Human Capital Development in Developing Countries: A Comparative Bibliometric Analysis

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Article Info

ABSTRACT

This study presents a bibliometric analysis of research on human capital development in developing countries, utilizing data from the Scopus database and visualization tools from VOSviewer. By examining 1,842 scholarly publications from 2000 to 2024, the analysis identifies key themes, influential authors, collaboration patterns, and temporal trends in the literature. The findings highlight that "human capital" is closely interlinked with core concepts such as "economic development," "education," and "sustainable development," reflecting its central role in the discourse on inclusive growth. Over time, research has expanded to encompass newer topics like "innovation," "climate change," and "foreign direct investment," indicating a shift toward integrative and forward-looking frameworks. Co-authorship and country collaboration maps reveal a dominant role of developed nations, particularly the United States, but also an encouraging rise in contributions from emerging economies in Africa and Asia. While the literature is increasingly diversified and collaborative, gaps remain in gendered analysis, informal labor perspectives, and South–South knowledge production. This study underscores the need for more inclusive, interdisciplinary, and context-sensitive approaches to advance the human capital agenda in developing countries.

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1. INTRODUCTION

Human capital development has emerged as a cornerstone of sustainable economic growth, particularly in developing countries striving to elevate their socio-economic status. Human capital, often defined as the skills, knowledge, competencies, and attributes embodied in individuals that facilitate the creation of personal, social, and economic well-being, plays a vital role in determining a nation's productivity and innovation potential [1], [2]. In the context of developing countries, where structural challenges such as poverty, inequality, and limited access to quality education and health services persist, investment in human capital becomes a strategic imperative. Education, vocational training, healthcare, and social protection

systems serve as essential pillars in fostering human development, improving labor market outcomes, and reducing intergenerational poverty cycles [3].

The last few decades have witnessed a growing recognition among international development agencies, such as the World Bank, United Nations, and International Labour Organization, that long-term growth cannot be achieved without significant investments in human capital. The Human Capital Index introduced by the World Bank in 2018 underscores this notion by quantifying the contribution of health and education to the productivity of the next generation of workers [4]. Countries that score higher on this index tend to exhibit more resilient economic structures and higher rates of inclusive growth. However, the gap between developed and developing nations remains substantial, reflecting disparities in policy implementation, institutional capacity, and resource allocation. These variations warrant deeper exploration to understand the trajectory of human capital development across different geopolitical contexts [5].

Bibliometric studies provide a powerful tool to examine how human capital development has been conceptualized, studied, and debated within academic discourse. By quantitatively analyzing patterns in scholarly publications, bibliometric analysis enables researchers to trace the evolution of research trends, influential authors, institutions, countries, and thematic clusters within a field [6]. In the case of human capital development, such analyses can reveal how developing countries are engaging in knowledge production, what themes are prioritized, and which policy areas are gaining momentum. The application of bibliometric techniques is particularly pertinent given the exponential growth of literature in this domain, necessitating systematic mapping to avoid duplication and identify knowledge gaps.

Several regional studies have focused on aspects of human capital in individual countries or sectors, such as the impact of education on labor productivity in Sub-Saharan Africa [7], or the role of health interventions in workforce development in South Asia [8]. However, there remains a dearth of comparative bibliometric research that comprehensively evaluates how the academic discourse on human capital development differs across regions or economic contexts. A cross-national bibliometric approach can uncover disparities in research intensity, collaboration networks, and emerging priorities, offering insights into the global knowledge landscape on human capital.

Furthermore, the COVID-19 pandemic has brought renewed attention to the importance of resilient human capital systems. The crisis exposed the vulnerabilities in healthcare, education, and labor markets, especially in developing nations. As countries reevaluate their development strategies, human capital investment is increasingly seen as not just an economic necessity but a pathway to recovery and resilience. In this light, understanding the trajectory of research on human capital in developing countries is essential to inform future policies, academic agendas, and international collaboration.

Despite the growing volume of research on human capital development, there is limited synthesis of how this knowledge is distributed, shared, and evolved across different developing regions. The lack of a comparative bibliometric perspective has made it difficult to assess whether global research efforts align with the specific developmental needs of different countries. Existing studies are often fragmented, focusing on singular dimensions such as education or health, and rarely consider the broader conceptual or geographic shifts in human capital scholarship. Consequently, policymakers, educators, and development practitioners may lack a comprehensive understanding of where academic efforts are concentrated and what knowledge gaps remain. This study aims to conduct a comparative bibliometric analysis of human capital development literature in developing countries.

