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The Advancement of the Circular Economy in Micro and Small Businesses in Brazil and Worldwide

El avance de la economía circular en las micro y pequeñas empresas de Brasil y del resto del mundo

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Abstract

This study investigates the progress of the circular economy (CE) in micro and small enterprises (MSEs), with a focus on Brazil. A bibliometric and systematic literature review (2014–2024) analyzed 130 studies globally and 17 from Brazil. Research on CE in small businesses is growing but remains fragmented. Key barriers include financial, knowledge, and organizational constraints, while capabilities, collaboration, technology, and institutions can enable CE. The adoption of CE ranges from recycling to circular business models. The evidence from Brazil aligns with global trends but emphasizes the importance of institutional support, infrastructure, and local networks for effective CE implementation.

Resumen

Este estudio analiza los avances de la economía circular (EC) en las micro y pequeñas empresas (mypes), centrándose en Brasil. Mediante una revisión bibliométrica y sistemática de la literatura (2014-2024), se analizaron 130 estudios mundiales y 17 de Brasil. La investigación sobre la EC en las pequeñas empresas está creciendo, pero sigue fragmentada. Entre las principales barreras se encuentran las limitaciones financieras, de conocimientos y de organización, mientras que las capacidades, la colaboración, la tecnología y las instituciones pueden facilitar la EC. La adopción de la EC abarca desde el reciclaje hasta los modelos de negocio circulares. Los datos de Brasil coinciden con las tendencias mundiales, pero subrayan la importancia del apoyo institucional, de las infraestructuras y de las redes locales para una implantación eficaz de la EC.

KEYWORDS / PALABRAS CLAVE

Circular economy, MSEs, bibliometric analysis, systematic review, Brazil / Economía circular, mypes, análisis bibliométrico, revisión sistemática, Brasil.

JEL Classification / Clasificación JEL: *L26, Q01, Q53.*

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1. Introduction*

The intensive use of natural resources and the growing generation of waste have rendered the linear model of production and consumption increasingly unsustainable within today's economic system—a situation that has worsened over the past decades. Structured around the logic of extraction, production, consumption, and disposal, this model causes significant environmental impacts and threatens the long-term continuity of productive systems (Lehmann et al., 2014; Ellen MacArthur Foundation et al., 2015). In this context, governments, businesses, and researchers are exploring solutions that reconcile economic growth, innovation, and sustainability.

The CE has emerged as a promising alternative, promoting closed-loop production systems based on practices such as reuse, recycling, remanufacturing, and optimized resource use. Beyond being an environmental management approach, the CE represents an integrated strategy that seeks to create economic, social, and environmental value across the entire supply chain (Geissdoerfer et al., 2017; EEA, 2016). In contrast to the linear "take–make–dispose" model, circularity aims to regenerate resource flows, extend material lifespans, and reduce pressures on ecosystems (Haas et al., 2015).

Despite its growing prominence on political and corporate agendas, the adoption of circular practices still faces considerable challenges. Conceptual barriers (such as the lack of standardized definitions), financial constraints (including high initial costs and uncertain returns on investment), technological limitations (requiring innovation and specialized expertise), cultural resistance, and regulatory fragmentation remain significant obstacles (Friant et al., 2020; Kirchherr et al., 2017; Rizos et al., 2016). These barriers are even more pronounced for micro and small enterprises (MSEs), which often operate with limited resources and restricted access to technology (Mishra et al., 2022; Ormazabal et al., 2018).

Although research on the CE has progressed significantly in recent years, studies focusing specifically on small enterprises remain incipient and fragmented. The literature shows that most analyses concentrate on large corporations or industrial sectors with greater access to technology and financing, overlooking

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the dynamics and specific characteristics of MSEs. Furthermore, few studies combine bibliometric and systematic review approaches to simultaneously analyze the evolution of scientific production and the practical dimensions of CE implementation in small enterprises, particularly in emerging economies such as Brazil. This gap underscores the importance of strengthening theoretical and empirical frameworks that demonstrate how circular practices can be adapted to the reality of small businesses, particularly in emerging economies such as Brazil (Thorley et al., 2019; Sawe et al., 2021; Harland et al., 2023).

Given that small enterprises account for more than 90% of active businesses in Brazil and play a fundamental role in job creation and income generation, understanding how circularity can be incorporated into this sector is of major socioeconomic and environmental relevance. The adoption of circular models can reduce waste and resource dependency while fostering innovation, competitiveness, and the strengthening of local networks by integrating economic growth with social and environmental responsibility (Rizos et al., 2016; Borsatto et al., 2023).

Thus, the objective of this study is to present the state of the art in CE research in MSEs, employing bibliometric and systematic analyses to identify the main barriers, opportunities, and enabling factors, with a particular focus on the Brazilian context. The combination of these two methods provides a comprehensive and evidence-based understanding, helping to address existing academic gaps and to guide management strategies and public policies aimed at sustainability. In addition to mapping scientific trends, this study contributes by connecting international discussions on CE with the practical realities of micro and small enterprises in emerging economies, especially Brazil.

2. Theoretical Framework

The CE has emerged as a multidimensional approach to addressing the limitations of the traditional linear economic model by promoting the circulation and efficient use of products, materials, and resources. Its conceptual development is associated with the convergence of perspectives such as Industrial Ecology, the Green Economy, and the Cradle-to-Cradle model, which contribute to the broad applicability of CE and to conceptual diversity in its definitions, principles, and measurement (Blomsma & Brennan, 2017; Kirchherr et al., 2017). Consequently,

CE encompasses not only environmental practices such as reuse, recycling, remanufacturing, and resource recovery, but also organizational, technological, economic, and institutional changes aimed at creating and maintaining value while reducing resource consumption and waste (Geissdoerfer et al., 2017; Corona et al., 2019).

The adoption of CE in micro and small enterprises (MSEs) requires particular attention because these organizations frequently operate with more limited financial, technological, and human resources than larger firms. Such constraints can affect their ability to invest in new technologies, redesign products and processes, develop specialized knowledge, and establish new organizational practices (Rizos et al., 2016; Mishra et al., 2022). At the same time, the smaller scale and organizational flexibility of MSEs may facilitate innovation, adaptation, and the development of context-specific circular solutions (Ormazabal et al., 2018). The adoption of CE should therefore not be understood solely as the implementation of individual environmental practices, but as a process shaped by the resources and capabilities available to firms, their ability to adapt organizational practices, and the perceptions and intentions of the actors involved.

From a Resource-Based View (RBV), CE adoption can be understood in terms of the resources and capabilities that firms possess or can access. Financial resources, technological knowledge, human expertise, and organizational capabilities can influence the firm's ability to identify and implement circular practices. This perspective is particularly relevant to small enterprises because resource constraints may directly limit their capacity to undertake investments and organizational changes associated with CE. Touratier-Muller and Mesnier (2024), for example, employ the RBV to examine CE-related issues among SMEs. However, the RBV primarily emphasizes resources internal to the firm and thus offers limited explanation of how external actors, institutional conditions, and interorganizational relationships may influence CE adoption.

The Dynamic Capabilities perspective complements the RBV by focusing on the firm's ability to adapt, integrate, and reconfigure resources in response to environmental changes. In the context of CE, this perspective helps explain how firms can identify circular opportunities, mobilize available resources, and modify organizational processes and business practices to address sustainability challenges and evolving market conditions. Aranda-Usón et al. (2024), for instance, apply the Dynamic Capabilities perspective in the context of CE. However, the development and exercise of such capabilities may themselves

depend on access to financial, technological, and institutional resources, which can constrain small enterprises' ability to transform identified opportunities into concrete circular practices.

