

**FINTECH AND SMES SUSTAINABLE BUSINESS MODELS: REFLECTIONS AND
CONSIDERATIONS FOR A CIRCULAR ECONOMY**

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Fintech and SMEs sustainable business models: reflections and considerations for a circular economy

Abstract

Following the operational paradigms proposed by Industry 4.0, the last years have been characterized by the rapid growth of technology-based firms increasingly adopting sustainable business models. In particular, an increasing number of Fintech enterprises have started to launch new services in order to avoid the organizational barriers that impact negatively on the voluntary adoption of sustainable business models by SMEs. However, research is still scarce in systematizing the efforts and identifying the facilitating factors for such a transition. Drawing on a diverse set of companies, case studies linking Fintech application and circular economy (CE) in diverse industries and contexts are analyzed and discussed. The findings of the qualitative analysis suggest that Fintech, an example of sectors developed under the influence of Industry 4.0, can play a relevant role in the transition of SMEs toward a more sustainable business model leading to better integration of circular economy practices. A conceptual framework using the ReSOLVE model is then presented with relevant implications for both research and practice.

Keywords: sustainable business model, business model canvas, circular economy, fintech, ReSOLVE

1. Introduction

The circular economy (CE) concerns the production, consumption of goods and services, and the supply of money based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems (Ellen MacArthur Foundation, 2015; Murray et al., 2017). CE requires restoration, regeneration, and disruption to the economic systems and consequently poses severe challenges to the adaptation and evolution of business models (Lopes de Sousa Jabbour et al., 2019). The achievement of a high level of sustainable development via the CE requires concrete actions, practices, and investments not only by policymakers but also by the private sector (Scheyvens et al., 2016). Within the private sector, small and medium enterprises (SMEs) constitute the majority of businesses globally and provide the highest potential for the transition to CE and cleaner production (OECD, 2019). Yet, SMEs contribution has been limited due to economic and organizational barriers (Caldera et al., 2019),

such as their size, and the scarcity of economic, human or technical resources (Bartolacci et al., 2020). Despite evidence of positive externalities related to the adoption of sustainable practices (Chen and Yang, 2019; Malesios et al., 2018), such benefits are uncertain and achievable mostly in the long term, making it more difficult for SMEs to commit to the required investments (Bartolacci et al., 2020). Therefore, the understanding of the motives behind SMEs transition to CE implies a balance between the long-term need for more sustainable practices and the short-term interests for sufficient financial returns (e.g., Slawinski and Bansal, 2015).

The advancements in digital and smart technologies that characterize the Industry 4.0 revolution can serve as means for SMEs to reduce the gap between short-term and long-term benefits, allowing for the exploitation of the full potential of Industry 4.0 and its impact on sustainable and circular economies (Lopes de Sousa Jabbour et al., 2018; Luthra et al., 2020). In particular, prior studies highlighted the existence of a link between CE and digitalization related to the development of new technological tools to support the development of industrial symbiosis between firms interested to include sustainable practices within their business model (Lopes de Sousa Jabbour et al., 2019; Rosa et al., 2020; Tseng et al., 2018). One example of sectors developed under the influence of Industry 4.0, which impacts the supply of money in the CE, is financial services and the rise of financial technology (Fintech). Fintech consists of the application of large-scale machine-to-machine communication and the internet of things (IoT) to financial services (Huynh et al., 2020). Yet, current literature has not sufficiently explored the link between Fintech and the adoption of more sustainable business models, particularly in the context of SMEs.

In the panorama of studies calling for the investigation of the role covered by Industry 4.0 driven technological applications and frameworks promoting the implementation of circular economy practices, the present paper builds upon previous contributions on Fintech (Arner et al., 2020; Lee and Shin, 2018), and the circular business model canvas (Bocken et al., 2018), by putting forward the following research question: What are the benefits of implementing Fintech solutions

for SMEs wishing to accelerate the transition to *more* equitable and sustainable business models? To address this novel question, the paper explores the enabling role of Fintech for SMEs' transition to circular business models, which are considered a subtype of sustainable business models (SBMs) (see Bocken et al., 2018), and proposes a novel SBM canvas that takes into account the role of digital technologies such as Fintech in the circular economy.

The contributions of the paper are several. First, the findings on the SBM canvas contribute to the emerging literature on the link between digitalization and sustainable business models, such as circular business models (Piscicelli et al., 2018). Furthermore, the paper contributes to the debate on the integration between CE, cleaner production, ethical business development, and digital innovations under the Industry 4.0 paradigm (Lopes de Sousa Jabbour et al., 2019; Saberi et al., 2019). Finally, the findings provide insights about the potential externalities related to the development of the Fintech sector and offer managerial and policy-making reflections about the link between the characteristics of CE for SMEs and Fintech in the context of Industry 4.0, cleaner production and ethical business development.

