

Global Value Chain Competitiveness in the Coffee Industry: A Systematic Literature Review

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ABSTRACT

The role of global value chains (GVC) in integrating smallholders into global markets has become a prominent research concern, particularly due to challenges in value distribution, sustainability, and economic welfare. This paper explores the landscape of global coffee value chain research, focusing on prevailing trends, emerging concerns, and potential avenues for future investigation, particularly in the areas of competitiveness and sustainability. Employing a systematic literature review of 107 peer-reviewed articles, the study identifies key themes, challenges, opportunities, and conditions across the entire value chain—from production to consumption. The analysis highlights a predominant academic interest in sustainability standards, smallholder integration, and competitive strategies. Nonetheless, the review uncovers critical research gaps, including a scarcity of cross-country comparative studies, insufficient exploration of digital transformation, and limited application of advanced national competitiveness models in the coffee sector. Most studies are qualitative-centric, emphasizing the need for more quantitative and mixed-method studies. The review also highlights several areas that appear promising for future research, including governance arrangements, the incorporation of new technological paradigms, and the development of holistic measures that capture the multidimensional nature of competitiveness. Scholars are encouraged to deepen and broaden these lines of inquiry by adopting integrative methodological approaches that account for micro-level dynamics, smallholder participation, and the specific conditions of emerging markets. This review thereby provides a critical foundation for guiding and enriching future academic inquiry into the global coffee value chain competitiveness.

Key words: Coffee; Smallholder Farmers; Sustainability Standards; Trade Competitiveness; Value Chain.

1 INTRODUCTION

Coffee has been consumed for more than a millennium and remains the world's most popular beverage, with more than 400 million cups consumed annually (Sachs et al., 2020; Freitas et al., 2024). Coffee is also one of the most widely traded agricultural commodities worldwide and is a source of income for millions of smallholder farmers (ICO, 2022). In addition to 195 countries, 77 countries exported coffee in 2023, whereas 143 countries reported the import of coffee. This indicates that about 39.5% of nations export coffee, whereas about 73.3% import it (UN Comtrade, 2023). In addition, the value of the coffee trade reached USD 36 billion, or about 0.14% of the total value of international trade (OEC, 2023). The five countries with the highest coffee import volumes are the United States, France, Germany, Italy and Belgium. The increasing demand for coffee has led to a significant increase in coffee production in both the upstream and downstream sectors (Rahmah et al., 2023). The global scale of coffee consumption and trade, reflected in the wide participation of exporting and importing countries and the substantial share in international market, indicates that coffee represents not only a key agricultural commodity but also a sector marked by strong competitiveness in which nations seek to reinforce their positions within the global value chain.

Global value chains (GVCs) have now become a globally recognized phenomenon. This is because export

values no longer adequately represent a country's economic returns. Globalization, the production process and the speed of technological development have become essential factors in explaining recent trends in environmental and economic indicators within the GVC (Espinosa-Gracia et al., 2023). Developing countries, including Brazil, Indonesia, Colombia, and Vietnam, are home to a disproportionate number of global GVCs in the coffee industry. These countries rank among the world's top producers and exporters of raw coffee. However, their participation in the export of processed or value-added coffee remains limited, along with efforts to enhance equitable value distribution across the supply chain (Lima & Lee, 2023). The GVC framework exposes deep-rooted inequalities and structural hardships, particularly affecting smallholder farmers, who form the backbone of the coffee industry (Grabs et al., 2016). Despite their central role, smallholders face persistent vulnerabilities due to global price fluctuations, weak bargaining power (Karatepe & Scherrer, 2021; Rodrigues et al., 2024), certifications (Piao et al., 2019; Glasbergen, 2018), and limited access to critical resources such as credit, technology, and markets (Clay et al., 2018; Suryana et al., 2023b). These challenges are intensified by the growing dominance of multinational corporations in controlling key stages of the value chain, often resulting in minimal returns on labor and investment for producers (Behuria, 2020; Vicol et al., 2018). The situation is further complicated by the dynamics of sustainability

certification schemes—such as Rainforest Alliance, Fair Trade, and Organic Coffee—which, while designed to promote ethical and environmental standards, frequently impose disproportionate compliance burdens on smallholder farmers. (Dietz et al., 2020; Gather & Wollni, 2022; Grabs et al., 2016; Ruben & Zuniga, 2011; Wahyudi et al., 2020). Many farmers cannot participate in these programs because of the costs associated with meeting certification requirements and the limited number of certification bodies and available technical support. Promised price premiums often do not reach producers, even after certification measures are implemented. This phenomenon exacerbates pre-existing disparities in GVC (Pinto et al., 2014).

The need to address these challenges is intensifying as international policies and market regulations increasingly shape the global coffee value chain. International regulatory dynamics are intrinsically connected to the lived realities of smallholder farmers, as policy directions in advanced economies often cascade through global value chains and manifest as structural pressures at the farm level (Utrilla-Catalan et al., 2022). Shifts in the competitive landscape are being driven by the sustainability standards, trade frameworks, and climate policies imposed by major importing countries (Hochachka, 2023; Rodrigues et al., 2024). The implementation of stricter environmental regulations in key consumer markets may compel exporters and producers to undertake significant operational changes, potentially increasing financial pressures on smallholder farmers with already limited resources (Piao et al., 2019; Suzianti et al., 2024). Concurrently, evolving consumer preferences toward traceable and sustainably grown coffee are reshaping market dynamics—creating new opportunities for some actors while marginalizing those unable to adapt (Vicol et al., 2018). In this context, the capacity of local industries and smallholder farmers to sustain their livelihoods depends heavily on building resilience (Lima & Lee, 2023). This involves technological advancement, skills development, and the creation of institutional frameworks that facilitate fair value distribution and mitigate systemic vulnerabilities (Behuria, 2020). Given coffee's critical role in economic stability, rural development, and environmental management, producing countries have substantial stakes in navigating these transformations effectively (Neilson & Shonk, 2014). These multifaceted challenges underscore the necessity for comprehensive and targeted research on the global coffee sector.

Despite the extensive body of scholarship examining the coffee industry within the framework of global value chains (GVCs), much of the existing research remains fragmented, providing only partial insights into the dynamics of competitiveness across the chain. Prior reviews have seldom offered an integrative synthesis that

systematically links competitiveness with emerging issues such as sustainability standards, evolving trade regimes, and methodological innovations. In addition, limited efforts have been directed toward delineating future research trajectories that could inform both theoretical advancement and policy design. To address these gaps, the present review is guided by several research questions as follows.

RQ1: What is the current state of global research on the GVC of the coffee industry, particularly in terms of competitiveness?

RQ2: What are the emerging issues related to the competitiveness of the GVC of the coffee industry?

RQ3: What are the future research directions for the competitiveness of the GVC of the coffee industry regarding context, constructs, and methodologies?

2 MATERIAL AND METHODS

We employed the systematic literature review (SLR) method to address the research objectives. The SLR approach is designed to critically evaluate and synthesize all relevant scholarly literature on a defined research topic (Smith, 2018). The systematic literature review (SLR) constitutes a rigorous methodological approach that enables the systematic identification of emerging scholarly trajectories, the consolidation and synthesis of prior empirical and conceptual findings, and the delineation of underexplored or overlooked domains within the literature (Clay & Feeney, 2019). Moreover, it facilitates a critical appraisal of the methodological designs and empirical outcomes of previous studies, while simultaneously providing a structured foundation that informs and directs future research agendas. According to the framework developed by Tranfield et al. (2003), the process of conducting a systematic literature review comprises three (3) principal stages, namely: (1) planning the review, which entails defining the need and developing a review protocol; (2) executing the review process, which involves identifying, selecting, quality-assessing, extracting, monitoring, and synthesizing data; and (3) reporting and dissemination, which consists of presenting findings, offering recommendations, and contextualizing the evidence for practical application. SLRs are recognized for enhancing the rigor and comprehensiveness of research outputs by delivering analytically robust insights (Mallett et al., 2012). Moreover, the increasing availability of digital databases enables researchers to execute literature searches with greater efficiency and consistency (Lacerda & Wangenheim, 2018). This study exclusively utilized sources indexed in the SCOPUS database, selected for its broad coverage of over 20,000 peer-reviewed journals and its emphasis on high citation standards (Smith, 2018). SCOPUS encompasses a wide array of reputable publishers, including Elsevier, Emerald, Taylor & Francis, and Springer, and is

considered more comprehensive than alternative databases (Van Eck & Waltman, 2010).

