Circular entrepreneurial ecosystems: a Quintuple Helix Model approach

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Abstract

Purpose – The shift toward a circular economy (CE) represents a collaborative endeavor necessitating the presence of efficient frameworks, conducive contexts and a common comprehension. This research serves as a pivotal stride towards this goal, presenting an exclusive prospect for the investigation and fusion of these frameworks, with particular emphasis on the Quintuple Helix Model (5HM), into a unified theoretical framework that underscores the core principles of the CE. This study is centered on three pivotal questions aimed at decoding the CE transition in specific regional settings.

Design/methodology/approach – Adopting an abductive approach firmly anchored in a two-stage qualitative process, this study specifically merges the foundational principles from institutional theory, entrepreneurship literature and CE frameworks to provide insights into the dynamics of circular ecosystems, with a specific focus on the Huelva region in Spain.

Findings – The findings demonstrate significant potential in the CE, ranging from the integration of product and service systems to innovations in eco-industrial practices. Yet, a notable deficiency exists: the absence of institutional entrepreneurs, highlighting the essential role that universities can play. As recognized centers of innovation, universities are suggested to be key contributors to the transformation toward a CE, aligning with their societal and economic responsibilities.

Practical implications – This study highlights the importance of managing relationships with entities like SMEs and policymakers or academia for effective CE adoption. Policymakers can refine strategies based on the research's insights, while the impact of university-driven circular ecosystems on sustainable societies is another crucial area for research.

Originality/value – The sustainability models cited in CE literature may not be comprehensive enough to prevent problem shifting, and it can be argued that they lack a sound theoretical and conceptual basis. Furthermore, the connections between sustainability objectives and the three levels of the CE operating system remain vague. Additionally, there is insufficient information on how regions foster the involvement of the environment in fivefold helix cooperation and how this impacts the CE.

Keywords Institutional theory, Circular business model, Circular economy ecosystem, Quintuple Helix Model, University circular ecosystems, University circular entrepreneurial ecosystem

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1. Introduction

Our world currently finds itself grappling with a series of intertwined crises. Resource depletion and climate change-induced events, like increased temperatures, frequent natural

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disasters, and intensifying droughts (Aengenheyster *et al.*, 2018; IPCC, 2021), form a backdrop to the "slow crisis" we are experiencing. This scenario is further exacerbated by the socio-economic consequences of the ongoing COVID-19 pandemic and the energy crisis triggered by the Russia–Ukraine conflict. These unforeseen challenges disproportionately impact the most vulnerable, pushing over 75 million people into extreme poverty and deepening global inequalities (Chancel *et al.*, 2022; Gray Molina *et al.*, 2022). Against this backdrop, the effectiveness of current policy measures, such as the European Green Deal (European Council, 2019) and the Fit for 55 package (European Council, 2022) comes into question raising an urgent need to reconsider our economic paradigms, in order to simultaneously address environmental sustainability and socio-economic inequities. One such promising paradigm is the Circular Economy (CE), which has the potential to balance the triad of sustainability – economy, society, and environment (Elkington and Rowlands, 1999; Khan *et al.*, 2021; Wiebe *et al.*, 2022).

The CE, defined by Kirchherr *et al.* (2017) as an economic system aimed at replacing the traditional "end-of-life" concept through reduction, reuse, recycling, and recovery across micro, meso, and macro levels, offers a viable alternative to our unsustainable linear model. It emphasizes achieving sustainable development by fostering environmental quality, economic prosperity, and social equity. Notwithstanding its inherent challenges, CE-based business models are increasingly attracting the attention of policymakers across local, regional, national, and international spectrums (European Commission, 2015; Geissdoerfer *et al.*, 2020). Startups, in increasing numbers, are incorporating CE principles into their operations (Ludeke-Freund *et al.*, 2018; Pieroni *et al.*, 2019). Nevertheless, the transformation to a CE-centric system necessitates significant modifications in business models, a capacity not all firms possess (Christis *et al.*, 2019; Ferasso *et al.*, 2020; Stahel, 2016). For Small and Medium-sized Enterprises (SMEs), the transition becomes especially daunting due to challenges like the lack of technical and innovation skills, administrative burdens, and issues related to financing and information (Kirchherra *et al.*, 2018; Rizos and Bryhn, 2022). While the economic potential of a CE could reach an impressive $4.5 trillion, currently, the world economy operates with only 8.6% circularity (CGRi, 2022).

While numerous CE models like the n-Rs (Reike *et al.*, 2018) and ReSOLVE (EMF, 2015), alongside other related constructs such as the Triple Bottom Line (TBL, Elkington and Rowlands, 1999) or the Sustainable Development Goals (SDGs: UN, 2015) exist, their successful implementation by SMEs and their impact on regional development remain subpar. This is primarily due to insufficient specification, absence of theoretical underpinnings, or lack of clear definitions in these models (van Bueren *et al.*, 2023). Given that businesses are regarded as the principal economic entities, it becomes crucial to meticulously examine the assumptions of scholars in the field of business models who delineate potential pathways toward circularity (Dzengiz *et al.*, 2023). In contrast, the Triple Helix Model (3HM) offers a framework detailing the collaborative dynamics between government, industry, and academia, i.e. institutional capacity, in fostering innovation, economic development, and CE principles (Barrie *et al.*, 2019; Razak and White, 2015; Scalia *et al.*, 2018). The Quadruple Helix Model (4HM) enhances this framework, positing that CE transition depends on the interplay of the aforementioned stakeholders with civil society (Ahonen and Hamalainen, 2012; Haschea *et al.*, 2019; Ranga and Etzkowitz, 2013). Yet, this model has overlooked the environmental dimension in regional innovation and entrepreneurship. The environment's role, encompassing more than ecological conservation and the need for innovative sustainable products/services, also implies its active involvement in the innovation process and contribution to the CE. The Quintuple Helix Model (5HM) addresses this omission, including the environment as a contributor to knowledge structures, innovation systems based on sustainability, and entrepreneurial ecosystems (Carayannis *et al.*, 2018; Carayannis and Campbell, 2019; Donati *et al.*, 2023).

Despite the comprehensive nature of these frameworks, particularly the 5HM, there remains a dearth of research on its applicability to the development of CE-based innovative ecosystems (Baccarne *et al.*, 2016; Durán-Romero *et al.*, 2020). Our work thus identifies a unique opportunity to explore and integrate these models, especially the 5HM, into a cohesive theoretical construct emphasizing CE principles. Building on this, existing literature presents an evident void concerning regional motivation strategies for new environmental agents within quintuple helix collaborations and their CE implications. Especially relevant is the 5HM's proposition of developing circular and smart entrepreneurial ecosystems (Perfetto and Vargas-Sánchez, 2018; Wurth *et al.*, 2022). In alignment, our study seeks to bolster this domain by elucidating strategies that integrate the "environment"—the quintessential fifth dimension of the 5HM. In doing so we further aim to highlight the ways to navigate potential challenges and mitigate adverse impacts during the transition towards a localized CE ecosystem in SME regions like Southern Spain.

Institutional dynamics are instrumental in the CE transition, molding a sustainable economic future. Yet, there exists a noticeable gap in understanding these dynamics within the CE framework, especially the intricate balance of regulations and their bearing on stakeholders' behaviors (Ahrens and Ferry, 2018). Also, scant research has probed the involvement of institutional entrepreneurs in the CE, particularly their innovative potential in crafting novel business models (Battilana *et al.*, 2009; De Jesus and Mendonça, 2018). Grounded in institutional entrepreneurship theory, our research is underpinned by the belief that societal change is deeply entwined with extant power dynamics. Recognizing the dire societal challenges threatening humanity and our planet, our study revolves around three pivotal questions aiming to decode the CE transition in specific regional settings, particularly Huelva, Spain: (1) What are the prevalent *R*-strategies employed by Spanish circular SMEs, and are these akin to the strategies adopted by SMEs in southern Spain, particularly Huelva, a region marked by scant start-up activity and elevated unemployment rates? (2) What are the significant obstacles thwarting the transition towards a CE in this region? (3) Guided by the 5HM, what are the primary facilitators and opportunities bolstering the establishment of a circular entrepreneurial ecosystem in this region, and which actor from the 5HM should pioneer the transition towards a CE in this region? These questions guide our exploration, aiming to bridge the identified research gaps and augment our comprehension of the CE transition, especially in the defined regional context.

In adopting an abductive approach, our research interweaves insights from institutional theory, entrepreneurship literature, and CE frameworks with empirical findings to elucidate the operation of circular ecosystems in Huelva, Spain. In pursuit of our objectives, we employ a qualitative methodology, melding the knowledge derived from a content analysis of 43 Spanish circular SMEs listed as Benefit Corporations (B Corps) or within the Economy for the Common Good (ECG) registry, with interviews involving five circular SMEs and five institutional entrepreneurs from Huelva. This synergistic approach affords us an enriched understanding of the conceptualization of the CE within the 5HM, and the significant barriers and facilitators associated with establishing a circular entrepreneurship ecosystem (Konietzko, 2021). As for the subsequent sections of this paper, we commence with a comprehensive review of literature pertaining to the 5HM and institutional entrepreneurship. Next, we explain the material and methods, followed by findings. The final section provides a discussion of the findings, culminating in the study's conclusions.

2. Literature review

In this section, we delve into the research contributions through the lens of the identified research gap and research questions. The first subsection underscores the imperative for adopting a more comprehensive and systemic approach to sustainable development.

Following that, we shed light on the theoretical and practical hurdles associated with the application of the 5HM within the framework of regional innovation systems and CE. Lastly, the third section unveils the prospective impact of institutional entrepreneurs within this transformative process.