2. Background

2.1. Circular Economy (CE) and the ReSOLVE model

The increasing attention paid to the need to rethink the global economy has generated in recent years a vibrant discussion around the positive externalities associated with the transition to CE paradigms (Geissdoerfer et al., 2017). The scientific debate has interested multiple disciplines resulting in a proliferation of definitions and interpretations (Kirchherr et al., 2017). Further attempts at integrating diverse streams allowed the concept of CE to develop from a “waste management” approach to more extensive definitions inspired by the principle of “value retention” (Reike et al., 2018).

In this vein, three main principles inspiring a paradigm have been identified: the conservation of the natural capital; the minimization of the waste within the processes; and, the reduction of negative externalities (Ellen MacArthur Foundation, 2015). The interpretation of such principles initially focused on the recycling of business waste and byproducts (Ghisellini et al., 2016). However, to fully comprehend the true meaning of circularity from a business model perspective, an extension of those principles that also includes sectorial and geographical effects is needed (Prieto-Sandoval et al., 2018). The systematization of the different CE approaches resulted in the ReSOLVE framework, based on six business actions: regenerate, share, optimize, loop, virtualize, and exchange (Ellen MacArthur Foundation, 2015).

The transition from a principle-based to a business action-based approach stems from the need to integrate different sectors with common practices. Indeed, industrial symbiosis requires the integration of the economic ecosystems with the CE (Tseng et al., 2018), so that technical, cultural, and economic barriers structurally pertinent to some sectors are considered as influential factors toward CE practices (Jaeger and Upadhyay, 2020). Similarly, the limitations related to firm size must be addressed as complexity factors impacting negatively on the adoption of sustainable, circular practices (Heyes et al., 2018).

2.2. Sustainable and circular business models

The transition from a linear to a circular economy implies the creation of a sustainable ecosystem characterized by sustainable business models aiming at circularity (Bocken et al., 2018). A business model articulates the logic about how a business creates and delivers value to its customers, and in turn, society. It also outlines the architecture of revenues, costs, and profits associated with a said value (Teece, 2010). While economic value is central in the definition of a business model as it describes the rationale for the existence of the firm in the market, the need for

companies to integrate sustainability in the equation has also been highlighted (e.g., Porter and Kramer, 2011).

Incorporating sustainability into business models requires firms to go beyond the pursuit of economic performance, considering the preservation and renewal of all resources that allow the business to take place. Firms may, therefore, either adapt an existing business model or create a new one. Thus, SBMs can serve as a vehicle to coordinate social and technological innovations with ecosystem sustainability (Bocken et al., 2014, p.44). This paradigm shift has given rise to SBMs that create a competitive advantage via superior customer value that contributes to sustainable development (Lüdeke-Freund, 2010). SBMs are defined as a model that “helps describing, analyzing, managing, and communicating (i) a company’s sustainable value proposition to its customers, and all other stakeholders, (ii) how it creates and delivers this value, (iii) and how it captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries” (Schaltegger et al., 2016, p.6). Examples of SBMs include closed-loop models (Wells and Seitz, 2005), product-service systems (Tukker, 2004), and social enterprises (Seelos and Mair, 2005).

One of the key features of a sustainable economy is the circularity where resources are not allowed to be wasted, where reuse, repair, and remake are preferred to mere recycling (Bocken et al., 2014). The idea of CE aimed at minimizing resource input, waste, emissions, and energy leakage (Geissdoerfer et al., 2017) has also attracted scholars interested in sustainable business models. As such, circular economy business models (CEBMs) are considered as a subset of SBMs (Bocken et al., 2014). Several opportunities and advantages are presented in relation to the adoption of CEBMs, including cost savings and reduced ecological and social impacts, as well as the possibility to address new market segments, extend customer experiences, and generate additional revenues (Lüdeke-Freund et al., 2019). A canvas for CEBMs has also been developed on the

following dimensions: 1) value proposition, 2) value delivery, 3) value creation, and 4) value capture (Bocken et al., 2018).

Within the emerging field of circular business models, technology and digital tools can act as drivers for the transition to circularity and, more broadly, sustainability. For instance, it has been argued that Industry 4.0 technologies can help companies integrate CE principles into their businesses (Lopes de Sousa Jabbour et al., 2018). Digitalization (through IoT, big data, AI, blockchain, and machine learning) promises to deliver significant value to companies engaging in sustainable initiatives. The digitalization-sustainability convergence provides new opportunities for firms to use digital tools to map their impact on the environment and measure the impact of environmental shifts on their business (Kiron and Unruh, 2018). The business model literature has often explored the relationship between business models and technology (Baden-Fuller and Haefliger, 2013). However, with a few exceptions (e.g., Piscicelli et al., 2018), the equally important link with sustainable business models is somehow left underexplored (Dentchev et al., 2018). A pivotal aspect where digital technology promises to deliver value is the financing of a sustainable and circular economy, particularly in the case of new ventures and SMEs that often have more difficult access to capital compared to large businesses. Because capturing value changes significantly from linear to circular businesses, the revenue streams will also change, creating the need for adapted financial tools (Bocken et al., 2018). To that respect, Fintech can represent an enabler of the transition to SBMs and CEBMs through new forms of access to financial capital (Hieminga, 2015).