An extensive search strategy was used to retrieve literature on the global value chain (GVC) of the coffee industry. Boolean logic, as described by (Snyder, 2019), was applied using the operators “AND” and “OR” to narrow keyword relationships and ensure comprehensive coverage of relevant studies. To increase inclusiveness, full terms and common variations were combined, combining “coffee” and “global value chain” with alternative expressions such as “GVC” and “value chain.” This approach facilitated the retrieval of a diverse range of publications relevant to the research focus while minimizing the risk of excluding studies using different terminology. The search was not restricted by publication year, and the resulting literature collection spans the period from the early 2000s to May 2025. The search string employed in this study is as follows:

(TITLE-ABS-KEY (coffee) AND TITLE-ABS-KEY (“global value chain”) OR TITLE-ABS-KEY (“GVC”) OR TITLE-ABS-KEY (“value chain”)).

The screening process was subsequently refined by limiting the selection to journal articles and conference papers published in English and accessible in open access

form, while excluding review articles. This criterion was applied to guarantee that the materials analyzed were both relevant and widely available, thus enhancing the contribution of the review to the field. The inclusion of articles was determined by evaluating the relevance of the title, abstract, accessibility, and the substantive content of prior studies concerning the application of business analytics in the palm oil industry. The overall procedure for identifying the final set of studies is illustrated in Figure 1, following the PRISMA guidelines.

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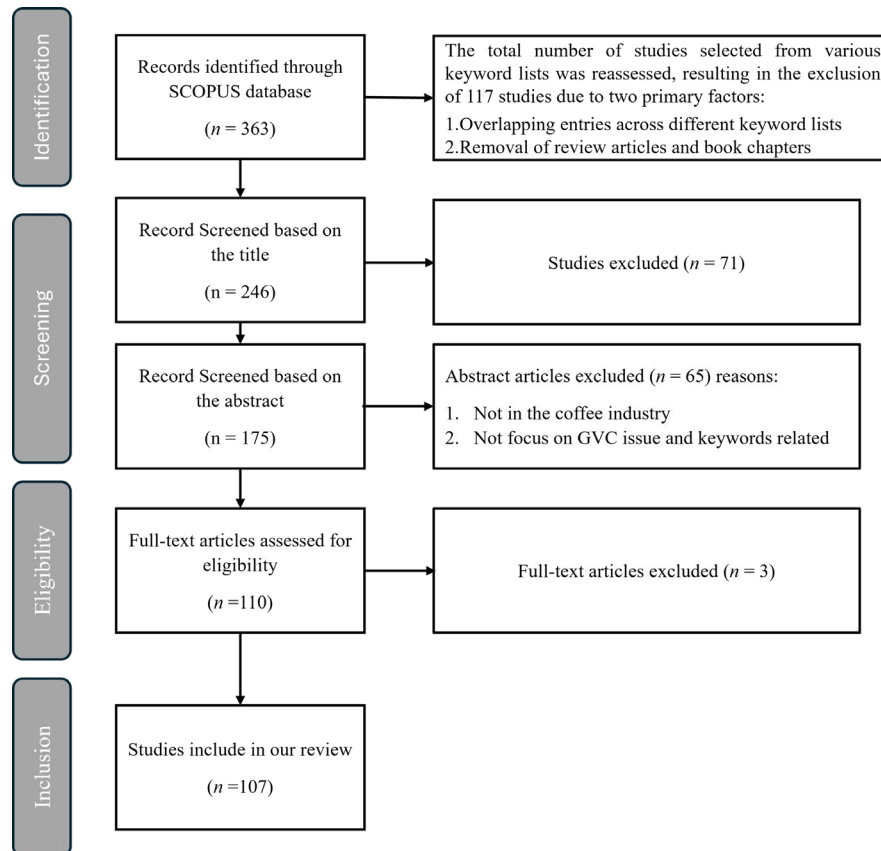


Figure 1: PRISMA flowchart of the systematic literature review.

To ensure a rigorous and comprehensive review process, the PRISMA framework was employed to guide the stages of identification, screening, eligibility assessment, and final inclusion. At the identification stage, 365 articles were retrieved from the Scopus database using the predefined search string. Following the removal of duplicates and non-relevant document types, 246 articles were retained for title screening. In this phase, 71 articles were excluded as their titles were unrelated to the coffee industry or did not demonstrate a clear connection to global value chain (GVC) issues, leaving 175 articles. A subsequent abstract screening resulted in the exclusion of 65 articles that were not focused on the coffee industry or failed to address themes such as smallholders, competitiveness, and sustainability within the GVC context, yielding 110 articles for full-text assessment. During the eligibility stage, the 110 full-text articles were carefully examined, and three studies were excluded for not aligning with the scope of the review. Consequently, 107 articles fulfilled all inclusion criteria and were incorporated into the final synthesis of this systematic review.

3 RESULTS

This section outlines the bibliometric analysis of the articles reviewed in this study. Figure 2 illustrates the publication trends related to GVC in the coffee sector between 2011 and 2025. A total of 107 articles were systematically analyzed. The data shows notable fluctuations, with only one to three publications per year from 2011 to 2015. A slight increase occurred in 2016, recording three publications, followed by a consistent rise from 2017 onwards, culminating in 9 publications in 2021. A substantial growth spurt was observed in 2022 with 19 publications, which continued with 20 in 2023 and 22 in 2024. The sharp drop to three publications in 2025 is attributed to the study's

data collection cutoff in May 2025. This trend supports the perspective of Lima and Lee (2023), who argue that research on GVCs offers vital insights into both the potential and the challenges facing developing economies. Coffee, as a key source of income for millions of smallholder farmers, also exposes deeper issues such as inequality, price instability, certification complexities, trade competitiveness, and the impact of international trade regulations on sustainability efforts in the global coffee market.

Figure 3 presents the geographical distribution of the research analyzed, which is based on the 107 articles reviewed in this study. Indonesia has the highest share, accounting for 21 articles (19.63%), followed by studies with a global scope comprising 15 articles (14.02%). Colombia ranks third with 13 articles (12.15%), whereas India and Brazil each contributed 8 articles (7.48%). Ethiopia accounted for 5 articles (4.67%), and Costa Rica, Peru, Rwanda, and Vietnam each contributed 3 articles (2.80%). The remaining 28 articles (22.76%) were published from other countries.

Table 1 shows the list of articles by displaying the author's name, title, and journal name, and the highest citation count among the 107 articles analyzed in this paper. The five articles with the highest number of citations in this paper are as follows: 1) Geographical Indications, Public Goods, and Sustainable Development: The Roles of Actors' Strategies and Public Policies (187 citations); 2) Who decides what is fair in fair trade? The agri-environmental governance of standards, access, and price (161 citations); and 3) Who gains from product rents as the coffee market becomes more differentiated? A value-chain analysis (140 citations), 4) National contexts matter: The co-evolution of sustainability standards in global value chains (118 citations), and 5) How standards compete: Comparative impact of coffee certification schemes in Northern Nicaragua (115 citations).

