportion of MCPs, highlighting their reliance on international partnerships to produce impactful research. This trend suggests that countries with smaller research outputs often benefit from global collaborations to strength visibility and academic contribution.

Overall, the data underscores the importance of international collaboration, particularly for countries with fewer resources or a smaller academic presence. While dominant nations like the U.S. and the UK lead in terms of volume, the growing contributions from smaller nations through MCPs indicate a globalizing research landscape in the field of education and economics. Encouraging such collaborations could further diversify and enrich the body of knowledge within this domain.

Regarding the evolution of publications over time for the most prolific countries could be observed significant disparities in research output growth. The United States leads by a substantial margin, exhibiting an

exponential increase in publications, particularly from 2010 onward, which aligns with its established dominance in academic research and resources. The United Kingdom follows as the second-most productive country, showing a consistent upward trend, likely due to its active international collaborations and strong academic infrastructure. China has also experienced notable growth, particularly in the past decade, reflecting its increasing investment in research and education. Russia and Spain, while contributing steadily, show slower growth compared to the top three, maintaining a relatively modest output over the years. These trends underscore the varying research capacities and priorities among these countries, with the U.S. and China leading the global effort to explore the intersection of education and economics.

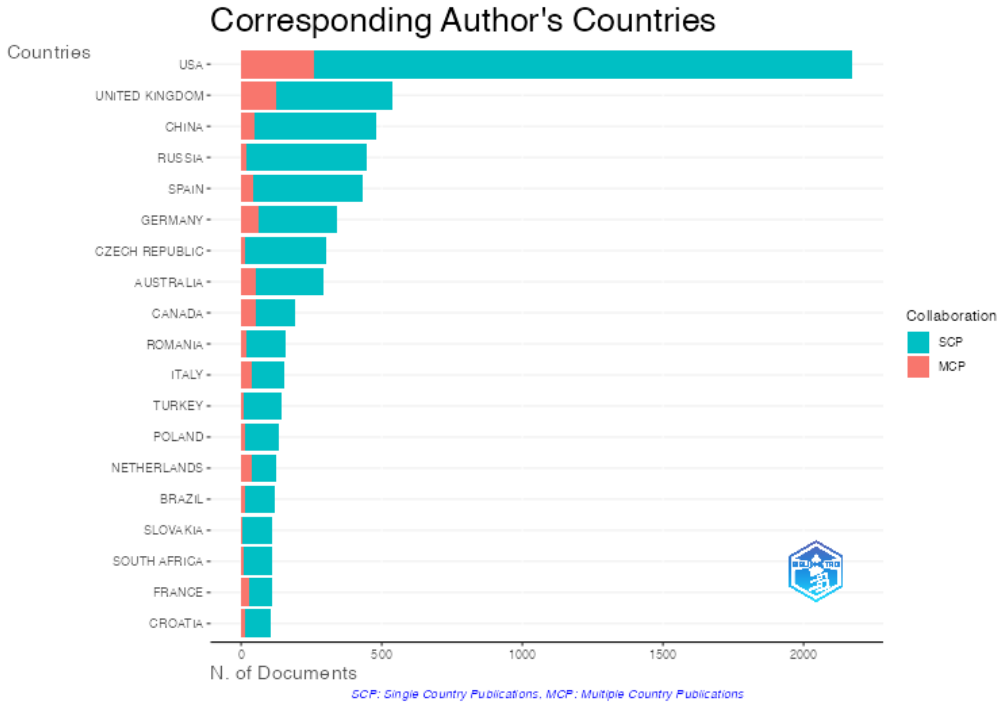

Figure 4. Corresponding authors' countries

Source: Author's own computation

Analyzing the evolution of authors' production over time (Fig. 5) provides insights into the dynamics of individual contributions and their connection to the research output of their respective countries. Authors like McGoldrick KM and Mixon FG show steady contributions over time, which aligns with the United States' consistent leadership in education and economics research. Their sustained productivity reflects the country's strong academic infrastructure and significant domestic research efforts.

