

Article

# Circular Economy Business Models: The Complementarities with Sharing Economy and Eco-Innovations Investments

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**Abstract:** The transition from the linear economy to the circular economy exhibits some criticalities that can be solved through the identification of factors pushing and pulling the transition itself. By adopting a public good perspective in analysing the main features of the circular business models, this study underlines how the sharing economy business models are well integrated and complementary to some features of the circular economy, representing a strong pulling factor. Other loops of the circular economy need an explicit push factor, individuated in a strong impulse to eco-efficiency, to be reached through consistent incentives to invest in R&D for eco-innovations. Seven case studies are investigated in their aims, feasibility and implementation to support the interpretative framework.

**Keywords:** circular economy; business models; sharing economy; eco-innovations



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## 1. Introduction

The circular economy is considered as a new business model able to combine environmental sustainability and business profitability, but the transition toward this new economic model is still problematic [1,2]. The transition toward a circular economy has all the characteristics of public good, non-rival and non-excludable, fostering many collective benefits, but at the same time, private benefits may not be so evident. In this perspective, to be efficiently imported in the real world, the idea of a circular economy has to be founded on clear leverage points attracting businesses without hesitation.

In 2020, the European Commission [3] compiled a Circular Economy Action Plan showing a strong interest in the promotion of a shift from a linear model of production and consumption to a circular one. In this plan, some specific areas of intervention are outlined, with a detailed list of instruments, ranging from regulations implementations to direct investments incentives [4–6]. The need for a more sustainable approach to the economic and business systems is an undeniable issue.

Additionally, the sharing economy models have been suggested as frameworks fostering a sustainable approach to the economy, where the access vs. ownership scheme may reduce the overall resources use [7–9]. It is of interest, therefore, to underline where the circular and the sharing business models show their strongest complementarities, to put in evidence if private benefits emerging from these complementarities may overcome the free-riding problem, creating a pull force stimulating the transition. The transition is very relevant for sustainable development, as largely discussed in the literature [10–14].

Bocken et al. [15] and Geissdoerfer et al. [16] individuated some main characteristics of the circular economy, synthesized in five loops the creation of the circulation of resources and materials helping the realization of a circular economy. These loops are differently characterised in their stage of actual implementation in the value chain, calling for a detailed attention in some areas of intervention. If accelerating the transition toward the circular economy is considered a valuable objective, the stimulus to specific R&D investments must be concentrated where more efficacies can be found. A convincing

address for eco-innovations development by policy makers may efficiently push some of the loops where the implementation of the circular economy shows its main critical points.

In line with this, this study proposes a systematic classification of the principal features of the circular economy to individuate specific intervention areas where sharing economy models and eco-innovation systems may be the pivotal elements to push and pull the transition toward the circular economy. The research objective is to give a comprehensive approach of the links and the complementarities among circular economy, sharing economy and eco-innovation, to derive specific policy implications. Main contributions are synthesized in the following steps.

The first step objective is to enlighten the complementarities between circular and sharing business models, in the framework designed the European Commission [3], according to the five loops of the circular economy [15,16].

The second step adds to the previous classification transformations in the production process needed to meet the transition toward the circular economy, fostering the introduction of product–service systems, new products and/or markets or rearrangement of existing products.

The third step puts in evidence the areas where a public good problem emerges and defines the main instruments to adopt to sustain the transition toward a circular economy, analysing where the social benefits of the circular economy are associated with private benefits.

Finally, we compare the proposed framework with seven case studies selected on the basis of the essential features individuated in the first step. The analysis follows a methodological approach built on the significance of the product/service supply for circular transition, but it is enriched by the investigation of company sustainability profile, market drivers and business project origins. A detailed analysis of further sustainability implications of value chain implementation is also performed through the inspection of patents characteristics, when available.

We conclude that the main objectives for policy maker interventions should be the stimulus to R&D investments focused on eco-innovations and the promotion of consumers' awareness for sustainable products and services, as alternatively push and pull factors for the realization of a circular economy model.

