



D2.1 Supply Chain Configurations and alternative Circular Futures

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Introduction

This deliverable of the ExPliCit project presents a first reflection on the configuration of supply chain and production networks under different Circular Economy (CE) future scenarios. In this sense, this work is closely linked to efforts conducted within WP1, specifically Deliverable 1.4, titled “Report from a Series of Workshops with the Scenario Exploration System Foresight Tool”, which presented an in-depth literature review and an iterative co-creation process that led to the design of four scenarios for circular futures. These scenarios are based on the intersection of two key dimensions: the governance model (ranging from bottom-up, decentralised to top-down, centralised society) and the priority focus (either economic growth or a shift towards environmental sustainability and social equity, reflecting limits to growth). The resulting four scenarios are: Centralised Circular Uptake, Planned Circular Loops, Decentralised Circularity Uptake, Bottom-Up Circular Loops (Figure 1).

This Deliverable 2.1, titled “Supply Chain Taxonomy in different Circular Futures”, pushes forward the characterisation of different Circular Economy futures, by examining how supply chains are organised in each of the four scenarios. This research contributes to current debates on circular futures by elaborating on the supply chains implications of future transition pathways to a CE. Circular Futures that feature different approaches to governance and economic growth are indeed expected to favour different pathways towards circularity. In each of these pathways, organisations might tend to organise their supply chains in very different ways, depending on who is involved in taking decisions on what to produce and how, and on what factors/values they prioritise. For example, the promotion of (or the absence of) strong environmental legislation is expected to impact what supply chain configuration is going to emerge as the most effective in satisfying societal needs, by affecting costs of production.

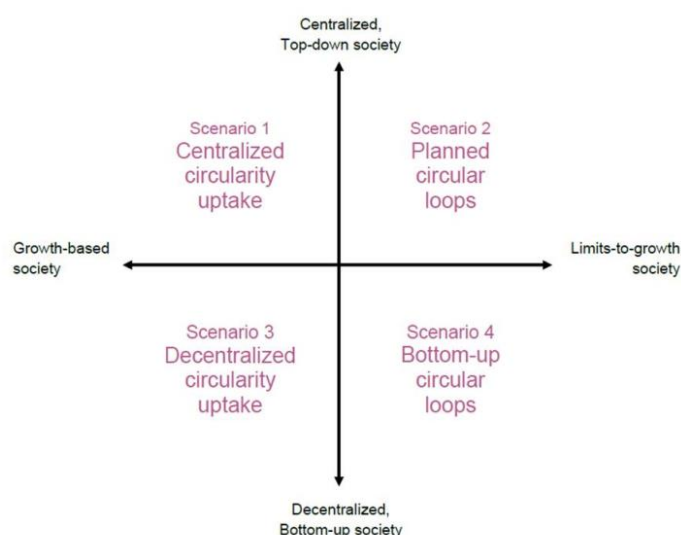


Figure 1 - Each of the 4 scenarios explores different pathways towards circularity, shaped by varying levels of governance and growth priorities.

The following paragraphs introduce the four scenarios and then explain how each chapter contributes to the objectives of this deliverable.

As described in D1.4, in Scenario 1, namely *Centralised Circular Uptake* (characterised by an unrestricted pursuit of growth and centralised governance) the state and large corporations promote circular innovations and technical solutions for addressing the shortcomings of linear production and consumption systems. Their goals are to increase economic growth and to decouple economic growth from the environmental impact of certain elements (mainly trying

to reduce greenhouse gas emissions). Key strategic resources such as critical raw materials for green technologies and artificial intelligence are under their strict control and are used to maintain the status quo. Circular economy practises aim to improve material efficiency through massive recycling and energy recovery facilities, using recycled materials instead of primary materials. With personalised advertising, citizens are encouraged to consume ever-increasing amounts of environmentally friendly and circular goods for emerging needs. There is no control over planned obsolescence, which is actually used as a tool to stimulate economic growth. Although greenhouse gas emissions are partially decoupled from economic growth, most other impacts and environmental limits are not. As a result, the effects of ecological crises that threaten human existence are worsening.

Within this context, Chapter I of this Deliverable is a paper, titled “Unlocking Circularity: the Interplay between Institutional Pressures and Supply Chain Integration”, which has been published in the *Journal of Operations and Production Management*. This empirical research examines Circular Economy practices in Global Fortune 500 Multinational Enterprises (MNEs) focusing on how supply chain integration and institutional pressures shape decision-making. Despite this research is based on current secondary data, many of the contextual conditions are coherent to a Centralised Circular Uptake future. In a Centralised Circular Uptake future, large Multinational Enterprises are expected to react to institutional pressures coming from governments, industry groups and the market and adopt CE practices as a way to improve their legitimacy to consumers and society. The only way in which MNEs can operationalise CE principles over their global supply chains, is through a greater control of their suppliers and customers. To demonstrate this, this paper describes how Supply Chain Integration is a fundamental mechanism to facilitate the adoption of Circular Economy practices at a (global) supply chain level, directly characterising important aspects of supply chains in a scenario where the transition to a CE is led by MNEs.

In Scenario 2, namely *Planned Circular Uptake* (characterised by the imposition of limits to economic growth and a centralised governance) nation states, large corporations and international organisations such as the UN work together to create a society where the transition towards a CE through a technocratic and authoritarian regime of decision-making. Economic activity remains in the hands of a few organisations and the benefits are largely distributed among them. The organisations in control produce standard products and distribute them more or less equally to the population. This could include a rationing system, a heavy tax system to centralise large priority investments, and various ways of accessing products such as product-as-a-service models and sharing economy models. In this context, the CE aims to reduce production and consumption by all means and adapt society's throughput to the limits of nature. As a result, supply chains are shifting to more localised structures due to the escalating costs associated with global supply chains. Circular districts, for example, could be promoted and multiplied. The crucial aspect in this scenario is that decision-making on production and consumption lies in a few hands that aim to adapt societal throughput to the limits of nature.

Within this context, Chapter II of this Deliverable is a titled “Reshoring initiatives and circular economy practices – strange bedfellows?” (which has already been presented at the international conference IPSERA 2024 in Rio de Janeiro), resulting from several secondments conducted by the UNICT and USFD research teams. This empirical research examines an in-depth case study of a short and circular supply chain, which, following strong government pressures and incentives, re-localised its production and adopted CE practices. Also this research uses historical longitudinal data (from 2016 to 2024), but describes a very peculiar case and context, in which a national government, created strong institutional pressures to

support local manufacturing firms to reshore their production and their sourcing of parts and components previously offshored to the Far East. These institutional conditions are aligned with a future of *Planned Circular Uptake* with top-down governance (in this case the strong top-down legislation) and limits to growth approach (in this case, the promotion of recycled and greener materials, as well as circular business models).

In Scenario 3, namely *Decentralised Circular Uptake* (characterised by the unrestricted pursuit of growth and decentralised governance), the state does not restrict social throughput and uses subsidies and eco-taxes to change demand in the hope that companies will develop cleaner and more circular innovations and technologies. Society is fighting back against the dominance of large corporations and reclaiming ownership of personal data that tech companies have used to expand their power. Following some anti-monopoly measures, economic activity is becoming much more distributed across society and decentralised within different organisations, revitalising innovation across the economy. CE strategies are incentivised to keep key materials and energy within its economic sphere and improve security of supply and social efficiency. Commoditisation opens up new avenues for economic growth. In the long term, this system struggles to prevent environmental degradation as many negative externalities remain untreated as low-cost transport encourages long, global supply chains with multiple actors. There are also still problems with coordination, especially for larger circular initiatives.

In Scenario 4, *Bottom-up Circular Loops* (characterised by the imposition of limits to growth within a decentralised governance approaches) the transition to a CE happens within a more widely systemic change to an ecologically and socially just political system. Autonomous organisations emerge at a local level, using CE strategies as a tool to achieve sufficiency through self-organising initiatives and imposing thresholds for maximum consumption of resources. The CE is understood in a broader sense (energy-material, biogeochemical, supply and energy cycles). Supply chains are shortened and located in close proximity to the places of consumption and production systems adapt in the long term to the resources available nearby. Regional coordination boards take responsibility for resource allocation at a local level.

In order to characterise further these two scenarios, Chapter III of this Deliverable presents an early version of some research conducted by the UPN and USFD research teams (resulting from several secondments). In this paper (already submitted to an international conference) the focus is on decentralised peer-to-peer platforms providing customers with access to goods and services, analysing their effectiveness in promoting sustainable practices, supporting community-based resource sharing, and fostering a transition toward a model that respects ecological limits. The findings reveal that the concept of "sharing" varies significantly across different types of platforms, which enable it in distinct ways – whether through ownership structures, access models, or means of exchange. This chapter provides a detailed characterisation of sharing platforms across various industries, focusing on the two contrasting Circular Futures characterised by decentralised governance. In the first one, in line with *Decentralised Circular Uptake*'s conditions, platforms prioritise profit maximisation over ecological or social objectives, operating primarily with a commercial focus rather than a sustainability-driven mission. In the second one, in line with *Bottom-up Circular Loops*, platforms align with a "limits to growth" perspective, facilitate a sufficiency economy and foster sustainable interactions within communities.

The rest of the deliverable presents, in each of the chapters, the three individual studies; some concluding remarks are then offered, also sharing some perspectives about future research avenues.

CHAPTER I -

Unlocking Circularity: The Interplay between Institutional Pressures and Supply Chain Integration

Abstract

This paper investigates the role of Institutional Pressures (IPs) and Supply Chain Integration (SCI) in driving the adoption of Circular Economy (CE) practices. It is hypothesised that, responding to IPs, firms might adopt higher levels of SCI in the attempt to implement CE practices. A research model is developed and tested on a cross-sectional sample of 150 Multi-National Enterprises (MNEs). Textual content from Corporate Sustainability reports is used to measure the constructs of interest through an advanced coding approach. Findings show that IPs are driving the adoption of CE practices primarily through the mediation of SCI; the prominent roles of coercive regulatory pressures (CRPs) and normative pressures (NPs) are also highlighted. CRPs influence on CE practices is partially mediated by SCI, with NPs influence being fully mediated by it. The study shows that SCI is a key mechanism that lies in between IPs and CE practices; as such, organisations interested in implementing CE practices need to be aware of requirements for achieving higher levels of SCI. This empirical study is the first large scale analysis that conceptualises how MNE-driven supply chains adopt CE practices. The study empirically validates the model and identifies research avenues in Supply Chain Management (SCM) research to support the adoption of CE practices.

1 Introduction

The Circular Economy (CE) paradigm is becoming increasingly important for its potential to address grand societal challenges like climate change, waste generation, and resource scarcity. CE-related concepts have been incorporated in policy discussion and initiatives (European Commission, 2020), and, subsequently, in corporate sustainability plans in the last decade (Sehnem *et al.*, 2019). The political push for a CE is stimulating the development of new production systems where materials and products are reused, remanufactured and recycled, leading to positive environmental, social and economic outcomes (Batista *et al.*, 2023).

The literature has recognised institutional pressures (IPs), of coercive (related to legislative and market constraints), normative (linked to industrial standards) and mimetic (due to inter-firm competitive dynamics) natures as important drivers to the adoption of CE practices (Ranta *et al.*, 2018) and crucial factors in driving the transition towards more sustainable futures (Venkatesh *et al.*, 2020; Calzolari *et al.*, 2023). It is also acknowledged that the prevalence of different types of pressures might result in alternative types of CE implementations, ranging from market-driven to state-led circularity (Bauwens *et al.*, 2020; Genovese and Pansera, 2021).

Within this context, it is widely understood that CE practices cannot be implemented, in isolation, at a single firm level, but require the collaboration of many actors (Chavez *et al.*, 2023). In order operationalise CE principles, it is crucial to establish Circular Supply Chains (CSCs). CSCs go beyond the traditional linear flow of materials from suppliers to customers, and instead involve new actors such as collectors, sorters, re-processors and remanufacturers (Bimpizas-Pinis *et al.*, 2022). By expanding the scope of collaboration horizontally across different sectors, CSCs help to promote the implementation of CE principles and business models in practice, for example enhancing markets of secondary products and materials and

promoting servitisation (EMF, 2015; De Angelis *et al.*, 2018). Therefore, to achieve a transition towards CSCs, it is crucial to enhance the capacity of companies to share knowledge, information and planning practices with their partners (Cousins *et al.*, 2019; Herczeg *et al.*, 2018). This can help to reduce uncertainty and resource dependency (Silva *et al.*, 2023). In order to develop such capabilities, improving Supply Chain Integration (SCI) has been recognised as a key strategy for promoting collaboration across CSC networks (Calzolari *et al.*, 2021).

In order to achieve the transition towards a CE, a major contribution is expected from Multi-National Enterprises (MNEs), as these organisations coordinate resource-intensive global supply networks, which are responsible for a very relevant share of carbon emissions and primary materials extraction worldwide (Zhang *et al.*, 2020; Calzolari *et al.*, 2021). MNEs (either private or state-owned) significantly influence resources allocation, investments, materials selection, and product design (Kostova *et al.*, 2008; Suwandi *et al.*, 2019). MNEs are key players to foster upstream-downstream collaborations in CSCs, to support the recovery and sourcing of secondary raw materials. As such, it makes sense to scrutinise them, taking advantage of the vast amount of unstructured data they are already obliged to publish every year, following pressures from governments and societal stakeholders, which are requesting more detailed disclosure on commitments, targets and indicators¹.

This study, based on MNEs in Asian and European countries, examines the impact of external pressures on the adoption of CE-oriented practices, and the mediating effect of SCI.

This paper argues that SCI plays a key role in influencing responses to IPs for CE. The bi-directionality of resource flows across supplier-consumer nodes of a CSC requires alignment with further actors external to the focal supply chain to enable the circular flow of resources (Bimpizas-Pinis *et al.*, 2022). This change cannot come from a single organisation, but rather from a concerted effort of supply chain actors; as such, different aspects of SCI are required to respond to these pressures as a supply chain, which include the implementation of new technologies to couple systems and improve information sharing (De Giovanni, 2022).

Within this study, a research model derived from the literature will be tested, through a purpose-built databank. Doing this, the study also answers recent calls for more empirical research, to explore how organisations are approaching the CE with a perspective on supply chain and operations management aspects (Batista *et al.*, 2023). In particular, the study advances the theoretical understanding of CE field from an institutional theory perspective by borrowing the SCI concept which has been widely employed in the SCM literature (Batista *et al.*, 2023). It does so by exploring the role of SCI and how it interacts with IPs in the transition towards the CE in supply chains orchestrated by MNEs, also shedding light on the role of the different types of pressures and their relevance for the transition.

The remainder of the paper is organised as follows. Section 2 introduces the literature review and the development of the research hypothesis. The research method is described in Section 3. Section 4 illustrates the results of the analysis. Section 5 discusses the research findings and presents the theoretical and practical implications. Section 6 includes the conclusions, the future research avenues, as well as the limitations of the study.

¹ See, for instance, the recent EU Corporate Sustainability Reporting Directive (CSRD).

2 Literature Review and Hypotheses Development

In this section, an overview of the current literature is provided, along with an understanding of real-world issues pertaining the implementation of CE practices, in order to develop, in a rigorous way, a set of hypotheses to be tested (Houston, 2019).

2.1 Theoretical foundations

Using grand management theories and SCM concepts can help analysing how major supply chains are gradually adopting CE practices (Stank et al., 2017). This section introduces institutional theory and SCI, identifying the relevant constructs for the research problem, as well as the preliminary links between the constructs and the main research gaps. Institutional theory helps understanding why supply chains adopt CE and sustainable practices, while SCI looks at the required collaborative mechanisms. This study builds and tests a research model based on these constructs that contributes to a better understanding of the process of adoption of CE practices.

2.1.1 Institutional theory

Institutional theory explains how organisations respond to societal demands and pursue objectives dictated by the external environment in order to gain stability and legitimacy (DiMaggio and Powell, 1983). Organisations tend to adopt similar practices to other entities operating in the same institutional field, driven by coercive, normative, and mimetic pressures (DiMaggio and Powell, 1983). Coercive pressures can arise from regulatory bodies (Coercive Regulatory Pressures, CRPs) or other organisations in the supply chain (Coercive Market Pressures, CMPs), while normative pressures (NPs) stem from shared values within an industry. Mimetic pressures (MPs) involve imitation of best practices from successful social actors.

In today's globalised production systems, IPs occur at a supply chain level rather than at a firm one (Ketchen and Hult, 2007). The literature has investigated how these pressures work outside of the single organisation's boundaries and create coercive, normative and mimetic isomorphisms at the supply chain level (Kauppi, 2013). Supply chains are considered spaces where participating actors influence each other and promote their values (Wu and Jia, 2018). This happens for example in buyer-supplier relationships – when suppliers need to comply with environmental clauses. Some actors have a greater urgency, as well as responsibility and power, to enforce their system of values across the supply chain to reduce risks from upstream stages (Busse et al., 2016). Focal Firms, often MNEs, are believed to play a fundamental role in spreading these pressures in their multi-tier supply chains, also through coercive mechanisms, especially in the absence of strong regulatory institutions. This is also the reason why in the recent conceptualisation of IPs for supply chains, CMPs were kept separate from CRPs (Kauppi and Luzzini, 2022).

Some authors have tried to establish the concept of an *institutional field* in a SC context (Wu and Jia, 2018; Kelling et al., 2021). In most cases, however, the whole supply chain cannot be considered a uniform and linear institutional field. In multi-tier supply chains, organisations at different supply chain echelons deal with different institutions, some of which connected with their geographies, or the sector they belong to, or with their customers, and all these different institutions might promote contrasting values and compete (Busse et al., 2016). This requires engaging and involving suppliers with different strategies (Sauer and Seuring, 2018).

Institutional pressures are thought to be playing a role when studying the adoption of CE practices from a SCM perspective (De Angelis et al., 2018; Liu et al., 2018). Research

suggests that pressures to adopt sustainable practices, structures, or technologies are intense (Adebajo *et al.*, 2016) and are associated with stakeholders (e.g., customers, regulators, and NGOs) requiring firms to reduce their environmental impact and enhance their social responsibility. The adoption of these practices in SCM may be associated with reputation gains, risk mitigation, and increased customer loyalty (Paulraj *et al.*, 2017) and also with efficiency (Do *et al.*, 2023). Looking at specific types of practices, research has shown that organisations approach sustainability mainly as a mean to adhere to legislative requirements and to improve brand image (Paulraj *et al.*, 2017). As such, IPs are one of the main drivers of sustainable practices in organisations and their supply chains, reflecting corporations' alignment with triple-bottom-line strategies (Tate *et al.*, 2010).

Some studies have tested the direct relationship between IPs and the adoption of CE practices. These studies have some limitations having conceptualised CE as a performance construct devoid of any explicit reference to the implementation of specific industrial practices (Jain *et al.*, 2020); or measuring IPs with proxies or bundled external pressure constructs (Arranz *et al.*, 2022; Gusmerotti *et al.*, 2019). Recently, more reliable scales were developed to measure IPs constructs at the supply chain level (Kauppi and Luzzini, 2022). Some authors are delineating a hierarchy of the pressures, with coercive pressures being dominant ones (Agyabeng-Mensah *et al.*, 2022), a pre-condition for effective sustainability actions, and for the effectiveness of other pressures (Arranz *et al.*, 2022). As a second limitation, existing studies have considered only the direct impact of IPs on the adoption of CE practices, overlooking how sustainability practices seem to be driven mainly through the effect of an increased collaboration with suppliers and customers (Hofman *et al.*, 2021; Calzolari *et al.*, 2023).

2.1.2 Supply Chain Integration

To explain how supply chains are organised, SCM literature has widely employed the SCI concept. SCI involves a set of constructs including information exchange, the presence of collaborative activities, and the alignment of strategic interests with key suppliers and customers (Frohlich and Westbrook, 2001).

The “Arcs of integration” framework conceptualised SCI distinguishing between upstream supplier integration (SI) and downstream customer integration (CI) and across 4 aspects of integration: sharing information, developing collaborative approaches, joint decision-making and coupling systems (Frohlich and Westbrook, 2001). Later conceptualisations leverage on this framework, with the aspects being aggregated into 2 sub-dimensions highlighting the cooperative and collaborative aspects of SCI in a nuanced explanation (Wiengarten and Longoni, 2015). SCI was also reconceptualised differently, distinguishing among technological, logistical and relational integrations (Leuschner *et al.*, 2013). However, empirical research on the topic has more often referred to the seminal measurement scales introduced by Frohlich and Westbrook (2001) (see, for instance: Chaudhuri *et al.*, 2018).

The key argument behind SCI is that relationships and strategic integration can improve supply chain performance and lower transaction costs (Cao and Zhang, 2011). Higher levels of SCI have usually been linked to better operational performance (Schoenherr and Swink, 2012). Research also highlighted the importance of developing all the aspects of integration (Danese *et al.*, 2014), as well as the crucial nature of internal integration to achieve improvements in operational performance (Flynn *et al.*, 2010).

Recent literature has identified collaboration and coordination as fundamental components of a systemic transition to a CE (Sudusinghe and Seuring, 2022). CE requires a collaborative approach that involves all actors in the supply chain, including suppliers, manufacturers,

distributors, and customers. Developing high levels of external SCI is considered as an imperative to increase the capabilities of companies involved in the supply chain to share information and knowledge in order to reduce uncertainty and resource dependency (Bimpizas-Pinis *et al.*, 2022), and to develop eco-innovations (Hofman *et al.*, 2020). This is in line with the literature that identifies digital technologies and business analytics as key mechanisms to track and trace products and materials, share environmental information, and increase transparency and traceability (Rosca *et al.* 2023). These key capabilities seem to be key factors in affecting the effective implementation of green and CE practices (Cousins *et al.*, 2019).

SCI can provide better foundations to operationalise CE principles, can stimulate innovation also outside traditional suppliers and customers networks (Berardi and de Brito, 2021), and can enable the orchestration of complex systems in a logic of adaptive cycles and quick prototyping (Kristoffersen *et al.*, 2021). SCI is related to better coordination of material, financial and information flows along the supply chain. Due to the multi-directional flows associated with CSCs, where downstream and upstream flows must be coordinated in such a way primary production is replaced by secondary production, SCI has a pivotal role in the transition towards a CE (Bimpizas-Pinis *et al.*, 2022). Better coordination in CSCs could also mitigate rebound effects, where CE practices benefits are not offset by increases in overall production (Batista *et al.*, 2023). Recent papers are extending the SCI concept in order to include new CE-specific actors (such as waste collectors and remanufacturers) (Bimpizas-Pinis *et al.*, 2022; Braz and de Mello, 2022).