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2. METHODS

This study employs a bibliometric analysis approach to examine the scholarly landscape of human capital development in developing countries. Bibliometric analysis is a quantitative method used to assess the volume, impact, and structure of scientific literature by analyzing metadata from academic publications [8]. The primary aim of this method is to uncover patterns, trends, and relationships among authors, institutions, countries, and research topics. The Scopus database was chosen as the primary source of bibliographic data due to its extensive coverage of peer-reviewed literature across multiple disciplines, particularly in the fields of economics, education, and development studies. The search strategy used a combination of keywords such as "human capital," "developing countries," "education," "health," "workforce," and "labor productivity," filtered by publication years from 2000 to 2024 to capture contemporary trends.

The data collected from Scopus were exported in RIS and CSV formats, including fields such as author names, titles, abstracts, keywords, affiliations, publication years, source titles, and citation counts. After cleaning the dataset to remove duplicates and irrelevant entries, the final sample consisted of 1,842 documents. These records were then imported into VOSviewer, a specialized software for constructing and visualizing bibliometric networks. VOSviewer was used to generate co-authorship maps (to analyze collaboration patterns between authors, institutions, and countries), keyword co-occurrence maps (to identify research themes and topics), and citation networks (to highlight influential studies and scholarly impact). Each analysis was visualized using network, overlay, and density visualizations to provide a comprehensive interpretation of the bibliometric data.

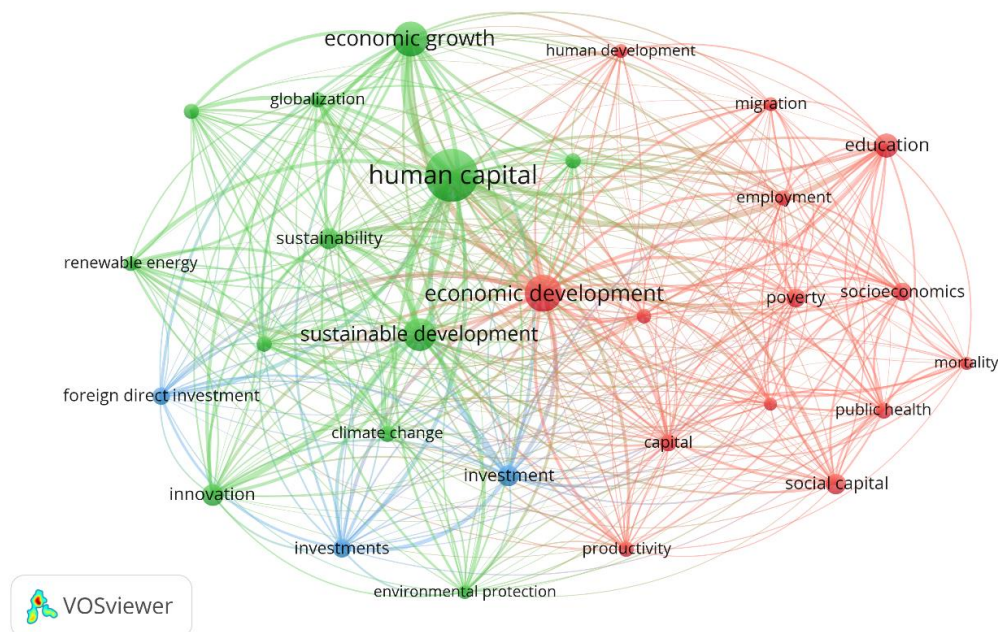## 3. RESULTS AND DISCUSSION

3.1 Keyword Co-Occurrence Network

Figure 1. Network Visualization
Source: Data Analysis Result, 2025

Figure 1 visualizes keyword relationships within the literature on human capital development in developing countries. Each node represents a keyword, and its size

indicates the frequency of occurrence in the dataset. The connections (edges) between nodes denote co-occurrences in the same documents, illustrating thematic relationships. Clusters are color-coded to group related terms based on their proximity and strength of co-occurrence. The central keywords in this network—*human capital*, *economic development*, and *sustainable development*—highlight the foundational role these concepts play in the scholarly discourse.