## 2. Literature Review

### 2.1. Circular Economy and the Public Good Problem

The circular economy has been defined from various perspectives. Korhonen et al. [17] starts from the perspective of WCED [18] and the sustainability science. Urbinati et al. [19] decline a circular economy taxonomy in terms of circular business models, but in this area, a recent systematic review can be found in Centobelli et al. [20], to which we remind for further details. In what follows, we will adopt the terminologies from Boken et al. [15] and Geissdoerfer et al. [16] to enlighten the main complementarities with the sharing economic business models. As stressed by Riisgaard et al. [21], a circular economy is often a public good problem: the environmental impacts are a societal problem whereas the consumption of the goods is private [22]. To promote circular economy, it is of interest to clarify which basic interventions may incentive private goods production which can foster this public good production. Policy makers yet study regulations fostering a circular economy by imposing standards on materials efficiency, best practices promotion, extending existing guarantees and so on [3]. All interventions are in line with a public good framework where the focus is on free riding prevention, but it could be useful to investigate how strategies designed to promote a circular economy could combine private needs with the delivery of public goods [23].

### 2.2. Sharing Economy

The sharing economy is a debated area of interest for many disciplines, ranging from sociology to economics, but a comprehensive definition is given by the European Com-

mission who define it as ‘business models where activities are facilitated by collaborative platforms that create an open marketplace for the temporary usage of goods or services often provided by private individuals’ [24]. The main characteristic of the sharing economy is in the activating networks effects [25], creating new peers-to-peers or business-to-consumer markets. However, the sustainability aspect of collaborative or sharing consumption is also stressed [26–28] because it is often represented as a consumption ideology, where relationality, sustainability and frugality are pursued [29]. The sharing economy is often identified as a product–service system [26] whose environmental effects have been assessed together with unintended impacts [30].

### 2.3. Eco-Innovations

Eco-innovations are defined by Rennings [31] as innovations which contribute to a reduction of environmental burdens or to ecologically specified sustainability targets (p. 322). Among proposed measures of eco-innovations, the eco-efficiency is particularly relevant in this framework because it concerns one of the main features of a circular economy that will be discussed below [32]. In more details, the eco-efficiency is referred to as environmental impact per unit of product or service value [33] and is synthesized in the ratio between the added value of products and the added environmental impacts of the product or service [34]. It is worth to note that the eco-efficiency concept as a pillar for a circular economy is questioned by some authors [35] because it is still based on cradle-to-grave material flows [36]. An eco-effectiveness approach could be more appropriate in a circular analysis, though it is often considered not realistic [17].

### 2.4. Connections among Circular Economy, Sharing Economy and Eco-Innovations

Linkages among the circular economy, sharing economy and eco-innovations are multiple and debated, also in their causal directions. Connections among these three topics strongly depend on their potentialities in terms of sustainability.

The sustainability aspect of the sharing economy lies on the idea that through a model based on the access instead of ownership, goods consumption and the associated production will decrease, improving the resources use [27,28]. Other authors underline that a sharing economy is not sustainable by default [37] because it enhances indulgent consumption [38] or accelerates consumption [39] or produces rebound effects due to increased demand at lower prices [40] or to increase earnings that can be spent [41].

While underlying that the concepts of sustainability and a circular economy are not completely overlapped, because there is some similarity but also many differences that can be identified [16], it is worthwhile to note that also for a circular economy, some rebound effects have been investigated because insufficient substitutability, price effects and other effects that accelerate consumption may eliminate the potential environmental benefits [42].

A common feature of these arguments on the relationship between a sharing economy, circular economy and sustainability is that they are more focused on consumer practices instead of business practices, which is a suggestion explicitly proposed by Curtis and Mont [37]. Accordingly, the sharing economy cannot be considered more or less sustainable by itself, when considering the topic only for its consumption effects. By connecting the sharing economy and circular economy, it emerges also the fundamental role of institutions in promoting the sharing economy as a business model that, in a circular framework, can foster and support environmental sustainability.

In line of this, we consider a fundamental task to link the sharing and circular economy to a third issue, concerning the eco-innovations and the ecosystems of innovation as a pillar to be integrated with the first two. The relationship between circular economy and eco-innovations is well highlighted in the fact that they are complementary because ‘circular model requires cyclical and regenerative environmental innovations in the way society legislates, produces and consumes’ [43]. In light of this, eco-innovations constitute a strong push factor that can be enabled by institutions to foster a real circular economy transition [44,45] because they are a powerful means to foster sustainability if the implementation is supported

both by citizens sensibility [46] and by the existence of adequate ecosystems of innovations. In the area of eco-innovations, eco-efficiency is one of the main drivers for the circular economy; additionally, if at the business level, sustainability is not automatically equated with eco-efficiency, then more refinements are needed to meet business needs [47].