Table 2 describes the analytical techniques employed across the 107 articles reviewed in this study. The investigation of global value chains is intrinsically complex

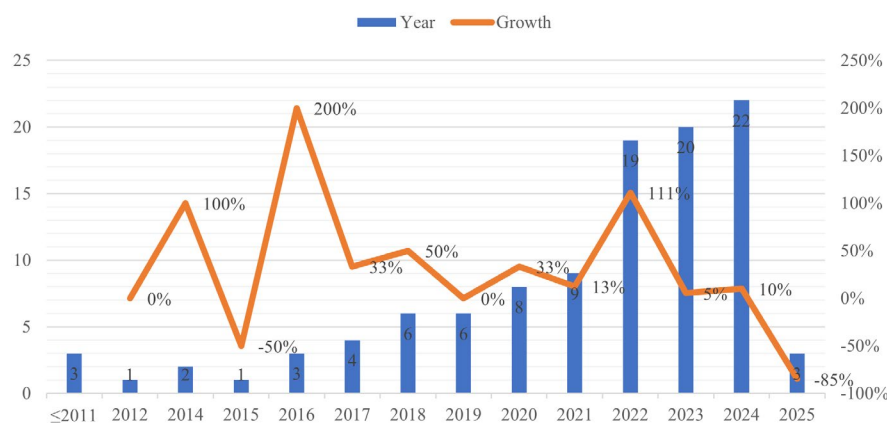


Figure 2: Publication Development.

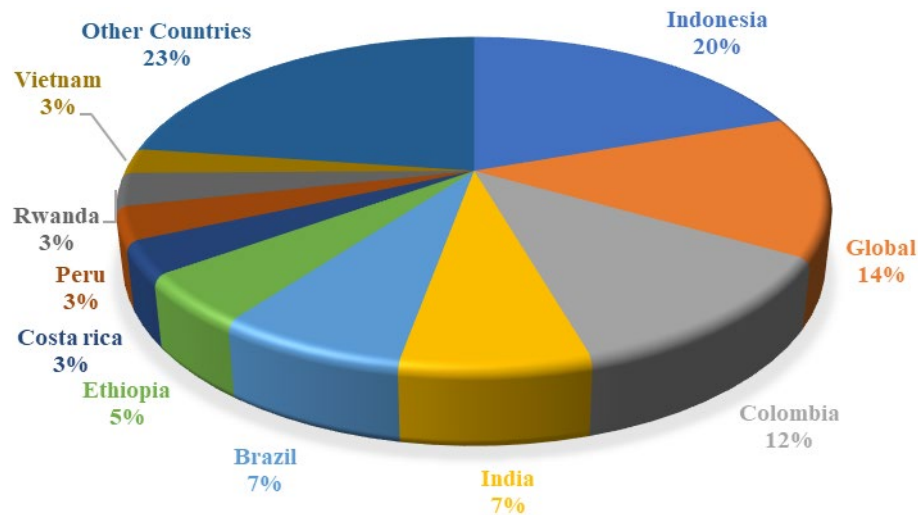


Figure 3: Geographic Distribution of Articles by Country.

Table 1: Top 10 Articles with Highest Citation.

Author	Article Title	Journal	Cited
(Belletti et al., 2017)	Geographical Indications, Public Goods, and Sustainable Development: The Roles of Actors' Strategies and Public Policies	World Development	187
(Bacon, 2010)	Who decides what is fair in fair trade? The agri-environmental governance of standards, access, and price	Journal of Peasant Studies	161
(Fitter & Kaplinksy, 2001)	Who gains from product rents as the coffee market becomes more differentiated? A value-chain analysis	IDS Bulletin	140
(Manning et al., 2012)	National contexts matter: The co-evolution of sustainability standards in global value chains	Ecological Economics	118
(Ruben & Zuniga, 2011)	How standards compete: Comparative impact of coffee certification schemes in Northern Nicaragua	Supply Chain Management	115
(Vicol et al., 2018)	Upgrading for whom? Relationship coffee, value chain interventions and rural development in Indonesia	World Development	113
(Neilson, 2008)	Global Private Regulation and Value-Chain Restructuring in Indonesian Smallholder Coffee Systems	World Development	108
(Grabs & Ponte, 2019)	The evolution of power in the global coffee value chain and production network	Journal of Economic Geography	101
(Glasbergen, 2018)	Smallholders do not Eat Certificates	Ecological Economics	89
(van Keulen & Kirchherr, 2021)	The implementation of the Circular Economy: Barriers and enablers in the coffee value chain	Journal of Cleaner Production	87

Source: SCOPUS Database (2025), Processed.

and multifaceted, reflected in the diversity of methodologies applied. Qualitative approaches remain dominant, with value chain analysis applied in 29 articles (27.10%). Ordinary least squares (OLS) econometric models were employed in 11 articles (10.28%), whereas content analysis were used in 8 articles (7.34%). Additionally, RCA and RSCA were featured in 7 articles (6.54%). Overall, 36 distinct analytical techniques were identified, highlighting the methodological richness characterizing the study of global value chain issues.

Figure 4 illustrates the evolving focus of research within the global value chain coffee industry. Earlier studies concentrated on smallholder challenges, certification, and competitiveness, while more recent works expanded into processing methods, farmer upgrading, downstream analysis, and consumer behavior and marketing strategies. Despite this diversification, some domains remain underexplored, particularly the integration of downstream dynamics with sustainability and trade frameworks, leaving important gaps for future investigation.

Table 2: Distribution of Articles by Research Method Used.

