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A Bibliometric Analysis on Cooperatives in Circular Economy and Eco-Innovation Studies

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Abstract: Cooperatives address societal challenges embracing values beyond mere profit-oriented production. Considering the ongoing shift to achieve efficient use of resources and increased circularity, cooperatives should be better equipped to incorporate circular economy (CE) and eco-innovation (EI) into their strategies (compared to regular enterprises). This paper reviews the scholarly literature focusing on the application of CE and EI within cooperative studies with the aim to understand the relationships between these topics, identify the existing scholarly communities, and to observe salient research themes. This study refined the method of van den Hoven and Rubalcaba (2016) to conduct a two-step bibliographic review of documents: a thematic analysis of citation data from Scopus (including a manual review of 16 papers) was followed by a bibliometric analysis of 101 documents from Web of Science (using R-Studio's *Biblioshiny*). Our results identified three intellectual clusters of cooperative studies focusing on the downstream of CE: (1) industrial ecology; (2) recycling; and (3) waste management. Our study also revealed an emerging scholarly field focused on cooperatives and CE, and with little attention to EI. These findings aim at catalyzing the integration of cooperatives more effectively into scholarly discussions, suggesting that environmental sustainability should be recognized as an additional principle of the cooperative identity—providing a wider perspective that enhances interest in the research of these topics and their interconnections.

Keywords: cooperatives; cooperative enterprise; circular economy; eco-innovation; environmental sustainability; new economy; social and solidarity economy

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1. Introduction

Cooperative enterprises play an important role towards a just society, born to tackle the struggles of governments and markets [1]. Their objective is meant to close the gap on untackled spaces that derive in society from economic, social, and cultural differences, yet considered a utopian undertaking or a futile once underappreciated by many [2].

This type of enterprise is inserted within the "Third Sector" or in the "Social and Solidarity Economy" that the European Union (EU) identifies as a set of institutions of the economic system that act as a third form of production either of goods and/or services between the State and the private market [3] (For instance, the definitions associated to these terms in the "social economy" gateway of the European Commission: https://social-economy-gateway.ec.europa.eu/about-social-economy/social-economy-definitions-and-glossary_en (accessed on 15 October 2023). Similar notions and definitions are used by the OECD Social Economy programme, see: https://www.oecd.org/cfe/leed/social-economy/social-economy.htm (accessed on 15 October 2023)). The above is a definition that was developed after the crisis of the welfare state of the 1990s [3] and viewed as central to a "…healthy democratic society" [4]. This same society is now being challenged by resource depletion. The sixth assessment report from the Intergovernmental Panel on Climate Change

(IPCC) [5] has underscored an urgent need for a paradigm shift. Human activities leading to climate change has in turn affected the availability of our natural resources. This emphasizes the growing imperative to adopt methods and approaches focused on sustainability and resilience [6]. The last decades have demonstrated the need to divide economic growth from resource exploitation and waste accumulation [7]. Hence, it is supposed that cooperatives as business entities have a role, such as any non-cooperative enterprise, to shift towards environmental sustainability by rethinking how we produce and consume.

The concept of the circular economy (CE) has been signposted as the solution to face unsustainable economic trends needing to go beyond the linear model where consumption and disposal are carried out by closing the production loops [8]. The latter is a newer concept compared to eco-innovation (EI) and they have been viewed as key elements to support the creation, use, and diffusion of solutions that improve the environmental performance of products (goods and services), technologies, processes and organizations compared to existing alternatives [9,10]. To this point, cooperative enterprises, "…can play a very important role in introducing the ideas and practice of resilience to our national and global communities" [11] (p. 131).

In 2021, the EU established a new action plan for the social economy including collaboration and funding opportunities between stakeholders, including cooperatives, where "…social enterprises […] which designs a sector different from the traditional public 'general interest serving' and the private market […] can play a unique role in identifying unmet needs and in developing new types of service" [12]. Without explicitly mentioning cooperatives, the European Commission (EC)'s CE Action Plan (CEAP) and the upcoming revision to the Ecodesign Directive and the Sustainable Products Regulation address several aspects related to the lively sustainability impacts of enterprises: ensuring less waste, making sustainable products the norm, empowering consumers to make more sustainable choices, increasing resource efficiency in key economic sectors, improving the durability and repairability of goods and services, promoting the wide spread of circular business models (including those in the solidarity and sharing economy) and a just and fair transition for all economic actors [13] and, years prior, the EU's EI Action Plan (EcoAP) aiming to deliver smart, sustainable, inclusive growth via a greener economy [14]. It is a shared observation with the Organisation for Economic Co-operation and Development (OECD) about the positive and impactful role played by social economy to promote CES and its social impacts. The relevance of these European policies derives from an acknowledgement that public policy can contribute to the transition of society and the economy towards sustainability [15] necessary also for cooperatives to implement, but a deeper understanding of how this is carried out is needed.

This paper attempts to contribute to the literature of cooperative enterprises by providing an initial exploratory review of documents focusing on cooperatives, CE and EI. The results of this study may suggest that while the overall thematic field is unexplored, CE appears to be discussed within the context of cooperatives more strongly comparted to EI—despite the latter being a scholarly field studied for a much longer period. Additionally, the (inter)connection between EI and CE remains also unexplored, when speaking of cooperatives, and the main cluster themes focus downstream the supply chain (e.g., around waste management and recycling). Hence, suggests that there is a strong need to tackle CE and EI in relation to cooperatives, observing in detail their barriers and drivers—how their management skills and diversified business structure provide positive outlet—towards environmental sustainability and what it means for their identity and definition of their corporate values and sustainable products and services. The latter can provide an input to the additional debates on the role of (eco)innovation and CE in the business sphere and environmental attention.

The remaining of this article is organized as follows: section two offers an introductory exploration of the literature about cooperative enterprises within the context of environmental and social sustainability. Following on, section three includes the method used in this study, followed by a fourth section with the results of the thematic analysis of a

Scopus data set and the in-depth bibliometric analysis with results from Web of Science (WoS). Next, section four presents the results of our analysis of the two different datasets. It unveils topical relationships, scholarly communities, and themes of research about co-operative enterprises, CE and EI. A concluding section provides a discussion about the main conclusions, key insights, potential limitations and suggesting avenues for further scholarly investigation.

2. Cooperative Enterprises and Environmental Sustainability

Cooperatives are integrated into the emerging discourse of the "new economy", characterized by the integration of ecological and social elements. In contrast to the "traditional" economy, cooperatives embody a collective and collaborative mindset that should emphasize the harmonious integration of ecological and social (and solidarity) elements. They symbolize a new way of thinking where rather than proposing the elimination of the market as such, its rationale works for a different form of institutionalization of the market where in cooperative undertakings, "…people (the members) rather than the capital, constitute the focus on productive activity" [2] (p. 195). The International Cooperative Alliance (ICA) wants cooperatives to show the world how: "… human-centred business models, inspired by the cooperative values, are building a better world" [16]. It has also been suggested that cooperatives may represent a contradiction as organizations, "…whose objective was to counterpose entrepreneurs with the workers' solidarity and instead cooperatives have set themselves as new competitors" [17].

The role that business enterprises and single industries play in the much-needed ecological transition to reduce emissions, reduce pollution, and reduce overall the impact of human activity is well known and proven. Cooperatives are quite relevant and present in resource intensive and extractive sectors; for instance, farmers' cooperatives in the European Union and in North America account for 30–70% of the market in their respective world regions [18,19]. One way to the ecological transition is to redefine how we produce and consume products, making it clear that all stakeholders, including consumers, play a role in this mission. Some researchers believe this means revisiting economic processes and business values through innovative measures.

The Web of Science (WoS) repository can be used as a reference to note the growing interest of the scholarly community to study cooperative enterprises, where it is possible to identify over 2200 documents published in the period between 1970 and 2023 (A search in WoS with the keyword "co-operative enterprises" OR "cooperative enterprises" in the TOPIC field resulted in 2209 documents including articles, review articles and editorial materials only (search conducted on 08.10.23). The results of a similar search increases to 2600 documents when adding the following additional keywords suggested by WoS: "cooperative enterprise", "workers cooperatives", "cooperative production" and "social cooperatives"). Recent studies have suggested that cooperative enterprises not only promote the implementation of Circular Economy Strategies (CES) [10] but also play a role in fostering the adoption of eco-friendly production technologies [20]. In this context, the significance of EI is emphasized, as it encompasses a range of environmentally beneficial innovations aimed at mitigating our ecological footprint [21]. Consequently, the exploration of diverse management approaches and business models becomes essential in understanding the execution of such innovative practices across different types of organizations, including cooperatives. The latter is alongside the acknowledgement that innovation application by enterprises is not carried out on its own, rather it enables the progression of a greener economy, however supported by the application of policies and resulting from feedback of international "pressures" such as the United Nation's Sustainable Goals (SDGs) (Figure 1) that in turn can impact policies. In analyzing where cooperatives stand in the application of CES and EI, the latter should be kept in mind.

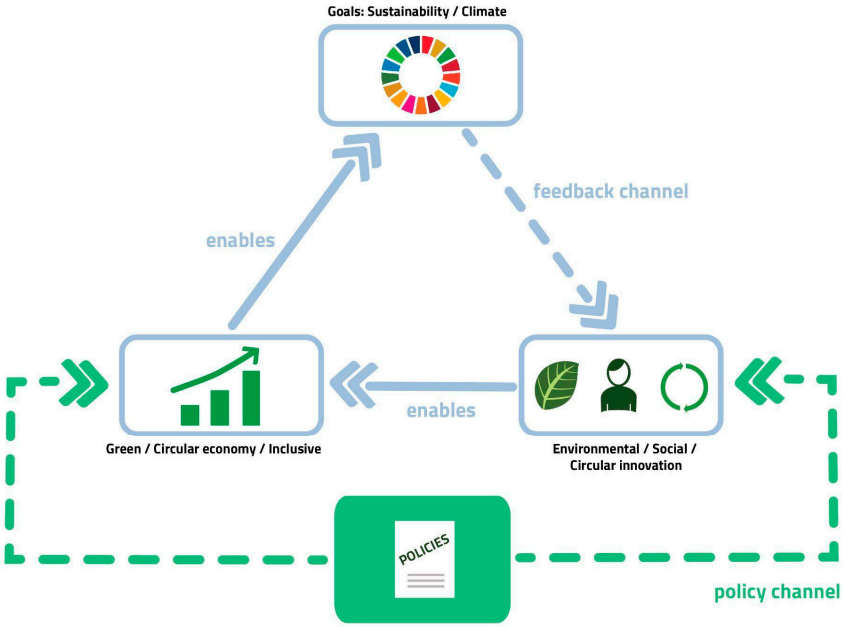

Figure 1. Green Innovation and Economic Restructuring to Achieve the SDGs (Based from [15]).

