

Global Value Chains and Sustainability of SMEs: A Systematic and Bibliometric Review of Emerging Trends and Research Gaps

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Abstract

Small and medium-sized enterprises (SMEs) play a crucial role in global value chains (GVCs) through innovation, employment generation, and specialised production. However, increasing sustainability and ESG-related requirements have made participation in GVCs more complex for SMEs, particularly due to resource and capability constraints. In response to these challenges, the present study systematically examines how sustainability has been addressed in the SME–GVC literature and identifies key research trends and gaps. Using a bibliometric and systematic method, the study analyses 283 peer-reviewed articles indexed in Scopus between 2000 and 2025. Bibliometric techniques, applied using VOSviewer and Biblioshiny, are used to map publication trends, influential authors, journals, countries, and thematic structures. At the same time, a systematic synthesis assesses the dominant sustainability strategies and governance mechanisms adopted by SMEs. The findings indicate a substantial increase in research activity after 2016, driven by the diffusion of Industry 4.0 technologies, expanding ESG regulations, and alignment with the United Nations Sustainable Development Goals. Three dominant sustainability strategies—basic compliance, resource pooling, and strategic upgrading- emerge from the literature, with digital readiness, financial capacity, and institutional support identified as critical enabling factors. Despite this growth, the review reveals a strong concentration of studies in developed economies and a persistent lack of SME-specific ESG measurement frameworks. By integrating fragmented research streams, the study contributes a coherent overview of the intellectual landscape on SME sustainability in GVCs. The findings underscore the need for inclusive policy support, staged digital capability frameworks, and context-sensitive ESG metrics to strengthen sustainable and resilient SME participation in global value chains.

Keywords: Digital Transformation, ESG, Industry 4.0, Supply Chain, Sustainable Development Goals (SDG).

JEL: F23, F14, L26, O33, Q56, F63

1. Introduction

1.1.1. Globalisation and the Rise of Global Value Chains (GVCs)

Global Value Chains allow firms to specialise in different stages of production across countries, thereby increasing trade efficiency. SMEs have increasingly sought integration into GVCs to enhance competitive capabilities and enter new markets, though sustainability requirements may pose challenges due to limited resources. The attention has thus shifted to the sustainable integration of SMEs, thereby revealing key research gaps. GVCs refer to fragmented, cross-border production processes in which goods and services pass through multiple countries (De Marchi et al., 2017; Rainnie et al., 2013). The GVC fragmentation has been accentuated by ICT, logistics, and trade policies, with lead firms on digital platforms coordinating complex, multi-tier supplier networks and modular production systems to increase responsiveness while reducing costs (Mohiuddin et al., 2025).

Since 2000, production systems have been moving toward a decentralised, networked setup enabled by technologies such as digital platforms and real-time data sharing. These developments have encouraged SME participation, created highly multilayered supply chains, and promoted cross-border collaborations. Sustainability concerns are now at the Centre Stage of entrepreneurship, with innovation, transparency, and social development being as important as regulatory compliance. Hence, fulfilling ESG standards has become imperative for policy and shareholder demands. Thus, globalisation and digitalisation have opened windows on a whole array of nature restricted within a single boundary of production, governance, or sustainability (Rosário & Dias, 2022).

Small and medium-sized enterprises (SMEs) are pivotal nodes in global industrial ecosystems as they supply specialised inputs and services that large firms typically outsource, enabling rapid turnaround, tailored design, and continuous incremental innovation thanks to close supplier relationships, tacit knowledge and skilled labour (Thaha et al., 2022; Kulej-Dudek, 2021). SMEs often operate in “short chains” within multilayered global value networks and pilot new materials or processes before wider adoption by lead firms (Marques & Guerra, 2020; Mayho et al., 2023). Many leverage digital marketplaces, contract-manufacturing consortia, and virtual R&D collaborations to access niche export opportunities (Sinkovics et al., 2021a; Banda et al., 2021).

SMEs make up around 90 per cent of businesses worldwide and potentially employ at least half of the workforce, contributing some 40 per cent of the Gross Domestic Product (GDP) in emerging economies. The estimated number of SMEs worldwide ranges from 420 to 510 million, with 365 to 445 million in developing countries (World Bank SME Finance 2026; MSMEs Day 2020; UNESCAP). They take on-the-trade from a perspective: 15 per cent of manufacturers in general export, and in certain contexts, the exchange goods account for more than 50 per cent of export value added. Being over 98 per cent of all industrial enterprises in China, the SMEs contribute roughly 60 per cent of GDP and 75 per cent of employment in urban areas (United Nations, 2021). Global Value Chains (GVCs) account for about 50 per cent of trade flows, reaching up to 70 per cent in some estimates, and a 1 per cent rise in GVC participation is associated with more than 1 per cent growth in per-capita income (UNCTAD, 2021). Despite their size, SMEs face significant barriers to GVC integration. Financial constraints prevent investment in certifications; the buyers across various global levels need a lack of resources in traceability and automation; and due to asymmetries of power among the suppliers, tight delivery schedules, and orders placed at the very last moment compress margins, thus impeding investment in the long run (Alam et al., 2025; Ssenyonga, 2021; Straková et al., 2022; Medrano & Olarte-Pascual, 2016). Cultural and language challenges, coordination across multiple time zones, and weak institutional support further increase transaction costs.

Responses differ based on capability: basic compliance suits low-capability firms, while resource pooling and shared infrastructure support those with higher needs. A value chain focus narrows activities to high-value niches, and strategic upgrading encompasses innovations in technology, processes, and business models (Lwesya, 2021; Mick et al., 2024). Technologies such as cloud ERP, blockchain traceability, and IoT monitoring enhance transparency and streamline logistics, while specialised functions such as rapid prototyping, customisation, and aftermarket services enable firms to secure higher-margin, long-term contracts (Madhavan et al., 2024; Marín et al., 2023). Researchers increasingly define sustainability as “sustainable upgrading,” which integrates functional upgrading with Environmental, Social, and Governance (ESG) improvements. Emerging frameworks aimed at fulfilling ESG and Sustainable Development Goals (SDG) requirements while maintaining competitiveness include multi-stakeholder consortia, third-party certifications, circular economy designs, and real-time emissions monitoring to support small and medium enterprises (Sinkovics et al., 2021a; Le Tran & Coqueret, 2023; Pacheco et al., 2024; Mohiuddin et al., 2025). Therefore, the provision of tiered compliance frameworks, blended finance, and shared technological infrastructure for small and medium enterprises requires prioritised intervention to ensure equitable and robust engagement in GVCs.

Multilateral treaties and international regulatory frameworks have influenced the demand for responsible and ethical production. The influence of the United Nations SDGs, especially the 12th goal on responsible consumption and production, extends to the governance of GVCs. During annual Conferences of the Parties (COPs), including the most recent COP 28, attendees advocate for the decarbonization of industries, the abandonment of fossil fuels, and the prioritisation of nature-based solutions and climate finance (Jiang et al.,

2024). Regional authorities include the EU-proposed Corporate Sustainability Reporting Directive (CSRD) and the climate-risk disclosures proposal by the U.S. Securities and Exchange Commission, both of which demand corporations and subcontractors present labour-practice audits, human rights due diligence, and scopes 1, 2, and recently, 3 emissions (Le Tran & Coqueret, 2023; Straková et al., 2022). The demands on GVCs lead primary firms and SMEs to align procurement standards, adopt advanced decarbonization practices, and engage external monitoring to avoid reputational risk and ensure market access.