A complementary behavioral perspective is provided by the Theory of Planned Behavior (TPB), which considers the role of attitudes, subjective norms, and perceived behavioral control in shaping behavioral intentions and actions. In relation to CE, this perspective can help explain how entrepreneurs and managers perceive circular practices, how stakeholder expectations influence their decisions, and how they assess their capacity to adopt them. Singh et al. (2018), for example, employ an extended version of the TPB to investigate CE readiness among manufacturing MSMEs. Nevertheless, behavioral intentions alone may not be sufficient to explain actual implementation, particularly when firms face structural constraints related to financial resources, technological capabilities, infrastructure, or regulatory conditions.

Taken together, these theoretical perspectives provide complementary explanations of CE adoption in small enterprises. The RBV emphasizes the resources and capabilities available to the firm. At the same time, the Dynamic Capabilities perspective focuses on the ability to mobilize, adapt, and reconfigure these resources. The TPB addresses the behavioral and perceptual factors that influence adoption intentions. However, none of these perspectives is sufficient on its own to capture the complexity of CE implementation in small enterprises. Interorganizational relationships with suppliers, customers, partners, and networks, as well as institutional factors such as public policies, financing mechanisms, infrastructure, and regulatory frameworks, may condition both the availability of resources and firms' ability to implement circular practices. CE adoption can therefore be understood as a multilevel process resulting from the interaction between organizational resources and capabilities, managerial perceptions and intentions, and broader interorganizational and institutional conditions.

Based on this theoretical perspective, the present study considers CE adoption in MSEs through the interrelated dimensions of needs and opportunities, implementation practices, barriers, and enabling factors. This approach provides a theoretical basis for interpreting the evidence identified in the systematic literature review and for examining how different organizational, interorganizational, and institutional conditions influence the advancement of CE practices in small enterprises.

3. Methods

To examine studies on CE in micro and small enterprises (MSEs), this study used a combination of bibliometric analysis and a systematic literature review, complemented by a separate analysis of evidence from the Brazilian context. The systematic review provided a qualitative synthesis of evidence on CE adoption and implementation in small enterprises. At the same time, the bibliometric analysis characterized the development and structure of the scientific literature. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework was used to report the systematic review procedure (Moher et al., 2009).

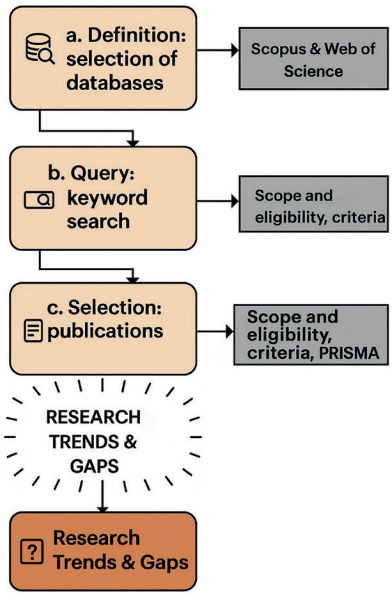
3.1 Search strategy

Scopus and Web of Science (WoS) were selected as international bibliographic databases for their broad coverage of scientific publications and relevance to multidisciplinary research. The searches were conducted on January 15, 2025, using the Title, Abstract, and Keywords fields in both databases. The following search string was applied**:** *"circular economy" AND ("small business" OR "small enterprise" OR "small companies" OR "small firms" OR "micro enterprise" OR "MSE").*

The international search covered publications from 2014 to 2024. The beginning of the period was defined by identifying the first publications addressing the topic in the retrieved records. The search initially identified 160 records, comprising 114 records from Scopus and 46 from Web of Science. After removing 30 duplicate records, 130 unique records remained.

To complement the international evidence with studies addressing the Brazilian context, additional searches were conducted separately in SciELO and the Brazilian Digital Library of Theses and Dissertations (BDTD), using equivalent Portuguese search terms. These searches were designed to identify Brazilian evidence that the international databases might not capture. Figure 1 presents the overall research design and study-selection process (see Figure 1).

Figure 1. Research Design and Study-Selection Process



Source: Prepared by the authors.

3.2 Study Selection

The systematic review selection process followed the stages of identification, screening, eligibility assessment, and inclusion. Of the 130 unique records identified after duplicate removal, 81 were excluded during title and abstract screening because they did not fall within the scope of the research questions. The remaining 49 records were assessed through full-text reading. Subsequently, 22 records were excluded according to the eligibility criteria, resulting in 27 studies included in the systematic literature review.

Studies were eligible for the systematic review when they:

(a) Addressed circular economy strategies, practices, adoption, implementation, or circular business models;
(b) Focused on micro and/or small enterprises, or on broader SME/MSME populations in which micro and/or small enterprises were explicitly represented within the analytical scope; and

(c) Provided empirical, conceptual, or analytical evidence relevant to at least one of the research questions.

For the international systematic review, the eligibility criteria for publication type and language were applied to the final review corpus, as shown in Table 1 (see Table 1).

Studies were excluded from the systematic review when they:

(a) Did not address circular economy as a substantive topic.
(b) Did not address micro and/or small enterprises within the defined scope.
(c) Did not provide information relevant to the research questions.
(d) Were duplicate records, or
(e) Did not meet the publication-type and language criteria established for the systematic review corpus.

Table 1. Selection Process for the Systematic Literature Review

Stage	Records
Records identified - Scopus	114
Records identified – Web of Science	46
Total records identified	160
Duplicates removed	30
Unique records after duplicate removal	130
Records excluded after title/ abstract screening	81
Full-text records assessed	49
Full-text records excluded	22
Studies included in systematic review	27

Source: Prepared by the authors.

3.3 Bibliometric Analysis

The bibliometric analysis was conducted to characterize scientific production on the CE and small enterprises. The analysis considered publication year, country of origin, document type, thematic areas, authorship, journals, and keyword occurrence.

The bibliometric network analysis was performed using VOSviewer version 1.6.20 (Zupic & Čater, 2015). Keyword co-occurrence analysis was used to identify relationships among the main research terms. In contrast, overlay visualization was used to examine their temporal evolution. In the network visualization, node size represents the frequency of keyword occurrence, whereas links represent relationships among keywords. In the overlay visualization, node colors represent the average publication year of keywords, enabling the identification of relatively established and emerging research themes.

The bibliometric component was analyzed independently from the eligibility assessment used to construct the systematic review corpus. Consequently, document-type distributions identified in the bibliometric analysis should not be interpreted as equivalent to the publication-type criteria applied to the systematic review.

3.4 Systematic Review Analysis

The 27 studies included in the systematic review were qualitatively analyzed according to five research questions:

RQ1. What are the needs and opportunities for implementing the circular economy in micro and small enterprises?
RQ2. How is CE implemented in MSEs?
RQ3. What are the main barriers to implementing CE in MSEs?
RQ4. What are the key enablers for implementing CE in MSEs?
RQ5. Which practical examples, particularly in Brazil, have already been documented?

Information was extracted from the included studies and organized according to the five research questions. The synthesis considered, when reported by the studies, the country, economic sector, firm-size category, methodological approach, theoretical perspective, CE practices, barriers, enabling factors, opportunities, and main findings. The extracted information was then compared across studies and grouped into analytical categories corresponding to the research questions.

The synthesis was conducted qualitatively to identify recurring patterns, differences among studies, and gaps in the literature, rather than to estimate pooled effect sizes.

3.5 Complementary Brazilian Corpus

To address the Brazilian dimension of the study, a complementary search was conducted in SciELO and the Brazilian Digital Library of Theses and Dissertations (BDTD), using equivalent Portuguese search terms. The Brazilian search was conducted separately from the international systematic review because the databases differ in scope and publication characteristics.