As a catalyst for CE, EI refers to "...new technologies that improve economic and environmental performance but also some definitions include organizational and social changes for improving competitiveness and sustainability and its social, economic and environmental pillars" [22]. Within EI studies, it has been observed that the application of this form of innovation helps increase a firm's economic sustainability and employment [23]. From the definition of EI in the above, it is possible to suggest that EI is a form of innovation that takes into consideration other business values. Thus, we wonder if cooperatives could be better equipped to facilitate the implementation and uptake of eco-innovation processes and solutions. While there are some concerns regarding the concept of EI related to its effectiveness and overall impact on the environmental and social sustainability of enterprises [24], (Some authors such as Kemp (2010) [25] and Ekins (2010) [26] have long argued that eco-innovation (EI) is a relative concept; a green or social solution is considered an EI when it constitutes a better environmental alternative than existing solutions—but without fully quantifying, up-front, those possible rebound or future negative effects at the micro (e.g., through LCAs, social-life cycle costing, etc.) or at the macro-economic level (e.g., through environmentally-extended input-output analyses). An EI can be purposively designed or used to meet environmental targets or to achieve green performance gains (e.g., a green technology such as air pollution filter), but it can also be the consequence of unintended actions or regular production-related activities of enterprises (e.g., quality or operational efficiency gains that lead to environmental improvements at the facility level, for instance, from implementing energy efficiency measures, a total quality management plan, or an integral process automation that ultimately minimizes the use of raw materials and waste). This view of EI is yet debated by authors, such as Pansera (2011) [24]. It is worth noting that other terms are used as synonyms to EI, such as "environmental innovation", "green innovation", "sustainable innovation", among others. Nonetheless, in this study we only used the core term EI as it is better established in the literature, particularly in the field of economics and management (for a recent review of terms and ongoing research needs, refer to [27])) we acknowledge the scholarly view that social and institutional EI requires educated citizens, cultural and institutional diversity, involvement of local actors, and communication and investment in social capital [24]. Moreover, recent studies go one step further to suggests the term '*exnovation*' as a form of phasing out processes, technology or solutions to truly create, meet or achieve environmental sustainability or policies (e.g., phasing out and elimination of coal-based technologies) [28].

In recent years, CE has been promoted as an approach to minimize the burden on the environment, while stimulating the economy [29]. The exact definition of CE is ambiguous, and the attempt at a single definition is merely unachievable [30] leaving out also matters of justice, gender, or effects on labor [31]. In fact, the definition of CE remains a subject of ongoing debate, considered unchallenged [32], with increasing criticism directed at current proposals, resulting in a longer version as follows:

"[CE] is a multi-level resource use system that stipulates the complete closure of all resource loops. Recycling and other means that optimize the scale and direction of resource flows, contribute to the circular economy as supporting practices and activities. In its conceptual perfect form, all resource loops will be fully closed. In its realistic imperfect form, some use of virgin resources is inevitable" [33].

While EI can be more efficiently implemented through cooperation not only within companies, but also in strengthening the relationship between different business enterprises, academia, and governments—who at the same time can implement public policies that promote the application of the same—limited research has been conducted with a specific focus on cooperatives or forms of cooperative governance (as it will be highlighted by the results of this study presented in Section 4). Furthermore, in view that cooperatives are not profit-oriented, but as EI is expressed through terms of capitalization, the former authors expand on where this might position cooperatives not only in competing in the market but be able to implement EI to achieve environmental sustainability at the speed required against bigger and alternative firms [34].

Cooperatives' business model is also known to increase employment, especially in more challenged countries. There is research highlighting behavioral aspects of employees as drivers to EI [35–37] and some recent work is about cooperation and open EI [38], but until recently the focus has not been on the organizational mode of cooperatives as an element analyzed for EI generation, adoption, or diffusion. Additionally, there is an overall absence on identifying how managerial environmental awareness and external resource acquisition could affect corporate EI activities [34]. Thus, in the case where workers are potentially also members making managerial decisions, their level of knowledge can impact potentially the application of EI.

The Rochdale Society of Equitable Pioneers, a cooperative established in 1844 in the United Kingdom (UK) by twenty-eight impoverished weavers, was successful in defining the principles for cooperatives of the future [39]. They were suffering from the results of the Industrial Revolution with low pay, unhealthy cities, and dangerous workplaces resulting in a cooperative existing through mutual self-help. A sense of mutual help has been observed also in other countries, such as Italy, where according to the Law 59 (1992) [40] all cooperatives must transfer to the mutual funds 3% of their profits through an important financing tool that is the solidarity funds (*Fondi Mutualistici* in Italian). These funds are then collected to reinvest into the creation of new cooperatives and similar projects, a possibility absent for other forms of enterprises. Hence, there is a sense of economic (and social) sustainability required.

It should be noted that while not directly inherent to this paper, the narrative that cooperatives exist, potentially only, to resolve a social task may be undermining the expectations (and barriers) to their achievement of environmental sustainability. Cooperatives are described as a "genuine two-faced Janus [combining] two distinct if not conflicting dimensions: the economic dimension of an enterprise that operates within the market and accepts its logic; and the social dimension of an institution that pursues meta-economics aims and produces positive externalities for other agenda and for the community. This dual nature is what makes the cooperative so difficult to explain and so hard to govern" [41] (p. 1).

Economists have criticized cooperatives for their business form, in view of their ability to thrive in competitive markets regardless of the challenges [42]. Their efficiency has been questioned when compared against investor-owned firms. According to some theoretical arguments, it is not uncommon for cooperatives to be considered as being less efficient (but the contrary is also possible) [43].

It becomes essential to incorporate mutualistic principles within democratic business frameworks to address the gaps in social equity [44]. Cooperatives are described as acquiring an important role in establishing different forms of organizational network [45]. It was Charles Fourier in 1808 who initially idealized a world where people could live together in harmony based on commonly agreed rules and cooperation [46] (p. 14). He was followed by William Thomson considered the "fathers" not only of cooperativism, but also unions, as "…instrumental tools against capitalism" [46] where production cooperatives, due to their capitalist nature, or towards consumerism, could be better managed by cooperatives enterprises since "workers are their own entrepreneurs" [46] (p. 15). Thus, we observe a discourse of cooperatives working together for a collective good that should go beyond personal or industrial greed. A relevant matter in terms of cooperatives when speaking of EI and CE, as it framed around the role of innovation (technological or other) and nature, therefore their relationship and implications [24].

Workers in production co-op are viewed as those more likely to make better economic decisions for everyone's benefit than single managers [47] (p. 331). Instead, production co-ops stand out for a specific reason: they rely on single managers to make rapid and essential economic decisions. The Mondragon Corporation, the largest global cooperative complex, exemplifies this approach, where workers' involvement in decision-making is limited due to the pressures of a globalized market. This evolution has given rise to a new perspective known as neo-cooperativism, which blends elements of the traditional cooperative framework with new approaches [48]. Thus, there is an overall understanding that only cooperatives operate within a specific, and unique, framework where additional values are embedded, but also could be providing alternative ways of operating in society and the business world. How does this affect their ability to remain competitive, innovate, and implement measures to achieve environmental sustainability?

While not using the term EI, the paper by Osti (2012) [49] remains particularly relevant for our study: it focuses on four distinctive environmental sustainability-oriented (operational and business) models of (green) social cooperatives (Table 1). The author identified key characteristics defining the relationship between social enterprises and the environment, and further explored if these features could be combined to form a typology that assists in guiding empirical research. Osti proposes that relatively simple green products and highly technical green services can be considered as logical objectives for green business enterprises. Attention is also paid by this author to the local community, and production and habitation are pursued as valuable goals. Therefore, activities for the protection and maintenance of the environment begin as a local matter before becoming of bigger attention and cooperatives could be more aware of local needs than larger and more distributed private enterprises.

Table 1. Aim and type of green social enterprises (GSE) in regard to the value set on the environment [49].

Value Set on the Environment	Aim of the Social Enterprise	
	Produce	**Produce and Inhabit**
Instrumental	A—Simple environmental services (e.g., urban cleansing) SIMPLE GSE	B—Territorial promotion services (e.g., environmental education) TERRITORIAL GSE
Final	C—Services with high technical-innovative content (e.g., solar energy plants) INNOVATIVE GSE	D—Services incorporating lifestyles (e.g., residences with self-contained consumption) COMMUNITARIAN GSE

Osti also proposes that social cooperatives centered on work and reciprocity are not sufficient to cope with goods exhaustion that profoundly undermines the possibility of working and living together. To understand these limits and the impact of environmental

problems, knowledge is required about the impacts of man-made (production) activities and resource use. The latter requires expertise and skills that generally cooperatives may not have at hand, considering the complexity of the topic and the field of work that requires specialized services, such as waste recycling or clean energy supplies.

It is Manfred Max Neef (2014) [50] who wrote about the crisis caused by the exponential human-induced climate change affecting globally due, among many reasons, to a disregard of planetary limits and promotion of consumerism (p. 16). He proceeds defining cooperative alongside solidarity and compassion, as the solutions to the above postulating a new economy where there the introduction of local co-operation to avoid monopolies and requires a greater democratic commitment to ensure effectiveness and equity in the transition to local economies. A new economy that [51] Neva Goodwin (2014, p. 39) discusses as a way to refocus economic activity, including systems of production, towards an enhancement of wellbeing. The latter not only when we speak of environmental consideration in our economic equation, rather in our view of employment and work, where in a decreased market demand it can be supported by job-sharing achieved through growth in cooperatives. It is debated on our current consumption of resources and how economically that is impactful with fluctuating prices as the demand increases. Furthermore, they underline that a new economy would consider its ecological and social context [51] (p. 45). A social context that takes into consideration a new form of work vision where it can generate valuable goods and services, while providing meaning to the worker [51] (p. 50) and where the way societies organize should include also unpaid work for social causes, frequently carried by cooperatives.

Cooperatives find themselves in an ambiguous position within the economic discourse. The traditional neoclassical approach tends to overlook their environmental impact, focusing solely on financial gains [42]. When redefining our economy through alternative management and business structures, we seek to understand if cooperatives can contribute to positive change and transformation on this issue [42] (p. 10). Thus, this study aims to explore in the scholarly works the interconnection between cooperatives, regardless of their type, in the EI and CE context.

In their research on solidarity funds and comparative comparing scenarios from Italy, United Kingdom, and France, Bernardi et al. (2022) [40] highlighted a crucial policy implication. They identified the necessity to establish dedicated institutions in countries where cooperatives are lagging behind. Traditional institutions may struggle to finance cooperatives due to their existing property rights regime. Therefore, research should investigate those institutions that manage natural resource and supports financing CE and EI actions. Especially considering the difference in business structure, governance, and financial availability that cooperatives are exposed to compared to other forms of legal business structures.