In contrast, Wang Y and Li J, affiliated with China, demonstrate increased research activity in recent years, paralleling China's rapid growth in research output. This trend highlights China's rising academic influence and investment in education and economics. Similarly, authors such as Machin S from the United Kingdom and Woesmann L from Germany have consistent publication patterns, reflecting their countries' active engagement in both single-country and collaborative research efforts.

Emerging contributors like Van Wyk MM from South Africa and Zlatkin-Troitschanskaia O from Germany illustrate the participation of countries with smaller overall research outputs. Their individual contributions signal the growing global reach of the field, with international collaboration often enhancing their academic visibility. This analysis underscores how national priorities and institutional support shape individual authors' productivity, further enriching the global landscape of research in education and economics.

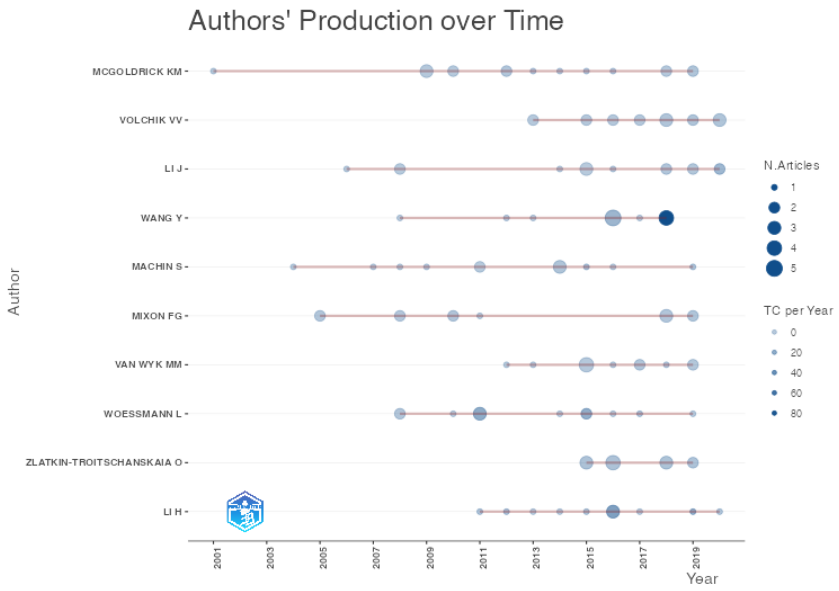

Figure 5. The production of the most relevant authors over time

Source: Author's own computation

The affiliations of the most prolific authors (Fig. 6) reflect strong contributions from globally renowned institutions, often located in the most research-active countries. For instance, McGoldrick KM and Mixon FG are likely affiliated with universities in the United States, such as Harvard University, the University of Michigan, and the University of Illinois, which are among the top contributors. These institutions represent the U.S.'s robust academic landscape, with a significant focus on education and economics research. Similarly, Machin S is associated with the United Kingdom, potentially linked to institutions like the University of Oxford or the London School of Economics, which are known for their influence and collaborations in this field.

Authors from emerging research hubs, such as Li J and Wang Y, are likely affiliated with institutions in China, such as the University of Economics or National Research Universities, showcasing China's growing investment in academic research. In Germany, Woesmann L and Zlatkin-Troitschanskaia O may be connected to institutions like Monash University or the National Research University, reflecting Germany's balanced focus on both domestic and international collaborations. The alignment between authors, countries, and institutions illustrates the interplay between individual productivity and institutional support, underscoring how affiliations with leading universities drive impactful research in education and economics globally.