The green cluster, which includes keywords like *human capital*, *economic growth*, *sustainability*, *climate change*, *globalization*, and *foreign direct investment*, represents a thematic focus on macroeconomic and environmental dimensions. This suggests a significant portion of the literature explores how investments in human capital contribute to broader economic and sustainability goals. Notably, terms like *renewable energy* and *innovation* indicate growing interest in aligning human development with green economic transitions. This cluster illustrates the strategic narrative that human capital is not only a driver of economic productivity but also a catalyst for sustainable transformation.

The red cluster prominently features terms such as *education*, *poverty*, *employment*, *migration*, *public health*, and *socioeconomics*, reflecting a social development perspective. These keywords point to research concerned with the micro-level implications of human capital, particularly in terms of social inequality, labor markets, and public service delivery. The tight interconnection between *education*, *poverty*, and *employment* reinforces the established understanding that educational access and quality are pivotal in breaking the poverty cycle and enhancing employment outcomes in developing countries. Furthermore, the presence of *social capital* and *mortality* signals research into health outcomes and community-based human development strategies.

The blue cluster contains terms like *innovation*, *foreign direct investment*, *investment*, and *productivity*, which align with financial and technological dimensions of development. This cluster is more peripheral but tightly linked to the central themes, implying that while less dominant, these topics are essential bridges between macroeconomic policy and human capital enhancement. The emergence of *innovation* and *FDI* suggests an evolving research interest in how external investments and technological advancements intersect with human capital formation.
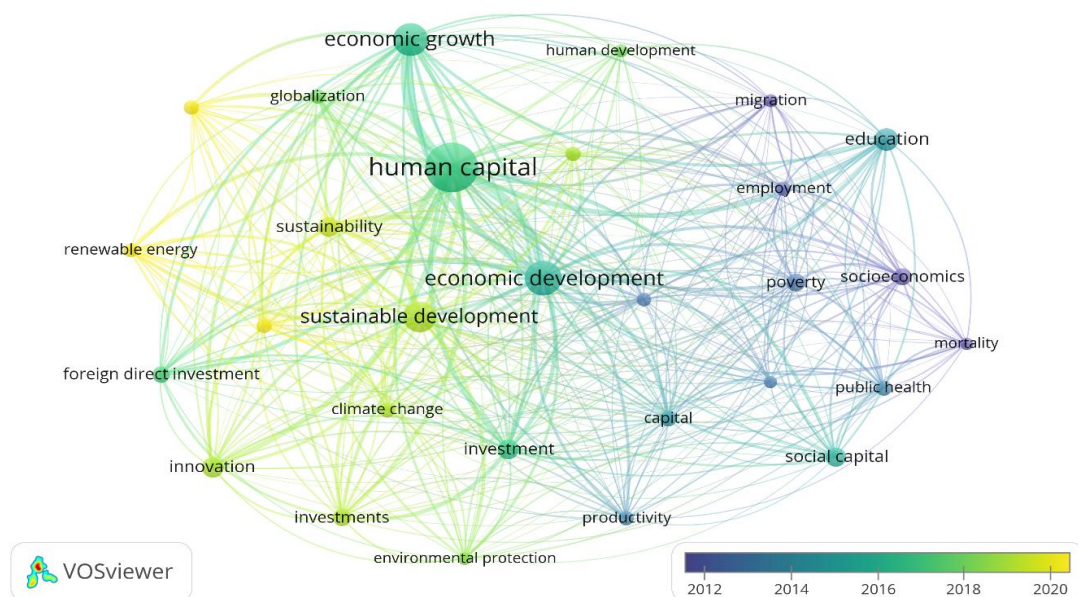

Figure 2. Overlay Visualization
Source: Data Analysis Result, 2025

Figure 2 above provides a temporal perspective on keyword occurrences in the literature concerning human capital development in developing countries. The color gradient—ranging from purple (older, ~2012) to yellow (newer, ~2020)—indicates the average publication year associated with each keyword. Central terms such as "human capital", "economic development", and "sustainable development" appear in green and cyan shades, suggesting that they have remained consistently relevant over the last decade, particularly peaking in the mid-2010s. These core concepts form the intellectual backbone of the research field, maintaining sustained scholarly interest.