Despite recognising its importance, literature has not explicitly considered what role SCI plays in the relationship between IPs and the adoption of CE practices. Considering it as a specific capability of firms, studies have highlighted SCI as an enabling factor to the adoption of sustainable supplier development practices, which can also interact with institutional pressures (Sancha *et al.*, 2015). The conceptual framework proposed by Calzolari *et al.* (2021) was centred around the idea that IPs are drivers of the adoption of CE practices, and that higher integration with suppliers and customers amplifies the effect of IPs on supply chains. However, the literature does not agree on whether SCI is a prerequisite for the adoption of CE practices, or a driver of them (Calzolari *et al.*, 2023). The literature on multi-tier SSCM highlights that supply chains constitute a relational space where value systems can be transmitted (Sauer and Seuring, 2018; Wu and Jia, 2018). SCI is increasingly recognised as an important mechanism for overcoming institutional distance and facilitating the coordination of activities across multiple supply chain partners; in the context of MNEs, SCI is considered as a powerful alignment mechanism that can mitigate the effect of sub-national institutional distance (Dong *et al.*, 2016).

2.2 Hypothesis development

The research model of this study is based on institutional theory and on the concept of SCI. The model investigates the inter-relations between the three concepts introduced (IPs, SCI and the adoption of CE practices), which are described in detail in the following.

2.2.1 Linking institutional pressures to the adoption of Circular Economy practices

Coercive pressures to adopt CE practices come from environmental regulations and restrictions imposed on companies and from the associated monitoring and inspection activities (Kauppi and Luzzini, 2022). More stringent environmental regulations have been initially identified as a key factor in pushing production systems towards a cleaner pathway (Mathews and Tan, 2011). In the European Union (EU), CRPs can be associated with regulations imposing fines or bans. EU Directive 2018/852/EC, which tries to address the issue

of plastic waste, is a prominent example of this, but also specific national legislations on food waste. French law 138 (2016) for example, bans supermarkets from throwing away unsold food; this has pushed companies to reduce waste streams leveraging on multiple strategies: donating surplus food (e.g., to charitable trusts or food banks), establishing dynamic pricing in their sale points, reducing packaging (Calzolari *et al.*, 2021).

The other source of coercive pressures is the market, in the form of powerful external customers or suppliers making requests to adopt certain environmental practices or initiatives or withholding contracts if such standards are not met (Kauppi and Luzzini, 2022). CMPs are about private actors making use of their power to enforce their supply chain partners to comply with certain standards, values or practices (Kelling *et al.*, 2021).

Research argues that further institutional pillars, besides legislation, foster the adoption of CE initiatives (Ranta *et al.*, 2018; Jain *et al.*, 2020). Normative factors play an important role in driving isomorphic actions. Organisations might showcase CE approaches in their reporting to legitimise their position, giving more importance to standards, certifications, and industrial best practices rather than to legislation (Dagiliene *et al.*, 2020). The work of powerful NGOs, academia, consulting companies, trade bodies on environmental management practices and standards is part of this (Kauppi and Luzzini, 2022). Organisations and employees might be influenced by the procedures and tools advocated by some of these associations. New standards have been developed to use materials more efficiently, for example recovering end-of-life products, and closing material loops (e.g., aluminium, steel, plastic). The Global Battery, Aluminium Stewardship, and Responsible Steel initiatives are all powerful examples of current attempts, which are defining norms and standards for a transparent and sustainable supply chain, promoting the adoption of CE practices. The work of Ellen MacArthur Foundation and WBCSD, in developing standard tools to measure the progress towards the CE at the organisational level, like Circulytics and Circular Transition Indicator (CTI), represents another relevant example of NPs.

Also, a company could adopt CE practices to follow the example of industry peers. MPs are about monitoring and benchmarking environmental management practices and tools that appear to benefit and are adopted by competitors and peers (Kauppi and Luzzini, 2022). The most successful and respected companies are driven by concerns about legitimacy and competitiveness (DiMaggio and Powell 1983). Mimetic isomorphism occurs at all levels of the supply chain when companies follow the adoption of innovations and new technologies by competitors. For example, financial institutions that are starting to divest from the non-renewable energy sector, might be facing MPs from more proactive competitors that have already specific long-term targets in place. Similarly, automotive companies launching Product-as-a-Service models (like Daimler, Volkswagen, Renault) are likely to be driven by the existence of market opportunities and are facing mimetic isomorphism (Calzolari *et al.*, 2021).

This paper aims to explore the extent to which the adoption of CE practices by companies is affected by IPs, also clarifying the roles played by different categories of pressures. This leads to the formulation of the first hypothesis:

H1. Institutional pressures have a positive influence on the adoption of CE practices.

In particular, within this hypothesis, the influence of specific categories of institutional pressures on the adoption of CE practices will be tested: CMP, through sub-hypothesis H1a; CRP, through sub-hypothesis H1b; NP, through sub-hypothesis H1c; MP, through sub-hypothesis H1d.

2.2.2 Linking Supply Chain Integration to the adoption of Circular Economy practices

Several studies have emphasised the significance of SCI in facilitating the transition towards CSCs leading to a subsequent improvement in sustainability performance (Sudusinghe and Seuring, 2022). Empirical papers have found SCI being associated with a higher adoption of CE practices (Elia *et al.*, 2020; Pinto and Diemer, 2020). SCI can mediate the effect of the adoption of Industry 4.0 technologies on the improvement of CE performance (Di Maria and De Marchi, 2022).

In general CE-related literature has placed a strong emphasis on different aspects of SCI (e.g., information sharing among supply chain partners, product design for circularity, and the use of advanced technologies) as strategies to overcome the main risks and uncertainties of CSCs (De Lima, and Seuring, 2023). Information and technological integration, through the use of digital technologies (e.g., blockchain, smart contracts, and digital platforms) might facilitate the coordination of multi-tier supply chains for addressing major societal challenges (Rosca *et al.*, 2022).

Major obstacles to the transition to a CE can arise when companies have little influence on their extremely fragmented and global supply chains (Berardi and de Brito, 2021), due to the misalignment of incentives and limited visibility beyond the first tier (Mejías *et al.*, 2019) or uncertainties concerning the quality of secondary materials (Masi *et al.*, 2018). Reducing these barriers and improving ties between companies can support the adoption of CE practices, similar to the case of industrial symbiosis networks (Herczeg *et al.*, 2018) or industrial districts (Bressanelli *et al.*, 2022).

Traditionally, SI and CI should be measured separately because of the quite different ways companies engage and collaborate with suppliers and customers (Hofman *et al.*, 2020). Also, within the specific context of CSCs, customers end up playing pivotal roles in the recovery of secondary resources, thus directly contributing to the operationalisation of reverse flows (Batista *et al.*, 2023).

Overall, SI and CI might be seen to drive aspects of CE in supply chains. This leads to the formulation of the second hypothesis.

H2. SCI has a positive influence on the adoption of CE practices.

In particular, within this hypothesis, the influence of SI (through sub-hypothesis H2a) and CI (through sub-hypothesis H2b) on the adoption of CE practices will be tested.

2.2.3 The mediating effect of Supply Chain Integration in the relationship between Institutional Pressures and the adoption of Circular Economy practices

Today's global supply chains are facing sustainability challenges, which underscore the necessity for integration, collaboration, and cohesive action across the entire supply chain ecosystem. As such, IPs may influence a company choice about the level of integration with suppliers and customers (Kauppi, 2013; Danese *et al.*, 2020) and then be a driver of SCI (Wong *et al.*, 2008; Turkulainen *et al.*, 2017). In the context of sustainability transitions, IPs affect first the level of supply chain collaboration with suppliers and customers to create key capabilities and only then they drive eco-innovations at the product and at the process level (Hofman *et al.*, 2020). It could be then hypothesised that, in the process of driving the implementation of CE practices, IPs also contribute to the implementation of higher degrees of SCI, which, in turn, will be also beneficial to the adoption of CE practices themselves. This leads to the formulation of the third hypothesis:

H3. SCI mediates the relationship between IPs and the adoption of CE practices.

In particular, within this hypothesis, the mediating power of SI on the relationship between specific categories of IPs (CMP, through sub-hypothesis H3a; CRP, through sub-hypothesis H3b; NP, through sub-hypothesis H3c; MP, through sub-hypothesis H3d) and the adoption of CE practices will be tested. Likewise, the mediating power of CI on the relationship between the same categories of IPs (CMP, through sub-hypothesis H3a'; CRP, through sub-hypothesis H3b'; NP, through sub-hypothesis H3c'; MP, through sub-hypothesis H3d') and the adoption of CE practices will be tested.

2.3 Paper Contribution

Testing the above-mentioned research hypothesis has both theoretical and practical relevance. At a theoretical level, the paper aims at establishing whether IPs are acting at a company level or rather favouring the implementation of higher degrees of SCI, which then acts as a further driver for the implementation of CE practices (Figure 1). As such, the paper is characterised by a *moderate* level of theoretical contribution as per Colquitt & Zapata-Phelan (2007) taxonomy, as it introduces SCI as a mediator of the existing relationship between IPs and the adoption of CE practices, grounding the hypothesis development with existing conceptual arguments.

A better understanding of the relationship between IPs and the adoption of CE practices is also important from a practical point of view. It can inform policymakers about ways to maximise the effectiveness of their interventions; it can provide insights to managers into the ways that SCI can drive the adoption of CE practices, highlighting the need for supply chain visibility and transparency as well as the important role of key suppliers and customers.

So far only a few studies have studied (or tested) the effect of IPs on the adoption of CE practices. This is the first one that focuses on MNEs and that has a consideration of the role of SCI in this.

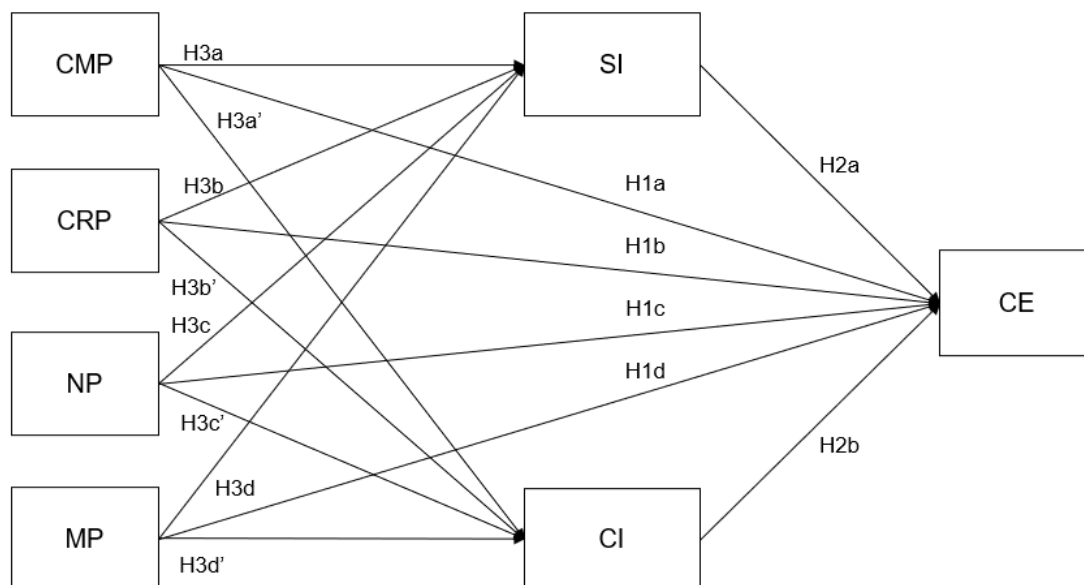


Figure 1 – The research model. Institutional Pressures (categorised in CMP, CRP, NP, MP) have a direct effect on the adoption of Circular Economy practices (H1); Supply Chain Integration (through its

two components, SI and CI) has a direct effect on the adoption of Circular Economy practices (H2); Supply Chain Integration (through its two components, SI and CI) mediates the effect of Institutional Pressures (categorised in CMP, CRP, NP, MP) on the adoption of Circular Economy practices (H3)

3 Methods

This research adopts a positivist philosophical stance. As such, the research model (Figure 1) was tested by examining publicly available Corporate Sustainability (CS) Reports for a representative sample of 150 MNEs for the year 2021. A *directed content analysis* approach was employed, where raw messages (the content of reports) are coded according to a classification scheme that is deductively predefined (Seuring and Gold, 2012). The coding scheme in this case includes both the variables and the hypothesised relationship between them, which is theoretically grounded.

Using CS reports as a data source is becoming common in SCM research (Piecyk and Björklund, 2014; Mejías *et al.*, 2019; Sancha *et al.*, 2022), with different techniques being employed, e.g., automated text extraction processes like text mining, or the creation of purpose-built quantitative databanks (Sancha *et al.*, 2022).

The reasons behind this choice are multiple: CS reports are validated sources of information, scrutinised by multiple stakeholders; companies with a sustainability orientation aim to signal the practices they have adopted. Governments are increasingly relying on public disclosure to achieve macro-level objectives, as demonstrated by recent regulation on sustainability reporting in the EU. Also, the use of CS reports can help overcoming the limitations of survey research, when it comes to individual responses and self-assessments on both sustainability practices and supply chain concepts (Ketokivi, 2019).

Disadvantages of using these sources are linked to potential discrepancies between information reported and real actions (e.g., greenwashing), as the writing of these reports is often contracted to consulting companies, and to the low specificity of available information, especially on SCM aspects. However, the use of these data sources can give some complementary and unique insights to survey-based research in analysing companies' transitions towards more sustainable pathways (Tate *et al.*, 2010).

This study uses whole CS reports as a unit of analysis, in order to assess, through a coding procedure, how key concepts emerging from the literature review are disclosed. The concepts are evaluated through well-established measurement scales from the literature. The measurement process does not focus on keyword searches, but on reading the whole report for each of the MNEs, identifying relevant content extracts and evaluating them in order to measure the identified concepts. The process was not automated so as to achieve a higher degree of precision. In this way, the research team could manually identify all the parts of the reports that were relevant for the analysis. This choice also required some actions to improve the reliability of different phases of the data collection.

Steps highlighted in Figure 2 were followed to codify content, following approaches employed in similar analyses (Piecyk and Björklund, 2014). The following subsections explain, in detail, the processes adopted in each step.

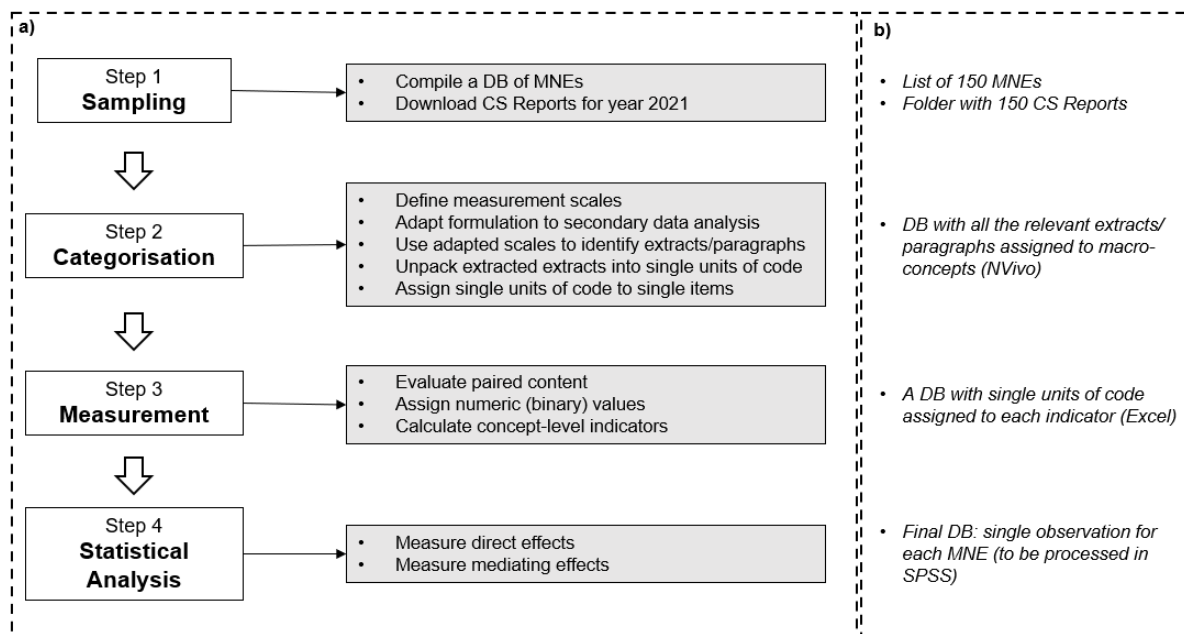


Figure 2 – Characterisation of the four steps of the Method (2a); Detail of the data produced after each step of the analysis (2b).

3.1 Sampling

A database of MNEs was created based on the Global Fortune 500 list (year 2021); 150 MNEs were chosen by selecting the largest ones (in terms of revenues) headquartered in Asia or Europe. The decision to restrict the study to these two macro-areas is related to the fact that the CE agenda has become central to policymaking in many national states and supranational entities within these areas². The only inclusion criteria were related to the presence of a public CS report, or, at least, of an annual report that included sustainability information. For each of the selected companies we checked the presence of a CS report in their company website and on the repository corporateregister.com. Only reports published in English were considered, and if the report was in another language (two cases) the company was not considered. The sample includes MNEs from different industries, which facilitates the generalisability of the results. The entire CS report was used as the unit of analysis in this research. Additional information was collected for each MNE (type of ownership³, headquarter location, industrial sector, type of sustainability report); annual reports and websites were used in order to gather this information. The full sample is available in the supplementary materials.

3.2 Categorisation

In this phase, the concepts identified in the literature review were used as pre-defined categories to identify textual content in each report for the purpose of our analysis. The extracted content was scrutinised to identify smaller units of code to measure the different

² Some examples: EU Circular Economy Package (2015, 2021); Circular Economy Promotion Law of the People's Republic of China (2008, 2020); India's Framework for Sustainable Development of Low-Carbon Cities" under its National Action Plan on Climate Change (2019); South Korea National Circular Economy Roadmap; Japan Basic Act on the Promotion of a Sound Material-Cycle Society (2000).

³ Type of ownership refers to the participation of the state or other regional authorities in the property of the MNE.

aspects of the constructs, following the measurement scales chosen. We started by choosing the most appropriate measurement scales in the literature for the three concepts (IPs, SCI, CE practices), also considering the limitations highlighted in different papers, especially when measuring IPs (Kauppi and Luzzini, 2022) and SCI (Wiengarten and Longoni, 2015).

Institutional pressures – Literature demonstrates that CS reports are the manifestation themselves of IPs (Tate *et al.*, 2010), as they represent the direct answer to specific IPs that push organisations towards some sustainability direction. As such, it is considered applicable to use CS reports content to measure IPs. To measure IPs, we used the scales from Kauppi and Luzzini, 2022 (Table I), which provide empirical measures that distinguish the different elements within each pressure category and new guidelines on how to measure IPs in a standard and rigorous way within a SCM context. As clarified by authors, such scales “can be adapted to the specific type of supply chain practice”. In practice, measurement items were just adapted to the context and data sources. Basically, each specific item (“survey question”) was re-phrased to assess whether comments regarding that item existed or not within the CS report. As an example, the first item for Coercive Market Pressure from Kauppi and Luzzini (2022) (“Our major external customers frequently make requests for us to adopt certain practices or initiatives in our purchasing procedures”), was adapted as follows: “Comments about requests from customers to adopt certain environmental management practices (or initiatives)”.

Supply Chain Integration – MNEs provide in their CS reports information about their supply chain relationships with suppliers and customers; MNEs are expected to be signalling to their stakeholders’ positive supply chain practices. Following the literature, we measure SCI through the seminal conceptualisation of Frohlich and Westbrook (2001). These scales have been widely used to measure SCI in manufacturing contexts, especially looking at the plant level. In this case the unit of analysis is different, because we looked at the MNE level, measuring how the four different aspects of SCI are disclosed in the context of CS reporting. We disaggregated the SCI construct into upstream SI and downstream CI in line with studies that keep the two directions of integration separate (Blome *et al.*, 2014; Frohlich and Westbrook, 2001). Also, in this case the measurement scales were re-phrased and adapted to the context of this analysis in an analogy to how we handled Kauppi and Luzzini (2022) scales for IPs (Table I).

Table I – Adapting measurement items to the scope of the analysis

Construct	Measurement item	Literature
Coercive Market Pressures	CMP1. Comments about requests from customers to adopt certain environmental practices	<i>Kauppi & Luzzini, 2022</i>
	CMP2. Comments about major customers withholding their contracts if the company does not meet their requests to adopt certain environmental practices	
	CMP3. Comments about major suppliers withholding their contracts if the company does not meet their requests to adopt certain environmental practices	
Coercive Regulatory Pressures	CRP1. Comments about the presence of a large number of environmental regulations and restrictions imposed on the company’s industry that also impact their procedures/ decision making?	
	CRP2. Comments about government environmental regulation impacting their decision making	

	CRP3. Comments about (frequent) government inspections or audits on the company's environmental practices to ensure they comply with laws and regulations	
Normative Pressures	NP1. Comments about following academic research on environmental practices to learn about environmental procedures to implement	
	NP2. Comments about environmental practices becoming a norm within their industry	
	NP3. Comments about opinions of consulting companies and external auditors on the best practices influencing their environmental practices	
	NP4. Comments about employees being influenced by the environmental practices and tools advocated by industry bodies	
Mimetic Pressures	MP1. Comments about paying attention to the environmental practices and tools that appear to benefit their competitors and peers	
	MP2. Comments about actively benchmarking the environmental practices and performance of their main competitors and peers	
	MP3. Comments about paying attention to the environmental practices and tools used and adopted by their key competitors	
Suppliers integration	SI1. Comments about sharing information with key suppliers (about sales forecast, production plans, order tracking and tracing, delivery status, stock level)	
	SI2. Comments about developing collaborative approaches with key suppliers (e.g., supplier development, risk/ revenue sharing, long-term agreements)	
	SI3. Comments about joint decision-making with key suppliers (about product design/modifications, process design/modifications, quality improvement and cost control)	
	SI4. Comments about system coupling with key suppliers (e.g. vendor managed inventory, just-in-time, Kanban, continuous replenishment)	
Customers integration	CI1. Comments about sharing information with key customers (about sales forecast, production plans, order tracking and tracing, delivery status, stock level)	<i>Frohlich & Westbrook, 2001</i>
	CI2. Comments about developing collaborative approaches with key customers (e.g., risk/revenue sharing, long-term agreements)	
	CI3. Comments about joint decision-making with key customers (about product design/modifications, process design/modifications, quality improvement and cost control)	
	CI4. Comments about system coupling with key customers (e.g. vendor managed inventory, just-in-time, Kanban, continuous replenishment)	
Adoption of CE practices	CE1. Comments on the adoption of "reduce" practices	
	CE2. Comments on the adoption of "reuse" practices	
	CE3. Comments on the adoption of "recycle" practices	
	CE4. Comments on the adoption of "renewable energy and energy efficiency" practices	
	CE5. Comments on the adoption of "recover" practices	

Adoption of CE practices – In their reports, companies provide descriptive information about their CE actions. The scales to measure the adoption of CE practices were based on the literature (Calzolari *et al.*, 2021). CE practices are conceptualised according to a 5-Rs

framework, which is based on the 4-Rs Waste Hierarchy Framework (e.g., reduce, reuse, recycle, recover) from the European Commission. The fifth type of practice (renewable energy and resource efficiency) includes incremental improvements of the efficiency in production systems, and the adoption of renewable sources of energy. The rationale behind this distinction refers to the fact that these are quite commonly mentioned in CS reports. In this way these incremental approaches are distinguished from other types of CE practices.