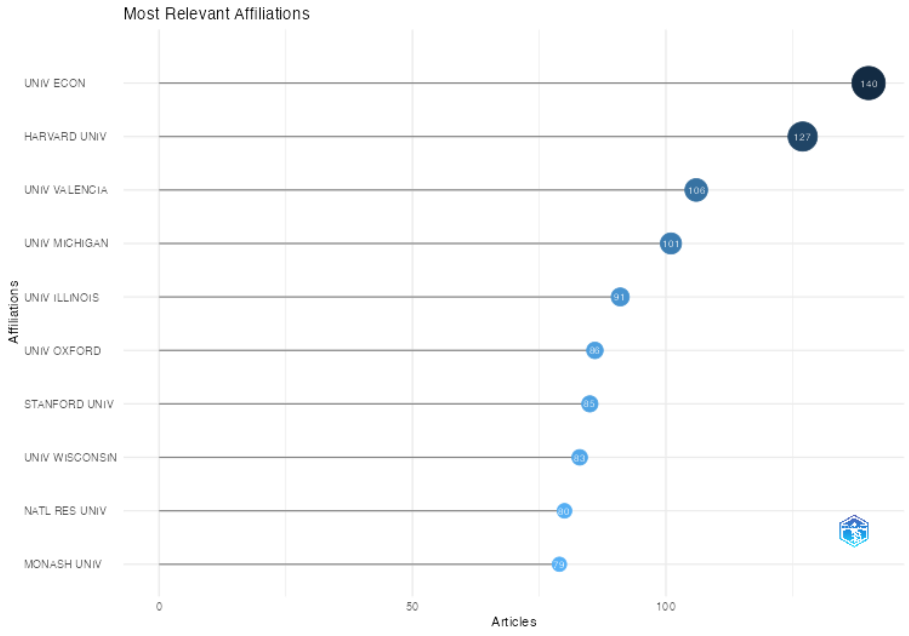

Figure 6. Most relevant affiliations

Source: Author's own computation

4.3 Cited documents and most relevant sources

The most cited documents (Fig. 7) in the field of education and economics highlight foundational and influential contributions that have shaped the research landscape. The top-cited work, Zimmerman RD, 2011, IEEE Trans Power Syst, with 4,522 citations, likely addresses a topic that extends beyond the core focus of education and economics, perhaps intersecting with engineering or system dynamics, demonstrating the interdisciplinary impact of certain studies. This suggests the breadth of influence that can arise when research integrates multiple disciplines.

Other highly cited works, such as Shane S, 2000, Organ Sci (2,491 citations) and Mebens GM, 2008, J Economi (941 citations), focus on organizational and economic perspectives that are crucial for understanding systemic issues in education and economics. These documents likely provide theoretical frameworks or empirical analyses that researchers widely adopt in related studies.

Papers such as Pampel FC, 2010, Annu Rev Sociol (116 citations) and Fernandes D, 2014, Manage Sci (99 citations) may address sociological or managerial dimensions of education and economics, reflecting the importance of interdisciplinary approaches in this field. Similarly, Angrist JD, 2010, J Econ Perspect (78 citations) is likely an essential reference for econometric methods or policy implications in education research. The diversity in topics and focus areas of these highly cited documents underscores the interdisciplinary nature of research in education and economics. These works have set a foundation for subsequent studies, driving new inquiries and shaping academic discourse in this evolving field.