Notably, keywords on the right side of the map—such as "education", "poverty", "public health", and "socioeconomics"—tend to be older, reflected in darker blue and purple hues. This implies that early discussions in the literature were focused on the fundamental social dimensions of human

capital, such as access to education and health as critical drivers of development. These areas laid the groundwork for broader inquiries and served as the initial points of entry into the discourse on human capital in the Global South. While still important, the shift in color toward the center and left side indicates an evolution of interest over time.

More recent attention, as indicated by yellow and light green nodes, has shifted toward topics like "sustainability", "innovation", "renewable energy", and "foreign direct investment". This pattern suggests an increasing alignment of human capital discussions with global development agendas such as the Sustainable Development Goals (SDGs) and green growth strategies. The emerging emphasis on "climate change", "environmental protection", and "globalization" further reflects a growing scholarly effort to contextualize human capital within global challenges
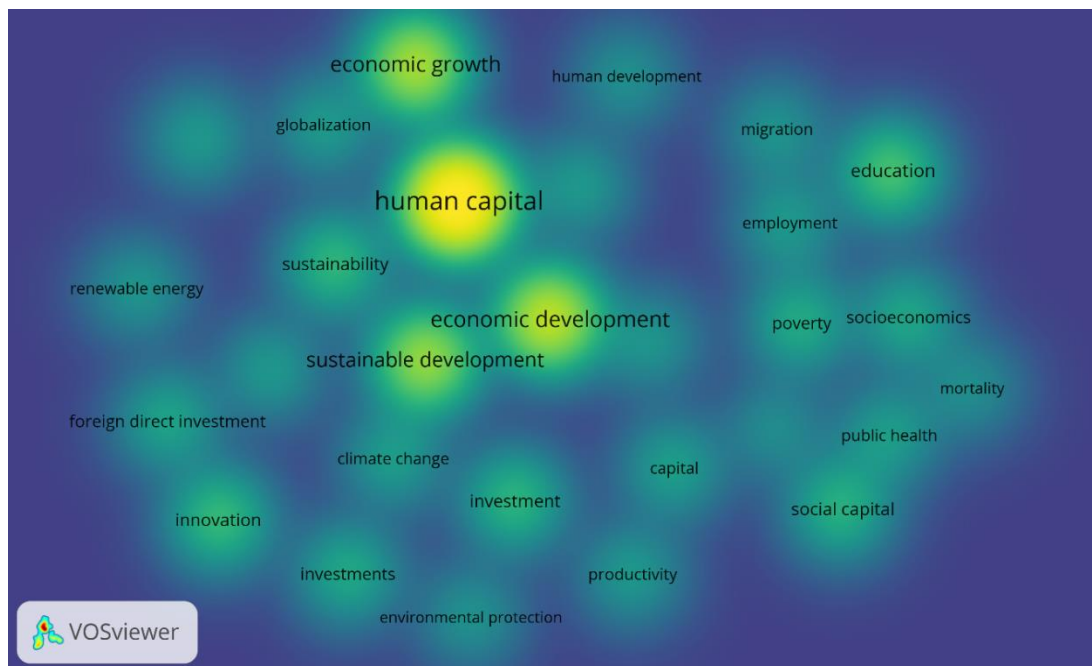

Figure 3. Density Visualization
Source: Data Analysis, 2025

Figure 3 highlights the intensity and frequency of keyword occurrences within the literature on human capital development in developing countries. The color gradient—ranging from deep blue (low frequency) to

bright yellow (high frequency)—illustrates which topics dominate scholarly attention. The keyword "human capital" appears at the center with the brightest yellow spot, confirming its centrality and high citation

frequency in the dataset. Surrounding this core are frequently co-occurring terms like "economic development", "economic growth", and "sustainable development", which also show high density areas, indicating their strong association with the main research theme.