### 3. Materials and Methods

To compare systematically features of the sharing and circular economy, we use a deductive approach that, starting from classifications proposed in previous research, depicts a synoptic representation of the main links connecting the circular economy, sharing economy and eco-innovations. In details, we use the terminology of slowing, closing and narrowing resource loops, introduced by Bocken et al. [15], complemented by the two loops (intensifying loops and dematerialising loops) suggested by Geissdoerfer et al. [16]. In what follows, we will refer to the five identified features of the circular business model as ‘*actions on loops functioning*’. The loops description is displayed following the classification delineated in the Circular Economy Action Plan [3], distinguishing three main areas of economic intervention for the circular economy development as: production, consumption and waste management.

The proposed framework is then enriched with a dynamic perspective, which considers transformative elements characterizing the transition towards the circular economy. In this dynamic perspective are underlined transformations of production processes firms have to engage in, to meet the needs of circular transition: product–service systems, new products and markets, and rearrangement of existing products. Gains and losses on the private and public levels allow us to define areas where the public intervention is needed to push the transition toward the circular economy.

In this theoretical framework, we conduct an explorative analysis on the qualitative characteristics of seven case studies to verify that the product/service supply has a significant impact in fostering the circular economy. We selected a sufficient number of case studies to cover with at least a significant example all the five loops. Therefore, as selection criteria, we follow Geissdoerfer et al. [16] in choosing projects that can be aligned with either closing, slowing, intensifying, narrowing and dematerialising loops. The inclusion criteria are:

- (i) The case was supported by the availability of public information about product/services characteristics;
- (ii) The case can be clearly attributed to one loop.

On the selected cases, we performed two kinds of information gathering, concerning business and technological characteristics. First, we collected qualitative information on the company business from websites, considering the following points of attention:

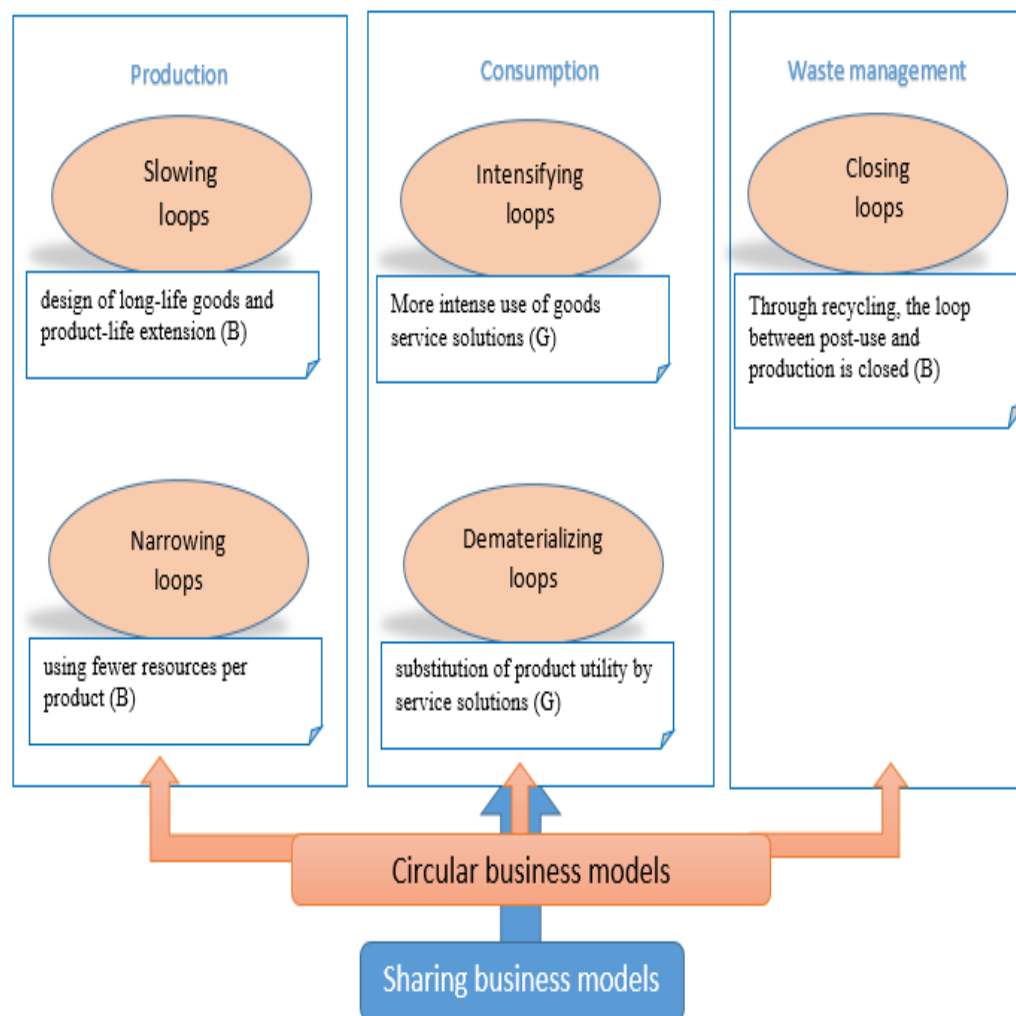
- (a) *Products/services characteristics*: this step allows the classification of the case study in the most pertinent loop;
- (b) *Type of innovation process*: information about the innovative development process is finalised to identify the relevant stakeholders and organizational arrangements, which can help the circular transition;
- (c) *Market destination*: this information is relevant to identify market pulling forces, particularly pertinent to the sharing economy striving business models;
- (d) *Sustainability mission*: expressed by companies/institutions: we also verify if companies and institutions explicitly assess to pursue sustainability or circular policies [48].