2.3. Fintech and Circular Economy business models

Fintech is the range of digital financing technologies, including mobile payment platforms, artificial intelligence, big data, IoT, blockchain, and cryptocurrencies (United Nations, 2019). The total Fintech investment in 2019 reached \$135.7 billion invested globally across M&A, PE, and VC

deals (KPMG, 2020). Fintech's constant growth was mostly fueled by the success of the sharing economy, widespread favorable regulations, constant innovations in ICT, and the effects related to Industry 4.0 (Huynh et al., 2020).

Fintech is benefiting the unlocking of green finance technologies (Nassiry, 2018). These innovations can reduce the cost of capital, improving efficiency (scale and speed) in matching investors with investments. Fintech-enabled companies like Amazon and Alibaba-linked Ant Financial emerged as some of the world's largest lenders to SMEs (United Nations, 2019). Having such a widespread impact in the economy, Fintech was recognized by the United Nations (2019) as one of the key innovations that could facilitate the achievement of the Sustainable Development Goals (SDGs). Blakstad and Allen (2018) posited how Fintech could be an enabling factor in stimulating the development of new innovative solutions and business models that can help support SDGs.

Given the above, Fintech promises to contribute to the transition from linear to SBMs and CEBMs by allowing SMEs to access technologies such as IoT and artificial intelligence that is required to achieve the strategic flexibility needed (Rialti et al., 2020). Therefore, Fintech-enabled CEBMs can place citizens at the center of environmentally and sustainable impactful decisions. There are many potential applications, which mostly go toward increasing efficiencies and sustainable behaviors in the utilization of services and products (Blakstad and Allen, 2018). Examples of areas in which Fintech can play a significant role include:

- food trust and supply chain traceability;
- reputation systems to build trust;
- fractional ownership of assets;
- improved identity applications through traceability of use/ownership;
- disaster prediction and management;
- traceability of investment and tracking of development funds.

3. Illustrations of Fintech’s impact on SMEs circular business models

3.1. Research approach

An inductive research was conducted through multiple case studies, a research method widely adopted for exploratory purposes and theory development (Fernández Campos et al., 2019; Kouhizadeh et al., 2019). Research through multiple case studies requires establishing a clear research protocol that ensures reliability and generalization via sample selection, validity/credibility, and thick description (Parker and Northcott, 2016). The novelty of studying the enabling role covered by Fintech for SMEs’ sustainable business models represents a fertile ground for this methodological approach.

Sample selection was conducted using the CBInsight database, which represents one of the leading sources on digital firms, including Fintech enterprises. The selection was performed through a boolean research based on keywords related to sustainable practices (e.g., “green”, “circular”, “sustainab*”) on a dataset consisting of eight thousand start-ups and scale-ups classified as Fintech. The need to adopt different keywords is related to the few Fintech enterprises classified as “ESG Tech” (CB Insights, 2020). The cases were selected via a theoretical sampling of firms involved in activities related to the ReSOLVE framework.

To ensure the validity of our research, the methodological approach used followed the case method approach proposed by Kouhizadeh and colleagues (2019), which suggests reaching maximum variance between cases along relevant dimensions of research interest. In detail, diversity and variance were achieved by selecting cases across three different Fintech sectors that had sufficient geographical diversity as well as presenting sufficient diversity in terms of capital raised (including both start-ups and scale-ups). Following the indications of Kouhizadeh and colleagues (2019), five cases (see Table 1) were selected for in-depth analysis.

[Insert Table 1 about here]

3.2. *Payments*

The transition to CE requires the identification of the financial returns associated with it (Geissdoerfer et al., 2017), which poses the need to rethink the financial relationships among the stakeholders interacting with the company (e.g., suppliers, customers). This is particularly relevant for SMEs that face higher financial constraints relative to large firms. Consequently, SMEs are often impeded to develop sustainable practices due to the existence of financial barriers (Bartolacci et al., 2020). Prior studies on CE's implementation have also highlighted that firms require financial incentives to cover the opportunity costs related to the revision of their processes (Abu-Ghunmi et al., 2016). As such, the externalization of the financial risks to Fintech enterprises represents a possible driver for the implementation of circular business models (Hieminga, 2015). Fintech enterprises can enable the adoption of circular business models by providing customizable payment solutions both from a sell-side and from a buy-side perspective.