In contrast, terms like "innovation", "foreign direct investment", "environmental protection", and "mortality" appear in cooler, greenish or bluish tones, suggesting they are less frequently discussed but still contribute to the broader research network. This distribution implies that while human capital is primarily framed within economic and development discourses, there is growing—though still limited—engagement with interdisciplinary topics such as sustainability, health, and technology.
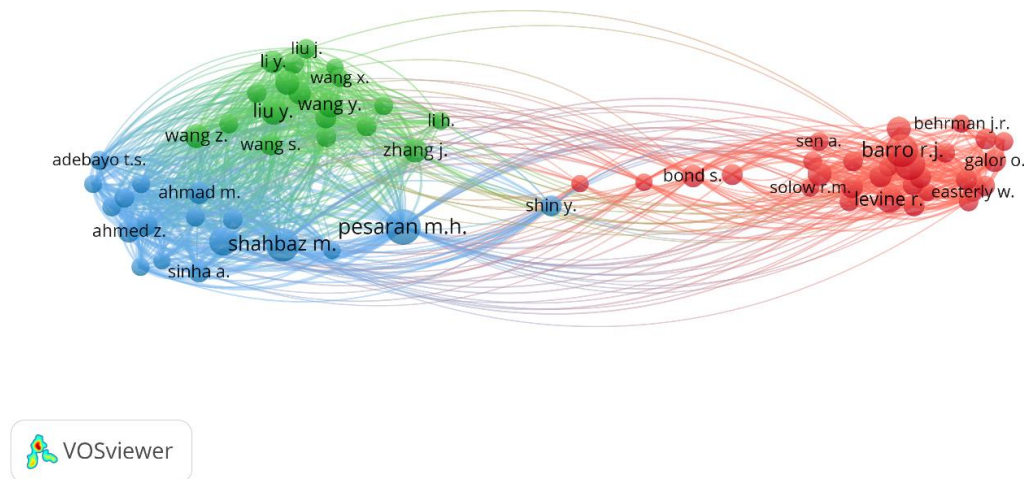
3.2 Co-Authorship Network

Figure 4. Author Collaboration Visualization
Source: Data Analysis, 2025

Figure 4 displays clusters of influential authors in the field of human capital and economic development, segmented by color to represent collaborative communities. The red cluster on the right includes foundational scholars such as *Barro R.J.*, *Levine R.*, *Solow R.M.*, and *Easterly W.*, whose works have significantly shaped the theoretical and empirical landscape of economic growth and human capital theory. The green cluster in the center-left appears dominated by researchers with Chinese affiliations like *Liu Y.*, *Wang Y.*, and *Zhang J.*, indicating a strong regional collaboration network. Meanwhile, the blue cluster features authors such as *Shahbaz M.*, *Adebayo T.S.*, and *Ahmed Z.*, often associated with applied econometric modeling in emerging economies, particularly in Africa and South Asia. The blue-to-green interface, including nodes like *Pesaran M.H.* and *Shin Y.*, reflects bridging scholars who contribute to both methodological advancement and cross-regional collaborations.
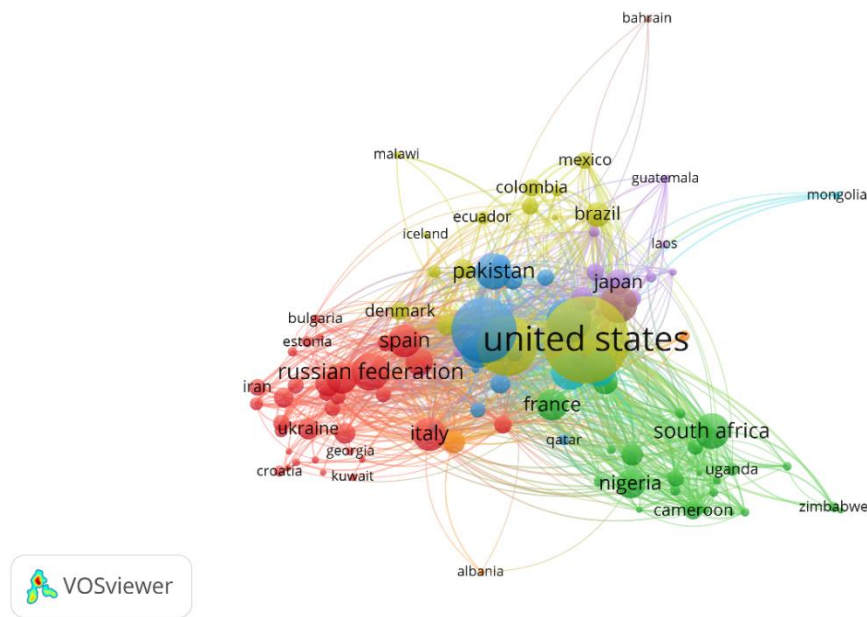
Figure 5. Country Collaboration Visualization
Source: Data Analysis, 2025