The search retrieved 113 records, comprising 20 records from SciELO and 93 records from BDTD. During title and abstract screening, 89 records were excluded, and 24 full-text records were subsequently assessed. Following full-text assessment, seven records were excluded, resulting in 17 studies retained for complementary synthesis.

The Brazilian corpus was not treated as an extension of the 27 studies included in the international systematic review. Instead, it was analyzed separately to identify documented examples of CE practices, initiatives, and implementation experiences in the Brazilian context, thereby providing context-specific evidence for RQ5.

Because BDTD includes theses and dissertations, these documents were treated as complementary academic evidence. They were not considered equivalent to peer-reviewed journal articles. The inclusion of this corpus was intended to broaden the contextual understanding of CE in Brazil rather than to establish a second systematic-review corpus equivalent to the international sample. This corpus is shown in Table 2 (see Table 2).

Table 2. Selection of the Complementary Brazilian Corpus for Research Question 5

Stage	Records
Records identified - SciELO	20
Records identified - BDTD	93
Total records identified	113
Records excluded after title/ abstract screening	89
Full-text records assessed	24
Records excluded after full-text assessment	7
Studies included in complementary Brazilian corpus	17

Source: Prepared by the authors.

3.6 Data Synthesis and Analytical Framework

The findings from the international systematic review were synthesized according to four analytical dimensions derived from RQ1–RQ4: needs and opportunities, implementation practices, barriers, and enablers. RQ5 was addressed primarily through the complementary Brazilian corpus, which was analyzed separately to identify documented practical examples of CE implementation in Brazil. To minimize conceptual overlap among these dimensions, needs were defined as the resources, knowledge, capabilities, and conditions required by firms to advance circular practices; opportunities as potential economic, environmental, organizational, and market benefits associated with circularity; barriers as factors that hinder or constrain CE adoption; and enablers as mechanisms or conditions that facilitate adoption.

For the implementation dimension, the analysis distinguished between individual CE practices and broader adoption of circular business models. Practices such as recycling, reuse, resource efficiency, waste recovery, upcycling, or material substitution were therefore not automatically interpreted as evidence of a transition toward a circular business model. This distinction enabled the review to capture varying degrees and forms of CE implementation among small enterprises.

The extracted evidence was subsequently compared across studies to identify recurring patterns, convergences, differences, and context-specific findings. The synthesis also considered the organizational, sectoral, and geographical contexts in which the studies were conducted, allowing the findings to be interpreted without assuming that CE adoption follows a uniform pathway across small enterprises.

The analytical framework was applied to the 27 studies included in the international systematic literature review. In comparison, the 17 studies identified through SciELO and BDTD were analyzed separately as complementary Brazilian evidence. This distinction was maintained throughout the analysis to avoid treating the Brazilian academic corpus as equivalent to the international systematic-review sample.

4. Presentation and Discussion of Results

This section presents the findings of the bibliometric analysis and systematic literature review. The bibliometric analysis was conducted using the 130 unique records retrieved from the Scopus and Web of Science databases for the period 2014–2024. Subsequently, 27 studies that met the established eligibility criteria were

included in the systematic literature review. Complementary Brazilian evidence was also examined separately through searches in SciELO and the Brazilian Digital Library of Theses and Dissertations (BDTD), resulting in 17 studies included in the Brazilian corpus.

The bibliometric analysis characterizes the evolution and structure of scientific production on CE and small enterprises. At the same time, the systematic review synthesizes evidence concerning the needs, opportunities, implementation practices, barriers, and enabling factors associated with CE adoption. The two components were therefore analyzed separately but interpreted in a complementary manner.

4.1 Bibliometric Analysis

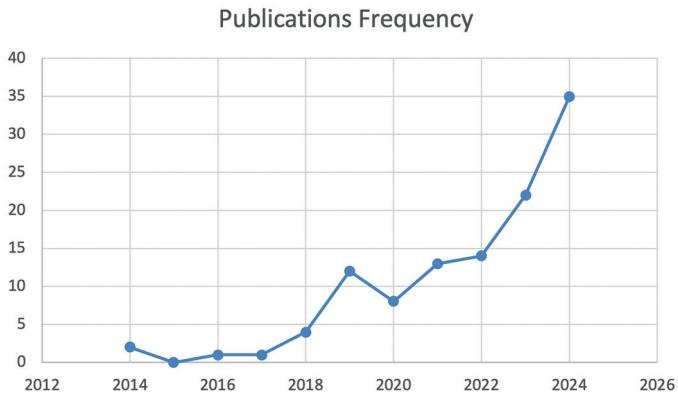
4.1.1 Evolution and Publication Trends

The temporal distribution of publications indicates that research on CE in micro and small enterprises remained relatively limited during the initial years of the period under review. From 2019 onward, however, the number of publications increased substantially, indicating growing academic interest at the intersection of CE and small enterprises. As shown in Figure 2, approximately 82% of the publications were concentrated between 2019 and 2024 (see Figure 2).

This temporal pattern indicates that research on CE in small enterprises has expanded particularly in the most recent years of the period analyzed. The increase may be associated with the broader consolidation of CE as a research field and with the growing attention given to sustainability, resource efficiency, and alternative production models. However, the bibliometric analysis itself does not establish causal relationships between these developments and the observed increase in publications.

Overall, the publication trend suggests that research on CE and small enterprises remains a relatively recent field of investigation, but one that has experienced considerable expansion since 2019.

Figure 2. Distribution of Publications on Circular Economy and Small Enterprises (2014–2024)



Source: Prepared by the authors.

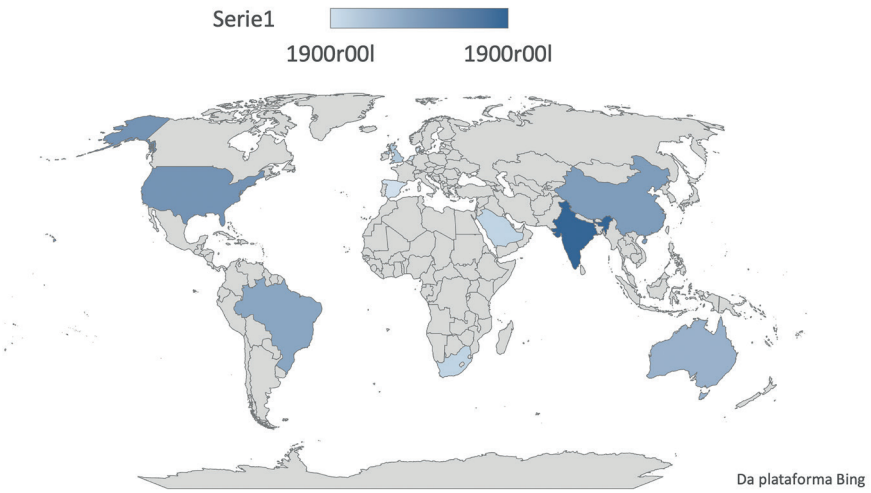
4.1.2 Geographic Distribution of Scientific Production

The 130 records in the bibliometric corpus included researchers from 47 countries, indicating a geographically diverse yet uneven distribution of scientific production. Figure 3 shows that the United Kingdom accounted for the largest share of publications (10.77%), followed by India (9.23%) and Brazil (6.92%) (see Figure 3). Other countries with relevant contributions included Italy, the United States, China, and South Africa.

The geographical distribution indicates a concentration of research in countries located predominantly in the Northern Hemisphere. However, contributions from emerging economies are also present. Brazil accounts for 6.92% of publications in the corpus. This finding is particularly relevant to the present study because it indicates that research on the CE in small enterprises has gained visibility in the Brazilian context, yet remains less developed than in some leading countries.

