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SOCIALES**



DOCTORAL DISSERTATION

**CIRCULAR ECONOMY FROM MACRO TO MICRO:
NATIONAL IMPACT, CORPORATE STRATEGIES AND
DIGITAL ENGAGEMENT**

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INTRODUCTION

INTRODUCTION

The combination of global resource scarcity, climate change and increasing resource consumption has pushed the linear economy to its limits. This confluence of factors highlights the need for new business models that can achieve harmony across the economic, environmental and social dimensions of sustainable development (SD).

The circular economy (CE) has attracted much attention in academic research and practice in recent years because of its potential to contribute to SD. The CE operates on three fundamental principles: designing out waste and pollution, keeping products and materials in use at the highest possible value, and regenerating natural systems (Ellen MacArthur Foundation, 2022). The definition of the CE has not yet been standardised (Kirchherr et al., 2017). To define the CE, this PhD thesis uses the definition provided by the Ellen MacArthur Foundation (2014, p. 7): “A circular economy is an industrial system that is restorative or regenerative by intention and design. It replaces the ‘end-of-life’ concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models”.

The potential of the CE means that this interdisciplinary topic continues to attract interest from economists, engineers, chemists, biologists and experts from other specialisations. Within this context, this PhD thesis aims to expand the existing literature in a meaningful way by thoroughly investigating the impact of CE implementation. It aims to explain the potential, importance and relevance of the CE business model, thereby contributing to a better understanding of its role in fostering SD. Furthermore, this thesis endeavours to create compelling incentives for transitioning from the traditional linear business model of production-consumption-disposal to a sustainable paradigm of make-use-reuse-remake-recycle (Mhatre et al., 2021). By analysing the potential, necessity and relevance of this transformation, the thesis underscores the substantial benefits of embracing CE strategies at country

and company levels. Furthermore, a social media analysis illustrates the relevance of the CE for German companies and examines the characteristics of companies that are active in the CE. The impact of various CE strategies on company reputation is also analysed. In addition to investigating possible relationships with environmental performance and the dimensions of SD, this thesis examines further potential benefits of CE implementation, such as enhanced corporate reputation, which can lead to positive spillover effects. To achieve the research objectives, the thesis is structured into four chapters.

Chapter 1 examines the relationship between the CE and its value sources of renewable energy, reuse and sharing, repair and remanufacturing, and recycling, as well as their impact on SD from a European country perspective. This analysis considers the three dimensions of SD: the social dimension, measured by unemployment rate; the economic dimension, measured by gross domestic product (GDP) per capita; and the environmental dimension, measured by greenhouse gas (GHG) emissions. Principal component analysis enables the combination of the individual value sources of the CE into an overall CE measure in order to determine the influence of CE for the countries studied. This chapter presents empirical evidence of the potential of the CE to achieve SD from a macroeconomic perspective and supports evidence from previous studies (Bocken et al., 2018; Deloitte, 2016; Ellen MacArthur Foundation, 2015a). This approach reflects a comprehensive view and represents an advance with respect to earlier research, which has primarily focused on the effects of CE on individual dimensions of SD. The empirical analysis is based on a sample of 25 European countries for the period 2010 to 2019 and panel data methodology is used.

Chapter 2 examines the relevance of the CE in German companies using social media data from LinkedIn. Around the world, companies are exploring ways to unleash the potential of the CE and transition to CE business models (Elia et al., 2017; Nesterova, 2022; Schroeder et al., 2019). A number of studies have already highlighted the potential of the CE for companies (Chen and Dagestani, 2023; Chui et al., 2024; Rodríguez-Espíndola et al., 2022; Rusmayadi et al., 2023). This chapter analyses the relevance of the CE for companies using real-life data from LinkedIn. Based on a meso-level analysis

of the 16 federal states of Germany, companies whose profile on the social media platform LinkedIn indicates activity in the CE are analysed. This analysis extends the approach to using data from LinkedIn developed by Tsironis et al. (2022). Specifically, it focuses on all German companies that claim to be active in the CE sector on LinkedIn. In addition to investigating the development of relevance and the absolute number of companies, the study also examines the most prominent strategies mentioned by the companies. The empirical study is based on a sample of 514 German companies analysed on the basis of four data sets collected from January 2022 in a four-month cycle until January 2023.