Analytical Techniques	Count	References
Value Chain Analysis/Mapping	29	van Kollenburg and van Weert (2024), Batistic et al. (2024), Ochago et al. (2024), Arslan et al. (2024), Oviedo-Rodríguez et al. (2024), Santika et al. (2024), Olupot et al. (2024), Boudreau et al. (2023), Addisie and Tebarek (2023), Hochachka (2023), Khatri et al. (2023), Lima and Lee (2023), Mehrez et al. (2023), Suryana et al. (2023), Tamru and Minten (2023), Wongpit et al. (2023), Gurmessa et al. (2022), Pradeepa Babu et al. (2022), Ramirez-Gomez et al. (2022), Henrique et al. (2021), Salam et al. (2021), Damayanti and Setiadi (2019), Pradeepa Babu et al. (2019), Glasbergen (2018), Neilson et al. (2018), Mithöfer et al. (2017), Mata et al. (2017)
Ordinary Least Squares	11	Arslan et al. (2024), Khatri et al. (2023), Dietz and Grabs (2022), Cubillos et al. (2021), Dietz et al. (2020), Minten et al. (2019), Mitiku et al. (2017), Peixoto et al. (2023), Luna (2015), Chen and Lee (2015) Ruben and Zuniga (2011)
Content Analysis	8	Navarrete-Cruz and Birkenberg (2024), Rodrigues et al. (2024), Bennett and Grabs, (2025), Glasbergen (2018), Samper and Quiñones-Ruiz (2017), Neilson and Shonk (2014), Pinto et al. (2014), Ruben and Zuniga (2011)
RCA/RSCA	7	Innayatuhibbah et al. (2024), Olupot et al. (2024), Fernandez-Güimac et al. (2023), Suryana et al. (2024), Yaulilahua et al. (2023), Bahta (2021), Pascucci (2018)
Explorative Research	5	Bennett and Grabs, (2025), Grabs and Ponte, (2019), Piao et al. (2019), Glasbergen (2018), Grabs et al. (2016)
Geographic Information System	5	Freitas et al. (2024), Morales et al. (2022), Neilson et al. (2018), Samper and Quiñones-Ruiz (2017), Grabs et al. (2016)
Vollarth Indices	5	Duana-Ávila et al. (2023), Bahta (2021), Boedirachminarni et al. (2017), Pinto et al. (2014), Gurmessa et al. (2022)
Thematic Analysis	4	Azis and Irjayanti (2024), Rubio-Jovel (2024), Sutarnin et al. (2022), Ramirez-Gomez et al. (2022)
GMM	3	Ravi Kumar et al. (2024), Gather and Wollni, (2022), Ruben and Zuniga (2011)
Ballasa Indices	3	Pascucci (2018), Boedirachminarni et al. (2017), Wahyudi et al. (2020)
GVC & GPN	3	Rodrigues et al. (2024), Behuria (2020), Neilson and Shonk (2014),
Price Spread Analysis	2	Pradeepa Babu et al. (2019) and (2022)
Constant Market-share Analysis	2	Anaya et al. (2022), Mithöfer et al. (2017)
Logistic Regression	2	Khatri et al. (2023), Bager and Lambin, (2020)
PAM	2	Kurniawan, (2016), Boedirachminarni et al. (2017)
SEM-PLS	2	Suzianti et al. (2024), Ochago et al. (2024)
Comparative Perspective Research	2	Bennett and Grabs (2025), Venus et al. (2024)
Network Analysis	1	Candelo et al. (2018)
System Dynamics	1	Haryono et al. (2024)
Process-Net Maps	1	Navarrete-Cruz and Birkenberg (2024)
Disclosure Analysis	1	Rubio-Jovel (2024),
Soft System Methodology (SSM)	1	Haryono et al. (2023)
Conjoint Analysis	1	Djufry et al. (2022)
Porter Five Force	1	Tan (2021)
Gravity Model	1	Suryana et al. (2023a)
Complex Network Analysis	1	Utrilla-Catalan et al. (2022)
AHP	1	Kurniawan (2016); Djufry et al. (2022)
ARA Model	1	Proença et al. (2022)
Business Model Canvas	1	Tan (2021)
Ishikawa Analysis	1	Suryana et al. (2023b)
Laffay-Index	1	Bahta (2021)
M4P	1	Suryana et al. (2023b)
Cost-Benefit Analysis	1	van Kollenburg & van Weert, (2024)
Typology Development	1	Clay et al., (2018)
SLQ-DLQ	1	Boedirachminarni et al. (2017)
Social-impact analysis	1	Rahmah et al. (2023)

Source: SCOPUS Database (2025), Processed.

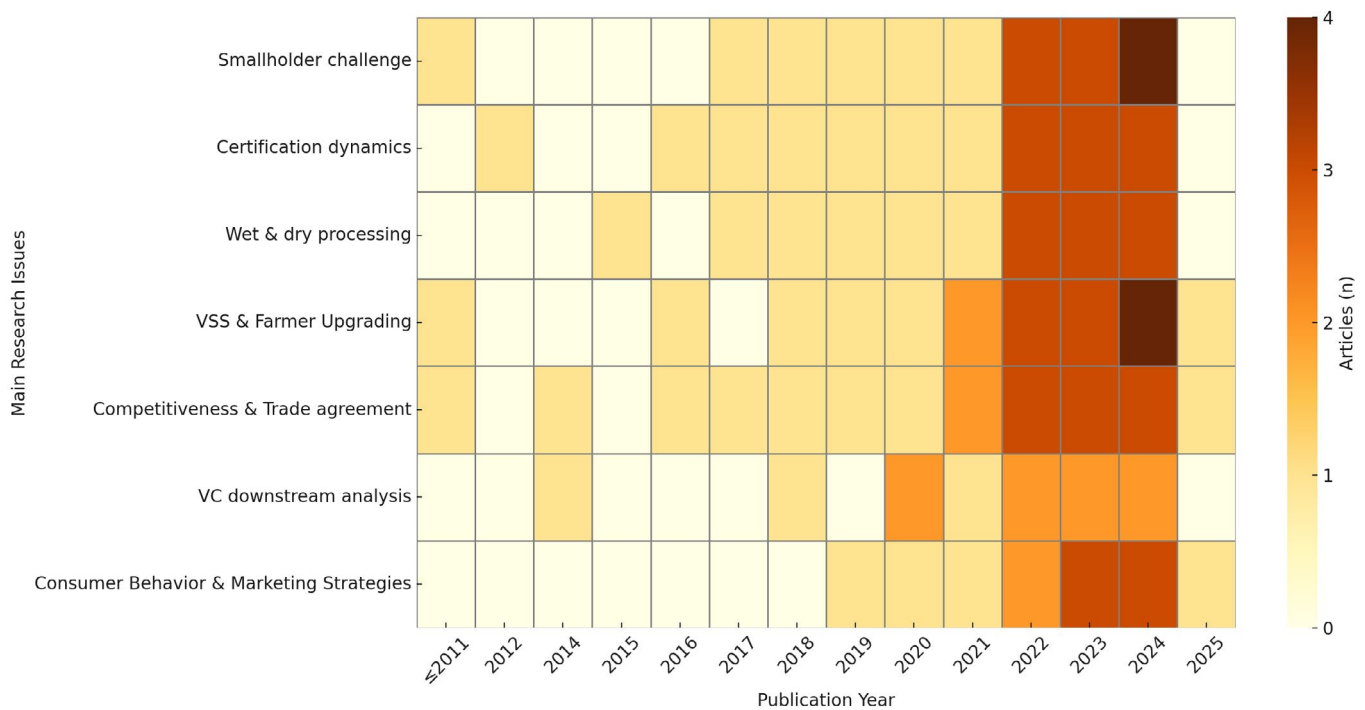


Figure 4: Heatmap of Thematic Distribution Across Publication Years.

4 DISCUSSION

4.1 Current Research on Global Value Chain Dynamics and Competitiveness

The GVC has gained prominence as a critical issue at both national and international levels, driven by a growing consensus that global trade must advance sustainability, equity, and shared benefits, especially for primary producers such as farmers (Nugraha et al., 2024). To explore this topic, a systematic literature review was conducted, analyzing the evolution of GVC-related research in the coffee sector to develop a refined conceptual framework. This study draws on the governance typology introduced by Gereffi et al. (2005), which categorizes GVC structures into five types: modular, market, captive, relational, and hierarchical. These categories are determined by three key dimensions: the ability to codify information, transaction complexity, and the capabilities of suppliers. This framework enables a detailed mapping of the global coffee value chain, helping to identify governance patterns and assess their implications for sustainability and farmer inclusion. The analysis also incorporates the geographical structuring of global value chains proposed by Suryana et al. (2023a), which serves as the basis for delineating each stage of the GVC. This integrated approach captures both global market linkages and inter-country dynamics.

The proposed GVC framework comprises four core components. The first, labeled “Input & Production,” refers to the early stages of the coffee supply chain, including bean

cultivation and harvesting, predominantly involving farmers and agricultural workers—this forms the upstream end of the value chain. The second component, “Advanced Processing & Distribution,” includes post-harvest processing and logistical operations, engaging a broad set of actors such as exporters, transporters, traders, firms, importers, and end markets—collectively representing the downstream segment. The subsequent sections will organize and present the identified challenges, issues, and empirical insights related to the GVC, categorized by value chain stages and stakeholder roles. Figure 5 presents the bibliographic coupling analysis used to develop the global coffee value chain framework through clustering of the reviewed articles.