The predominance of certain countries should be interpreted primarily as a characteristic of the distribution of scientific production rather than as evidence of a direct causal relationship with research infrastructure, public policies, or funding. Nevertheless, the uneven geographical distribution highlights the importance of expanding empirical research on CE in small enterprises in underrepresented regions, particularly in the Global South.

Figure 3. Global Mapping of Research on Circular Economy and Small Enterprises

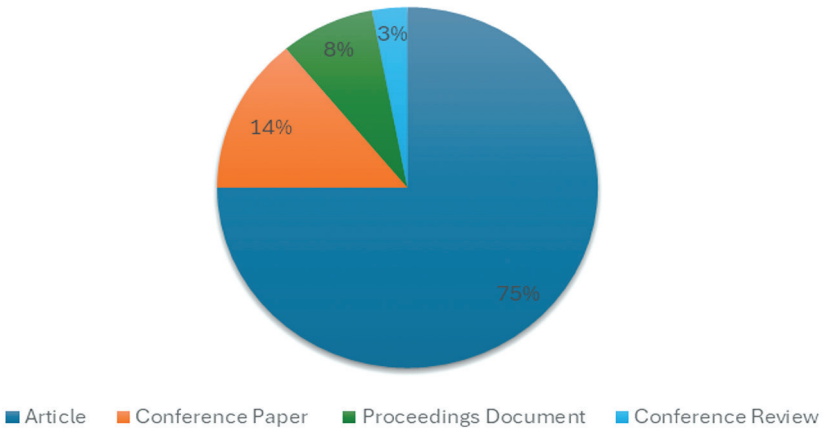


Source: Prepared by the authors.

4.1.3 Typology and Thematic Categories of Documents

The analysis of document types, shown in Figure 4, indicates that scientific journal articles represented the largest category within the bibliometric corpus, accounting for 75% of the 130 records analyzed (see Figure 4). Other document types were also identified, indicating that research on CE and small enterprises has been disseminated through different academic publication formats. This distribution provides an overview of the field's publication profile. It should be distinguished from the eligibility criteria applied to the systematic literature review, which considered publication type and language as part of the final selection.

Figure 4. Distribution of Document Types in Circular Economy Research Focused on Small Enterprises

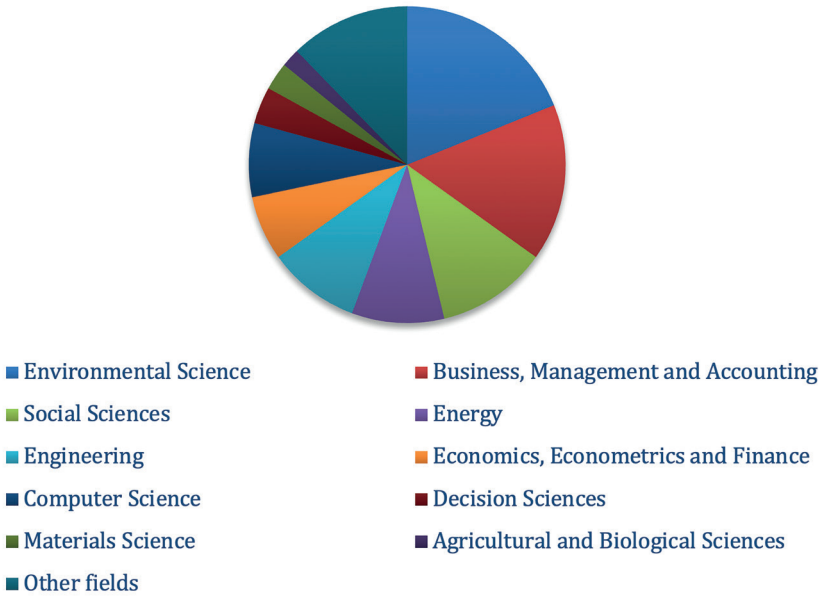


Source: Prepared by the authors.

Regarding the research areas, illustrated in Figure 5, the literature is distributed across several fields, confirming the interdisciplinary character of research on CE and small enterprises. Environmental Sciences represented the largest category, accounting for 20% of the publications, followed by Business and Management (17%) and Social Sciences (12%) (see Figure 5). The presence of these areas indicates that CE research in small enterprises encompasses environmental, organizational, managerial, and social dimensions.

The distribution across research areas also suggests that the implementation of CE in small enterprises is investigated from multiple disciplinary perspectives. Rather than being limited to environmental management, the literature addresses issues in business organization, innovation, social dynamics, resource management, and sustainability. This interdisciplinary distribution is consistent with the multifaceted nature of CE research. However, the bibliometric data alone does not indicate how these perspectives are theoretically integrated within individual studies.

Figure 5. Distribution of Publications by Field Of Knowledge in Circular Economy Research on Small Enterprises



Source: Prepared by the authors.

In terms of journals, the *Journal of Cleaner Production* was the most prominent outlet in the analyzed corpus, with nine publications and 252 citations, followed by Sustainability, with four publications. These results indicate that journals specializing in sustainability, environmental management, and cleaner production are important publication venues for research linking the CE and small enterprises.

Citation counts should, however, be interpreted as descriptive bibliometric indicators rather than direct measures of research quality or influence. Because citation counts vary by database and data collection date, the values reported here should be understood to correspond to the bibliometric dataset used in this study.

4.1.4 Authors and Academic Contributions

Given the recent development of research on CE in small enterprises, the bibliometric analysis reveals a relatively dispersed authorship pattern, with no single researcher accounting for a substantial proportion of the publications analyzed. Only three

authors published more than one article on the topic during the 2014–2024 period, representing approximately 12.26% of the selected bibliography.

Among the most prominent authors identified in the analysis, José Arturo Garza-Reyes stands out for his contributions to the study of the CE and small and medium-sized enterprises, particularly in industrial contexts. His publications accumulated 13,246 citations in the analyzed bibliometric dataset. Anil Kumar, whose contributions include research on sustainable supply chains and circular economy-related practices, accumulated 9511 citations. Harland et al. (2023), whose research includes the use of CE monitoring dashboards in micro, small, and medium-sized enterprises, also appears among the recurring contributors identified in the corpus.

The concentration of citations among a limited number of authors contrasts with the broader dispersion of publications across researchers. This pattern indicates that although some authors have achieved greater bibliometric visibility, research output remains distributed across different research groups and disciplinary contexts. Such dispersion is consistent with the interdisciplinary nature of CE research. It indicates opportunities to develop more robust research networks and theoretical approaches for implementing the CE in small enterprises.

Overall, the authorship pattern demonstrates that the field has expanded through contributions from researchers working across different thematic and disciplinary areas. The coexistence of highly cited contributions and a dispersed publication structure suggests that CE research in small enterprises is expanding while continuing to develop its theoretical and empirical foundations.