Second, we collected technological information on products through a patent analysis, which is a relevant instrument to investigate promising technologies [49]. We conducted a patent search in the Google Patents repository by company name. The patent applications, when available, were inspected to find in the detailed patent description if further sustainability features can be attributed to the specific innovation.

Data collected were analysed according to the loop’s characterization, and the main driver inducing businesses/institutions to introduce the specific innovation.

#### 4. Results

To identify the links between the circular and sharing economy, as two different but overlapping business models, we classify each loop into the three main areas of economic intervention for the circular economy development: production, consumption and waste management. The aim is to identify where the two approaches are complementary. The five actions on loops functioning can be differently attributed to each area, but it is possible to underline that each one typically belongs to one or another, as depicted in Figure 1, where the action on loops functioning is associated to their descriptions as in Bocken et al. [15] identified with B, and Geissdoerfer et al. [16] identified with G.



**Figure 1.** Classification of actions on loops functioning.

The first area identifies actions on loops functioning that are more characteristic of the production phase and strictly linked to circular business models, together with the waste management area. The central area concerns the consumption sphere, and it is the locus where circular and sharing business models show their stronger complementarity.

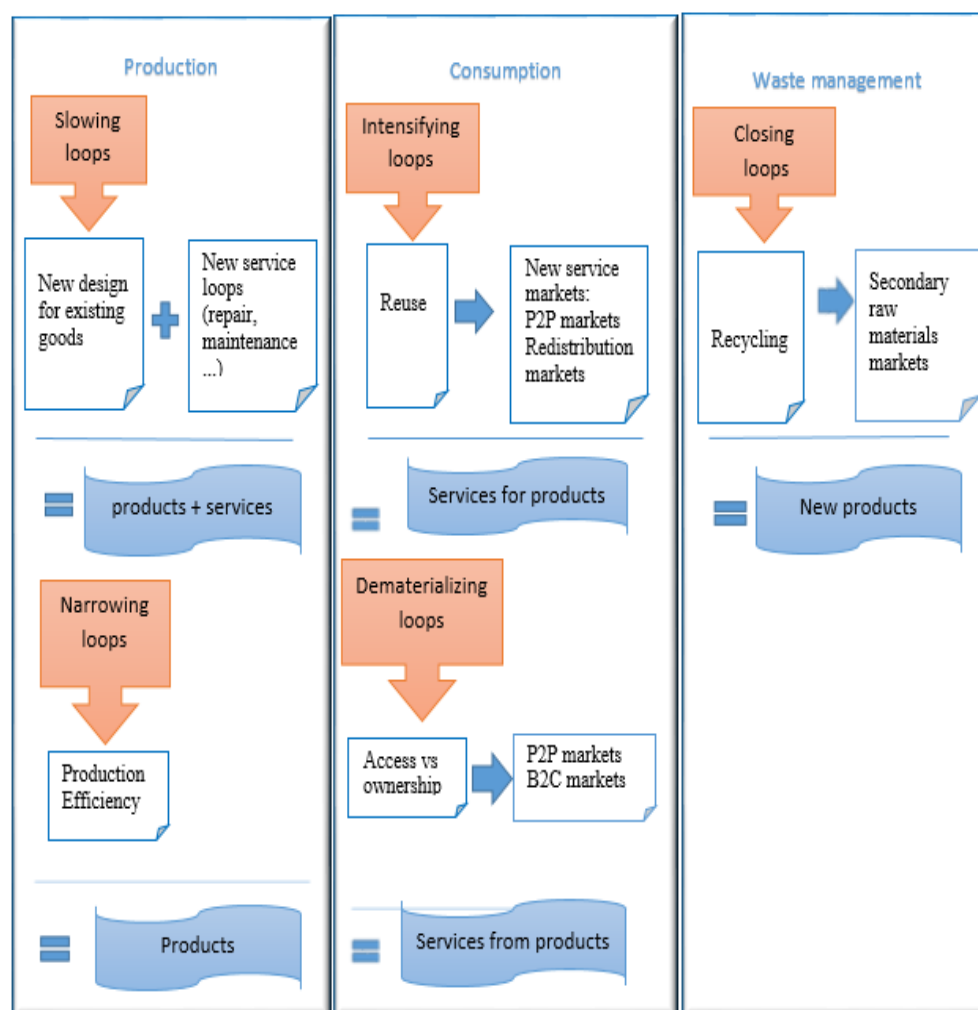
The further step in the analysis is focused on how business models must change to meet the needs of a transition toward a circular economy, to put in evidence business gains and losses.