Based on the bibliographic coupling of 107 articles used, the proposed framework for innovation within the GVC of coffee identifies seven core clusters that capture key dimensions of the sector. These encompass challenges faced by smallholders, including climatic variability, limited resources, restricted market access, and information asymmetries; certification dynamics, emphasizing the inconsistencies and implications of global certification schemes such as Fairtrade and Rainforest Alliance; and issues related to competitiveness and trade agreements, examining export determinants, free trade policies, and international regulatory frameworks. The framework further considers farmer upgrading through collective action and capacity-building initiatives, downstream value chain analysis, governance inequalities and the often-overlooked transformation costs, as well as supply chain management, with a focus on the adoption of sustainable

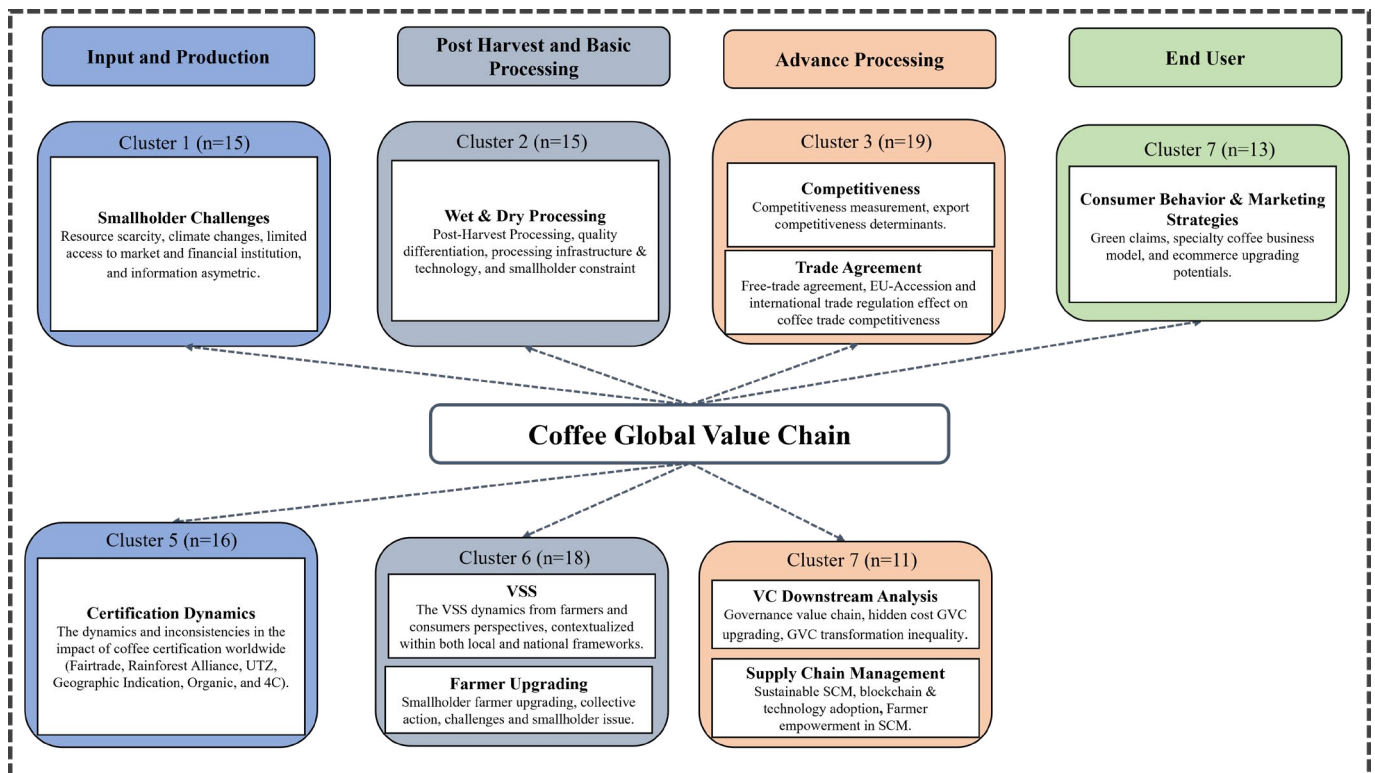


Figure 5: Bibliographic Coupling Analysis.

practices and technologies such as blockchain. Collectively, these thematic clusters highlight the critical role of strategic alliances and multi-level stakeholder collaboration in fostering innovation, promoting equity, and enhancing the overall competitiveness and sustainability of the coffee GVC as an integrated ecosystem.

4.1.1 Smallholder Farmers' Dilemma: Market Asymmetry, Climate, and Certification

At the input and production stages of the global coffee value chain, smallholder competitiveness emerged as a recurring and crucial issue in the reviewed literature. Participation in GVCs offers opportunities for market access and adoption of better agricultural practices, but adherence to stringent standards often presents a barrier for smallholder farmers with limited resources. A substantial body of literature on GVCs has highlighted the significant challenges faced by smallholder farmers in integrating into these systems. While participation in GVCs offers opportunities for market access and the adoption of improved agricultural practices, it simultaneously demands compliance with stringent standards—an often insurmountable hurdle for smallholders constrained by limited financial resources (Karatepe & Scherrer, 2024). Economic vulnerability is further intensified by the high upfront investment requirements, the risk of crop rejection, and exposure to market price fluctuations. Smallholders typically capture only a minimal share of the

final consumer price due to asymmetrical power relations within GVCs. Their confidence and negotiating capacity are further undermined by information asymmetries, inadequate infrastructure, and restricted access to essential production inputs (Rodrigues et al., 2024). Enhancing market access and promoting greater understanding of production systems can improve smallholders' competitiveness and positioning within the value chain. However, these efforts are increasingly challenged by the impacts of climate change. Under various emissions scenarios, Hochachka (2023) projects that up to 50% of Arabica coffee plantations may be lost, with declines reaching 65–100% by 2080. Smallholder farmers remain the most vulnerable segment in GVCs, particularly due to irregular rainfall, insufficient irrigation infrastructure, and limited availability of organic crop protection measures (Khatri et al., 2023).

Research on smallholder farmer certification in enhancing smallholder farmers' well-being and resilience have produced varied outcomes, underscoring the complexity of implementation and the unequal distribution of benefits across global value chains. Research by Henrique et al. (2021) suggests that certification can support farmer welfare through improved product standards, preferential market channels, increased transparency along the supply chain, and capacity-building via training and cooperative engagement. Certifications such as Fairtrade, organic, and Rainforest Alliance have been linked to greater value creation, expanded global market reach, and

the adoption of more sustainable farming practices Wahyudi et al. (2020). In the Ethiopian context, participation in the Rainforest Alliance program has been associated with higher farm-gate prices, thereby improving the economic outcomes for certified smallholders.

In contrast, some studies provide a pessimistic view. Gather and Wollni (2022) Rainforest Alliance certification promotes sustainable practices but has not had a major economic impact on smallholders. Moreover, geographical indication (GI) does not have a substantial effect on farmers' income. In a study of the value chain of Indonesian Gayo coffee, Damayanti and Setiadi (2019) revealed a similar condition. Although dual certification tends to decrease income diversification and increase economic vulnerability, Dietz et al. (2020) reported that Fairtrade had a limited effect on household incomes in Colombia. Given the phenomenon of production specialization, it can be postulated that Fairtrade and Rainforest Alliance certification may have a concomitant effect on coffee prices, farmer profits, and household income diversification (Mithöfer et al., 2017). Taken together, the literature demonstrates two contrasting perspectives: while some studies emphasize the potential of certification to improve sustainability practices, market access, and competitiveness, others highlight its limited or even adverse economic effects on farmers. A critical evaluation of the findings of this study is imperative, as they demonstrate the inconsistencies and dynamics that necessitate such an evaluation. Accordingly, the divergence between positive and negative views suggests that the impact of certification is highly context-dependent and requires careful synthesis within global value chain debates.