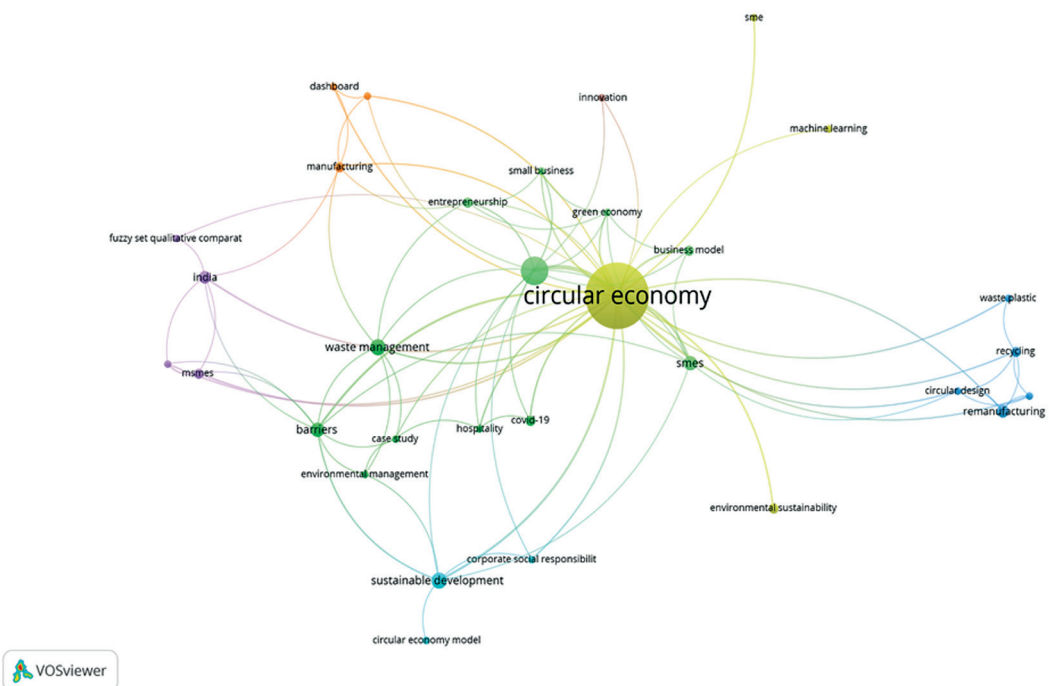
4.1.5 Trends and Keywords

Figure 6 shows the keyword co-occurrence analysis conducted using VOSviewer version 1.6.20. The analysis identified 33 terms that occurred at least twice in the bibliometric corpus (see Figure 6). The resulting network was organized into four thematic clusters, reflecting associations among the most frequently occurring terms in the analyzed literature:

- Cluster 1 (light green/blue): Sustainability, small business, green economy;
- Cluster 2 (green/yellow): Barriers, hospitality, environmental study;
- Cluster 3 (dark blue): Reuse, remanufacturing, waste plastic;
- Cluster 4 (yellow): Circular economy, SMEs, machine learning, dashboard.

The co-occurrence network indicates that research on CE and small enterprises encompasses both broad sustainability-related concepts and more specific operational and technological applications. The terms associated with reuse, remanufacturing, and waste management reflect the practical dimension of circularity. At the same time, the presence of machine learning and dashboards indicates the emergence of digital, data-oriented approaches in the analyzed literature.

Figure 6. Keyword Co-Occurrence Map in Circular Economy Research on Small Enterprises (VOSviewer Output)



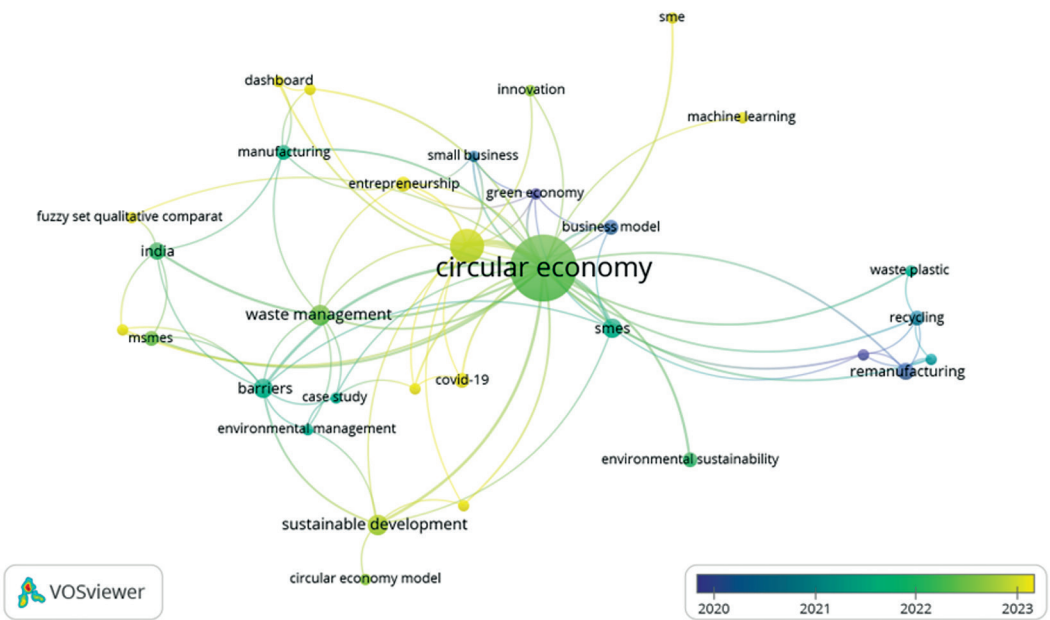
Source: Prepared by the authors.

As shown in Figure 7, the overlay visualization was subsequently used to examine the temporal distribution of the identified keywords (see Figure 7). In this visualization, colors represent the average publication year associated with each keyword. Terms such as “green economy” and “small business” are positioned among the earlier

themes identified in the corpus. In contrast, machine learning, dashboard, and SME are associated with more recent publications.

This temporal distribution suggests a diversification of research topics over the analyzed period. Earlier studies were more strongly associated with broader sustainability and small-business concepts. At the same time, more recent contributions incorporate technological and data-oriented terminology. Although the bibliometric analysis does not establish causal relationships between digital technologies and CE adoption, the emergence of these keywords indicates that digitalization has become increasingly visible in research addressing CE and small enterprises.

Figure 7. Incidence of Keywords Between 2020 and 2023



Source: Prepared by the authors.

Overall, the bibliometric analysis indicates that research on the CE and small enterprises has expanded considerably in recent years, while remaining geographically and theoretically dispersed. The literature encompasses environmental, managerial, organizational, and technological perspectives, with

increasing attention to digitalization and data-oriented approaches. At the same time, the distribution of publications and authors suggests that the field is still consolidating its theoretical and empirical foundations. These findings provide a broader overview of the field's development and structure and serve as a basis for the subsequent systematic analysis of the studies included in the review.

4.2 Systematic Literature Review

Following the bibliometric analysis, the 27 studies included in the systematic literature review underwent qualitative synthesis according to RQ1–RQ4, focusing on needs and opportunities, implementation practices, barriers, and enabling factors. Complementary evidence related to RQ5 was subsequently examined through the Brazilian corpus.

4.2.1 Overview of the Reviewed Studies

The 27 studies included in the systematic literature review exhibit considerable heterogeneity across geographical contexts, organizational characteristics, economic sectors, and methodological approaches. The reviewed literature encompasses different categories of small organizations, including small businesses, small and medium-sized enterprises (SMEs), micro, small and medium-sized enterprises (MSMEs), very small businesses, and circular start-ups. This diversity reflects the different ways small organizations are conceptualized and investigated in the CE literature.

Geographically, the studies span national and regional contexts, including European countries, India, Thailand, the United Kingdom, and developing or resource-constrained economies. Studies represent France and Italy focused specifically on SMEs, while Singh et al. (2018) examine manufacturing MSMEs in India, Thongplew et al. (2022) investigate a small fresh market in Thailand, and Sung et al. (2017) focus on small upcycling businesses in the United Kingdom. Other studies adopt broader European or developing-economy perspectives rather than focusing on a single national context.

The sectors investigated are similarly diverse. Manufacturing and supply chain activities are recurrent themes. However, the literature also addresses hospitality, fashion, waste recycling and upcycling, industrial symbiosis, electric-vehicle batteries, electronic devices, and circular start-ups. This sectoral diversity indicates that CE implementation in small enterprises is not limited to a particular economic activity

but encompasses a range of resource management, value creation, reuse, recycling, collaboration, and technological innovation.

