Circular economy and entrepreneurship in Europe: An analysis of the impact of cultural factors, regulatory framework and rate of entrepreneurship

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ABSTRACT

The aim of this work is to delve into the phenomenon of the circular economy (CE) to enhance understanding of the contextual factors that foster its development. We study how countries' cultural values, regulatory frameworks and rates of entrepreneurship, affect the transition to more circular economies. The model proposed and tested through a binomial logistic regression analysis of a sample of European small and medium-sized enterprises (SMEs), shows that such firms are more likely to adopt CE actions when located in more entrepreneurial societies, with more individualistic and feminine values, and with less stringent environmental regulations. Additionally, the study evidences a scale effect, but not an experience effect, in the transition to CE. Several practical and political implications are outlined.

1. Introduction

The circular economy (CE) is regarded as one of the solutions to the current environmental crisis, as it involves substituting the current predominant linear production model for an alternative cyclical model shifting from "extract-produce-use-dump" to "reduce-recycle-recover", thus being based on extending the useful life of products, their reuse, remanufacture (repair and reconditioning) and recycling (Ellen MacArthur Foundation, 2015; Díaz-García et al., 2020).

Since China enacted its Law for the Promotion of the Circular Economy on 29 August 2008, the term started to gain great popularity among the research community and politicians. In Europe, The European Union 2015 Circular Economy Action Plan (CEAP) (European Commission, 2015) and its second version in 2020 (European Commission, 2020), clearly show that policies related to CE currently play a key role in Europe with the objective to achieve the European Union's climate neutrality target and ensuring the long-term competitiveness (European Commission, 2023).

In academia, the number of studies on the CE has grown exponentially (Prieto-Sandoval et al., 2018) and several reviews of the literature have been published (Lewandowski, 2016; Kirchherr et al., 2017; Alcalde et al., 2022). Nonetheless, despite the enormous attention devoted to the CE, progress in the practical implementation of the concept remains limited (Kirchherr et al., 2018). Most of the works published to date have focused on analysing the level of implementation of the CE concept in industrial parks (Atanasovska et al., 2022; Uusikartano et al., 2021), cities and municipalities (Möslinger et al., 2023; Gabor et al., 2023) or countries (Martínez

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Moreno et al., 2023; Gura et al., 2023). These works concentrate, above all, on clean production processes and waste reduction but not consider the need to integrate the macro, meso and micro levels of CE.

In recent years, an increasing number of works have also focused on companies resulting in an incipient literature about what are the factors that enable firms to achieve an effective transition towards a circular and sustainable economy (Triguero et al., 2022; Baral et al., 2023). Consequently, a large number of studies in strategic management, operations management, and technology management has recently focused on four main research areas: Circular Business Models; managerial practices for value creation, value transfer and value capture; the role of other explanatory variables -as emerging digital technologies- (Sánchez-García et al., 2024); and contextual factors necessary for making the transition towards a CE (Centobelli et al., 2020). However, the literature on the influence of contextual factors is very heterogeneous and it is necessary to conduct further research to enhance understanding of the factors that encourage the development of the CE based on an integrated perspective to facilitate its implementation at all levels and to help design policies to promote the CE. This is especially important in SMEs for several reasons: first, 70% of industrial pollution is generated by SMEs in Europe (Koirala, 2019); secondly, because they need to align with the context and legal framework and face biggest barriers compared to large firms in this transition (Katz-Gerroand López Sintas, 2018). Furthermore, the literature has paid scant attention to such companies, and hence calls have been made for a greater research emphasis on this type of enterprise (Kirchherr et al., 2018).

The limited number of studies on SMEs that have analysed the importance of both the barriers and facilitators of the adoption of CE business models have provided evidence that must be reinforced with more research focused on SMEs (Rizos et al., 2016). From a theoretical perspective, the most important obstacles detected are market barriers (Pheifer, 2017), the lack of a clear regulatory framework (Kirchherr et al., 2018), technology-related issues (De Jesús and Mendonca, 2018) and cultural barriers (Mont et al., 2017). These can be considered the main stumbling blocks that companies face when transitioning to the CE, and hence there is a need for a more in-depth integrated analysis of these arguments in SMEs. In line with Beaurain et al. (2023), the technical and cultural dimension must be considered "encompassing the stakeholders involved in the production-consumption loop, their social and spatial relations, as well as the institutions and policies that govern their economic activities, is also essential to consider for effective CE implementation as it can be impacted by and impact CE" (Beaurain et al. 2023). This aim requires to adopt a multi-level perspective (MLP) to empower policymakers, consumers, industry associations and SMEs to CE transition (Zhu et al., 2022; Malik et al., 2022; Ahmadov et al., 2023). Therefore, it is necessary to focus more on the influence of political regulatory frameworks, cultural dimensions and entrepreneurship activity on the adoption of CE in a given industry in the European Union (Katz-Gerro and López Sintas, 2018; Centobelli et al., 2020).

To fill these gaps, this article's main objective is to understand the factors that drive SMEs to develop CE activities, focusing specifically at macro and meso level to delve deeper in the role of cultural factors, entrepreneurship, and regulatory framework in promoting the CE in within European SMEs. We thus seek to identify contextual factors that can explain why some countries show better conditions for CE transition than others. Accordingly, we address the following research questions:

- What is the role of environmental regulation on the CE transition by SMEs?
- How do cultural dimensions affect the adoption of CE practices by SMEs?
- And finally, how national entrepreneurship rate influence on these strategic decisions at firm level?

To achieve this objective, we adopt a MLP perspective to consider jointly the macro-level contextual factors (culture, regulation and entrepreneurship), the meso (industry), and the micro factors (size, age, R&D investment) that enable the adoption of CE practices in European SMEs. Thus, the empirical analysis uses established frameworks such as Hofstede's cultural dimensions to measure the cultural context, total early-stage entrepreneurial activity (TEA) from Global Entrepreneurship Monitor (GEM) report and Environmental Protection Stringency Index (EPSI) constructed by the OECD to measure the regulatory framework. Moreover, individual firm information from 10,618 SMEs (1–250 employees) operating in 12 sectors located in 28 European Union countries is used.

The remainder of this article is structured as follows. In Section 2, we discuss the conceptual background and the relationship between culture, entrepreneurship, and CE identified in the previous research to justify the development of hypotheses. In Section 3, we outline data, variables measurement and empirical model. In Section 4, we present the main results and discussion. Finally, we summarize the main implications for policy and managers in Section 5 as well as our concluding remarks in Section 6.

2. Theoretical analysis and research hypotheses

Following an analysis of more than 100 definitions, Kirchherr et al., (2017) defined CE as "an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing [and] recycling [...] materials in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation ...), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations" (Kirchherr et al., 2017, pp. 224–225). Although the concept of the CE dates back to the work by Boulding (1966), it was not until 1990 that Pearce and Turner (Pearce and Turner, 1990), in their "Economics of Natural Resources and the Environment" and specifically in the chapter entitled "The Circular Economy", set out the methodological underpinnings and key questions of the dynamics of the linear economy model in the context of the shortage and limited availability of resources.

The exponential growth in publications over recent years has led several authors to conduct systematic reviews, with the intention of developing basic notions for a common framework under which to analyse the CE (Winans et al., 2017; Alcalde et al., 2022), proposing a consensus definition (Urbinati et al., 2017; Kirchherr et al., 2017) and analysing the relationships between CE and other terms, such as ecological or eco-innovation (Prieto-Sandoval et al., 2018) or the green economy (Loiseau et al., 2016). Research in this

field of knowledge lacks organisation and the theoretical groundwork is insufficient and unsystematic (Friant et al., 2021), and it is needed to understand which contextual factors related to macro dimensions are relevant for CE transition.

According to Ghisellini et al. (2016), the principles of CE can be applied at micro, meso, and macro-operating levels. CE adoption at micro level focuses on the adoption of circular strategies within the firm, which include eco-design and cleaner production; consumers' responsibility and green public procurement; recovery of resources and environmental impact prevention. The CE actions at meso-level are related to the value-chain or industrial symbiosis. Therefore, it involves multiple entities, such as a group of companies, a sector, or an industrial park. Finally, the implementation at macro level involves policies, infrastructure, and societal norms that encourage or facilitate the adoption of a CE. All these levels are interconnected because the micro level can influence and be influenced by the meso and macro levels, and vice versa (Dopfer et al., 2004). Additionally, governance mechanisms showed by actors at different levels determine the role of government, society, industry and firms in facilitating or hindering the transition to CE (Beaurain et al., 2023). Furthermore, a transformative model of CE for SMEs highlights the importance of government policies, industry collaborations, and internal capabilities within SMEs under a MLP perspective (Zhu et al., 2022; Malik et al., 2022).

Since all three levels must be considered for the transition to a CE, contextual factors related to regulatory framework, culture and entrepreneurship need to be integrated to understand CE practices implementation at the firm-level as it is shown in Fig. 1.

2.1. Circular economy and regulatory framework

The relationship between CE and regulation is underlined by the fact that it was the implementation of policies to promote these types of actions that first sparked the interest of the research community in the CE. The academic literature identifies regulation and fiscal incentives as drivers of activities for environmental responsibility (González-Moreno et al., 2019), although environmental regulations may also be considered a double-edged sword (Fang et al., 2020). On the one hand, implementing the processes required to comply with environmental regulations forces companies to increase production costs, leading to reduce the investment in innovative capacity (Iraldo et al., 2011). Stringent environmental policies oblige companies to shift from their traditional processes towards processes aimed to abate the adverse effects of their activity on the environment (Albrizio et al., 2017). On the other hand, if they wish to create a win-win situation, firms must update their technological resources, resulting in higher technological and innovative capacities (Porter and Van der Linde, 1995). Additionally, environmental policies may increase entry barriers to the sector. The so-called Porter Hypothesis (Porter and Van der Linde, 1995) suggests that environmental regulation leads to a double win-win scenario, whereby companies adapt to such regulations and protect the environment while enhancing their competitive advantage because of implementing such actions.