Previous studies point out that competitiveness at the input and production stage is shaped by structural asymmetries, environmental pressures, and certification mechanisms. Evidence remains mixed and context-dependent, reflecting the absence of an integrated understanding of how smallholder vulnerabilities influence competitiveness across the coffee GVC. These insights highlight the importance of situating smallholder challenges as a core dimension of competitiveness within global value chains rather than as peripheral concerns.

4.1.2 Post-Harvest Practices and Institutional Dimensions in the Coffee Value Chain

The post-harvest and processing stage has been widely recognized in the literature as critical for competitiveness, with both technological practices and institutional arrangements shaping outcomes. Processing techniques applied after harvest strongly influence quality differentiation and determine the market position of producers within the value chain. Wet processing, also called thorough washing, is a series of procedures that include mechanical dehulling of coffee beans, spontaneous enzymatic or microbial fermentation of the mucilage layer, thorough washing, and controlled drying until

the beans reach a moisture content of about 10–12%, which is then hulled into green coffee beans (Poláková et al., 2022). Before dehulling, coffee beans pass through a transitional stage known as parchment coffee, during which the endocarp remains intact, serving as a protective layer during drying and storage (Khatri et al., 2023). This stage is particularly important in wet processing and is associated with enhanced sensory attributes in Arabica coffee, including improved flavor clarity, heightened acidity, and greater aromatic complexity—qualities highly prized in premium and specialty markets (Lopes et al., 2020). Despite its qualitative advantages, wet processing remains inaccessible to many smallholder farmers due to the substantial investment required in infrastructure, consistent access to clean water, and availability of skilled labor (Bro & Clay, 2017). Furthermore, the method generates considerable organic waste, which can pose serious environmental risks if not properly managed (Ribeiro et al., 2020). Empirical studies from Colombia and Burundi highlight that cooperative infrastructure and strong institutional backing are critical for enabling smallholders to adopt wet processing techniques and meet international quality standards (Bro & Clay, 2017; Parente-Laverde, 2020). Nevertheless, the continued absence of decentralized processing technologies tailored to small-scale operations, along with high capital demands and limited water resources, remain key barriers to broader implementation (Tan, 2021).

In contrast, despite its operational limitations, dry processing continues to be the most common post-harvest technique in areas with limited infrastructure, limited access to investment capital, or water scarcity. This method involves drying whole coffee cherries on a raised platform or paved surface for several weeks, a process that does not involve pulp removal or pre-fermentation of the cherries. Mechanical tools, such as knives or machines, are then used to remove the outer layers of the coffee cherries, including the skin, pulp, and bran (Fatima, 2015). The use of dry processing offers benefits owing to its cost-effectiveness and technical practicality. These difficulties are especially evident among smallholder farmers, who frequently do not have access to post-harvest training or technical support. The absence of standardized grading procedures and effective traceability systems limits market opportunities, especially in export sectors where quality is a critical factor (Oviedo-Rodríguez et al., 2024). While innovations such as mechanical dryers and optical sorting technologies have shown potential for improving consistency, their adoption remains hampered by several factors. These include the absence of coordinated training programs, limited access to financial resources, and the absence of an institutional support framework (Sutarmin et al., 2022).

Voluntary Sustainability Standards (VSS) have gained prominence as key instruments within global value chains, particularly in sectors like coffee, to advance environmental

protection, uphold labor rights, and promote social equity (Rubio-Jovel, 2024). From an optimistic perspective, VSS are viewed as tools to strengthen farmers' resilience and facilitate sustainability transitions. In Colombia, hybrid governance structures have shown the capacity to deliver positive environmental, social, and economic outcomes (Navarrete-Cruz & Birkenberg, 2024), while the adoption of the 4C system in Brazil has improved production management and enhanced farmers' roles within the value chain (Samper & Quiñones-Ruiz, 2017). When implemented effectively, VSS are argued to enhance livelihoods, open up premium market access, and support alignment with global development goals. However, critical perspectives caution that VSS may perpetuate existing power asymmetries. Despite the promise of higher returns, smallholders often receive a disproportionately small share of the added value, while shouldering high certification costs and being excluded from decision-making structures (Manning *et al.*, 2012). Evidence from Ethiopia, Brazil, Colombia, and Rwanda suggests that systemic barriers—such as limited access to inputs, vulnerability to climate change, and weak institutional frameworks—constrain the potential benefits of VSS (Minten *et al.*, 2019; Gather & Wollni, 2022). Furthermore, most of the economic value remains concentrated in downstream segments, while compliance demands are largely imposed on producers (Grabs *et al.*, 2016). Although VSS hold the promise of long-term positive transformation, their success hinges on equitable governance, local adaptation, and fairer power dynamics throughout the value chain.

Upgrading in the coffee GVC is a complex process shaped by process improvement, product differentiation, and functional upgrading. Comparative evidence from producing countries highlights how these strategies are applied differently across contexts, particularly in Indonesia and Ethiopia. In Indonesia, research emphasizes the role of good agricultural practices and post-harvest technologies in improving coffee quality, with specialty and certified coffee serving as key strategies for accessing premium markets (Suryana *et al.*, 2023b). In Ethiopia, studies demonstrate that coffee washing increases value through higher international prices, while “relationship coffee” illustrates the potential of closer buyer linkages to support farmer livelihoods (Tamru & Minten, 2023). Complementary mechanisms such as collective action and state-backed cooperatives, as highlighted by Karatepe and Scherrer (2021), play a crucial role in mitigating power asymmetries and advancing inclusive and sustainable development within coffee value chains. The literature shows that Indonesia's upgrading is constrained by difficulties in scaling technical improvements, whereas Ethiopia's upgrading generates price premiums but remains hindered by weak institutional support and limited market access. These challenges are not confined to these two countries but reflect broader patterns across emerging markets, which dominate

global coffee production yet face persistent structural barriers to achieving competitiveness through upgrading.

Previous research has shown that improvement strategies such as process improvement, product differentiation, and functional enhancement are key to strengthening farmers' positions in the value chain. The adoption of good agricultural practices, post-harvest technologies, and the production of specialty or certified coffee are important pathways to increased competitiveness. Outcomes remain context-dependent and conditioned by structural factors in producing countries and the broader institutional environment of coffee GVCs. The literature suggests that competitiveness at the post-harvest stage is explained by the degree of alignment between technological progress and institutional mechanisms, rather than by either dimension considered in isolation.

4.1.3 Export Competitiveness and Value Creation Challenges in GVC

Export competitiveness in the coffee GVC is closely tied to the capacity of producing countries to diversify markets, capture greater value, and reduce dependence on primary commodities. Trade agreements such as the EU-Colombia provide opportunities for export diversification, including coffee and palm oil. Nevertheless, dependence on primary products limits the development of value-added sectors (Cubillos *et al.*, 2021). In the global production network (GPN), economic value tends to be concentrated in downstream actors, such as processors and buyers in developed countries, whereas upstream actors, including farmers, receive only a fraction of the added value (Grabs & Ponte, 2019). Lima and Lee (2023) emphasize the influential position of downstream stakeholders especially roasters and retailers in industrialized nations—who leverage both tariff and non-tariff instruments to maintain value-added activities and inhibit technological development in coffee-producing countries such as Brazil, Colombia, and Vietnam. In Rwanda, the exclusion of producers from governance structures within the coffee value chain led to suppressed base prices and over two decades of production stagnation, illustrating the critical role of inclusive governance in promoting sustainable sector growth and economic viability (Clay *et al.*, 2018).