1.1.2. The Role of SMEs in Driving Sustainability

SMEs can collaborate with local communities to realise socially sustainable innovations that incorporate elements of the circular economy, eco-design, bio-based materials, and energy efficiency (Pacheco et al., 2024; Sinkovics et al., 2021b). This agility provides them the opportunity to transform their role in GVCs from a reactive supply-chain node to a sustainable innovation pioneer. However, difficulties in integrating disjointed and poorly designed sustainability frameworks, high certification costs, limited access to financing, and poorly integrated policies pose significant challenges to the sustainable transition these enterprises are striving for, causing poor integration of ESG, life cycle assessment, and carbon accounting frameworks, undermining the overall transition to sustainable business practices (Harsanto et al., 2024; Mohiuddin et al., 2025; Alam et al., 2025).

Eco-innovation R&D programs, enabling firms to penetrate sustainable markets such as low-carbon EV components (Sharma et al., 2015; Strakova et al., 2022). ESG requirements, including full Scope 3 emissions reporting and zero-deforestation sourcing, may lead larger firms to exploit smaller, non-scaled subcontractors through restrictive contracts and price leverage, thereby forcing SMEs into an “exit-or-die” decision trap (Sinkovics et al., 2021a; Pacheco et al., 2024). The expectation placed on multinational suppliers and policymakers in this regard is to propose inclusive innovation frameworks for SMEs, such as tiered compliance, blended finance-backed training, collaborative tech consortia, and GVC participation to fulfil sustainability goals.

The incorporation of ESG factors into corporate and supply chain activities has become a necessary component of business strategy rather than a mere option (Sánchez et al., 2011; Pacheco et al., 2024). An increase in the need for suppliers to adopt ethical, low-carbon, and socially inclusive practices has arisen from the global post-COVID-19 recovery, the Sustainable Development Goals (SDGs), and climate change agreements (Ssenyonga, 2021; Alonso Dos Santos et al., 2022). There has been an increase in emphasis on the inclusion of socially vulnerable groups, green procurement, and circular economy frameworks (Colley et al., 2020; Moreira et al., 2022). The ability to monitor emissions and renewable energy consumed in production in real time is a demonstration of innovation as a driver of sustainability and a testament to sustainability achievement (Madhavan et al., 2022; Radicic & Petković, 2023).

SMEs exhibit significant creativity in assisting lead firms in attaining their ESG goals, partly due to their agility, quick decision-making, and relationships with local actors, thus increasing their contributions (Appiah et al., 2019; Tomlinson & Fai, 2013; Medrano & Olarte Pascual, 2016; Cucino et al., 2023). However, these SMEs are often constrained by limited finances, skills, and policy support targeted toward big players (Sharma et al., 2015; Straková et al., 2022). Trade networks are one avenue for technology, skills, and green finance, but SMEs mostly negotiate with compliance-heavy demands and power imbalances that limit their clout (Harsanto et al., 2024; Madhavan et al., 2022)

1.1.3. Theoretical Underpinnings

The study employs multiple complementary theoretical frameworks to elucidate how SMEs embrace sustainability in GVCs. RBV emphasises the unique combinations of tangible or intangible resources owned by an SME, such as skills, knowledge, or networks, that enable or constrain its enhancement and value extraction within global value chains (GVCs) (Appiah et al., 2019; Doran et al., 2019). According to the Resource-Based View (RBV), firms with greater internal capabilities are also better able to satisfy the fixed-cost requirements of new markets and to drive eco-efficient processes. A step forward from the RBV may be the dynamic capabilities concept, which holds that SMEs should constantly reconfigure their resource base through learning, forming

alliances, and digital integration to respond to rapidly changing technological and regulatory environments (Estensoro et al., 2022; Mohiuddin et al., 2025). In this sense, capabilities such as technology transfer, digital transformation, and circular economy design will constitute key mechanisms for embracing sustainable development and resisting disruptions (Juergensen et al., 2020).

GVC governance theory highlights that lead firms and institutional standards impose compliance and enable strategic upgrading of opportunities (Pacheco et al., 2024; Sinkovics et al., 2021a). GVC governance theory explains how lead firms and institutional actors both enforce compliance and provide avenues for strategic upgrading opportunities (Pacheco et al., 2024; Sinkovics et al., 2021a). In sustainability governance, small and medium enterprises (SMEs) become co-innovators rather than just suppliers through multi-stakeholder consortia or traceability governance frameworks. On the other hand, institutional theory refers to how rules, standards, and certifications regarding ESG mandates and watchdogs condition SME behaviour and, thus, create a 'license to operate' that further deepens sustainability (Alonso Dos Santos et al., 2022). Collectively, these theories illustrate how resource endowments determine competitiveness, while dynamic capabilities facilitate innovation and drive GVC governance for upgrading. Institutions compel the integration of sustainability into the core of the business model (Madhavan et al., 2024). This study aims to integrate the domain's literature silos, identify under-theorised areas, and construct a cohesive body of literature to provide clarity and actionable policy and strategy insights for sustainable development. This will facilitate the development of GVCs that are inclusive, equitable, and resilient to the needs of SMEs. The specific research questions that will frame the analysis are:

RQ1: What are the publication trends and citation impact of research on sustainability practices among SMEs in global value chains over the past two decades, including the most influential papers and journals?

RQ2: Which countries, institutions, and authors lead research on SME sustainability within global value chains, and what core themes, keywords, and co-occurring concepts define this literature?

RQ3: How has research over the last decade examined SME sustainability in global value chains, including the strategies implemented (e.g., basic compliance, resource pooling, strategic upgrading) and the measures used to assess their environmental, social, and economic outcomes?

2. Research Methodology

2.1. Research Design

The study adopts a two-fold methodological approach that combines bibliometric analysis with a systematic review. The bibliometric aspect investigates the evolution of scholarly output, including productivity, citation impact, and collaboration networks. At the same time, the systematic synthesis will explore the patterns underlying SMEs' integration of sustainability and innovation within global value chains. Thus, combining these approaches will not only show "what" has been published but also explore "how" and "why" certain sustainability themes arise for SMEs in GVC contexts.

2.2. Database and Search Parameters

To achieve the stated goals, assessing published articles in Scopus is relevant for identifying key factors, including "Global Value Chains and Sustainability of SMEs from 2000 to 2025." To reflect the exponential growth in sustainability research after 2000, fuelled by the 2015 UN Sustainable Development Goals, and to synthesise the latest empirical and theoretical advancements on Global Value Chains and SME sustainability, the timeframe from 2000 to 2025 allows for comprehensive bibliometric analysis using Scopus. The Scopus database is the most comprehensive quality database, featuring the leading journals in economics, business, finance, and the social sciences. This source provides a reliable count of citations and long summaries, which are useful as reference data for bibliometric studies. Moreover, Scopus covers more than 25,000 titles from over 7,000 publishers and indeed offers extensive, credible research data assessment. The study search keywords are:

Table 1: Keywords Used in the Search

GVC-related Keywords	Sustainability-related Keywords	SMEs-related Keywords
Global value chain	Environment	Small and Medium firms
Value chain	Social	Small firms
Global Manufacturing	Governance	SMEs
Global Industry	Sustainability	MSMEs
Global offshoring	ESG	
Global production network	Climate footprint	
	Ecological footprint	

Source: Author’s Own

In Step 1, a comprehensive Scopus search was conducted using three keyword clusters GVC-related terms (“Value chain,” “Global value chain,” “Global manufacturing,” “Global industry,” “Global offshoring,” “Global production network”), sustainability-related terms (“Social,” “Governance,” “Sustainability,” “ESG,” “Climate footprint,” “Ecological footprint,” “GHG,” “Environment”), and SMEs-related terms (“Small firms,” “Small and Medium firms,” “SMEs,” “MSMEs”) - yielding 549 unique records. In Step 2, all 549 titles and abstracts were screened, and four records were excluded for falling outside the 1 January 2000–31 May 2025 date range or for being the wrong document type, leaving 545 full texts for retrieval. In Step 3, the 545 full texts were assessed for English-language availability and disciplinary relevance: 25 were removed for not being in English, and a further 228 were excluded because their subject matter fell outside Business and Economics, leaving 292 studies that met both criteria. Finally, in Step 4, nine studies were excluded for not having reached final publication, producing a final corpus of 283 studies for inclusion in the qualitative synthesis. Metadata fields for each retained document, such as author names, titles, abstracts, affiliations, author keywords, cited references, and citation counts, will be exported in CSV format. For further processing, standardisation of author and institution names will create a strong basis to resolve variations and disambiguate entities, harmonisation of keyword spellings (for example, really making "SMEs" and "Small and Medium firms" allied keywords), and cleaning of data through text processing methods such as stop word removal and stemming to facilitate further co-occurrence analyses.