Jaffe and Palmer (1997) distinguish three versions of the Porter Hypothesis: the "weak" version is that stricter, well-designed, environmental policies stimulate business-based innovation by companies, even when the cost of such innovation exceeds its benefit. The "strong" version posits that environmental policy improves company productivity, as the regulation is intended to reduce
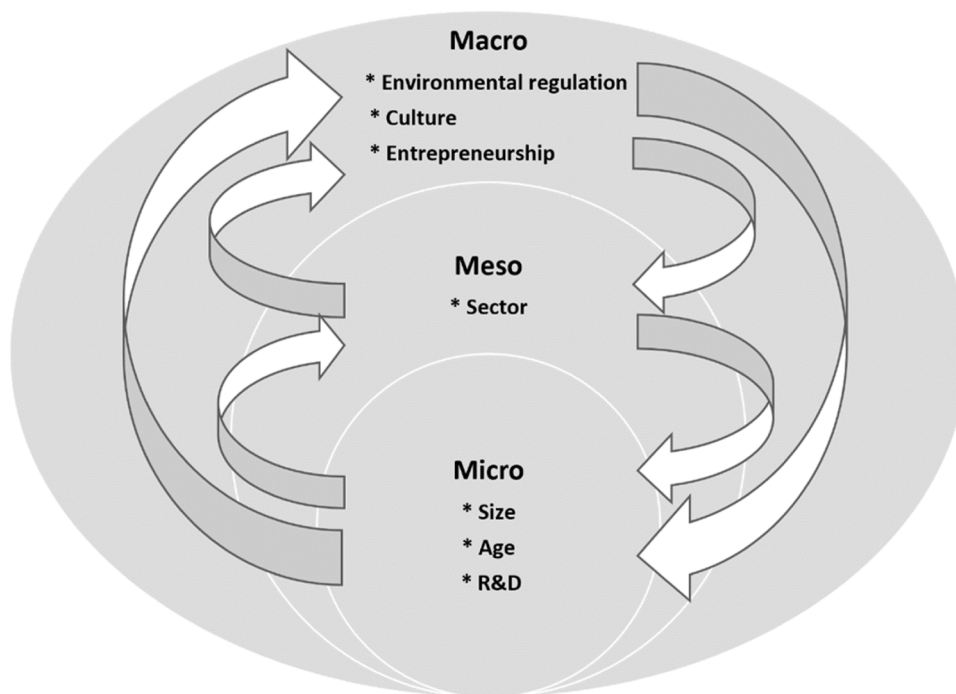
Fig. 1. Conceptual framework.
Source: Own elaboration

the use of materials, save energy and drive the implementation of more efficient processes. This hypothesis has been empirically corroborated in several studies at industry level that have reported increased efficiency in companies that implement environmentally responsible practices (Frondel et al., 2008; Ashford and Hall, 2011; Stucki, 2019). Company-based studies are scarcer and present inconsistent findings, suggesting that the benefits depend on the type of innovation (Rubashkina et al., 2015). Finally, the "narrow" version postulates heterogeneous effects, depending on the type of regulation used, suggesting that gains in productivity and reorientation of innovation are more likely when environmental policies are more flexible, such as market-based instruments. A review on how the Porter Hypothesis has evolved can be found in the work by Ambec et al. (2013).

At European level, Fabrizi et al. (2018) confirmed the narrow version of the Porter Hypothesis, demonstrating that, of the regulatory variables, market-based instruments are the most effective in fostering eco-innovations. However, Triguero et al. (2015) show that this type of policy instruments is more important for small firms because large firms are more sensitive to command-and-control regulations. In contrast, Albrizio et al. (2017), despite confirming the strong hypothesis at industry level, reported a partial effect of regulatory burden on company-level productivity. Indeed, their work finds that half of the companies in their sample, the less productive ones, experience a fall in productivity because of increased environmental policy stringency. At industry level, this effect is offset by firms' aggregation. Nonetheless, the positive relationship between regulatory pressure and firms' engagement in environmental innovation is, broadly speaking, corroborated in the literature (Horbach, 2008; Ketata et al., 2014), although some studies have presented contradictory findings (Wang et al., 2019). Additionally, Fang et al. (2020) provide empirical evidence for the weak version of the Porter Hypothesis, finding a positive relationship between environmental regulation and innovation activities in Chinese firms. Thus, drawing on these arguments, we propose that the existence of corresponding regulation will foster the development of CE activities. Specifically, our hypothesis is as follows:

H1a: "Greater regulatory stringency is positively related to a greater propensity for the development of circular economy activities in SMEs."

Additionally, we aim to analyse the impact of public aid, subsidies and funding. Regarding public subsidies and aid to implement CE activities, the literature suggest that the existence of state aid positively impacts the development of environmental innovations (Ghisetti et al., 2015; Wang et al., 2019; Fang et al., 2020). The literature on SMEs shows that financial constraints are one of the main impediments for companies when incorporating environmental innovations (Ghisetti et al., 2017) and tackling the processes involved in the transition to more circular business models (Ghisetti and Montresor, 2020), and hence this type of public aid can significantly encourage firms to adopt CE actions. Fang et al. (2020) recently reported that government initiatives, such as pollution control funds and subsidies for clean technology audit programmes, help to reduce the financial constraints encountered by companies when developing CE activities, thus fostering their adoption and implementation. Hence, we propose the following:

H1b: "The existence of public funding for circular economy activities is positively related to a greater propensity to implement circular economy actions in SMEs."

2.2. Circular economy and culture

Based upon MLP perspective, culture is considered a significant contextual factor in the adoption of CE practices. Culture is defined as a system of shared values, beliefs and expected behaviours (Hofstede, 1980). A country's culture is a factor that leads individuals from that society to behave differently from those in other societies (Mueller and Thomas, 2001), and which affects company managers' decisions and actions (Thanetsunthorn, 2015). Culture shapes the way organizations perceive and respond to new ideas and changes. It interacts with the economic system in a complex way, influencing growth rates and income distribution, which in turn leads to diverse economic outcomes and managerial decisions (Kostis, 2021).

Cultural dimensions are typically considered at the macro level in the studies of economics of innovation. Culture, as defined by values, beliefs, and norms, is a societal characteristic that influences the behaviour of individuals and organizations within a society. However, their impact can be felt at all levels. For instance, the cultural context of a country (macro) can influence the innovation practices of industries (meso) and individual firms (micro). There is a need to disentangle the different effect of diverse cultural dimensions of each society. Regarding innovation and sustainable development, there are cultural dimensions that foster them such as trust, control, work ethic and honesty, whereas obedience, hierarchy and affective autonomy can hinder innovation (Kostis et al., 2018). Therefore, culture must be related to the innovative changes implicit in the CE transition, but it is needed to explore the way the specific dimensions of culture affect innovation strategies related to CE.

The management literature has used diverse frameworks to analyse culture, the main ones being those proposed by Hofstede (1980, 2010), Schwartz (1994), GLOBE (House et al., 2004), Trompenaars and Hampden-Turner (1993), and the World Values Survey (Inglehart, 1997). Nonetheless, the most widely cited and that which enjoys the greatest consensus in the social sciences is the framework suggested by Hofstede (Pérez-Cornejo et al., 2021), which is used to underpin the present study. Hofstede's analytical model comprises six cultural dimensions that shape behaviour patterns: individualism/collectivism, power distance, uncertainty avoidance, long-term orientation, masculinity/femininity and indulgence. The present study draws specifically on three of these variables: long-term orientation, individualism, and masculinity, as we consider them to be related to the propensity to develop CE activities.

The first cultural dimension we analyse is that of a society's long- vs short-term orientation. The former refers to fostering virtues oriented towards future rewards, particularly, perseverance and thrift (Díez-Esteban, 2019), while short-term orientation entails encouraging values related to the past and present, especially respect for tradition and fulfilling social obligations (Hofstede, 2001). This dimension delineates how each society must balance its ties to its history while confronting the demands of the present and future. Societies prioritize these dual existential objectives in varied ways. Normative societies, characterized by low scores on this dimension

(short-term oriented), tend to uphold longstanding traditions and norms while regarding societal evolution with scepticism. Conversely, cultures scoring high on this dimension (long-term orientation) adopt a more pragmatic stance, advocating for thrift and investing in contemporary education as a means of future readiness (Hofstede et al., 2010).

Arguments exist for and against the relationship between these two orientations and the development of CE actions. Although thrift is clearly linked to lower consumption, and reducing consumption is one of the pillars of the CE, the reviewed literature seems to lean towards that fact that respect for tradition, which is implicit in short-term orientation, may also imply greater propensity for the CE, as many traditional production systems in sectors such as agriculture are associated with respect for the environment and the tenets of CE. Traditional societies often exhibit characteristics that align with principles of the CE, which emphasizes minimizing waste, maximizing resource efficiency, and promoting sustainability. Additionally, these societies have often utilized the key tenets of the CE due to the scarcity of limited resources (Hajoary et al., 2023). Hence, traditional societies often rely on subsistence living, where they utilize resources available in their immediate surroundings to meet their needs. Moreover, motivated by tradition and by scarcity, the concept of reuse, recycle, repair, and refurbishing things is ingrained in the rural culture (Hajoary et al., 2023). Therefore, we propose the following:

H2a: "Long term-orientation societies compared with traditional and normative societies (higher in short-term orientation) are negatively related to a greater propensity for circular economy activities in SMEs."

The second dimension under analysis is individualism vs collectivism. The position of a society in this dimension depends on whether people's self-image is defined in terms of "I" or "we". An individualistic society is one in which ties between individuals are weak, that is, everyone is expected to look after only themselves and their immediate family (Estrada-Cruz et al., 2019). In contrast, collectivism is typified by a preference for closeness in society, where individuals may expect their family or the members of a particular group to look after them in exchange for unquestioned loyalty. In individualistic cultures, people are more motivated by fulfilling their own personal aims rather than group achievements, while in less individualistic and more collectivistic cultures, people feel they are part of a group from the time they are born and are motivated by group goals (Triandis, 1993). This approach leads us to assume a positive relationship between the level of collectivism in a society and the propensity of its companies to implement CE actions. Thus, we propose the following hypothesis:

H2b: "A more individualistic society is negatively related to the propensity to develop circular economy activities in SMEs."