To this point in relation to the Just Transition, the EU has looked to provide appropriate labor market and skills policies within the European Social Fund Plus (ESF+) considering that a rise in fossil fuel will have a significant social and disproportional impact to the most vulnerable. In this scenario, the role of cooperatives is described as "anti-capitalistic" and the present contradiction of this enterprise's role within the private economic paradigm [17] (p. 20). It is debated that either cooperatives are meant to pursue a small space within the economic framework where those who pursue profit obtain the largest space and—hence the mutualistic approach has the strongest value—or the cooperatives choose to compete yet push forward self-interest (towards profit).

In summarizing the discussion offered in the precedent paragraphs, which delve into the connection between cooperatives and the environment, Figure 2 illustrates key themes that emerge from our discussion about how sustainable production and consumption can be conceptualized in cooperative enterprises studies (e.g., by focusing on CE and EI). Consequently, it becomes clear that these considerations, as well as co-operatives themselves, could play a pivotal role in shaping economic processes and decisions.

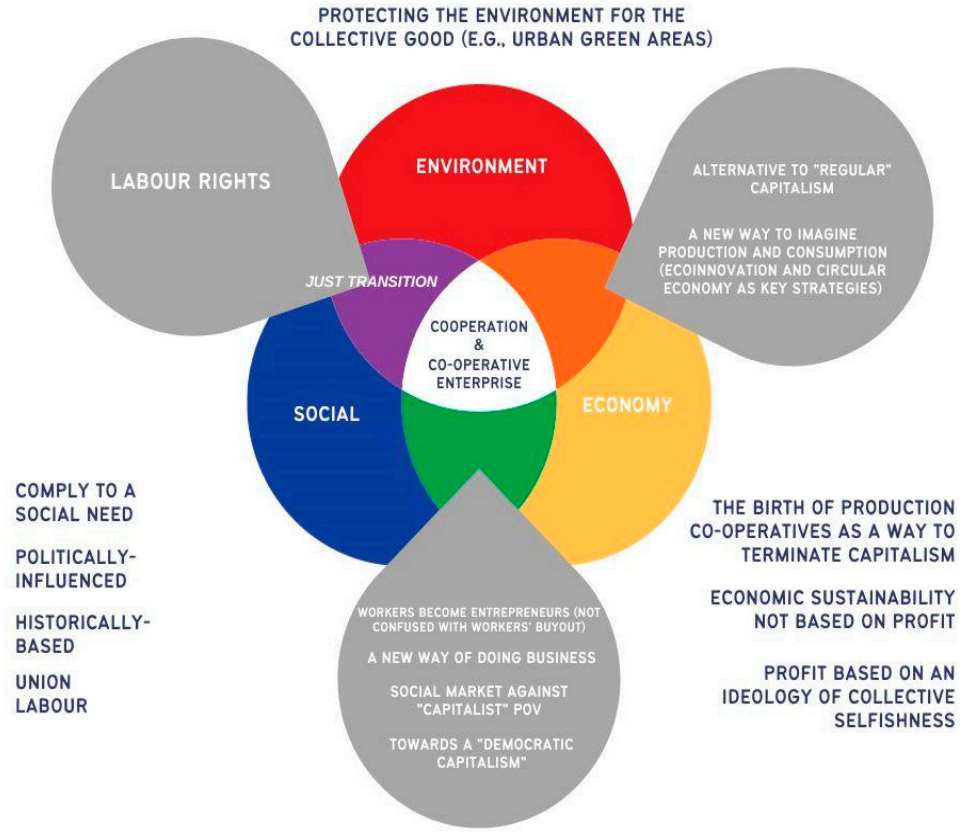

Figure 2. Summary diagram on the basic concepts of economy, social, and environment developed in the introductory part of this paper (own production).

3. Methodology

This paper follows an application of the method developed by van der Have and Rubalcaba (2016) in Research Policy [52] conducting a bibliometric analysis of the existing body of knowledge on social innovation in the period 1986–2013. These authors curated and analyzed a data set of 172 publications using citation data obtained from the WoS and Scopus (Specifically, van den Have and Rubalcaba's method was as follows: the authors first retrieved citation data included in the Social Sciences Index of Web of Science. They further used Scopus to identify missing and relevant journals in the field of social innovation, resulting in the manual addition of 14 citation records from three additional journals. Following on, they searched both databases for the tern "*social innov*" in the abstract, title or keyword fields of both knowledge repositories, resulting in an integrated data set of 172 unique documents that contained 6500 references and 400 different keywords. Their results excluded results from publications not written in English, book reviews, and editorial articles. For the analysis of the data, they used Sci2 [53] and applied techniques based on 'algorithmic community detection' and 'bibliometric coupling' to conduct a scientific mapping of documents to identify the co-occurrence of keywords and citations, the frequency of publications over time, and the burst detection algorithm method). van der Have and Rubalcaba used Sci2 to identify four distinctive clusters of the literature (based on citation data), and several bibliographic metrics (inter-cluster bibliographic coupling and a temporal bar graph with burst analysis). In their study, the abovementioned authors [52] acknowledged salient limitations of the selected approach that remain valid for our study, most notably: the possible biases and caveats from only using English speaking documents, and the use of other similar key words. These are expressed and further detailed in the limitation's section of this paper.

As shown in the PRISMA diagram below (Figure 3), in this study we refined van den Hove and Rubalcaba's original bibliographic analysis method to follow a two-step

review process of the literature. Initially, we conducted a thematic analysis of the literature focusing on keywords related to cooperatives, CE and/or EI using the Scopus database. This first step had the objective to provide a 'bird-eye' view of the connection between CE and EI within the cooperative's literature (total number of publications and an overview of salient topics in a sub-sample of papers). As a second step, and to better understand the discourse and epistemic communities surrounding these topics in the scholarly literature, a more robust bibliometric analysis was conducted using a data set of 101 papers obtained from the WoS. The methodological novelty of our approach may seem minor at first glance [54]. However, a two-step approach adds some foundational elements commonly used in meta-analyses and systematic literature reviews [55]. Moreover, it was considered a more adequate approach for the analysis of documents in a rather scattered and emerging area of knowledge—and where the exclusive use of citation data could have led to misled interpretations of the results (e.g., by including documents from non-relevant Journals or by focusing on papers with a superficial focus on the topics of interest (The two-step method for the bibliographic analysis ultimately used in this paper has some similarities with the bibliographic review approach employed in [56] and [57], combining thematic analyses and computer-aided content analysis (using Nvivo [58]) and topic modelling of documents, respectively). (The data sets with the full list of documents used for the thematic analysis study (n = 16) and bibliometric analysis (n = 101) have been included as Supplementary Materials).

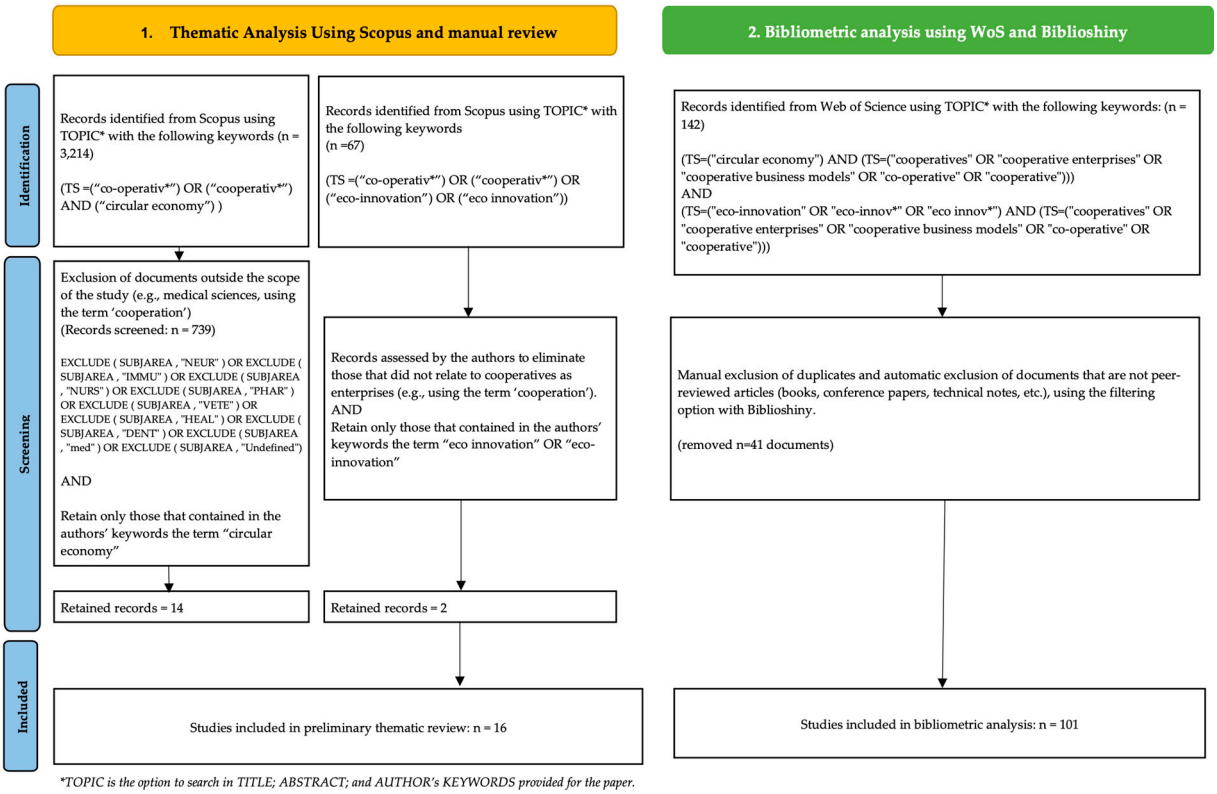

Figure 3. PRIMA flow diagram (based on Page et al. (2022) [59]) illustrating the methodology employed in this study to integrate the data sets with the relevant articles for analysis (own production) (The search for results from Scopus was carried out in October 2022 and the search for WoS was carried out in May 2023).

3.1. Thematic Analysis Using Scopus and Manual Review

The preliminary thematic review of cooperative studies was conducted in the Scopus database using the terms 'co-operativ' OR 'co operativ' in the fields TITLE, ABSTRACT and KEYWORDS (also defined as TOPIC by search engines).

As a first step, a logical approach was employed to exclude articles from non-relevant Journals, such as those in the medical domain yielding 739 documents (using the excluding criteria in the automated filters of Scopus, as shown in Figure 3). This bulk dataset was used to produce a frequency count of documents published over time (in the period 1988–2023).