2.3. Bibliometric Tools and Techniques

VOSviewer and RStudio’s Bibliometrix will be used for visual and network analysis. Metrics include annual output, citations, h-index, and contributions by country and institution. Science mapping through co-authorship, co-citation, bibliographic coupling, and keyword co-occurrence will uncover research structure, key themes, and the field’s intellectual evolution.

Table 2: “The Criterion Of Determining What Is Included And Excluded”

Criterion	Inclusion	Exclusion
Subject Area	Business, Management & Accounting and Economics, Econometrics & Finance.	Environment, Socio-environmental, Scientific, and others
Thematic Areas	All thematic areas relevant to “SMEs.”	Irrelevant thematic areas (e.g., unrelated fields)
Geographical Scope	All countries/territories	None
Language	English	Non-English languages
Timeframe	From 1st January 2000 to 31 May 2025	Before 1st January 2000 and after 31 May 2025

Source: Author's Own

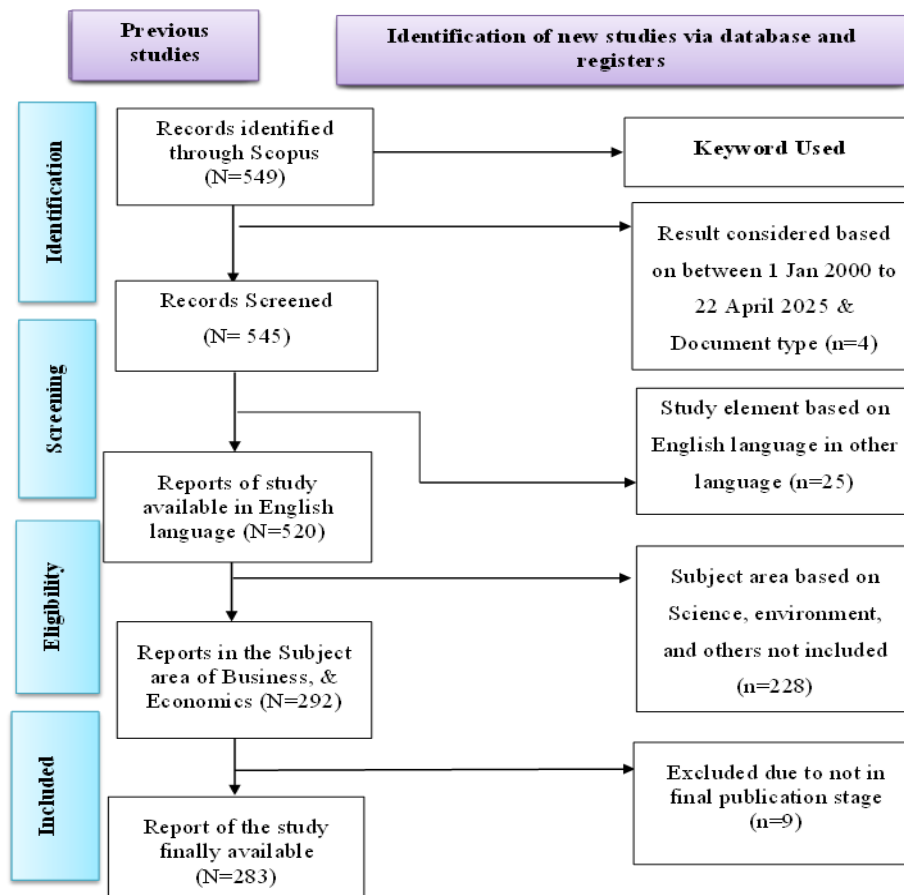


Figure 1: “Methods for Data Collection Using PRISMA Guidance”

Source: Author's Own

The study investigates how small and medium-sized enterprises pursue sustainable practices within global value chains by examining their corporate strategies, organisational structures, and methods of advancing production. Environmental impacts are studied through these three areas, but their primary focus remains on research published in Business Management, Accounting, and Economics. Environmental science research centres on technical evaluations, such as life-cycle assessments and biophysical modelling, rather than on how organisations make decisions. The research will become less focused because adding these topics will create new conceptual areas to be examined in the study of SME capabilities and governance. The research maintains analytical consistency while comparing different bibliometric elements through its selected research topics.

To enhance the quality of our analysis, the study conducted meticulous document preprocessing to reduce randomness, remove duplicates, and address missing values in the Scopus database's metadata. The final dataset was 283 articles. After data analysis was performed using VOSviewer 1.6.20 & Biblioshiny 4.3.0. VOSviewer & biblioshiny (Ninova, 2024) is a robust tool for creating, visualising, and exploring scientific maps (Ninova, 2024). Figure 2 presents a detailed methodological diagram for investigating the literature on SME sustainability in the context of global value chains, using SME performance analysis, science mapping, and systematic synthesis as three dimensions. The performance analysis focuses on the publication’s impact by examining publication activity, the most influential publications, principal publishers, and leading authors and countries (Dodge & Hoagland, 2011).

3. Results

Here is a brief overview of the study's findings. The major discoveries are discussed, and suggestions for further investigations are given:

3.1. Keywords Search

The keyword search conducted on April 22, 2025, yielded 283 publications. Among the 283 total publications, there are 200 articles, 25 conference papers, 39 book chapters, 5 conference reviews, 4 books, an erratum, 2 editorials, and 7 reviews. These numbers are illustrated in Figure 3.

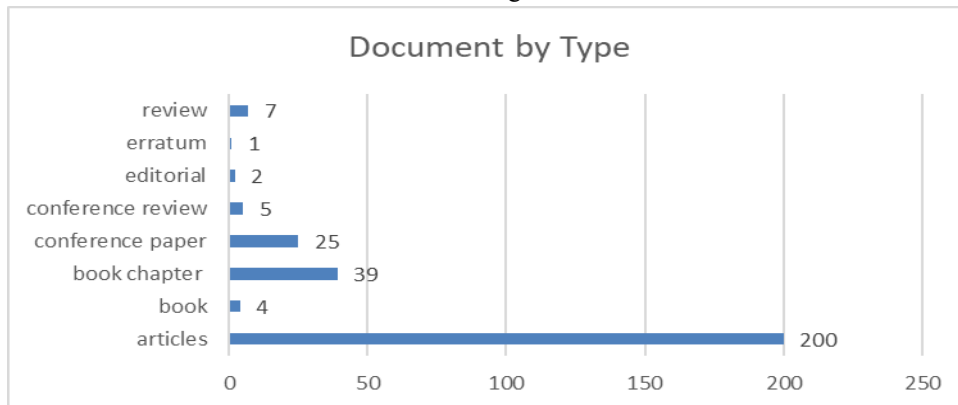


Figure 3: Document Type

Source: Author's Own

3.2. Publication Trends

The publication trend in Figure 4 represents the yearly totals of publications on GVCs and SME sustainability from 1 Jan 2000 to 22 April 2025.