Finally, we address the level of masculinity vs femininity in a society and its impact on pursuing CE activities. In a strict sense, "only behaviours directly connected with procreation (childbearing and child begetting) are "feminine" or "masculine." Yet every society recognizes many other behaviours as more suitable to females or more suitable to males; these represent relatively arbitrary choices, medicated by cultural norms and traditions" (Hofstede, 2001, p. 280). Masculinity relates to the acceptance of masculine values and rigid gender roles in a society and the emphasis on success at work in relation to fostering the wellbeing of others (Griffin, 2018). Masculine cultures favour a performance orientation, emphasising proactive competitive behaviour and self-confidence (together with preference for achievement, heroism, assertiveness), while in feminine cultures, a more empathetic social orientation prevails (Li and Harrison, 2008), accompanied by a preference for cooperation rather than competition, presenting also a preference for modesty, caring for the weak, quality of life and more consensus-oriented.

These gender stereotypes are deeply ingrained in individuals who form expectations of how they and others should behave based on gender roles. Thus, there is evidence that women tend to adopt more participatory and relationship-building approaches in leadership roles and are more likely to pursue long-term strategies and outcomes focused on stakeholder groups/interpersonal orientation, issues that are fundamental for successful environmental practices and search for social goals (Glass et al., 2016; Matsa and Miller, 2013; Hechavarría et al., 2012; Fortin, 2005). In this line, women would be more inclined to carry out proactive environmental innovation as a business action that meets the needs of stakeholder groups and reduces environmental pollution (Galia et al., 2015; Liao et al., 2019; Nadeem et al., 2020). Davidson and Freudenburg (1996) as well as Zelezny et al. (2000) find empirical support for the view that females show higher levels of environmental consciousness. Similarly, the review by Terjesen et al. (2016) states that male entrepreneurs are generally less likely to be motivated by non-economic goals. In this sense, we believe that a more feminine society will be more disposed towards respecting the environment and upholding future generations' quality of life, both of which are related to the CE. Thus, our next hypothesis is as follows:

H2c: "A higher level of masculinity in a society is negatively related to a greater propensity for circular economy activities in SMEs."

2.3. Circular economy and entrepreneurship

An increasing amount of research has paid attention to the link between CE and entrepreneurship (Fernandes et al., 2023; Suchek et al., 2022). Entrepreneurship encompasses the dynamic pursuit of opportunities, a realm that extends into CE domain as well (Zucchela and Urban, 2019). Through entrepreneurial endeavours, individuals can effectively address environmental market shortcomings by identifying and seizing opportunities inherent in these failures, thereby fostering a more efficient use of natural resources (Dean and McMullen, 2007). In this sense, adopting CE initiatives involves companies implementing practices designed to improve the circularity of their production systems, making changes to become more sustainable (Prieto-Sandoval et al., 2018). CE requires companies to modify their supply chains and business models to adapt them to the new paradigm. All the changes mentioned necessitate companies having a clearly entrepreneurial attitude. Recently, Suchek et al. (2022), in their systematic literature review on entrepreneurship and CE research, showed that an environmental culture and leadership commitment become fundamental factors influencing the decision for CE implementation in SMEs. Hence, it can be considered that an organisation's entrepreneurial orientation may be a driver of sustainable changes leading to their adopting CE models, fostering the effects of enabling factors and mitigating the force of inhibiting factors. In this line, Fernandes et al. (2023) have recently found that countries with higher rates of entrepreneurship,

show a greater capacity to shift towards CE. In this sense, entrepreneurship can be considered a key asset for sustainable growth (Suchek et al., 2022). Thus, we propose the following hypothesis:

H3a: "A higher rate of entrepreneurship is positively related to a greater propensity for the development of circular economy activities in SMEs".

The role of a supportive ecosystem, specially, governmental support has also been studied in the literature as a promoter of CE practices in SMEs (Garrido-Prada et al., 2021). Suchek et al. (2022) call for a joint analysis of the influence of institutional frameworks and entrepreneurship on CE adoption. Hence, we aim to explore the moderating effect of the entrepreneurship rate on the impact of the variables of the SMEs' environment, specifically the regulatory framework. Entrepreneurial opportunity recognition for CE, may also arise from the public policies implemented (Alonso-Almeida et al., 2021). Therefore, there could be an interaction between the entrepreneurship rate and the regulatory framework, modulating the effect of the later on CE adoption by SMEs. We analyse to what extent a greater regulatory stringency, together with a high entrepreneurship rate, influence the development of CE activities in SMEs. Additionally, we study the combined impact of a high entrepreneurship rate and the use of public financial incentives to CE actions on this type of activities. Based on the above assumptions, we propose the following hypothesis:

H3b: "The effect of regulation on the development of circular economy activities in SMEs is moderated by entrepreneurship rate".

Additionally, we aim to study whether cultural factors and entrepreneurial ecosystems interact to encourage or limit the transition towards CE in SMEs. Although not focused on SMEs, recent literature suggests that "the impact of culture on corporate sustainability performance may vary depending on the entrepreneurial context in which the performance is considered" (Boffa et al., 2023, p.528). Therefore, we propose the following:

H3c: "The effect of cultural factors on the development of circular economy activities in SMEs is moderated by entrepreneurship rate"

Based on the above theoretical analysis, this article proposes a total of three sets of research hypotheses that await further empirical testing. The overall research framework is shown in Fig. 2.

3. Research design

3.1. Data sources

To test our hypotheses, we used the following databases: Environmental Policy Stringency Index, Hofstede's Cultural Values; Global Entrepreneurship Monitor; and the Eurobarometer. To obtain company-level data, we used Flash Eurobarometer 441 (European SMEs and the Circular Economy) from 2016, a survey covering 10,618 SMEs (1–250 employees) from 28 European Union countries, accounting for approximately 400 firms per country. The sample was obtained using quotas by size (micro, small and medium-sized) and sector (retail, services, manufacturing and industry). The questions were answered by the CEO or general manger by means of telephone interviews. The surveys were conducted between 18 and 27 April 2016. The sectors covered in the survey were the following: mining; electricity and gas supply; water supply; construction; wholesale and retail trade; transporting and storage; tourism; ICT; financial and insurance activities; professional, scientific and technical activities; and administrative activities.
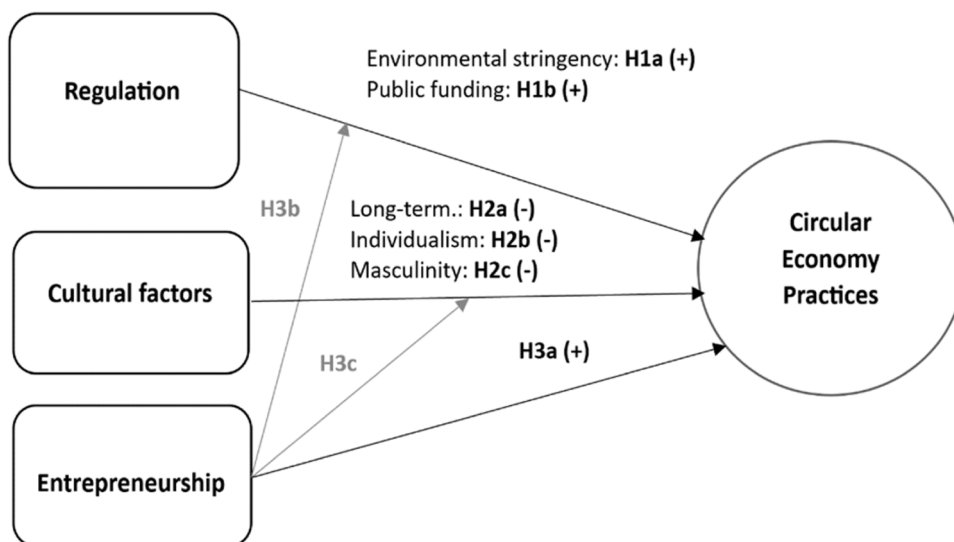

Fig. 2. Research framework for hypothesis testing.
Source: Own elaboration

3.2. Variables and measures

This section deals with the measurement units used in the present study. First, the dependent variable is described, followed by the independent variables, that is, regulatory, cultural, and entrepreneurship variables. Finally, the control variables are explained.

3.2.1. Dependent variable

Circular Economy: Our dependent variable is dichotomous and takes the value 1 when the company undertakes any of the following activities: replanning use of water to minimise it or maximise its reuse; use of renewable energies; replanning use of energy to minimise its consumption; minimising waste through recycling, reusing or selling; redesigning products and services to minimise the use of materials and to use recycled ones. If a company does not engage in one of these actions, the variable takes the value 0.

3.2.2. Independent variables

Environmental Policy Stringency Index (EPSI). This is an internationally comparable indicator, designed by Botta and Kozluk (2014) for the OECD. The index measures the degree to which environmental policies put an explicit or implicit price on polluting or environmentally harmful behaviour. It is grounded in the classification proposed by De Serres et al. (2010) and includes two types of components, market based and non-market-based. The market-based component comprises instruments that assign a specific price to externalities, such as taxes on CO2, SOX, NOX or fossil fuels, or market models such as CO2 emissions level certificates, renewable energy certificates and energy efficiency certificates. On the other hand, the non-market component covers control instruments, including standards (emission limit values for NOX, SOX and PMX, sulphur content limit in diesel) and technology support policies, such as government R&D. The index is scored on a scale from 0 to 6 according to the level of stringency. It covers 28 OECD countries and the 6 BRIICS countries and is based on the level of stringency of 14 environmental policy instruments, mainly related to climate and air pollution (Botta and Kozluk, 2014).

Recent years have witnessed a growth in the stringency of environmental regulation, although in some countries, such as Greece, Ireland and Turkey, the level remains relatively low. Other countries, however, including Denmark, Finland, Switzerland and United Kingdom present values above the average (Wang et al., 2019). Despite the existence of a single European norm based on diverse regulations, directives, and communications within the EU, the transposition into national laws by each member state and the absence of legal targets or sanctions result in significant differences in the European regulatory framework (Farmer, 2020). This not only justifies the interest in including this variable in the analysis but also supports the dichotomy between EU environmental talk and action from 2000 to 2016 (Friant et al., 2021).