Once defined the categories and the individual measurements, we read each MNE report in its entirety to identify all the content that was significant for the analysis, containing evidence on the existence of IPs in the MNE, as well as of SCI aspects and CE practices. We used the adapted formulation of each construct's item as a guide to understand where in their reports MNEs were giving any evidence of the constructs of we want to measure. All the unstructured content was firstly mapped and then assigned to themes in a predefined template. Each extract was classified by macro-themes (IPs, SCI, and CE) in a preliminary database. At this stage, every possible text extract was included and stored using the NVivo software. The following stages mostly refer to the text that was extracted in this preliminary phase.

In the next stage, we worked on the extracted content and categorised it further. We followed multiple waves of coding to make the amount of unstructured content fit for measuring the constructs in the research model. All the text assigned to a macro-theme was scrutinised, to identify single units of code that were in some way giving evidence of more specific aspects of that macro-theme, referring to the level of detail of the measurement items. After this, single units of coding were assigned to measurement items of the three constructs. In the supplementary material the steps followed during the coding for one of the extracts, which included three unit codes to measure three different items, are exemplified.

Subsequently, data was coded using a pre-defined MS Excel template, following the adaptation of the measurement items exemplified in the previous Table I. This process was repeated for each company in the sample. A third wave of coding was conducted to perform a final keyword check for each report, with the aim of enhancing the homogeneity of the extracted text and codes across companies within the same sector/geographical area. This process involved utilising specific keywords to identify and capture potentially missing text from reports of companies operating within the same sector, considering the assumption that such companies might share similar vocabulary in their reports. The output of this stage was a MS Excel worksheet containing 150 rows, each representing an MNE, and multiple columns representing the various measurement items. The worksheet was enriched with unit codes specific to each measurement item and MNE (supplementary materials provide an example of the coding process followed).

To ensure the reliability of the different phases in the coding procedure (Table II), two main actions were undertaken. The first one was concerned with the mapping of the text in a report. Two authors performed the same process into a subset of reports. After this, we calculated a k-agreement coefficient. The following phase (textual data refinement) consisted in recognising in each text extract single units of code and in assigning each unit of code to a measurement item. Similarly, the same two authors coded the same content; the disagreements were measured. In both phases, disagreements occurred in less than 5% of cases. Each disagreement was discussed by the authors in order to reach an agreement.

Table II - Reliability tests taken in different phases and actions taken

Phase	Description	Actions taken	Reliability measure
Text mapping	Recognising in a report the relevant content. Decide whether to include or exclude text. Assign text to macro-themes.	2 authors did the same job into a set of reports. Discuss on every disagreement.	K-agreement coefficient (disagreements were observed in less than 5% of cases)
Textual data refinement	Recognising in each text extract single units of code. Assign each unit of code to a measurement item.	2 authors did the same job into a set of extracts. Discuss on every disagreement to reach an agreement.	K-agreement coefficient (disagreements were observed in less than 5% of cases)

3.3 Measurement

To measure the three constructs in a quantitative way, a structured coding approach was used to convert textual data into binary variables, assigning a single binary score to each item in the template, rewarding with a 1 the detailed presence of information regarding a specific item, and penalising the absence of them with a 0. We followed similar approaches to those in the SCM literature that aim to use the unstructured textual content in a quantitative way also to test research models (Ancarani *et al.*, 2019).

As a last step, aggregated construct level scores are built as the sum of the single binary items they represent. As a result, 7 construct level scores were obtained for each company (CMP, CRP, NP, MP, SI, CI, adoption of CE practices). These are all ordinal variables with a range varying from 0-3, to 0-5. Additional information (mentioned in the previous sub-sections) was the basis for some control variables. The outcome of the whole analysis is a DB with Company Name, Indicators, binary scores assigned to each indicator, and construct level scores.

3.4 Statistical analysis

The analysis employs linear regression considering aggregated construct-level scores. We ensured data validity by utilising measurement scales that are widely accepted in the academic community (Table I). These 7 ordinal variables were considered continuous, in line with the assumptions of linear regression⁴. The employed procedure is described in Figure 3.

The relationship between IPs and CE was firstly tested, followed by the direct relationship of SCI on CE. Then, the indirect effects of SCI on the relationship between IPs and CE were assessed. Indirect effects were measured through a linear regression using the PROCESS macro in SPSS⁵. Regressions included some control variables. The literature and some interactions with experts have identified some factors that are likely to influence the outcome variable. Control variables are both industry-specific and firm-specific. In particular, industry-specific variables were captured by two dummy variables. The first one isolates manufacturing companies from all the others, as these companies are more frequently involved in CE actions;

⁴ To make sure that assuming continuous variables was a reasonable assumption, the same regression was re-done using ordinal regression and the results were comparable.

⁵ Four different regressions were run to build the full mediation model by specifying one independent variable at the time.

the second one isolates service companies, which are typically late-adopters. Firm-specific variables include the type of ownership (e.g., state-owned vs privately-owned), the geographical location of the headquarters, and the presence of a CS report.

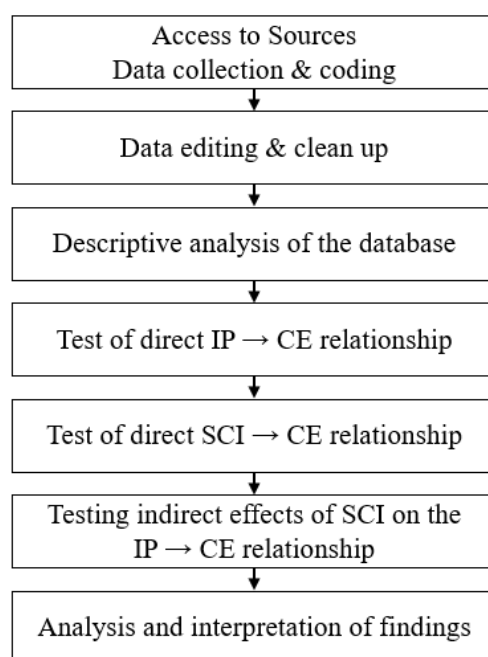


Figure 3 – Data analysis description

4 Results

4.1 Sample characteristics and analysis

Sectors represented in the sample are shown in Table III, along with countries of incorporation of the MNEs. Notably, one third of the sample is represented by state-owned companies (including MNEs with some form of State participation). Around half of the MNEs have published a CS report in 2021.

In the preliminary stage of analysis, the distribution of variables was checked. As in the prerequisites of linear regression, the outcome variable was approximately normally distributed, as were most of the predictors (see Supplementary materials).

Different linear regressions models were used to answer the RQs. Three linear regressions models are reported (Table IV): Model 1 measures the direct effects of IPs on the outcome variable Adoption of CE practices (RQ1), with all IPs having a positive and significant effect, excluding mimetic pressures; Model 2 shows that adding to this regression 5 control variables (presence of a CS report, manufacturing sector, service sector, Headquarter in the EU, type of ownership), only coercive regulatory pressures and normative pressures have a positive and significant effect on the outcome variable (RQ1); Model 3 includes SI and CI as predictors to start accounting for RQ2. When SI and CI are included in the regression, they account for most of the significant effect on the outcome variable and no IP has a significant effect anymore. Only three of the control variables were found to have a significant effect on the outcome variable (Model 3, Table IV). Overall companies from the manufacturing sector,

companies from the European Union, and companies with a sustainability report are more likely to implement more CE practices.

Table III – Sample descriptives (n=150)

Variable	n	Proportion
Industry		
Services	55	37%
Manufacturing	36	24%
Energy	28	19%
Agri-food	13	9%
Materials	7	5%
Construction	7	5%
Conglomerates	4	3%
Report type		
Sustainability Report	75	50%
ESG report	25	17%
CSR report	20	13%
Annual report	13	9%
Integrated report	11	7%
Universal Registration Document	5	3%
Climate report	1	1%
Ownership		
Private	92	61%
State-owned	58	39%
Country		
China	47	31%
Japan	25	17%
Germany	14	9%
France	11	7%
Britain	10	7%
South Korea	7	5%
Switzerland	6	4%
Other Asians	15	10%
Other European	15	10%

Finally, the mediated model was tested (Figure 4). The main outcome of the analysis is that IPs are not directly related to the adoption of CE practices, but only indirectly through the effect of SI and CI, which seem to explain most of the variance of the outcome variable. Also, the effect of CI on the outcome variable is greater than the one of SI.

Table IV –Performing different regressions of the outcome variable “Adoption of CE practices” on the different sets of predictors and control variables.

Dependent variable: Adoption of CE practices

Independent variables	Model 1	Model 2	Model 3
	Coeff. (St. err.)	Coeff. (St. err.)	Coeff. (St. err.)
CMP	0.344*** (0.087)	0.138 (0.092)	0.086 (0.079)
CRP	0.360*** (0.097)	0.438*** (0.096)	0.171 (0.092)
NP	0.324*** (0.096)	0.249** (0.091)	0.095 (0.082)

Dependent variable: Adoption of CE practices

Independent variables	Model 1	Model 2	Model 3
MP	-0.113 (0.108)	-0.059 (0.107)	-0.081 (0.092)
Sustainability report		0.326* (0.151)	0.287* (0.130)
Type of Ownership		-0.237 (0.176)	-0.248 (0.152)
Manufacturing		0.706*** (0.199)	0.389* (0.178)
Services		0.148 (0.180)	-0.030 (0.163)
European Union		0.411* (0.167)	0.158 (0.149)
SI			0.197** (0.071)
CI			0.437*** (0.075)
Observations	150	150	150
Fixed-effects	1.027	0.8609	0.5291
R2	0.357	0.469	0.612
Adjusted R2	0.339	0.435	0.582
F Statistic	20.3*** (df=4; 146)	13.9*** (df=9; 141)	20.0*** (df=11;139)

*p<0.05

**p<0.01

***p<0.001

Note: Coercive regulatory pressure effect on the outcome variable in the third model is very close to be significant (sig. 0.064)

Looking more specifically at the effect of independent variables on the two mediators, two drivers (NP and CRP) have a significant and positive effect on the two mediators (SI and CI). The other two drivers, CMP and MP, do not have a significant effect on SI and CI. CRP is the only pressure to have some direct effect on the outcome variable (Table IV shows that its effect is not far from being significant and might become significant if the sample size is increased). CRP's direct effect is also partially mediated by SI and CI (the mediation path has a more significant and stronger effect). NP effect is fully mediated by SI and CI. The direction of the relationships is not a surprising one. Higher pressures relate to higher degrees of SCI; higher levels of SCI are related to a higher adoption of CE practices.

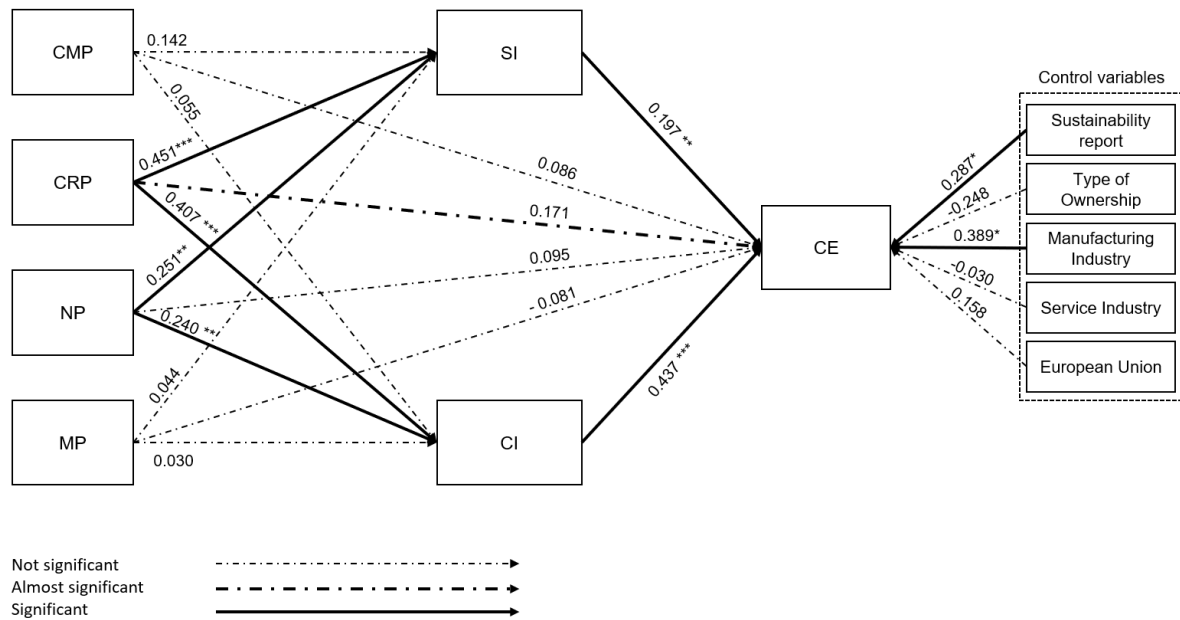


Figure 4 – Mediation model. Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

5 Discussion and implications

5.1 Discussion of the results

5.1.1 Institutional Pressures drive the adoption of CE practices via SCI

The results suggest that SCI plays an active role in the complex relationship between IPs and the adoption of CE practices; indeed, SCI mediates the effect of some of some IPs on the outcome variable, suggesting that IPs might first drive higher SCI which, in turn, have a positive association with the adoption of CE practices. As such, SCI seems to be a key mechanism that lies in between IPs and the adoption of CE practices, which has the function of carrying the effect of IPs in the context of a company decision-making process. This also suggests that most IPs are not able to influence the outcome variable without first affecting the level of SCI. These results are in line with research on eco-innovations – institutional factors have a first effect of increasing collaboration with suppliers and customers (Hofman *et al.*, 2020) and confirm the close link between IPs and SCI (Wong *et al.*, 2008; Turkulainen *et al.*, 2017). These results also confirm that integrated supply chain structures are paramount for enforcing value systems and transferring ideas (Wu and Jia, 2018; Busse *et al.*, 2016; Sauer and Seuring, 2018) also in the context of adoption of CE practices.

To better explain this concept, two practical cases from the sample are presented. The French Agri-food sector is characterised by high CRPs, e.g., under the French law 138 (2016) that bans food waste. Carrefour, a food distributor, and Danone, a food producer⁶ reacted to the high CRPs by enhancing supply chain information sharing for environmental and climate data, also through new digital tools; providing financing solution for agricultural transition and regenerative agriculture (both); developing strategic alignment with suppliers and customers on multiple topic among which the CE (Danone); sharing economic benefits with suppliers

6 The qualitative content presented in this sub-chapter is the result of the coding extracted from the following two Company reports: Danone Universal Registration Document 2021, Carrefour Universal Registration Document 2021.

through fair pricing policies (*Danone*); developing collaborations with suppliers on product or packaging design (*Carrefour*); developing shared inventory management systems with its leading distributors and just-in-time (*Danone*). Thanks to the adoption of these practices, both the MNEs achieved a medium/high score on SI and CI. Also, the German manufacturing industry operates under high CRPs (the Supply Chain Act, and the European Directive on end-of-life vehicles) and NPs (pressures from responsible steel, aluminium, and plastic industry initiatives, advocating sustainability in material usage). Both the car producers Volkswagen Group and Daimler show high levels of SI and CI, including information sharing in the battery supply chain, and also through Blockchain technology (both companies); collaborating with customers to build closed loops for batteries, and investing in digital technologies like "Industrial Computer Vision" in collaboration with partners such as Amazon Web Services and Siemens (*Daimler*). Also in this case, the development of SI and CI is clearly beneficial to the adoption of CE practices and is seen as a prerequisite to enact a wide range of CE practices. The statistical analysis confirms that, frequently, higher scores on SI and CI are associated with higher levels of adoption of CE practices. When SI and CI scores are low, often they are associated with lower levels of adoption of CE practices.

5.1.2 *The predominant role of regulation and industry standards over market pressures*

The results also shed light into the specific mechanisms by which the IPs affect the adoption of CE practices, by discussing their link to SCI. Not all IPs seem to have an appreciable effect on SCI, with IPs related to regulation and industry standards (CRPs and NPs) being more relevant in influencing SCI when compared to pressures coming from the market (CMPs, MPs, see Figure 4). As a result, CMPs and MPs, in the absence of CRPs and NPs, might not be sufficient to drive SCI and the adoption of CE practices.

Also, this idea is explained through the industrial cases mentioned in the previous sub-chapter. Carrefour and Danone's high levels of SI and CI seem to be associated with their institutional environment, which is characterised by high CRPs and NPs. High CRPs relate to energy efficiency and plastic waste regulation, along with EU targets on packaging collection. NPs relate to training and e-learning modules for employees (*Carrefour*) and for farmers on environmental best practices (*Danone*); cooperation initiatives and partnerships with the academic and scientific world (*Danone*); collaborations with prominent NGOs that work and advocate for the CE (Ellen MacArthur Foundation, *Danone*); as well as commitments on international agreements aiming at reducing plastic waste, e.g., Global Declaration on Plastics and New Plastics Economy (*Carrefour*). Also Volkswagen Group and Daimler's high levels of SI and CI seem to be associated with their institutional environment, which is characterised by high CRPs and NPs. CRPs come from existing regulations (the EU Emission Trading Scheme; Directive 2000/53/EC) and from the threat of more legislation associated to the EU Green Deal; NPs are associated with Responsible Minerals Initiative, Science Based Targets Initiative (SBTi), with the close interactions with the German Association of the Automotive Industry (VDA) and with universities.

Like in many cases in the sample, institutional contexts with such strong pressures are likely to drive higher levels of SCI. This is not necessarily true in different institutional environments, with less prominent CRPs and NPs. The results suggest that MNEs, in the absence of strong CRP and NP, and in the presence of some MP and CMP, do not show higher levels of SCI. This, in line with the main argument of the previous sub-section on the mediating role of SCI, has a repercussion on the ability of these MNEs to adopt effective and performant CE practices.

The research model also shows CRPs and NPs might drive the outcome variable in slightly different ways. CRPs might directly drive some CE practice due to their punitive and coercive nature, which represents a direct threat to business continuity and push organisations to quick actions to avoid sanctions.

NPs seem not to have a significant direct effect and to be fully mediated by CI and SI. This could be explained looking at the less formalised control systems that are associated with this type of transformation (Scott, 2013). Under NPs, MNEs choose practices that they feel it is appropriate and morally fair to adopt. NPs might be behind more performant and long-term systemic transitions, driving actions only through the mediation of SI and CI. However, this is only a slight difference, considering that most of the effect of both CRP and NP seems to be mediated by the effect of SI and CI. This issue, connected with the previous one, seems to suggest that MNEs might need more than traditional economic and transactional arrangements and market pressures to enact a structural transformation process. They might need stronger pressures from regulations and industry standards. Then, once supply chains are more integrated, it might also be easier to put in place enforcement mechanisms with external suppliers and customers. The adoption of CE practices in other points in the supply chain is usually more strongly associated with CMPs that come from the integrated structures MNEs set.

5.2 Theoretical implications

This study provides several theoretical contributions. Firstly, it extends research on SCM collaborative approaches for sustainability (Sancha *et al.*, 2015; Blome *et al.*, 2014; Hofman *et al.*, 2020) to the context of MNEs managed supply chains and to the CE field, strengthening the idea that SCI is necessary for a systemic transition towards CE. This study also highlights that customers have a prominent role in the process of adopting CE practices, which tends to be even more important than the role of suppliers. This aspect requires some reflections. SCI literature claims that there is a popular route that companies usually follow to improve integrative capability. At first enhancing internal effectiveness, then streamlining upstream integration with suppliers and then finally enhancing downstream integration with customers (Childerhouse and Towill, 2011). The study poses a question on whether the same route needs to be followed also in the context of CSCs. In this context, downstream-upstream collaborations involving internal and external supply chain actors might be key (Batista *et al.*, 2023). This is also suggested by how regulations targeting consumption have a greater effect than those targeting production (Arranz & Arroyabe, 2023).

Secondly, these results contribute to the literature on institutional antecedents of CE and green practices in supply chains (Adebanjo *et al.*, 2016). The study aim does not aim to alter the core logic of institutional theory; it is rather aimed at using this theory, along with the SCI concept, to understand CE transformations in supply chains (Whetten, 1989). In addition to confirming the important role of IPs in the transition towards more sustainable supply chains, this study enriches the debate in two ways: first, it reflects on how single IPs affects the adoption of CE practices; second, it tries to improve the way IPs are measured, adopting newly developed scales from Kauppi and Luzzini (2022). To overcome limitations with previous studies, where IPs were measured with proxies or bundled IPs constructs or as tied to some outcome variable, we considered how general IPs for environmental management actions drive different types of CE practices. In this way, IPs were untied from the outcome variable.

This study shows how SCI interacts with IPs in MNEs. First, it confirms the idea that more integrated supply chain structures are necessary to facilitate shared meaning systems and an institutional field in which new sustainability logic (like the CE) can work. Second, it highlights

the strong association between CRPs and NPs and SCI, showing MPs and CMPs are not associated with SCI. These findings contribute to the literature on hierarchy of IPs confirming the prominent role of CRPs (Agyabeng-Mensah et al., 2022; Arranz et al., 2022), which operate predominantly via the mediation of SI and CI, and to a lesser extent directly, at a company level. Furthermore, the study also sheds light on the prominent role of NPs in stimulating more efficient CE practices, by exclusively leveraging on the mediation of SI and CI. More generally these results contribute to the debate on what is needed to push CE in global supply chains and confirms that market forces alone might be not a sufficient driver of efficient CE practices (Calzolari et al., 2023). The same findings also contribute to the literature on antecedents of SCI (Turkulainen et al., 2017; Wong and Boon-Itt, 2008) which has hypothesised IPs themselves impact the level of SCI.

5.3 Managerial implications

This study has some implications for practice. Understanding better IPs in their various facets and complexity can help managers to take more informed decisions - as many of their decisions might not be the most efficient ones - especially if they come from NPs and MPs (which clearly pose a risk of *jumping on the bandwagon*) (Kauppi and Luzzini, 2022).

The study suggests practitioners that their level of SCI is an essential mechanism on which they can leverage if they want to adopt CE practices. To overcome the challenges faced by single companies to implement CE practices, it is necessary first to reach higher degrees of SCI that will then make it possible to implement CE practices.