A major impact of actions on loops functioning is often in the transformation of products in services, or in coupling new services to existing products. Following Stahel [50] '... an extension of the utilization period of goods through the design of long-life goods ... [implies] ... the introduction of service loops to extend an existing product's life', whereas the narrowing loops do not involve any service loops or service creation [15]. On the other

hand, the dematerializing loops are based upon one of the main features of the sharing economy; that is, the ‘access vs. ownership’ consumption model [51]. In these loops, it emerges a substitution of product utility by service solutions [16], with the appearance of new markets for services exchange, which often has the characteristics of a two-sided market, both in the peer-to-peer (P2P) and in the business-to-consumer version [29]. In these loops, one can find the most famous cases of the new sharing economy business models, ranging from Airbnb to the numerous forms of car/bike/bus sharing.

The complementarity between the circular and sharing economy mainly lies in the consumption area, where the intensifying and dematerializing loops are strongly reinforced by the implementation of the sharing economy business models. In the intensifying loops, the reuse of existing goods fosters the emergence of new redistribution markets (again in their P2P or business-to-consumer version), where the platforms have their core business directly linked to the goods exchange, associated to commission payments and/or to other typical two-sided markets features, such as advertisements. These loops show the creation of new services for exchanging existing goods.

Finally, the closing loops yet create new products and markets, generally classified as secondary raw materials markets. The transformation process of products and services implied by the actions on loops functioning is summarised in Figure 2.



**Figure 2.** Transformation processes of products and services.

We choose to go further in explaining links underpinning the complementarity between the circular and sharing economy by employing two main categories of economic analysis; that is, investigating how rivalry and excludability can be designed to give more



appeal to the adoption of a circular business model. A clear classification of the circular economy features in terms of rivalry and excludability could help to enlighten where the link with the public provision of the circular economy is more thin.

We start again from the five actions on loops functioning, declined as in Figure 2. All the five categories have public good features, namely, non-rivalry and non-excludability, when considered in their macro perspective, if the environment preservation and a reduced environmental resources use are considered as social benefits. In the micro and meso perspective, some action may also produce private benefits, also when firms cannot directly internalize the macro benefits.

In the production area, the slowing loops actions implies a transformation of products characterised by fast obsolescence in long lasting products. New repair, maintenance and assistance services have to be associated to new products, but the balance between fewer old products selling, and new services earnings may have an ambiguous sign. In the early stages of a circular economy transition, slowing the loops could be of interest for niche markets, exploiting the long tale of consumers more environmentally inclined. At the same time, if the more repairable products have a stronger economic gain for consumers, the markets may reach the same dimensions as before, combining private gains with social benefits.

As to the narrowing loops, more efficiency is associated with lower costs due to less resources employed in the production, with a clear private benefit. Nevertheless, the transition toward new technologies obviously implies investments in R&D activities, which must be promoted to be addressed to this specific goal. In this aspect, in the production area, the role of policies implemented to support the R&D activities is fundamental to push adequately the circular transition.