Public funding for the CE. The Eurobarometer includes a question on the level of knowledge and use of financial incentives to support CE activities as part of government programmes. Managers of SMES are asked whether they are aware of the existence of these types of public incentives in their country and whether they have benefited from them. The variable is recoded such that it takes the value 1 if the managers are unaware of the existence of such public aid, 2 if they are aware of their existence, but are unsure of exactly what they are, 3 if they are aware of their existence but have not used them, and 4 if they are aware of their existence and have in fact used them.

Culture: As discussed in the second section of this work, we use the research conducted by Hofstede (1980; 2001), and revised by Hofstede et al. (2010), to measure a country's culture. Geert Hofstede developed a set of indicators that capture cultural differences between countries. Data were initially obtained from 116,000 IBM employees in 40 countries between 1967 and 1973. The model was extended to 93 countries in 2010. Hofstede's analytical framework for culture comprises six cultural dimensions affecting behaviour patterns: individualism/collectivism, power distance, uncertainty avoidance, long-term orientation, masculinity/femininity and indulgence. Each of these variables can take a value between 0 and 100, although they may exceed this limit in exceptional cases. The present study examines individualism, long-term orientation and masculinity.

Entrepreneurship (TEA). To measure entrepreneurship, we used the Global Entrepreneurship Monitor (GEM) database. The rate of entrepreneurship was obtained from the GEM of each of the 28 countries for 2015. The basic indicator of this global entrepreneurship observatory is the total early-stage entrepreneurial activity (TEA) rate, which measures the percentage of the adult population, aged over 18 years, involved in creating a business. It includes the rate of nascent entrepreneurship (less than 1 year and no wages paid yet) and the new business rate (within the first 42 months of starting).

3.2.3. Control variables

Size: Company size was measured by number of employees.

R&D. To measure the level of companies' commitments to innovation, we used a Likert-type variable measuring expenditure on R&D as a percentage of sales (1, less than 5%; 2, from 5% to 10%; 3, from 10% to 15%; 4 from 15% to 20%; and 5, more than 20%).

Age (Young firm): Company age was measured using a dichotomous variable that takes the value 1 if the company is less than 5 years old and 0 if not.

Sector: A company's sector of activity was assigned according to the Eurobarometer classification, that is, mining; manufacturing; electricity and gas supply; water supply; construction; wholesale and retail trade; transporting and storage; tourism; ICT; financial and insurance activities; professional, scientific and technical activities; and administrative activities. These variables enable us to include the meso-perspective in the empirical analysis.

3.3. Empirical model

The methodology used to measure the propensity for CE activities is that of binary logistic regression (see Eq. 1). Our dependent

variable is a dichotomous variable that takes the value of 1 when companies have undertaken CE activities and 0 if not:

$$p_i = \frac{1}{1 + e^{-\left(\beta_0 + \beta_2 x_{1,i} + \beta_k x_{k,i}\right)}} \tag{1}$$

where 'p' is the probability of a case being in a specific category, that is, it undertakes CE activities and the 'βs' are the variable predictor coefficients 'x'. We decided to use this methodology as logistic regression coefficients can be directly interpreted in terms of odds ratios, making it easier to understand the impact of predictors on the odds of the binary outcome.

We estimate distinct equations, where the dependent variable is a dummy which assumes the value of 1 if the firm adopts CE activities, and value 0 otherwise. Each estimated model assumes the following form (see Eq. 2):

$$Z_{ij} = \beta_1 size_i + \beta_2 age_i + \beta_3 R\&D_i + \beta_4 sector_{ij} + \beta_5 EPSI_j + \beta_6 PublicfundingCE_i + \beta_7 Long\text{-}term_j + \beta_8 Individualism_j + \beta_9 Masculinity_j + \beta_{10} TEA_j \tag{2}$$

Moreover, we include two additional specifications to test the moderation effect of TEA on the relationship between regulatory variables and CE adoption (see Eq. 3) and the moderator effect of TEA on the relationship between each cultural dimension and CE adoption by the firm (see Eq. 4) as follows:

$$Z_{ij} = \beta_1 size_i + \beta_2 age_i + \beta_3 R\&D_i + \beta_4 sector_{ij} + \beta_5 EPSI_j + \beta_6 PublicfundingCE_i + \beta_7 Long\text{-}term_j + \beta_8 Individualism_j + \beta_9 Masculinity_j + \beta_{10} TEA_j + \beta_{11} (TEA_j \times EPSI_j) + \beta_{12} (TEA_j \times PublicfundingCE_i) \tag{3}$$

$$Z_{ij} = \beta_1 size_i + \beta_2 age_i + \beta_3 R\&D_i + \beta_4 sector_{ij} + \beta_5 EPSI_j + \beta_6 PublicfundingCE_i + \beta_7 Long\text{-}term_j + \beta_8 Individualism_j + \beta_9 Masculinity_j + \beta_{10} TEA_j + \beta_{11} (TEA_j \times Long\text{-}term_j) + \beta_{12} (TEA_j \times Individualism_j) + \beta_{13} (TEA_j \times Masculinity_j) \tag{4}$$

4. Results and discussion

Table 1 shows the descriptive statistics for the variables used in the model.

According to the European Commission, 73% of European SMEs have invested in the transition to a more circular model for their businesses (Flash Eurobarometer nº 441). On average, the enterprises are small, with a mean size of just over 20 employees. Table 1 shows the Pearson bivariate correlation statistics for the variables analysed. The lack of significantly high correlations among explanatory variables indicates that multicollinearity is not a major issue, and hence it is possible to test the model according to the estimation method.

Table 2 shows the results of our logistic regression models. Model 0 presents the effects of the control variables. Model 1 yielded the results of the direct effects and enabled us to test Hypotheses 1–3. Model 2 introduced the moderating effect of the TEA on regulatory burden (EPSI) and the moderating effect of the TEA on public funding for CE activities. Finally, Model 3 introduced interactive effects of TEA on culture variables. As can be seen in Model 1 in Table 2, the model correctly classifies 76.6% of the companies in our sample and presents a good fit ($X^2 = 489.779$; significance 99%).

If we focus on the company variables, size is a determinant of the adoption of CE activities (coefficient 0.664; significance 99%). The larger the SME, the greater is the propensity for such activities, which is consistent with previous findings in the literature. Ghisetti and Montresor (2020), for example, found a positive relationship between firms' size and percentage of income invested in R&D and their level of adoption of CE practices. As shown by our results and those in the previous literature, there appears to be a scale effect, technical and organisational in nature, which fosters the development of CE practices. Additionally, as might be expected, a greater dedication to, or propensity for, innovation, as measured by the percentage of income devoted to R&D activities, shows a positive and significant relationship (coefficient 0.146; significance 99%) to the adoption of CE practices in European SMEs. This finding is consistent with previous literature on R&D activities and eco-innovation (Horbach, 2008; Marzucchi and Montresor, 2017).

Our work, however, finds no significant relationship between company age and CE practices. Hence, our results suggest the absence of an experience effect that favours the adoption of such activities. The variable "Age (young firm)" has no significant effect. This is

Table 1
Descriptive statistics.

	Mean	SD	Pearson bivariate correlations								
			1	2	3	4	5	6	7	8	9
Circular economy	0.73	0.43	1								
Size (number of employees)	20.68	38.48	0.11	1							
Age (Young firm)	0.83	0.37	0.06	0.13	1						
% Income invested in R&D	1.41	1.01	0.07	-0.00	-0.03	1					
EPSI	3.85	2.80	-0.02	0.03	-0.05	-0.03	1				
Public funding for CE	1.76	1.05	0.18	0.07	0.05	0.07	-0.09	1			
Long- vs short-term orientation	56.61	16.14	-0.09	-0.00	-0.05	-0.04	0.19	0.00	1		
Individualism vs collectivism	58.54	18.19	0.04	0.03	0.00	0.02	0.58	-0.03	0.17	1	
Masculinity vs femininity	46.91	25.77	0.04	0.00	0.04	0.00	-0.26	0.07	0.14	0.10	1
Entrepreneurial activity (TEA)	8.59	3.70	-0.07	0.13	0.06	0.07	-0.02	0.18	-0.09	0.04	0.04

Table 2

LOGISTIC REGRESSION MODEL. Dependent variable: Circular economy.

Independent variables (Normalised)	MODEL 0 Betas	MODEL 1 Betas	MODEL 2 Betas	MODEL 3 Betas
Constant	1.164***	1.399***	1.350***	1.255***
COMPANY VARIABLES				
Size (Number of employees)	0.277***	0.264***	0.264***	0.265***
Age (Young firm)	0.051	0.037	0.044	0.044
% Income invested in R&D	0.167***	0.146***	0.152***	0.155***
SECTOR (ref. Mining)	***	***	***	***
Manufacturing	1.302	1.059	1.071	1.118
Electricity and gas supply	0.477**	0.506***	0.520***	0.543**
Water supply	0.444	0.322	0.347	0.337
Construction	1.649**	1.585***	1.594***	1.607**
Wholesale and retail trade	0.028	0.033	0.042	0.046
Transporting and storage	0.175	0.151	0.158	0.171
Tourism	-0.587***	-0.542***	-0.529***	-0.526**
ICT	0.659***	0.559***	0.532***	0.558**
Financial and insurance activities	-0.583**	-0.581***	-0.566***	-0.564**
Professional, scientific and technical activities	-0.198	0.355*	0.315	-0.279
Administrative activities	-0.336*	-0.404***	-0.389***	-0.383*
REGULATION				
EPSI		-0.207***	-0.261***	-0.135*
Public funding for CE		0.450***	0.448***	0.455***
CULTURE				
Long- vs short-term orientation		0.006	0.055	-0.075
Individualism vs collectivism		0.210***	0.192***	0.215***
Masculinity vs femininity		-0.246***	-0.258***	-0.179***
ENTREPRENEURSHIP				
Entrepreneurial activity (TEA)		0.281***	0.276***	0.150**
INTERACTIONS				
TEA x EPSI			-0.209***	
TEA x Public funding			-0.012	
TEA x Long- vs short-term orientation				-0.292***
TEA x Individualism vs collectivism				0.046
TEA x Masculinity vs femininity				0.203***
X^2 Model	256.512***	489.779***	505.414***	520.198***
-2 Log likelihood	6751.032	6517.765	6502.130	6487.346
Nagelkerke pseudo-R^2 (1)	0.059	0.111	0.114	0.117
Hosmer-Lemeshow	10.545	14.629	11.701	17.302
% correct predictions	76.4%	76.6%	76.8%	76.8%
N	6409	6409	6409	6409

(1) The Nagelkerke pseudo-R2 is a measure of goodness of fit in logistic regression analysis. Unlike linear regression, where R^2 can be directly interpreted as the proportion of variance explained, the Nagelkerke pseudo-R2 should be supplemented by other measures of model fit such the Hosmer-Lemeshow test, AIC, or BIC for determining the relationship between a dependent variable and independent variables (predictors), rather than solely relying on goodness of fit measures.