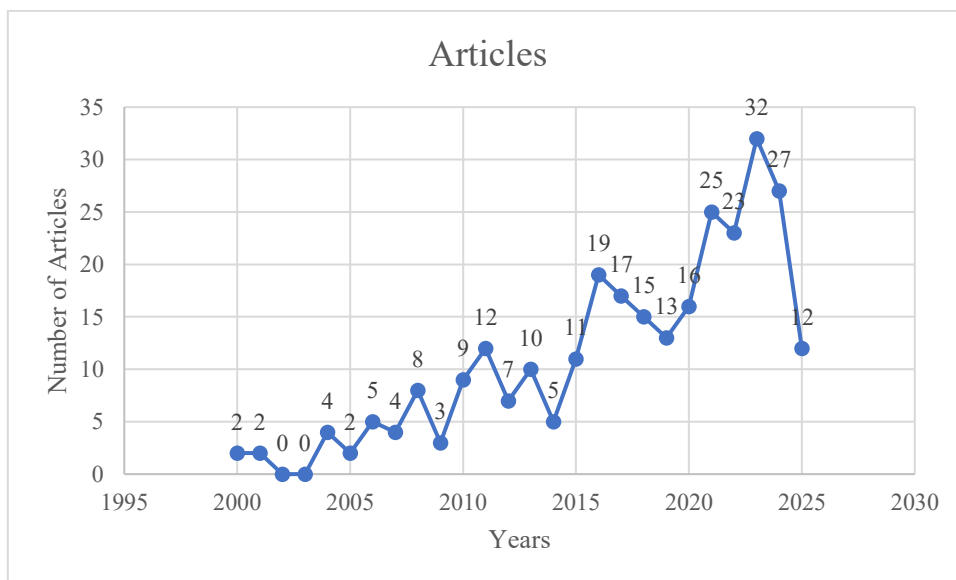


Figure 4: Number of Publications

Source: Author's Own

Figure 4 shows publication trends over 25 years on GVCs and SME sustainability, beginning with just 2 in 2000–2001, oscillating slightly until 2010, and rising to 19 by 2016. After slight falls in 2017–2019, the output is said to have grown again post-2020, peaking at 32 papers in 2023, with 27 so far in 2024 and partial data for 2025 at 12. From 2016, growth is claimed to have accelerated, which is probably in line with a policy focus on sustainable supply chains and their post-crisis resilience. The early 2000s gaps and mid-cycle dips are suggested to be

underexplored periods, hinting at opportunities for historical analyses linking peaks to global events and regulatory milestones.

3.3. Most Cited Publication

Table 3: Top 10 Documents by Number of Citations

Authors	Title	Source Title	Total Citations
Müller et al.,(2018)	Fortune favours the prepared: How SMEs approach business model innovations in Industry 4.0	Technological Forecasting and Social Change	873
Nichter & Goldmark (2009).	Small Firm Growth in Developing Countries	World Development	370
Naidoo (2010)	Firm survival through a crisis: The influence of market orientation, marketing innovation, and business strategy	Industrial Marketing Management	369
Juergensen, et al. (2020)	European SMEs amidst the COVID-19 crisis: assessing impact and policy responses	Journal of Industrial and Business Economics	343
Garzoni, et al.(2020)	Fostering digital transformation of SMEs: a four-level approach	Management Decision	247
Chaminade & Vang (2008)	Globalisation of knowledge production and regional innovation policy: Supporting specialised hubs in the Bangalore software industry	Research Policy	191
Freel (2000)	External linkages and product innovation in small manufacturing firms	Entrepreneurship and Regional Development	190
Schmid, et al. (2012)	The bio-economy concept and knowledge base from a public goods and farmer perspective	Bio-based and Applied Economics	164
Tomlinson &Fai (2013)	The nature of SME co-operation and innovation: A multi-scalar and multi-dimensional analysis	International Journal of Production Economics	143
Ghobakhloo, et al. (2022)	Drivers and barriers of Industry 4.0 technology adoption among manufacturing SMEs: a systematic review and transformation roadmap	Journal of Manufacturing Technology Management	140

Source: Author's Own

Table 3 highlights the 10 most-cited documents in SME sustainability and global value chains between 2000 and 2022, showing a shift in research focus. Leading with 873 citations is Müller et al. (2018), stressing SME innovation in Industry 4.0. Nichter & Goldmark (2009) and Naidoo (2010) looked at growth and resilience in developing economies. Recent research focuses on digital transformation and crisis response, with Juergensen et al. (2020) examining COVID-19 and Garzoni et al. (2020) examining the digital maturity of SMEs. Ghobakhloo et al. (2022) continue this line of inquiry through Industry 4.0 adoption barriers. Other papers by Chaminade & Vang (2008) and Freel (2000) examine networks and policy, whereas Schmid et al. (2012) and Tomlinson & Fai (2013) focus on the public-good collaboration view. The literature has moved from resilience and innovation toward digital transformation and policy-led collaboration.

3.4. Most Effective Authors

Table 4: Top 10 Most Effective Authors (On Citation Basis)

Rank	Author	Total Citations	Total Production	Affiliation	Hirsch index
1	Müller JM	956	4	Friedrich-Alexander University, Erlangen-Nürnberg	26
2	Buliga O	873	4	Friedrich-Alexander University, Erlangen-Nürnberg	5
3	Voigt K-I	873	3	Friedrich-Alexander University, Erlangen-Nürnberg	31
4	Goldmark L	370	3	Development Alternatives, Inc., Rabat, Morocco	3
5	Nichter S	370	3	Deakin University, Enterprise Connect, Australia	12
6	Naidoo V	369	3	Uttaranchal University, Dehradun, India	13
7	Guimón J	343	3	Autonomous University of Madrid, Campus de Cantoblanco, Madrid, 28049, Spain	13
8	Juergensen J	343	3	Henley Business School, University of Reading, Whiteknights, Reading, RG6 6UD, United Kingdom	3
9	Narula R	343	3	Henley Business School, University of Reading, Whiteknights, Reading, RG6 6UD, United Kingdom	41
10	Garzoni A	254	3	Università LUM Jean Monnet, Casamassima, Italy	11

Source: Author's Own

Erlangen-Nürnberg is the exemplar of the field. It has almost half of the citations through Müller (4 papers, avg. 239 citations, h-index 26), Voigt (3 papers, avg. 291 citations, h-index 31), and Buliga (h-index 5), whose few but rapidly cited works distinguish him as an emerging scholar. Goldmark and Nichter stand at equal heights with 370 citations each, for three papers; Nichter's impact (h-index 12) is quite dispersed compared to Goldmark's narrow impact (h-index 3). Crisis resilience research has become prominent under Naidoo (369 citations, h-index 13) and the COVID-19 studies of Guimón, Juergensen, and Narula (343 citations each, with Narula having an h-index of 41). Garzoni (254 citations, h-index 11) is another name signifying the promotion of digital transformation research. Overall, the field seems to be a strong blend of institutional hubs, established and emerging scholars, and works spanning foundational to crisis-related themes.

3.5. Most Influential Journals

Table 5: The Top 10 Publication Sources Based on the Number of Publications

Source	Total Citation	Number of Papers	Citation Per Paper	Cite Score	Source-Normalised Impact per Paper	SCImago Journal Rank
Technological Forecasting and Social Change	1189	6	198.166	26.3	3.255	3.472
Industrial Marketing Management	376	2	188	15.2	1.965	2.621

World Development	370	1	370	13.1	2.553	2.161
Journal of Industrial and Business Economics	343	1	370	3.6	1.164	0.732
Management Decision	292	2	146	8.0	1.37	1.028
Journal of Business Ethics	248	2	124	14.4	3.01	3.039
Journal of Manufacturing Technology Management	232	3	77.333	14.4	2.047	1.532
Research Policy	208	2	104	15.0	3.204	3.443
Entrepreneurship and Regional Development	190	1	190	7.4	1.557	1.353
Bio-Based and Applied Economics	164	1	164	3.6	0.67	0.58

Source: Author's Own

Table 5 shows Technological Forecasting and Social Change leading with six articles, 1,189 citations (198 per paper), and top impact metrics (CiteScore 26.3, SNIP 3.255, SJR 3.472), reflecting the field’s alignment with technology–society futures. Industrial Marketing Management follows with two SME papers (376 citations; 188 per paper) and strong indicators that link marketing to industrial ecosystems. World Development includes only one article from 2009 (with 370 citations) that is relevant to policy. More specialised journals, such as the Journal of Industrial and Business Economics and the Journal of Management Decision, focus on the crisis and managerial frameworks. “Bubble journals” (including the Journal of Business Ethics, Journal of Manufacturing Technology Management, Research Policy, Entrepreneurship and Regional Development, and Bio-Based and Applied Economics) link ethics, technology, innovation, entrepreneurship, and the bioeconomy, though their impact scores vary. This variation highlights the transdisciplinary nature of research on the sustainability of SMEs.