2.1 The CE model and sustainable development

The CE represents a potential paradigm shift from traditional linear economic models, characterized by a "take, make, use, dispose" pattern (Velenturf *et al.*, 2019). Instead, the CE model offers closed-loop production and consumption, which potentially reduces environmental impacts, promotes economic growth, and fosters social well-being (Mahmoum Gonbadi *et al.*, 2021; Mhatre *et al.*, 2021; Geissdoerfer *et al.*, 2017). However, it is crucial to acknowledge that the existing CE models are not without their limitations. For instance, one key concern is the potential for problem shifting, an issue that arises from the lack of systematic sustainability models in CE literature (Economist, 2015; Schleicher *et al.*, 2018). This concern is further amplified by criticisms addressing issues such as a lack of conceptual clarity, characterized by ambiguous and unclear boundaries primarily centered on production processes, and a scarcity of critical work on CE in the business field (Dzengiz *et al.*, 2023). These criticisms extend to the various R-frameworks employed for circularity implementation, ranging from 3 Rs (Reike *et al.*, 2018) to 10 Rs (Blomsma and Brennan, 2017). Despite their practical applications, these frameworks have been criticized for lacking a solid theoretical and conceptual foundation (van Bueren *et al.*, 2023).

Moreover, aligning the chosen R-framework with long-term strategic goals appears to be a challenge for some firms, resulting in inefficiencies, particularly in addressing resource depletion and environmental degradation (Schleicher *et al.*, 2018). From a broader perspective, CE plays a significant role in addressing climate change, one of the most pressing planetary boundaries (IPCC, 2021). Research suggests that implementing CE strategies can contribute positively to mitigating climate change through circular innovations. These innovations include efficient use of materials and energy through recycling, remanufacturing, or refurbishing (Durán-Romero *et al.*, 2020; Ferasso *et al.*, 2020; Murray *et al.*, 2017).

The levels at which CE operates include the micro-level (individual consumers, products, and firms), meso level (eco-parks), and macro level (from the planet to neighborhoods, including continents, countries, regions, and cities) (Ghisellini *et al.*, 2016; Kirchherr *et al.*, 2017; Domenech *et al.*, 2019; van Bueren *et al.*, 2021). The relationship between the different levels of the CE operating model and sustainability goals is crucial for achieving a truly sustainable and efficient system. To achieve a successful CE that aligns with sustainability goals, there must be seamless integration and coherence among these three levels. At the micro level, CE practices can potentially contribute to Sustainable Development Goal (SDG) 12, which promotes responsible consumption and production, through recycling and remanufacturing initiatives (Nudurupati *et al.*, 2022; Regueiro *et al.*, 2022; Shang *et al.*, 2022). At the meso level, CE could address SDG 9, which aims to foster industry, innovation, and infrastructure, through promoting industrial symbiosis and efficient resource use. The success of sustainability goals at the meso level depends on effective coordination and synergy among different stakeholders (Bressanelli *et al.*, 2022; Cudečka-Puriņa *et al.*, 2022; Tapaninaho and Heikkinen, 2022). Lastly, at the macro level, CE can contribute to SDG 13 (Climate Action) and SDG 15 (Life on Land) by reducing resource consumption and waste (Lahane and Kant, 2022; Nayal *et al.*, 2022; Puntillo, 2023). However, it is crucial to note that these relationships between the CE model's different levels and the sustainability goals are complex, with a lack of concrete methodologies on how to effectively integrate sustainability goals at all levels of CE operation (van Bueren *et al.*, 2023). These gaps underscore the need for

more comprehensive frameworks to guide CE strategies, setting the stage for our ensuing discussion on the Quintuple Helix Model (5HM).

2.2 The Quintuple Helix Model (5HM) of the circular economy

The 5HM expands upon the traditional triple helix model by incorporating civil society and the natural environment. This model has been utilized in numerous studies to foster environmental preservation, address climate change, or generate sustainable technologies (Carayannis *et al.*, 2012; Grundel and Dahlstrom, 2016; Laguna-Molina and Duran-Romero, 2017). The 5HM serves as a valuable theoretical tool for comprehending the development of Entrepreneurial Ecosystems (Carayannis *et al.*, 2018) enhancing the understanding of the dynamic interplay of institutions within these ecosystems (Cloitre *et al.*, 2023; da Costa Mineiro *et al.*, 2023; Donati *et al.*, 2023). In spite of the growing need for sustainability transitions to tackle the escalating social and economic complexities (Park and Stek, 2022) that prompted the development of the 5HM (Donati *et al.*, 2023), there is still a deficiency in empirical studies applying the quintuple helix framework to circular economy ecosystems. This scarcity is linked to the intricate nature of the involved interactions and the difficulty in pinpointing the agency within the quintuple helix.

The 5HM serves as an integrative framework perfectly suited for addressing CE strategies, sustainable dimensions, and the Sustainable Development Goals (SDGs) at all CE levels (Carayannis and Campbell, 2010, 2019). Within the 5HM, sustainable, human, and social innovation capitals emerge as valuable intangible assets driving regional sustainable value (Carayannis and Campbell, 2019). Each helix can adopt principles from the various R-frameworks. For example, government regulations often promote "Reduction" strategies (Manickam and Duraisamy, 2019), universities can educate about "Reuse" or "Recycling" in their teaching programs and research projects (Farre-Perdiguer *et al.*, 2016), firms may "Refurbish" in their business models, and society's consumption habits could align with "Repairing" and "Remanufacturing" (Durán-Romero *et al.*, 2020). These integrations offer the potential to operationalize the CE principles across all helices, driving the shift towards a CE. Furthermore, the role of thermoeconomics, or the application of thermodynamics to socio-economic systems, also factors into environmental governance and sustainability indicators (Melgar-Melgar and Hall, 2020; Lucia *et al.*, 2022). Nonetheless, a historical analysis suggests that the government's conceptualization of the CE may overlook the integral roles of natural processes and the biosphere (Mayumi, 2020).

Although the 5HM is recognized as crucial for regional innovation and economic performance and has been used by the European Commission as a circular indicator to measure the success of collaborations between CE levels (European Commission, 2018), its implementation is not without challenges. Firstly, the identification of levels as stakeholders poses issues. While most helix models view levels as helixes due to an emphasis on stakeholder interaction (Gebhardt *et al.*, 2022), there is ongoing debate over whether society and environment, due to their lack of self-awareness and capacity to drive dynamic innovation mechanisms, can be classified as helixes. Despite these limitations, this paper argues that society and the environment should be considered as stakeholders and helixes, given their unique standing as natural entities in perpetual interaction (Baccarne *et al.*, 2016).

Secondly, research on the 5HM within the context of regional entrepreneurial ecosystems and CE is limited. Prior work has identified three models for regional CE ecosystem development, each focusing on a different actor: firms, institutional sectors, or citizens (Baccarne *et al.*, 2016; Omrcen *et al.*, 2018). Taking agency into account, we argue that circular transitions require multi-level initiatives and helical processes of innovation (Carayannis *et al.*, 2018; Park and Stek, 2022). In our view, region-specific circular transitions provide a significant context for the emergence and functioning of five-fold helical coalitions.

Lastly, the 5HM's pursuit of enhanced sustainability may ironically lead to negative societal impacts, such as inequality and legitimacy issues (Grundel and Dahlström, 2016). Furthermore, criticisms have been levied at policies seemingly overlooking alternative circularity approaches like degrowth, simple living, or indigenous discourse within the scope of circular entrepreneurial ecosystems (Calisto *et al.*, 2020). However, these criticisms might be addressed by ensuring the principles of "Recycle," "Recover," or "Repurpose," among others, are well represented in policies and practices. This approach may offer a balanced perspective, considering not only the economic growth but also the environmental and social implications, thereby aligning better with the ideals of a circular economy.

Given these gaps and limitations in the literature, and based on this framework, we analyze the circular practices of a local ecosystem to propose a coalition of five helices that trigger a transition process towards sustainability. We turn to both theoretical and practical models for insight, specifically to institutional entrepreneurship theory (Ahrens and Ferry, 2018) and models of purpose-oriented firm certification in the following section. Through this, we aim to deepen our understanding and potentially refine the theoretical underpinnings of the CE.

2.3 Institutional entrepreneurship theory and its application to circular economy

Institutional theory, which perceives institutions as society's "rules of the game", has been applied in the field of CE to understand how economic behavior and decision-making are shaped (Arranz and Arroyabe, 2023; Arranz *et al.*, 2022). These institutions cultivate behaviors by creating a common understanding of what is acceptable and legitimate, offering incentives, and establishing constraints. This influence implies that institutional factors are vital in the transition to a CE and in the development of a more sustainable and resilient economy. However, while institutional theory provides a useful framework for understanding these dynamics (Arranz and Arroyabe, 2023; Arranz *et al.*, 2022; Risi *et al.*, 2023), it does not offer a complete picture. By integrating it with stakeholder theory, a management and ethical framework advocating that organizations should take into account the interests of all stakeholders affected by their actions, companies should conduct their operations in a way that reconciles the frequently conflicting needs and expectations of diverse stakeholders. Recognizing that firms are embedded in an intricate network of relationships and that long-term success hinges on effectively managing and satisfying the diverse interests of these stakeholders, it goes beyond the conventional emphasis on merely maximizing economic value (Demartini *et al.*, 2023; Shah and Rezai, 2023). Alternatively, considering the perspective of pressure, institutional pressures within which a firm operates significantly impact and shape its social, environmental, and economic behaviors, practices, and performances (Arranz *et al.*, 2022). Additionally, regarding stakeholder pressures, it involves the capability and power of stakeholders to influence organizational decisions (Tiscini *et al.*, 2022). These factors create substantial motivation for organizations to adopt specific sustainability initiatives (Jakhar *et al.*, 2019; Marrucci *et al.*, 2023; Sahoo, 2024). Thus, there are limitations in its application to CE, particularly regarding the interactions between formal and informal rules and their influence on actor behavior. These gaps represent key areas for future research.