* $p<0.05$
** $p<0.01$
*** $p<0.001$

similar to the findings of Ghisetti and Montresor (2020), who reported a relationship between company experience and certain CE practices, but this effect disappeared when the overall collection of such practices was analysed.

We proposed two hypotheses regarding the regulatory framework variables. Hypothesis 1a postulated a positive association between regulatory stringency and CE. To measure regulatory stringency, we used the EPSI, which includes both market-related and non-market instruments. The results of our analysis, contrary to our expectations, revealed a negative (coefficient −0.207) and significant (99%) relationship -see model 1–. Given the cross-sectional nature of our empirical study, we cannot propose a causal relationship between the variables. The results of this negative association lead us to think that it is likely a consequence of an inverse causal relationship. In other words, the negative association might be explained by the fact that in settings where companies tend not to undertake actions to mitigate the harmful impacts of business activity on the environment, greater regulatory stringency is required to foster such behaviour. In contrast, in societies where companies implement CE business models, government intervention is less necessary. A longitudinal analysis to reveal the evolution of both indicators and establish the causal relationship may clarify this issue.

Using the EPSI for countries from the OECD, Wang et al. (2020) recently found that for low levels of environmental regulation, the relationship is positive, but when environmental regulation stringency rises above a certain level, the effect is negative, showing an inverted U-shaped relationship. Low and moderate levels of regulatory stringency, induce higher levels of environmental innovation, which offsets the compliance costs, while the effects of compliance costs exceed the benefits from innovation activities in scenarios with highly stringent regulations, thus disincentivising it. Hörisch et al. (2017) state that "for entrepreneurs in OECD countries, the negative influence of environmental taxes indicates that a lack of environmental regulation concerning a specific environmental

problem can offer potential for entrepreneurial ideas which address the externalities coming along with that specific environmental problem". However, a more extensive, in-depth analysis of regulatory pressure is needed, as is a policy-disaggregated analysis (market-related vs non-market).

Despite the advantages of EPSI as a single and comparable country-specific proxy of environmental stringency, the analysis of the impact of environmental regulation policies on the CE transition in EU countries is complex. In this sense, the rigor in environmental stringency cannot be automatically equated to a high regulatory burden. Regulatory burden reflects the cost, complexity, and time required for firms to comply with environmental regulations. Therefore, it includes understanding the regulations, implementing necessary changes, maintaining and reporting compliance to regulatory bodies. On the other hand, regulatory stringency refers to the strictness of the regulations themselves. Thus, stringent regulations may require firms to meet high standards or follow specific procedures, which could in turn increase the regulatory burden. Since we are using the OECD Environmental Policy Stringency Index (EPSI), our results show that the effect of a more stringent regulation policy is negative on CE probably since the compliance cost effect is higher than innovation offset effect under a stringent regulation policy. Though not fully comparable, this is in line with Wang et al. (2020).

Hypothesis 1b. proposed a positive relationship between public funding for CE activities and their implementation in SMEs. Our results confirm this positive (coefficient 0.450) and significant (99%) association -see model 1–. Moreover, this factor has the greatest impact on the adoption of such activities. Hence, we can conclude that, in the case of SMEs, the greater the knowledge and use of public aid for CE activities, the greater is their propensity for the CE. This conclusion coincides with the findings and proposals in the previous literature (Ghisetti et al., 2015; 2017; Ghisetti and Montresor, 2020). Fang et al. (2020) found that government initiatives, such as pollution control funds and subsidies for clean technology audit programmes, help reduce the financial constraints encountered by companies when developing CE activities, thus fostering their adoption and implementation. Our results at company level, focusing on financial incentives, allow us to accept the weak Porter Hypothesis.

With regard to the cultural variables, as can be seen in Table 2, the relationship between long- vs short-term orientation and CE is close to zero, and, furthermore, is non-significant -see model 1-. Thus, our results suggest there is no significant relationship between these two variables. There is no clear direct relationship between long- vs short-term orientation and CE. Indeed, we cannot accept the hypothesis H2a. As we mentioned in previous sections, thrift, usually associated with long-term orientation, is clearly linked to lower consumption and reducing consumption is one of the pillars of the CE; while respect for tradition, which is implicit in short-term orientation, implies greater propensity for the CE as many traditional production systems in sectors such as agriculture are associated with respect for the environment and the tenets of CE. However, as we will see below, the combined effect of long-term vs short-term orientation and entrepreneurial activity impacts the CE activity in SMEs.

Hypothesis H2b. proposed a negative relationship between the level of individualism of a society and the propensity for CE activities in its companies. Table 2 reveals a positive (coefficient 0.210) and significant (99%) association -see model 1-. This relationship, which contradicts our hypothesis, suggests that in societies where individuals are more motivated by fulfilling their own goals than in group achievements, business managers are more likely to undertake CE activities. This finding is alignment with recent research developed by Rovanto and Finne (2023) comparing two different cultures. Their study shows how the individualistic Finnish culture fostered progress on the CE, while the collectivistic Japanese culture emphasised the need for relatedness and caused stagnation in the CE transition in its society. According to them, "perhaps the individualistic Finnish culture that fostered autonomous action without high pressure to conform to societal norms had enabled making a rather radical and open push towards a CE and taking a big step towards a CE away from the dominating linear logic" (Rovanto and Finne, 2023, p. 85). Our finding, in line with Rovanto and Finne (2023) might be explained by the relationship between a society's level of individualism and the entrepreneurial character of its citizens. In this sense, Thomas and Mueller (2000) showed that achievement motivation, internal locus of control, risk-propensity and innovation are traits that define the entrepreneurial profile and are typically associated with individualism. Additionally, Mueller and Thomas (2001) and Estrada et al. (2019) found that highly individualistic cultures are more likely to foster entrepreneurship and innovation than more collectivistic ones. Hence, the relationship between individualism and entrepreneurship may underlie our finding.

Hypothesis H2c. proposed a negative relationship between the degree of masculinity of a society and the propensity for CE activities in its companies. As can be seen in Table 2 (model 1), the coefficient for this variable is negative (-0.246) and significant (99%). This finding is in line with that of Rovanto and Finne (2023) who suggest that in Finland, due to sustainable values aligning with the feminine dimension of the Finnish culture (preference for caring, cooperation and quality of life), entrepreneurs are more prone towards CE than in the masculine Japanese society. Thus, we can conclude that enterprises in more feminine societies are more likely to adopt actions for transitioning to a CE. Femininity reflects a preference for cooperation, modesty, caring for the weak and quality of life (Hofstede, 1980). A more feminine society has a greater tendency to respect the environment and maintain future generations' quality of life, with both elements being related to the CE. Consequently, we can conclude that a more feminine society is positively related to a greater propensity for adopting CE actions in European SMEs.

The last of the direct effects analysed was entrepreneurial activity. Table 2 (model 1) shows a positive (coefficient 0.281) and significant (99%) relationship between TEA and our dependent variable. Consequently, we can accept our third hypothesis and conclude that the rate of entrepreneurship positively impacts the implementation of CE actions in European SMEs. Entrepreneurs with small and medium-sized businesses appear to perceive that incorporating recycling actions and renewable energy use in their enterprises represents a business opportunity.

Model 2 incorporated the moderating effects of the TEA on regulatory stringency and public funding, respectively. As can be seen in

Table 2, the joint effect of the TEA and public funding is non-significant, while that of the TEA and regulatory stringency is significant. The negative effect of regulatory stringency is enhanced in settings with a high rate of entrepreneurship (coefficient −0.209; significance 99%). In other words, in countries with a high entrepreneurship rate, a substantial regulatory stringency has a negative impact on SMEs' propensity to adopt CE activities. This finding suggests that in more entrepreneurial societies, CE could also be seen as an opportunity for the development of CE business models, and hence, government intervention is less necessary.

Finally, Model 3 presents the best fit (X2 = 520.198; significance 99%), correctly classifying 76.8% of the SMEs in the sample and explaining 11.7% (Nagelkerke pseudo-R^2). Our results show that entrepreneurship rates moderate the influence of cultural factors on SMEs' propensity to develop CE. The joint effect of TEA and long-term orientation is negative and significant (coefficient −0.292; significance 99%). In traditional societies (short-term orientation), an entrepreneurial ecosystem with high entrepreneurship rates will foster the development of CE activities by SMEs. Additionally, an entrepreneurial ecosystem positively moderates the negative effect of societal masculine values, promoting the transition towards CE in SMEs. The joint effect of TEA and masculinity is positive and significant (coefficient 0.203; significance 99%). As also observed in this study, in a society with feminine values there is a higher tendency of SMEs to the transition to CE (hence the negative sign of the independent variable). However, the presence of masculine values will have a positive effect on the transition to CE, especially when the entrepreneurship rate in that society is higher, since conventional entrepreneurship is frequently linked to be a male-dominated field in terms of a higher fit with male stereotypes (Malach-Pines and Schwartz, 2008; Shinnar et al., 2012). In sum, when the combined effect of culture and entrepreneurial activity is observed, the higher the later, the more CE is promoted in traditional and normative cultures and with masculine values.