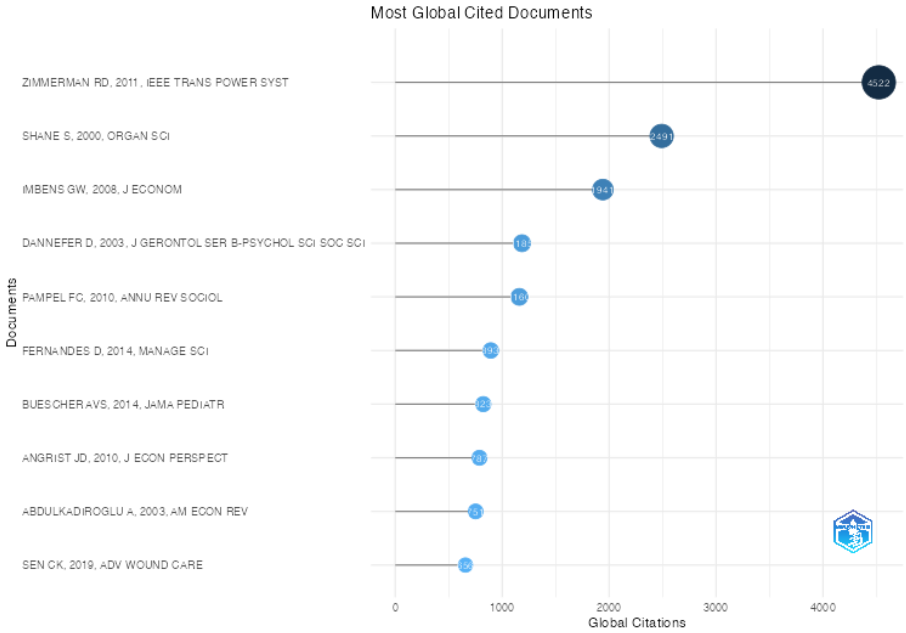

Figure 7. Most global cited documents

Source: Author's own computation

The most relevant sources (Fig. 8) in the field of education and economics demonstrate a clear focus on exploring the intricate relationship between these two domains. The Economics of Education Review, leading with 220 articles, serves as a key journal for addressing policy analysis, education funding, and the economic impact of educational systems. Its prominence indicates its role as a foundational platform for the most influential and diverse studies in this area.

The Journal of Economic Education, with 139 articles, is particularly focused on advancing research related to teaching methods, curriculum development, and pedagogical innovations. Its high relevance suggests a strong academic interest in improving economic education and understanding how it shapes individual and societal outcomes. Similarly, the International Review of Economics Education and Education Economics cater to comparative and policy-oriented studies, exploring global educational challenges and solutions.

Other sources, such as Higher Education and Sustainability, highlight the interdisciplinary nature of the field by addressing topics that intersect with social sciences, environmental concerns, and sustainable development goals. Conference proceedings, including the 11th International Conference of Education, Research, and Innovation, reflect the importance of collaborative discussions and the dissemination of emerging ideas in shaping the research agenda. Collectively, these sources showcase a comprehensive research landscape, providing a robust platform for both theoretical and applied studies in education and economics.