The study also points out how organisations can leverage CRPs and NPs to improve their SCI, which will then improve their circularity. Lastly, it identifies the importance of customers in the transition towards the CE.

6 Conclusions

This study examines the impact of external pressures on the adoption of CE-oriented practices on MNEs in Asian and European countries. It tests a research model by examining publicly available CS Reports for a representative sample of 150 MNEs for the year 2021 and using an advanced coding procedure to measure IPs, SCI and CE.

The results identify the role of SCI as a mechanism that lies in between IPs and the adoption of CE practices and reflects on how this is related to key capabilities requested in CSCs. Also, it describes how regulation and industry standards have a predominant role over market pressures being more strongly and significantly associated with higher SI and CI. Lastly, the role of CI is highlighted, being more strongly associated with the outcome variable.

6.1 Limitations - Future developments

While this study has some important contributions, it is important to acknowledge its limitations. The sample size could be expanded to improve the generalizability of the findings. Some control variables could not be considered due to time and resource constraints, such as the type of customers (B2C or B2B) or the position of the MNE in the supply chain, which may have influenced our results. The study was conducted over a single year, which may have limited our ability to capture changes over a longer period. Future research could conduct longitudinal studies to examine the processes of institutionalisation and deinstitutionalisation of CE practices in supply chains over time. It could also focus on specific sectors. The use of secondary data could also constitute a limitation. Future research should also focus on CE performance and CE indicators rather than on an ordinal outcome variable. Finally, future

studies could focus on how the combination of different pressures would lead to a better adoption of CE practices, rather than on the individual effects of single pressures.

The existing study does not adequately consider the impact of Small-Medium Enterprises (SMEs) on MNEs, overlooking the fact that SMEs also play a significant role (Dey *et al.*, 2022). This assumption of MNE dominance leads to an omission of the responsibilities and potential influence that MNEs possess over their partners in global supply chains. Therefore, future research should address this oversight and take into account the dynamic interplay between MNEs and SMEs in order to gain a comprehensive understanding of supply chain dynamics. By doing so, researchers can better explore the intricate relationships and mutual influence that exist within supply chains, ultimately providing a more accurate depiction of the complex nature of global SCM.

Future studies could also add more granularity in the outcome variable, measuring more aspects. For example, they could measure the level of CE practices implementation, distinguishing purely internal CE practices from CSC practices, or the potential of a circular rebound effect associated with different CE initiatives.

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CHAPTER II - Reshoring initiatives and Circular Economy practices – strange bedfellows?

Abstract

This working paper explores the links between reshoring initiatives and the adoption of circular economy practices, as well as the enabling conditions for the joint implementation of these strategies. An in-depth case study of a European manufacturing company that has already implemented both reshoring and circular economy practices is employed in order to understand the common drivers, the main challenges and the opportunities for joint implementation. To interpret these phenomena, the analysis builds on resource orchestration and neo-institutional theories, and proposes a framework to describe the complementarities between reshoring and circularity that can guide future research. This research contributes to the analysis of supply chain configurations in circular futures characterised by increased economic planning, where States' incentives influence the reorganisation of global supply chains and favour more local and circular production networks.

1 Introduction

In recent years, there has been a growing focus on reshoring, which involves the relocation of production or sourcing activities from low-cost to high-cost countries, amidst global disruptions and increasing criticism of globalisation. Within these initiatives, back-shoring (the relocation to the country of the parent company) and near-shoring (the relocation to a nearby region in order to create local/regional supply chains) can be distinguished (Fratocchi et al., 2014). Reshoring is currently highlighted as one of the manufacturing trends post-COVID (UNCTAD, 2020). Extensive research efforts have been devoted to understanding the drivers of reshoring (Di Mauro and Ancarani, 2022; Pedroletti and Ciabuschi, 2023) and the characteristics of firms engaging in these initiatives, including factors related to home countries (Wan et al., 2019), industries and production processes (Ketokivi et al., 2017), and enterprise size (Ancarani and Di Mauro, 2024) .

However, there is still limited understanding about how reshoring strategies link with other strategic decisions, such as those related to sustainability (Orzes and Sarkis, 2019). At a policy level, being Europe the largest net importer of CO₂ emissions (Zhu, Shi, Wu, Wu, and Xiong, 2018), the European Commission is stimulating greener, circular, and regional supply chains, by pricing carbon emissions. Companies are expected to reduce their supply chain emissions and resource intensity by setting up closed-loop models to recycle materials and circular business models to extend product lifecycles (European Commission, 2020), also through reshoring initiatives. Despite reshoring being typically driven by motivations other than sustainability (Gray et al., 2017), such initiatives may also have positive effects on sustainability and circularity, especially if these are evaluated at a global level and with an extended producer responsibility view. In fact, for firms serving high-cost markets, transportation and logistics CO₂ emissions can be reduced by locating sourcing and production closer to market. Additionally, focal firms pursuing the goal of sustainable supply chains may exert more control on a domestic supply network; this is particularly relevant as regulatory restrictions on environmental emissions and social corporate responsibility tend to be more stringent in high-cost countries. Additionally, circular economy practices could

improve resource efficiency and help companies dealing with higher costs of materials in the home country. In fact, regional and geographically concentrated supply chains facilitate the access to locally recycled secondary materials (Nandi et al., 2021), as well as servitisation and repair (Hopkinson, 2018). As such, it is realistic to imagine that the transition towards a more sustainable economy might incentivise the concurrent adoption of reshoring and Circular Economy (CE) practices.

Although the link between circularity and reshoring emerges as a tenet in many policy and companies reports (EU Parliament, 2021; Manteco Sustainability report, 2022), to date this remains an undemonstrated assumption. The reshoring literature shows little evidence of the link of reshoring with the green transition in general, and circularity in particular, although it acknowledges that understanding the intersections between the two phenomena is a relevant research gap (Fratocchi and Di Stefano, 2019). On the other hand, the CE literature has argued that proximity of sourcing and manufacturing can facilitate CE practices (Sirilertsuwan et al., 2019) but has not yet explicitly investigated the linkages in the context of the reshoring of supply chains.

Understanding the nature of the relationship between reshoring and the CE would help unveiling potential dependencies and reinforcing mechanisms. Therefore, this study addresses the following research question (RQ): *Is there any link between reshoring initiatives and the adoption of CE practices?*

To address the research question, the study examines in-depth and longitudinally the case of an industrial company that has implemented both reshoring and CE practices. The theoretical lenses of Resource Orchestration theory (Sirmon et al., 2011) and Neo-Institutional theory (Di Maggio and Powell, 1983) are used to generate initial insights on the research question.

This work contributes to the reshoring literature by reflecting on the institutional conditions and supply chain resource management that support the concurrent implementation of reshoring and circularity. The study proposes a conceptual framework that characterises the link between the two phenomena and identifies potential directions for future research.

2 Literature review: the relationship between reshoring and circular economy

In order to understand the penetration of sustainability and circularity issues in the reshoring literature, a structured literature review was performed, through the Scopus database, by employing the following search string:

“*shoring” AND (“sustain*” OR “circular” OR “green”)

The search returned 236 contributions (including articles, book chapters, reviews and short surveys). A manual check of all contributions was then performed, in order to assess the relevance of individual articles to the research theme; this returned a set of 38 articles that were then closely scrutinised (Figure 1). Many of these publications are conceptual, while there is a dearth of empirical studies providing evidence that reshoring occurs for sustainability reasons or showing the sustainability benefits of reshoring (Di Stefano and Fratocchi, 2021).

Extant research indicates that the influence of sustainability as a driver for reshoring decisions is still relatively low (Gray et al., 2017; Zhang et al., 2022). Data from the US-based Reshoring Initiative (www.reshorenw.org) suggest that reshoring for reasons linked to sustainability

accounts for less than 5% of the over 2000 initiatives in the archives. Research shows that sustainability is generally a side-effect of the dominant reshoring driver of seeking customer proximity (Ashby, 2016; Sequeira et al. (2022). For instance, Burberry, the iconic British clothing brand, decided to realign its business towards a brand-led model and to reshore to the UK and to develop mutually beneficial relationships with UK suppliers, which facilitated achieving sustainability goals. Interestingly, the paper points to the emergence of partnerships with suppliers of raw materials based on recycled goods as part of the reshoring process, suggesting a link between reshoring and CE practices.

While more stringent sustainability regulations (such as supply chain due diligence and carbon pricing mechanisms) are expected to exert powerful coercive pressures on the future location decisions of European companies, other pressures may come from the market side. The scandals regarding the social and environmental impact of offshoring are raising consumers' sustainability concerns (Singhal, 2017); several studies suggest that domestic products are associated with shorter supply chains and with the customers' belief that they are more sustainable (Grappi and Bagozzi, 2020; Gillani et al., 2022).

Likewise, there is ambiguous evidence on the impacts that reshoring exerts on environmental sustainability outcomes (Fratocchi and Di Stefano, 2019). Choudhary et al. (2022) find that reshoring improves supply chain resilience but no evidence for the impact of reshoring on sustainability outcomes. Conversely, Fernández-Miguel et al. (2022) show that, by bringing extraction sources closer to factories, emissions from transportation are reduced.

Despite the intuitive connection between reshoring and CE initiatives, scant efforts have been directed to the investigation of the potential linkages. Kim and Do Chung (2022) untangle the role of reshoring in the different stages of a closed-loop supply chain by formulating a network design model to determine whether manufacturing centres, suppliers, and reverse logistics facilities should be reshored. Similarly, the CE literature argues that reshoring has a positive impact on circularity, enabling companies to bring recycling facilities and production closer, and improving the efficiency of recycling processes (Nandi et al., 2021). However, there is no empirical analysis to demonstrate this tenet yet. In general, proximity manufacturing and local sourcing have a positive effect on the adoption of some CE practices, as they facilitate reverse logistics for recycling (Sirilertsuan et al., 2019). Additionally, they support circular business models (Hopkinson et al., 2018) by making the establishment of refurbishment centres easier.

In conclusion, the review confirms the emerging and poorly understood relationship between reshoring initiatives and circular economy practices. As such, there is a gap in the literature that deserves empirical exploration (Gualandris et al., 2024).

3 Theoretical background

To provide initial and complementary theoretical interpretations of how reshoring and CE initiatives may be linked, this study draws on Resource Orchestration Theory (ROT henceforth) (Sirmon et al., 2011) and Neo-Institutional Theory (NIT henceforth) (Di Maggio and Powell, 1983). ROT can shed light on how internal and external resources are deployed and managed along the life cycle of these initiatives; NIT can illuminate on how institutional pressures affect firms' reshoring and CE initiatives (Di Mauro and Ancarani, 2022).

3.1 Reshoring and circular economy: a ROT perspective

Expanding upon the resource-based perspective, ROT has been introduced to describe the processes involved in building capabilities and to elucidate the managerial role in converting resources into capabilities (Sirmon et al., 2011). ROT characterises resource management as a dynamic process of structuring, bundling, and leveraging company resources to generate value for customers and establish competitive edge for the company (Sirmon et al., 2011). Structuring involves obtaining, accumulating, and divesting resources to shape the resource pool. Bundling consists of stabilising, enhancing capacities and innovating. Leveraging includes mobilising, coordinating and deploying resources. Resource orchestration must be explored across the life cycle of a firm (start-up, growth, maturity and decline).

The nascent literature that applies the ROT framework to CE goals concurs that it is imperative to coordinate resources throughout the entire supply chain (Asante et al., 2022; Sudusinghe and Seuring, 2022; Saccani et al., 2023; Wong et al., 2015). Network orchestrators promote collaboration among organisations within industrial ecosystems (Parida et al., 2019; Zaoual and Lecocq, 2018) and support innovation processes (Hansen and Schmitt, 2021).

3.2 Reshoring and circular economy: an institutional theory perspective

NIT may represent a suitable theoretical lens to study the adoption of reshoring and circular practices. According to NIT, firms will adopt isomorphic practices with respect to the organisational field and respond to coercive, normative and mimetic pressures (Di Maggio and Powell, 1983). Coercive isomorphism includes formal and informal pressures exerted on suppliers by corporate and end customers demanding “Made in” and/or circular products. Marketing research distinguishes pragmatic legitimacy, which determines whether a product can satisfy market needs, and moral legitimacy, which determines whether a social actor’s actions are appropriate with respect to current social norms and cultures (Handelman and Arnold, 1999). While the former represents a reputational resource that backs other product attributes such as quality or innovativeness and can therefore represent a source of competitive advantage, the other serves the purpose of signalling social orientation or compliance to cultural and ethical norms (Wang et al., 2014). Normative pressures derive from practises promoted by industry associations and professional networks (DiMaggio and Powell, 1983) and lobbying by labour unions. Finally, mimetic pressures are linked with uncertainty, which encourages imitation of peers. Imitating companies that successfully brand themselves as being “loyal to the country” or adopt sustainable practices provides an example of mimicry drawn by peers’ performance, even if this mimetic behaviour may not be optimal according to specific contingencies of the company.

There is ample evidence showing that institutional pressures drive environmentally friendly practices (Zhu and Sarkis, 2007), while absence of institutional pressure can be key causes of lagging efforts with circularity (Farooque, Zhang et al., 2019). As for reshoring, coercive pressures stem from the introduction of trade barriers or from supportive measures at government level, or from political leaders’ advocating domestic sourcing/production as a sign of patriotism (Di Mauro and Ancarani, 2022).

4 Method

4.1 Case selection and data collection

Because of the scant research on the topic, the research followed a qualitative case study approach. Specifically, we focused on a single exemplar case study (Yin, 2009). The case study is revelatory as it showcases how reshoring and circularity can be hand in glove. The case is longitudinal and allows the appreciation of dynamic processes: the single case was observed at two points in time, in 2021 and at the end of 2023. The company analysed is a small UK-based company producing high-end bikes for children. The company began its operations in 2013 by outsourcing the assembly process to China and sourcing components from all over the world. In 2016, the company back-shored assembly to offset the long delivery lead times. With the financial support of the Welsh government, the company opened an assembly factory in the UK, while most of the components continued to come from China. The relocation in the UK favoured product innovation through use of sustainable materials and improved bike design and process innovation. Material circularity is considered the key to lower emissions embodied in the production. The company has recently adopted a product-as-a-service model in different markets, with customers being able to lease bikes. There are plans to reshore more components and manufacturing, as well as to expand the circularity in the use of materials and in the business model. Apart from assembly, the company has three bicycle wheel production lines in the same plant, while all other components are outsourced.

Data collected include both primary and secondary material. Two extended online interviews with the CEO of the company were collected the first in 2021 and the second in late 2023. The interviews were recorded, transcribed and sent to the interviewee to be checked and approved. Publicly available secondary data (Sustainability report, online news) were also collected over time to track new initiatives and to triangulate the primary interview data. A field visit to the UK plant and additional interviews with managers and workers of the factory are also planned in the coming months.

4.3 Data analysis

The study adopts a flexible-pattern-matching (FPM) design, which is based on the understanding that researchers do not typically approach their work without an *a priori* theoretical perspective (Eisenhardt, 1989; Sinkovics, 2018). Instead, it advocates for an iterative combination of deductive and inductive elements to better comprehend reality. After the identification of the research questions, FPM involves using initial theoretical insights from existing literature, identifying observed patterns through data analysis, and comparing the two to uncover any discrepancies/mismatches that could lead to new insights and theorising (Bouncken et al., 2021) (Figure 1).

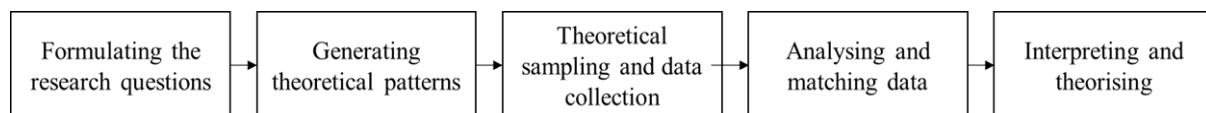


Figure 1 - The Data analysis process

FPM offers various advantages, related to the credibility that extant theories can provide in guiding the generation of observed patterns, to the transparency in the processes of conceptualisation, analysis, and interpretation of data, and as a foundation for theory development or refinement. To apply FPM, a template (King, Brooks and Tabari, 2018) was developed, based on the theoretical lenses (ROT and NIT) (Table I).

Table I - Template for analysis of Reshoring and CE implementation

Analytical framework	Theoretical themes	Expected pattern
ROT	Structuring, bundling, leveraging over the life cycle	• The adoption of both Reshoring initiatives and CE practices is supported by resource orchestration
NIT	Coercive, mimetic, normative pressures	• The adoption of Reshoring and CE is driven by equivalent institutional pressures • Because of equivalent institutional pressures, Reshoring and CE are developed concurrently

The expected pattern derived from ROT builds on literature findings related to the coordination of resources by network orchestrators (Asante et al., 2022; Sudusinghe & Seuring, 2022; Saccani et al., 2023). This view is also coherent with research on reshoring that has shown the importance of proactive network creation efforts and network collaboration for relocation initiatives (Baraldi et al., 2018; Ancarani and Di Mauro, 2024). As for NIT, coercive pressures stem from legislation and formal and informal pressures exerted on suppliers by corporate and end customers demanding “made in” and greener products. Normative pressures derive from practises promoted by industry associations and professional networks (DiMaggio and Powell, 1983) that use the popular narrative of successful reshoring initiatives or advocate the adoption of sustainable production processes. Further normative pressures include lobbying by labour unions that sponsor the protection of domestic manufacturing and employment, as well as more environmentally and socially oriented practices. These pressures can be considered contemporaneous, thus suggesting that they will lead to parallel efforts to develop Reshoring and CE.

5 Results

Interviews were transcribed and manually coded through the systematic examination of the transcripts. Coding was first undertaken independently by each researcher and then compared and modified until agreement was reached. Starting from the interview data, similar passages (first order indicators) were grouped together into second order concepts and then linked to the different theoretical themes used in the initial expected patterns. New themes were also allowed to emerge inductively from the data. The main themes that emerge: resource orchestration activities; external pressures; resource dependencies. The last empirical pattern cannot be associated with ex-ante theoretical framings. These codes point towards the idea of non-immittigable dependencies the company needs to deal with. These are of different nature, from global suppliers, from local shops and from current industry standards.

5.1 Resource orchestration activities

For the company, the following resource orchestration activities, of structuring (S), bundling (B), and leveraging (L), were necessary for achieving competitive advantage.

The first orchestration activities refer to the initial reshoring of assembly. In 2016 the first mechanics were hired in the new assembly plant in Wales. Throughout the company life, workers’ skills and expertise were key factors to raise the products’ quality and establish a

competitive advantage. At first, the company established a partnership with Welsh government (S) to get financial support for training mechanics locally. Then, the company invested in enhancing workers' skills with new capabilities: for instance, production workers learned to assemble wheels (B); purchasers learned to manage material flows complexity following reshoring of assembly (B); operations became more flexible to adapt to a more uncertain sourcing process (B). Clear benefits were also generated in terms of economies of learning and efficiency improvements (L).

In a second phase, the company took actions to orchestrate its environmental know how, which is a key resource to link future reshoring initiatives with environmental sustainability also through the adoption of CE practices. The company first established a partnership with an NGO (S), SME Climate Hub, which empowers SMEs to take climate action, and then consolidated this know-how over time (B). Environmental know how was insourced and integrated into a long-term strategy (B), as well as into training in specific company functions, like purchasing (B). For example, the buyers needed to use environmental criteria in their conversations with existing suppliers and to select potential suppliers. Additionally, the government had a key role, providing a grant in support of R&D experiments to test the resistance of frames and forks made of recycled aluminium (S). These experiments were used to convince potential partners of the synergies between CE, sustainability and quality.

Substituting global virgin aluminium with locally recycled aluminium allowed for a great reduction of the emissions associated with the production of bicycles. Local and circular suppliers were a key resource to jointly implement reshoring and CE initiatives. In the initial structuring phase, the purchasing team scanned the UK and Europe supply market to look for potential partners (S). This activity was very challenging because potentially interested partners had no sufficient production capacity. In parallel, the purchasing team started to push existing suppliers to use recycled materials, and to reduce the use of plastics (S). This process involved terminating relationships with some reliable suppliers, if they were not willing to align with the new company's goals (S). Finally, the company succeeded in identifying some local manufacturers willing to experiment and innovate by integrating recycled materials in their products (S). By experimenting and innovating with suppliers the company was able to develop a patent, to create some circular components, and to facilitate groups of suppliers to co-create complex solutions collaboratively (B).

The long-term plan of the company is the move towards a product-as-a-service model. The company refers to closed-loop circular business models as "true circularity". The real sustainability potential of the CE stands in prolonging the product lifecycle. The company has acquired initial know-how on Circular Economy by becoming a partner of Ellen McArthur Foundation (S). This partnership was paramount to learn about CE from an environmental and a business model point of view. The company has started innovating and experimenting on this level with the collaboration of different leasing companies by launching circular business models in different markets (B). These models are currently operating through the online channel while the future aim is to scale this model by involving the traditional distribution channel made of small shops (L). Currently, the company has started to enhance existing partnerships with existing bike shops and to promote life-extension through warranty certificates following repair of second-hand bikes. The Welsh government has also financed a testing Infrastructure (S), which is a prerequisite for life extension to happen and the company has started to offer a service to other companies (B).

5.2 External pressures behind the adoption of reshoring

Reshoring and CE appear to respond to different types of pressures. The main pressures for reshoring derive from government and customers. In fact, the Welsh government has strongly incentivised reshoring financially, providing grants and loans for the infrastructure, and for the training of the workers. Additionally, customers have a higher willingness to pay for Made in UK products.

These two coercive pressures, however, are not driving in a similarly strong manner the adoption of CE and sustainable practices. Regulatory pressures on the adoption of CE practices are still weak and unclear, even if the company took advantage of some governmental incentives (to set up the testing infrastructure, and to conduct some R&D activities on recycled materials). The company's top management is currently lobbying with the Welsh government to improve the way legislation promotes the use of recycled materials or life extension strategies and fights planned obsolescence. Customers are not willing to pay for the use of recycled materials, and the main distribution channel, made of local shops, does not find circular business models and leasing economically attractive. While acknowledging the important role of cultural change through education, according to the CEO's perspective a real change will come only through strong regulation.

The company learns from and uses tools from industry groups, environmental NGOs and think tanks, which is a sign of normative pressure. However, the company refers also about the absence of adequate normative pressures for the CE, and the lack of a collaborative industry-wide solution to reverse logistics. The success of circular business models and life-extension activities depends on the existence of efficient and affordable reverse logistics processes that bring end-of-life products back to the industrial plant. At the moment these processes do not exist because of the costs of reverse logistics.

Mimetic pressures seem absent, being the company a front-runner within both the spheres of reshoring and circular economy. In synthesis, institutional pressures for reshoring and circular economy are very different with strong coercive regulatory and market pressures to drive reshoring initiatives but not in a perspective of circular economy.