5. Practical implications and further research

Several practical implications can be obtained from this paper. Regarding managerial issues, recent research has shown that firms have an increasingly clearer understanding of the importance of CE, as communicated through firms' mission statements (Caferra et al., 2023). However, from our findings, it can be advised that the firms need to have a sufficient size to engage in implementing CE actions, that is, there appears to be certain technical and organisational conditions in larger SMEs which foster the development of CE practices. Additionally, the higher the percentage of income devoted to R&D activities, the higher the possibilities to develop CE actions.

The present results also highlight some political implications. Our findings show that managerial awareness of the existence of public funding for CE activities is key on the development of these practices by SMEs. Therefore, public resources should be used to encourage CE activities among these firms, but it is also important that these funding is publicised, as managerial awareness is key. Additionally, public funds should be allocated to generate the suitable conditions and ecosystems to stimulate new entrepreneurial activities. As it has been shown in this paper, in contexts with high entrepreneurial activity rates, the propensity to develop CE activities by SMEs is higher, and regulatory frameworks and government intervention are less necessary to foster the transition towards CE. Therefore, promoting entrepreneurial activity and fostering new businesses and ideas would favour the transition to a CE.

Regarding cultural dimension of CE, our results support the idea that there is a need to integrate the cultural and technical dimensions to effectively target the barriers that may hinder the CE transition. In this regard, "a transition to a CE cannot only be achieved through a technical perspective but also requires a change in culture and values through interactions between all humans and broader groups of stakeholders" (Beaurain et al., 2023, p. 10). Distinct sociocultural environments can greatly impact approaches in implementing CE practices: societies with more individualistic and feminist values are the ones which promote them more. Rovanto and Finne (2022) state that these two characteristics might make breaking patterns (from a linear to a circular production model) easier in a culture. Therefore, public institutions should foster these characteristics to provoke a quicker transition towards CE.

One limitation of the study is that it examined SMEs' CE approaches in general, rather than focusing on specific CE activities applied, despite some studies observed that recycling is typically prioritised by regulation over the principles of reducing, reusing and recovering (Ranta et al., 2018). Future research should focus on different types of CE activities analysing whether the effect of contextual factors is similar in all of them. This paper has another limitation due the cross-section nature of the data. Thus, it would be interested to obtain longitudinal data issues to understand the important challenges and modifications that imply the CE transition. With that data, dynamic models could be used to understand the evolutionary paths of adoption of CE transitions at different spatial scales and to analyse the emerging new practices or changes within each socio-economic and cultural ecosystem. In addition, only European SMEs firms are investigated in this study. Hence, the results obtained here should be applied cautiously to other countries with different contextual factors. Additionally, examining the effect of different environmental regulation measures and cultural dimensions not covered in this study would provide a more comprehensive analysis of the multi-faceted relationship between environmental regulation, cultural factors and entrepreneurship and CE initiatives. Furthermore, the findings underscore the need for more quantitative research to establish causal relationships between regulatory framework, cultural factors, entrepreneurship, and circularity drivers thereby advocating for extensive primary surveys and interviews at micro-level.

6. Conclusions

This work analyses the influence of a series of variables related to entrepreneurship, environmental regulation and societal culture on European SMEs' adoption of CE. We found a positive relationship between feminism and individualism with CE. The later can be explained by individualism being positively associated with entrepreneurship, as has been evidenced in previous studies. The negative relationship found between regulatory stringency and the CE, could be justified by the fact that in countries where respect for the environment is more deeply rooted and companies voluntarily adopt measures in this regard, the role of the regulator is less important.

Finally, in settings where entrepreneurship is more forceful, a regulatory framework to drive a transition to the CE is less necessary, or less effective, than in environments where the entrepreneurship rate is weaker. Entrepreneurs possess an important role in fostering further sociocultural institutionalisation of the CE. An entrepreneurial ecosystem that fosters implementation of CE practices, and a general interest in CE within the society can create a virtuous cycle.

CRediT authorship contribution statement

Angela Gonzalez-Moreno: Writing – original draft, Conceptualization. **Angela Triguero:** Writing – original draft, Methodology, Data curation, Conceptualization. **Francisco José Saéz Martínez:** Writing – original draft, Methodology, Data curation, Conceptualization. **Cristina Díaz-García:** Writing – original draft, Methodology, Data curation, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

I have shared the link to my data at the attach file step

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References

Ahmadov, T., Durst, S., Gerstlberger, W., Kraut, E., 2023. SMEs on the way to a circular economy: insights from a multi-perspective review. Manag. Rev. Q. https://doi.org/10.1007/s11301-023-00380-2.

Albrizio, S., Kozluk, T., Zipperer, V., 2017. Environmental policies and productivity growth: evidence across industries and firms. J. Environ. Econ. Manag. 81, 209–226. https://doi.org/10.1016/j.jeem.2016.06.002.

Alcalde-Calonge, A., Sáez-Martínez, F.J., Ruiz-Palomino, P., 2022. Evolution of research on circular economy and related trends and topics. a thirteen-year Review. Ecol. Inform. 70, 101716 https://doi.org/10.1016/j.ecoinf.2022.101716.

Alonso-Almeida, M., Rodriguez-Anton, J.M., Bagur-Femenías, L., Perramon, J., 2021. Institutional entrepreneurship enablers to promote circular economy in the European Union: impacts on transition towards a more circular economy. J. Clean. Prod. 281, 124841 https://doi.org/10.1016/j.jclepro.2020.124841.

Ambec, S., Cohen, M., Elgie, S., Lanoie, P., 2013. The Porter Hypothesis at 20: Can Environmental Regulation Enhance Innovation and Competitiveness? Rev. Environ. Econ. Policy 7 (1), 2–22.

Ashford, N.A., Hall, R.P., 2011. The importance of regulation-induced innovation for sustainable development. Sustainability 3 (1), 270–292. https://doi.org/10.3390/su3010270.

Atanasovska, I., Choudhary, S., Koh, L., Ketikidis, P.H., Solomon, A., 2022. Research gaps and future directions on social value stemming from circular economy practices in agri-food industrial parks: insights from a systematic literature review. J. Clean. Prod. 354, 131753 https://doi.org/10.1016/j.jclepro.2022.131753.

Baral, M.M., Mukherjee, S., Singh, R.K., Chittipaka, V., Kazancoglu, Y., 2023. Exploring antecedents for the circular economy capability of micro, small and medium enterprises: an empirical study. Bus. Strategy Environ. 32 (8), 5785–5806. https://doi.org/10.1002/bse.3448.

Beaurain, C., Chembessi, C., Rajaonson, J., 2023. Investigating the cultural dimension of circular economy: a pragmatist perspective. *Journal* Clean. Prod. 417, 138012 https://doi.org/10.1016/j.jclepro.2023.138012.

Boffa, D., Prencipe, A., Papa, A., Corsi, C., Sorrentino, M., 2023. Boosting circular economy via the b-corporation roads. The effect of the entrepreneurial culture and exogenous factors on sustainability performance. Int. Entrep. Manag. J. 19, 523–561. https://doi.org/10.1007/s11365-023-00835-8.

Botta, E., Kozluk, T., 2014. Measuring environmental policy stringency in OECD countries – a composite index approach. OECD Economics Department Working Paper, No. 1177. OECD Publishing. ⟨https://www.oecd.org/economy/measuring-environmental-policy-stringency-in-oecd-countries-90ab82e8-en.htm⟩ (accessed 16 April 2023).

Boulding, K., 1966. The economics of the coming spaceship earth, 1st edition. Routledge, New York, United States.

Caferra, R., Tsironis, G., Morone, A., Tsagarakis, K.P., Morone, P., D'Adamo, I., 2023. Is the circular economy proposed as sustainability in firm mission statements? A semantic analysis. Environ. Technol. Innov. 32, 103304 https://doi.org/10.1016/j.eti.2023.103304.

Centobelli, P., Cerchione, R., Chiaroni, D., Del Vecchio, P., Urbinati, A., 2020. Designing business models in circular economy: a systematic literature review and research agenda. Bus. Strategy Environ. 29 (4), 1734–1749. https://doi.org/10.1002/bse.2466.

Davidson, D.J., Freudenburg, W.R., 1996. Gender and environmental risk concerns: a review and analysis of available research. Environ. Behav. 28 (3), 302–339. https://doi.org/10.1177/0013916596283003.

De Jesús, A., Mendonça, S., 2018. Lost in transition? Drivers and barriers in eco-innovation road to the Circular Economy. Ecol. Econ. 145, 75–89. https://doi.org/10.1016/j.ecolecon.2017.08.001.

De Serres, A., Murtin, F., Nicoletti, G., 2010. A framework for assessing green growth policies. OECD Economics Department Working Papers, No. 774. OECD Publishing. ⟨https://www.oecd-ilibrary.org/economics/a-framework-for-assessing-green-growth-policies_5kmfj2xvcmkf-en⟩ (accessed 16 April 2023).

Dean, T.J., McMullen, J.S., 2007. Toward a theory of sustainable entrepreneurship: reducing environmental degradation through entrepreneurial action. J. Bus. Ventur. 22 (1), 50–76. https://doi.org/10.1016/j.jbusvent.2005.09.003.

Díaz-García, C., González-Moreno, A., Sáez-Martínez, F.J., 2020. Circular economy and SMEs: insights and EU situation. In: Laveren, Blackburn, Ben-Hafaïedh, Díaz-García, González-Moreno (Eds.), Sustainable Entrepreneurship and Entrepreneurial Ecosystems. Frontiers in European Entrepreneurship Research. Edward Elgar, London, pp. 12–28.

Díez-Esteban, J.M., Farinha, J.B., García-Gómez, C.D., 2019. Are religion and culture relevant for corporate risk-taking? International evidence. Bus. Res. Q. 22 (1), 36–55. https://doi.org/10.1016/j.brq.2018.06.003.