3.2.1 *Grover*

Grover is a German scale-up founded in 2015 that has a workforce of over 100 employees and a total financing volume of € 298 million to date. The business model of Grover is based on the pay-as-you-go model allowing business enterprises to rent technological devices such as tablets, monitors, or virtual reality glasses with flexible contracts. This allows client firms to replace their technologies according to their needs. The opportunity for SMEs to replace their technologies increases their flexibility, potentially overcoming economic barriers caused by the lack of financial resources that may, for example, limit the adoption of green technologies (Pacheco et al., 2017).

The contribution provided by Grover to sustainable development is twofold. The first contribution is represented by the opportunity for SMEs to reduce their environmental impact through a more flexible business model. In fact, the pay-as-you-go model represents a contract characterized by the opportunity for firms to minimize their waste through the renewal of their

resources (Wieser and Tröger, 2016). The second contribution is represented by the possibility for SMEs to mitigate the adverse effects on financial cash flows caused by the investment in new infrastructure. In this sense, the transition to technologies characterized by a greater degree of “circularity” is simplified, given the flexibility of those contracts (Blomsma et al., 2019). In addition, the opportunity to replace assets every month allows firms to adequate their technology to their financial resources. *To conclude, Grover enables SMEs to Regenerate, Loop, and Exchange.*

3.2.2 *Flutterwave*

In a geographic context dominated by scarce financial resources, Flutterwave is a global payments technology company building a digital payment infrastructure. The business model of Flutterwave is based on the goal of making financial transactions safer and easier in order to boost the development of African companies. In detail, the company has developed a dashboard that enables financial transactions between international suppliers or clients and African businesses.

Since the official launch of the platform, the contribution provided by Flutterwave to the African context has been relevant, tackling one of the main issues for the un-sustainable development of Africa represented by the lack of technical and financial resources (Geng et al., 2019). Thus, the provisions of more flexible tools to favor the engagement with international suppliers and clients represent an enabler for the development of sustainable enterprises.

An example is represented by Fruits2Go, a Nigerian company that has increased its performance through the adoption of the digital services released by Flutterwave. The experience of Fruits2Go underlined the enabling role covered by digital payments on CE. In fact, the lack of a technological infrastructure limits the development of successful enterprises inspired by a sustainable vision. The comprehension of the phenomenon is even more relevant from an African perspective. On the one hand, the transition to more sustainable paradigms by African firms is limited by the cost of capital, at 18-25% per year (Poku et al., 2018). On the other hand,

international investors perceived financial transactions with African companies as a high-risk activity (Preisendörfer et al., 2014). *To conclude, the digital payment infrastructure of Flutterwave allows SMEs to Optimize and Virtualize.*

3.3 Crowdfunding

During the last decade, financial markets have been characterized by the proliferation of socially responsible investments (SRI) (Widyawati, 2020). SRI's proliferation has been favored by the increasing attention paid by investors regarding the win-win relationship between financial and non-financial performance (Bartolacci et al., 2020). Besides, financial analysts have included within their ratings new indicators in order to favor the comprehension of the contribution provided by firms to sustainable development (Clementino and Perkins, 2020; Weber and Hogberg-Saunders, 2018). However, despite the lack of non-financial information regarding SMEs, an increasing number of investors have started to invest their financial resources on crowdfunding platforms. The development of crowdfunding platforms has been a radical innovation due to the possibility for SMEs to achieve external funds from investors (Chen et al., 2018), allowing them to develop new projects through the direct contribution of external funders (Hörisch, 2019). Fintech firms could favor this process by implementing ad-hoc platforms that sustain the implementation of projects based on CE paradigms (Blakstad and Allen, 2018).

3.3.1 The Sun Exchange

The need to favor the adoption of clean energy by SMEs represents one of the main challenges of the modern world. Policymakers have highlighted the need to convert industries to renewal sources in order to reduce the carbon dependency of the countries (Gibassier et al., 2020; United Nations, 2015). The Sun Exchange was founded to address this challenge through a crowdfunding platform that enables micro-investing into solar projects focusing on developing

countries. The Sun Exchange's business model is based on the offer of solar energy-producing cells within the international markets. In detail, the company allows worldwide firms to invest in solar cells. The investments in solar cells contribute both to the firms' financial and non-financial performance. In fact, the concept of CE requires the adoption of an integrated approach in order to sustain the development of an integrated circular model. The direct investments in solar plants generate other externalities caused by the reduction of the carbon-dependency of the developed countries. In this sense, investors can indirectly enable the adoption of circular business models by SMEs and entrepreneurs in developing countries. The Sun Exchange includes environmental, social, and economic criteria within its activities. In fact, the contribution provided by the Sun Exchange to sustainable development is not limited to the reduction of the GHG but also embraces the adoption of a socially responsible behavior during its activities. In this sense, the enterprise adopts a paradigm inspired by an integrated approach. *In conclusion, the Sun Exchange enables SMEs to Regenerate, Optimize, Loop, and Exchange.*