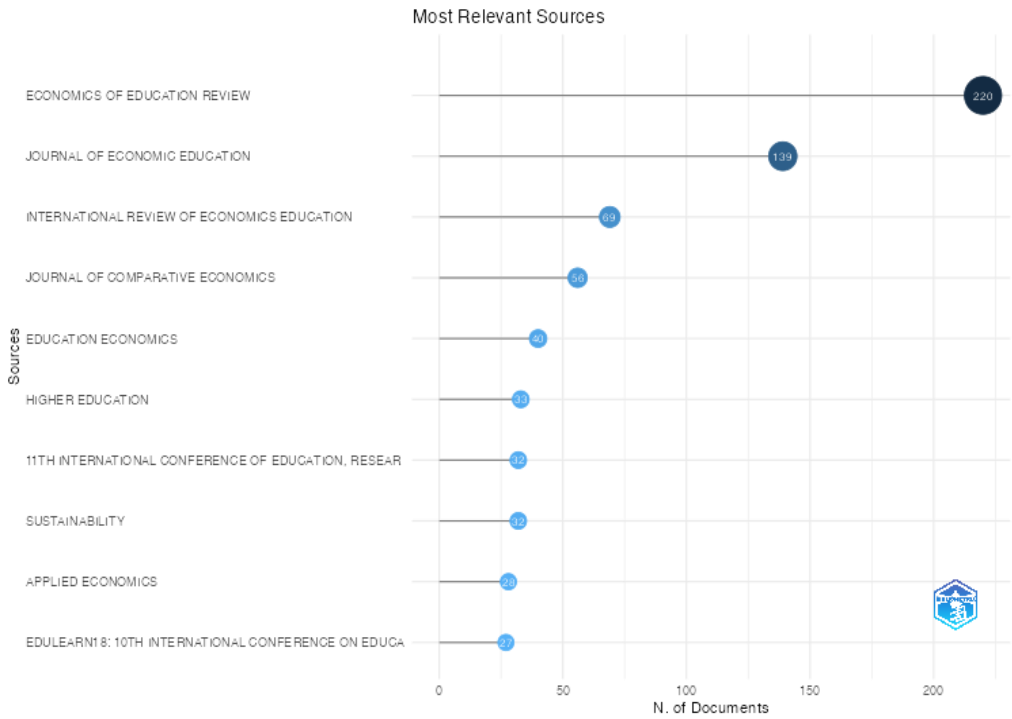

Figure 8. Most relevant sources cited documents

Source: Author's own computation

4.4 Trend topics and collaborations

The analysis of trend topics (Fig 9) reveals the evolving focus areas in the intersection of education and economics over time. Early topics, such as "intention," "antecedents," and "behavioral economics," reflect the foundational efforts to explore human behavior, decision-making, and economic theories applied to education. These terms dominated the initial years, indicating an interest in theoretical and psychological frameworks.

As the field progressed, more practical and context-specific themes emerged, such as "adoption," "agriculture," "skills," and "impact." These terms highlight a shift towards applied research, addressing how education influences various sectors, such as agriculture and workforce development. From 2010 onward, there is an increasing focus on broader structural and systemic issues, such as "management," "quality," and "growth," reflecting an emphasis on improving educational systems and understanding their economic implications.

Key terms like "returns," "earnings," and "costs" gained prominence in later years, underscoring the growing attention to the economic value of education and its role in shaping individual and societal prosperity. Similarly, terms like "class size" and "competition" point to a focus on policy-related questions and the optimization of educational practices.

More specialized terms, such as "crime," "mortality," and "public schools," suggest an expanding interdisciplinary approach, linking education to social outcomes and public policy. The consistent appearance of terms such as "students," "economics," and "education" across the timeline reflects their foundational relevance to the field.

Overall, the trend topics illustrate a dynamic and evolving research landscape, transitioning from theoretical explorations to applied and interdisciplinary studies, driven by global challenges and priorities in education and economics. This evolution highlights the field's responsiveness to emerging issues and its growing impact on policy and practice.

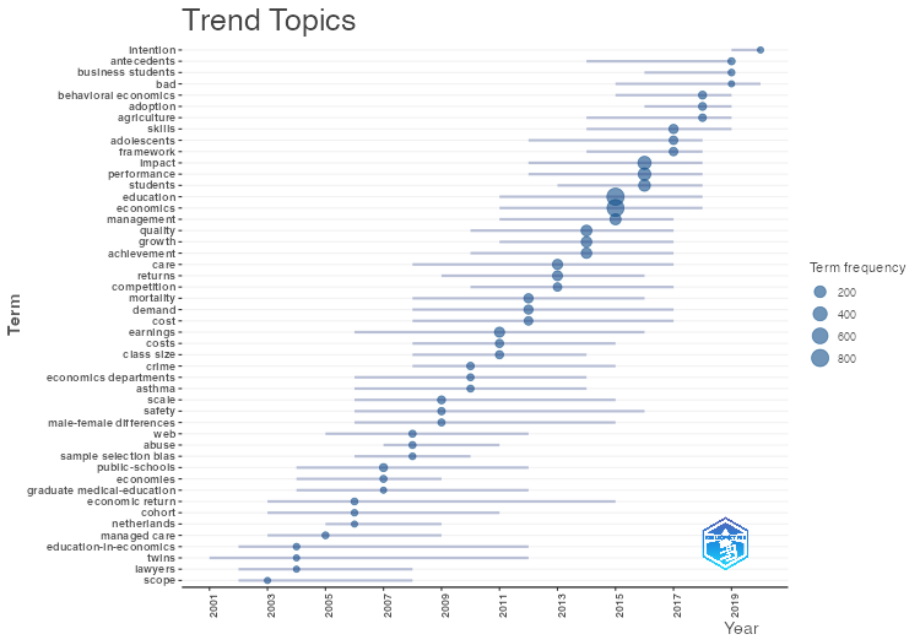

Figure 9. Trend topics

Source: Author's own computation

The collaboration map (Fig. 10) illustrates a dense global network of research partnerships in the field of education and economics, with the United States and Europe emerging as key hubs of international collaboration. The United States, in particular, demonstrates widespread connections with institutions worldwide, reflecting its leading role in academic research and its ability to attract international partnerships. European countries, notably the United Kingdom and Germany, also serve as major nodes, facilitating extensive regional and intercontinental collaborations, particularly with North America, Asia, and Australia. These regions highlight the importance of established academic networks and resource availability in driving collaborative research.