Dopfer, K., Foster, J., Potts, J., 2004. Micro-meso-macro. J. Evolut. Econ. 14, 263–279. https://doi.org/10.1007/s00191-004-0193-0.

Ellen MacArthur Foundation, 2015. Growth Within: A Circular Economy Vision for a Competitive Europe. Ellen MacArthur Foundation. ⟨https://www.mckinsey.de/files/growth_within_report_circular_economy_in_europe.pdf⟩ (accesed 16 April 2023).

Estrada-Cruz, M., Verdú-Jover, A.J., Gómez-Gras, J.M., 2019. The influence of culture on the relationship between the entrepreneur's social identity and decision-making: effectual and causal logic. Bus. Res. Q. 22, 226–244. https://doi.org/10.1016/j.brq.2018.10.002.

European Commission, 2015. Closing the loop. An EU action plan for the Circular Economy. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. COM (2015) 614 final. ⟨https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0614⟩ (accesed 16 April 2023).

European Commission, 2020. A new Circular Economy Action Plan. For a cleaner and more competitive Europe. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. COM (2020) 98 final. ⟨https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386yuri=COM:2020:98:FIN⟩ (accesed 16 April 2023).

European Commission, 2023. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on a revised monitoring framework for the circular economy, Brussels, 15 May 2023 COM/2023/306. ⟨https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52019DC0640⟩ (accesed 16 February 2024).

Fabrizi, A., Guarini, G., Meliciani, V., 2018. Green patents, regulatory policies and research network policies. Res. Policy 47 (6), 1018–1031. https://doi.org/10.1016/j.respol.2018.03.005.

Fang, J., Gao, C., Lai, M., 2020. Environmental regulation and firm innovation: evidence from National Specially Monitored Firms program in China. J. Clean. Prod. 271, 122599 https://doi.org/10.1016/j.jclepro.2020.122599.

Farmer, A., 2020. Developing the Circular Economy in the European Union. in: Circular Economy: Global Perspective. Springer, Singapore, Singapore, pp. 389–412.

Fernandes, C.I., Veiga, P.M., Ramadani, V., 2023. Entrepreneurship as a transition to the circular economy. Environ., Dev. Sustain. https://doi.org/10.1007/s10668-023-03513-5.

Fortin, N.M., 2005. Gender role attitudes and the labour market outcomes of women across OECD countries. Oxf. Rev. Econ. Policy 21 (3), 416–438. https://doi.org/10.1093/oxrep/gri024.

Friant, M.C., Vermeulen, W.J., Salomone, R., 2021. Analysing European Union circular economy policies: words versus actions. Sustain. Prod. Consum. 27, 337–353. https://doi.org/10.1016/j.spc.2020.11.001.

Frondel, M., Horbach, J., Rennings, K., 2008. What triggers environmental management and innovation? Empirical evidence for Germany. Ecol. Econ. 66 (1), 153–160. https://doi.org/10.1016/j.ecolecon.2007.08.016.

Gabor, M.R., Panait, M., Bacos, I.B., Naghi, L.E., Oltean, F.D., 2023. Circular tourism economy in European Union between competitiveness, risk and sustainability. Environ. Technol. Innov. 32, 103407 https://doi.org/10.1016/j.eti.2023.103407.

Galia, F., Zenou, E., Ingham, M., 2015. Board composition and environmental innovation: does gender diversity matter? Int. J. Entrep. Small Bus. 24 (1), 117. https://doi.org/10.1504/IJESB.2015.066152.

Garrido-Prada, P., Leniban, H., Doran, J., Rammer, C., Perez-Alaniz, M., 2021. Driving the circular economy through public environmental and energy R&D: evidence from SMEs in the European Union. Ecol. Econ. 182, 106884. ⟨https://doi.org/10.1016/j.ecolecon.2020.106884⟩.

Ghisetti, C., Mancinelli, S., Mazzanti, M., Zoli, M., 2017. Financial barriers and environmental innovations: evidence from EU manufacturing firms. Clim. Policy 17 (1), 131–147. https://doi.org/10.1080/14693062.2016.1242057.

Ghisetti, C., Marzucchi, A., Montresor, S., 2015. The open eco-innovation mode. An empirical investigation of eleven European countries. Res. Policy 44 (5), 1080–1093. https://doi.org/10.1016/j.respol.2014.12.001.

Ghisetti, C., Montresor, S., 2020. On the adoption of circular economy practices by small and medium-size enterprises (SMEs): does "financing-as-usual" still matter? J. Evolut. Econ. 30, 559–586. ⟨https://link.springer.com/article/10.1007/s00191-019-00651-w⟩.

Glass, C., Cook, A., Ingersoll, A.R., 2016. Do women leaders promote sustainability? Analyzing the effect of corporate governance composition on environmental performance. Bus. Strategy Environ. 25 (7), 495–511. https://doi.org/10.1002/bse.1879.

González-Moreno, A., Triguero, A., Sáez-Martínez, F.J., 2019. Many or trusted partners for eco-innovation? The influence of breadth and depth of firm's knowledge network in the food sector. Technol. Forecast. Soc. Change 147, 51–62. https://doi.org/10.1016/j.techfore.2019.06.011.

Griffin, B., 2018. Hegemonic masculinity as a historical problem. Gend. Hist. *30* (2), 377–400. ⟨https://doi.org/10.17863/CAM.12481⟩.

Gura, K.S., Nica, E., Kliestik, T., Puime-Guillén, F., 2023. Circular economy in territorial planning strategy: incorporation in cluster activities and economic zones. Environ. Technol. Innov. 32, 103357 https://doi.org/10.1016/j.eti.2023.103357.

Hajoary, P.K., Ramani, V., Nuur, C., 2023. New for Some, old for others: circular economy practices in ancient time. Circ. Econ. Sustain. https://doi.org/10.1007/s43615-023-00323-9.

Hechavarría, D.M., Ingram, A., Justo, R., Terjesen, S., 2012. Are women more likely to pursue social and environmental entrepreneurship? In: Hughes, K.D., Jennings, J.E. (Eds.), Global women's entrepreneurship research: Diverse settings, questions and approaches Cheltenham. Edward Elgar, pp. 135–151.

Hofstede, G., 1980. Culture and organizations. Int. Stud. Manag. Organ. 10 (4), 15–41. https://doi.org/10.1080/00208825.1980.11656300.

Hofstede, G., 2001. Culture's Consequences: Comparing Values, Behaviours, Institutions and Organizations Across Nations, Second ed. Sage Publications, Thousand Oaks, USA.

Hofstede, G., Hofstede, G.L., Minkov, M., 2010. Cultures and Organizations: Software of the Mind, Revised and Expanded, Third ed. McGraw-Hill, New York, USA.

Horbach, J., 2008. Determinants of environmental innovation—new evidence from German panel data sources. Res. Policy 37 (1), 163–173. https://doi.org/10.1016/j.respol.2007.08.006.

Hörisch, J., Kollat, J., Brieger, S.A., 2017. What influences environmental entrepreneurship? A multilevel analysis of the determinants of entrepreneurs' environmental orientation. Small Bus. Econ. 48, 47–69. ⟨https://link.springer.com/article/10.1007/s11187-016-9765-2⟩.

House, R.J., Hanges, P.J., Javidan, M., Dorfman, P.W., Gupta, V., 2004. Culture, Leadership, and Organizations: The GLOBE Study of 62 Societies. Sage Publications, Thousand Oaks, USA.

Inglehart, R. 1997. World Value Survey. ⟨www.worldvaluesurvey.org⟩.

Iraldo, F., Testa, F., Melis, M., Frey, M., 2011. A Literature Review on the Links between Environmental Regulation and Competitiveness. Env. Pol. Gov. 21, 210–222. https://doi.org/10.1002/eet.568.

Jaffe, A.B., Palmer, K., 1997. Environmental regulation and innovation: a panel data study. Rev. Econ. Stat. 79 (4), 610–619. https://doi.org/10.1162/003465397557196.

Katz-Gerro, T., López Sintas, J., 2018. Mapping circular economy activities in the European Union: patterns of implementation and their correlates in small and medium-sized enterprises. Bus. Strategy Environ. 28 (4), 485–496. https://doi.org/10.1002/bse.2259.

Ketata, I., Sofka, W., Grimpe, C., 2014. The role of internal capabilities and firms' environment for sustainable innovation: evidence for Germany. RD Manag. 45 (1), 61–75. https://doi.org/10.1111/radm.12052.

Kirchherr, J., Piscicelli, L., Bour, R., Kostense-Smit, E., Muller, J., Huibrechtse-Truijens, A., Hekkert, M., 2018. Barriers to the circular economy: evidence from the European Union (EU). Ecol. Econ. 150, 264–272. https://doi.org/10.1016/j.ecolecon.2018.04.028.

Kirchherr, J., Reike, D., Hekkert, M., 2017. Conceptualizing the circular economy: an analysis of 114 definitions. Resour., Conserv. Recycl. 127, 221–232.

Koirala, S., 2019. SMEs: Key drivers of green and inclusive growth, OECD Green Growth Papers, No. 2019/03, OECD Publishing, Paris. ⟨https://www.oecd-ilibrary.org/environment/smes-key-drivers-of-green-and-inclusive-growth_8a51fc0c-en⟩ (accessed 16 April 2023).

Kostis, P.C., 2021. Culture, innovation, and economic development. J. Innov. Entrep. 10 (1), 1–16. ⟨https://innovation-entrepreneurship.springeropen.com/articles/10.1186/s13731-021-00163-7⟩.

Kostis, P.C., Kafka, K.I., Petrakis, P.E., 2018. Cultural change and innovation performance. J. Bus. Res. 88, 306–313. https://doi.org/10.1016/j.jbusres.2017.12.010.

Lewandowski, M., 2016. Designing the business models for circular economy-towards the conceptual framework. Sustainability 8 (1), 43. https://doi.org/10.3390/su8010043.

Li, J., Harrison, J.R., 2008. National culture and the composition and leadership structure of boards of directors. Corp. Gov.: Int. Rev. 16 (5), 375–385. https://doi.org/10.1111/j.1467-8683.2008.00697.x.