Export competitiveness is also shaped by the ability of supply chains to integrate technological and organizational innovation. Digital transformation and access to real-time data have been shown to improve efficiency and strengthen the competitiveness of small- and medium-scale exporter (Azis & Irjayanti, 2024; Suzianti *et al.*, 2024). Collaborative models that position farmers as partners in business strategies enhance resilience against market volatility, while sustainable sourcing and certification protocols create additional competitive advantages (Candelo *et al.*, 2018; Proença *et al.*, 2022). Value distribution and sustainability issues are significant topics in

most of the literature on downstream GVCs. A more equitable profit distribution could be achieved through innovations such as value chain profit sharing (Bennett & Grabs, 2025). Santika et al. (2024) state that market-based approaches often fail to address structural inequality and environmental degradation in global supply chains. Ponte (2022) revealed how the hidden costs of ecological improvement are frequently imposed on producers in developing countries, benefiting large corporations in developed countries without solving sustainability challenges. Furthermore, Utrilla-Catalan et al. (2022) highlight that increasing market concentration in the coffee sector intensifies disparities between producing and consuming countries, with producers in developing countries increasingly losing control over the economic value generated. Overall, the evidence suggests that export competitiveness in coffee GVCs is constrained by unequal value distribution, limited technological advancement, and a disproportionate burden of sustainability placed on producers, underscoring the structural challenges faced by coffee-exporting countries in improving their position in the global market.

4.1.4 Consumer Behaviour and Digital Transformation in Global Value Chains

Consumer preferences have become an increasingly decisive factor in shaping competitiveness within the coffee GVC, with growing emphasis on sustainability, ethical sourcing, and traceability. Digital commerce platforms play crucial role in this transformation by facilitating direct interaction between producers and consumers, reducing reliance on intermediaries, and enhancing transparency (Mata et al., 2017). These platforms help foster consumer trust and promote ethical consumption practices. In Costa Rica, the adoption of sustainability initiatives has been linked to increased consumer loyalty and has yielded both economic and environmental benefits, as evidenced by the effectiveness of direct-to-consumer models and certifications such as Fairtrade and ISO 14001 (Boudreau et al., 2023). Similarly, eco-marketing strategies emphasizing authenticity and environmental commitment have been shown to strengthen brand equity and influence consumer purchase behavior (Chen & Lee, 2015).

Technologies that enable digital traceability further empower consumers to make ethically informed decisions, offering opportunities for smallholder farmers in contexts (Karatepe & Scherrer, 2021). Shifts in consumer demand for specialty coffee in Vietnam and the adoption of certifications like Rainforest Alliance and UTZ illustrate how socially conscious markets influence production systems (Agergaard et al., 2009; Manning et al., 2012). The third-wave coffee movement in Brazil reinforces the role of artisanal practices and value co-creation in shaping consumer experiences and differentiating products in sustainable ways (Boaventura et al.,

2018). Taken together, the literature demonstrates that evolving consumer expectations for transparency, sustainability, and ethical conduct are redefining the dynamics of the coffee GVC. These trends highlight how digital transformation and socially conscious consumption increasingly determine competitiveness, influencing not only market access but also the long-term strategies of producers and exporters.

4.2 Competitiveness Measurement in Global Value Chain

In the literature on coffee industry GVC, competitiveness emerges as one of the most rigorously studied themes. This demonstrates that competitiveness constitutes a pivotal element within the GVC. A review of the 107 articles included in this study shows a wide variety of indices and computational models employed to assess the competitiveness of coffee commodities, which illustrates both the maturity and the methodological diversity of this research domain. These approaches can be broadly categorized into two levels of analysis: product-level and regional or country-level. Product-level analysis evaluates the competitiveness of specific coffee commodities from the perspective of exporting countries, whereas regional and country-level analysis captures competitiveness through indicators of trade performance and structural factors embedded within geographic or national contexts. While this dual classification provides valuable insights, it also demonstrates the fragmented nature of competitiveness research in the coffee GVC, with studies often focusing on one dimension without integrating multiple levels of analysis. This highlights a research gap and signals the need for more integrative approaches that combine product- and country-level perspectives, thereby enabling a more comprehensive understanding of how competitiveness is embedded within the global coffee value chain. By situating competitiveness at the center of the review, this section addresses the first research question concerning the state of research, while also informing the third research question by pointing toward future directions that emphasize methodological integration and multi-level analysis. Table 3 below presents the various measurement techniques employed to assess coffee competitiveness.

4.3 Limitation and Research Gap

This review is subject to several limitations that should be acknowledged. First, the exclusive reliance on Scopus may have resulted in the omission of relevant studies indexed in other databases, particularly those published in interdisciplinary or region-specific journals. Second, the focus on English-language journal articles, review papers, and conference papers narrows the scope and may exclude important contributions available in other languages, especially from coffee-producing countries. Third, the exclusion of grey

Table 3: Measurement Techniques of Coffee Competitiveness.

Group	Methodology	Measurement	Description	References
Product Level Analysis	Balassa Indices	Revealed Comparative Advantage (RCA)	Index measuring the competitiveness of a country's product based on trade patterns.	Nasution et al. (2024); Suryana et al. (2024), Santika et al. (2024), Yaulilahua et al. (2023), Bahta (2021)
		Revealed Symmetric Comparative Advantage (RSCA)	Modification of RCA to address asymmetry issues in RCA values, providing a better representation of comparative advantage.	Suryana et al. (2024), Pascucci (2018)
		Revealed Trade Advantage (RTA)	Index considering both exports and imports to evaluate the comparative advantage of a commodity.	Pascucci (2018)
	Sector-Based Competitiveness	Static Location Quotient (SLQ)	Index measuring the degree of specialization of an economic sector in a specific region compared to a reference region.	Boedirachminarni et al. (2017)
		Dynamic Location Quotient (DLQ)	Index assessing changes or dynamics of sectoral specialization in a specific region over time, compared to a reference region.	Boedirachminarni et al. (2017)
	Economics Policy Analysis	Policy Analysis Matrix (PAM)	Methodology for measuring competitive and comparative advantage of a product and evaluating the impact of policies on efficiency, competitiveness, and economic welfare within production systems by comparing private (market) and social (economic) price.	Kurniawan, (2016), Boedirachminarni et al. (2017)
Regional and Country-level Analysis	Export-Import Performance Indices	Export Product Dynamics (EPD)	The method is to analyze the competitive position of a product in a matrix that includes market strength and market attractiveness.	Innayatuhibbah et al. (2024)
		Vollarth Index	Index assessing a country's comparative advantage in terms of both exports and imports.	Bahta (2021), Boedirachminarni et al. (2017)
		Laffay Index	Index measuring a country's competitive advantage and trade specialization in specific commodities by considering international trade structure and total trade balance.	Bahta (2021)
		Herfindahl-Hirschman Index (HHI)	Index measuring level of market concentration or diversification in export or import trade.	Bahta (2021)
		Export Diversification Index (EDI)	Index measuring extent to which exports of a country are concentrated on a few commodities or evenly distributed across a variety of commodities.	Bahta (2021)
		Dynamism Participation Index (SP)	Index assessing a country's participation in the international market by considering the global export growth of a specific commodity.	Yaulilahua et al. (2023)
		Market Share Index (MS)	Index measuring a country's competitiveness based on export market share in the global market.	Yaulilahua et al. (2023)
		Net Export Index (NEI)	Index evaluating the balance or orientation trend between exports and imports for a product.	Duana-Ávila et al. (2023)
		Additive Revealed Competitive Advantage Ratio (VCRA)	Index measuring competitiveness or specialization in the production of a product compared to global production	Duana-Ávila et al. (2023)
		Self-Sufficiency Index (AI)	Index measures the dependency level of a country's commodity on foreign imports.	Duana-Ávila et al. (2023)
		Trade Balance Index (TBI)	Index assessing the country's net contribution position, identifying whether it is more export-oriented or import-oriented for a specific product	Suryana et al. (2024),
		Major export category (MEC)	Index identifying primary commodity groups contributing most to the export value of a country, reflecting leading sectors in international trade.	Bahta (2021)
		Constant Market Share (CMS)	Method for identifying factors influencing changes in a country's exports, breaking them down into market growth, commodity structure, and competitiveness effects.	Anaya et al. (2022).

literature such as reports and working papers, although outside the peer-reviewed domain, restricts the incorporation of timely and policy-oriented evidence. Finally, the synthesis is inherently influenced by the scope, methodology, and reporting practices of the selected studies, which may limit the extent to which interdisciplinary perspectives are fully represented.