Methodologically, the reviewed studies employ different research designs, including empirical studies, case studies, modeling approaches, instrument development and validation, and case-based explorations. This methodological diversity reflects the exploratory and interdisciplinary development of research on CE in small enterprises. At the same time, it makes direct comparison between findings more challenging, particularly because studies differ in organizational size, sector, geographical context, and analytical approach.

The review also reveals the presence of different theoretical perspectives for explaining CE adoption and implementation. Among the studies that explicitly articulate a theoretical perspective are the Dynamic Capabilities perspective (Aranda-Usón et al., 2024), the Extended Theory of Planned Behavior (Singh et al., 2018), and the Resource-Based View (Touratier-Muller & Mesnier, 2024). Other studies approach CE from perspectives including entrepreneurial orientation, sustainable supply chain management, environmental entrepreneurship, and internal organizational dynamics. However, theoretical perspectives are not consistently articulated throughout the literature, indicating that the field remains theoretically fragmented.

Overall, the reviewed studies demonstrate that CE adoption in small enterprises is investigated through multiple organizational, sectoral, technological, and institutional lenses. Rather than forming a homogeneous body of evidence, the literature comprises studies addressing different dimensions of circularity and organizational change. This heterogeneity is important for interpreting the subsequent findings, particularly regarding the needs and opportunities, implementation practices, barriers, and enabling factors associated with CE adoption in small enterprises.

4.2.2 Needs and Opportunities for the Circular Economy in Small Enterprises

In the context of this review, needs refer to the resources, knowledge, capabilities, and structural conditions that small enterprises require to initiate or advance CE practices. In contrast, opportunities refer to the potential economic, organizational, environmental, and market benefits that may arise from circularity. This distinction is important because the existence of an opportunity does not necessarily imply that small enterprises have the resources and capabilities required to capture it.

The reviewed studies indicate that small enterprises require access to financial resources, technical knowledge, appropriate technologies, and organizational capabilities to advance circular practices. These needs are particularly relevant because smaller firms frequently operate with more limited financial and human resources than larger organizations. Rizos et al. (2016), for example, emphasize the importance of financial resources and knowledge in implementing circular business models, while Mishra et al. (2022) identify multiple organizational and structural conditions that affect CE adoption among MSMEs. Thus, the transition toward circularity cannot be understood exclusively as an internal managerial decision; it also depends on the availability of resources and capabilities that enable firms to act on circular opportunities.

At the same time, CE creates opportunities that extend beyond environmental benefits. The literature associates circular practices with resource and cost efficiency, waste reduction, innovation, new forms of value creation, and competitive differentiation. Circular business models may allow small enterprises to rethink how products, materials, and resources are used. In contrast, circular innovations can create opportunities for new products, services, and markets. Evidence from the fashion sector, for instance, indicates that circular innovations may also need to demonstrate financial sustainability to become viable for SMEs (Dainelli et al., 2024). Similarly, studies on environmental entrepreneurship highlight the potential for circular initiatives to generate new forms of value (Mohapatra et al., 2024).

Market positioning represents another relevant opportunity. Circularity may enable small enterprises to differentiate their products and services through sustainability-related attributes and respond to increasing expectations from consumers and other stakeholders. However, the reviewed literature suggests that these opportunities are not always clearly perceived by small-business owners. Limited information and awareness can prevent firms from recognizing the potential economic and strategic value of circular practices. Consequently, the opportunity offered by CE depends not only on market demand, but also on the firm's capacity to identify, interpret, and transform circular possibilities into viable business strategies.

Overall, the evidence suggests that needs and opportunities are interdependent but conceptually distinct. Small enterprises may have significant opportunities to reduce costs, innovate, differentiate themselves, and create new value forms. However, their ability to realize these opportunities depends on the resources, knowledge, and capabilities available to them. This finding is particularly relevant to small enterprises because it shifts the discussion from the simple identification of

potential CE benefits toward the conditions required for those benefits to become attainable in practice.

4.2.3 Implementation of Circular Economy in Small Enterprises

The reviewed studies indicate that the implementation of CE in small enterprises occurs through a heterogeneous set of practices rather than through a single standardized pathway. These practices include resource reuse, waste recovery, recycling, upcycling, substitution of virgin materials, product and process redesign, industrial symbiosis, and the adoption of digital technologies to improve resource management. The diversity of practices identified across the reviewed studies reflects differences in sector, organizational characteristics, available resources, and local contexts.

At the operational level, several studies focus on specific circular practices implemented within existing business activities. These include the reuse of materials and waste, upcycling, recycling, and resource recovery. For example, Thongplew et al. (2022) examine a solid-waste reuse initiative in a small fresh market, while Sung et al. (2017) investigate the challenges faced by small businesses seeking to scale up their upcycling activities. These examples demonstrate that circularity can be introduced through relatively specific changes in the way materials and waste are managed.

Other studies address CE implementation at a broader organizational level, particularly through circular business models and circular value creation. In these cases, circularity involves changes that extend beyond an individual operational practice and affect how the firm creates, delivers, and captures value. Rizos et al. (2016), for example, examine the implementation of circular business models among SMEs, while Parte and Alberca (2024) investigate the relationship between circular business models and efficiency in waste-recycling firms. This distinction is important because adopting a single circular practice does not necessarily constitute a transition to a circular business model.

Collaboration also emerges as an important dimension of CE implementation. Small enterprises may depend on relationships with suppliers, customers, other firms, and regional actors to access materials, exchange resources, develop circular solutions, or establish industrial symbiosis arrangements. Patricio et al. (2018), for instance, examine the conditions enabling industrial symbiosis collaborations among SMEs from a regional perspective. Such findings indicate that CE implementation may

extend beyond the organizational boundaries of individual firms and depend on interactions within broader value chains and regional networks.

Digital technologies constitute another emerging dimension of implementation. Yang et al. (2023) examine the adoption of information and digital technologies in small, medium-sized, and micro enterprises in the context of sustainable smart manufacturing and Industry 4.0. Similarly, other studies in the reviewed corpus address digital solutions associated with circular activities, including monitoring and digital marketplaces. These technologies may support the identification, monitoring, exchange, and more efficient use of resources. However, their adoption should be understood as an enabling mechanism rather than as circularity itself.

Overall, the evidence suggests that CE implementation in small enterprises can occur at different levels of organizational transformation. Individual practices, such as reuse, recycling, recovery, and upcycling, may represent initial steps toward circularity. In contrast, circular business models involve more comprehensive changes in the firm's value-creation logic. Between these two levels, collaborative arrangements, technological solutions, and changes in production and supply-chain processes can support the gradual development of circular practices. These findings suggest that CE implementation among small enterprises is better understood as a heterogeneous, potentially incremental process rather than a uniform transition from a linear to a circular business model.

4.2.4 Barriers to the Adoption of the Circular Economy in Small Enterprises

The reviewed studies identify a set of barriers that can limit the adoption and implementation of CE practices in small enterprises. These barriers operate at different levels and are interconnected, involving internal organizational conditions, relationships with other actors in the value chain, and broader institutional and external conditions. Organizing the barriers according to these levels clarifies that CE adoption is influenced not only by firms' internal resources but also by their ability to interact with suppliers, customers, institutions, and supporting networks.