Next, the resulting documents were further narrowed by focusing only on documents containing the authors' keywords "circular economy" OR "ecoinnovation". The documents included in the final dataset comprised 16 papers published in the period 2017–2021, which were manually reviewed to ensure they did indeed pertain to studies about cooperative enterprises. The data set only included peer-reviewed articles, excluding any other type of documents.

3.2. Bibliometric Analysis Using WoS and Biblioshiny

This paper also modified the method of van den Hoven and Rubalcaba (2016) by employing WoS in conjunction with the Bibliometrix Tool Biblioshiny [60] (implemented using R Studio [61]). WoS was chosen as the data source, due to its compatibility and integration with the latter R Studio library tool that was used for the bibliometric analysis. This methodological expansion enables a more comprehensive and nuanced analysis, yielding a deeper understanding of the interplay between the examined papers and the advancement of cooperatives-related themes when discussing EI and CE (The Biblioshiny software is a tool that has been designed to be used with WoS. This software has the limitation of being unable to conduct analysis of 'merged' datasets that include WoS and Scopus records. According to the developers, Scopus uses a different method to codify bibliographic metadata compared to WoS, which prevents Biblioshiny from conducting citation and co-citation analyses of merged data (See https://www.bibliometrix.org/home/index.php/faq, accessed on 15 October 2023). This was an important technical limitation that motivated the authors to test and implement our refined two-step method).

The TOPIC field in WoS was used to conduct two searches using different terms of 'cooperatives' and 'circular economy' or 'ecoinnovation' (see the complete list of terms and criteria in the right-hand side of Figure 3). The research results identified a total of 142 results; however, after manually removing duplicates from the two separate searches and excluding non-article publications, a final dataset of 101 documents was retained and used for our analysis (published between the years 2012 and 2023). Biblioshiny produced results of the inputted data for: citation metrics, three-fold plots, a thematic map, and cluster metrics (co-occurrence network, clustered thematic map, and factorial map) (Refer to [60] for a description of the methods used in Biblioshiny with R Studio and their theoretical/empirical foundations).

4. Results

4.1. Thematic Analysis

This section presents basic citation counts for all documents identified in Scopus addressing both cooperatives and the CE or EI. In each sub-section, we present citation counts for the total number of documents identified in Scopus for each theme: CE (N = 739) or EI (N = 67). The number of documents in a sub-sample of the same theme are denoted with the word 'n' (e.g. n = 2).

4.1.1. Cooperatives and CE

In this sub-section, we first present the frequency count of the number of articles focusing on CE identified in Scopus (N = 739). Considering the increased significance in the topic of sustainability, Figure 4 shows the rising number of papers focusing on environmental sustainability, and related topics confirm the interest of the scholarly community in the connection between cooperatives and CE.

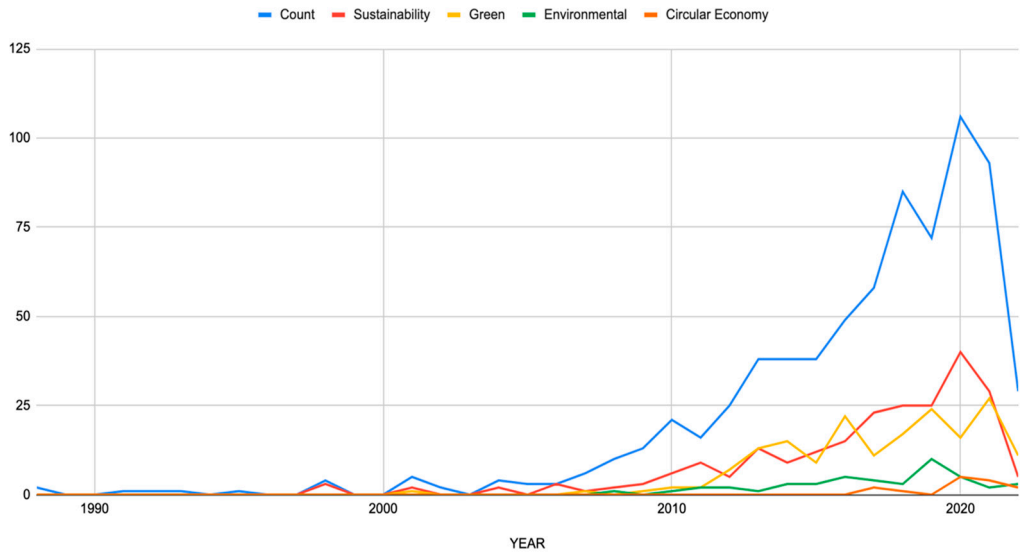

Figure 4. Final count per year of publications 1988–2022 with specific separate count for keywords "Sustainability", "Green", "Environmental", and "Circular Economy", N = 739 (own production).

When looking at the papers ultimately retained for manual analysis in this section that focused on CE (n = 14), it was observable that the majority focused on downstream processes: CE as tool for emissions reduction [62], and cooperatives as a legal enterprise facilitating the application of CES [63] providing further support towards an economy that through employment can support reducing inequalities. Values such as co-operation, or even solidary-focus economy business models, provide the space to provide and offer decent work to eliminate inequalities and poverty [63]. As the objective of CE is to lower material input and reduce waste production [64], specific CES can help preserve products, their parts, the used materials [65] promoting ways that can go beyond product preservation with direct and indirect impact on the economy [64].

A salient message from our review was that efficient CE can be achieved through efficient cooperation, which is a key element already embedded in cooperatives. It was deemed that it should be, through cooperative efforts, researchers, policymakers, and other involved stakeholders' responsibility to provide the infrastructure to facilitate the transition to effective circular business by using realistic CE labelling system, which can affect the willingness to pay (WTP) [66]. While labelling products as more circular can impact consumer's WTP, it should not be confused with products that have implemented only a partial CE strategy (e.g., using recycled materials without completing the loop misleads consumers about CE practices implemented by the company).

When observing the integration of a specific type of labor into the market contributing to CE, the reviewed literature suggested that cooperatives can act as a bridge between the municipality and informal workers, such as waste pickers in developing countries. Informal workers who now through a cooperative can also be given the legal support needed and social status leading to the creation of a network [67,68]. Thus, as cooperatives can support the implementation of CES, the same CE oriented activities can push via indirect feedback that a business model should be cooperative in order for CES to be more efficiently implemented.

An additional message from the papers in the dataset was related to waste management being a crucial aspect when speaking of CES, and that cooperatives are successful in providing a market space for selling waste as secondary resource [69] similar to the process of industrial symbiosis as a means to increase environmental, social, and economic benefits [70] and a mechanism capable of maximizing resource potential [71]. Moreover, waste management processes require strong, clear, and efficient cooperative models that co-operatives can provide [72] that can help reduce costs of waste exchange, avoid competition, leading to a fairer market that is also economically beneficial on the long-term [73–76].

A specific case discussed in a study was the application of CE strategies for a solar power park for an Olympic village [77]. In order to also achieve some form of decarbonization, energy cooperatives were identified as the model that could render successful the application of these strategies in this context [77].

Barriers when implementing CES for non-cooperative and cooperatives appear to be similar, such as, lack of information, awareness, and ineffective recycling policies towards CE [78]. However, in the latter study, there was a clear acknowledgement that cooperative enterprises could provide additional value to tackle these barriers. In the case of EI, there is no similar paper to observe whether barriers or drivers remain similar. Additionally, the discourse remains downstream the CE chain and focused on cooperativism as the key element that embedded in cooperatives, however without providing insights to other corporate elements that potentially make this enterprise-form efficient for CES implementation.

4.1.2. Cooperatives and EI

A similar analysis was undertaken for the documents focusing on EI in cooperatives in the bulk dataset obtained from Scopus (N = 67). While only one result referred to cooperative enterprises, an additional EI study was added for stronger analysis that related to cooperativism in a broader sense but was yet relevant for the research at hand resulting in two used for this analysis.

Considering the limited number of results, we wondered how innovation in the traditional and overall sense was studied in cooperative studies to provide an initial comparison with other forms of innovation (While not necessary for the thematic analysis nor the bibliometric analysis, to complete Figure 5, a Scopus search for papers focusing on authors' keywords ("cooperatives" AND "innovation") was completed on 23.10.22 (n = 707). Considering it useful only for this figure and discussion it was excluded from the PRISMA graph representation).

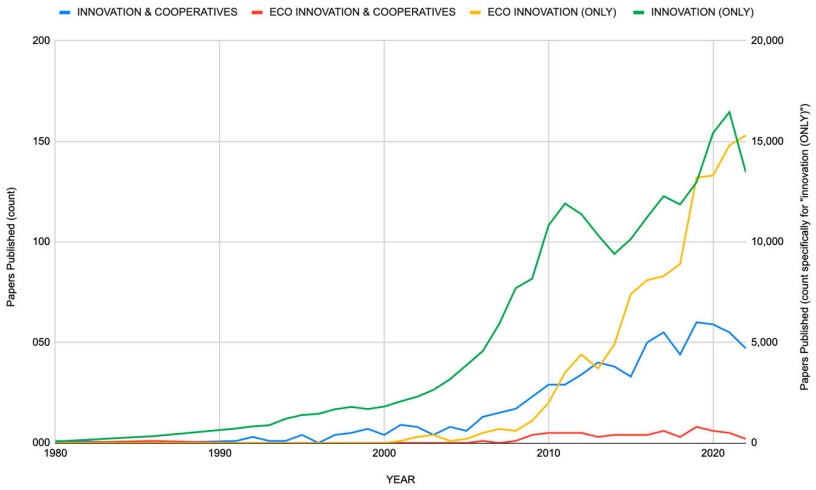

Figure 5. Count papers published with keywords "innovation" and "eco innovation" published between 1980 and 2022 focusing those that also include the keyword "cooperative" and those without (only) (own production). The right Y axis shows the count only for "innovation (ONLY)".

Observing the publication trends over time (Figure 5), by comparing articles containing the keywords "innovation" (intended traditionally), "eco-innovation" only, and those encompassing the latter and former keywords in conjunction with "cooperatives" it becomes immediately apparent that the number of publications specifically exploring the intersection of EI and cooperatives remains comparatively limited.

When analyzing innovation more traditionally it is shown that cooperatives with more committed memberships display higher levels of capitalization and that the latter factor positively relates with innovation levels, also confirmed to enhance cooperatives'

performance [79]. Instead, when setting a focus is on EI, it is understood that cooperative models support the achievement of EI regardless of a firm business enterprise choice [80,81].