3.3.2 Impact guru

Impact Guru is India's leading online crowdfunding platform that enables NGOs to fund their programs as well as individuals, entrepreneurs, and social enterprises to fund their medical expenses, creative and personal projects. In 2019, five years from its founding, the company has been awarded by several institutions due to its contribution to Indian society. The support of NGOs represents one of the main drivers to support the diffusion of more circular paradigms (Kirchherr et al., 2017). Thus, the investment of financial resources in NGOs' activities directly impact SMEs due to their interlinkage in developing countries (Harangozó and Zilahy, 2015). An example is the development of projects inspired by the need to reduce the waste generated during the transformation of raw materials into finished products (Santos, 2011). In addition, Impact Guru allows investors to make donations to support the development of sustainable projects or causes. The opportunity to share projects with stakeholders represents a strategic driver for SMEs interested

to develop circular practices. As evidenced in prior studies, crowdfunding platforms favor the involvement of investors interested to actively contribute to the achievement of a higher degree of sustainable development (Hörisch, 2019; Vismara, 2019). *In conclusion, Impact Guru enables SMEs to Share and Exchange.*

3.4 Lending

The financial crisis that has characterized the last decade has changed the relationship between financial institutions and SMEs (Lee et al., 2015). Contrary to the past, lending money represents an activity characterized by a high degree of bureaucratization (Cimon and Garriott, 2019), which has a negative impact on SMEs due to their difficulty in providing adequate financial reliability (Altman and Sabato, 2007). The contribution provided by Fintech to lending is represented by the provision of alternative channels to achieve financial funds. An example is peer-to-peer (p2p) lending, where SMEs and investors can lend or borrow resources to develop social or sustainable projects (Mild et al., 2015).

One of the main challenges related to access to financial resources is social inequality (Zhao and Wry, 2016). Prior studies have highlighted that p2p lending could enable the development of circular practices by business enterprises (Fischer and Pascucci, 2017). In this sense, the provision of alternative channels to achieve funds represents an effective contribution to mitigating the negative effects caused by social inequality.

3.4.1 CNote

CNote is a US-based investment platform that aims to fill the social gaps caused by the recent financial crisis. In particular, its founders have identified SMEs that contribute positively and actively to reduce the social gaps as their main audience. CNote's business model consists of the development of financial services to favor value creation for both investors and business enterprises. The approach of CNote to sustainable development is characterized by an intense activity aiming to identify a potential nexus between lending activities and SDGs. The main

contribution provided by the company is represented by the SDG 11 (i.e., make cities and human settlements inclusive, safe, resilient, and sustainable). The positive externalities related to the adoption of CE paradigms by business enterprises also have implications for the entire society (e.g., Chiappetta Jabbour et al., 2019). Thus, the contribution provided by CNote to society is twofold. The first contribution is represented by the financing of sustainable practices made by SMEs, while the second contribution is the development of more sustainable cities through CNote's investments.

In conclusion, CNote enables SMEs to Loop and Virtualize.

3.4.2 Ario™

Ario™ is a Fintech company that builds lending systems for SMEs to simplify small business lending. Ario allows SMEs to identify potential consumers through an algorithmic system built on the specificity of the firm (e.g., localization, sector of activity, environmental impacts). Also, the platform enables a more accurate matching between potential investors and enterprises. One of the primary limits of traditional lending services is the difficulty of identifying potential stakeholders interested to invest in SMEs (Irwin and Scott, 2010). One of the main characteristics that distinguish Ario from financial institutions is the high degree of customization. The opportunity to identify specific market segments represents a compelling driver to engage with investors interested in CE practices (Piscicelli et al., 2018). Ario rejects the “one-size-fits-all” approach that typically characterizes financial markets allowing SMEs to invest in technological infrastructure according to their needs. *In conclusion, Ario™ enables SMEs to Share, Optimize, and Exchange.*

A summary of practical reflections linking Fintech application to CE dimensions described in the ReSOLVE framework is presented in Table 2. Using the ReSOLVE model for CE dimensions, the Fintech characteristics applied in the context of SMEs offer the opportunity to analyze and summarize the selected cases.

[Insert Table 2 about here]

4. Discussion

This study addressed the following question: What are the benefits of implementing Fintech solutions for SMEs wishing to accelerate the transition to *more* equitable and sustainable business models? Given the novelty of this topic and the relative scarcity of studies exploring this research question, an inductive qualitative study was performed. Based on case study illustrations, Figure 1 explains how an SME's sustainable business model could be enabled by Fintech in the CE paradigm and builds upon scholarly and practitioner-oriented contributions on Fintech (Arner et al., 2020; Hierminga, 2015), the ReSOLVE model for the CE, and the sustainable business model canvas developed by Bocken and colleagues (2018).