3.6. Worldwide Publications

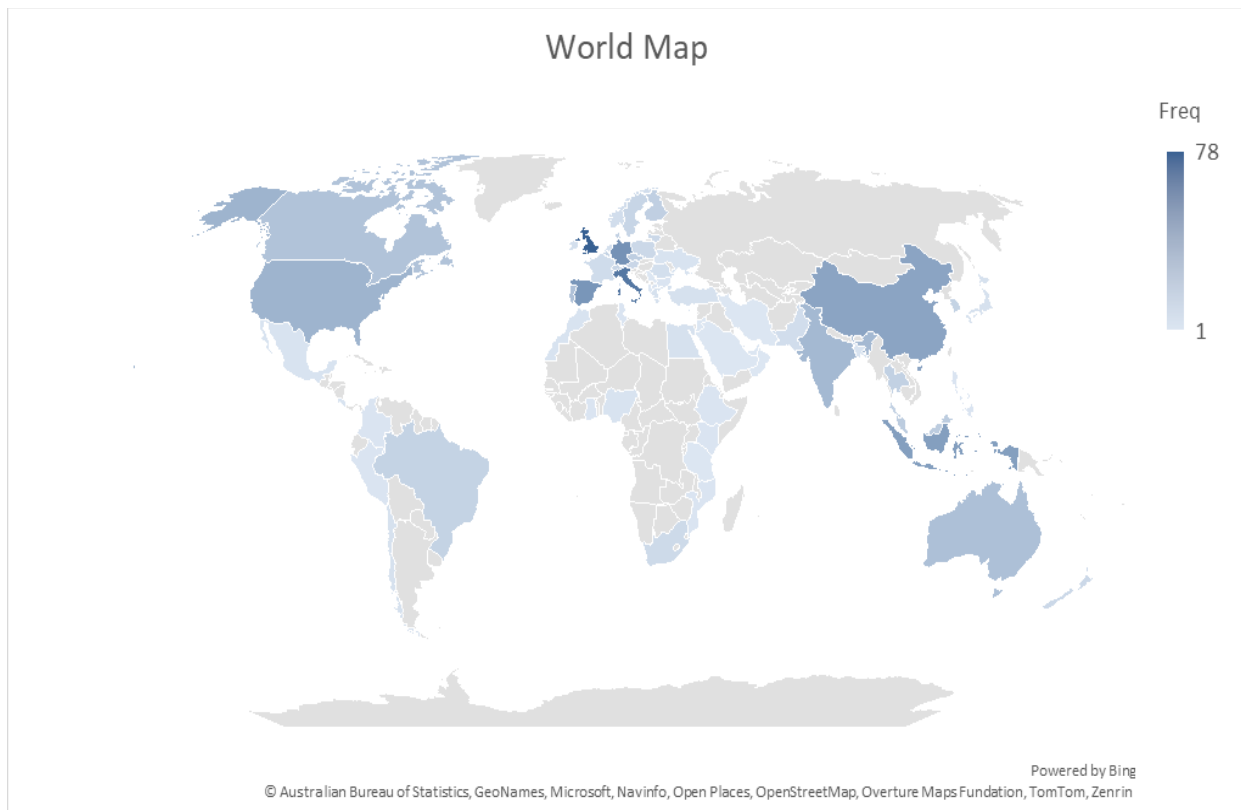


Figure 5: Worldwide Publications

Source: Author's Own

Figure 5 indicates that most research on the sustainability of SME-GVCs is focused in Europe, particularly East Asia, with the United Kingdom (25 papers, 8.8%, 40% MCP) ranking the highest, followed by Italy (15, 5.3%, 9% MCP) and Spain (11, 3.9%, 20% MCP). China and Germany are at the moderate level of collaboration (10 and 10 papers, respectively; 3.5% and 30% MCP). In contrast, Indonesia (9, 3.2%), India (8, 2.8%, 0% MCP), and Portugal (6, 2.1%, 33% MCP) exhibit high variability in collaboration, with uneven participation among emerging contributors. The US (6, 2.1%) has high collaboration (66.7% MCP), whereas Thailand (5, 0%), Korea (5, 20%), and New Zealand (5, 60%) show mixed patterns of collaboration. Peripheral countries, pursuing offbeat attempts in 1 or 2 papers through full foreign collaboration, suffer from weaker research capabilities. Europe and East Asia dominate due to strong institutional capacity, funding, networking, and policy support, while developing regions still struggle with infrastructural gaps, funding shortages, and limited academic connectivity, calling for capacity enhancement, greater funding access, and cross-border collaboration. Latin America’s academic participation in SME and GVC sustainability research is constrained by comparatively low R&D investment and weaker research infrastructure, which limits both production capacity and global scholarly visibility relative to Europe and East Asia. Additionally, barriers such as limited Access to cutting-edge technology, fewer international research linkages, and structural logistical challenges in regional value-chain integration further suppress the region’s presence in global research outputs (Guzman et al., 2023).

3.7. Document by Institution

Table 6: The Top 10 Affiliations’ Sources Based on the Number of Citations

Organization	Total Production	Total Citations
School of Business and Economics, Friedrich-Alexander University Erlangen-Nürnberg	1	873
Development Alternatives, Inc., Rabat, Morocco	1	370
University of California, Berkeley, CA, United States	1	370
Deakin University, Enterprise Connect, Australia	1	369
Department of Development Economics, Autonomous University of Madrid, Spain	1	343
Henley Business School, University of Reading, Whiteknights, United Kingdom	1	343
Università LUM Jean Monnet, Italy	1	247
Department of Innovation Engineering, University of Salento, Lecce, Italy	1	247
CIRCLE, Lund University, Sweden	1	191
Copenhagen Institute of Technology, Aalborg University, Denmark	1	191

Source: Author's Elaboration

Table 6 shows that each of the top-10 institutions in SME–global value-chain research publishes only one series of publications. One way to differentiate impact among publications is by citations: Friedrich-Alexander University leads with the Industry 4.0 Innovation Study of 2018 by Müller, Buliga, and Voigt, with 873 citations. Development Alternatives, Inc., Rabat, and UC Berkeley tie at 370 citations in small-firm development. In comparison, Deakin University (with 369 citations) and Madrid (343 citations) have further developed crisis resilience and COVID-response evaluation. Specialised centres lend further depth—Henley Business School melds crisis with policy research; Università LUM Jean Monnet and the University of Salento pursue digital transformation; CIRCLE, Lund University, and the Copenhagen Institute of Technology affect regional innovation and bioeconomy. This geographic distribution from Europe and North America to Africa and Australasia indicates that high-impact research is not limited to elite universities, suggesting an enormous potential for collaborations that straddle methodological rigour, field expertise, and thematic specialisation for advancing SME sustainability and value-chain innovation.