Liao, Z., Zhang, M., Wang, X., 2019. Do female directors influence firms' environmental innovation? The moderating role of ownership type. Corp. Soc. Responsib. Environ. Manag. 26 (1), 257–263. DOI: 10.1002/csr.1677.

Loiseau, E., Saikku, L., Antikainen, R., Droste, N., Hansjuergens, B., Pitkänen, K., Leskinen, P., Kuikman, P., Thomsen, M., 2016. Green economy and related concepts: an overview. J. Clean. Prod. 139, 361–371. https://doi.org/10.1016/j.jclepro.2016.08.024.

Malach-Pines, A., Schwartz, D., 2008. Now you see them, now you don't: gender differences in entrepreneurship. J. Manag. Psychol. 23 (7), 811–832. https://doi.org/10.1108/02683940810896358.

Malik, A., Sharma, P., Vinu, A., Karakoti, A., Kaur, K., Gujral, H.S., Munjal, S., Laker, B., 2022. Circular economy adoption by SMEs in emerging markets: towards a multilevel conceptual framework. J. Bus. Res. 142, 605–619. https://doi.org/10.1016/j.jbusres.2021.12.076.

Martínez Moreno, M.M., Buitrago Esquinas, E.M., Yñiguez, R., Puig-Cabrera, M., 2023. A global and comparative assessment of the level of economic circularity in the EU. J. Clean. Prod. 425, 138759 https://doi.org/10.1016/j.jclepro.2023.138759.

Marzucchi, A., Montresor, S., 2017. Forms of knowledge and eco-innovation modes: Evidence from Spanish manufacturing firms. Ecol. Econ. 13, 208–221. https://doi.org/10.1016/j.ecolecon.2016.08.032.

Matsa, D., Miller, A., 2013. A Female Style in Corporate Leadership? Evidence from Quotas. Am. Econ. J.: Appl. Econ. 5 (3), 136–169. https://doi.org/10.1257/app.5.3.136.

Mont, O.; Plepys, A.; Whalen, K., NuBholz, J.L.K., 2017. Business model innovation for a circular economy drivers and barriers for the Swedish industry – the voice of REES companies. Mistra REES. ⟨https://lup.lub.lu.se/record/833402ef-b4d4-4541-a10e-34d1e89d2146⟩ (accessed 14 February 2023).

Möslinger, M., Ulpiani, G., Vetters, N., 2023. Circular economy and waste management to empower a climate-neutral urban future. J. Clean. Prod. 421, 138454 https://doi.org/10.1016/j.jclepro.2023.138454.

Mueller, S.L., Thomas, A.S., 2001. Culture and entrepreneurial potential: a nine country study of locus of control and innovativeness. J. Bus. Ventur. 16 (1), 51–75. https://doi.org/10.1016/S0883-9026(99)00039-7.

Nadeem, M., Bahadar, S., Gull, A.A., Iqbal, U., 2020. Are women eco-friendly? Board gender diversity and environmental innovation. Bus Strat. Env. 29, 3146–3161. https://doi.org/10.1002/bse.2563.

Pearce, D.W., Turner, R.K., 1990. Economics of Natural Resources and the Environment. MD, USA, 1st ed. Johns Hopkins University Press, Baltimore.

Pérez-Cornejo, C., de Quevedo-Puente, E., Delgado-García, J.-B., 2021. The role of national culture as a lens for stakeholder evaluation of corporate social performance and its effect on corporate reputation. Bus. Res. Q. 26 (4), 282–296. https://doi.org/10.1177/23409444211007487.

Pheifer, A.G., 2017. Barriers and Enablers to Circular Business Models. ⟨http://www.valuec.eu/wp-content/uploads/2017/04/Whitepaper_ValueC_Barriers_Enablers_to_CBM.pdf⟩ (accessed 1 November 2023).

Porter, M.E., der Linde, C, Van, 1995. Toward a new conception of the environment-competitiveness relationship. J. Econ. Perspect. 9 (4), 97–118. ⟨https://10.1257/jep.9.4.97⟩.

Prieto-Sandoval, V., Jaca, C., Ormazabal, M., 2018. Towards a consensus on the circular economy. J. Clean. Prod. 179, 605–615. https://doi.org/10.1016/j.jclepro.2017.12.224.

Ranta, V., Aarikka-Stenroos, L., Mäkinen, S.J., 2018. Creating value in the circular economy: a structured multiple-case analysis of business models. J. Clean. Prod. 201, 988–1000. https://doi.org/10.1016/j.jclepro.2018.08.072.

Rizos, V., Behrens, A., Van der Gaast, W., Hofman, E., Ioannou, A., Kafyeke, T., Flamos, A., Rinaldi, R., Papadelis, S., Hirschnitz-Garbers, M., Topi, C., 2016. Implementation of circular economy business models by small and medium-sized enterprises (SMEs): barriers and enablers. Sustainability 8 (11), 1212. https://doi.org/10.3390/su8111212.

Rovanto, S., Finne, M., 2023. What motivates entrepreneurs into circular economy action? evidence from Japan and Finland. J. Bus. Ethics 184, 71–91. https://doi.org/10.1007/s10551-022-05122-0.

Rubashkina, Y., Galeotti, M., Verdolini, E., 2015. Environmental regulation and competitiveness: Empirical evidence on the Porter Hypothesis from European manufacturing sectors. Energy Policy 83, 288–300. https://doi.org/10.1016/j.enpol.2015.02.014.

Sánchez-García, E., Martínez-Falcó, J., Marco-Lajara, B., Manresa-Marhuenda, E., 2024. Revolutionizing the circular economy through new technologies: a new era of sustainable progress. Environ. Technol. Innov. 33, 103509 https://doi.org/10.1016/j.eti.2023.103509.

Schwartz, S., 1994. Beyond individualism-collectivism: New cultural dimensions of values. In: Kim, U., Triandis, H.C., Kagitcibasi, C., Choi, S.-C., Yoon, G. (Eds.), Individualism and collectivism: Theory, method, and application. Sage, Newbury Park, CA (USA), pp. 81–119.

Shinnar, R.S., Giacomin, O., Janssen, F., 2012. Entrepreneurial perceptions and intentions: the role of gender and culture. Entrep. Theory Pract. 36 (3), 465–493. https://doi.org/10.1111/j.1540-6520.2012.00509.x.

Stucki, T., 2019. Which firms benefit from investment in green energy technologies? The effect of energy costs. Res. Policy 48, 546–555. https://doi.org/10.1016/j.respol.2018.09.010.

Suchek, N., Ferreira, J.J., Fernandes, P.P., 2022. A review of entrepreneurship and circular economy research: state of the art and future directions. Bus. Strategy Environ. 31 (5), 2256–2283. https://doi.org/10.1002/bse.3020.

Terjesen, S., Bosma, N., Stam, E., 2016. Advancing public policy for high-growth, female, and social entrepreneurs. Public Adm. Rev. 76 (2), 230–239. ⟨http://www.jstor.org/stable/24757963⟩.

Thanetsunthorn, N., 2015. The impact of national culture on corporate social responsibility: Evidence from cross-regional comparison. Asian. J. Bus. Ethics 4 (1), 35–56. ⟨https://10.1007/s13520-015-0042-2⟩.

Thomas, A.S., Mueller, S.L., 2000. A case for comparative entrepreneurship: assessing the relevance of culture. J. Int. Bus. Stud. 31 (2), 287–301. ⟨https://www.jstor.org/stable/155638⟩.

Triandis, C., 1993. Collectivism and individualism as cultural syndromes. Cross Cult. Res. 27, 155–180. https://doi.org/10.1177/106939719302700301.

Triguero, Á., Cuerva, M.C., Sáez-Martínez, F.J., 2022. Closing the loop through eco-innovation by European firms: circular economy for sustainable development. Bus. Strategy Environ. 31 (5), 2337–2350. ⟨https://onlinelibrary.wiley.com/doi/pdf/10.1002/bse.3024⟩.

Triguero, A., Moreno-Mondéjar, L., Davia, M.A., 2015. Eco-innovation by small and medium-sized firms in Europe: from end-of-pipe to cleaner technologies. Innov.: Manag., Policy Pract. J. 17, 24–40. https://doi.org/10.1080/14479338.2015.1011059.

Trompenaars, F., Hampden-Turner, C., 1993. Riding the waves of culture: understanding diversity in global business. Cultural dimension model, Third edition. McGraw-Hill, New York, USA.

Urbinati, A., Chiaroni, D., Chiesa, V., 2017. Towards a new taxonomy of circular economy business models. J. Clean. Prod. 168, 487–498. ⟨https://doi.org/10.1016/j.jclepro.2017.09.047⟩.

Uusikartano, J., Väyrynen, H., Aarikka-Stenroos, L., 2021. Public actors and their diverse roles in eco-industrial parks: a multiple-case study. J. Clean. Prod. 296, 126463 https://doi.org/10.1016/j.jclepro.2021.126463.

Wang, Y., Sun, X., Guo, X., 2019. Environmental regulation and green productivity growth: empirical evidence on the Porter Hypothesis from OECD industrial sectors. Energy Policy 132, 611–619. https://doi.org/10.1016/j.enpol.2019.06.016.

Winans, K., Kendall, A., Deng, H., 2017. The history and current applications of the circular economy concept. Renew. Sustain. Energy Rev. 68 (1)), 825–833. https://doi.org/10.1016/j.rser.2016.09.123.

Zelezny, L.C., Chua, P.-P., Aldrich, C., 2000. Elaborating on gender differences in environmentalism. J. Soc. Issues 56 (3), 443–457. https://doi.org/10.1111/0022-4537.00177.

Zhu, B., Nguyen, M., Siri, N.S., Malik, A., 2022. Towards a transformative model of circular economy for SMEs. J. Bus. Res. 144, 545–555. https://doi.org/10.1016/j.jbusres.2022.01.093.

Zucchela, A., Urban, S., 2019. Circular entrepreneurship: Creating responsible enterprise. 1st ed. Palgrave MacMillan. https://doi.org/10.1007/978-3-030-18999-0.