[Insert Figure 1 about here]

With respect to the value proposition, Fintech has the potential to improve customer experience through peer-to-peer or crowdlending by increasing transparency, reducing administrative costs and risks leading to a superior value offered by the SME with respect to competition. Fintech can also help SMEs contribute to a positive impact on people and society by delivering financial services at an affordable cost to all parts of society (Arner et al., 2020). The importance of people is further emphasized by the UN's Task Force on Digital Financing commitment to 'put people at the center', indicating Fintech as potentially the most relevant accelerator for the attainment of the SDGs. Fintech solutions can also help SMEs have a more evident impact on the environment through new models of collaborative consumption that include lending, reusing, and sharing.

To create value that goes beyond economic value, stakeholders play a pivotal role. These actors include banks, consumers, institutions, investors, and suppliers, all embedded within an ecosystem that should, in principle, favor collaboration between them and SMEs. Fintech can also contribute to two areas of SMEs' value chain. On the one hand, the adoption of innovative, digital solutions such as pay-per-use allows the optimization of cash flows to achieve longer-lasting financial relationships with customers. On the other hand, Fintech technology allows the dematerialization of part of the activities of an SME, redefining the production process and supply chains generating economic, social, and ecological efficiencies (Hierminga, 2015). Solutions based on blockchain or IoT present a concrete alternative to traditional banking and financing. Fintech offers the opportunity to redesign markets and infrastructure such as payment systems, securities clearing and settlement systems, and early-stage financing. It also creates the conditions for developing an entire infrastructure for a digital financial ecosystem underpinning the SDGs and financial development, inclusion, stability, and integrity (Arner et al., 2020).

Value delivery represents another important aspect of SBMs. Besides traditional B2B and B2C customer segments, the CE has reshaped market transactions creating new customer segments such as C2C through the emergence of peer-to-peer platforms and C2B where consumers supply and sell goods or services to another business. A fundamental difference between the customer of the circular and the linear economy is the relationship he/she establishes with the company. Whereas in the linear economy transactions are based on a direct sales model, in the CE, transactions are often based on continuous longer-term relationships that require investments in building communities as well as involving customers in sustainable initiatives. Physical and virtual touchpoints represent an important means of achieving this goal. The transition to SBMs, within Industry 4.0, implies a change in the revenue model of an SME that now charges a price for using the product based on the continuation of a contract over a more extended period relative to a one-

time sales transaction. Finally, Fintech can enable significant cost savings as digitalization reduces transaction costs and brings automation, reducing administrative costs.

5. Conclusions

5.1 Implications for research

This study suggests that Fintech, which sees the convergence of Industry 4.0 technologies such as blockchain and AI, can act as an enabler to integrate circular economy practices by SMEs. Therefore, this study is deeply rooted in and contributes to the understanding of Industry 4.0's potential for the development and implementation of sustainable business models that incorporate CE principles (Lopes de Sousa Jabbour et al., 2018; Tunn et al., 2019). In the context of Industry 4.0, Fintech could fill the main gaps negatively affecting the integration of sustainable practices by SMEs (Bartolacci et al., 2020; Santos, 2011) while shaping their business models. The case studies reveal that the positive externalities related to the adoption of Fintech are not limited to enterprises but extend to the entire society by contributing to cleaner production (CP), and by improving environmental management, production efficiency, and sustainable societal development (Hens et al., 2018). This evidence is relevant because an increasing number of policymakers have started to discuss the synergies between cleaner production, CE, and the 2030 Agenda. Inspired by the ReSOLVE framework, the last years have witnessed a proliferation of studies driven by the need to identify the strengths and weaknesses of the interconnections between innovative sectors and the CE (e.g., Kouhizadeh et al., 2019; Lopes de Sousa Jabbour et al., 2018). Few studies have analyzed the barriers to the integration of those paradigms by SMEs (e.g., Caldera et al., 2019) while relatively less is known on the relationship between digital technologies and the CE. This paper addresses this important issue, therefore contributing to the literature that adopts a technology-

centered approach to sustainable business models, which has also been highlighted as a focal point of research in the area of sustainability and business models (Dentchev et al., 2018).

The link between the CE and SMEs is further stressed by their importance within the global economy (OECD, 2019). Thus, identifying enabling factors represents one of the main challenges for academics, policymakers, and practitioners. On the point, Scheyvens et al. (2016), underlining the enabling role of businesses in sustainable development, discussed the need to evolve from a static to a dynamic approach regarding sustainable practices. However, this phenomenon is influenced by the existence of cultural, organizational, and financial barriers that negatively impact on SMEs' attitude toward sustainable practices (Bartolacci et al., 2020). In this sense, our insights extend existing knowledge on circular economy business models in SMEs by analyzing one of the main enablers identified by practitioners and policymakers (Blakstad and Allen, 2018; European Commission, 2020).