The map also reveals the increasing participation of countries in Asia, South America, and Africa, indicating the growing globalization of research in education and economics. Emerging economies like China, India, and Brazil display notable connections with the global research community, particularly with established academic hubs in North America and Europe. This trend reflects a shared interest in addressing global educational and economic challenges. Despite this, the collaboration appears less concentrated in some regions, such as sub-Saharan Africa, highlighting potential gaps in global participation that could benefit from stronger academic partnerships and capacity-building initiatives. This visualization underscores the dynamic and increasingly interconnected nature of research collaborations worldwide.

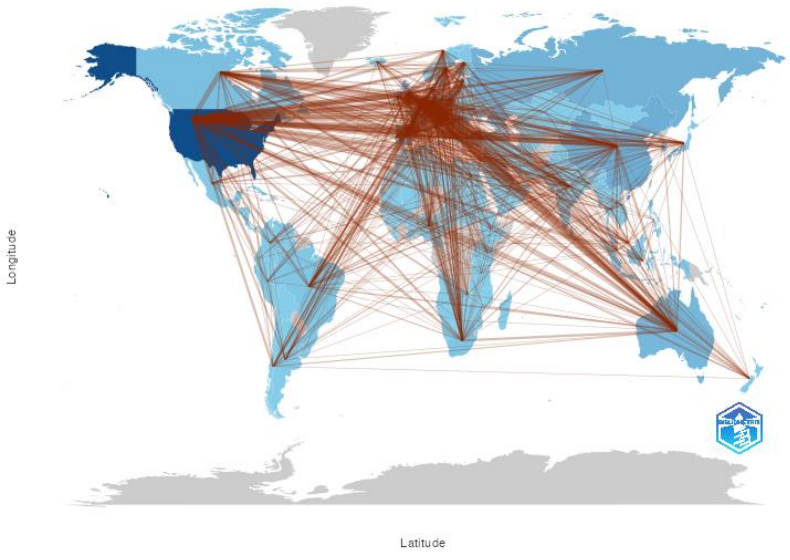

Figure 10. Collaboration world map

Source: Author's own computation

5. Conclusions

The analysis of research in education and economics reveals a steadily growing field with significant contributions from key countries, institutions, and authors. The United States leads in scientific production, with a strong focus on single-country publications, while the United Kingdom and Germany emphasize international collaborations. Emerging players like China are rapidly increasing their contributions, reflecting heightened investment in academic research. Leading institutions such as Harvard University, the University of Michigan, and the University of Oxford dominate research output, showcasing the central role of well-established academic hubs in shaping the field.

Highly cited documents and influential sources highlight the interdisciplinary nature of this research domain. Journals like the Economics of Education Review and Journal of Economic Education have been instrumental in disseminating impactful studies on topics ranging from educational returns and policy implications to systemic improvements in education. Trend topics have evolved from theoretical foundations, such as behavioral economics and intention, to more applied and policy-oriented themes like costs, class size, and returns, demonstrating the field's adaptability to emerging societal and economic challenges.

Global collaboration patterns underline the interconnectedness of research in education and economics, with the United States and Europe acting as central hubs for international partnerships. While Asia and South America are increasingly active participants, regions like sub-Saharan Africa display limited integration into global research networks, highlighting the need for further academic outreach and capacity-building initiatives. Overall, the findings emphasize the growing global relevance of education and economics research, driven by dynamic collaborations, impactful publications, and evolving thematic priorities.

While the methodology is rigorous, it is subject to certain limitations. The reliance on a single database might exclude some relevant publications, and the focus on the 2000–2020 timeframe limits the analysis of earlier or more recent developments. Additionally, the choice of keywords may not capture all pertinent research, potentially overlooking interdisciplinary studies. Despite these constraints, this analysis provides valuable insights into the evolution, collaboration, and impact of research at the nexus of education and economics.

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