6 Discussion

This section compares theoretical and observed patterns to unveil the principal factors that can support the joint implementation of reshoring and CE practices. Before delving into these factors, we observed an important time element. Whereas the expected pattern suggested a concurrent implementation of reshoring and CE, they do not happen in parallel. Instead, we observed three steps: the first concerns the reshoring of assembly, followed by the reshoring of sourcing in parallel with the adoption of the first CE practices, mainly the integration of recycled materials. In the last step, the company focuses on consolidating its adoption of CE practices, extending its products' lives with more circularity of use. This temporal disconnection seems relevant to understand the reinforcing mechanisms and complementarities between the two phenomena.

This temporal precedence of the reshoring process is coherent with a NIT perspective. In fact, results show that external pressures for reshoring are stronger than those for the adoption of CE practices (especially coercive regulatory pressures in the form of strong government incentives and market pressures for high quality/Made in EU products) thus determining larger benefits from reshoring than from circularity.

Findings also reveal substantive resource orchestration efforts, stemming from structuring, bundling and leveraging of resources across the three stages. From a ROT perspective, the proactive efforts of the entrepreneur to build shorter and local supply chains and to establish local innovation partnerships were the key elements enabling the circular loop. In each step, the company developed key capabilities that were necessary in the following step. Therefore, the case suggests that reshoring acted as a precondition for the adoption of CE practices. In brief, the lifecycles of reshoring and CE were staggered, with a more mature phase of reshoring paving the way for the early phase of CE.

Findings also point to observed patterns different from the two initial theoretical patterns and highlighting the criticality of resource dependency for reshoring and CE. In synthesis, apart from the resources that can be easily orchestrated, there are also other resources that are very difficult to acquire, bundle and leverage. Undeniably, some of the ambitious objectives set by the company depend mainly on the action of someone else they depend on, rather than only on the decisions of its managers. The first dependence is from powerful suppliers that oppose the CE. These could be powerful multinational companies with monopoly power on key components in the bicycle industry but also local suppliers that are important from a reshoring perspective and cannot be easily substituted. In both cases these suppliers are not willing to work towards circularity of materials or adopt other sustainability practices. The second dependence is from retailers, as existing small local shops are unwilling to adapt to circular business models. These companies usually do not have the experience, skills, resources to engage in a closed-loop model.

6.1 The relationship between reshoring and circular economy: An interpretative framework

Inspired by the Sirmon et al. (2011) model of resource orchestration lifecycle, we propose a framework (Figure 2) that describes the evolution of reshoring and adoption of CE practices as three subsequent stages. Each stage is characterised through the relative resource orchestration activities. The framework helps understanding how the two phenomena support each other in terms of key resources and orchestration activities at each stage but also across stages.

Start-up stage. During this phase, the company reshores just the assembly, without relocating any sourcing or manufacturing, which is still dislocated globally. This phase seems mostly internally focused. Most of the activities are related to structuring and building new resources that are necessary for experimenting and innovating in the following phase, which will focus more on supply chain resources orchestration. The company starts knowing more about its own production, familiarising with the manufacturing complexity, hiring workers, raising the products' quality level through learning. The key resource orchestration activities in this phase are the acquisition of production workers and of a production plant, the preservation of the relationship with the government, as first partner to support reshoring and to provide them with key resources (network, finances, infrastructure, workers); the establishment of environmental know how is a sort of first step to make further reshoring of manufacturing and also some CE practices possible.

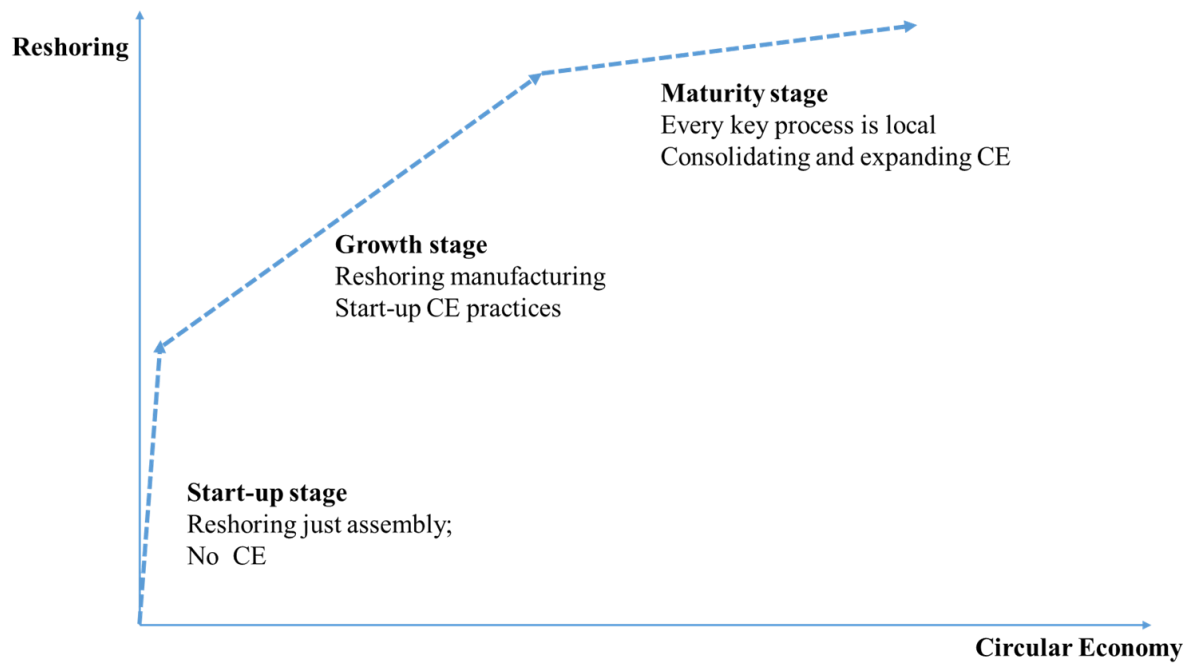


Figure 2 - Visual framework

Growth phase. During this phase, the company consolidates reshoring, by relocating some manufacturing and sourcing, and starts adopting CE practices. This phase focuses on the development of external resources and capabilities associated with the concurrent adoption of reshoring and CE practices. The orchestration of local and circular suppliers seems the key activity: internal sustainability knowledge is consolidated and becomes part of the company's culture and long-term strategy; the purchasing team looks for local manufacturers that are willing to experiment with recycled materials; the R&D team works with the new partners to develop new circular components. Some experimentation starts also on circular business models.

Maturity stage. The company has completed the relocation of all the manufacturing that it was possible to relocate, given its resource dependence, and the focus shifts to expanding CE efforts by leveraging supplier relationships and partners. The firm uses CE practices as a means to pursue both efficiency and innovation. Thanks to the development of a more affordable reverse logistics process and the collaboration of relevant stakeholders in operationalising reverse flows, the company is able to create local and closed-loops of products and materials. In parallel with this focus on efficiency, the second focus on innovation aims at expanding circular business models and ensuring that components that enter the second-hand market are recovered properly and repaired.

7 Conclusion

The study has explored in a case study whether there are links between reshoring and the adoption of CE practices. Results draw a dynamic relationship between reshoring and the adoption of CE practices, in which the two phenomena seem to support each other in different ways, in different phases. Most importantly, reshoring emerges as a pre-condition for CE practices. Results suggest that institutional pressures are not favouring the joint adoption, because they push with different intensity towards the two phenomena.

The study contributes to theory and practice. To effectively implement reshoring and CE companies need to acquire and manage key resources and capabilities. This study offers managers and entrepreneurs a three-step framework that may guide the concurrent adoption of reshoring and CE practices.

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CHAPTER III

Platform-driven decentralised circular futures

Abstract

This paper examines possible supply chain configurations in the circular future scenarios "*Bottom-Up Circular Loops*" and "*Decentralised Circular Uptake*". As described in the introduction to this deliverable, both these scenarios are characterised by decentralised and collaborative approaches to governance, as opposed to top down hierarchical ones. As such, the *sharing economy* (SE) paradigm aligns very well to both these scenarios, especially in its version based on peer-to-peer (P2P) platforms. For this reason, in this paper we empirically review P2P SE platforms existing in the market, evaluating and classifying them according to their characteristics and to their capability to contribute to the three pillars of sustainability. This approach allowed us to analyse how effectively these platforms might promote sustainable practices, support community-based resource sharing, and foster a transition toward a model that respects ecological limits. To achieve this, we evaluated the P2P platforms' social, environmental, and economic sustainability, employing distinct measurement approaches for each pillar of sustainability. First we used Khalek and Chakraborty (2023) work, to categorise P2P platforms into eight distinct types based on the nature of the exchanges they facilitate; second, we evaluated P2P platforms based on three dimensions of sustainability. More specifically, we used Martin's (2016) work to assess the platforms from a social perspective; Öberg's (2024) study for evaluating the platforms environmentally; and Chen et al. (2020) framework for their economic evaluation. Findings reveal how closely common P2P platforms embody the values of a sufficiency-based economy while facilitating more localised, resilient, and sustainable interactions within communities; on the other hand, they also recognise that P2P platforms often replicate models which, despite their decentralised nature, could still pursue growth-oriented approaches and promote further commodification and capital accumulation. This research contributes to place the analysed P2P SE platforms on a continuum between within the *Bottom-Up Circular Loops* and *Decentralised Circular Uptake* quadrants, showing the extent to which they align with the principles of a "Limits to Growth Society".

1 Introduction to the Sharing Economy

The growing global awareness about the environmental crisis, the increasing occurrence of natural disasters, and the need to address unequal income distribution has moved the attention of mass media and leaders on strategies to ensure a sustainable future, both ecologically and socially, placing them as the main objectives of the 2030 Agenda (Öberg, 2024). In response to evolving social and environmental demands, innovative economic models like the SE have emerged, offering sustainable alternatives to traditional practices.

The concept of Sharing is not something new but has always been present in human habits throughout history. The idea of sharing has been an integral part of human life since ancient times (Khalek and Chakraborty, 2023). Sharing is defined as "*the act and process of distributing what is ours to others for their use as well as the act and process of receiving something from others for our use*" (Belk, 2007, p. 127). Communities across the globe have been sharing food among themselves for ages through family meal-sharing (thanksgiving), community kitchens ('langars'), food banks, or other arrangements (Jayashankar and Cross, 2020; Michelini et al., 2018).

Traditionally, the practice of sharing was limited to small groups, typically restricted to close-knit circles such as family, friends, or extended relatives. These exchanges were governed by personal bonds and physical proximity, making it challenging for the concept to expand beyond these intimate groups. However, with rapid advancements in technology, the scope of sharing has dramatically

evolved. This shift has enabled the practice to extend far beyond traditional boundaries, reaching wider audiences and gaining unprecedented traction in recent years (Dabbous and Tarhini, 2019).

The principles underlying sharing are rooted in pro-social values such as mutual support, cooperation, interdependence, and solidarity. People may willingly share resources with others to enhance collective well-being, often without the expectation of immediate return (Benkler, 2004; Belk, 2007). This form of generalised reciprocity, grounded in altruistic motives, lends sharing its nature as a social exchange (Homans, 1961). Engaging in collaborative activities allows individuals to forge new connections, strengthen social ties, and build social capital (Aspara and Wittkowski, 2019; Belk, 2010). In this way, sharing approaches empower consumers to forget the 'burdens of ownership' (Moeller and Wittkowski, 2010); consumers can temporarily use tangible or intangible resources shared by others without owning them.

This disinterested approach to profit and close to disinterested sharing is the application of the "sharing nicely" theory hypothesised by Benkler (2004). This concept emphasises the use of goods in a way that does not rely on traditional market mechanisms, promoting sharing that is more beneficial, equitable, and efficient for individuals and communities. For the author, this approach works best with resources that have low marginal costs of sharing, such as digital goods, unused car seats in carpooling, or idle computational power.

Social exchanges, however, can be partially based on the expectation of return (Uehara, 1990, p. 523); this is evident in how the sharing economy has transformed the very perception of 'sharing'. The modern sharing economy has shifted from intimate forms of 'sharing' to broader practices driven by economic and utilitarian motivations. In this context, individuals permit others to access resources with mutual expectations of reciprocity. This profit-driven alteration of sharing habits is referred to as "pseudo-sharing" (Belk, 2014). In his critique of the manner in which many sharing economy platforms commodify sharing ideals in order to conform to neoliberal capitalist framing, Martin (2016) expands on this issue. True sharing, according to Martin, is built on non-reciprocal, unselfish, and trust-based community acts. However, by replacing these principles with profit-maximising transactional exchanges, often cloaked as community-building or communal resource sharing, pseudo-sharing perpetuates the goals of neoliberal capitalism.

2 Platform Sharing Economy

With the advancement of digital technology, the widespread availability of the internet, and the accessibility of affordable electronic devices, the concept of sharing has evolved significantly, driving an unprecedented global trend in economic activities like sharing, exchanging, lending, and leasing among consumers (Puschmann and Alt, 2016; Botsman and Rogers, 2010).

Table I – Articulations of the "sharing" concept

Concepts of Sharing	Definition	Reference
Sharing	The act of jointly using goods or services among individuals, often without transferring ownership, to maximise resource utilisation and reduce waste (e.g., car sharing, housing).	Botsman and Rogers (2010)
Exchange	The reciprocal transfer of goods or services between two or more parties, which can occur with or without	Puschmann and Alt (2016)

	monetary involvement (e.g., bartering or monetary transactions).	
Lending	Temporarily allowing someone else to use a good with the expectation that it will be returned after a specified period (e.g., lending books or tools to neighbours).	Belk (2010)
Leasing	A contractual agreement where one party (the lessor) grants another party (the lessee) the right to use a good for a fixed period in exchange for periodic payments. Examples include car or equipment leasing	Puschmann and Alt (2016)

This new economy is reshaping traditional business models, and developing in different directions (Öberg, 2021). In particular, new business models are developing, such as i) Peer-to-Peer (P2P) platforms that facilitate direct exchanges between individuals; ii) Collaborative Consumption (CC), which emphasises the shared use of resources to reduce waste; iii) Access-Based Consumption (AC), prioritising temporary access over ownership (e.g. the gig economy, enabling flexible and on-demand labor); and iv) Community-based platforms, which promote localised collaboration and collective value creation, the sharing economy continues to redefine traditional economic practices and foster innovative approaches to resource utilisation. In addition to the emergence of innovative business models, the development of new platforms has been observed (Geissinger et al., 2021). These platforms often form part of 'niches'—small-scale, experimental initiatives characterised by high uncertainty. In the context of sharing economy platforms, such niches are supported by dedicated actors, including startups, research institutions, and community-driven projects. These initiatives aim to challenge established 'regimes,' which refer to the dominant systems, rules, and structures (including established industries, regulations, cultural norms, and market dynamics), governing mainstream societal practices (Geels 2002; Geels and Schot, 2007). By doing so, these niches serve as incubators for disruptive innovations, fostering transitions toward more sustainable and inclusive economic systems. Hence, different incumbent companies have adapted to the sharing economy by understanding its potential and adapting their business models to it; an example is the case of the car-sharing company ZipCar which has adapted its core business, namely car rental, to the sharing economy by linking the concept of temporary acceptance and vehicle sharing.

SE is based on the interaction of three main actors: (1) an Internet platform that enables matching and trust-verified transactions among users; (2) a peer service provider who offers temporary access or full ownership to idle assets; and (3) a customer who seeks access or ownership of an asset and offers monetary or non-monetary compensation (Akhmedova et al., 2020). Such practice has gained unprecedented momentum due to the ease of availability of the Internet, enabling increased opportunity for interpersonal connectivity since it supports the development of online-based communities and networks with low transaction costs (Möhlmann, 2015).

The SE is gaining popularity and growing at a fast pace, as demonstrated by the data referring to some different products markets, such as the carsharing market revenue estimated to reach US\$16.5 billion by 2026, from US\$9.6 billion in 2019 (Statista, 2021); the shared apparel market is expected to grow to US\$7.4 billion in 2026 of US\$4.7 billion in 2021 (Calio, 2022); while in accommodation sharing, the revenue of Airbnb has grown to US\$5.99 billion in 2022 from US\$2.56 billion in 2017 (Statista, 2022). Over time, the sectors embraced by SE are increasingly numerous; initially, this approach found diffusion in the field of short term accommodations (Couchsurfing, Airbnb), fashion, and accessories (Poshmark) but currently the landscape of SE has widened across

multiple sectors (Geissinger et al., 2020; Laukkanen and Tura, 2020), meal-sharing services (Eatwith), space sharing (JustPark, WeWork), energy (Gridmates, Vandebron), pet care (Rover), and others. As society norms and economic forces change, the sharing economy has become a revolutionary model. This paradigm reflects shifts in consumer behaviour, such as a greater focus on cost-effectiveness, sustainability, and teamwork (Botsman & Rogers, 2010; Sundararajan, 2016). This change was enabled also by the emergence of digital platforms, which have facilitated new kinds of communication and resource use (Hamari et al., 2016). Key factors that have significantly contributed to the diffusion and success of sharing framing include:

1. **Economic Benefits:** Many users are motivated by the opportunity to save or earn money. Sharing platforms allow individuals to monetise underutilised resources, providing an additional source of income, especially during economic downturns.
2. **Environmental Sustainability:** Sharing resources can reduce waste and decrease environmental impact. This appeals to eco-conscious users who seek to lower their ecological footprint by reusing and sharing goods and services.
3. **Community and Social Connection:** Participation in the sharing economy often fosters a sense of community. Many individuals value the social interaction that comes with shared experiences, creating bonds and a sense of belonging.
4. **Access over Ownership:** Users are increasingly interested in accessing goods and services without the need for ownership. This preference aligns with a lifestyle that values experiences and flexibility, especially among younger generations.
5. **Work Flexibility and Autonomy:** Sharing economy platforms offer flexible work options, allowing individuals to control their schedules and work according to their lifestyle needs, appealing to those seeking independence from traditional employment.

There are different types of Sharing platform models in the literature; however, in this study we focus on P2P SE platforms. P2P SE platforms are characterised by transactions between customers and peer service providers; sometimes these transactions are facilitated via community-based online services, while others use more centralised or for-profit platforms. As Hamari et al. (2016) describe, P2P sharing involves “peer-to-peer-based activity of obtaining, giving, or sharing access to goods and services, coordinated through community-based online services.” This model links consumers, who “aim to temporarily utilise assets,” with peer providers who grant access to these assets, delivering the core service (Benoit et al., 2017, p. 220).

This research aims to position the analysed P2P SE platforms on a continuum between within the *Bottom-Up Circular Loops* and *Decentralised Circular Uptake* quadrants, and to qualitatively assess the extent to which they align with the principles of a “Limits to Growth Society”. To achieve this, it was first necessary to evaluate the platforms' social, environmental, and economic sustainability, employing tailored methodologies for each pillar of sustainability.

3 Methods

3.1 Identification of Peer-to-Peer Platforms

The first step involved identifying a list of P2P platforms that aligned with the objectives of our research. This phase combined of academic and grey literature analysis, including forums, blogs, and websites. The incorporation of grey literature proved essential, given the limited availability of comprehensive academic material and the absence of dedicated databases on the subject. A key criterion for platform selection was their alignment with circular economy principles. Specifically, only platforms enabling a circular approach to goods were included in the study. This selection process involved a detailed examination of each platform's mission, vision, and activities, ensuring that only

those promoting circularity in their operations were considered. This approach allowed us to gain a broader understanding of the P2P platforms that have emerged and evolved over time, offering valuable insights into their role within a sustainable framing.

3.2 Typologies in the Sharing Economy: Platform Classification

Having defined the pool of platforms to be analysed, we then used Khalek and Chakraborty (2023) work to classify the platforms. In their seminal paper, they synthesise and consolidate existing conceptual foundations of SE, and apply the theoretical and analytical approach of the "anatomy of exchange" (Anderson et al., 1999) to the SE context. By applying this approach we aimed to combine conceptual and empirical elements to distinguish between different types of platforms and models within the sharing economy, focusing on key components that determine the nature of exchange.

The first step involves examining exchanges through five fundamental components. The objectives of the exchange relate to the motivations of the actors involved, which can be profit-oriented (utilitarian) or focused on social and relational values (symbolic). The context in which the exchange takes place reflects the socio-cultural, economic and technological conditions that influence the functioning of the sharing economy, such as economic crises, climate change or the advancement of digital technologies. The network refers to the actors involved in the exchange and their dynamics, distinguishing, for example, between dyadic (where the platform owns the resources) and triadic exchange structures (where the resources belong to the users). The process includes the modes of interaction, such as the level of intermediation of the platform or on-demand access, while the content of the exchange focuses on the media used for the exchange itself, such as money or non-monetary goods, and on the possibility of transferring ownership (see also Figures 1 and 2 for an illustration).

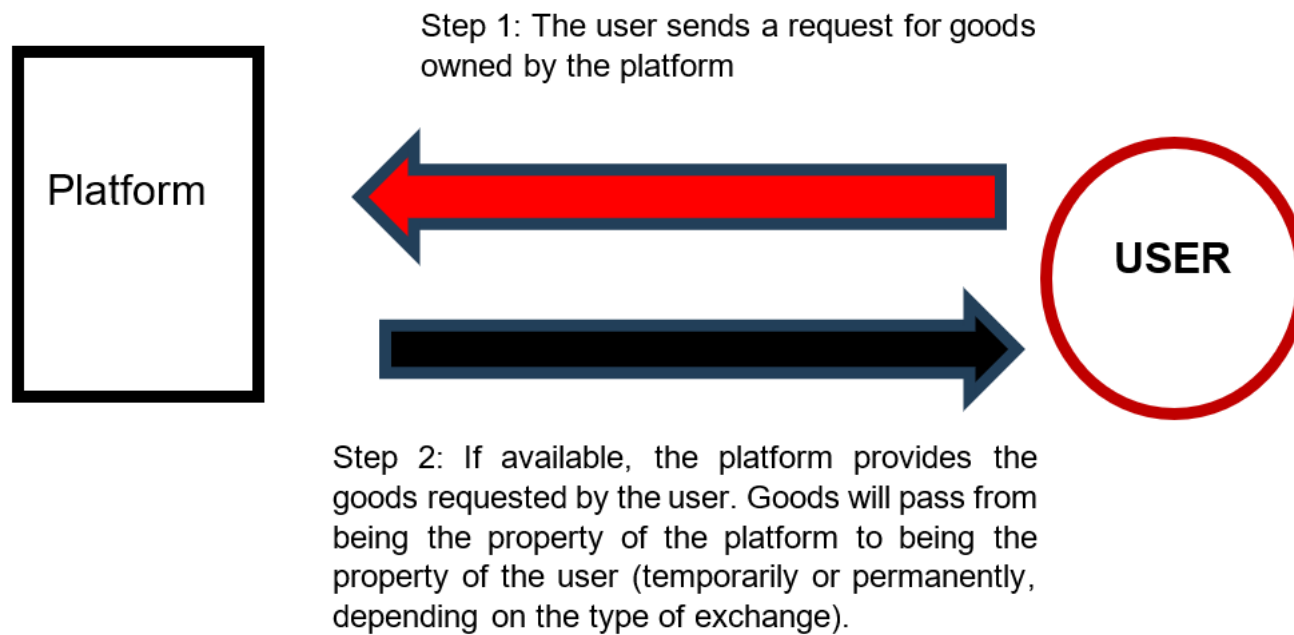


Figure 1 - Example of dyadic interaction between the platform and the user. The user requests a good from the platform, the latter provides a good its own.