The shift towards a CE is intricate, requiring an institutional entrepreneur to champion it (Ahrens and Ferry, 2018). An institutional entrepreneur initiates change in a particular institutional setting, leveraging resources to create or transform an existing institutional context (Covaleski *et al.*, 2013). Despite this clear definition, there is limited research exploring the role of institutional entrepreneurs within the context of CE, particularly regarding the ways they might introduce novel business models and innovations (Battilana *et al.*, 2009; De Jesus and Mendonça, 2018). While institutional entrepreneurs can shift values and norms

(Arranz *et al.*, 2022; De Jesus and Mendonça, 2018), their effect on the transition to the CE is unclear. Some may act as barriers, while others may function as enablers (Bag and Pretorius, 2022). This dichotomy highlights another significant research gap–understanding the factors that determine whether institutional entrepreneurs hinder or facilitate the transition to a CE. Furthermore, in the context of 5HM, the government and academia can be viewed as circular institutional entrepreneurs. However, their precise roles, and how they interact with other stakeholders in the transition to a CE, are not well explored, pointing to another gap.

The literature review's three sections — the CE and sustainable development, the 5HM of the CE, and institutional entrepreneurship theory — are interconnected. They collectively illustrate the complexity of transitioning to a CE. The first section identifies the need for a more holistic and systemic approach to sustainable development. The second section exposes the theoretical and practical challenges of applying the 5HM within the context of regional innovation systems and CE. The third section reveals the potential role of institutional entrepreneurs in this process, while also highlighting the lack of comprehensive research on their influence on the CE transition, especially in conjunction with the 5HM framework. These observations emphasize significant gaps and limitations in the existing literature, creating a roadmap for future research and the ensuing sections of this paper, as depicted in Figure 1.

3. Method

The research underpinning this study is situated within an abductive research paradigm. This approach is chosen for its unique ability to intertwine theoretical constructs with empirical insights, allowing for a more dynamic interplay between existing literature and newly observed phenomena. Specifically, this research merges foundational principles from institutional theory, entrepreneurship literature, and CE frameworks. Our primary goal is to shed light on the functioning of circular ecosystems, particularly within the context of Huelva, Spain (Figure 1).

Our research design leans heavily on a two-stage qualitative methodology, each stage meticulously planned to extract rich, contextual data pertinent to our research questions. The first stage aims to develop an understanding of the Resource (R)-strategies that Spanish SMEs adopt. The intent is to discern how these strategies compare to or deviate from the practices reported by the firms we engaged with. While secondary data sets the stage for this exploration, primary insights are sourced through ten semi-structured interviews. The selection of these interviewees is a careful orchestration of three sampling strategies. Beginning with purposive sampling, we initiated the process by seeking out individuals who, by virtue of their professional experiences, could offer rich insights. This was supplemented by chain-referral sampling, where our initial respondents introduced us to other potential

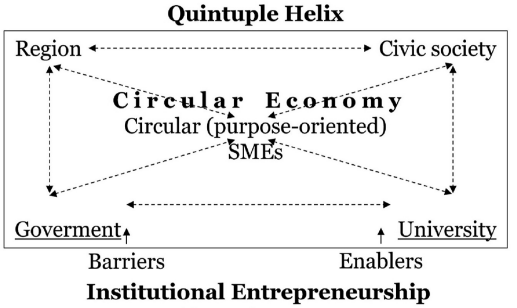

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Figure 1.
Analytical framework for circular economy and nexus through Quintuple Helix Model and institutional entrepreneurship macro level (underlined)

contributors. The process culminated with snowball sampling, enabling our sample to grow organically as each interviewee pointed us toward other potential participants. The narratives obtained from these interviews were subjected to a rigorous content analysis, with a focus on entrepreneurial experiences. A keen interest was maintained in pinpointing barriers and facilitators within Huelva's entrepreneurial ecosystem, especially with regards to the 5HM framework presented by CE.

Transitioning to the second stage, a meticulous analysis of the secondary data was undertaken. In doing so, a conscious effort was made to distill first- and second-order codes, ensuring that the data was not constrained by pre-existing theoretical constructs. The approach allowed for the potential emergence of novel concepts or insights. Open coding, rooted in grounded theory, was the chosen method for this exploration, allowing data to naturally reveal inherent patterns and themes. Concluding the methodological journey, findings from both the primary interviews and secondary data were synergized through a cross-case analysis, the outcomes of which are visually encapsulated in Figure 2.

3.1 Context of this study – CE at the European, national and regional levels

With the fundamental aim of facilitating and promoting the transition to CE, contributing to achieving the SDGs (UN, 2015) and the fight against climate change, the European Commission designed in 2015 its Action Plan for CE (European Commision, 2015). Far from limiting itself to the results obtained in this Action Plan, and with the firm intention of making Europe the first climate-neutral continent by 2050, the European Parliament's declaration of climate emergency together with the European Climate Pact, that is part of the European Green Deal driven by the Commission (European Commision, 2019), advocate achieving a sustainable growth model. Considering that half of total greenhouse gas (GHG) emissions and more than 90% of biodiversity loss and water stress are due to the extraction and processing of resources, the Commission proposed a second CE Action Plan (European Commision, 2020a).

In the Spanish context, the National CE Strategy (MITECO, 2020) represents the Spanish strategic and action framework for 2030 based on collaboration between regional governments, the productive sector and society. This strategy is also in line with the main international initiatives for safeguarding a healthy environment and with the lines of action promoted within the European Green Pact, and the two European Commission Plans in this area. Finally, at the regional level, the Government of Andalusia developed its CE strategy combined with a series of initiatives related to the transition, including the 2018 Andalusian Circular Bioeconomy Strategy (Government of Andalusia, 2018a); the Strategy for Sustainable Development 2030; Government of Andalusia (2018b), the Integrated Waste Plan of Andalusia: Towards a Circular Economy by 2030 (Government of Andalusia, 2019), and the Circular Economy Law (Government of Andalusia, 2022).

Regional and organizational scope. The Spanish economy was in 2021, with 1.2 trillion euros, the fourth largest economy in the Eurozone (Eurostat, 2022a). In terms of population, Spain, with more than 47.3 million, represents 10.6% of the EU-27 population (Eurostat, 2022b). In the years of crisis, the Spanish entrepreneurial activity rate has fallen from 7.0% in 2008 to 5.5% in 2021 (GEM, 2022). At the regional level, in 2021 Andalusia was the Spanish

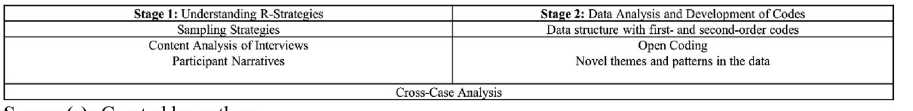


Figure 2.
Proposed research method

Source(s): Created by authors

region with the highest unemployment (23.83%), compared with Spain (14.79%) and UE-27 (7.05%) (Institute of Statistics and Cartography of Andalusia, 2022; OECD, 2022). Huelva is the capital of the province of the same name and, with 142,538 inhabitants in 2021, the fifth most populous city in the region of Andalusia. But Huelva's population is aging: in 2021, the population over 65 years of age accounted for 19% of the city's total population, at the Spanish average (INE, 2022a). Moreover, the population decreased by 4.54% between 2009 and 2021 (INE, 2022b). Finally, unemployment in Huelva, in 2021 remains high (26.60%) compared to regional, national and UE-27 (Institute of Statistics and Cartography of Andalusia, 2022). These data reveal the socio-economic gap between Huelva and other geographical levels.

3.2 Sample and data

The data for this study were collected in two stages. The aim of Stage 1 was to gain a better understanding of the R-strategies implemented by Spanish SMEs and compare them with those employed by the firms interviewed. This was accomplished by utilizing information from the firms' websites and the annual Benefit Corporation reports or Balance reports.

Our sample was selected from the list of firms certified in Spain by B Corp (B Corp Spain, 2022). B Corps (bcorporation.eu) are firms that aim for goals similar to those of the CE and strive to achieve balance in the three dimensions of sustainability (Ferioli *et al.*, 2022; Liute and De Giacomo, 2022; Mion and Loza Adaui, 2020). We distinguish between Benefit corporations or purpose-oriented firms, which are a legal form that allows the incorporation of social, environmental, and economic objectives in their social purpose (Gazzola *et al.*, 2019; Mion and Loza Adaui, 2020), and certified B Corps, which are firms that have received a sustainability certification from B Lab due to their high standards of social and environmental performance, transparency, and accountability (B Lab, 2022). In our sample, B Corp certified firms were selected due to their demonstrated commitment to sustainability, making them relevant to our study on CE practices. We applied several selection criteria, including firm size, sector, and region, as well as the explicit incorporation of CE in their business models. We focused specifically on SMEs, as they represent the majority of businesses in Spain and are crucial to the success of the CE transition. The chosen SMEs were identified as operating within the CE, providing a clear context for understanding the implementation of the 5HM and the various R-frameworks.

Our second source of data was the Economy for the Common Good (ECG, 2022) instrument for measuring social and environmental values, complementing the measurement of economic and financial value (Felber, 2019). This includes human dignity, solidarity and justice, ecological sustainability, social justice, democratic participation, and transparency (ecogood.org). ECG questions the current behavior of the market as it is incapable of promoting general welfare by focusing on individual interest and the accumulation of wealth in the hands of a few people. It emphasizes that to ensure the common good, understood as the general interest, the market rules must be changed through cooperation (Campos and Rodríguez, 2017; Gómez-Álvarez *et al.*, 2017) and people (Aust *et al.*, 2020; Ollé-Espluga *et al.*, 2020). ECG can be considered the oldest tool related to the Triple Bottom Line (TBL) and is recognized by the EU through its initiative opinion, "The Economy for the Common Good: a sustainable economic model oriented to social cohesion" (European Economic and Social Committee, 2015). An interesting alternate source of secondary information could have been the "goCircular Radar" project, launched by Ecoembes in Spain, as it offers a portfolio of solutions or products that can contribute to the CE (The Circular Lab, 2022). However, the list of firms in this project (and the same for other private ones) contains large firms in its database, and the relationship between some of its records and CE is doubtful or not evident (Vargas-Sánchez, 2022).