4.2.4.1 Internal Barriers

At the internal level, the most recurrent barriers concern financial constraints, limited technical knowledge, lack of qualified personnel, insufficient organizational

capabilities, and resistance to organizational change. Financial limitations can restrict investments in new technologies, equipment, product redesign, and other changes required for circular practices. At the same time, limited knowledge and technical expertise may prevent small enterprises from identifying appropriate circular solutions or evaluating their potential economic and environmental benefits. Mishra et al. (2022), for example, specifically investigate barriers to CE adoption in MSMEs, while Rizos et al. (2016) highlight the relevance of financial and knowledge-related constraints in the implementation of circular business models.

Internal barriers may also be associated with organizational culture and managerial priorities. Because small enterprises frequently operate with limited human and financial resources, CE initiatives may compete with immediate operational and financial priorities. In this context, adopting circular practices may require changes to routines, capabilities, and decision-making processes rather than simply introducing a new technology. The literature therefore indicates that resource limitations and organizational capabilities interact in shaping the firm's capacity to implement CE.

4.2.4.2 Interorganizational barriers

A second group of barriers emerges from relationships between firms and other actors in their value chains. CE practices often require coordination among suppliers, customers, waste-management actors, and other business partners, particularly when circular solutions depend on the return, recovery, exchange, or reuse of materials. Limited cooperation, inadequate information exchange, and difficulties in establishing reliable partnerships can therefore restrict the implementation of circular practices. The study by Patricio et al. (2018), for example, demonstrates the importance of regional collaboration for enabling industrial symbiosis among SMEs, highlighting how circular initiatives may depend on relationships that extend beyond the boundaries of individual firms.

These challenges can be particularly relevant for small enterprises because they may have less bargaining power and fewer resources to coordinate complex value-chain arrangements. Consequently, even when a firm possesses the internal motivation to adopt circular practices, implementation may be constrained when suppliers, customers, or other partners are unable or unwilling to participate in the required circular processes.

4.2.4.3 Institutional and external barriers

At the institutional and external level, the literature points to regulatory uncertainty, limited public support, inadequate infrastructure, market conditions, and weaknesses in the broader CE ecosystem as factors that may constrain adoption. The transition toward circularity can require supportive policies, appropriate waste-management and reverse-logistics infrastructure, access to financing mechanisms, and regulatory frameworks that provide incentives and predictability for businesses. These conditions are particularly important for small enterprises, which may have limited capacity to compensate for deficiencies in the external environment through their own resources.

Market conditions can also influence the feasibility of circular initiatives. Limited consumer awareness, uncertain demand, and the absence of sufficiently developed markets for circular products or recovered materials can reduce the economic attractiveness of CE investments. Similarly, the absence of standardized indicators and clear criteria for measuring circular performance may make it difficult for small enterprises to assess their progress or communicate the value of their circular initiatives to stakeholders.

Overall, the reviewed evidence suggests that CE adoption in small enterprises is constrained by interacting barriers rather than by a single limiting factor. Internal resource and capability constraints may be reinforced by difficulties in coordinating with external actors. At the same time, institutional and market conditions can either intensify or mitigate these challenges. This multilevel perspective is important because addressing only one category of barriers may be insufficient when constraints are interconnected across organizational, interorganizational, and institutional levels.

4.2.5 Enablers of Circular Economy in Small Enterprises

In contrast to the barriers identified above, the reviewed studies indicate that a combination of organizational, technological, interorganizational, and institutional factors can support the adoption of CE practices. Rather than operating independently, these enabling factors can interact by providing small enterprises with access to resources, knowledge, capabilities, networks, and market opportunities that may otherwise be difficult to obtain. These factors are particularly relevant for small enterprises, whose limited internal resources can increase their dependence on external forms of support.

At the organizational level, managerial commitment, entrepreneurial orientation, innovation capabilities, and an organizational culture supportive of change can facilitate the development of circular initiatives. These factors can contribute to recognizing circular opportunities and to the willingness to modify existing processes and business practices. Studies addressing entrepreneurial factors and internal company dynamics suggest that the transition toward circularity is influenced not only by external conditions, but also by how entrepreneurs and organizations perceive and respond to opportunities for circular value creation (Al-Awlaqi & Aamer, 2023; Von Kolpinski et al., 2023). In this sense, managerial engagement can serve as a mechanism linking the recognition of CE opportunities to their practical implementation.

Knowledge development and technical support are other important enabling mechanisms. Training, access to specialized knowledge, and cooperation with universities, research institutions, and technical organizations can help small enterprises overcome knowledge gaps and develop the capabilities required to implement circular solutions. Such support is particularly relevant when CE practices involve new technologies, changes in production processes, or the redesign of products and services. Rather than simply providing information, these relationships can facilitate the development and transfer of capabilities that small enterprises may not be able to develop internally.

Digital and technological capabilities also emerge as relevant enablers. Digital technologies can facilitate resource monitoring, information exchange, process optimization, traceability, and the coordination of circular activities. Yang et al. (2023), for example, examine the adoption of information and digital technologies in SMMEs in the context of sustainable smart manufacturing and Industry 4.0. Similarly, digital marketplaces may facilitate connections between users and providers of reused products, expanding the possibilities for circular value creation. These technologies should therefore be understood not as circular practices in themselves, but as enabling mechanisms that can support the implementation and scaling of circular activities.

At the interorganizational level, partnerships and collaborative networks can provide access to resources, knowledge, infrastructure, and markets. Cooperation among SMEs, suppliers, customers, waste-management organizations, and other stakeholders can facilitate material exchanges, resource recovery, industrial symbiosis, and the development of circular supply chains. Patricio et al. (2018), for instance, highlight the importance of regional conditions and collaboration for enabling industrial symbiosis among SMEs. Such relationships can compensate, at

least partially, for the resource limitations of individual small enterprises by allowing firms to access complementary capabilities and resources through networks.

Institutional and financial support can further strengthen these mechanisms. Public policies, financial incentives, technical assistance, green financing mechanisms, and supportive regulatory frameworks can reduce the resources and risks associated with CE investments. The importance of such support is particularly evident when circular innovations require initial investments whose returns may be uncertain or occur over longer time horizons. In this context, institutional support can contribute not only by reducing financial constraints, but also by creating a more predictable environment in which small enterprises can experiment with and develop circular solutions.

The reviewed evidence therefore suggests that CE adoption is more likely to advance when different enabling mechanisms operate in combination. Financial resources may facilitate investment, but technical knowledge is necessary to identify and implement appropriate solutions; partnerships can provide complementary resources and infrastructure; and supportive policies can reduce institutional and market uncertainty. Similarly, managerial commitment can determine whether these external resources are actually mobilized. The interaction among these factors indicates that enabling CE adoption requires more than isolated interventions; it depends on the development of supportive organizational and external conditions.

Overall, the findings indicate that enablers should be understood as mechanisms that increase small enterprises' capacity to overcome barriers and translate CE opportunities into concrete practices. This perspective complements the preceding analysis of barriers. It reinforces the view that CE adoption results from the interaction between internal capabilities and the broader institutional, technological, and interorganizational environment.

4.3 Complementary Brazilian Evidence

In addition to the international systematic literature review, a complementary search was conducted in SciELO and the Brazilian Digital Library of Theses and Dissertations (BDTD) to identify evidence specifically related to CE in the Brazilian context. This complementary corpus comprised 17 studies and was analyzed separately from the 27 studies included in the international systematic review. The purpose of this additional analysis was not to expand the systematic-review corpus, but to identify context-specific patterns that could contribute to a more comprehensive understanding of CE implementation among Brazilian small enterprises.

4.3.1 Patterns of Circular Economy Implementation in Brazil

The Brazilian evidence indicates that CE practices among small enterprises are expressed through different forms of resource recovery, reuse, recycling, upcycling, waste management, and the incorporation of circular principles into business models. The studies also demonstrate that circularity may occur at different levels of organizational transformation, ranging from isolated operational practices to more structured changes in products, processes, and business models.