Figure 5 visualizes the international collaboration landscape in the field of human capital development research. The United States is clearly the most prominent node, indicating its dominant role in both productivity and global collaboration. It is strongly linked with countries across multiple clusters, including France, Nigeria, Pakistan, Japan, and Brazil, suggesting a wide geographical span of partnerships. The green cluster, which includes several African nations such as Nigeria, South Africa, Cameroon, and Uganda, shows growing intra-regional collaboration and emerging links to global research hubs. The red cluster, led by Russia, Ukraine, and Spain, reflects concentrated regional efforts within Eastern Europe and adjacent areas. Meanwhile, countries like Pakistan, Colombia, and Mexico form bridging clusters that connect developing regions with more established academic systems.

3.3 Citation Analysis

Table 1. Top Cited Research

Citations	Authors and year	Title
8178	[9]	Projections of global mortality and burden of disease from 2002 to 2030
1856	[10]	Do institutions cause growth?
1851	[11]	The product space conditions the development of nations
1460	[12]	Opportunities of Sustainable Manufacturing in Industry 4.0
1338	[13]	Every Newborn: Progress, priorities, and potential beyond Survival
1265	[14]	Agricultural sustainability: Concepts, principles and evidence
1181	[15]	Natural resources, education, and economic development
1145	[16]	The worldwide expansion of higher education in the twentieth century
1039	[17]	The epidemiology of global micronutrient deficiencies

Citations	Authors and year	Title
719	[18]	The human core of the shared socioeconomic pathways: Population scenarios by age, sex and level of education for all countries to 2100

Source: Scopus, 2025

Discussion

The bibliometric analysis of human capital development in developing countries reveals a diverse and evolving scholarly landscape shaped by varying regional priorities, conceptual frameworks, and collaborative networks. The results indicate that "human capital" is a central and highly integrated theme, interconnected with core development objectives such as "economic development," "sustainable development," and "economic growth." This finding affirms that the discourse on human capital in the Global South is not isolated from broader development paradigms but rather embedded within multidimensional goals of socioeconomic transformation. The literature clearly recognizes that enhancing human capital—through education, health, and skill development—is indispensable for achieving inclusive and sustainable growth.

A thematic clustering of keywords, as seen in the co-occurrence network, reveals three major knowledge domains. The first is socio-developmental, focusing on *education*, *employment*, *public health*, and *poverty*. This stream emphasizes the role of human capital in alleviating social inequalities and improving individual life outcomes, reflecting traditional development concerns in lower-income contexts. The second cluster centers around macroeconomic terms such as *economic growth*, *foreign direct investment*, and *productivity*, indicating a recognition of human capital as a driver of national competitiveness and innovation. The third and most recent cluster includes topics such as *climate change*, *sustainability*, and *renewable energy*, reflecting the growing integration of environmental and ecological considerations into human capital discourse. This shift is consistent with global movements toward green growth and just transitions, particularly relevant for developing countries facing both developmental and environmental vulnerabilities.

The overlay visualization provides valuable insights into the temporal evolution of research themes. Keywords such as *education*, *poverty*, and *employment* appeared earlier and formed the foundational discourse on human capital. These earlier studies laid the groundwork for understanding the mechanisms by which human capital influences individual and societal outcomes. Over time, attention expanded toward newer and more complex intersections, including *innovation*, *climate change*, and *environmental protection*. This transition suggests a maturing field that is moving from foundational to integrative research, exploring how human capital links to larger systemic issues such as sustainability and resilience. The prominence of keywords like *sustainable development* and *globalization* in more recent publications suggests that scholars are increasingly viewing human capital as both a national and global asset, shaped by transnational flows of knowledge, labor, and investment.

The heatmap visualization reinforces these trends by highlighting the density of focus around key terms. "Human capital," unsurprisingly, shows the highest frequency of occurrence, followed closely by "economic development" and "sustainable development." Meanwhile, terms like "innovation," "renewable energy," and "social capital" appear less frequently, suggesting either emerging interest or underdeveloped research areas. This disparity presents opportunities for future investigation. For instance, the low density around *innovation* and *climate change* implies that while these topics are beginning to intersect with human capital research, they remain secondary themes. Encouraging interdisciplinary research that explores these intersections could yield important insights,

particularly in the context of SDGs and climate-resilient development in the Global South.