As of December 2021, there were 157 certified Spanish B Corps, of which 34 were identified as CE SMEs (21.66%) and 80 Spanish ECG SMEs (EBC, 2022), of which nine had circular business models (11.25%). We collected and stored all extracts from their websites in which these 43 firms referred to CE, for example, including the following words: "circular economy," "circular," "circular model," "sustainability," "circular business," "circular development," "circularity," or "circular thinking". Then, we coded the recording units using a deductive approach against the list of "9 R" strategies (European Commission, 2020b).

Table 1 presents a profile of the 43 firms and Table 2 present the 10 respondents that were interviewed for Stage 2 of data collection. Most of the 43 firms included in the first phase of data collection are from Madrid, Catalonia, or Valencia Spanish regions, and the most representative activity comes from the consumer goods sector. These circular SMEs belong to diverse sectors such as agriculture, consumer goods, digital, textile, tourism, industry, construction, or energy.

These results are in line with the respondents from the 10 organizations and SMEs interviewed in phase 2 of data collection. The collection and analysis of data from the firms and interviews were carried out during summer and fall 2022.

The secondary data collected in Stage 1 were supplemented with semi-structured interviews conducted in Spanish with ten respondents. This group comprised five representatives from circular SMEs and five staff members from the University of Huelva, the city council, the regional government, a union of cooperatives, and a start-up platform. A blend of purposive, chain-referral, and snowball sampling strategies were utilized to pinpoint potential participants and assure an adequate sample size to acquire enriched insights into our research questions. We performed a content analysis (Krippendorff, 2013) on the data from these interviews, aiming to delineate the barriers within the region's entrepreneurial ecosystem and pinpoint facilitators and opportunities within the context of the 5HM presented by the CE. The data constituted participant narratives describing their entrepreneurial experiences. All interviews, ranging from 30 to 90 min, were conducted in Spanish, and were often followed by informal conversations lasting up to two hours. A formal ethical review process was adhered to: The first author's university ethics committee approved the research protocol, and participants were briefed about the study's objectives, the obligation to cause No harm, the guarantee of confidentiality, and their right to withdraw from the project at any time. The interviews were transcribed in real-time, subsequently translated into English, and back-translated into Spanish by an external bilingual researcher.

In analyzing the secondary data, our goal was to extract information that would facilitate our understanding of the circular ecosystem's challenges by developing a data structure with first- and second-order codes. Although the preliminary literature review provided an initial understanding of the research question (Klein and Myers, 1999), we avoided imposing conceptual labels or a theoretical framework on the data at this stage to uncover new concepts (Glaser, 1992). Therefore, we employed open coding for data analysis. In the same manner, the data obtained from the interviews with the SMEs were triangulated with the data from the institutions to compare perceptions of the CE among different agents and institutions.

Within the framework of our qualitative research methodology, we adopted rigorous measures to ascertain data validity and accuracy. Firstly, we employed triangulation, whereby we cross-referenced multiple sources of data and perspectives to ensure consistency and reliability in our findings (Miles *et al.*, 2013; Yin, 2014). This approach not only added depth to our analysis but also provided a multi-faceted view of the phenomenon under study (Eisenhardt, 1989). Furthermore, we pursued data saturation, a key benchmark in qualitative research, to ensure comprehensiveness in our findings. This entailed continuing our data collection until No new themes or insights emerged, thereby ensuring that our analysis captured the full spectrum of participants' experiences and perspectives. To provide transparent and tangible evidence of our data's authenticity, we diligently incorporated verbatim quotes from the participants. These

#	ID	Firm name	Region	Sector	Activity in terms of triple bottom line	9R*
1.	BC01	Bcome	Catalonia	Digital	Digital sustainability management	1
2.	BC02	Biogran	Madrid	CG	Organic food and food supplements	3
3.	BC03	Bioskan	Canary Islands	CG	Food supplements	3
4.	BC04	Canussa	Valencia	Textile	Sustainable and vegan backpacks/ accessories	3
5.	BC05	Circoolar	Catalonia	Textile	Organic workwear	3
6.	BC06	Debuencafe	Madrid	CG	Sustainable coffee in compostable packaging	3
7.	BC07	De la Conca	Catalonia	CG	Healthy and sustainable food	3
8.	BC08	Delicious and Sons	Catalunia	CG	Sauces and condiments	3
9.	BC09	Ecoalf	Madrid	Textile	Fabrics/ clothing from recycled materials	3,9
10.	BC10	Ekomodo	Basque	CG	Sustainable office products	3,9
11.	BC11	Flor de Doñana	Andalusia	CG	Organically grown berries	3
12.	BC12	Hannun	Catalunia	CG	Sustainable and reusable furniture	3,4
13.	BC13	Hemper	Madrid	Textile	Handcrafted backpacks and accessories	3
14.	BC14	Heura	Catalunia	CG	100% plant-based foods	3
15.	BC15	i3D	Madrid	Industry	Ecopackaging	3,4,7,9
16.	BC16	km0 Energy	Catalonia	Energy	Renewable and local energy	3
17.	BC17	La colmena dice que sí	Catalonia	CG	Local and organic products sales network	3
18.	BC18	Lc Paper	Catalonia	Industry	Sustainable paper mill	3
19.	BC19	Miller and Marc	Madrid	CG	Ecological prescription glasses	3
20.	BC20	My Alma	Madrid	CG	Sustainable feminine hygiene	3
21.	BC21	nuoc	Basque	CG	Reusable glass bottles	3,4
22.	BC22	Ocean 52	Catalonia	CG	Natural mineral water and beverages	3,4,9
23.	BC23	Organic cotton colors	Catalonia	CG	Suppliers of organic cotton fabrics and garments	3
24.	BC24	Parafina	Madrid	CG	Ecological glasses with 100% recycled materials	3
25.	BC25	Phenix	Madrid	Digital	Digital solutions to act against food waste	1
26.	BC26	Pura	Catalonia	CG	Water purifier	3
27.	BC27	Quomer	Valencia	CG	Distribution of sustainable bioactive ingredients with blockchain	1
28.	BC28	Luna Brands	Catalonia	Textil	Sustainable fashion	3
29.	BC29	Sea2See	Catalonia	CG	Glasses and watches made from recycled marine waste	3,9
30.	BC30	Sheedo	Madrid	CG	Seed paper and other plant-based products	3
31.	BC31	Sleep'n Atocha	Madrid	Tourism	Accommodation	3
32.	BC32	Too Good To Go	Catalonia	Digital	App for food waste management	1
33.	BC33	Trednsplant	Valencia	Textil	Sustainable clothing and accessories	3
34.	BC34	Veritas	Catalonia	CG	Green supermarket chain	3
35.	ECG01	Traperos Murcia	Murcia	CG	Second life and second-hand products	3,4,5,6
36.	ECG02	Biotremol	Valencia	CG	Cooperative green supermarket	3

(*continued*)

Table 1. Circular business strategies among Spanish circular SMEs – PHASE 1 – data collection through certified B corps and ECG in Spain

#	ID	Firm name	Region	Sector	Activity in terms of triple bottom line	9R*
37.	ECG03	Eco Invéntame	Valencia	Industry	Circular economy packaging manufacturing	3
38.	ECG04	Horta del Rajolar	Valencia	Agri	Organic farming	3
39.	ECG05	Mercado IT	Valencia	CG	Recycling of computer equipment	4,5,6,7
40.	ECG06	We Water	Canary Islands	Industry	Circular water management	3
41.	ECG07	Limonium Canarias	Canarias	Tourism	Activities and services in nature	3
42.	ECG08	Subbética ecológica	Andalusia	CG	Producers and Consumers Association Ecological	3
43.	ECG09	The Circular Project Shop	Madrid	Textil	Sustainable ethical fashion	3

Note(s): *9R: 1 = Refuse; 2 = Rethink; 3 = Reduce; 4 = Reuse; 5 = Repair; 6 = Refurbish; 7 = Remanufacture; 8 = Repurpose; 9 = Recycle. CG = Consumer goods; BC = B Corporation certified (bcorporation.eu); ECG = Economy for the common good (ecogood.org)
Source(s): Created by authors

Table 1.

#	ID	Firm name (position of respondent)	Sector (activity)	9R*
1.	R1	Consumo Gusto (Co-Founder and President)	Consumer goods (Food)	3
2.	R2	Fango y Flores (Two Co-Founders)	Consumer goods (Body-care)	3
3.	R3	Traperos (Co-Founder and President)	Consumer goods (Second life and second-hand products)	3,4,5,6
4.	R4	Bo True Activities (Founder and SCO)	Digital (AG-Tech)	1,2,3
5.	R5	LAR Arquitectura (Founder and CEO)	Construction (Architecture)	3
6.	R6	Junta de Andalucía (Head of Design and Strategy in Huelva)	Andalusian Government (Andalusian Entrepreneurship)	
7.	R7	University of Huelva (Director – Transfer of Research Results)	Higher education and development (Transfer of Research) Results	
8.	R8	Huelva City Council (Head of Planning and Projects)	Huelva Government (Planning and Projects)	
9.	R9	Agri-food Cooperatives Spain (Director in Huelva)	Cooperatives (Spanish Confederation of Agricultural Cooperatives)	
10.	R10	Transfutura (Founder)	Start-ups (Start-up Innovation Platform)	

Note(s): *9R: 1 = Refuse; 2 = Rethink; 3 = Reduce; 4 = Reuse; 5 = Repair; 6 = Refurbish; 7 = Remanufacture; 8 = Repurpose; 9 = Recycle; CG = Consumer goods; BC = B Corporation certified (bcorporation.eu); ECG = Economy for the Common Good (ecogood.org). All based in Huelva region
Source(s): Created by authors

Table 2.
Circular business strategies among Spanish circular SMEs – PHASE 2 – Data collection through qualitative in-depth interviews

direct excerpts underpin our analytical assertions, offering readers an unfiltered glimpse into the participants' viewpoints. This inclusion also reinforces the fact that our thematic interpretations and subsequent findings are anchored in genuine participant responses, showcasing the depth and authenticity of our collected data.