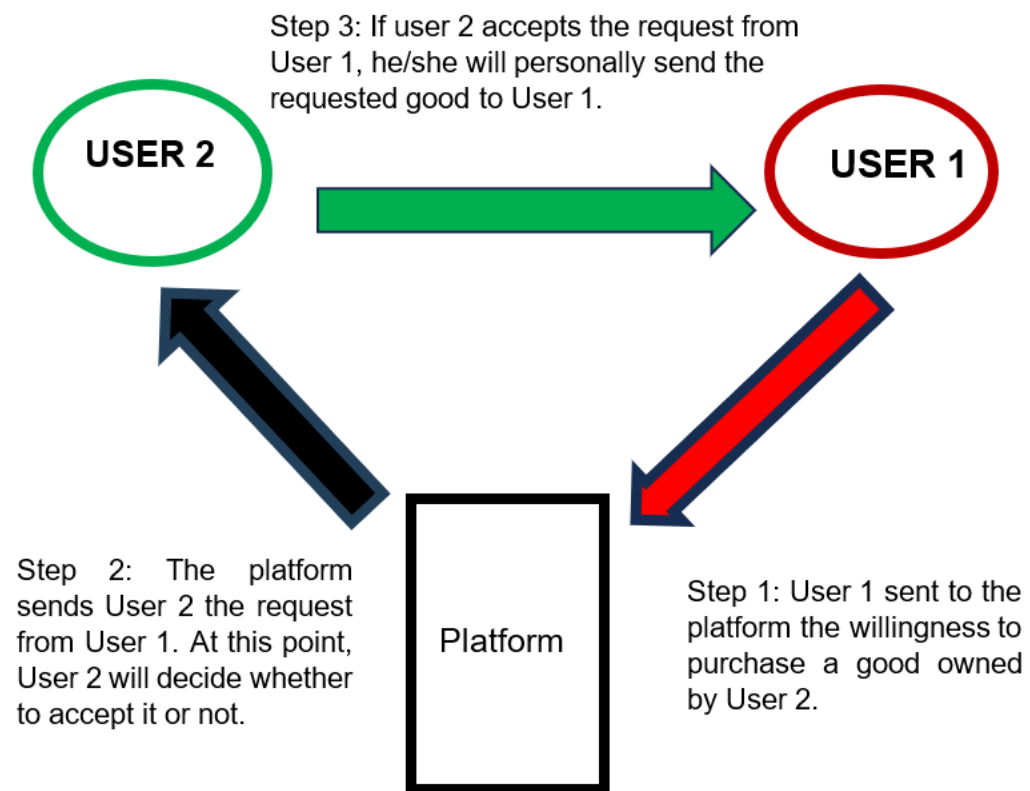


Figure 2 - In the case of a triadic exchange, the goods remain the property of the users. The platform acts as an intermediary between the users, but does not own any goods.

Furthermore, according to Khalek and Chakraborty (2023), platforms must meet some fundamental conditions. They must use digital technologies to facilitate trade, promote shared use of resources with spare capacity, and ensure on-demand access, where access costs are proportionate to the use of resources.

The method then classifies platforms hierarchically, through the construction of a sort of decision tree (Figure 3). At the first level, it is possible to distinguish two main categories: Access-Based Consumption (ABC), which is based on dyadic models in which resources are centralised and owned by the platform, and Collaborative Consumption (CC), which involves triadic models in which resources are owned by individuals and shared through a platform. At a more detailed level, eight subtypes are identified based on three main characteristics: the type of reciprocity (explicit or implicit), the media used in the exchange (monetary or non-monetary) and the possibility of transfer of ownership (allowed or prohibited).

An important element of this methodology is the concept of continuum of the *essence of sharing*. This methodology enables us to assess and position P2P platforms according to the nature of the transactions supported by them along a continuum, ranging from symbolic exchanges (namely driven by altruism and a sense of community values) to utilitarian transactions (more oriented towards profit and the maximisation of economic efficiency). Symbolic exchanges are represented by platforms like Freecycle or Couchsurfing, while utilitarian ones include platforms like Airbnb or Uber. This approach helps to understand the different purposes and motivations of the platforms. The various SE typologies are described in Table II.

Table II – Classification of Sharing Economy exchanges

Essence of sharing	Definition
Altruistic Sharing	Sharing motivated by altruism and prosocial intentions, without any explicit expectation of reciprocity.
Commercial Sharing	Temporary access to resources or services facilitated by platforms with a clear profit-driven objective.
Complementary Sharing	Sharing that blends economic and social motivations, emphasising resource optimisation and co-utilisation.
Resale	The sale of goods that are no longer needed by the original owners to new users via platforms.
Swapping	The exchange of goods or services between users without monetary transactions, relying on mutual agreements.
True Sharing	Genuine sharing that fosters social reciprocity and relational value without economic or commercial motives.

In Table III, we can see a practical example of Khalek and Chakraborty's approach, while the complete evaluation of all P2P platforms selected is the Appendix A (Table A.1).

Table III – Classification of the platforms according to Khalek and Chakraborty's approach

Platform	Dyadic Exchange	Owner of Resource	Level 1	Explicitness of Reciprocity	Monetary	Permanent	Level 2
Airbnb	No	Individual	Collaborative Consumption	Yes	Yes	No	Commercial Sharing
Buy Nothing Project (BNP)	No	Individual	Collaborative Consumption	No	No	Yes	Altruistic Sharing
Catawiki	No	Individual	Collaborative Consumption	Yes	Yes	Yes	Resale
Peerby	No	Individual	Collaborative Consumption	No	No	No	True Sharing
Goswap	No	Individual	Collaborative Consumption	Yes	No	Yes	Swapping
SwitchHome	No	Individual	Collaborative Consumption	Yes	No	no	Complementary Sharing

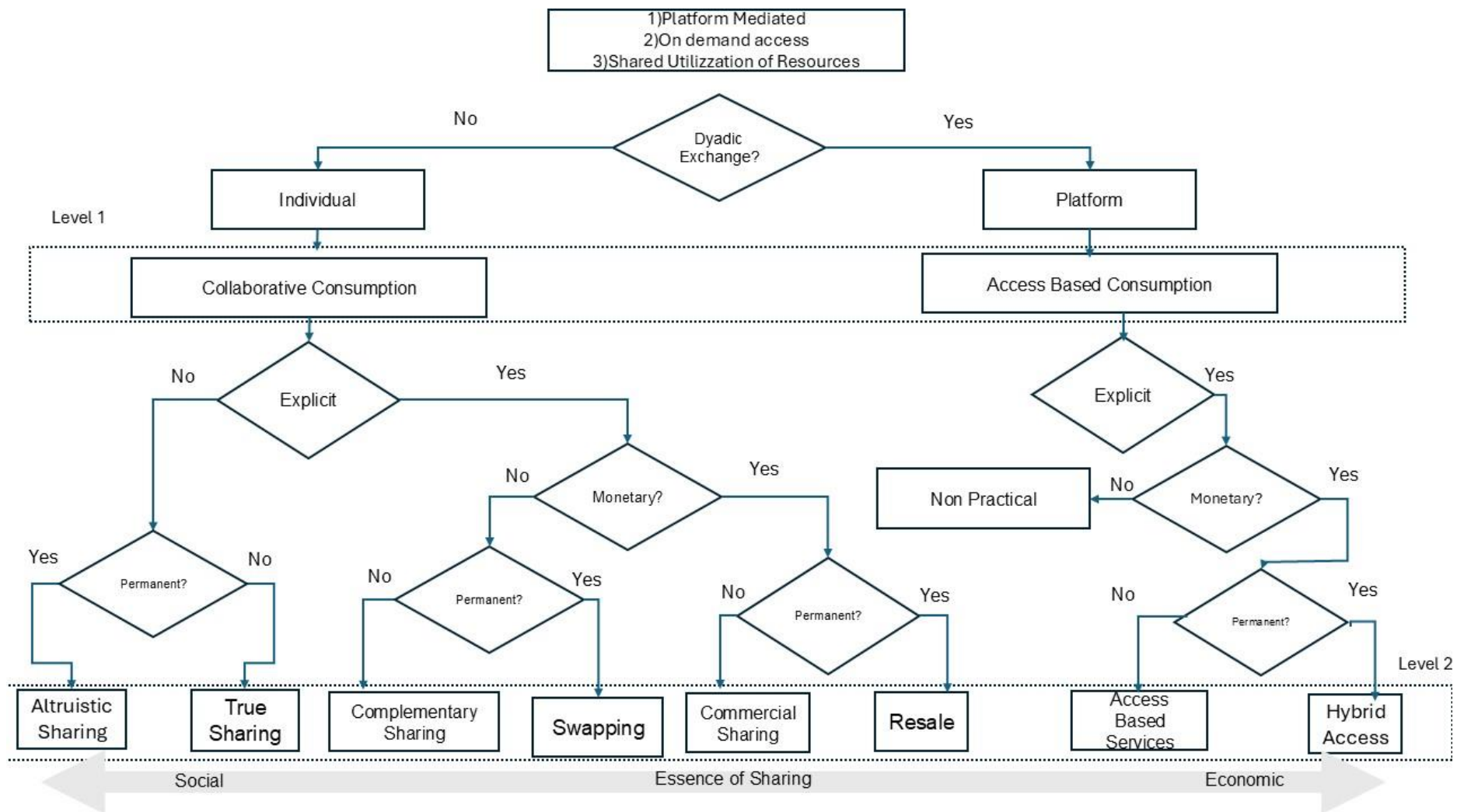


Figure 3 - The application of the work of Khalek and Chakraborty (2023) is configured as a decision tree.

Adapted from: Khalek and Chakraborty (2023).

3.3 Evaluation of P2P platforms according to the sustainability framing (Environmental, Social and Economic)

To achieve the set objectives, the sustainability of the considered platforms has been evaluated based on the three pillars. *The triple bottom line focuses on the interrelated pillars of economic, social, and environmental sustainability, emphasizing that long-term prosperity depends on balancing these three dimensions.* (Elkington, 1997).

While the environmental and social dimensions were assessed qualitatively, aiming to approximate their impact, the economic dimension was evaluated by examining the governance structures as it is envisaged that more democratic platform governance models have more potential to promote the enactment of environmental, social and instrumental values and at least fewer risks in this regard than less democratic models (Martin, 2016).

The evaluation of the platforms was conducted independently by two researchers. In cases of disagreements, a third researcher was consulted, who provided their opinion autonomously and without knowledge of the assessments made by the other two members of the research team, ensuring an unbiased resolution of the disagreement.

3.3.1 Social Impact evaluation

In our research, we used the framings developed by Martin (2016) to assess the social dimensions of P2P platforms. Martin (2016) develops such evaluation framings through a deep examination of 224 Internet publications and studies. Specifically, such framing allows to examine P2P platforms using six main framings: economic potential, sustainability implications, decentralisation impacts, regulatory issues, neoliberal inclinations, and conceptual coherence. These sources were chosen with care to include both traditional sectors that engage with or oppose the sharing economy and proponents of the SE. We categorised the first three variables as “*positive*” indicators of social impact (Table IV), while the remaining three were considered “*negative*” (Table V). We implemented a binary voting system for evaluating the platforms. Each platform was evaluated using a simple “yes” or “no” system. A point was given for each “yes” to positive aspects and for each “no” to negative aspects. This approach made easy to measure and compare P2P platforms’ social impacts.

Based on this approach, platforms have been categorised into three macro-categories based on their social impact score: low (ratings 1 and 2), medium (ratings 3 and 4), and high (ratings 5 and 6). Table VI shows some practical applications of Martin (2016) framings. The complete evaluation of all the surveyed P2P platforms is in Appendix A (Table A.2).

Table IV - Positive framings from Martin (2016) classification.

Positive framings	Meaning
Economic Opportunity	SE provides individuals with the possibility to monetise their unused goods, free time, and skills. Those who successfully earn money within this model are often celebrated as micro-entrepreneurs
Sustainable form of consumption	SE is viewed as a new and sustainable way of consuming, where individuals no longer own goods but instead access them as needed.
Pathway to a Decentralised, Equitable, and Sustainable Economy	SE approaches are considered as a diverse field of innovation that weakens the power of centralised corporations, empowering individuals and communities.

Table V – “Negative” framings from Martin (2016) classification.

Negative framings	Meaning
Creation of Unregulated Marketplaces	Platforms in this space are criticised for transferring risk to consumers, creating unfair competition, establishing illegal, black, or grey markets, and promoting tax avoidance. As a result, critics argue that these platforms should be regulated on the same basis as established businesses and proactively adapt to existing market practices
Reinforcing neoliberalism paradigm	This perspective critiques the model for contributing to the neoliberal economic paradigm. Key drawbacks include corporate appropriation, the casualisation of labour, neglect of environmental sustainability, the assumption that individual actions alone drive social change, and the exclusivity of the peer-to-peer mode
Incoherent field of innovation	Stronger definitions of its scope, the development of a more cohesive movement, and increased collaboration among public, private, and non-profit actors are necessary to address the perception that it lacks coherence as a field of innovation.

Table VI – Applications of the framings to Martin (2016) to some selected platforms.

Platform	Economic Opportunity	More Sustainable Form Of consumption	Pathway to a decentralised, equitable and sustainable economy	Unregulated Marketplace	Reinforcing neoliberal Paradigm	Incoherent Field of Innovation	Social Impact Score	Social Impact Assessment
<i>Airbnb</i>	yes	no	no	yes	yes	yes	1	Low
<i>BlaBlaCar</i>	no	yes	yes	no	no	No	5	High
<i>Facebook Marketplace</i>	no	yes	no	no	no	yes	3	Medium

3.3.2 Economic Impact evaluation

In assessing the economic impact of platforms, we adopted framings developed by Chen et al. (2020). These framings, grounded in mechanism design theory, highlight key framings critical to platform governance and performance. Among the different framings considered as resulting from the platform, those that we considered closest to our needs are listed in Table VII.

Table VII - Chen et al. (2020) framings for economic impact evaluation.

Framings	Definition
Incentive Compatibility	Incentive compatibility is achieved when participants in a system are motivated to truthfully reveal their preferences or information, aligning their individual incentives with the overall system goals. This ensures that the system leverages all available information efficiently, promoting informational efficiency and favourable governance outcomes.
Role of Leadership	The extent to which platform leaders influence governance, balancing centralised control with decentralised participation.
Community Involvement	The degree to which platform participants (e.g., developers, users) are involved in governance processes such as decision-making and implementation.

Once the evaluation framings were identified, we decided to convert such qualitative evaluation in quantitative one. According to this, for each platform, a rating was given ranging from -1 (when the platform was far from the concept of framing considered) to 1 (platform close to the concept of framing analysed) with 0 included (neutral attitude of the platform). This rating system was applied across all three framings considered (Table VIII). The ratings were assigned using the same process as social evaluation: two researchers performed independent evaluations, and in cases of disagreement, a third researcher provided a final, impartial judgment.

Table VIII – Rating system for platforms' comparison.

Variable	Ranking	Explanation
Incentive Compatibility	-1	The platform fails to align individual and collective goals, creating inefficiencies and reducing stakeholder engagement.
	0	The platform achieves partial alignment, balancing stakeholder incentives with some gaps in addressing collective objectives.
	1	The platform effectively aligns individual stakeholder goals with system-level objectives, enhancing overall functionality and performance.
Community Participation	-1	Community involvement is minimal or symbolic, limiting the inclusion of diverse perspectives and shared governance.
	0	Community participation is moderate, allowing for some influence in decision-making while maintaining significant control by platform owners.
	1	Community members actively participate in governance and decision-making, fostering inclusivity, accountability, and collective action.

Role of Leadership	-1	Leadership is highly centralised, resulting in strong hierarchical control and reduced stakeholder influence in decision-making processes.
	0	Leadership provides guidance while allowing some community input, creating a balanced but still semi-centralised governance structure.
	1	Leadership empowers community members by decentralising governance control, fostering shared decision-making and collaborative platform management.

Next, we sum the values assigned to each platform for each variable. The total score ranges between -3 and 3 (Table IX).

Table IX – Score ranges representing attitudes towards decentralisation.

Total Score	Interpretation
-3, -2	Low attitude toward decentralisation model
-1, 0, +1	Medium alignment with the concept of decentralisation
+2, +3	High attitude toward decentralisation

The following Table X outlines our definitions of low, medium, and high attitudes toward decentralisation models. This framing allows for a nuanced understanding of how different levels of decentralisation affect platform governance effectiveness, enabling targeted improvements in platform governance design (Table XI). The complete evaluation of all P2P platforms selected is the Appendix A (Table A.4).

Table X – Attitudes towards decentralisation

Attitude to Decentralisation	Explanation
Low	The platform operates with a High, centralised structure, where leaders or administrators maintain primary control over decisions, policies, and governance. User input and autonomy are limited, with a focus on consistency, stability, and top-down management. While users may participate in the platform's activities, their influence on governance is Low. This model is typical of platforms where strict oversight is prioritised to maintain quality and operational efficiency.
Medium	The platform strikes a balance between central control and community involvement. Leaders retain decision-making authority over major aspects, but user input is encouraged and sometimes integrated into governance. Users have moderate autonomy in their interactions and can influence certain platform aspects, creating a collaborative environment. This level supports both structure and flexibility, allowing the community to shape the platform within boundaries set by leadership.
High	The platform is highly community-driven, with Low central control. Governance and decision-making are largely in the hands of the users, allowing for a flexible and autonomous environment. Leadership, if present, serves primarily as a facilitator, and most policies and practices are shaped by community needs and preferences. This model fosters a high sense of ownership and engagement among users, prioritising peer-to-peer interactions and collective decision-making over top-down control.

Table XI - Practical example of applying Chen et al. (2020)'s framings.

Platforms	Incentive Compatibility	Rate	Community Participation	Rate	Role of Leaders	Rate	Total Environmental Score	Attitude to Decentralisation
<i>Airbnb</i>	Low	-1	Low	-1	High	-1	-3	Low
<i>Buy Nothing Project (BNP)</i>	High	1	High	1	Low	1	3	High
<i>CouchSurfing</i>	High	1	Medium	0	Medium	0	1	Medium

3.3.3 Environmental Impact evaluation

To evaluate the environmental impact of platforms, we used the approach outlined by Öberg (2024). Öberg analysed 63 P2P SE platforms, according to these steps: 1) categorising the sharing economy models based on resource use, 2) analysing the sustainability and scalability of each configuration, 3) tracing mechanisms explaining scalability and sustainability issues, and 4) developing the typology. In the first step, each of the 63 sharing economy models was open coded as first-order codes (Gioia et al., 2013) based on resource-use variants. While Belk (2014) and Frenken and Schor (2017) provide various verbs of sharing and delineate sharing economy models based on service or product provisions, the open coding allowed for a more resource-use focused approach. The coding process begins by identifying specific activities within sharing economy models, known as first-order codes, such as “lending tools” or “sharing rides.” These codes are then grouped into broader categories, or second-order themes, based on shared characteristics. For instance, borrowing tools is categorised as “repeated use of latent resources,” while ridesharing is classified as “co-use.” The process is iterative, allowing for refinement to ensure each framing accurately represents resource use patterns, ultimately forming the seven configurations.

For the second step, the analysis focused on systematically capturing sustainability and scalability connections for each configuration. The sharing economy models were overlaid with descriptions of sustainability elements, such as resource depletion, the non-ownership logic, and social inclusion (Qureshi et al., 2021). Traces of scalability were also examined, including revenues, financial status, success, venture funding provision, and the number of exchanges (scalability potential), depending on the available data and types of models (to be able to capture also for-free sharing's scalability).

The third step involved investigating mechanisms explaining the connections between sustainability and scalability using backward tracing (Jessop, 2005) while revisiting the collected data. As a result, coordination (including locality) and provision were identified as mechanisms creating tension and affecting scalability and sustainability, respectively.

In the fourth step, the focus shifted to developing a typology (Baden-Fuller and Morgan, 2010; Short et al., 2008). The mechanisms of coordination and provision served as the axes in the typology, with the seven resource-use configurations from Step 1 sorted accordingly.

To give a quantitative evaluation, based on the coding developed in the article, we gave a rating between -1 (negative environmental impact) and 1 (positive environmental impact), including 0 (neutral environmental impact) to the various variables that can be assumed by resource use, sustainability and scalability framing (Table XII, XIII, and XIV). The same rating system was employed across all the framings considered. Consistent with the approach used in evaluating the other pillars of sustainability, two researchers independently assigned ratings. In the event of a disagreement, a third researcher was consulted to deliver a final and unbiased judgment.

We then calculated the total values after voting for the three framings for each platform. The overall score ranges between -3 and 3 (Table XV). Table XVI reports our definitions of the different environmental impact levels.

Table XVII reports a practical example of our application of Öberg's framings, while the complete environmental evaluation of all P2P platforms is the Appendix A (Table A.3).

Table XII - Rating system for “Resource use framing” according to Öberg (2024) classification.

Resource use	Rate	Explanation
Service created specifically	-1	These services are designed to create new offerings, often leading to additional resource consumption and environmental impacts, which is negative.
Co-use	1	Maximises resource efficiency by allowing multiple users to share the same product or service, reducing overall consumption.
Re-use	1	Promotes sustainability by extending the lifecycle of resources and reducing waste, which is environmentally and socially beneficial.
Repeated use of latent resource	1	Utilising latent resources, like underused assets, minimises waste and maximises value, aligning with sustainable consumption practices.

Table XIII - Rating system for Sustainability framing according to Öberg (2024) classification.

Sustainability	Rate	Explanation
Not more sustainable than traditional services. Possible discrimination.	-1	The service may not provide sustainability benefits compared to traditional options, and potential discrimination reduces its social and ethical value.
No added depletion	0	While the service does not cause further resource depletion, it also does not contribute positively to sustainability or resource efficiency.
Increasing efficiency of resources	1	Improving resource efficiency leads to reduced waste and more effective use of materials, directly supporting sustainability goals.
Efficient use of latent resources	1	Utilising underused or idle resources avoids unnecessary consumption and maximises the value of existing assets.
Sustainability created	1	Services that actively promote sustainability contribute to environmental and social improvements, demonstrating a strong positive impact.