Despite these methodological constraints, this review draws attention to several research gaps that remain to be addressed. Studies on coffee global value chain competitiveness have predominantly focused on specific segments rather than advancing an integrated framework that connects production, trade, industry, and policy dimensions. Empirical work has been largely situated within national contexts, which has limited the development of comparative and cross-country perspectives that are essential to capture the global nature of the value chain. Methodological orientations have been concentrated on descriptive analyses and conventional competitiveness indicators, offering fewer extensions into more diversified analytical strategies. Thematic issues such as sustainability standards, climate-related regulations, and smallholder resilience also appear unevenly emphasized, with limited treatment as central determinants of competitiveness. These gaps point to the need for more conceptually integrative, internationally comparative, and methodologically pluralistic research to enrich understanding of competitiveness in the coffee global value chain.

4.4 Directions for Future Research

This paper aims to conduct a systematic review of the global value chain literature with the objective of developing a comprehensive roadmap for future research, building on prior studies related to competitiveness and the global coffee value chain. Drawing on the framework established by Paul and Rosado-Serrano (2019), the study proposes directions for future inquiry by analyzing the contextual factors, conceptual constructs, and methodological approaches employed in the existing body of research.

4.4.1 Context where studies can be conducted

This systematic literature review revealed that many coffee industry GVCs consider the coffee sector as a whole. However, studies on the global coffee value chain related to small farmer groups and MSMEs are very limited. Local economies and farmer welfare are also supported in a vital way by MSMEs and smallholder groups (Neilson, 2013). The aspects currently lacking in this research offer great potential for future research. Hence, studying the GVC of the coffee industry for small farmer groups and MSMEs within a more specific industry is imperative. Hence, future studies are encouraged to study small farmer groups and MSMEs to increase the diversity of current research on the value chain of coffee.

Since most studies on GVC in the coffee industry have been conducted in specific countries, including Indonesia, Brazil, Colombia, India, and Vietnam, there are opportunities to conduct studies in emerging markets, especially those located in Africa, European countries, and other regions of Latin America. Since globalization has interconnected coffee markets worldwide and ensures the inclusion of diverse actors in global trade, future research should focus on these emerging markets to enrich the understanding of regional dynamics and their role in the worldwide coffee value chain.

Several studies have explored the GVC in the coffee industry through cross-country comparisons, particularly in the context of developing economies (Grabs et al., 2016; Karatepe & Scherrer, 2024). However, the majority of this research focuses on the position of individual countries in the GVC. As such, this study encourages future scholars to adopt cross-national comparative approaches to examine the GVC. This examination will enable the generalization of prior findings and theoretical frameworks while deepening the understanding of broader contextual influences, including socioeconomic conditions, cultural particularities, and technological investment patterns.

4.4.2 Constructs that can be used in future studies

The findings of this study indicate sustained academic interest in the coffee industry's GVC; however, analyses centered on global production networks through a governance perspective remain limited, with only a few notable contributions (Grabs & Ponte, 2019; Behuria, 2020). This finding implies the urgency for future empirical research to investigate governance structures within global coffee value chains more thoroughly. In addition, while emerging technologies—such as blockchain and the Internet of Things (IoT)—offer substantial potential for advancing the field, these topics are notably absent from the reviewed literature, presenting a significant research gap. Moreover, insufficient attention has been paid to the roles of regional cultural practices, financial inclusion for MSMEs and smallholder farmers, and the implications of trade policies and tariff regimes. Future investigations should address these themes to strengthen academic understanding of governance, inclusiveness, and competitiveness in the global coffee value chain. Addressing these dimensions will enhance the practical relevance and analytical depth of scholarly contributions in the context of a rapidly evolving business and technological environment.

Future GVC research—particularly within the coffee sector—should also focus on constructs that assess value-added contributions from both domestic and international inputs. Understanding the product-specific impact of these inputs on competitiveness is crucial, yet often overlooked (Koopman et al., 2014). The integration of forward and backward

linkage analysis can offer a comprehensive perspective on upstream and downstream processes, thereby informing industry development and guiding policy interventions. This methodological approach has yielded positive results in other sectors, such as seafood exports, where targeted strategies based on linkage insights have improved sectoral integration and export performance (Egunjobi & Ngepah, 2022). Despite the importance of sector-specific GVC participation analysis, current literature—such as the works of Kowalski et al. (2015) and Pietrobelli (2008)—tends to focus on aggregate-level participation factors in emerging economies. Future research could adapt these conceptual frameworks to the coffee industry to identify key enablers of integration and upgrading, particularly in light of the distinct structural and developmental challenges faced by producing countries.

4.4.3 Methodologies that can be employed in future studies

Previous research on the methodological front of the global coffee value chain has evaluated trends predominantly through empirical studies, with a strong emphasis on qualitative methodologies. Most prior studies employed approaches such as qualitative value chain mapping and analysis. However, quantitative analyses addressing the dynamics of global coffee value chains from upstream to downstream are scarce. Among the literature we reviewed, only Wongpit et al. (2023) applied a quantitative approach, specifically value chain mapping, to estimate value-added transitions across various actors in the chain. The use of a quantitative approach in GVC research is an area that has more potential. This study recommends that qualitative studies on the GVC also enhance the variety of observations of various countries worldwide, which can be extended using network analysis, which we also recommend adopting for further research on the global coffee value chain.

From a methodological perspective, various analytical tools have been applied to analyze competitiveness, which is one of the central issues in the GVC. We observe that the competitiveness measurement techniques currently employed are highly diverse. However, several methods could serve as references for future research, such as product space analysis (Hildago et al., 2007), the global value chain index (Koopman et al., 2012), and the economic complexity index (Hidalgo & Hausmann, 2009). The diverse range of analytical methodologies employed in GVC research holds significant potential for deepening the understanding of GVC dynamics and addressing emerging challenges. To advance the field, future studies are encouraged to expand the analytical scope of GVC research by incorporating national competitiveness frameworks, such as Porter's Diamond model, and employing composite index methodologies. Techniques including entropy-based weighting, panel data analysis, and cross-country benchmarking—commonly used in manufacturing

sector analyses (Dou et al., 2021; Fainshmidt et al., 2016; Tsai et al., 2021)—could be effectively adapted to examine the impact of institutional quality, infrastructure, and innovation ecosystems on competitiveness in the coffee industry. Despite their analytical relevance, these methods remain underutilized in current GVC literature and warrant broader integration in future research.

5 CONCLUSIONS

This systematic review shows that research on the global coffee value chain, particularly in relation to competitiveness and sustainability, remains limited in methodological diversity and geographic scope. Most studies are qualitative, with few employing quantitative or mixed-method approaches and only limited cross-country comparisons. Key gaps include digital transformation, competitiveness models, and multidimensional measures. Promising directions involve governance, new technological paradigms, and linking competitiveness with social outcomes. Future research is recommended to explore micro-level dynamics and smallholder participation in emerging markets.

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7 AUTHOR CONTRIBUTIONS

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8 DATA AVAILABILITY STATEMENT

Data available upon request to authors.

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