The manual review of documents proved to be challenging due to the reduced number of papers retained for review (n = 2). The only article that focused on EI in cooperative enterprises, showed no significant differences between cooperatives and other firms concerning their environmental behavior [13]. Although EI is a field with a longer history than CE (e.g., the first EI papers can be tracked to the 1970s and early 2000s (see e.g., [82,83]), attention to cooperatives related to this form of innovation is near to absent in the identified documents.

However, since in the analyzed documents there seems to be an apparent behavioral contrast between differing enterprises, we wondered about how the firm reasons and approaches profit could differ and if it instead impacted by management decisions. Rabadán et al. (2019) [81] examine the capacity of companies to enhance their environmental sustainability as a means to remain competitive in the market. They explore how increased research and development (R&D) investment, and the advancement of technological EI can contribute to this goal. However, since profitability is not the main cooperatives' goal, how can it compete within the market so that it achieves the ability to have a margin for R&D spending and technological advancement?

The two papers in our study did not provide specific evidence to the question above. Nonetheless, there is attention drawn to SMEs and debate that while innovation provides the ability to compete, cooperation however could support the creation of an eco-innovative business model, which does not directly relate to strategies [84]. Especially, with attention to bringing closer members of the industrial, research, and educational sector [85].

Since cooperatives provide already a business model that takes into account sustainability in other factors, social and economic, they could be more defined to efficiently implement eco-innovative strategies or build EI-oriented business models. Moreover, an additional concern, and point of study, would be their ability to compete against bigger companies.

4.2. Bibliometric Analysis (WoS Data Set and Biblioshiny with R Studio; N = 101)

As noted in Section 3.2, citation data from 101 documents obtained from WoS were used to conduct a bibliographic analysis using the software Biblioshiny with R Studio. Considering the relatively young age of the topic of sustainable development, and business sustainability more generally, it is somehow expected that the research and scholarly attention on cooperatives enterprises would be less developed as observed in the thematic analysis. In fact, prior to 2012 there appears to be no publication on CE and EI in the cooperative literature (Figure 6).

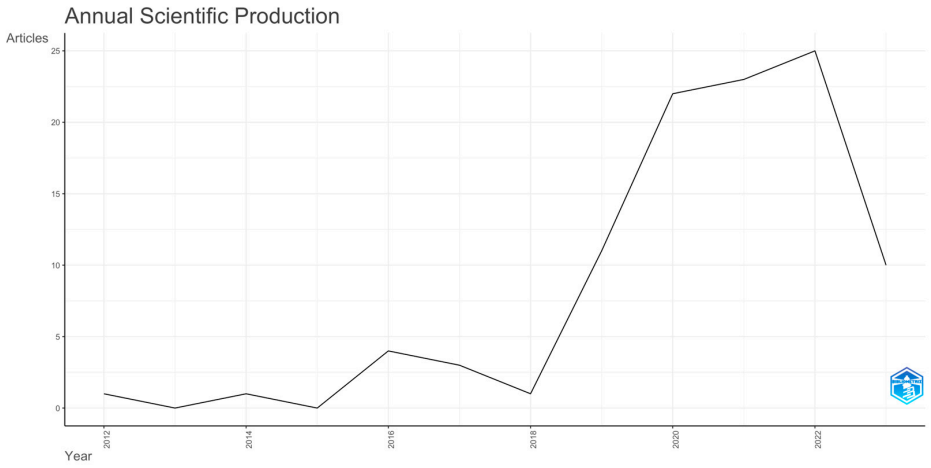

Figure 6. Annual distribution of articles published per all years focusing on cooperatives and CE or EI (created using Biblioshiny; own production).

The average citations per year (Figure 7) serves as a vital reference metric for authors and journals [60] providing insights into how articles are being cited and shared, reflecting the topic's integration into various fields, fostering interdisciplinary and multi-methodological approaches. The citations per year have remained stable within the last ten years. Thus, while the decrease may be attributed to the possibility that some research is still awaiting publication, it could be indicative that the interest in this field is still low.

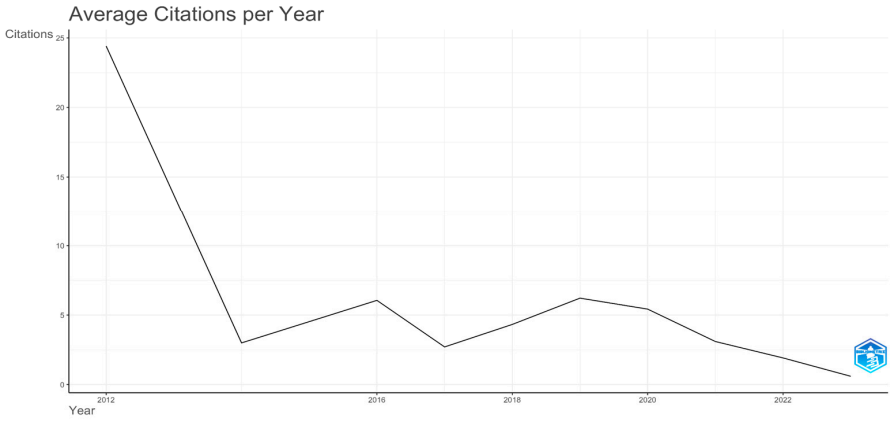

Figure 7. Average Citations per Year for all articles (created using Biblioshiny; own production).

It could be hypothesized that articles authored by a limited number of researchers may not receive significant citations, which could confine them to their respective fields, excluding interdisciplinary engagement. This underscores the importance of further research to prevent the exclusion of cooperatives as a subject in social and economic sciences, given their relevance as stakeholders in sustainable development. However, integrating cooperatives into interdisciplinary fields should be carried out cautiously, as research suggests they differ from conventional enterprises in their functioning and impact. The risk is placing cooperatives as enterprises similar to others or that act just as with other types, which as research demonstrates this is not the case.

The number of publications per year in key Journals (Figure 8) have also remained relatively low within the last ten years—being Sustainability and the Journal of Cleaner Production the most used outlets for academic publications in the past four years. However, since this study excluded articles in press, it is not possible to know if an upsurge of publications is coming.

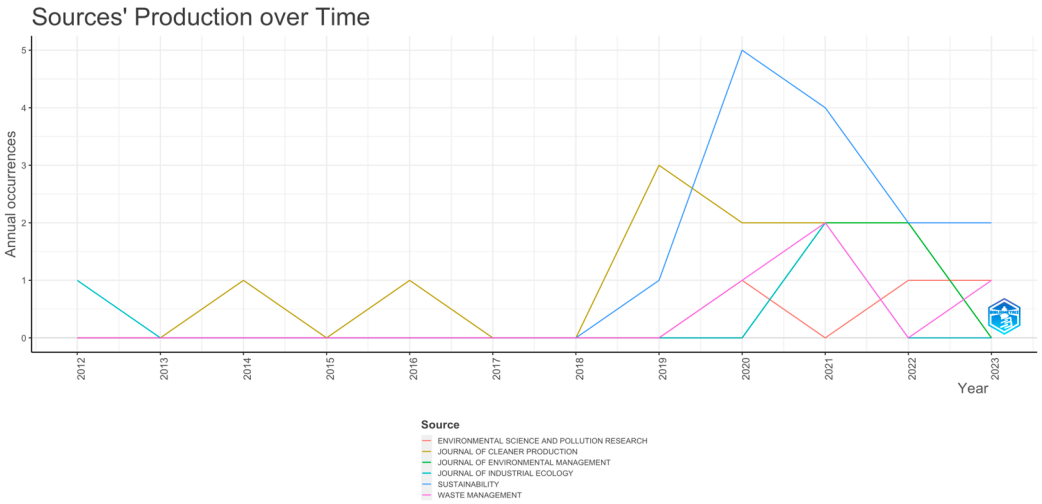

Figure 8. Sources' Production Over Time per Journal (created using Biblioshiny; own production).

The originality of this study is further underscored by the analysis of Figures 9 and 10. The country that published the most is China (Figure 9), which is also expected considering

that the concept of CE was first introduced in the latter country [86]. The presence of Brazil is also not unexpected, since this country's social context has played a significant role in fostering the development of cooperatives. Subsequent governmental initiatives have further enhanced the understanding and support for cooperatives [87].

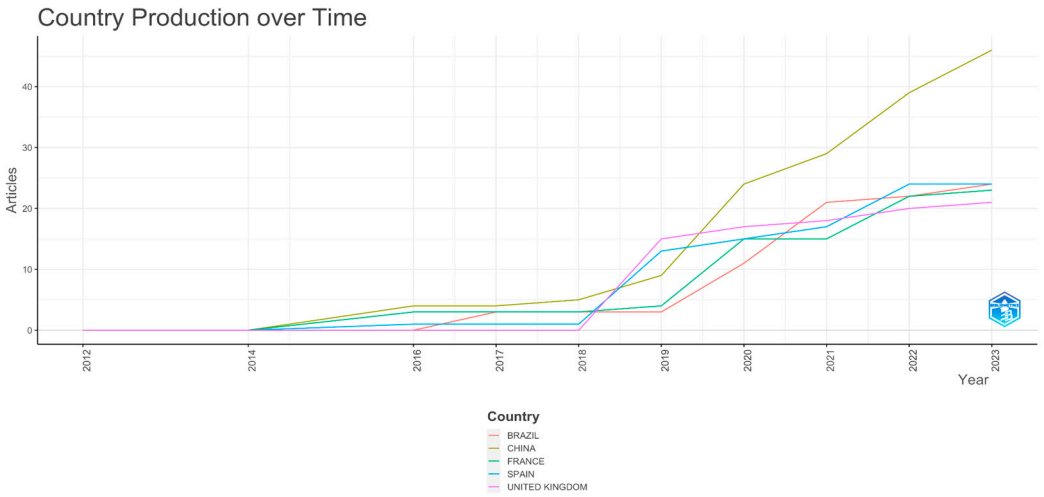

Figure 9. Sources' Production Over Time (created using Biblioshiny; own production).