The co-authorship network analysis reveals a fragmented but increasingly interconnected scholarly community. The red cluster features seminal economists such as *Barro, Levine, Easterly*, and *Solow*, whose work has laid the theoretical foundation for linking human capital to growth models. These authors are highly cited and form a dense, ideational core of the literature. However, they appear relatively isolated from newer clusters, which are more empirically oriented. The green and blue clusters, dominated by scholars like *Shahbaz M., Liu Y., Pesaran M.H.*, and *Adebayo T.S.*, represent more recent contributors who are advancing the field through econometric applications and region-specific studies, particularly in Asia and Africa. The relative isolation between classic theorists and empirical modelers suggests a potential gap between conceptual and applied research—a gap that could be bridged by efforts to integrate theory-driven and data-driven approaches.

The country collaboration network reinforces the centrality of the United States in driving global research on human capital. As the largest and most connected node, the U.S. serves as a hub for academic exchanges and joint publications, often in partnership with developing countries. Interestingly, the map shows strong ties between the U.S. and countries like Pakistan, Nigeria, South Africa, and Brazil, indicating that North-South collaboration is active and essential for the production of knowledge in this field. Regional clusters also emerge, such as a European node centered around Russia, Spain, and Italy, and an African cluster encompassing Nigeria, South Africa, Cameroon, and Uganda. While these regional concentrations suggest intra-continental cooperation, they also point to the importance of cross-continental collaboration in expanding the reach and relevance of human capital research.

Another notable observation is the increasing visibility of authors and institutions from developing countries. While historically dominated by scholars in high-income nations, the field is now characterized by rising contributions from researchers based in countries like China, Pakistan, Nigeria, and South Africa. This shift may be attributed to enhanced research funding, the proliferation of academic networks, and the growing accessibility of global databases. Importantly, it reflects a diversification of perspectives and experiences, enriching the theoretical and empirical narratives of human capital development. However, the relatively smaller node sizes and lower betweenness centrality of many developing countries in the network indicate that they still play a peripheral role in shaping dominant research agendas. Addressing this asymmetry will require structural support for capacity building, co-authorship equity, and policy-oriented knowledge translation.

Despite the progress, several gaps remain in the literature. First, there is limited focus on informal labor markets and non-traditional forms of human capital, such as indigenous knowledge systems and community-based learning, which are especially relevant in rural and underserved areas. Second, gendered analyses of human capital are underrepresented. Given the central role of women in education, health, and caregiving systems, integrating gender perspectives into human capital frameworks is both analytically necessary and socially imperative. Third, much of the literature is quantitative, relying heavily on secondary data and econometric modeling. While these approaches provide rigor, they often overlook the lived experiences, institutional dynamics, and contextual nuances that qualitative and mixed-methods studies can offer.

From a policy perspective, the findings underscore the importance of aligning national development plans with insights from human capital research. Policymakers should recognize the interlinkages between education, health, innovation, and sustainability when designing interventions. For example, investments in green skills training can

simultaneously address unemployment and environmental degradation. Moreover, fostering international research collaboration—especially South-South cooperation—can enhance contextual relevance and local ownership of knowledge production. Academic institutions in developing countries should also be supported to participate in global networks, access high-quality data, and publish in internationally indexed journals.

4. CONCLUSION

This study provides a comprehensive bibliometric analysis of human capital development research in developing countries, revealing an evolving intellectual landscape marked by increasing thematic complexity, regional diversification, and international collaboration. Core themes such as education, economic development, and sustainability dominate the discourse, while emerging areas like innovation, environmental protection, and social capital suggest a shift toward integrative development models. The analysis also highlights the central role of countries like the United States in global research networks, alongside the growing contributions from scholars in Asia, Africa, and Latin America. Despite these advancements, the field still faces challenges related to theoretical fragmentation, limited gender and contextual analyses, and unequal participation from developing nations. To move forward, greater emphasis must be placed on interdisciplinary research, equitable collaboration, and policy-relevant knowledge production that reflects the diverse realities of the Global South.

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