For example, Silva et al. (2019) examine CE practices within a Brazilian network composed of small companies and individual entrepreneurs connected through common product and by-product flows. The study identifies 19 CE practices distributed across internal environmental management, ecological design, and investment recovery, illustrating how collaboration among small firms can support the implementation of circular practices.

Evidence from Brazilian academic research also indicates that circular business models have been investigated in specific sectors. Lazzerini (2019), for instance, examined how CE practices are incorporated into the business models of micro and small enterprises in the Brazilian fashion retail sector, considering both barriers and facilitators to implementation.

4.3.2 Brazilian Barriers and Enabling Conditions

The Brazilian studies reveal patterns that are broadly consistent with the international literature, particularly regarding financial constraints, limited knowledge, organizational difficulties, and the need for external support. However, the Brazilian evidence places particular emphasis on contextual conditions such as limited awareness of the CE concept, institutional support, infrastructure, and the availability of resources for small businesses.

This pattern is also evident in Brazilian research focusing specifically on micro and small enterprises. Mena (2022), for example, found that a lack of knowledge about the CE concept is a recurring challenge and developed an instrument to assess the implementation of CE principles in a small food-sector enterprise. The study identified five groups of CE principles: circular design; reduction; preservation and extension of product value; optimization of waste value; and circular management.

These findings complement the international evidence by demonstrating that knowledge limitations may affect not only the implementation of specific practices,

but also the firm's ability to recognize what constitutes a circular practice in the first place. Thus, awareness and technical knowledge can be understood as conditions for the development of circular capabilities rather than merely as isolated barriers.

At the institutional level, Brazilian evidence also highlights the importance of public policies, financial mechanisms, technical assistance, and coordination among actors. This evidence is consistent with broader Brazilian research showing that economic and political barriers are prominent to the adoption of CE among SMEs, particularly due to limited financial resources and insufficient institutional incentives.

4.3.3 Comparison with the International Literature

When compared with the international literature, the Brazilian evidence reveals substantial convergence in the main challenges and opportunities associated with CE adoption. Financial limitations, technical knowledge, organizational capabilities, collaboration, and technological access appear across both bodies of evidence. This convergence suggests that many of the challenges faced by Brazilian small enterprises are not fundamentally different from those identified internationally.

Nevertheless, the Brazilian evidence adds a stronger contextual dimension to the discussion. The studies analyzed in the complementary corpus emphasize the role of institutional support, access to infrastructure, knowledge dissemination, and the development of local networks in shaping the feasibility of circular practices. These aspects are particularly relevant in a context in which small enterprises may have limited internal resources to compensate for weaknesses in the surrounding business ecosystem.

The Brazilian evidence therefore suggests that CE implementation should not be interpreted solely as a firm-level process. While managerial capabilities, innovation, and entrepreneurial orientation are relevant, the transition also depends on the institutional and territorial conditions in which small enterprises operate. The evidence reinforces the multilevel perspective identified in the international literature. It also provides a context-specific interpretation of how these mechanisms operate in Brazil.

Overall, the complementary Brazilian evidence reinforces the main findings of the international systematic review while highlighting the importance of context-specific institutional, infrastructural, and knowledge-related conditions. The separation between the two bodies of evidence is therefore important: the 27 international studies provide the basis for the systematic synthesis of CE adoption among small

enterprises, whereas the 17 Brazilian studies contribute contextual evidence that helps interpret how these dynamics manifest in Brazil.

5. Conclusions

This study analyzed the advancement of CE in micro and small enterprises by combining bibliometric analysis, a systematic literature review, and complementary evidence from the Brazilian context. The bibliometric analysis of 130 unique records retrieved from Scopus and Web of Science demonstrated that research on CE and small enterprises has expanded considerably in recent years, while remaining geographically, methodologically, and theoretically heterogeneous. The keyword analysis further indicated the coexistence of sustainability-oriented themes with more recent research on digital technologies, Industry 4.0, and data-oriented approaches.

The systematic literature review of 27 studies indicates that CE adoption in small enterprises is heterogeneous and potentially incremental. The reviewed studies identify different forms of implementation, including reuse, recycling, recovery, upcycling, material substitution, industrial symbiosis, digital technologies, and circular business models. Importantly, the findings indicate that individual circular practices should not necessarily be equated with the adoption of a circular business model. Rather, firms may progress from specific operational practices toward broader changes in value creation, delivery, and capture.

The review also demonstrates that the transition toward CE involves a combination of needs, opportunities, barriers, and enabling mechanisms. Small enterprises require financial resources, technical knowledge, organizational capabilities, and access to appropriate technologies to advance circular initiatives. At the same time, CE may create opportunities related to resource efficiency, cost reduction, innovation, differentiation, and new forms of value creation. However, the ability to capture these opportunities is constrained by barriers operating at multiple levels, including internal organizational limitations, interorganizational challenges, and institutional and external conditions.

The findings concerning enabling mechanisms indicate that CE adoption cannot be explained solely by the availability of individual resources or incentives. Managerial commitment, entrepreneurial orientation, knowledge development, technological capabilities, collaborative networks, and institutional and financial

support may reinforce one another, increasing firms' capacity to overcome barriers. The evidence therefore supports a multilevel understanding of CE adoption in small enterprises, in which internal capabilities interact with value-chain relationships and the broader institutional environment.

From a theoretical perspective, the reviewed literature remains fragmented. Although some studies explicitly employ perspectives such as the Dynamic Capabilities approach, the Extended Theory of Planned Behavior, and the Resource-Based View, theoretical frameworks are not consistently articulated across the literature. This fragmentation indicates an opportunity for future research to develop more integrated explanations of how small enterprises recognize circular opportunities, mobilize resources, develop capabilities, and translate these conditions into sustained circular practices and business models.

The complementary analysis of 17 Brazilian studies reinforces several findings identified in the international literature, particularly regarding financial constraints, knowledge limitations, organizational capabilities, and the importance of external support. At the same time, the Brazilian evidence underscores the importance of contextual factors, including institutional support, infrastructure, knowledge dissemination, and local networks. These findings demonstrate the value of examining CE adoption within specific institutional and territorial contexts rather than assuming that mechanisms identified in international research operate uniformly across countries.

The contribution of this study therefore lies in integrating the structural overview provided by bibliometric analysis with a qualitative synthesis of CE adoption among small enterprises and a context-specific examination of Brazilian evidence. By distinguishing between the international systematic-review corpus and the complementary Brazilian corpus, the study provides a more nuanced understanding of both general patterns and context-dependent conditions associated with CE advancement in small enterprises.

Despite these contributions, the study has limitations. The systematic literature review is restricted to the databases, search strategy, period, and eligibility criteria defined in the methodology, which may have excluded relevant studies indexed elsewhere or published in other languages. In addition, the heterogeneity of the reviewed studies in terms of firm size, sectors, geographical contexts, methods, and theoretical perspectives limits direct comparison among findings. The Brazilian complementary corpus also includes various types of academic

evidence, such as peer-reviewed publications and academic works retrieved from BDTD. It should therefore not be interpreted as equivalent to the international systematic-review corpus.

Future research could address these limitations through longitudinal and comparative studies examining how CE practices evolve within small enterprises over time. Further research is also needed to investigate how organizational capabilities, entrepreneurial characteristics, interorganizational networks, digital technologies, and institutional policies interact in different contexts. Comparative studies involving Brazil and other emerging and developed economies could help identify which mechanisms are broadly applicable and which depend strongly on national and regional conditions. Finally, greater theoretical integration and empirical validation are needed to explain how small enterprises move from isolated circular practices toward more systemic and economically viable circular business models.

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