Table XIV - Rating system for Scalability framing according to Öberg (2024) classification

Scalability	Rate	Explanation
Scaled, spread around the globe	-1	Global scaling often requires significant resource consumption, increased transportation, and infrastructure demands, leading to higher environmental impacts.
Large-scale operations	-1	Large-scale operations can lead to inefficiencies, increased waste, and a higher carbon footprint due to extensive logistics and resource requirements.
Coordination issues	-1	As services scale, moving goods and resources across locations becomes necessary, increasing transportation emissions and logistical inefficiencies. Poor coordination can amplify these effects, leading to higher environmental costs.
Provision issue	-1	Scaling strains resource availability, requiring the movement of goods from surplus to deficit areas, which adds to environmental impacts through transportation. Additionally, increased accessibility can lower costs, leading to overuse or unnecessary consumption, driving a rebound effect and undermining sustainability goals.
Scaling issue based on free premises	-1	Scaling strains resource availability, requiring the movement of goods from surplus to deficit areas, which adds to environmental impacts through transportation. Additionally, increased accessibility can lower costs, leading to overuse or unnecessary consumption.
Local presence required	1	A local presence ensures shorter supply chains and reduced environmental impact, while fostering community-based sustainability practices.

Table XV - Score ranges representing attitudes towards environmental impact.

Total Score	Interpretation
-3, -2	low environmental impact
-1, 0, +1	medium environmental impact
+2, +3	high environmental impact

Table XVI - Attitudes towards environmental impact.

Environmental Impact	Explanation
Low	Low-impact platforms focus on the local reuse of resources, effectively avoiding the need for new production and significantly reducing environmental pressures. By prioritising the efficient use of local goods, they minimise emissions and foster sustainable practices. These platforms also support community-oriented approaches, such as reducing food waste and promoting local food systems, cutting down on transportation emissions. Their emphasis on localised, circular practices ensures minimal ecological disruption while maximising the sustainability of existing resources.
Medium	These kinds of platforms balance some environmental benefits with notable trade-offs. While they reduce emissions by promoting the sharing of resources, such as cars or infrastructure, they often encourage additional travel or movement of goods, partially offsetting these advantages. Many promote the reuse and valorisation of existing objects, reducing the need for new production. However, emissions related to transportation, such as shipping goods or the use of fossil-fuelled vehicles, present a significant challenge. They also often optimise existing facilities, such as parking spaces or hospitality services, but may inadvertently incentivise longer-distance use or consumption patterns, leading to a moderate environmental impact.
High	High environmental impact platforms are those that do not prioritise the reuse of existing resources, but instead encourage the production of new goods or services, often leading to increased resource consumption and waste. A key characteristic of these models is their high scalability, which, while beneficial for growth, often results in greater environmental degradation due to the scale of production and consumption they promote. These platforms tend to be less sustainable than existing market alternatives, as they focus more on profit-driven objectives rather than socio-environmental concerns. Consequently, they often contribute to higher carbon emissions, greater resource depletion, and a more significant environmental footprint compared to models that prioritise sustainability and the efficient use of existing resources.

Table XVII - Practical application example of Öberg (2024)'s.

Platform	Resource use configuration	Resource Use Score	Sustainability	Sustainability Score	Scalability	Scalability Score	Total Environmental Impact	Environmental Impact
<i>Airbnb</i>	Service created specifically for the user	-1	Not more sustainable than traditional service (hotel). Often increases housing demand.	-1	Scaled, spread around the globe	-1	-3	High
<i>BlaBlaCar</i>	Co-use	1	No added depletion. Possible social interaction.	0	Coordination issues	0	1	Medium
<i>Buy Nothing Project (BNP)</i>	re-use	1	Increasing efficiency of resource.	1	Local presence required	1	3	Low

3.3.4 Attitude to limits-to-growth results

The final phase of the analysis focused on evaluating whether the platforms align with the principles of a "limits-to-growth" society. This evaluation involved integrating qualitative assessments of the platforms' social, environmental, and economic impacts/dimensions. Each dimension was scored based on the extent to which the platform's structural characteristics adhered to the principles of a society that prioritises growth limitations, fostering sustainability and equity. The rating ranges between -1 and 1 (Table XVIII). This multidimensional approach ensured a holistic understanding of how the platforms contribute to a sustainable and balanced socio-economic framing according to the three pillars of sustainability. As we can see from the table below (Table 18):

Table XVIII - Rating system for platforms' comparison.

Rate	Evaluation
-1	Indicates that the platform diverges from "Limits to Growth Society" concept, promoting growth beyond societal and environmental limits
0	Indicates a neutral viewpoint, where the platform neither promotes nor hinders the "Limits to Growth Society" concept.
1	Indicates that the platform aligns with the "Limits to Growth Society" concept (e.g., sustainable, resource-efficient, socially equitable).

Scores provided for each dimension (social, environmental, and economic) were summed up; total scores ranged from -3 to +3, with interpretations as following table (Table XIX):

Table XIX - Score ranges representing attitudes to limits-to-growth.

Total Score	Interpretation
-3, -2	low attitude toward limiting society's growth.
-1, 0, +1	medium alignment with the concept
+2, +3	high attitude toward limiting society's growth

Applied example of our evaluation of the platforms in the Table XX, while the complete growth attitude evaluation of all P2P platforms selected is the Appendix A (Table A.5).

Table XX - Practical example of final framework application.

Platforms	Social Impact	Social Rate	Environmental impact	Environmental Rate	Decentralisation Attitude	Decentralisation Attitude Rate	Total Limits-to-Growth Score	Attitude to the Limits-to-Growth
Airbnb	Low	-1	High	-1	Low	-1	-3	Low
BlaBlaCar	High	1	Medium	0	Low	-1	0	Medium
Buy Nothing Project (BNP)	High	1	Low	1	High	1	3	High

4 Results

4.1 Essence of Sharing Results

Analysing the platforms considered, through the Khalek and Chakraborty's (2023) approach, we obtained a first results of classification considering the essence of sharing, how we can see from the Table (Table XXI).

Table XXI - Khalek and Chakraborty's (2023) framework application results.

Essence of sharing	Count	% on total
Altruistic Sharing	6	15%
True Sharing	2	5%
Complementary Sharing	3	7%
Swapping	2	5%
Commercial Sharing	10	24%
Resale	18	44%

The first consideration is that all the P2P platforms analysed fall into the 'Collaborative Consumption' category; none have been identified within the 'Access-Based Services' or 'Hybrid Access' categories. Among the platform types, the most prevalent are “Resale” and “Commercial Sharing,” which together account for nearly 70% of all platforms examined. On the other hand, the platform type most associated with a strong inclination toward disinterested sharing is “Altruistic Sharing”, representing 15% of the total. This observation highlights how the majority of platforms currently exhibit a sharing model that leans more toward profit-driven motives rather than disinterested sharing.

4.2 Social Impact Results

The use of Martin's framings (2016), combined with a rating model, allowed us to assess the social impact of platforms. Only 17% of platforms have been assessed with a low social impact (Table XXII), while the remaining platforms are almost equally distributed between medium and high impact evaluations, with 41.5% of platforms falling into each of these two categories. This indicates that, generally, P2P platforms tend to have a positive social impact. Although there is room for improvement, in fact most platforms have a medium impact rating and it's notable that the number of platforms with a high impact is twice as large as those with a low impact.

Table XXII - Attitudes towards social impact results.

Social Impact Evaluation	Numbers of Platforms	Percentage of total
Low	7	17%
Medium	17	41.5%
High	17	41.5%

The analysis reveals notable differences in the social impact of sharing economy platforms across various typologies (Table XXIII). Altruistic Sharing, Complementary Sharing, and Swapping platforms demonstrate the highest levels of social impact, with 100% of platforms in these categories classified as High Social Impact.

The Altruistic Sharing category stands out because it fundamentally focuses on selfless, non-reciprocal sharing, where individuals come together to share resources without the expectation of anything in return. This model inherently fosters community bonds and sustainability by encouraging collective action for the benefit of others, which explains why 100% of the platforms in this category are classified as having High Social Impact.

Similarly, Complementary Sharing platforms, which emphasise resource sharing without ownership transfer, also fall into the High Social Impact category. These platforms rely on non-monetary exchanges, where individuals reciprocate by granting access to their own resources or engaging in alternative virtual currencies (such as time credits). While their primary goal may not be directly social, these exchanges still build a sense of community and support, creating significant societal value through mutual assistance and resource optimisation.

Swapping platforms also achieve 100% High Social Impact, despite the fact that their main objective is often resource efficiency and consumption without monetary transactions. By facilitating the exchange of goods and services, these platforms encourage the reuse of items and promote sustainability. The act of swapping goods without involving money helps build social connections, promotes environmental awareness, and contributes to community engagement.

Thus, Altruistic Sharing, Complementary Sharing, and Swapping all excel in fostering sustainability and community engagement by promoting non-monetary, resource-based interactions. These platforms create significant societal benefits, even when their primary objectives may not be explicitly focused on social outcomes.

On the other hand, True Sharing presents a more nuanced scenario, with platforms evenly split between Medium and High Social Impact (50% each). This suggests that while these platforms are rooted in sharing principles, additional factors—such as governance, operational practices, and community involvement—can influence their actual social impact.

Platforms in the Resale category also show a significant presence in the Medium Social Impact category, with 83% of platforms falling into this range. This indicates that while these platforms contribute positively to sustainability and resource efficiency, there is still room for improvement in enhancing social engagement and fostering deeper community connections.

The Commercial Sharing category shows a stark contrast, with 70% of platforms classified as Low Social Impact, and only 20% achieving a High Social Impact rating. This reveals a significant challenge for profit-driven platforms to align with broader societal goals. The limited percentage of

platforms achieving positive social outcomes suggests that economic priorities often overshadow social objectives, limiting their potential for meaningful societal change.

Overall, the data underscores the potential for platforms across all typologies to enhance their social impact. However, platforms in the Commercial Sharing and Resale categories need to prioritise community engagement, sustainability, and socially responsible practices. By doing so, they could create a more balanced, inclusive, and socially beneficial outcome for society.

Table XXIII - Social impact evaluation according to Khalek and Chakraborty's (2023) framework.

Essence of Sharing	Count	Social Impact			Low % on total	Medium % on total	High % on total
		Low	Medium	High			
Altruistic Sharing	6	0	0	6	0%	0%	100%
True Sharing	2	0	1	1	0	50%	50%
Complementary Sharing	3	0	0	3	0%	0%	100%
Swapping	2	0	0	2	0%	0%	100%
Commercial Sharing	10	7	1	2	70%	10%	0%
Resale	18	0	15	3	0%	83%	17%

4.3 Environmental results

According to Table XXIV, the 27% of platforms are characterised as having a minimal impact on the environment, and over 60% are classified as having a "medium" impact. Interestingly, only two platforms (five percent of the total) are classified as having a "high" environmental impact, which is a positive result. In line with their wider reputation as sustainable substitutes for conventional models, these findings imply that P2P platforms generally avoid serious environmental harm.

Table XXIV - Attitudes towards environmental impact results.

Environmental impact Evaluation	Number of platforms	Percentage of total
Low	11	27%
Medium	25	61%
High	5	12%

How we can notice from the Table XXV it's important to draw attention to the prevalence of medium-impact platforms. This shows that many platforms nevertheless function in a way that balances their environmental impact, even though it is not as desirable as low-impact categorisation. This is because of things like localised trades, decreased resource consumption, and the encouragement of reuse or sharing activities. This supports the idea that P2P platforms can be used as instruments to further sustainability objectives, particularly if they are created with the environment in mind.

The industry's capacity to favourably influence environmental sustainability is further demonstrated by the existence of low-impact platforms. These platforms emphasise energy-efficient operations, circular economies, and waste minimisation, which could set standards for other businesses in the industry. The little proportion of high-impact platforms, meanwhile, serves as a reminder of the necessity of ongoing assessment and development, especially as the sector expands and changes.

These results highlight the significance of P2P platforms as comparatively long-lasting organisations. Nevertheless, they also draw attention to the necessity of more deliberate attempts to lessen environmental impact generally, moving more platforms into the low-impact category and making sure that those with medium or high impacts put sustainable measures into place.

Developing a focus consideration about what are the categories of platforms with best environmental impact, we can notice how the best are Swapping and Altruistic both with respectively 100% of platforms in this category, this thanks to the way of how sharing happen, that is, favouring the reuse of goods mainly without moving them over large distances, and favouring the use of goods in the same locations. True Sharing category has an environmental impact balanced between two categories with 50% between low and another 50% medium, this to underline how True Sharing, has a positive environmental impact but some platforms must further improve their *modus operandi* to be totally sustainable, as in the case of Complementary Sharing and Resale falling respectively at 100% and 78% in the platforms with a medium impact. The worst environmental result, however, is Commercial Sharing, with 20% of the platforms falling into this category.

Generally, the total of the platforms has a predominantly low and medium environmental impact, thus showing how P2P have a positive environmental impact, proving to be a valid alternative to traditional types of commerce.

Table XXV - Environmental impact evaluation according to Khalek and Chakraborty's (2023) framework.

Essence of Sharing	Count	Environmental Impact			Low % on total	Medium % on total	High % on total
		Low	Medium	High			
Altruistic Sharing	6	6	0	0	100%	0%	0%
True Sharing	2	1	1	0	50%	50%	0%
Complementary Sharing	3	0	3	0	0%	100%	0%
Swapping	2	0	0	2	0%	0%	100%
Commercial Sharing	10	1	7	2	10%	70%	20%
Resale	18	3	14	1	17%	78%	6%

4.4 Economic results

Table XXVI shows that platforms predominantly operate with either Low Decentralisation (61%) or High Decentralisation (24%), while only a modest proportion (15%) fall under Medium Decentralisation. This polarisation highlights the challenge of creating and implementing hybrid governance models that balance centralisation and decentralisation. It may also reflect a preference for more well-defined and extreme governance systems rather than intermediate approaches.

This distribution underscores a clear market trend favouring distinct governance systems, either highly decentralised to empower users or highly centralised for efficiency. Platforms with low decentralisation prioritise trust, efficiency, and managerial control, while highly decentralised models often aim to foster autonomy and community-driven interactions. The relative scarcity of medium decentralisation suggests an area of potential growth and innovation as platforms experiment with hybrid governance structures.

Table XXVI - Attitude towards decentralisation results.

Attitude of Decentralisation	Numbers of platforms	Percentage of totale
Low	25	61%
Medium	6	15%
High	10	24%

The analysis of platform typologies based on their essence of sharing reveals distinct patterns in their alignment with societal growth objectives. No category falls entirely within the Low commitment range, although Commercial Sharing and Resale stand out for their significant concentration in this category. Commercial Sharing has 90% of its platforms classified as Low, emphasising its profit-driven and traditional growth-oriented focus. Similarly, Resale platforms exhibit 89% of their platforms in the Low category, reflecting a similar prioritisation of profitability over societal impact.

Medium commitment is less prevalent across the typologies, with only a few categories showing notable representation in this range. True Sharing demonstrates the strongest alignment with Medium commitment, with 100% of its platforms falling into this category, indicating a balanced approach that combines meaningful societal contributions without achieving transformative impact. Complementary Sharing also shows a moderate presence in the Medium range, with 67% of its platforms reflecting this balanced stance.

High commitment is strongly represented in categories characterised by community-focused and resource-sharing principles. Altruistic Sharing stands out, with 67% of its platforms falling into the High commitment range, reflecting their dedication to fostering societal growth through unselfish, community-oriented models. Swapping also shows full alignment with High commitment, with 100% of its platforms classified in this range, underscoring the category's ability to maximise social benefits.

The distribution of platforms highlights a stark divide between typologies like Altruistic Sharing and Swapping, which prioritise societal impact, and Commercial Sharing and Resale, which predominantly focus on profit. While the latter categories have some presence in the High range (10% and 11%, respectively), the overwhelming concentration in the Low range suggests a need for more intentional efforts to align these platforms with societal growth goals. Overall, the data suggests significant potential for platforms to move towards High impact, particularly in profit-oriented typologies, to enhance their contribution to societal progress.

Table XXVII - Decentralised evaluation according to Khalek and Chakraborty's (2023) framework.

Essence of Sharing	Count	Low	Medium	High	% low on total	% medium on total	% high on total
Altruistic Sharing	6	0	2	4	0%	33%	67%
True Sharing	2	0	2	0	0%	100%	0%
Complementary Sharing	3	0	2	1	0%	67%	33%
Swapping	2	0	0	2	0%	0%	100%
Commercial Sharing	10	9	0	1	90%	0%	10%
Resale	18	16	0	2	89%	0%	11%

4.5 Results about the towards limits-to-growth

Based on the analysis presented in the Table XXVIII, 56% of platforms exhibit a medium attitude toward the "Limit of Society's Growth", indicating that the majority adopt a balanced approach. These platforms likely integrate both growth-oriented and sustainability-driven elements, seeking to achieve operational and societal goals without heavily prioritising one over the other. Meanwhile, 32% of platforms are categorised as having a high attitude, showcasing a stronger alignment with limiting society's growth. This indicates a commitment to principles like sustainability, resource efficiency, and societal equity, often at the cost of rapid scalability or expansion. These platforms may have the potential to bring significant positive change, albeit with challenges in scaling or resource allocation.

The remaining 15% of platforms are categorised as low, reflecting a limited alignment with the principles of limiting societal growth. These platforms are more likely to focus on traditional growth models, emphasising efficiency and profitability over broader societal or environmental considerations.

This distribution highlights a clear trend where most platforms aim for a middle-ground strategy, while a significant portion leans toward transformative models aligned with growth limitations, offering avenues for innovation and sustainable development.

Table XVIII - Attitude towards limits-to-growth results.

Attitude to Limits-to-Growth	Total Platforms	% on total
Low	6	15%
Medium	22	53%
High	13	32%

The analysis of platform typologies highlights notable differences in their alignment with societal growth objectives. None of the categories are exclusively positioned in the Low commitment range, although Commercial Sharing stands out with 60% of its platforms classified as Low, reflecting its profit-driven and traditional growth-oriented focus. Medium commitment emerges as the dominant category for most platform typologies, demonstrating a balance between profit motives and societal impact. Resale platforms, for example, show a strong concentration in the Medium category, with 89% of platforms demonstrating meaningful but not transformative contributions to societal growth. Complementary Sharing also aligns predominantly with the Medium range, where 67% of its platforms adopt this balanced approach. True Sharing, on the other hand, shows an even distribution, with half of its platforms categorised as Medium and the other half as High.

Platforms demonstrating High commitment to societal growth are primarily concentrated in the Altruistic Sharing and Swapping typologies, where 100% of platforms in both categories exhibit strong alignment with societal growth objectives. This result underscores the community-oriented and resource-sharing principles embedded in these models, prioritising social impact over profit. In contrast, Commercial Sharing and Resale platforms, while showing some presence in the High range at 10% and 11% respectively, are primarily concentrated in the Low and Medium ranges. This distribution reflects their prioritisation of profitability while leaving room for greater societal contributions. The overall distribution suggests that while the majority of platform typologies adopt a Medium impact approach, there is significant potential for improvement. Shifting platforms, particularly in the Commercial Sharing and Resale categories, towards the High impact range could enhance their alignment with societal growth objectives, strengthening the broader role of sharing economy platforms in fostering societal progress.

Table XXIX - Attitude to limits-to-growth evaluation according to Khlen and Chakraborty's (2023) framework.

Typology SE	Count	Attitude to the Limits-to-Growth			Low % on total	Medium % on total	High % on total
		Low	Medium	High			
Altruistic Sharing	6	0	0	6	0%	0%	100%
True Sharing	2	0	1	1	0%	50%	50%
Complementary Sharing	3	0	2	1	0%	67%	33%
Swapping	2	0	0	2	0%	0%	100%
Commercial Sharing	10	6	3	1	60%	30%	10%
Resale	18	0	16	2	0%	89%	11%

5 Conclusions

5.1 Theoretical Contributions

This paper has two theoretical contributions. First, it contributes to the literature that focuses on circular economy futures by showing how bottom-up, P2P SE platforms can be part of two different circular futures and contribute to different supply chain configurations. A "*Bottom-Up Circular Loops*" future might be characterised by profit driven platform, that promote access through markets and commercial sharing and reselling. On the other hand, "*Decentralised Circular Uptake*" future could promote instead platforms facilitating altruistic sharing and swapping. Second, this work also provides some initial empirical evidence of how different bottom up futures contributes to sustainability pillars

by assessing P2P SE platforms taking into account the three sustainability pillars,.

5.2 Implications

This study emphasises how important it is that platform managers, developers, and legislators take a more balanced and sustainable approach to P2P platform architecture and governance. The prevalence of platforms with "medium" environmental impact indicates that there is potential for development, as evidenced by low-impact platforms that have effectively incorporated resource efficiency, waste reduction, and circular economies. These methods offer a way to lessen overall impact while simultaneously promoting environmental sustainability and serving as a model for others in the industry.

Another important area for innovation is governance framings. Because semi-decentralised platforms are underrepresented, there is a chance to create governance models that strike a compromise between the autonomy and user empowerment of decentralised techniques and the effectiveness and confidence of centralised systems. By offering rewards and establishing legal framings that promote experimentation and the adoption of hybrid models, policymakers could be instrumental in easing this transition.

Concerns regarding long-term sustainability and equity are raised at the societal level by P2P platforms' significant emphasis on expansion and scalability. Platforms must be aware of their wider effects on social and environmental systems, even though growth can spur innovation and economic gains. P2P models have previously shown how they can help achieve societal objectives by minimising waste and encouraging resource optimisation in industries like food sharing and resale. The advantages of such approaches could be increased by extending them to other industries.

5.3 Future research

Subsequent studies ought to concentrate on creating techniques that enable a more impartial categorisation of P2P platforms according to both their operational classifications and their true sustainability impact. Although helpful, current framings frequently depend on arbitrary interpretations or broad measurements that might not adequately account for the subtleties of platform operations or their effects on the environment and society. Researchers could offer more accurate assessments of how P2P platforms fit with sustainability objectives and more exact benchmarks by honing and standardising these approaches.

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Appendix A

Table A.1- Application of the decision tree proposed by Khalek and Chakraborty (2023) on all the analysed platforms.