3.8. Word analysis

In Figure 6, word cloud visualisation has "small and medium-sized enterprise" dominating the front, 29 times, to anchor the conceptual view of the literature. Ranked just after "innovation" is "sustainable development," demonstrating that academics are interested in how novel practices advance social and environmental objectives. "Value chains" (13) and "Industry 4.0" (9) are also identified as significant frameworks because they address both the structural networks that surround SMEs and the cutting-edge digital technologies that enhance them. The intermediate-sized terms "commerce," "digital transformation," and "manufacturing" (7 each) capture the intertwining of market activity, the adoption of new technologies, and production, while the smaller, albeit still prominent, terms "circular economy," "electric energy storage," and "public policy" introduce more specialized subthemes that are rapidly evolving at the frontier of research.



Figure 6 Word Cloud

Source: Author's Elaboration

3.9. Thematic Analysis

There has been a considerable evolution in research concerning SMEs in global value chains. Interestingly, smaller research niches, such as electric energy storage (2008, with a resurgence by 2020) and industrial management (2012-2016), were eventually replaced by more substantial structural areas, such as 'value chains' and 'supply chains' (2016), which have remained popular until 2022. Manufacturing has remained consistently interesting (2013-2022), whereas research in commerce and interrelated industrial sectors has greatly increased after 2016. The most important research in recent years has focused on the intersections of digital transformation and sustainability, including innovation (2016-2024, with a median of 2021), Industry 4.0 and supply chain management (2020-2022), and SMEs and sustainable development (2018-2023). The recent increased interest in digital transformation (2022-2024) and the circular economy (2021-2024) indicates a research focus on sustainability driven by new technologies.

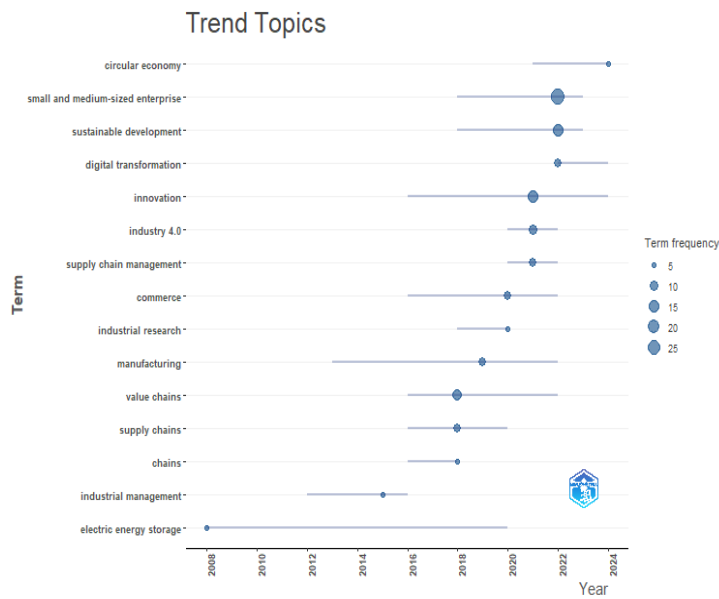


Figure 7 Topic Trends

Source: Author's Elaboration

Thematic mapping (Figure 8) shows that SME–GVC research spans mainly two broad areas: the technology interface (digital platforms, smart manufacturing) and sustainability imperatives (circular economy, ESG compliance). With respect to aligning digital transformation with global sustainability, the main lacunae germane to SMEs with legal and resource constraints in developing countries persist. Coloured under speciality topics, mobile telecom systems and knowledge value chains remain in the periphery of mainstream. Future work may aim to link Industry 4.0 with circular practices and to propose SME-relevant ESG metrics. In contrast, policy-level support should focus on stratified compliance and digital-green programs to foster inclusive and resilient GVC growth.

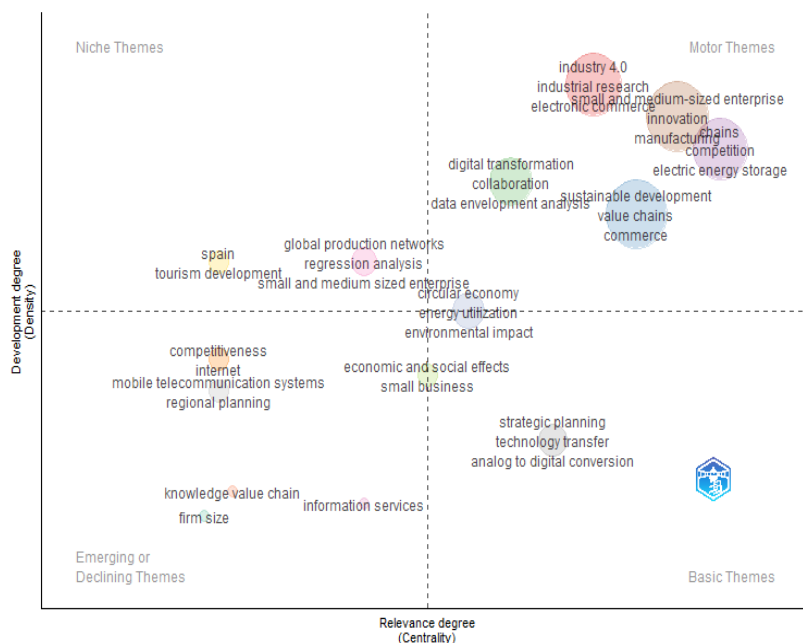


Figure 8: Thematic Analysis

Source: Author's Elaboration

	design, small and medium enterprises, strategy, supply chains, textile industry, textiles, value chain.	
Cluster 3 (blue)	artificial intelligence, business development, business models, chains, competition, competitive advantage, corporate strategy, economics, ecosystems, electric energy storage, government, information and communication technology, investment, public policy, value proposition.	Policy, Technology, and Competitive Advantage
Cluster 4 (yellow)	circular economy, corporate social responsibility, emerging market, global value chains, industrial clusters, Italy, small and medium-sized enterprises, small business, small to medium-sized enterprises, supply chain management, sustainability, sustainable development, sustainable supply chain management.	Sustainable Practices and Responsible Value Chains
Cluster 5 (Purple)	big data, collaboration, commerce, performance, PLS-SEM, social responsibility, sustainable business, sustainable innovation, sustainable production, value chain analysis	Performance Metrics and Sustainable Business Models
Cluster 6 (sky blue)	adoption, entrepreneur, industry, product development, small and medium-sized enterprise, small and medium-sized enterprises (SMEs), technology transfer, United Kingdom, value chains	SME Innovation Adoption and Regional Development
Cluster 7 (orange)	digitalisation, digitisation, Germany, industrial performance, industrial technology, manufacturing, process innovation, value creation.	Industrial Modernisation and Value Creation in SME Manufacturing
Cluster 8 (brown)	COVID-19, global value chain, governance, hotel industry, innovation, SME, tour operator	Resilience and Governance of SMEs in Global Crises
Cluster 9 (pink)	automotive industry, developing countries, engineering research, manufacturing, open innovation, surveys	Sectoral Innovation and Research in Developing Countries
Cluster 10 (body)	digital technologies, digital transformation, efficiency, industrial research, internet of things	Digital Infrastructure for SME Integration into GVCs

Source: Author's Elaboration

The thematic evolution map depicts the changing priorities in research on SMEs in global value chains over the period 2000-2025. From 2000 through 2014, the main periods focused on innovation, firm size, global production networks, and electric energy storage. From 2015 to 2019, research focused on SMEs, sustainable development, and value chains. In the 2020-2022 timeframe, themes expanded to encompass the circular economy, commerce, and Industry 4.0, in light of recent transformations driven by technology and sustainability. In 2023-2025, digital transformation and competition took the forefront while keeping SMEs and sustainable development at the centre of attention, emphasising continued focus on integrating competitiveness, technology, and sustainability in SME-focused GVC studies.