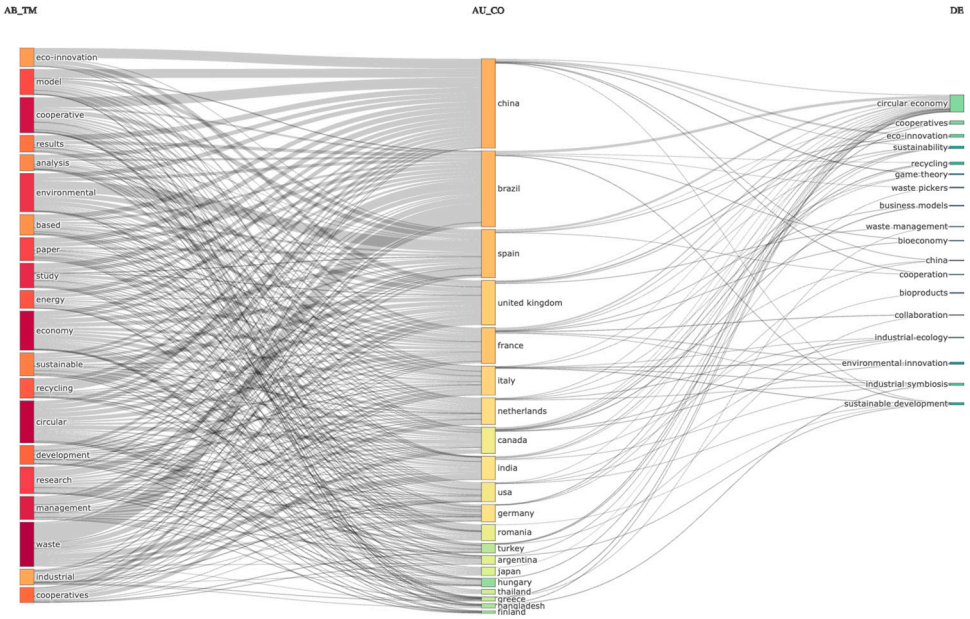

Figure 10. Three-Fold Plot using Abstract Keyterms (AB_TM; **Left**), Authors' Countries (AU_CO; **Middle**), and Authors' Keywords (DE; **Right**) (created using Biblioshiny; own production).

While these figures reveal that publications primarily concentrated within the past decade, in particular the interest in the subject matter experienced a significant surge in the most recent four years. This notable upsurge could potentially be attributed to the impact of key events such as the Paris Agreement [88] and the first European Circular Economy Action Plan of 2015 [12] raising awareness and interest in environmental and resource efficiency issues. Additionally, the declaration by the United Nations designating the International Day for cooperatives in 2020 with a specific focus on their contribution to combating climate change [89] may have further contributed to the increased attention in this area. It should also be understood that while ways to diminish the impact of climate change is through forms of innovation, such as CES and EI, it is crucial to mention that the ways are many as the barriers and drivers. Therefore, CE and EI do require specific focus.

Upon examining the keywords associated with the corresponding authors' countries and those predominantly found within the abstracts, a noteworthy observation emerges. While CE emerges as a prominent keyword, the occurrence of "cooperatives" (or similar variations) and EI appears to be comparatively lower. This disparity becomes more apparent when investigating the prevailing themes within these articles, which are currently driving the literature or have done so in the past. The keywords observed also in the abstract (Figure 10; left column) appear to be indicating additional similarity to the CE thematic analysis where the focus remains downstream (e.g., recycling).

It can be inferred that the literature is more focused on the concept of CE, which garners greater attention and emphasis, while paradoxically the definition yet remains to be clarified. On the other hand, the presence of cooperatives and EI-related themes may be relatively less prominent or influential in shaping the current discourse. This observation highlights the existing trends and priorities within the literature, indicating that the CE theme (within the cooperatives arena) (in the 4th figure in Section 4.4) may have taken precedence over EI in terms of driving research and scholarly discussions in the field.

During the examination of common and emerging themes in the study three motor primary themes have been identified (as depicted in Figure 11; top right). To determine the subthemes that drive the exploration of cooperatives within the contexts of EI and CE, the analysis focuses on the authors' keywords by excluding other keywords that could influence the results but are deemed irrelevant (e.g., "results"). This allows for a more targeted understanding of the specific subthemes that propel the direction of research in the latter field.

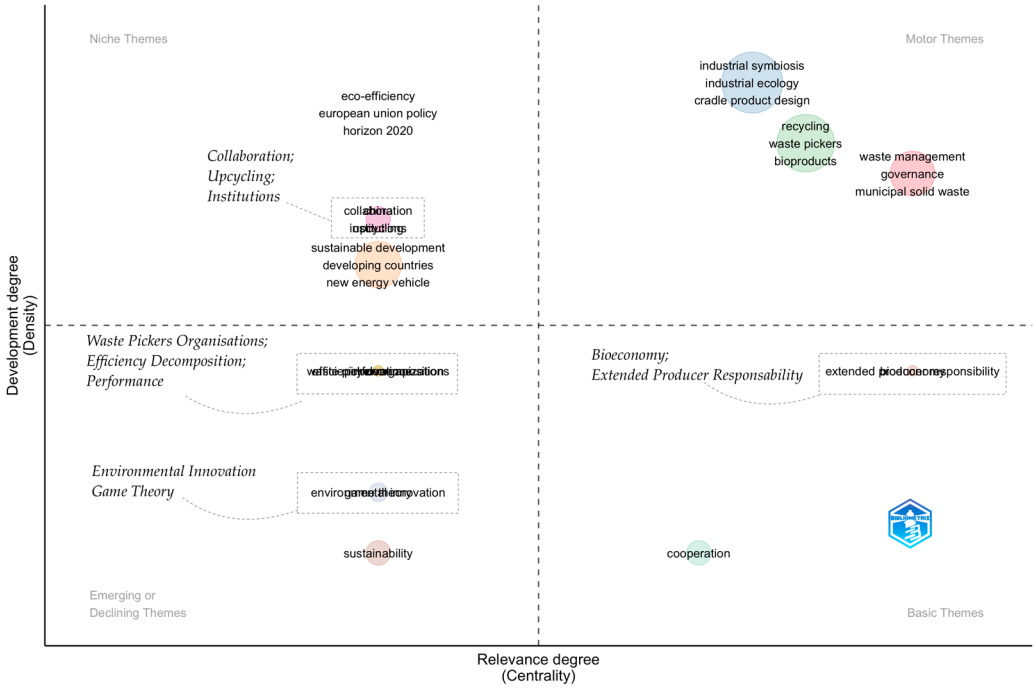

Figure 11. Thematic Map with authors' keywords (created using Biblioshiny; own production. The following keywords were excluded to provide a deeper understanding of the subtopics: "circular economy; cooperative; eco innovation; eco-innovation; cooperatives; paper; results; data; textual analysis; to-").

The motor themes in Figure 11, provide insight to those repeated keywords by the authors and are meant to give insight to the direction where the research is headed for the topics chosen for this paper. The following section presents the main findings of these clusters, also referred below as to 'motor themes'.

4.3. Motor Themes (Clusters) of Cooperatives Research Focusing on CE and EI

4.3.1. CE Principles (Brown Cluster): Industrial Ecology & Cradle-to-Cradle

Industrial ecology, including concepts such as cradle-to-cradle, predates the more recent theories of CE and EI. It encompasses approaches aimed at optimizing the entire materials cycle, from the use of virgin materials to the production of finished goods and their eventual disposal [90]. The theory of industrial ecology was already addressing the need to revise our production and consumption patterns, even before the 21st century, as a response to the unsustainable exploitation of the Earth's natural resources. In both cases, we can assume that the presence of these subtopics is expected being the foundation of EI and CE studies.

EI seeks to reduce resource consumption resulting from either environmental issues or the market's response to high resource prices, which necessitates new or improved products and practices that have the desired environmental impact [91]. In this context, it can be speculated that industrial ecology was originally conceived with similar objectives in mind.

Overall, industrial ecology and its principles were developed as a means to address resource overuse and promote more sustainable production and consumption patterns, aligning with the underlying goals of EI and CE, which are now terms most commonly used and we would suppose them being intertwined. However, the analysis shows that in the case cooperative, this may not be the case.

4.3.2. Material Recovery (Pink Cluster): Recycling, Waste Pickers, and by Products

Following the first cluster, the pink one focuses on the end of the supply chain and what can be done with products once it reaches the End-Of-Life and/or End-Of-Use. Two sub-concepts are also commonly observed and described in CE and EI. As an example of EI, the former are relevant since not only do they tackle a branch of research material opportunities from waste (e.g., material science), but the behavior behind product consumption, such as product-as-a-service where a product is rather rented and returned, rather than disposed of. In the particular case of waste pickers, as previously underlined in the thematic analysis, they are mostly discussed as a form of employment in developing countries. In this case, cooperative enterprises are described as those who can efficiently manage and act as connectors between the government (or other private enterprises) and local people who are hired as pickers.

4.3.3. Material Management (Green Cluster): Waste Management, Governance, and Municipal Solid Waste

The last cluster regards how governance and management can matter in terms of waste management. Discard studies [92] have shed light on the multifaceted nature of waste, transcending its perception as a mere by-product of human desires or a technical challenge within the domain of sanitation experts. Regarding the intricacies of waste management processes, scholars have illuminated its central role in discussions concerning materiality, ontology, labor dynamics, environmental justice movements, and critical examinations of modernity and imperial constructs [93]. Especially if investigating the relationship between waste and non-human entities, due to its profound implications for the future of the planetary ecosystem.

4.4. Relationship between Clusters

Although it appears that the three clusters are naturally interconnected, this is not visible in the analysis (Figure 11). The three thematic clusters remain connected mostly more to the theme of CE, rather than EI, which instead remains also isolated and yet to be discussed in regard to cooperative enterprises. An assumption potentially observed from the thematic analysis, is that the role of the cooperative requires further exploration and consideration without it being limited and framed either in the waste management arena potentially making a distinction between EI and CE or better clarifying its interconnected-

ness. However, since CE appears to a field that yet requires more detailed definition, the focus applied to co-operatives could begin from EI studies where impacting factors and elements—as barriers and drivers—are more defined.

Figure 12 shows the co-occurrence network (A keyword co-occurrence network (KCN) is centered on comprehending the elements and organization of knowledge within a scientific or technical domain, achieved by studying the connections between keywords in the body of literature [94]) analysis suggesting the presence of four distinct clusters, comprising a total of 34 keywords. These clusters are visualized through graphs, where keyword connections are represented by nodes and links.

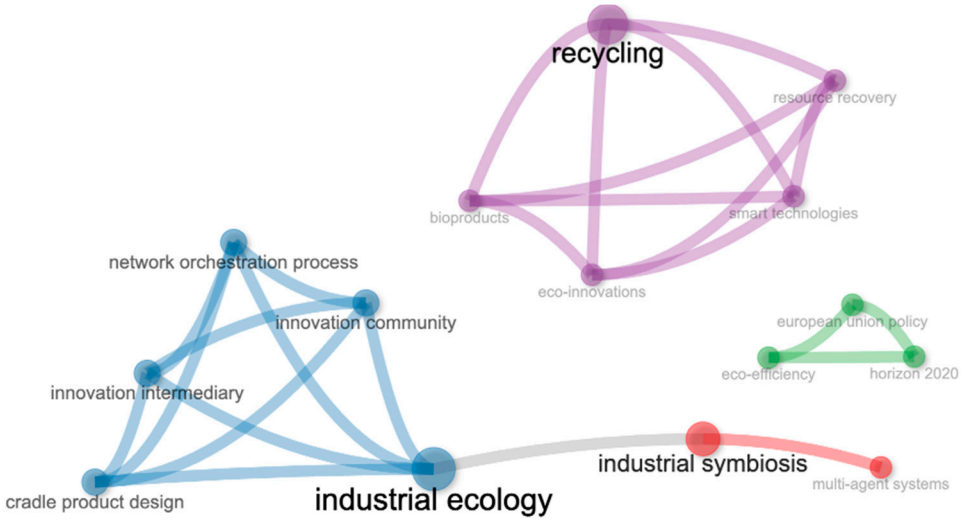

Figure 12. Co-occurence network with authors' keywords (created using Biblioshiny; own production. The following keywords were excluded for deeper understanding of the subtopics: "circular economy; cooperative; eco-innovation; cooperatives; paper; results; data; textual analysis; to-; eco innovation").