4. Results

We frame our findings within the 5HM by explaining the interrelationships between the main subsystems, such as industrial, political, educational, social and natural environment, and

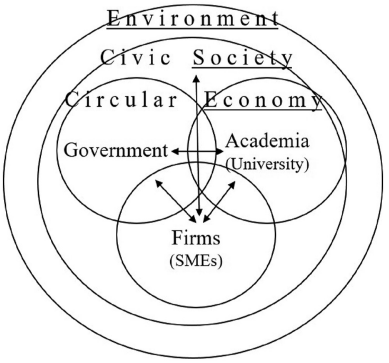
their respective stakeholders in driving the need for collaboration among the five stakeholders of 5HM to achieve a successful transition to a CE (Baccarne *et al.*, 2016; Barth, 2011; Carayannis and Campbell, 2010, 2019; Carayannis *et al.*, 2012; Leydesdorff, 2012). In Figure 3, the three CE levels are represented with firms (micro), binary relations (meso) and all (macro). This re-interpretation of the 5HM also integrates decision-making levels (short-term/operational with long-term/strategic), sustainable goals and ecosystem boundaries goals.

4.1 Circular R-*strategies*

Firms in Spain, like those in other countries, are likely to employ a combination of R-strategies depending on their industry, size, and business model, highlighting the "reduce" strategy among all the others. The circular R-strategies of the 43 SMEs analyzed were diverse, mainly focusing on reduction as indicated in Table 1. Among the Spanish SMEs that adopt circular business models, we find that those firms certified in B Corps incorporate the "recycle", "reuse" and "refuse" principles into their business models, while those that belong to the economy for the common good prefer the "reuse", "repair" and "refurbish" strategies. One difference between both categories of firms is that purpose-driven firms are more eco-innovative than those linked to the ECG. Thus, for example, the adoption of the "recycle" and "refuse" principles requires business models aimed at developing new products, while the "repair" and "refurbish" principles are more oriented towards extending the life of products. Similarly, the application of the "reuse" principle is also different in both groups, as the first group employs innovative strategies for example to reuse water or plastic bottles, while the second group formulates strategies for the use of second-hand products. The small firms interviewed in Huelva also use the "reuse" principle with this last interpretation. Regarding this third group, we highlight the lack of strategies related to the "remanufacture", "repurpose" and "recycle" principles. We explain this result because the implementation of these strategies requires more capital and knowledge.

4.2 Institutional pressures as barriers

The complex process of transitioning from a linear to a circular economic model works at three different levels: at the macro level with political agreements, at the meso level with policies, and at the micro level with incentives (Domenech and Bahn-Walkowiak, 2019; Florido *et al.*, 2019). As the adoption of the CE and its diffusion implies radical changes at all these three levels, institutional theory takes on a relevant role.



Source(s): Created by authors

Figure 3.
Re-interpretation of the 5HM integrating decision-making levels, sustainable goals and ecosystem boundaries goals

One key aspect of institutional theory is the idea that institutions are the "rules of the game" in society. These rules can be formal, such as laws and regulations, or informal, such as norms and customs. Institutions shape behavior by providing a shared understanding of what is considered appropriate and legitimate, and by creating incentives and constraints for actors to conform to these rules. The theoretical framework of institutional theory suggests that the institutional pressures in which a firm operates greatly affects and guides its social, environmental and economic behavior, practices and performances (DiMaggio and Powell, 1983) including their energy consumption behavior, ecological practices and environmental management practices (Dubey *et al.*, 2015; Liu *et al.*, 2018; Lucas and Noordewier, 2016; Silvestre, 2015).

Following the institutional pressures, we present our findings on the barriers as coercive, normative and mimetic, as they vary in nature and originate from different stakeholders. As indicated in Table 3, all the barriers identified by the participants could be related to one of the three pressure mechanisms defined in the institutional theory.

Coercive pressure arises when institutional stakeholders impose intense pressures like rules and regulation, sanctions, and punishments (Arranz *et al.*, 2022). Using various environmental standards and regulations, firms react to this regulatory pressure, which might enforce mandatory and disciplinary measures on firm behaviors that are deemed illegal or immoral (Li and Yu, 2011).

Regarding coercive pressure, the respondents highlight the need for economic support to finance investments or to enter the market. The four sub-themes that emerged are lack of finance, high implementation cost, stricter laws or lack of regulations, and punitive policies.

Normative pressure refers to the expectations, values, norms, beliefs and standards within the firm's internal and external environment that push firms to adopt new actions and behavior. With regards to the normative pressure, in addition to those related to the perception of a decrease in business profitability (high product prices and high raw material costs) and the lack of capabilities (lack of specific entrepreneurial skills) to cope with these new innovations, we further highlight five sub-themes that have not been previously studied in the literature (lack of trust in institutions, lack of trust among institutions, lack of communication, lack of belief in the agents of the institutions as institutional entrepreneurs). The first four we associate with the ineffectiveness of institutions. The final sub-theme related to the normative institutional pressure is the lack of dynamism and immobility related to the understanding of the CE model or the profitability of the business models. Mimetic pressure is caused by uncertain situations in the internal and external environments, forcing the firm to react and copy the actions of other firms to reduce uncertainty (Heugens and Lender, 2009). In relation to the last dimension, mimetic pressure, our analysis identified the need for understanding or lack of awareness.

4.3 Enablers and opportunities

To identify the enablers, we first associated the enabler quotes with the barriers. For instance, if a barrier is the lack of funding, the corresponding enabler could be financial incentives. The results are presented in Table 4 and reveal three themes that align with the work of Alonso-Almeida *et al.* (2021) to promote the transition to a CE. The first enabler is the mobilization of necessary resources, mainly focused on the financial incentives required to implement CE practices. The second enabler is collaboration among actors in the circular ecosystem, which involves building partnerships and networks among stakeholders to facilitate knowledge sharing and innovation. The third enabler is support for knowledge creation, primarily focused on dissemination practices to gain a better understanding of new opportunities.

Aggregate Themes Second-order codes: Barriers	First-order codes (significant statements)
1. Coercive pressures	
Lack of finance	"We have the economic barrier. Because as a project idea everyone has always liked it, but we have had to support it financially for a long time as partners." (R1)
High implementation costs	"They demand a laboratory from you as if you were Garnier." (R2)
Stricter laws or lack of regulation	"The biggest obstacle is the regulations themselves." (R2) " . . . we do it [public contracting] with firms of this type, because nobody forces you, and they usually hire the biggest or the ones with the biggest name." (R2)
Punitive policies	"Those who do not work in this line [firms] are going to have a barrier to enter the market because the legislation itself is already going to be taking care of saying you cannot do this type of thing if you are not able to take care of the subsequent phase or to have the subsequent phase managed." (R3)
2. Normative pressures	
High product prices	"Because organic products are a little bit more expensive, they are not competitive." (R4)
High raw materials costs	"Farmers [. . .] think that it means an increase in costs or a drop in productivity, which undermine their already low profitability." (R4)
Lack of specific entrepreneurial skills	"Firms lack sufficient capacities to undertake circular businesses." (R6)
Lack of trust (in institutions)	"But there is still a huge lack of sensitivity [. . .] States are not really committed. If these big summits are held and the necessary agreements are not reached to really seriously consider the fight against climate change, this transcends to the population. It's going to be slow work." (R3)
Lack of trust (among institutions)	"There is No collaboration between firms, institutions, Chamber of Commerce, Federation of entrepreneurs [. . .] Many times because of political interests." (R10)
Lack of communication	"SMEs either believe fervently in this [circular economy] or you have to sell them that they will make a profit. And this is not being done well." (R9) "If you are not sensitised. And they don't make it easy for you. Then you don't do it." (R9)
Lack of institutional entrepreneurs	"We have to stop being opaque. [. . .] We don't know what is done at the University." (R10) "The institutions don't move." (R10) "There are people in the institutions that do not vibrate with this." (R7)
Lack of vision	"Day to day life consumes them [firms] and they don't see the opportunities of the circular economy." (R8) "There is a problem which is immediacy, and this cannot be done quickly, it is progressive, as with innovations." (R6)
Lack of dynamism/ Immobility	"The main barrier is the traditional immobility of the construction sector." (R5)
3. Mimetic pressures	
Lack of awareness	"Farmers are not aware." (R4)
Lack of comprehension	"Nobody tells you how it's done." (R9) "Those firms clearly see that the Circular Economy is going to be an opportunity for them. But it's not being communicated well. Communication needs to be simplified." (R8)

Source(s): Created by authors

Table 3.
Institutional pressures as barriers

Finally, firms and institutions were asked to talk about the opportunities or external elements that the (potential) circular ecosystem could take advantage of SMEs interviewed identified several positive changes in consumer behavior trends and therefore the challenge of developing new circular business models.