In the consumption area, the action on intensifying loops already is a spontaneous private initiative, where new enterprises follow the pure market stimulus, creating or deleting opportunities for reuse. The same happens in the dematerializing loops, showing the power of the complementarity between the sharing and circular economy. In the consumption area, the private gains fulfil the social benefits arising from circular economy. Given this complementarity in the consumption area, the circular transition can be fostered by enhancing the sharing consumption model. A strong pull factor needed to pursue this aim can be found in growing consumers' awareness about the re-use of goods and the access vs. ownership attitude, enhancing businesses to engage in the sharing economy model.

Finally, the waste management area also shows the growth of new entrepreneurial opportunities arising from evolution of technologies for the use of waste materials to create secondary raw materials. Together with innovation stimulus, the consumers' consciousness for environmental problems gives chances to new entrepreneurship activities.

### *Case Studies*

In the case studies analysis, we selected two projects representing the narrowing loops, two for the closing loops and one project for each one of the remaining loops.

Project A is a typical output of a closed innovation process, born inside the company R&D department and patent protected. It concerns the self-repairing technology for tyres, which by reducing the risk of serious tyre damages, helps to extend the product life. This product is then classified in the slowing loops category. This company is explicitly devoted to pursuing sustainability efforts, combining innovation and sustainability. In the patent application, it is specified that the films employed in sealing complexes allow an advantageous and easy recycling of the semi-finished products, configuring an eco-innovation push.

In the narrowing loops, we have classified two different projects. Project B, born from the collaboration between a top home appliances company and a university spin-off, develops an anti-fish scaling procedure for enamelling that reduces the manufacturing of waste and, therefore, uses fewer resources for product. Patent description reports that this procedure reduces both the risk of cracking of a work piece and the use of chemical

substances that can be toxic or harmful, underlying its eco-innovation features. The spin-off mission is to promote technological research for industrial production in the context of environmental sustainability. The home appliances company has many other circular objectives in its sustainability section, as increasing the use of scrap-based steel or recycled plastic in its production.

Project C is a start-up, born in a university business incubator, that developed an Internet of Things system for building energy saving. Being designed especially for office buildings and to improve air quality, this innovative system allows real-time analysis of environmental data and remote energy management, narrowing the offices energy consumption loops. The patent describes an electronic device that allows controlling in closed-loop mode the environmental conditions of a building, without requiring complex interventions on existing systems, and can be easily labelled as an eco-innovation. The company has rapidly become a scale-up with an explicit mission of environmental sustainability. The business incubator mission is to support the ecosystems of entrepreneurship through technology transfer.

Project D is a typical intermediary platform in a P2P market, focused on clothes exchange, with the slogan of clean out each own closet. In this business it is easy to find an intensifying loop, where new service solutions give the opportunity for a more intense use of goods. No explicit mission for sustainable development can be found in the business description, which is mainly founded in the distinctive features of sharing economy, that are the peers' opportunities for additional earnings, frugality and sociality chances. Additionally, Project E is a typical sharing economy experience, which can be included in the dematerializing loops, being concentrated on the access vs. ownership formula. Project E is dedicated to the storage space exchange among peers, just as Airbnb is devoted to accommodations exchange. As for project D, no sustainability assessment has been detected, and the main driving factor for business is a strong pull demand force.