Platform	Dyadic Exchange	Owner of Resource	Level 1	Explicit Reciprocity	Monetary	Permanent	Level 2
Airbnb	No	individual	Collaborative Consumption	yes	yes	No	Commercial Sharing
BlaBlaCar	No	individual	Collaborative Consumption	yes	yes	No	Commercial Sharing
Buy Nothing Project (BNP)	No	individual	Collaborative Consumption	No	No	yes	Altruistic Sharing
Catawiki	No	individual	Collaborative Consumption	yes	yes	yes	Resale
CouchSurfing	No	individual	Collaborative Consumption	No	No	No	True Sharing
Depop	No	individual	Collaborative Consumption	yes	yes	yes	Resale
eBay	No	individual	Collaborative Consumption	yes	yes	yes	Resale
Facebook Marketplace	No	individual	Collaborative Consumption	yes	yes	yes	Resale
Fairbnb	No	individual	Collaborative Consumption	yes	yes	No	Commercial Sharing
Freecycle	No	individual	Collaborative Consumption	No	No	yes	Altruistic Sharing

Freegle	No	individual	Collaborative Consumption	No	No	yes	Altruistic Sharing
Getaround	No	individual	Collaborative Consumption	yes	yes	No	Commercial Sharing
GlobeChain	No	individual	Collaborative Consumption	No	No	yes	Altruistic Sharing
Idle Fish	No	individual	Collaborative Consumption	yes	yes	yes	Resale
JustPark	No	individual	Collaborative Consumption	yes	yes	No	Commercial Sharing
OfferUp	No	individual	Collaborative Consumption	yes	yes	yes	Resale
OLIO	No	individual	Collaborative Consumption	No	No	yes	Altruistic Sharing
Open Food Network	No	individual	Collaborative Consumption	yes	yes	yes	Resale
OpenBazaar	No	individual	Collaborative Consumption	yes	yes	yes	Resale
Peerby	No	individual	Collaborative Consumption	No	No	No	True Sharing
Poshmark	No	individual	Collaborative Consumption	yes	yes	yes	Resale
Scrapo	No	individual	Collaborative Consumption	yes	yes	yes	Resale
Sharewaste	No	individual	Collaborative Consumption	No	No	yes	Altruistic Sharing

SnappCar	No	individual	Collaborative Consumption	yes	yes	No	Commercial Sharing
Squiseat	No	individual	Collaborative Consumption	yes	yes	yes	Resale
Subito.it	No	individual	Collaborative Consumption	yes	yes	yes	Resale
The RealReal	No	individual	Collaborative Consumption	yes	yes	yes	Resale
ThredUp	No	individual	Collaborative Consumption	yes	yes	yes	Resale
Too Good To Go	No	individual	Collaborative Consumption	yes	yes	yes	Resale
Turo	No	individual	Collaborative Consumption	yes	yes	No	Commercial Sharing
Uber	No	individual	Collaborative Consumption	yes	yes	No	Commercial Sharing
Vinted	No	individual	Collaborative Consumption	yes	yes	yes	Resale
Wallapop	No	individual	Collaborative Consumption	yes	yes	yes	Resale
PaperbackSwap	No	individual	Collaborative Consumption	yes	no	yes	Swapping
Goswap	No	individual	Collaborative Consumption	yes	no	yes	Swapping
SwitchHome	No	individual	Collaborative Consumption	yes	no	no	Complementary Sharing

LoveHomeSwap	No	individual	Collaborative Consumption	yes	no	no	Complementary Sharing
HomeExchange	No	individual	Collaborative Consumption	yes	no	no	Complementary Sharing
Neighbor	No	individual	Collaborative Consumption	yes	yes	No	Commercial Sharing
StayleLend	No	individual	Collaborative Consumption	yes	yes	no	Commercial Sharing
Swap.com	No	individual	Collaborative Consumption	yes	yes	si	Resale

Appendix A.2

Table A.2- Application of the framings proposed by Martin (2016) according to our social evaluation system on all the platforms analysed.

Platform	Economic Opportunity	More Sustainable Form Of consumption	Pathway decentralised, equitable	Unregulated Marketplace	Reinforcing neoliberal Paradigm	Incoherent Field of Innovation	Social Impact	Social Impact
Airbnb	yes	no	no	yes	yes	yes	1	Low
BlaBlaCar	no	yes	yes	no	no	no	5	High
Buy Nothing Project (BNP)	no	yes	yes	no	no	no	5	High
Catawiki	no	yes	no	no	no	yes	3	Medium
CouchSurfing	no	yes	yes	yes	no	no	4	Medium
Depop	no	yes	no	no	no	yes	3	Medium
eBay	no	yes	no	no	no	yes	3	Medium
Facebook Marketplace	no	yes	no	no	no	yes	3	Medium
Fairbnb	yes	yes	yes	yes	no	no	5	High
Freecycle	no	yes	yes	no	no	no	5	High
Freegle	no	yes	yes	no	no	no	5	High
Getaround	yes	yes	no	yes	yes	yes	2	Low
GlobeChain	no	yes	yes	no	no	no	5	High
Idle Fish	no	yes	no	no	no	yes	3	Medium
JustPark	yes	yes	no	yes	yes	yes	2	Low
OfferUp	no	yes	no	no	no	yes	3	Medium

OLIO	no	yes	yes	no	no	no	5	High
Open Food Network	yes	yes	yes	no	no	no	6	High
OpenBazaar	no	yes	yes	yes	no	yes	4	Medium
Peerby	no	yes	yes	no	no	no	5	High
Poshmark	no	yes	no	no	no	yes	3	Medium
Scrapo	yes	yes	no	no	no	yes	4	Medium
Sharewaste	no	yes	yes	no	no	no	5	High
SnappCar	yes	yes	no	yes	yes	yes	2	Low
Squiseat	yes	yes	yes	no	no	no	6	High
Subito.it	yes	yes	no	no	no	yes	4	medium
The RealReal	no	yes	no	no	no	yes	3	Medium
ThredUp	no	yes	no	no	no	yes	3	Medium
Too Good To Go	yes	yes	yes	no	no	no	6	High
Turo	yes	yes	no	yes	yes	yes	2	Low
Uber	yes	no	no	yes	yes	yes	1	Low
Vinted	no	yes	no	no	no	yes	3	Medium
Wallapop	no	yes	no	no	no	yes	4	Medium
PaperbackSwap	no	yes	yes	no	no	no	5	High
Goswap	no	yes	yes	no	no	no	5	High
SwitchHome	no	yes	yes	no	no	no	5	High
LoveHomeSwap	no	yes	yes	no	no	no	5	High

HomeExchange	no	yes	yes	no	no	no	5	High
Neighbor	no	yes	yes	yes	yes	yes	2	Low
StayleLend	no	yes	no	no	no	yes	3	Medium
Swap.com	yes	yes	no	no	no	yes	4	Medium

Appendix A.3

Table A.3-Application of the framings proposed by Öberg (2024) according to our environmental assessment system on all the platforms analysed.

Platform	Resource use configuration	Resource Use Score	Sustainability	Sustainability Score	Scalability	Scalability Score	Total Environmental Impact	Environmental Impact
Airbnb	Service created specifically	-1	Not more sustainable than	-1	Scaled, spread around the globe	-1	-3	High
BlaBlaCar	Co-use	1	No added depletion	0	Coordination issues	0	1	Medium
Buy Nothing Project (BNP)	Re-use	1	Increasing efficiency of resource	1	Local presence required	1	3	Low
Catawiki	Re-use	1	Efficient use of latent resource	1	Provision issue	-1	1	Medium
CouchSurfing	Co-use	1	Sustainability created	1	Coordination issues	-1	1	Medium
Depop	Re-use	1	Increasing efficiency of resource	1	Provision issue	-1	1	Medium

eBay	Re-use	1	Increasing efficiency of resource	1	Provision issue	-1	1	Medium
Facebook Marketplace	Re-use	1	Increasing efficiency of resource	1	Provision issue	-1	1	Medium
Fairbnb	Repeated use of latent resource	1	Sustainability created	1	Scaled, spread around the globe	-1	1	Medium
Freecycle	Re-use	1	Increasing efficiency of resource	1	Local presence required	1	3	Low
Freegle	Re-use	1	Increasing efficiency of resource	1	Local presence required	1	3	Low
Getaround	Repeated use of latent resource	1	Efficient use of latent resource	1	Large-scale operations	-1	1	Medium
GlobeChain	Re-use	1	Increasing efficiency of resource	1	Local presence required	1	3	Low
Idle Fish	Re-use	1	Increasing efficiency of resource	1	Provision issue	-1	1	Medium
JustPark	Repeated use of latent resource	1	Efficient use of latent resource	1	Local presence required	1	3	Medium
OfferUp	Re-use	1	Increasing efficiency of resource	1	Provision issue	-1	1	Medium

OLIO	Re-use	1	Increasing efficiency of resource	1	Local presence required	1	3	Low
Open Food Network	Re-use	1	Increasing efficiency of resource	1	Local presence required	1	3	Low
OpenBazaar	Re-use	1	Increasing efficiency of resource	1	Scaled, spread around the globe	-1	1	Medium
Peerby	Repeated use of latent resource	1	Efficient use of latent resource	1	Local presence required	1	3	Low
Poshmark	Re-use	1	Increasing efficiency of resource	1	Provision issue	-1	1	Medium
Scrapo	Re-use	1	Increasing efficiency of resource	1	Scaled, spread around the globe	-1	1	Medium
Sharewaste	Re-use	1	Increasing efficiency of resource	1	Local presence required	1	3	Low
SnappCar	Repeated use of latent resource	1	Efficient use of latent resource	1	Large-scale operations	-1	1	Medium
Squiseat	Re-use	1	Increasing efficiency of resource	1	Local presence required	1	3	Low
Subito.it	Re-use	1	Increasing efficiency of resource	1	Provision issue	-1	1	Medium

The RealReal	Re-use	1	Increasing efficiency of resource	1	Provision issue	-1	1	Medium
ThredUp	Re-use	1	Increasing efficiency of resource	1	Provision issue	-1	1	Medium
Too Good To Go	Repeated use of latent resource	1	Increasing efficiency of resource	1	Local presence required	1	3	Low
Turo	Repeated use of latent resource	1	Efficient use of latent resource	1	Large-scale operations	-1	1	Medium
Uber	Service created specifically	-1	Not more sustainable	-1	Scaled, spread around the globe	-1	-3	High
Vinted	Re-use	1	Increasing efficiency of resource	1	Provision issue	-1	1	Medium
Wallapop	Re-use	1	Increasing efficiency of resource	1	Provision issue	-1	1	Medium
PaperbackSwap	Re-use	1	Increasing efficiency of resource	1	Provision issue	-1	1	Low
Goswap	Repeated use of latent resource	1	Increasing efficiency of resource	1	Provision issue	-1	1	Low
SwitchHome	Repeated use of latent resource	1	Efficient use of latent resource	1	Scaling issue based on free premises	-1	1	Medium
LoveHomeSwap	Repeated use of latent resource	1	Efficient use of latent resource	1	Scaling issue based on free premises	-1	1	Medium

HomeExchange	Repeated use of latent resource	1	Efficient use of latent resource	1	Scaling issue based on free premises	-1	1	Medium
Neighbor	Re-use	1	Efficient use of latent resource	1	Provision issue	-1	1	Medium
Swap.com	Re-use	1	Efficient use of latent resource	1	Provision issue	-1	1	Medium

Appendix A.4

Table A.4-Application of the framings proposed by Chen et al. (2020) according to our economic evaluation system on all the analysed platforms.

Platform	Incentive Compatibility	Incentive Compatibility's Rate	Community Participation	Community Participation's Rate	Role of Leaders	Role of Leaders's Rate	Total Attitude of Decentralisation	Attitude of Decentralisation
Airbnb	Low	-1	Low	-1	High	-1	-3	Low
BlaBlaCar	Medium	0	Low	-1	High	-1	-2	Low
Buy Nothing Project (BNP)	High	1	High	1	Low	1	3	High
Catawiki	Low	-1	Low	-1	High	-1	-3	Low
CouchSurfing	High	1	Medium	0	Medium	0	1	Medium
Depop	Medium	0	Low	-1	High	-1	-2	Low
eBay	Medium	0	Low	-1	High	-1	-2	Low

Facebook Marketplace	Medium	0	Low	-1	High	-1	-2	Low
Fairbnb	High	1	High	1	Medium	0	2	High
Freecycle	High	1	High	1	Low	1	3	High
Freegle	High	1	High	1	Low	1	3	High
Getaround	Low	-1	Low	-1	High	-1	-3	Low
GlobeChain	Medium	0	Medium	0	Medium	0	0	Medium
Idle Fish	Medium	0	Low	-1	High	-1	-2	Low
JustPark	Medium	0	Low	-1	High	-1	-2	Low
OfferUp	Medium	0	Low	-1	High	-1	-2	Low
OLIO	High	1	High	1	Medium	0	2	High
Open Food Network	High	1	High	1	Medium	0	2	High
OpenBazaar	Medium	0	High	1	Low	1	2	High
Peerby	High	1	Medium	0	Medium	0	1	Medium
Poshmark	Medium	0	Low	-1	High	-1	-2	Low
Scrapo	Low	-1	Low	-1	High	-1	-3	Low

Sharewa ste	High	1	Medium	0	Medium	0	1	Medium
SnappCa r	Low	-1	Low	-1	High	-1	-3	Low
Squiseat	Medium	0	Low	-1	High	-1	-2	Low
Subito.it	Medium	0	Low	-1	High	-1	-2	Low
The RealReal	Medium	0	Low	-1	High	-1	-2	Low
ThredUp	Low	-1	Low	-1	High	-1	-3	Low
Too Good To Go	Medium	0	Low	-1	High	-1	-2	Low
Turo	Low	-1	Low	-1	High	-1	-3	Low
Uber	Low	-1	Low	-1	High	-1	-3	Low
Vinted	Medium	0	Low	-1	High	-1	-2	Low
Wallapop	Medium	0	Low	-1	High	-1	-2	Low
Paperba ckSwap	High	1	High	1	Low	1	3	High
Goswap	High	1	High	1	Low	1	3	High
SwitchHo me	high	1	High	1	Low	1	3	High
LoveHo meSwap	Low	-1	Medium	0	Medium	0	-1	Medium
HomeEx change	Medium	0	Medium	0	Medium	0	0	Medium

Neighbor	Medium	0	Low	-1	High	-1	-2	Low
StayleLe nd	Medium	0	Low	-1	High	-1	-2	Low
Swap.co m	Medium	0	Low	-1	High	-1	-2	Low

Appendix A.5

Table A.5-Quantitative evaluation of all the analysed framings, in order to obtain an evaluation of the growth attitude limit of all the platforms.

Platforms	Essence of Sharing	Social Impact	Social Rate	Environmental impact	Environmental Rate	Attitude of Decentralisation	Attitude of Decentralisation Rate	Total	Attitude to limits-to-growth
Airbnb	Commercial Sharing	Low	-1	High	-1	Low	-1	-3	Low
BlaBlaCar	Commercial Sharing	High	1	Medium	0	Low	-1	0	Medium
Buy Nothing Project (BNP)	Altruistic Sharing	High	1	Low	1	High	1	3	High
Catawiki	Resale	Medium	0	Medium	0	Low	-1	-1	Medium
CouchSurfing	True Sharing	Medium	0	Medium	0	Medium	0	0	Medium
Depop	Resale	Medium	0	Medium	0	Low	-1	-1	Medium
eBay	Resale	Medium	0	Medium	0	Low	-1	-1	Medium

Facebook Marketplace	Resale	Medium	0	Medium	0	Low	-1	-1	Medium
Fairbnb	Commercial Sharing	High	1	Medium	0	High	1	2	High
Freecycle	Altruistic Sharing	High	1	Low	1	High	1	3	High
Freegle	Altruistic Sharing	High	1	Low	1	High	1	3	High
Getaround	Commercial Sharing	Low	-1	Medium	0	Low	-1	-2	Low
GlobeChain	Altruistic Sharing	High	1	Low	1	Medium	0	2	High
Idle Fish	Resale	Medium	0	Medium	0	Low	-1	-1	Medium
JustPark	Commercial Sharing	Low	-1	Medium	0	Low	-1	-2	Medium
OfferUp	Resale	Medium	0	Medium	0	Low	-1	-1	Medium
OLIO	Altruistic Sharing	High	1	Low	1	High	1	3	High
Open Food Network	Resale	High	1	Low	1	High	1	3	High
OpenBazaar	Resale	Medium	0	Medium	0	High	1	1	Medium
Peerby	True Sharing	High	1	Low	1	Medium	0	2	High
Poshmark	Resale	Medium	0	Medium	0	Low	-1	-1	Medium
Scrapo	Resale	Medium	0	Medium	0	Low	-1	-1	Medium

Sharewaste	Altruistic Sharing	High	1	Low	1	Medium	0	2	High
SnappCar	Commercial Sharing	low	-1	Low	1	Low	-1	-1	Low
Squiseat	Resale	high	1	Low	1	Low	-1	1	Medium
Subito.it	Resale	medium	0	Medium	0	Low	-1	-1	Medium
The RealReal	Resale	Medium	0	Medium	0	Low	-1	-1	Medium
ThredUp	Resale	Medium	0	Medium	0	Low	-1	-1	Medium
Too Good To Go	Resale	High	1	Low	1	Low	-1	1	High
Turo	Commercial Sharing	low	-1	Medium	0	Low	-1	-2	Low
Uber	Commercial Sharing	low	-1	High	-1	Low	-1	-3	Low
Vinted	Resale	Medium	0	Medium	0	Low	-1	-1	Medium
Wallapop	Resale	Medium	0	Medium	0	Low	-1	-1	Medium
PaperbackSwap	swapping	High	1	Low	1	High	1	3	High
Goswap	swapping	High	1	Low	1	High	1	3	High
SwitchHome	Complementary Sharing	High	1	Medium	0	High	1	2	High

LoveHomeSwap	Complementary Sharing	High	1	Medium	0	Medium	0	1	Medium
HomeExchange	Complementary Sharing	High	1	Medium	0	Medium	0	1	Medium
Neighbor	Commercial Sharing	Low	-1	Medium	0	Low	-1	-2	Low
StayleLend	Commercial Sharing	Medium	0	Medium	0	Low	-1	-1	Medium
Swap.com	resale	Medium	0	Medium	0	Low	-1	-1	Medium

Overall Conclusions

Starting from the results from Work Package 1, who has identified four scenarios of Circular Economy futures, this Deliverable 2.1 elaborates on what the supply chains implications of each circular futures are. It does so by identifying four different supply chain configurations in today world, which could become dominant under the conditions of scenarios that prioritise different governance models (ranging from bottom-up, decentralised to top-down, centralised society) and priority focuses (either economic growth or a shift towards environmental sustainability and social equity, reflecting limits to growth). The main findings of the deliverable are summarised by Figure 1 below.

Scenario 1 describes a future where society remains growth-based, with top-down, centralised decision-making shaping economic and industrial strategies. MNEs are key actors in driving more sustainable and circular production systems, primarily by integrating their global supply chains, fostering collaborative projects with Tier 1 suppliers, and enforcing robust information-sharing mechanisms. These efforts enhance supply chain transparency and enable precise measurement of environmental impacts. MNEs actively develop new circular products in partnership with customers and suppliers while optimising supply chains by closing the loops of end-of-life products. While they still pursue profit maximisation, they also strive to minimise the environmental harm of their production. As a result, highly integrated global supply chains characterise this future.

Scenario 2 describes a future where both bottom-up initiatives and top-down centralised decision-making guide economic and industrial organisation. The State takes an active role in planning production and ensuring that ecological boundaries are respected. This leads to a supply chain configuration built around more localised relationships and exchanges. SMEs and MNEs take advantage of State incentives to reorganise their supply chains into regional clusters, leveraging proximity to reduce transportation costs and serve local markets more efficiently. Supply chains in this scenario are viewed as adaptive ecological systems, responding to local needs while prioritising production that minimises reliance on primary resources, maximises the displacement of primary production by secondary production (repair, remanufacturing) and eliminates products that contribute to environmental harm and unsustainable accumulation rather than societal well-being.

Scenario 3 describes a future driven by bottom-up initiatives, where peer-to-peer platforms enable the growth of greener supply chains. While these platforms still prioritise profit maximisation, they also promote resource sharing and collaborative consumption, leading to greater decoupling between economic growth and environmental impact. Businesses and individuals use digital networks to exchange materials, optimise resource use, and extend product lifecycles. Supply chains in this scenario are highly flexible, with decentralised actors engaging in direct trade, remanufacturing, and recycling efforts. This results in a more distributed and resilient system, where growth continues but is increasingly aligned with circular economy principles and sustainability goals.

Scenario 4 envisions a future where limits to growth are embraced, and supply chains are built around sufficiency, grassroots innovation, and cooperative practices. Bottom-up initiatives drive the development of very localised supply chains, supported by commons-based resource management and community-led production networks. Rather than pursuing endless expansion, this scenario focuses on reducing material footprints and prioritising essential goods and services. Sharing platforms facilitate access to goods without the need for excessive production, while cooperative enterprises and mutual aid structures support resilient, place-based economies. Supply chains function as socio-ecological systems that prioritise well-being over accumulation, ensuring that production remains within ecological boundaries and meets local needs sustainably.

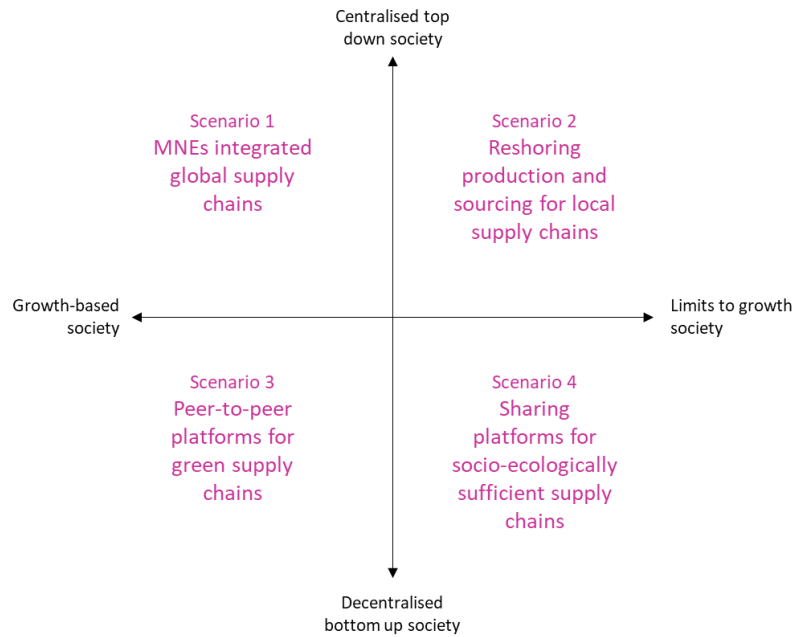


Figure 1 - Taxonomy of Supply Chain Configuration in different Circular Futures

These results are the foundation for the next steps of the project. In particular, Work Package 2 is going to identify key performance indicators for each supply chain configuration and then build a mathematical model, which describes the behaviour of different companies in a supply chain. This model will be useful to optimise the supply chain as a system that can pursue different objectives in different futures, like maximising the green growth, or minimising its ecological footprint.

This research adds to ongoing discussions about circular futures by exploring what they mean for supply chains. Different levels of governance and approaches to growth are likely to shape distinct paths towards circularity. In each of these paths, organisations structure their supply chains in different ways, depending on who makes decisions about what to produce and how, as well as the factors and values they prioritise.