5.2 Implications for practice and policy

From a practical standpoint, this study puts forward the opportunity for managers and entrepreneurs to externalize part of their activities to Fintech enterprises in order to sustain the development of business strategies inspired by the CE paradigm. In particular, the analysis revealed that the development of synergies with Fintech enterprises allows SMEs to avoid some of the main barriers such as fixed costs, short-termism, and lack of technological tools that negatively impact on the adoption of CE practices (Kirchherr et al., 2018; Ormazabal et al., 2018).

The involvement of the highest number of firms represents one of the main challenges for policymakers interested to develop new ecosystems based on the concept of industrial symbiosis (Baldassarre et al., 2019). However, an effective industrial symbiosis requires the involvement of all the business activities without any form of sectorial limitation. Recent research has advocated the existence of sectors defined as “facilitators,” such as banking and finance (Tao et al., 2019), which might act as enablers for the transition to CE business models. On this point, Domenech et al.

(2019) highlighted that external finance impacts positively on SMEs' orientation toward sustainable development. The authors highlighted that external funds mitigate the negative externalities caused by the financial risks related to sustainable investments. Therefore, the evidence presented here might be helpful for policymakers in charge of evaluating the opportunities related to the involvement of Fintech enterprises in CE policies (European Commission, 2020).

Increasing consciousness about the negative impacts caused by the anthropic activities implemented by business enterprises characterizes the current debate, which has pushed policymakers to rethink their policies through the adoption of an integrated approach toward sustainable development. Despite the absence of a direct connection with sustainable topics, Industry 4.0 represents an example of this new approach (Lopes de Sousa Jabbour et al., 2018; Tseng et al., 2018). In detail, policymakers have started to consider the enabling role covered by digital technologies on firms' sustainable transition with a particular focus on SMEs due to their central role in a large part of the worldwide economic systems. Prior studies agreed about the existence of barriers that impact negatively on SMEs' adoption of environmental practices (Caldera et al., 2019). The cases illustrated in this study highlight the potential related to the involvement of Fintech as a means to overcome such barriers. Therefore, in the context of policy actions related to Industry 4.0, Fintech offers the opportunity to ease the integration of sustainable practices by SMEs while shaping their business models.

5.3 Limitations and future research

This study presents limitations that offer opportunities for further research. First, the qualitative nature of our study limits the generalizability of our findings, a limitation that we attempted to address by drawing on a diverse set of companies both in terms of size, stage of development, country of origin, and Fintech area. While multiple case studies are particularly indicated when theory and evidence are limited (Eisenhardt and Graebner, 2007), such as in the

case of Fintech and sustainability, future studies might collect data on a broader amount of cases using both archival sources as well as data primary data collected through surveys. Second, besides exploring the influence that Fintech has on an SME's sustainable business model canvas, future studies might explore how the adoption of financial technologies by an SME impacts its performance and how this relationship is mediated or moderated by the SME's particular business model (e.g., pay per use or pay for performance). Finally, while the paper contributes to the emerging technology-centered research on sustainable business models (Heyes et al., 2018; Piscicelli et al., 2018) by linking financial technologies and SBMs, there is a need for additional empirical evidence on how technological advances in other domains such as fashion, food, and health to name a few, shape and reconfigure sustainable business models. To conclude, research on the role of Fintech and, more broadly, of digital technologies as facilitators of the transition towards more sustainable business models and practices seems like a promising avenue for future research and one that deserves further attention.

CRedit author statement

Simone Pizzi: Formal Analysis; Investigation; Writing - Review & Editing.