In Chapter 3, the data mining approach presented in Chapter 2 is used to analyse information and characteristics of CE professionals on LinkedIn. Using data on individuals whose LinkedIn profiles indicate activity in the field of CE, profile analysis based on their demographic characteristics, specialisations, professional positions and employers is presented. By analysing 3,245 profiles from four European countries (Austria, Cyprus, Germany and Greece), important characteristics of CE employees are identified.

Chapter 4 analyses the effects of a variety of CE strategies on the environmental performance and corporate reputation of companies. After the macro-level analysis in Chapter 1 and the meso-level analysis in Chapter 2, Chapter 4 deals with the effects of the CE at the micro-economic level. While Chapter 2 illustrates the increasing relevance of the CE for companies, Chapter 4 analyses the individual company effects of the CE strategies of renewable energies, recycling, and the integration of sustainable policies. The empirical sample consists of 67 global companies across 12 countries (United States, Germany, Japan, United Kingdom, Switzerland, France, Belgium, Finland, Korea, Netherlands, Spain and Sweden) over the period 2015 to 2023. The analysis is based on panel data methodology with random and fixed effects.

To complete this PhD thesis, a comprehensive conclusions section synthesises the primary findings and conclusions of the studies presented in these chapters. This section not only highlights the relevant contributions to the existing literature but also outlines future research avenues. Additionally, it addresses the limitations of the studies and explains the principal implications for managers, policymakers and practitioners in relation to the CE.

GENERAL CONCLUSIONS

The structure of this thesis enables comprehensive examination of the emerging circular economy (CE) business model. By providing a rigorous analysis of its relationships with sustainable development (SD), environmental performance, corporate reputation and other critical dimensions, this study offers deep insights into the transformative potential of the CE model. Furthermore, it emphasises the increasing importance of this topic in the current academic landscape and practical context. The following section outlines the core findings and conclusions. It emphasises how this thesis contributes to academic research, examines the limitations of the studies and suggests directions for future research that could build upon the insights gained from this thesis.

Chapter 1 of this PhD thesis rigorously investigates the effects of the CE strategies of renewable energy, reuse and sharing, repair and remanufacturing, and recycling on the three dimensions of SD at the macro level. Through principal component analysis, a composite metric is developed to consolidate these strategies into an overarching CE score. The results offer compelling evidence that the CE positively affects all dimensions of SD. Specifically, countries with higher CE scores have lower unemployment rates (social dimension), lower greenhouse gas (GHG) emissions (environmental dimension), and higher gross domestic product (GDP) per capita (economic dimension). This empirical analysis underscores the transformative potential of CE strategies in fostering

comprehensive SD outcomes. Its findings are thus in line with previous research (Cheng, 2016; Cudjoe et al., 2021; Fang, 2011; Jansson, 2016; Johansson and Henriksson, 2020; Matsumoto et al., 2016; Mendonça et al., 2020). However, each individual CE strategy exerts a distinct influence on the attainment of SD. First, renewable energy and reuse and sharing effectively mitigate environmental impacts. This finding is consistent with previous research (Kathan et al., 2016; Lee, 2019; Mukoro et al., 2021). Second, recycling has no discernible effect. Third, repairing activities actually increase GHG emissions. Notably, repair is the sole CE strategy with a positive economic impact at the national level. Finally, renewable energy, repair and recycling contribute to reducing unemployment rates, which is consistent with previous literature (Beccarello and Di Foggia, 2018; Bulavskaya and Reynès, 2018; Jansson, 2016; Llorente-González and Vence, 2020). These nuanced findings highlight the varied effects of different CE strategies on environmental sustainability, economic performance and social outcomes, emphasising the complexity and multifaceted nature of implementing CE strategies. The macroeconomic benefits of the CE presented in this chapter justify the approach of adopting differentiated perspectives in subsequent chapters to enable a holistic assessment of the business model.