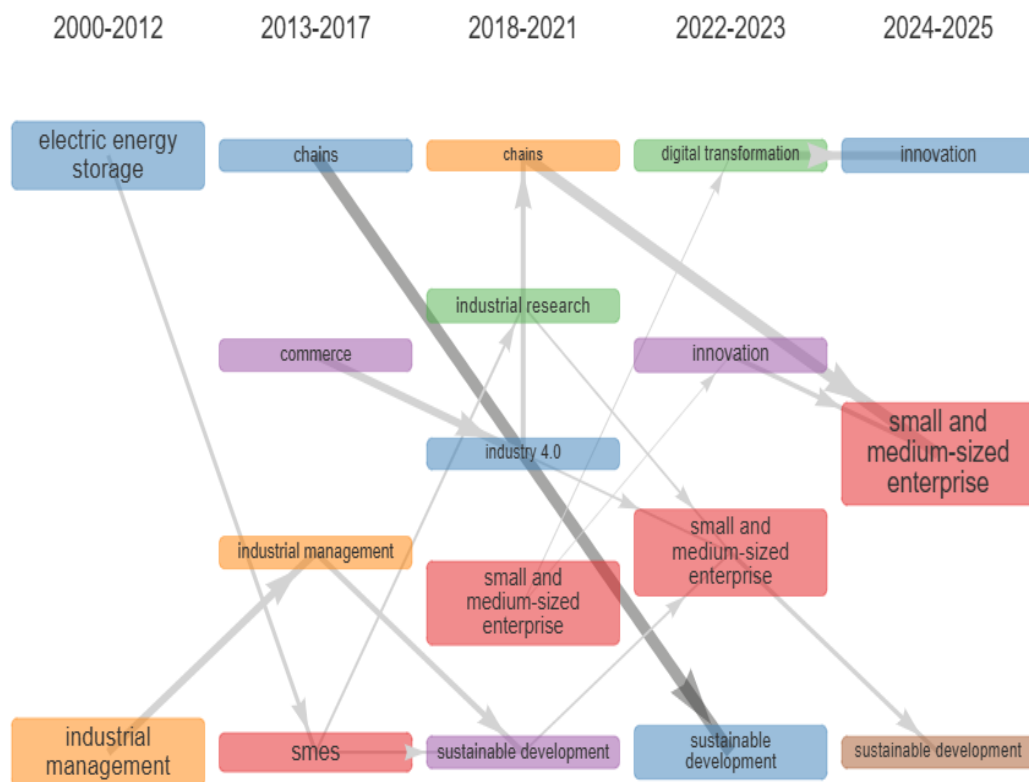


Figure 10: Thematic Evolution Map

Source: Author's Elaboration

4. Discussion

SMEs have been studied extensively over the last decade for incorporation into GVCs, with events aimed at sustainability. They play an intermediary role by producing niche goods and innovations worldwide, but they face greater challenges than larger firms in applying ESG standards. There has been a sudden shift in the research landscape since about 2016, with 32 publications appearing by 2023, marking the peak of trends that year (Juergensen et al., 2020; Radicic & Petković, 2023; Sinkovics et al., 2021a). The earlier literature reviewed production linkages and exports; the recent literature, in contrast, reviewed digital transformation, circular economy adoption, policies that promote SMEs, and crises that have strengthened their resilience. The merged research question guiding this systematic literature review is:

How has research over the last decade examined SME sustainability in global value chains, including the strategies implemented (e.g., basic compliance, resource pooling, strategic upgrading) and the measures used to assess their environmental, social, and economic outcomes?

Appiah et al. (2019) demonstrate that internal resource endowments, including managerial expertise, financial resources, and networks, are key determinants of investment decisions for SMEs. George (2025) links reactive entrepreneurial orientations to performance outcomes in agro-dealer businesses, indicating the significance of adaptive strategies. Juergensen et al. (2020) present strategic agility as a means to cope with market volatility. Radicic and Petković (2023) demonstrate that entrepreneurial orientation increases innovation potential and, consequently, improves sustainability performance. According to Sinkovics et al. (2021a), global integration is most successful when SMEs' resource-based strategies align with relevant institutional frameworks. These studies highlight strategic capabilities as fundamental for emerging markets to attain sustainability and compete in global

value chains (GVCs). Value chain digitisation is an innovation and a trigger for cross-border collaboration, as noted by Marín et al. (2023). In Malaysia, Shahzad et al. (2023) identified readiness gaps for SMEs to embrace Fourth Industrial Revolution technologies. Garzoni et al. (2020) propose the use of staged readiness frameworks to support the digital transformation of SMEs. Foster et al. (2018) warn of dependence on lead firms arising from connectivity without capability-building. Oliveira et al. (2021) argue that GVC power dynamics shift in favour of SMEs when digital assets are under their control, rather than being dependent on platforms. Digital integration is positioned as a critical enabler and as strategic capability alignment.

Bornert and Musolino (2024) identify how reshoring incentives and industrial subsidies tend to influence SME relocation decisions. Mohiuddin et al. (2025) suggest that competitive advantage dynamics are sustained through the capabilities offered by offshore outsourcing. Ngo et al. (2023) investigate the balance between government aid and the flow of knowledge from abroad within emerging-market SMEs. Geldermann et al. (2007) discuss how regulatory pressures can confine and shape market opportunities. Kühne et al. (2010) suggest generalised standards for assessing organisations' innovation capabilities and innovation across the value chain. These works collectively suggest that institutional frameworks and policy actions, as well as the adoption of advanced technologies, play a role in the formation and development of competitiveness. Bhatti et al. (2023) demonstrate that eco-innovation acts as a mediator in the positive impact of sustainable procurement and packaging on SME performance. Pacheco et al. (2024) analyse the incorporation of circular principles into food processing SMEs' production using a gate-to-gate life-cycle assessment. Malik et al. (2022) offer an integrated framework for multilevel analysis on the adoption of the circular economy. Kwak et al. (2023) show that, in low to medium-tech sectors, sustainable innovation can occur through design and branding, rather than substantial R&D. Ssenyonga (2021) illustrates how digital and other structural deficits limit the adoption of sustainable practices in SMEs from developing countries. This study demonstrates the promise and challenges of integrating value chains responsibly.

As demonstrated by Manurung et al. (2024), sustainable lending practices at Indonesian state-owned banks correlate with the implementation of customised business model strategies. In the work of Medrano and Olarte-Pascual (2016), it is shown that marketing innovation tends to precede the implementation of other innovative practices within retail sector SMEs. To enable cross-context comparison, Kühne et al. (2010) advocate the development of standardised metrics. Bansal et al. (2023) examine the trade-offs between the benefits of supply chain traceability and responsiveness, and the challenges posed by financial and legal compliance. Oliveira et al. (2021) describe digitisation of business models in ways that unlock new pathways for incremental upgrades. Having these studies in mind, it becomes evident that the development of more comprehensive performance frameworks is necessary. Doran et al. (2019) demonstrate knowledge dual sourcing in SMEs as a driver of innovation in Ireland. The work of Estensoro et al. (2022) positions Industry 4.0 maturity as a foundational element of competitiveness within European manufacturing clusters. Firm-level innovation behaviour is influenced by regional input-output linkages and innovation, as shown by Romero and Tejada (2011). In Indonesian manufacturing SMEs, moderated knowledge sharing improves supply chain performance as shown by Arsawan et al. (2023). Kwak et al. (2023) propose collaborative branding as an innovation strategy. There is clear interdependence between local ecosystems and GVC integration, as shown in these studies.

Anderson et al. (2012) noted technological advancements in modernising Tunisian textile firms. In the food industry, Savastano et al. (2018) highlighted the importance of ecosystem redesign using the digital manufacturing ecosystem model. Arsawan et al. (2023) underscored the combined effects of social capital and process efficiency. Digital asset control for value creation was stressed by Oliveira et al. (2021). Straková et al. (2022) noted the imbalance in the adoption of digital business models and the need for more focused management. The interaction of modernisation, digitisation, and competitive advantage is well articulated in the above literature. Juergensen et al. (2020) noted the absence of policies to support COVID-19-affected SMEs. Wachning et al. (2023) reported on the governance adaptations of craft brewers within the UK. Hatab and Lagerkvist (2024) evaluated the perception of risk among agri-food SMEs during the Russia-Ukraine conflict. Romero and Tejada (2011) examined the regional resilience factors, while Ssenyonga (2021) addressed the digital divide that emerged in the post-COVID period. The aforementioned works point towards the governance and adaptive strategies that SMEs need to survive in times of crises.