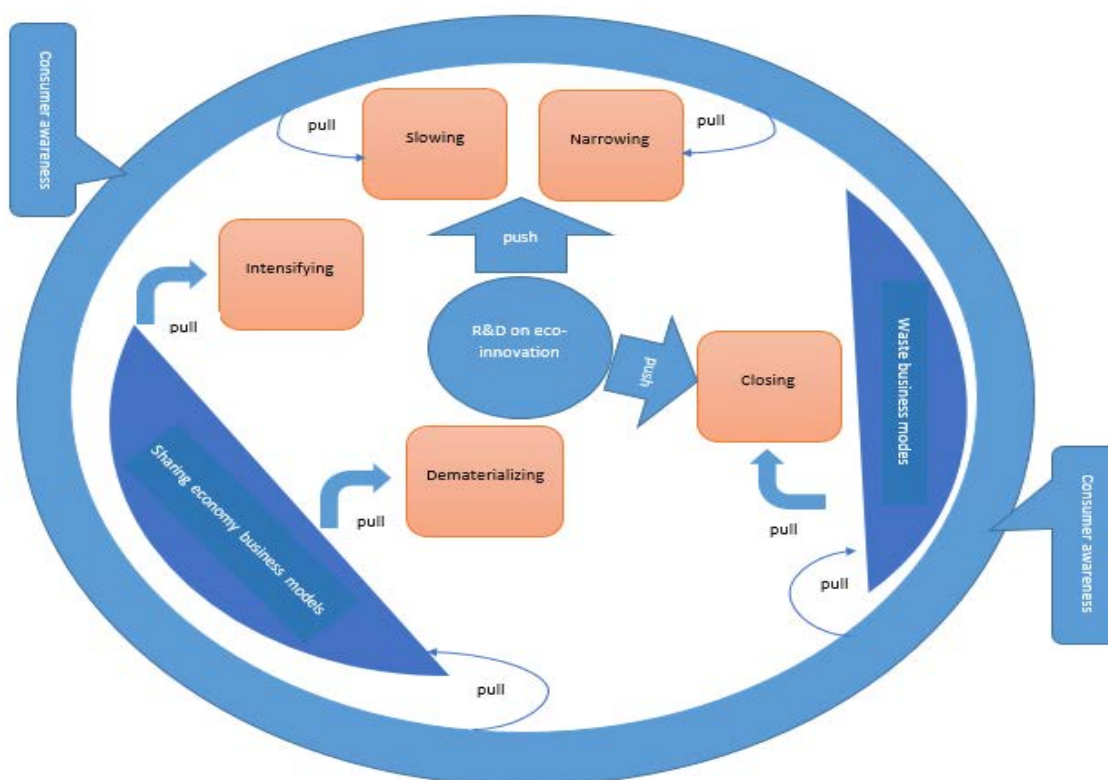
Finally, in the closing loops area, the two selected experiences underline different aspects of this area of circular improvement for business models. Project F concerns a smart waste collection bin, which is able to detect the degree of filling and to transmit instantaneously the relative information. This technology allows the optimization of the waste collection process, accelerating and improving the closing loop. The business idea arises from a collaboration among universities, companies and local administrations, developed in a consortium form. Interestingly, the consortium mission, focused on innovation, growth and digital technologies, proposes a statement that links the main themes here discussed. They suggest a mindset for developing innovation, which promotes shared innovation as a powerful tool to enable sustainability, but this generic proposition is not further developed elsewhere. Patent description mainly concerns the measuring device for detecting the filling status of a containing cavity to detect non-homogeneous materials and the data transmission to a centre configured to monitor filling status and plan intervention activities on and management of the containing cavity.

In project G, one can find more representative characteristics of the closing loops because the company's objective is in creating the market for renewable diesel made from used cooking oil. This business idea combines the sharing processes with the sustainable intents, fostering a local network of exchange between used cooking oil producers and fuel users. The sustainable approach is clearly stated in the company homepage as its fundamental mission is the use of waste for solving a social and environmental problem. The company also performs a trace and track system IOT based to prevent illegal collection and to ensure a full traceability. It is worth noting that the main company activity is in creating a sustainable biofuel market by supporting distribution, logistics and certification. It is, therefore, a symbolic case where eco-innovations are associated to local exchange markets (P2P or B2C) in fostering a circular transition.



## 5. Discussion

Summarising the theoretical considerations, main relationships about drivers of circular economy are showed in Figure 3. It appears that the consumption and the waste management areas benefit from spontaneous opportunities arising in the market, both because of new technological opportunities and consumers' specific needs to be satisfied. This consideration shows that the two main driving factors in the circular economy transition are technological innovation and social consciousness about environmental problems. Furthermore, the same two driving factors are sufficient to create new business models, which can be individuated as the sharing economy business model and the waste management business model.



**Figure 3.** Drivers of circular economy.

The second insight one can derive from the above discussion concerns the absence of clear indications for the production area. The slowing and the narrowing loops may be more problematic to implement because, until now, the private benefits are not so evident to ensure the pursuing of the social benefit of the circular economy. A stronger attention of policy intervention is needed to foster technological innovation and consumers' consciousness in this area. In more details, the main concern should be in fertilizing a ground for a new business model that can be born in this area.

The case studies analysis enlightens the areas where eco-innovations and sharing business models actually work, and if they are integrated in a wider sustainability policy. Table 1 synthesizes major results, enlightening drivers and barriers corresponding to the previous analysis.