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FIGURES AND TABLES

Figure 1. Fintech’s impact on SMEs sustainable business model canvas

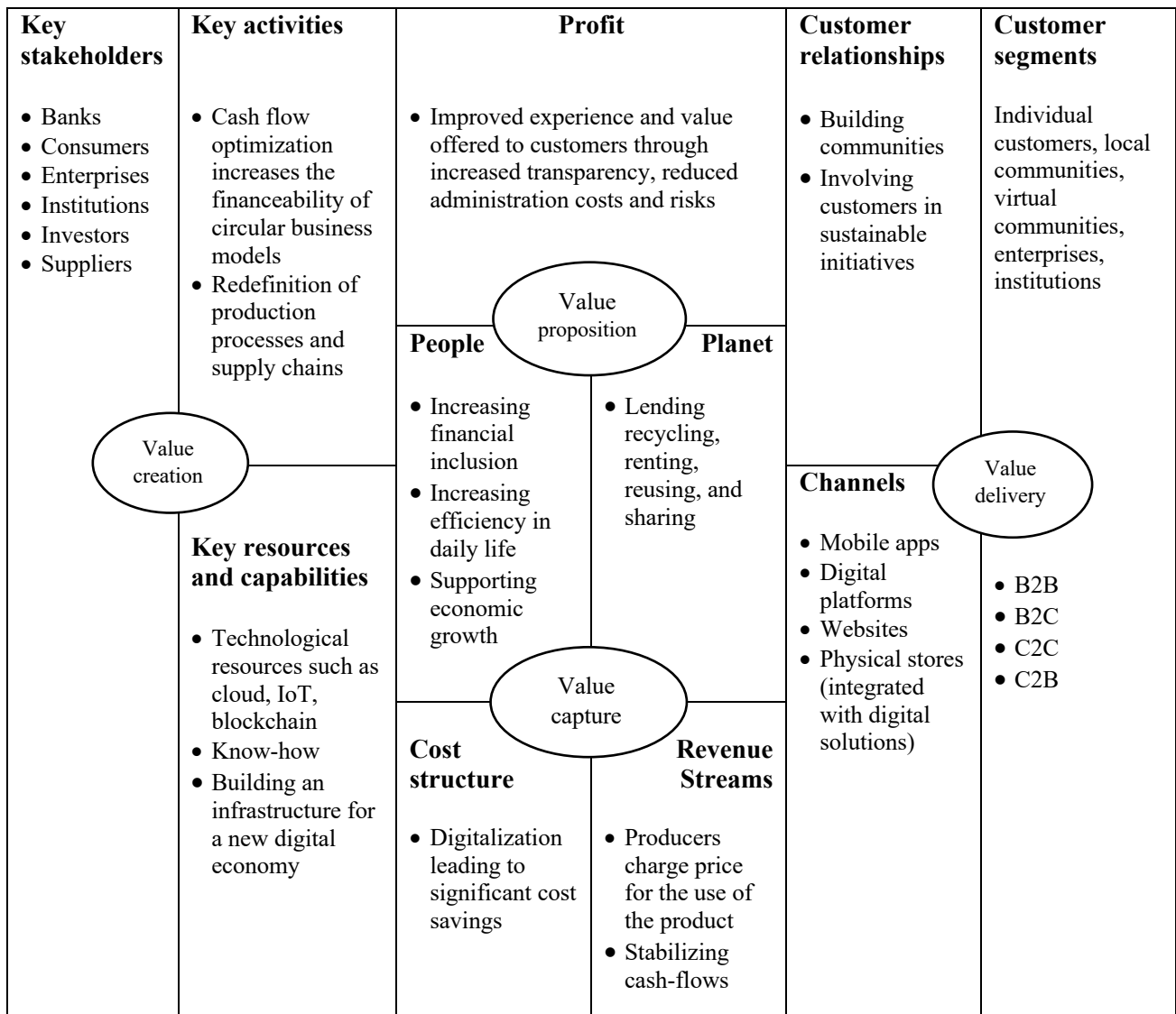


Table 1. Overview of selected cases

Fintech area	Cases	Year of founding	Country	Funding
Payment	Grover	2015	Germany	\$ 296 M
Payment	Flutterwave	2016	United States	\$ 64.5. M
Crowdfunding	The Sun Exchange	2015	South Africa	\$ 3.7 M
Crowdfunding	Impact guru	2014	India	\$ 4.5 M
Lending	CNote	2016	United States	\$ 1.6 M
Lending	Ario	2017	Canada	\$ 10 M

Table 2. Fintech and the circular economy – practical reflections using the ReSOLVE model

	Payment	Crowdfunding	Lending
Regenerate	<ul style="list-style-type: none"> • Regenerate technological devices (Grover) 	<ul style="list-style-type: none"> • Negotiations of solar energy (The Sun Exchange) 	
Share		<ul style="list-style-type: none"> • Implementations of shared projects (Impact Guru) 	<ul style="list-style-type: none"> • Identification of investors interested in circular practices (Ario)
Optimise	<ul style="list-style-type: none"> • Reduction of the transaction costs (Flutterwave) 	<ul style="list-style-type: none"> • Reduction of the carbon dependency (The Sun Exchange) 	<ul style="list-style-type: none"> • Reduction of the interests rates (Ario)
Loop	<ul style="list-style-type: none"> • Recycle digital devices (Grover) 	<ul style="list-style-type: none"> • Use of natural resources to build a no-carbon ecosystem (The Sun Exchange) 	<ul style="list-style-type: none"> • Favor the development of sustainable cities (CNote)
Virtualise	<ul style="list-style-type: none"> • An online marketplace to enable the transaction inside and outside Africa (Flutterwave) 	<ul style="list-style-type: none"> • An online platform to achieve external funds to sustain circular projects (Impact Guru) 	<ul style="list-style-type: none"> • An online platform to favor the development of more sustainable business models (CNote)
Exchange	<ul style="list-style-type: none"> • SMEs could replace their infrastructures with more technological and sustainable devices (Glover) 	<ul style="list-style-type: none"> • SMEs could convert their processes to renewable sources (The Sun Exchange) 	<ul style="list-style-type: none"> • SMEs could reorganize their business models through the use of external funds provided by socially responsible investors (Ario)