Chapter 2 analyses the importance of the CE for companies in Germany and its 16 federal states. Based on social media data from LinkedIn, this thesis shows a significant 36.34% increase in companies active in the CE within one year, in line with the findings of previous research (Bassi et al., 2021). Analysis of the industry sectors of all 514 German companies included in the research provide further insights. The most relevant sectors are “Environmental Services”, “Management Consulting”, “Renewables & Environment”, “Research”, and “Computer Services”. These sectors are consistent with those identified in previous research at the European level (Tsironis et al., 2022). Profile analysis of the analysed companies reveals that the term “recycling” is more frequently associated with these CE companies than all other strategies combined. This finding, which is in line with those of previous research (Morseletto, 2020; Reike et al., 2018; Schöggel et al., 2020), underscores a predominant focus

on recycling within the discourse surrounding the CE. The findings from Chapter 1 imply that recycling has a negligible impact on the environmental and economic dimensions at the national level. Building on these findings, this thesis underscores the greater importance and potential impact of other CE strategies. Chapter 2 further highlights the need for a broader view in CE discussions that looks beyond recycling. This thesis aims to promote such a perspective. These insights underscore the evolving landscape of CE practices in Germany, indicating both increasing interest and a predominant emphasis on recycling. They also highlight the need for a more comprehensive approach to reap the full benefits of CE strategies.

Chapter 3 presents analysis of 3,245 LinkedIn profiles of professionals active in the field of CE. The study covers four European countries: Austria, Cyprus, Germany and Greece. The analysis presents insightful findings in relation to demographic and professional characteristics. Men tend to feature more words in their profile descriptions than women, linked to higher numbers of followers. In general, the findings reveal that the average number of followers rises as the number of words used in the profile summary increases. Further, the results identify more than 500 different occupations associated with CE profiles. The most frequently cited job titles are “Chief Executive Manager” (Austria), “Environmentalism” (Cyprus), “Project Manager” (Germany) and “Researcher” (Greece). Employers with the most CE employees are Borealis (Austria), Ernst & Young Greece, the University of Piraeus (Greece), BASF (Germany) and Circular Economy Alliance (Cyprus).

The results presented in Chapter 4 show that environmental performance can have a positive influence on corporate reputation. This finding is in line with previous research (Baah et al., 2021; Mehmood et al., 2024; Quintana-García et al., 2022; Torelli et al., 2020). Further, the findings imply that CE strategies can enhance a firm’s environmental performance and corporate reputation. Specifically, adopting renewable energy improves firms’ environmental performance by reducing GHG emissions and overall energy consumption. This finding is consistent with previous research (Chui et al., 2024; Dey et al., 2022; Rusmayadi et al., 2023). Moreover, companies that prioritise renewable energy tend

to enjoy a stronger corporate reputation. This enhanced reputation can translate into several advantages: greater customer trust and loyalty due to perceived environmental stewardship, improved ability to attract and retain top talent drawn to sustainable practices, enhanced investor confidence leading to improved access to capital, increased resilience in coping with crises and regulatory challenges, and heightened brand value and differentiation in competitive markets (Fombrun and Shanley, 1990). The CE strategy of recycling contributes to reducing overall energy use but does not correlate with reductions in GHG emissions or improvements in corporate reputation. The implementation of sustainable policies strengthens companies' reputation, without improving environmental performance in the form of lower GHG emissions or energy consumption. This dual perspective underscores the complexity and potential risks associated with greenwashing. It highlights the importance for companies of carefully evaluating and implementing CE strategies that align with their sustainability goals to achieve meaningful and credible outcomes.