Aggregate themes Second-order codes: enablers	First-order codes (significant statements)	Second-order codes: Barriers	First-order codes (significant statements)
Mobilization resources Incentives and R&D funding	"To give fiscal incentives to this type of firm. Because we are already contributing to society, with other values." (R1)	Lack of finance	"We have the economic barrier. Because as a project idea everyone has always liked it, but we have had to support it financially for a long time as partners." (R1)
	"The New Generation funds are helping the governments to promote circular business models." (R6)	High implementation costs	"They demand a laboratory from you as if you were Garnier." (R2)
	"That tenders incorporate this type of criteria to, little by little, also make the administration more sustainable." (R1)	Stricter laws or lack of regulation	"The biggest obstacle is the regulations themselves." (R2) " . . . well do it [public contracting] with firms of this type, because nobody forces you, and they usually hire the biggest or the ones with the biggest name." (R2)
Laws and regulations	"The New Generation funds are helping the governments to promote circular business models." (R6)	Punitive policies	"Those who do not work in this line [firms] are going to have a barrier to enter the market because the legislation itself is already going to be taking care of saying you cannot do this type of thing if you are not able to take care of the subsequent phase or to have the subsequent phase managed." (R3)
Customer loyalty	"Only [customers] call us again when they realise that our business is different and when they have a first experience." (R1)	High product prices	"Because organic products are a little bit more expensive, they are not competitive." (R1)
Sector-specific developments	"Farmers are the first stakeholders. They have been circular ever since. But if you want to go further, you have to teach them." (R9)	High raw costs	"Farmers [. . .] think that it means an increase in costs or a drop in productivity, which undermine their already low profitability." (R4)
Collaboration among actors	"For innovative firms to be created, the University and the institutions have to go hand in hand with them." (R10)	Lack of entrepreneurial skills	"Firms lack sufficient capacities to undertake circular businesses." (R6)
	" . . . agreements needed to really seriously consider the fight against climate change." (R3)	Lack of trust (in institutions)	"But there is still a huge lack of sensitivity [. . .] States are not really committed. If these big summits are held and the necessary agreements are not reached to really seriously consider the fight against climate change, this transcends to the population. It's going to be slow work." (R3)

Table 4.
Enablers

(*continued*)

Aggregate themes Second-order codes: enablers	First-order codes (significant statements)	Second-order codes: Barriers	First-order codes (significant statements)
		Lack of trust (among institutions)	"There is No collaboration between firms, institutions, Chamber of Commerce, Federation of entrepreneurs [. . .] Many times because of political interests." (R10)
Supporting knowledge Diffusion/ Imitation	"If it doesn't touch the pocket, firms don't move. We need to show success stories." (R10)	Lack of communication	"SMEs either believe fervently in this [circular economy] or you have to sell them that they will make a profit. And this is not being done well." (R9)
Technical and managerial capabilities	"We have to help firms. Guide them. Focus on their business model." (R6)	Lack of communication	"If you are not sensitised. And they don't make it easy for you. Then you don't do it." (R9)
Diffusion		Lack of institutional entrepreneurs	"We have to stop being opaque. [. . .] We don't know what is done at the University." (R10)
Diffusion	"We need to help firms. Guide them." (R6) "This is going to be money for you." (R9)	Lack of institutional entrepreneurs	"The institutions don't move." (R10) "There are people in the institutions that do not vibrate with this." (R7)
Diffusion	"You need to create a critical mass of firms, even if they don't have the three dimensions of sustainability balanced. In this way a pull effect will be reached." (R8)	Lack of vision	"Day to day life consumes them [firms] and they don't see the opportunities of the circular economy." (R8) "There is a problem which is immediacy and this cannot be done quickly, it is progressive, as with innovations." (R6)
Diffusion/ Imitation	"What we need to be able to achieve is to bring that interest to reality to the end of work." (R5)	Lack of dynamism/ Immobility	"The main barrier is the traditional immobility of the construction sector." (R5)
Diffusion/ Imitation	"I would try harder to show what is there, so that we can serve as a reference. I think people are sick of hearing things. They need to see more referents." (R1)	Lack of awareness	"Farmers are not aware." (Case R4)
Diffusion/ Imitation	"I would try harder to show what is there, so that we can serve as a reference. I think people are sick of hearing things. They need to see more referents." (R1)	Lack of comprehension	"Nobody tells you how it's done." (R9)
Diffusion/ Imitation	"I would try harder to show what is there, so that we can serve as a reference. I think people are sick of hearing things. They need to see more referents." (R1)	Lack of comprehension	"Those firms clearly see that the Circular Economy is going to be an opportunity for them. But it's not being communicated well. Communication needs to be simplified." (R8)

(*continued*)

Table 4.

Aggregate themes			
Second-order codes: enablers	First-order codes (significant statements)	Second-order codes: Barriers	First-order codes (significant statements)
Customer loyalty	"Only [customers] call us again when they realise that our business is different and when they have a first experience." (R1)	High product prices	"Because organic products are a little bit more expensive, they are not competitive." (R1)
Sector-specific developments	"Farmers are the first stakeholders. They have been circular ever since. But if you want to go further, you have to teach them." (R9)	High raw costs	"Farmers [. . .] think that it means an increase in costs or a drop in productivity, which undermine their already low profitability." (R4)

Table 4. **Source(s):** Created by authors

Thus, the lifestyle of young people and their consumption patterns are more aligned with circular business models such as those of the collaborative economy:

> Young people have another way of looking at life that is more akin to this type of consumption or this type of [sustainable] relationship, they have it more normalised. So, I think that what is coming fits quite better with our [circular] business model, because young people also feel a bit of rejection of that. (R1).

> Today's young generation views sharing resources such as a house or car as a common and acceptable practice in their lives. So, why not extend this concept to the design of neighbourhoods or buildings by incorporating shared services like laundry facilities? With a bit of creativity, simple yet effective ideas can emerge that have the potential to evolve into practical and viable circular business models. (R3).

In the same way, new attitudes and customer interests emerge that lead to new commitments related to the purpose, i.e. sustainable attitudes

> People who come to consume with us are because they have a very clear conscience that another world is possible, or because they have a consumption difficulty with other products and they can't get it in other places. So, these are opportunities. (R1).

or demanding an intangible extension of the product such as transparency.

> Consumers are not only interested in the quality and taste of the fruit. They are also interested in the process by which this fruit was produced. (R4).

Other opportunities are related to possible models that link circularity with responsibility, such as in the field of health

> The products we offer are also [not only with the environment] respectful of health. And we offer products that are suitable for consumption by these people. (R1).

> Chemicals not only harm the planet but also your body. Our products only use natural ingredients from the area. But the big cosmetic firms control the industry and I think they are co-responsible for the damage and should pay for it. (R2).

or the environment.

> We work with farmers who are very concerned about protecting the environment in which we live. We are responsible for its deterioration and, therefore, everything we do is organic and local. We are

> small and the administration should encourage us to continue doing this, that is, to make a better world. But we ask for more financial incentives to help us achieve this common goal. (R1).

Ecological innovation and innovation in eco-design were also considered as other relevant opportunities to generate an economy based on circularity:

> A lot of very creative firms are going to be created [. . .] With a bit of creativity, simple yet effective ideas can emerge that have the potential to evolve into practical and viable circular business models. (R3).

> Right now, there is nothing else being talked about in the faculty of the architecture school. [. . .] CE is becoming an increasingly important topic in the architecture industry and many architecture schools are beginning to focus on how to apply circular principles to building design. In the context of architecture, this means designing buildings that are energy efficient, use renewable and recycled materials, and are constructed in ways that facilitate future repair and reuse. We are using design thinking in all our projects (R5).

In the same way, with the institutions we were able to obtain interesting challenges. Thus, on strategies, it is now a matter of turning threats into strengths, seeing them as an opportunity:

> In our province coexist practices that are sometimes contradictory. On the one hand, we are the province with the most protected natural areas of the entire Andalusian community and the agri-food sector continues to have a very important economic importance, which is a generator of wealth, but also the cause of many of the environmental problems we have, especially those related to water. On the other hand, we have an industrial center that promotes large circular projects, but which has been reducing the level of employability and which also generates major conflicts due to its polluting effect. All this cocktail is our reality. But we have to be capable of betting on a model aimed at resolving these dichotomies. We have to solve these problems and become a reference for any other country in the world, for example with water and waste management. (R8).

Also, the transition to a CE must pivot on SMEs:

> Traditionally, this province has been designed on the basis of large firms, that is to say, it has been on large sectors such as petrochemicals and agri-food that the present and the future of the province have been designed. Now it is time for a design based on innovation in which other voices also participate. SMEs and entrepreneurs must also be part of this process. (R6).

The CE offers a more conducive framework for collaboration and understanding:

> From the economic sphere, much more actors can be involved, unlike in other scenarios we have experienced where the conflict was between development and conservation. (R9).

4.4 The university as the key agent in the 5HM framework to foster a circular ecosystem in the region

Institutional entrepreneurs play a crucial role in shaping the transition to a CE by actively working to create and change institutional arrangements. To reveal the underlying mechanisms that allow the development of a circular ecosystem in the region, interviewers were asked about the agent that should lead the transition to a CE in the region.

All interviewers recognized the university as the institutional agent that must lead the change. In this sense, the university is considered as an agent highly appreciated by society as a whole and by the rest of the agents of the fivefold helix model. It has the capacity to generate innovation, knowledge and guide new circular business models, as well as pose challenges to policies. In the same way, the university can collaborate with firms and administrations to promote the transition towards the CE. And with the citizens to explain and discuss the CE concept and propose the territory model for the environment where the university operates:

We must not lose sight of the fact that we are a small public university. And it must recognize its size and its place in the territory. In the end, public universities have to be precisely the space of interrelation with the citizens. Providing a valuable public social service. (R7).

The University continues to be a prestigious actor in the territory, without a doubt. That is to say, the University has the capacity to convene, and people find out about it. It seems to me that this is a role that the university has to assume, opening up to society. (R10).

The university should be a space that goes far beyond attending a class. It must encourage young people to become actors, change makers. (R6).

The university must teach students to create circular firms. It can do it by adapting the teaching plans to these new challenges or also by creating business incubators in the campus or jointly with business groups (such as the agri-food or chemical sector, which are very strong in Huelva). (R5).

I believe that the university is the only agent that could create a valuable circular ecosystem in Huelva, because it is considered an independent agent with No self-interests, unlike firms or politics. (R10).

The university should do applied research on CE and then transfer better the research results. To do this, it must create partnerships with firms. (R9).

Citizens are more aware of climate change and consumerism, but they expect the university to help solve these problems in Huelva, either by giving better job opportunities to young people or by solving environmental problems at the same time that it creates jobs. The university is the institution that can ensure that there is an effective dialogue between conflicting parties. (R8).

The city council can know the demands and needs of the citizenry, but it needs the university to study the problems and offer innovative solutions in the CE, and the firms to implement these solutions in circular business models. We can create the environment, but the university has the authority. (R8).