In Figure 12, each node represents a specific keyword, and its size corresponds to the frequency of appearance within the analyzed documents. Consequently, a larger node size indicates a higher frequency of occurrence, while a smaller node size indicates a lower frequency. By examining the network and its clusters, it becomes possible to discern the relationships and patterns among the keywords. Thus, this analysis offers insights into the interconnectedness and thematic associations within the literature, aiding in identifying the central themes and their respective prominence based on the frequency of appearance.

As shown in Figure 12, there is no clear node connection between keywords related to EI and those for CE. As expected the larger node remains CE (Figure 13) with greater connections. This may indicate not only an absence of deeper research on the defined relationship between EI and CE, but also a larger interest in CES rather than EI.

The use of clustered thematic maps is to highlight the way the subtopics of this scholarly literature analysis are interconnected. Figure 14 provides an in-depth view by looking at subtopics when the main keywords, used in the first keyword search, are excluded in order to observe how keywords are subsequently interacting. Figure 14 shows the results of four main groups: industrial symbiosis/industrial ecology, waste management, recycling, and sustainable development. Other themes such as innovation or cooperation are less discovered and interconnected. As shown in Figure 15, even when all keywords are included, the latter still appears to be valid. Thus, while these two latter figures may not provide further information, they do provide further confirmation of what has been already identified.

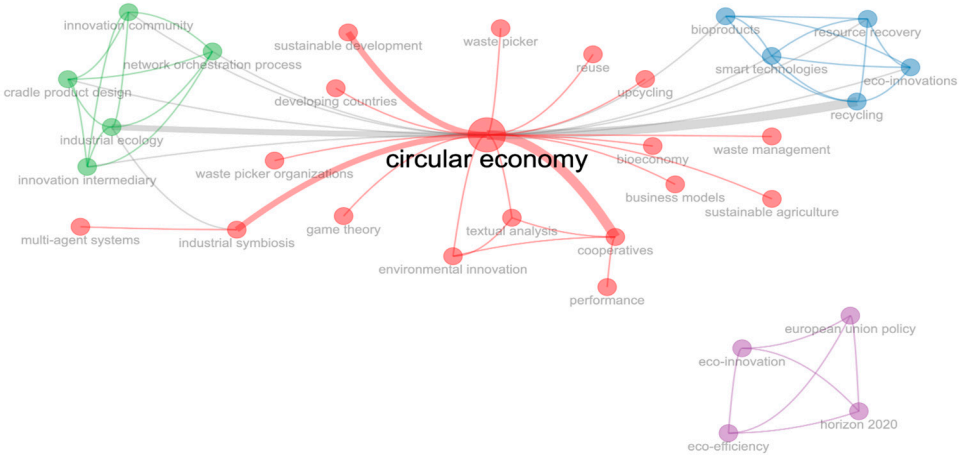

Figure 13. Co-occurrence network with authors' keywords (created using Biblioshiny; own production. All keywords were included).

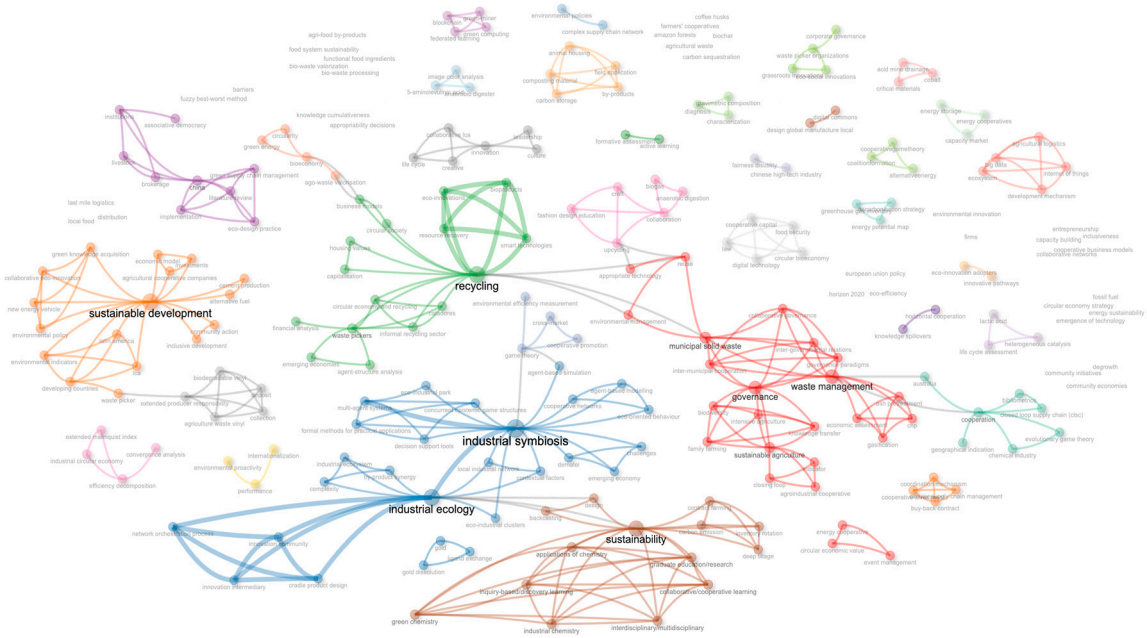

Figure 14. Clustered Thematic Map using authors' keywords (created using Biblioshiny; own production. The following keywords were excluded for deeper understanding: "circular economy; cooperative; eco-innovation; cooperatives; paper; results; data; textual analysis; to-; eco innovation").

To finally investigate if the references ideally are treated and chosen similarly among the papers selected for analysis, a conceptual structure map using the Multiple Corresponding Analysis (MCA) (Figure 16) and Keywords Plus was carried out. *Keywords Plus* is used in WoS to identify words or phrases that frequently appear in the titles of an article's references, but do not appear in the title of the article itself [95].

In the MCA conceptual structure map (Figure 16), concepts are visually represented based on their relationships and importance. The *x*-axis shows similarity or thematic connections, while the *y*-axis represents significance or weight. Consequently, the analysis reveals that the references cited in the analyzed articles exhibit similar keywords grouped into two main clusters. Among these clusters, EI emerges as a prominent theme, although it is less connected to other concepts or investigated compared to CE when discussing cooperatives. Additionally, the secondary cluster is more inclusive, and tackles more secondary themes altogether. Hence, the references utilized by the same articles used for this paper's research demonstrated a similar clustering pattern.

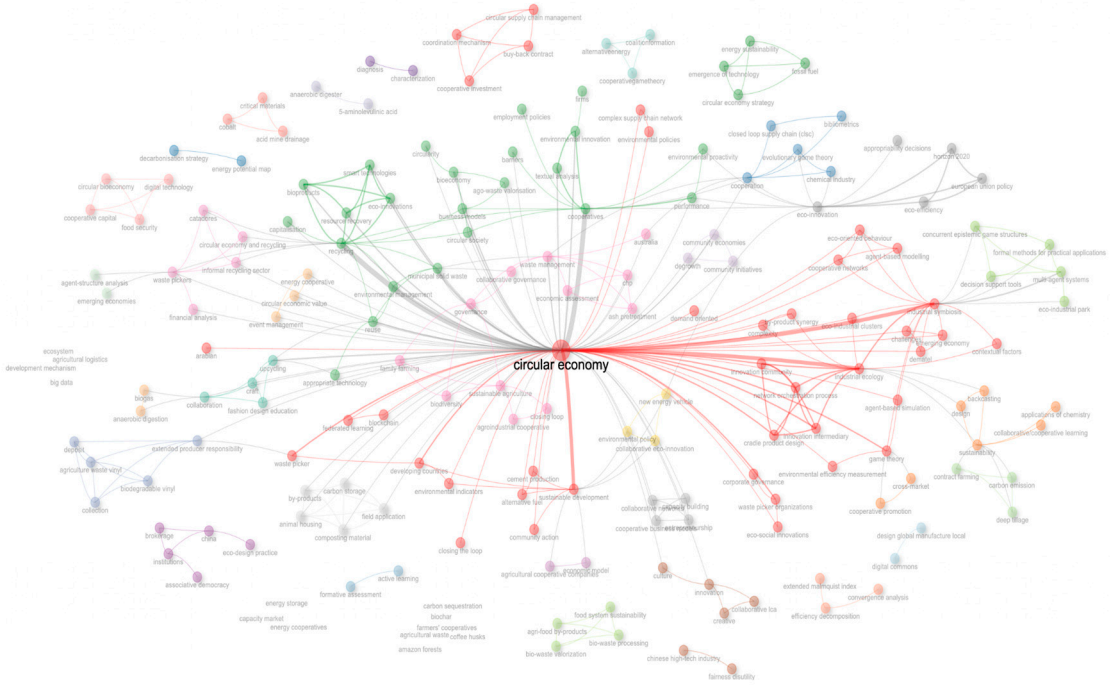

Figure 15. Clustered Thematic Map using authors' keywords (created using Biblioshiny; own production. All keywords were included).