**Table 1.** Case studies for circular business models.

	Loop	Project	Explicit Sustainability or Circular Policies	Methods	Public Engagement	Push Factors	Pull Factors
Production	slowing	A	✓	patents, private R&D investments		eco-innovation	
	narrowing	B	✓	spin-off partnership	✓	eco-innovation	
		C	✓	spin-off, start-up	✓	eco-innovation	
Consumption	intensif.	D		P2P marketplace			sharing economy
	demat.	E		P2P marketplace			sharing economy
Waste management	closing	F	✓	spin-off, public and private investment	✓	eco-innovation	
		G	✓	secondary raw materials exchange		eco-innovation	sharing economy

Project A represents an eco-innovation push in the slowing loops, originated from a private initiative. It is fully integrated in an explicit company sustainability policy. The two projects in the narrowing loop (B and C) highlight the difficulty in the production area to pursue a circular transition without a strong public engagement. In the consumption area, projects D and E show that the intensifying and dematerializing loops are basically driven by the sharing economy business models, also if platforms do not communicate about being sustainable [52]. Finally, in the closing loop, a partnership between private and public funding uses the eco-innovation push to foster a circular transition, as in project F. Interestingly, project G conjugates both drivers of circular economy (eco-innovation and sharing economy) to sustain a private initiative, signalling that in the waste management area more business opportunities can be found, also without public engagement. These results give support to the policy implications above depicted.

## 6. Conclusions

Starting from the key elements of the circular and sharing economy highlighted in the literature, this study puts forward a systemic approach to the instruments needed to foster an effective transition toward the circular economy. The focus is primarily on finding space for policy makers intervention. Other studies analyse organizational forms of inter-firm collaborations for transitioning into a circular economy [53]. With this focus in mind, the links between the sharing and circular economy are investigated in their business implications, as proposed by Plepys and Singh [40], whereas the consumers' participation in the circular business models is already stressed in other studies as a relevant factor in promoting circularity [17,54].

We start from considering the transition toward a circular economy as a public good, promoting many collective benefits with few clearly evident private benefits. In this perspective, to be efficiently imported in the real world, the idea of a circular economy should be designed to irremediably attract both business and consumption areas. Consequently, some leverage points should be addressed to pursue this objective. We base the analysis on the five essential actions on loops functioning as main characteristics of the circular economy to discuss their classification in three main areas of interest: individuated as production, consumption and waste management. In the consumption area, we find that the sharing economy is a strong point of attraction both for business and the consumers. A strong complementarity between the two business models gives evidence to private benefits overcoming the free-riding problem, mainly through a product–service system, because its strong sustainability potential facilitates circular innovation [55]. Additionally, the waste management area shows strong potentialities for business growth, identified in the new markets for secondary raw materials, where firm profit and social welfare optimizing objectives can be reconciled [56]. In the production area, we find conflicting results because, in the actions for slowing loops, a product–service transformation is not

advantageous in a straightforward manner [57], whereas the narrowing loops need technological innovations to be profitably implemented. The case studies analysis showed numerous potential intersections between the eco-innovations pushing factors and the pulling effects derived from new sensibilities created by the sharing economy framework, corroborating the theoretical analysis.

Main policy implications derived from comparison between theory and the real world call for a convinced address for an eco-innovations development by policy makers to adequately push action, especially on the loops concerning the production area. The role of public intervention in this area, by enhancing technological capability through spin-offs and partnerships, is stressed also in Ma et al. [58] because it stimulates innovation and consequently economic growth [59]. Additionally, Dominish et al. [57] underline that in the slowing and the narrowing loops many barriers to production efficiency persist, but our results highlight that it is especially true in the narrowing loops. In these loops, the eco-efficiency approach still requires attention because short-term financial gains may be lacking, and the further step toward an eco-effectiveness that focuses on long terms benefits, as proposed in Borrello et al. [35], can be less practicable. As shown in Quan et al. [60], both public-participated and formal environmental regulations promote industrial-technological innovations. In the consumption and waste management area the public good problem is strongly attenuated by mutual interests of producers and consumers. Conjugating the new consumption culture of the sharing economy and the profitability of eco-innovations, market factors and cost saving may be effective in driving environmental R&D.

By adopting a public/private good approach, the analysis contributes to a systematic identification of a more critical area of intervention for public support in fostering the transition toward a circular economy. Both sharing economy models and eco-innovation systems show complementarities with the circular business model and may be the pivotal elements to push and pull the transition in the areas where the relationships are attenuated.

Further research is needed to empirically assess the relative relevance of each action on loops functioning and to test the existence of negative rebound effects both for sharing and circular economy models.

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