5. Discussion, implications and future research

The ensuing discussion addresses the urgent need to mend institutional mistrust, notably within Europe, while highlighting the transformative potential of businesses in the CE transition. Emphasis is placed on pivotal enablers—resources, collaborations, and knowledge—that together shape the CE blueprint. Our exploration reveals rich opportunities within the CE landscape, from integrated product and service systems to eco-industrial innovations. However, a gap is evident: the lack of institutional entrepreneurs, underscoring the critical role of universities. Recognized as innovation hubs, universities are postulated as pivotal players in the CE metamorphosis, reflecting their societal and economic commitments. This discussion emphasizes the intertwined paths of business strategies, collaboration catalysts, and academic leadership in the CE journey. The duality of institutional factors, potentially aiding or obstructing the CE transition, is central to our narrative. Specifically, academia's role in the 5HM framework emerges as crucial. This section paves the way for a deeper exploration of these elements, hinting at potential avenues for future research.

5.1 Navigating the transition: the role and challenges of businesses in a circular economy

The transition to a CE is embedded in the business creation process, intricately connecting the agent with the sociohistorical context (Davidsson, 2006; Gartner, 1985; Kessler and Frank, 2009). In light of the current climate change discourse, there's an emphasized necessity for a circular ecosystem. This isn't just about conserving resources or recycling; it's a comprehensive system that requires collaborative efforts from various stakeholders to

produce effective circular business models (Kitching and Rouse, 2020). Businesses stand at the forefront of this transformation, crafting circular business models and employing R-strategies. In our study, the most prevalent *R*-strategies are the 9 Rs, particularly emphasizing "reduce". This focus on "reduce" presents an attractive proposition for SMEs due to its minimal intellectual and financial requirements (European Parliament, Council, 2008). This trend is consistent with findings from Henry *et al.* (2020) and Ormazabal *et al.* (2018), which underscore "reduce", "reuse", and "recycle" as the primary strategies adopted by European circular firms.

However, this shift is not without its challenges. As we have identified in our study, businesses face a slew of hurdles, primary among which are institutional pressures that dictate the pace and direction of their CE transition. To foster a thriving circular ecosystem, understanding these barriers and facilitators becomes paramount. The firm's positioning, in terms of structural and cultural aspects, greatly affects their ability to harness resources, which subsequently impacts their propensity to adopt circular business models (Jayawarna *et al.*, 2014; Kirchherra *et al.*, 2018; Loscocco and Bird, 2012; McMullen and Dimov, 2013; Rouse and Jayawarna, 2011; Tonoyan *et al.*, 2020). In the cases studied for this research, a lack of trust in (and among) institutions has also been identified. This is an interesting emergent result because it is related to the ineffectiveness of institutions in promoting the transition to a CE. Our findings and the existing literature highlight the need for new institutional arrangements that are better suited to support the transition to a CE. Compounding the aforementioned challenges are regulatory barriers. There's a prevalent sentiment among SMEs that perceives directives and plans by major entities, including the European Commission, as sources of coercive and normative pressures (Rodríguez-Antón *et al.*, 2019). The intricate nature of CE policies and inconsistent messaging from the EU intensify the regulatory burden for SMEs (Calisto *et al.*, 2021). Worsening the situation is a pervasive mistrust in institutions, raising questions about their role in steering the CE transition (Christis *et al.*, 2019; Kirchherra *et al.*, 2018). While institutional and stakeholder pressures have an impact on organizational performance or the adoption of circular practices (Jakhar *et al.*, 2019; Marrucci *et al.*, 2023; Sahoo, 2024), our study reveals that these pressures are not facilitating progress in this direction, or at least, not at the pace desired by the institutions. Moreover, the research landscape reveals an acute absence of studies addressing institutional trust and commitment within CE.

European firms consistently identify a profound lack of CE knowledge as another major barrier. This is further exacerbated by technical issues, unfamiliarity with CE benefits, and apprehensions about market acceptance (de Jesus *et al.*, 2019; Stumpf *et al.*, 2021). Additionally, a clear vision deficit exists among SMEs towards circular business models. Contemporary research accentuates the role of industry-leading firms in navigating the mimetic pressure and addressing the prevalent lack of awareness in the sustainability domain (Chen and Chen, 2020; Huang *et al.*, 2022). Such pioneering firms can catalyze the widespread adoption of circular models by setting benchmarks and exemplary practices. While there is a clear need for efforts to increase SME awareness and understanding of circular business models, we did not find any studies specifically addressing the issue of SMEs' lack of vision for the future of these models.

Finally, the conceptualization of the circular economy encounters notable challenges, marked by ambiguity and a lack of clearly defined boundaries. This characteristic poses obstacles to its comprehension and implementation, particularly among SMEs firms, as indicated in our study. To address this issue, we advocate for a strategic approach that involves crafting a metaphor or representative image to simplify and elucidate the fundamental principles of the circular economy (Dzhengiz *et al.*, 2023). This strategy aims not only to enhance understanding but also to promote the active adoption of circular practices, fostering sustainable and responsible behaviors within this business segment. Moreover,

such an approach will contribute to a more comprehensive integration of circular economy principles into the business landscape, facilitating a smoother transition toward more sustainable economic models.

Based on the above discussion, we present the following proposition:

Proposition 1. The successful transition to a Circular Economy hinges on addressing institutional mistrust, bridging the knowledge gap among SMEs, and leveraging the influence of industry leaders to set a clear and sustainable path forward.

5.2 Key enablers in the journey Towards a Circular Economy: resources, collaboration, and knowledge creation

Central to the journey towards a CE are the resources that facilitate this shift (Alonso-Almeida *et al.*, 2021). Echoing findings from our research, the first critical enabler is the mobilization of necessary resources (Battilana *et al.*, 2009). Recognizing this, the European Commission has invested in tools, programs, and public R&D in environmental and energy sectors that directly bolster CE activities in SMEs (de Jesus and Mendonça, 2018; Garrido-Prada *et al.*, 2021). Such financial inputs can encourage SMEs to be active participants in this transformative change. The onus is on larger entities, including governments at various levels, to play the role of institutional entrepreneurs, spearheading the drive towards a CE (Boons *et al.*, 2013; Greenwood and Suddaby, 2006). Therefore, resources have to be mobilized to drive the shift towards a more CE, as SMEs or start-ups do not have the financial resources, knowledge or determination to develop circular business models (Lieder and Rashid, 2016). As our interviews corroborated, supportive measures such as grants, soft loans, and funding for proofs of concept can catalyze circularity in SMEs (Agrawal *et al.*, 2023). Indeed, it has also been observed that firms that comply with waste management regulations are more innovative (Oliveira *et al.*, 2021), so the more incentive mechanisms the more innovations (Crecente *et al.*, 2021).

Collaboration emerges as the second pivotal enabler (Suchek *et al.*, 2022). Nordic countries exemplify the success of such collaborative efforts in the CE landscape (Refsgaard *et al.*, 2021). In alignment with Carayannis *et al.* (2018) and Cloitre *et al.* (2023), our findings indicate that a more sustainable knowledge production system is also achieved by incorporating civil society and its natural environment. Thus, CE strategies require actions to foster collaboration among different actors of the helix model such as university, government, business and citizenship (Domenech and Bahn-Walkowiak, 2019). As seen in findings, an institutional entrepreneur such as the University has the power and ability to engage the rest of the actors and inspire them to work together in CE (Greenwood and Suddaby, 2006). Digital platforms also influence the establishment of circular ecosystems, as they allow highlighting cross-sectoral opportunities and challenges by breaking the mimetic pressure, presenting cases or experiences or good practices (Del Vecchio *et al.*, 2021; EU, 2022). From another perspective, the clusters in the implementation of CE also are key actors in the collaborative processes (Razminiene, 2019; Refsgaard *et al.*, 2021). In our study, the intermediary (i.e. start-up platforms or business confederations) becomes the organization that develops suitable interfaces between the actors of the helix model.

The final enabler underscores the role of knowledge. Universities, acting as institutional entrepreneurs, are at the helm of knowledge creation and dissemination, furthering CE's principles, strategies, and practices (Alonso-Almeida *et al.*, 2021). They play a multifaceted role, from researching circular models to fostering business incubators and promoting benchmark practices (Millette *et al.*, 2020; Sukiennik *et al.*, 2021). This emphasis on knowledge, as our findings suggest, is indispensable for the CE transition.

Based on the above discussion, we present the following proposition:

Proposition 2. For a seamless transition to a Circular Economy, a confluence of ample resource allocation, robust collaborative frameworks, and a persistent emphasis on knowledge creation and dissemination is essential.

5.3 Shaping the circular economy: opportunities and the role of universities

In the trajectory towards a CE, our study echoes the sentiments of recent findings, emphasizing several salient opportunities. Product and Service Systems (PSS), which seamlessly integrate tangible products with intangible services, have been hailed as pivotal facilitators for a CE (Morseletto, 2020). The paradigm of sharing consumption resonates deeply with the shared economy and CE principles, championing the optimized utilization of dormant assets while combating rampant consumerism (Stumpf *et al.*, 2021). Another noteworthy consideration is the Extended Producer Responsibility (EPR). Viewed as a beacon of political opportunity, EPR mandates corporations to assume financial stewardship for the implications of their products, transcending their mere consumption phase (Maitre-Ekem, 2021). Innovations embedded in ecological consciousness and the ethos of eco-design have also been spotlighted as instrumental conduits to engender a circularity-based economy (European Commission, 2015; Saavedra *et al.*, 2018). Supplementing this narrative, Stumpf *et al.* (2021) endorse the establishment of eco-industrial parks as quintessential havens for circular innovation. It's noteworthy to mention that these opportunities have also been identified by the firms interviewed for this study.

Delving into the leadership dynamics, it's evident that the sphere of CE bears a conspicuous vacuum, predominantly attributed to the palpable dearth of institutional entrepreneurs. While this gap remains uncharted in existing research, several studies have embarked on journeys exploring the roles of diverse stakeholders like corporations, governments, academia, and the societal fabric in heralding the CE transition (Greenwood and Suddaby, 2006). Notably, Barrie *et al.* (2019) discerned that the metamorphosis towards a CE hinges intricately on the symbiotic relationships among these stakeholders and their operating milieu. Reinforcing this perspective, De Freitas Nascimento and Lima (2022) accentuate the imperative for inclusive participation, necessitating profound modifications in the economy's value chains to embrace the emerging paradigm.