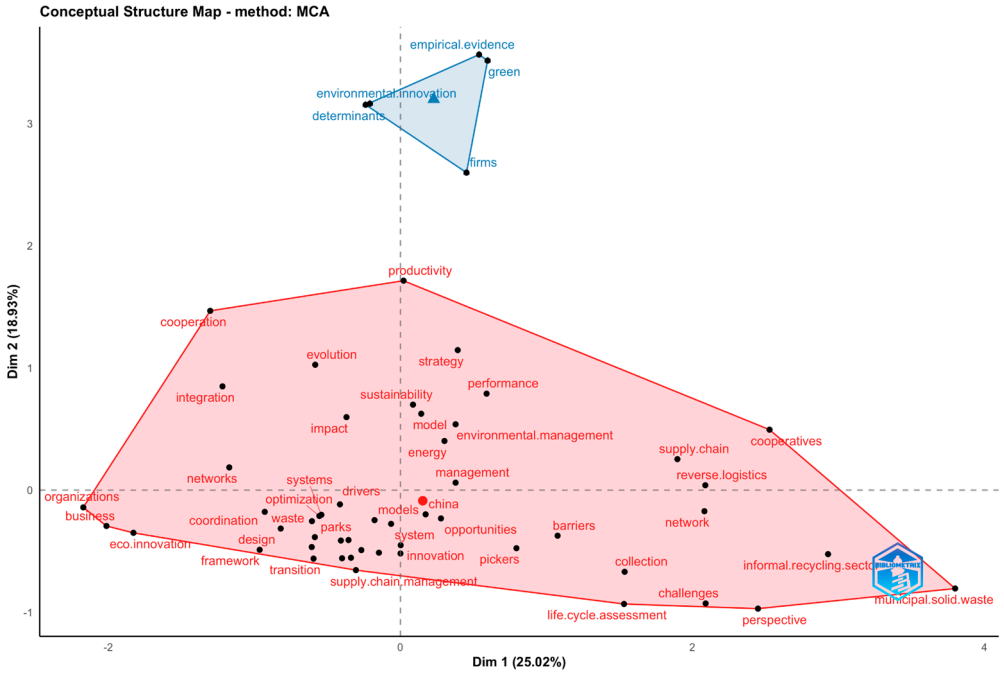

Figure 16. Factorial Map of Keywords' Plus (Two Clusters) (created using Biblioshiny; own production. All keywords were included). The authors' keywords were not used in this analysis since they did not provide enough indicative information.

This outcome may not appear surprising, but the additional information that it provides is that not only do CE and EI not interconnect, but the references used by academic in each relative field is also similar without providing stronger interdisciplinarity. The latter remains a large limitation, since as scholars acknowledge a field and establish it within academic authority structures, it paves the way for enhanced knowledge development [96]. Thus, in the case of cooperative studies, the abilities, drivers, and barriers of cooperatives

to achieve environmental sustainability and innovation need to be researched to acquire a stronger knowledge foundation.

5. Conclusions

Discussion and Value Creation

This document addressed the question of better understanding the existing connection between the topics of CE and EI and cooperative enterprises in scholarly literature. As the urgency for environmental sustainability increases, it is necessary to include all stakeholders into the scholarly research. For this reason, this paper aimed at understanding how CE and EI as thematic fields were integrated within the cooperative studies. To achieve this aim, we looked to carry out a preliminary thematic analysis using citation data and a manual review of a sample of documents from Scopus, followed by a robust bibliometric analysis from WoS citation data using R Studio's Bibliometrix (Biblioshiny) package.

The outcomes of this paper reveal the presence of distinct research clusters centered around three overarching themes. However, these thematic domains exhibit insufficient interconnection, as indicated by the thematic maps, revealing certain critical associations are overlooked considering the critiqued definitions of EI and CE and how those are then implemented within the cooperative enterprise. Specifically, while the exploration of cooperatives' adoption of CE strategies has gained reasonable attention, the same level of scrutiny is not extended to the study of EI in the context of cooperative studies. Consequently, the scholarly discourse not only lacks a robust linkage between CE and EI in academic literature but also this connection is further attenuated by the inadequate focus on the upstream dimensions (e.g., resource management versus waste handling) and (democratic or other) governance that influence the implementation of eco-conscious forms of innovation like EI.

This disjointed knowledge representation might foster assumptions about cooperatives that do not furnish a holistic grasp of their specific attributes. For instance, without delving into diverse managerial approaches, such as more participatory and inclusive methods, cooperatives often become subjects of analysis within the same conceptual framework as other enterprise types. This, however, falls short of capturing the distinctive potential of cooperatives as efficacious models for attaining sustainable development or fully uncovering the reasons behind their potential success (or even failure). These gaps in the literature obstruct the exploration of how distinct enterprise forms, cooperatives included, can contribute to sustainable business practices and streamlined operational modes. Therefore, this analysis puts forth three pivotal findings.

Firstly, a more comprehensive and interconnected investigation is required when examining cooperatives, particularly to comprehend the intricate interplay between EI and CE (and the industrial sector and elements). The precise nature of this interrelation and its consequential implications remain ambiguous. Secondly, the predominant focus of inquiry predominantly centers on downstream facets of cooperative activities (e.g., waste management), relegating other pertinent dimensions that warrant comprehensive exploration. Lastly, both the realms of CE and EI lack exhaustive insights into the hurdles, incentives, and the strategic role that cooperation might assume in their adoption. Given the limited corpus of available literature for scrutiny, further research is imperative. Neglecting to address these facets poses the risk of weakening direct reinforcement or lucid associations, not solely between CE and EI, but also concerning cooperative enterprises and their implications within this specific business framework.

The observed uncertainty hinders our understanding of how cooperatives can contribute to sustainable development from the upstream of the supply chain. The latter is relevant since a further detailed understanding of cooperatives enterprises, for these fields, can help distinguish the barriers and drivers in different sectors and cooperatives types going beyond an economic discourse framed in a neoclassical versus new economy narrative, and rather focusing on democratic stakeholding that provide space to what is in its entirety a business form that appears excluded from market-considerations but has to

comply to the environmental-needs nonetheless (and is yet expected to compete with other enterprise forms). There appears to be an absence to the role that cooperatives would place within the market when implementing EI pressures for sustainable CE practices against larger industries. Furthermore, there is an additional absence to how local and regional factors play a role as observed instead when studying singularly EI or CE.

Since cooperatives exist on values that go beyond profit, the pressure to innovate towards efficient CE strategies, it is necessary to revisit our paradigm in a market and economic system that does not benefit cooperatives revisiting our vision of production and consumption. Furthermore, if we consider EI as the means of harmonizing economic activities with environmental resilience [97] it is proven that regulations and government involvement in the promotion of EIs come out from a cooperative approach that can help business approach clear technologies and products.

It is already evident that CE can serve as a valuable tool for cooperatives to attain the fundamental pillars of sustainability. By considering CE as a catalyst for sustainable development, cooperatives emerge as instrumental in implementing CE, particularly in economically disadvantaged regions. While some solutions for decarbonization and environmental sustainability already exist, they often face limitations and high costs. However, the cooperative model can help mitigate these challenges, potentially reducing expenses. It is therefore apparent that CE represents a strategic choice for cooperatives to enhance their environmental sustainability efforts, while cooperatives themselves provide an optimal framework to efficiently implement these strategies, ultimately leading to reduced inequalities.

Cooperatives serve as a promising model for integrating sustainable EI and CE strategies, contributing to environmental sustainability, and reducing inequalities. Further research and analysis are warranted to delve deeper into the role of cooperatives in driving sustainable practices and their impact on various sectors and regions, especially in the context of market-positioning, economic competition (and reciprocity), effective management styles, and cooperative-specific barriers. Hence, as we rethink production and consumption a stronger understanding of cooperative and sustainable EI and CE within a unique enterprise as the cooperative could lead to a more effective strategy implementation toward environmental sustainability that takes into consideration values, such as democratic governance, social justice, and stakeholder inclusion for an ideal socially and environmentally sustainable circular cooperative (SECC).

6. Limitations and Further Research

The main limitation is the need to provide a deeper study based on specific sub keywords in the title and abstract (e.g., on a specific circular step or cooperative type), which was not carried out considering the overall aim of this paper which was meant to keep the analysis at the general level and to observe existing relationships and themes.

It is relevant to note that while there were not many papers resulting from our research for the analysis, the problem here is too large for manual analysis. The latter is the reason why we deemed a bibliometric analysis is more adapt form of analysis for this paper. We acknowledge that further graphical representations within the dataset did not exhibit substantial variability or informative patterns, thereby hindering our capacity for in-depth analysis. This is indicative of a limitation of scholarly attention to this topic, rather than an analysis error.

According to the initial results from the thematic analysis and those highlighted gaps, between the role of production cooperatives and application of CE and EI, shows that while there is potential for cooperatives to make a difference due to their social attention and ability to include multiple stakeholders, there is little clarity on how this can be carried out. Furthermore, it demonstrates the complexity of the application and transition to such CE and EI models.

There is difficulty in recognizing the conceptual boundaries among EI, business models, and CE with challenges to measure a company's performance in CE and EI [5]. Additional analysis would require expanding within the production chain since results demon-

strate that they were quite limited when focusing on specific CE strategy applications, such as upstream of the supply chain, such as for decisions prior to production and distribution, rather than purchasing and product design. Thus, the approach for cooperatives should be investigated alongside, considering the different models possibly suggesting that the private companies and cooperatives may not necessarily apply CE and EI in similar ways and/or with the same perception. Hence, this would also require expansion based on geographical location, sector, and industrial specificities.

Further research should identify the barriers and drivers toward EI and CE that cooperatives incur against other forms of enterprise. Although cooperatives already proceed in a collaborating manner just simply due to its governance it should be useful to see which economic and social elements support cooperatives' successful transition to CE and EI measures.

A deeper understanding of the policy implications or externalities should be required, since considering the studies identified for CE, barriers may be found not only internally. However, regarding internal management, since identity is an extremely important factor in the cooperative movement defining the spirit and model on which a cooperatives operate, there should be analysis on the insertion of environmental identity. Considering the aforementioned scholarly sides to EI and CE studies, as well within the cooperative movement, defining a potential environmentally-focused values would be useful to those cooperatives within to provide forms of innovation or CES that are land on stronger environmental values.

Given the increasing significance of environmental sustainability as a needed strategy, there arises a proposition to incorporate CE and environmentally-focused values into the principles of the International Cooperative Alliance [98]. This suggestion stems from the current juncture where cooperatives find themselves, necessitating heightened public awareness to accomplish their sustainability objectives [99]. Consequently, a more pronounced emphasis on cooperative enterprises' narrative, recognition, and concerted efforts will become imperative also when tackling environmental sustainability and (concepts of responsible) innovation that is now currently unexplored as identified by this paper. Potentially expanding on the questions of a form of democratic governance, such as those ideally embedded by cooperatives, which already expand on the concepts of stakeholder inclusion (or avoidance of exclusion) and heightened participatory elements would either apply EI and CE efficiently. Additionally, there is the question at which level would EI and/or CES be implemented and how they are induced internally or considering their level of levels engagement and dynamics [100]. Furthermore, a stronger understanding of the connection between EI and CE can provide support to how forms of innovation are incorporated by a model such as the cooperative one. Thus, it is expected that further analysis and scrutiny of this research will be crucial to the efficient application of EI and CES by cooperatives and identity reinforcement can structure these challenges.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/su152115595/s1, Table S1: Excel list of papers used in the Thematic Analysis; Table S2: Excel list of papers used in the Bibliometric Analysis.

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