Romero and Tejada (2011) utilise a multi-level framework that integrates regional and firm-level behaviours and boundaries. Medrano and Olarte-Pascual (2016) emphasise marketing's position before product and process innovations. Kwak et al. (2023) emphasise collaborative branding as a facilitator of innovation. Geldermann et al. (2007) highlight regulatory pressure as a force that shapes the market. Ssenyonga (2021) identifies ongoing structural barriers to the adoption of innovation in resource-poor contexts. These highlight the value of a bespoke approach to innovation. Garzoni et al. (2020) offer staged readiness frameworks for digital transformation. Foster et al. (2018) document how connectivity gaps limit East African SMEs—Oliveira et al. (2021) stress the importance of controlling digital assets for upgrading potential. Straková et al. (2022) identify process imbalances in digital adoption. Mala et al. (2023) provide evidence that branchless banking facilitates transactional integration for MSMEs. The consensus is that infrastructure must be complemented by capability-building and governance mechanisms.

The three major strategies that SMEs carry out for sustainability in global value chains, according to the systematic literature review in this study, include basic compliance, resource pooling, and strategic upgrading supported by managerial expertise, financial endowment, entrepreneurial orientation, and control over digital assets (Appiah et al., 2019; Radicic & Petković, 2023; Oliveira et al., 2021). Empirical and conceptual analyses argued that digital integration and staged readiness permitted innovation and upgrading, while policy incentives and institutional contexts more or less determined localisation and outsourcing choices (Marín et al., 2023; Garzoni et al., 2020; Bornert & Musolino, 2024). Outcomes were evaluated in light of life cycle and gate-to-gate environmental assessments, followed by eco-innovation and circularity indicators, traceability and supply-chain responsiveness measures, and firm-level innovation and performance measurements, with the academic community calling for benchmark standardisation to facilitate comparisons across sectors (Pacheco et al., 2024; Bhatti et al., 2023; Kühne et al., 2010; Bansal et al., 2023). In aggregate, the findings suggested that digital capabilities, capability-building, and policy support should be aligned to convert strategy into tangible environmental, social, and economic benefits.

The SLR discloses robust interlinkages: digital integration alongside policy frameworks shapes modernisation and sustainability. Policy frameworks respectively shape strategic capabilities and performance. Innovation varies across sectors and regions, creating diverse innovation geographies. Resilience studies illuminate certain governance mechanisms that can be embedded within overarching digital and sustainability governance frameworks. Sector-specific policy responses must be sensitive, providing appropriate capability development, financing, and digital resources to policy-embedded SMEs. In line with cross-sector benchmarking, standardised cross-sector sustainability governance frameworks must be developed. Regulatory frameworks should aim to optimise compliance and market access. Institutional reforms should facilitate innovation ecosystems that incorporate policy-embedded SMEs into resilient, sustainable GVCs. A cross-sectoral approach is needed to understand digital underdevelopment in certain regions, investigate cross-sectoral learning, and employ mixed-method longitudinal approaches to trace transformative change within SMEs. There must be greater attention to the interrelationships among power within GVCs, the sustainability of GVCs, and the digital transformations of GVCs.

The bibliometric and systematic analyses indicate that research regarding the roles of SMEs in sustainable GVCs has been growing since 2016, particularly with a notable increase in publications in 2023, suggesting heightened interest from both the academic and practical realms. Based on the findings, it can be concluded that SMEs enhance their sustainability performance and GVC integration through strategic dynamic capability upgrading and the exploitation of digital technologies, including cloud ERP and transparent alignment with blockchain, international treaties, efficiency regulations, the EU CSRD, and market demands. All these encourage businesses of any size to adopt ESG principles. However, the review also notes critical areas of research imbalance, including the dearth of studies in the Global South and the gap in ESG frameworks focused specifically on SMEs, underscoring the urgent need for research on more inclusive, contextually relevant solutions.

The outcomes of this study, sourced from bibliometric and systematic reviews, coincide with and expand the academic discourse on Small and Medium-sized Enterprises' (SMEs) inclusion into sustainable Global Value

Chains (GVCs). For one, growing interest in this field from public and private partnerships was observed after 2016, driven by sustainability-oriented global mandates and regulations, such as the EU's Corporate Sustainability Reporting Directive (CSRD), which incentivises even non-listed SMEs to adopt green practices for competitive reasons (Enhessa, 2024). The study further validates a clearly set gap in the literature concerning the underrepresentation of developing regions and the lack of SME-specific ESG metrics. The point is that supporting research suggests that inclusive policies and specialised financial instruments, such as impact investing, need to be put in place for these firms to participate on an equal footing in sustainable GVCs.

5. Conclusion

Over the past 25 years, trends have expanded the horizontal reach of value chains (GVCs) and research on SMEs, positioning the field as multidisciplinary. The publication pattern (Figure 2/Table 1) shows an initial lull during the 2000s, consistent growth until 2015, and exponential growth post-2016, culminating in 32 studies in 2023. In co-citation and network analysis of authors, an ecosystem of a few foundational studies is identified, especially around Industry 4.0 innovation and conventions for crisis resilience; our thematic mapping (Figure 3), on the contrary, gullies the big canopy of the study into ten domains, ranging from entrepreneurial dynamics in emerging markets to challenges in digital infrastructures. However, with all these advances, very big white spaces still exist: the period 2000–2010 remains unexplored, clusters such as mobile telecommunication systems (Cluster 9) and IoT platforms (Cluster 10) are still nascent, and there is also a geographical imbalance with much of the focus tilting towards Europe and East Asia with Latin America and Sub-Saharan Africa barely represented.

The first set of patterns would have important implications for those involved in policy making, implementation, and research. Undoubtedly, these GVC phases, being quite early and underrepresented, call for retrospective and longitudinal analyses, which would enable an understanding of how SMEs were functioning during the formative years of fragmented production networks. Second, the dominance of big-name authors and elite outlets almost demands that we entertain greater intellectual diversity, and that more mid-tier journals and emerging scholars be encouraged to address underexplored issues, especially those brought forth in niche clusters. Third, with the Euro Asia axis still dominating the research agenda, the realisation emerges that capacity-building and funding initiatives are underway in these under-researched regions; only through South–South collaborations will it be possible to grasp the full breadth of SME experiences by juxtaposing economic and regulatory arrangements.

Future research priorities must include three objectives. Archival and oral-history studies should reconstruct the underexplored 2000–2010 era of SME-GVC "-quiet decade-"; assessing Cluster 9's open innovation in automotive SMEs and Cluster 10's IoT-based platform to gauge the influence of advanced technology in developing economies; and piloting projects across clusters linking entrepreneurial frameworks (Cluster 1) with digital supply networks (Cluster 2) to explore potential synergies between business-model innovation and circular outcomes. Moreover, SME-specific ESG and digital maturity indices must be developed to replace large-firm-specific indices, thereby tying research to champions of the SDGs and to thematic map niches such as global production networks and SMEs.

This paper has highlighted two major research gaps: the over-concentration of studies in developed regions, leaving South Asia, Africa, and Latin America underexplored, especially India, with its large MSME sector; and the generalisations about GVC insights regarding the operations of giant enterprises versus SMEs. Future research should hence use mixed-methods, with SMEs as the unit of analysis, and employ regionalised approaches to examine how resource constraints, institutional barriers, and innovative capacities affect the adoption of ESG, digital transformation, and strategic upgrading in developing economies.

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