A unique finding from our study pertains to the conspicuous absence of institutional entrepreneurs within Huelva's innovation and entrepreneurial matrix, arguably stemming from prevailing institutional distrust. This phenomenon emerges as a nascent concern, given the lack of literature underscoring CE in this context. Despite the glaring absence of a CE-centric ecosystem in this region, study participants have unanimously recognized universities as the ideal custodians to spearhead the transition towards a circular ecosystem, a sentiment echoed by Estrada-Merino and Alvarez-Risco (2022). This recognition stems from the established credentials of universities as epicenters of innovation and entrepreneurship, endowed with the requisite resources, acumen, and networks to bolster the evolution and propagation of CE solutions.

The kaleidoscope of university-driven circular ecosystems encapsulates a diverse spectrum of elements, demanding astute strategizing to strike a harmonious chord between pedagogy and research translation for the academic fraternity (Guerrero and Urbano, 2016). Wright *et al.* (2017) demarcate these constituents, ranging from academic curricula and infrastructural provisions to regulatory protocols, cultural ethos, and engagements with the larger socio-economic collective. The juxtaposition of academia and research to cultivate circular entrepreneurs is both timely and paramount. Universities, on one hand, are acclaimed as the catalysts propelling economic augmentation and societal transformation (Klofsten *et al.*, 2019). Conversely, unforeseen upheavals like economic downturns necessitate agile adaptations, prompting a quest for innovative organizational frameworks and governance,

as articulated by Guerrero *et al.* (2016). This dual role of universities underscores their responsibility in reciprocating with sustainable dividends to the community (Graddy-Reed *et al.*, 2021). To adeptly navigate the prevailing challenges and opportunities, there's an undeniable urgency for fresh theories, strategic blueprints, and innovative models to ensure impeccable stewardship and management within academic entrepreneurship and CE innovation (Crow *et al.*, 2020; Siegel and Guerrero, 2021).

Based on the above discussion, we present the following proposition:

Proposition 3. As the global community endeavors to sculpt the contours of the Circular Economy, it becomes pivotal to not only identify and harness latent opportunities but also to entrust academia, particularly universities, with the mantle of leadership, fostering innovation, and facilitating transitions in this dynamic landscape.

5.4 Theoretical and practical implications, and future research agenda

The research outlined holds significant theoretical implications that stand to enrich the academic knowledge base within fields such as CE, institutional theory, and stakeholders. Drawing from Institutional Theory, the dynamics involving government, industry, academia, civil society, and the environment in CE transitions can be understood more holistically, especially in terms of how these entities adopt and adhere to CE principles due to external pressures or internal dynamics. The study's exploration of practical intricacies tied to implementing CE principles within a specific regional context, offers insights that can propel CE theory, especially when viewed through the Innovation Diffusion Theory, which examines the spread of new ideas and practices. The functioning of CE models in real-world scenarios provides invaluable empirical evidence that complements established theoretical frameworks.

Furthermore, the integration of the 5HM—augmenting our understanding of these intricate dynamics—can be further solidified when looked at through the Triple Helix Model, which underscores the pivotal interactions between academia, industry, and government. This extension paves the way for the evolution of a more holistic and comprehensive framework for studying innovation and sustainability, especially when reinforced by Ecological Modernization Theory, suggesting that economic growth and environmental protection can coexist. The research's methodological approach, which steers clear from imposing predefined conceptual labels, encourages the emergence of novel insights. By incorporating the Resource-Based View, the unique capacities and resources organizations possess in their CE transition become evident, showing how they can be a source of competitive advantage.

The research also presents practical implications with relevance to real-world actions. Stakeholder Theory provides a rich context here, emphasizing the importance of understanding and managing relationships with various entities like SMEs, policymakers, and regional development agencies to ensure the successful adoption of CE practices. The insights into challenges and opportunities associated with implementing CE within a particular context become invaluable tools for policymakers. They can refine their strategies in accordance with the unique barriers and enablers highlighted, making their approaches more effective and contextually pertinent. When discussing the role of universities in leading the CE transition, Social Learning Theory becomes pivotal. As centers of learning and influence, universities can drive change through educating businesses, policymakers, and society on the benefits and methodologies of CE.

The proposed circular entrepreneurial ecosystem model, in which the university plays a central role, distinguishes itself from the public-sector-centered circular ecosystem model. While the government-centric model, when understood through Institutional Theory, mainly

focuses on the design of a regional innovation strategy, the university-centered model underscores the actual innovation process. Such distinctions lay the foundation for intense deliberations among policymakers, university personnel, and business park managers. It promotes discussions on how best to operationalize these models to meet their specific aims.

An especially intriguing direction is the role of serendipity in the CE (Balzano, 2022). Unplanned discoveries might lead to innovative sustainable materials, while unexpected interactions may foster groundbreaking collaborations between diverse sectors. For instance, waste from one industry could become a resource for another. Further, unforeseen consumer behaviors can pave the way for novel product designs or suggest areas for enhanced recycling processes. Delving into real-world instances where such serendipitous events have played a pivotal role can illuminate new dimensions of the CE and its transformative potential.

Actors may exhibit "amphibious" characteristics (Powell and Sandholtz, 2012) even before engaging in helical coalitions, features that can potentially enhance these processes. For instance, many organizations in the "social economy" sector or purpose-based entities (R1, R2, R3) engaging in both market-oriented activities and social or environmental impact functions, exemplify these characteristics (Park and Stek, 2022). In our findings, university spin-offs inherently cultivate a bridging identity between academic research and market value, often with considerations for social or environmental impacts (R4, R5). Upon entering a new helical partnership, these amphibious actors naturally contribute to bridging, brokering, and hybridizing functions within the collaboration, alongside organizations with more clearly defined identities and functions. This aspect is crucial to consider in the evolutionary emergence of quintuple helix partnerships (Donati *et al.*, 2023). Examining opportunities and barriers to innovation and development in the local productive system faces circular challenges, emphasizing the intersection with sustainability transitions and new local development paths. The involvement of actors with direct contact with natural resources and environmental and social contexts, demonstrates the active participation of ecosystem actors in processes of knowledge sharing (Donati *et al.*, 2023), as evidenced in examples such as R1, R2, and R3. Therefore, an emergent quintuple helix process can benefit from actors leveraging their amphibious features from the outset (Donati *et al.*, 2023). Future research should give heightened attention to issues such as human agency and ethics (Dzengiz *et al.*, 2023).

Moreover, the growing significance of university-driven circular ecosystems is deserving of deeper exploration. Questions arise concerning how these educational powerhouses incorporate CE principles into their curriculums and their resultant impact on forging sustainable societies. How do universities aid public and private organizations in adopting circular practices? Research could scrutinize the integration of CE principles within university entrepreneurship and innovation programs, ensuring the cultivation of circular entrepreneurs, inventors, or managers (Crow *et al.*, 2020). The influence of university-led circular ecosystem initiatives on the establishment of more sustainable societies can offer valuable insights (Martin *et al.*, 2013). It would also be intriguing to discern how universities cooperate with external circular agents (Wright *et al.*, 2017) and to what extent public agendas shape their strategies and metrics (Audretsch *et al.*, 2022).

6. Limitations and conclusions

The rising centrality of the CE to policymakers and researchers underlines its transformative potential in steering our economic framework towards sustainability. Yet, inherent complexities and ambiguities in prevalent CE models, like the n-Rs and RESOLVE framework, pose formidable challenges for SMEs in assimilating them into their operations. In response, our proposed 5HM framework emerges as a multi-layered (micro, meso, and

macro) approach, facilitating SMEs in forging sustainable business strategies. Its efficacy hinges on robust multi-stakeholder engagement, underscoring the indispensability of collaborative endeavors for a resilient economy. Universities, as pivotal institutional entities, can galvanize this transition by catalyzing research, marshaling resources like incubators, and forging strategic stakeholder alliances, thereby amplifying the outreach and impact of CE solutions.

Illustrative case studies from diverse global regions like the Netherlands, Denmark, Norway, and Belgium, among others, testify to the pragmatic application and success of the 5HM and analogous CE approaches. From stimulating startup innovations and pioneering circular procurement models to championing producer responsibility in lifecycle management and sustainable urban development, these instances attest to the potential of the 5HM framework in fostering circular entrepreneurship and invigorating economic growth. Yet, the dynamism of entrepreneurial ecosystems underscores the imperativeness of sustained vigilance and adaptability. Within this milieu, universities can emerge as pivotal change agents, fortifying economic growth, job prospects, and competitiveness by cultivating innovation-friendly ambiances. Europe's Regional Innovation Strategy for Smart Specialization (RIS3) is a testament to this potential, exemplifying collaborative stakeholder synergy in pioneering an innovative CE ecosystem. As we progress, transparent communication and comprehension of these endeavors across all stakeholders will be paramount.

Acknowledging the constraints of our investigation is crucial. Our exploration is limited to Spanish SMEs, rendering the findings potentially non-representative for a global context. Nevertheless, from our perspective, the application to the Huelva region validates the interpretative significance of the proposed conceptual framework concerning quintuple helix partnerships in circular transitions. The primary contribution of the paper lies in the explanatory efficacy of a framework that intertwines an institutional and stakeholder perspective with the agency dimension of quintuple helix coalitions within the context of circular entrepreneurial ecosystems. Differences in cultural, regulatory, and economic nuances might modulate the CE landscape. To attain a holistic understanding, future research might venture into comparing CE practices across regions and between SMEs and larger corporations within identical locales. Moreover, while the 5HM underscores collaborative imperatives, it occasionally falls short in explaining the precise collaborative modalities and role delineations for actors, thus presenting challenges in its pragmatic implementation. Despite of these limitations, the transition to a CE is a collective journey requiring effective models, supportive environments, and shared understanding. This study is a step in that direction, and we hope it will inspire further efforts towards achieving a sustainable and prosperous future.

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