In light of the results of the analysis, this PhD thesis provides important insights and relevant contributions to academic research in the field of management and business administration by delivering critical insights into the role of the CE as a transformative business model. It presents an analysis at both microeconomic and macroeconomic levels, emphasizing the multifaceted relevance of different CE strategies for sustainable development, environmental performance, and corporate reputation. First, from a macroeconomic perspective, the results demonstrate that CE can positively influence all three dimensions of SD: social, environmental and economic. The development of a composite CE measure helps to empirically confirm that the CE contributes to reducing unemployment rates (social), lowering GHG emissions (environmental) and increasing GDP per capita (economy). However, the findings emphasise that none of the examined CE strategies is sufficient to achieve these outcomes in isolation. Second, by analysing real life social media data, this thesis underscores the increasing relevance of CE at the company level and sheds light on the characteristics of CE professionals. The findings highlight the increasing involvement of companies in CE practices while

also providing insights into the demographics and professional profiles of those driving these initiatives. Further, the research addresses the ongoing challenge of equating CE predominantly with recycling. While recycling can improve energy efficiency of firms, the analysis reveals that it does not significantly influence emissions at either the micro or macro level. Thus, the need for a broader perspective incorporating diverse CE strategies to achieve meaningful SD outcomes is highlighted. Finally, the thesis makes a valuable contribution to the corporate reputation literature by analysing how corporate environmental efforts and sustainability strategies affect corporate reputation. It provides empirical evidence of the effects of CE strategies on corporate reputation while also pointing out the risks associated with greenwashing.

Although this PhD thesis makes progress in various fields, it still has certain limitations. First, the geographical scope of the analysis is limited to 25 European countries. Hence, general conclusions at the macroeconomic level cannot be drawn from this thesis. Furthermore, the novelty of the topic leads to difficulties in data collection. In some cases, the indicators only partially cover the target concept, particularly in relation to reuse and sharing and repair and remanufacturing. The current issue of missing or incomplete data records should be taken into account in the future. Furthermore, the short observation period (Chapter 2) and the demographic and quantitative restrictions (Chapter 3) are also limitations. The chosen method enables continuous monitoring of results and further development of the analyses. The greatest limitation of Chapter 4 results from the scarcity of data on corporate reputation.

The results presented in this PhD thesis provide new lines of future research. Researchers should focus on developing measures to assess CE strategies. Given that this topic is still relatively new, current studies use a wide range of metrics, indicators and methods, making it difficult to standardise findings. Therefore, one key area for future research would be to identify and apply more consistent and appropriate indicators. Additionally, future studies should aim to use longer evaluation periods. At present, many data sets from countries, companies and institutions relating to sustainability, resource

use and environmental strategies cover only a few years. Because countries and companies are increasingly required to make their environmental and sustainability efforts more transparent to meet environmental regulations, guidelines and laws, new data resources will become available in the future. These evolving data sets will provide more comprehensive information, enabling longer-term analyses of sustainability, resource use and CE strategies. Extending study periods will provide more robust insights into long-term impacts and trends. Moreover, the findings from ongoing research must be continuously monitored and revaluated. Such continuous review could involve applying the developed methodologies in different contexts or extending analysis periods to ensure the reliability and generalisability of results.

Finally, this thesis leads to important recommendations for managers, practitioners and decision makers. First, the thesis emphasises the potential of introducing CE to improve environmental performance and achieve SD. In addition, it shows that CE strategies can also be used to strengthen corporate reputation, which can in turn lead to spillover effects. The thesis also emphasises the need for companies to engage actively with the CE because the transformation is progressing rapidly and companies run the risk of missing out on transitioning to new business models. Furthermore, the thesis shows the danger of sustainability strategies that have no influence on actual environmental performance (e.g. sustainable policies). Companies run the risk of greenwashing, which exposes them to major reputational risk. Managers should seize the opportunity to reap the full benefits and potential of CE strategies. However, the thesis also shows that no single CE strategy can achieve all dimensions of SD on its own. The interplay of various CE strategies is what leads to the achievement of SD and the Sustainable Development Goals (SDGs). Policymakers should ensure that sustainability strategies actually lead to environmental improvements and are not just framed in terms of an improved reputation. Strict regulations, monitoring and controls can ensure that companies that advertise environmental and sustainable management must also genuinely improve their environmental

performance. All stakeholders, managers and politicians should also recognise the full scope of the CE and should not just associate the CE business model exclusively with the term recycling.

Despite its limitations, this PhD thesis offers further insight into issues previously highlighted by scholars and practitioners alike. It thus deepens the existing understanding of the CE.

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