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Financing-Related Drivers and Barriers for Circular Economy Business: Developing a Conceptual Model from a Field Study

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Abstract
The transition toward sustainability and the circular economy is shaping technology investment and business, leading to there being growing interest in financial aspects of circular economy businesses. As research on circular economy drivers and barriers, in addition to the literature on circular economy business and finance, has not yet provided a comprehensive view on drivers of and barriers to circular economy business financing, this study takes a theory-developing qualitative approach. It integrates extant theoretical knowledge and empirical new insights from an extensive field study in Finland, Europe, based on over 270 data sources, including interviews, workshops, reports, and media documents. From these data sources, this paper analyzes and conceptualizes the driving and inhibiting factors that have shaped the sources, criteria, and subjects of circular economy business financing. The study results that the sources of financing—being public and private sources—apply diverse criteria for financing, such as valuation and profitability of circular business models, their type, investment costs, and their business potential for financing industry itself, when they assess different subjects of financing, such as individual companies' circular businesses, supply chains, and joint projects. Findings show that many factors that could serve as drivers have considered inhibitors. As a theoretical contribution, our study develops a conceptual model on the key factors shaping the financing of CE businesses and set of propositions on these factors inhibit and drive CE financing. Our findings provide guidance for practitioners such as managers and policy makers who aim to advance circular economy business.

Keywords Circular economy business · Finance · Sustainability · Sustainable finance · Qualitative study · Drivers and inhibitors

Highlights
- The financial aspects of CE businesses have been rarely studied.
- This qualitative field study analyzes over 270 data sources (interviews, workshops, and documents).
- The study develops a model and propositions on drivers and inhibitors of CE business financing.
- The model explains the sources, criteria, and subjects of CE business financing.
- Our findings provide guidance on how to advance CE business through financing.

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Introduction

Societies and businesses are transitioning toward sustainability and the circular economy (CE) [1], and this development is shaped by diverse technical, economic, and cultural barriers and drivers [2, 3]. Because of this, the finance industry is playing a crucial role in this transition [4, 5]. Even though the finance industry has shown increasing interest in sustainable development and related values [6, 7], and scholars' interest in the connection between finance and sustainability is likewise increasing [8, 9], and many factors, such as taxation [10], public financial incentives [4, 11], and high upfront investments [2, 3], have been found to drive or inhibit transition to the CE, focused view on financial drivers and barriers for CE business is still missing.

The shift toward the CE requires drastic changes in companies' business models. Large enterprises, small- and medium-sized companies, and start-ups need to begin implementing circular business models (CEBM) and create economic value from resource- and energy-efficient solutions that are recyclable, reusable, or last longer or ones that exploit waste, possibly via the product–service system (PSS) offering product-as-service (PaaS), instead of selling "take–make–waste" products in the way that is typical in linear business models [12–14]. Simultaneously, these business models are required to be developed to be more attractive for end-users than linear products [15]; for example, with superior digital customer experience and other advancements in technology, it is assumed that this shift needs support from financing. The recent taxonomy initiative by the EU [16] acknowledges that in the future, companies' financing is determined by their CE orientation.

Although finance has a crucial role in how businesses and society can move toward the CE [1], surprisingly, little research has focused on CE financing, particularly in terms of how the shift toward more circular business is financed and how financing can shape the transformation of the current linear economic model into a circular one toward a CE. Some CE studies have provided initial yet unfocused insights on diverse finance-related factors and aspects (e.g., the high upfront investment costs and low profitability of CEBM as barriers [see, e.g., 2, 3, 17). Only a handful of studies have so far focused on CE financing. Among these, Ozili studied the risks and rewards that CE financing can offer for financial institutions [5] and how central bank digital currency can affect transition to CE [18], Aranda-Usón et al. [11] examined the characteristics of the financial resources invested in circular activities in companies, Scarpellini et al. [15] investigated the kind of financial resources that are available for renewable self-consumption investments, and Ghisetti and Montresor [19] studied if and how CE practices applied by small- and medium-sized enterprises (SMEs) correlate with the financing decisions they make. Although these studies examine some financial aspects of CE business, they have not yet built a comprehensive understanding of financing-related factors shaping it. Sustainable investing concepts such as environmental, social, and governance (ESG) [e.g., 20, 21, socially responsible investing (SRI) [e.g., 22, 23], and corporate social responsibility (CSR) [e.g., 22, 23 are established approaches that argue that sustainability and finance are strongly linked. However, as they consider sustainability and finance on a general level, they have not offered focused answers concerning how finance enables or inhibits CE business development.

The rapidly increasing research on diverse CE drivers and barriers in different countries, industry sectors, and among diverse companies has typically also examined economic barriers such as high upfront investment costs and the role of public financial support, and many studies have mentioned financing-related barriers [see, e.g., 4, 24. However, these studies have not examined them further nor generated a focused understanding of the

financing-related drivers of and barriers to CE business. It is therefore critical to develop a deep understanding of these financial drivers and inhibitors if we are to encourage the development of financing CE businesses to further support the transition to a CE.

Given the relevance of financing CE businesses and the knowledge gaps outlined above, this study develops a new focused understanding of these by identifying the key factors that shape them and developing a conceptual model on finance-related factors acting as drivers and barriers for CE business. Our study aims to answer the following research question: What are the key factors shaping CE business financing, and is their impact positive (i.e., driving) or negative (i.e., inhibiting)? As the research area is still developing, we adopt a theory development approach and conduct a qualitative exploratory field study using systematic combining [25, 26] and thematic analysis. Our qualitative field study comprises over 270 data sources that include interviews, documents, and media data and allow us to capture and thematically analyze the financing-related barriers and drivers perceived by expert practitioners and researchers from various relevant stakeholder groups, including financiers, CE company executives, regulators, legislators, non-profit organizations (NPOs), academics, and different types of interest groups in Finland and across Europe. From these data sources, we analyze sources, criteria, and subjects of financing CE business and develop a conceptual model and related propositions that integrate micro- and macro-level aspects of CE business financing. These insights provide a theoretical contribution to CE business and financing and driver/barrier research as well as guidance for practitioners such as managers and policy makers who aim to advance CE business. The rest of the paper is constructed as follows. In the following section, the theoretical background is briefly discussed and synthesized, and the empirical methods for data gathering and analysis are explained. Thereafter, we discuss the results of finance-related factors shaping CE business, namely sources of financing, criteria for financing, and subjects of financing, and derive a conceptual model and propositions on how these factors drive or inhibit CE business. Finally, we discuss the implications and contributions of this work in terms of theory and for practitioners.

Theoretical Background

Three research areas have built an initial understanding of finance-related factors shaping CE business. Finance—and sustainability in general—has been studied within the research streams of ESG [e.g., 21, 27, SRI [e.g., 22, 28, and CSR [e.g., 23, 24. The ESG and SRI streams principally assess businesses and sustainability from the viewpoint of the investing universe, whereas CSR reviews sustainability from the point of view of business and company governance. These research fields do not provide a focused understanding of how CE business is financed, but they strongly indicate the significance of finance in the transition to sustainability in general [21], which has motivated the current study and informed the creation of our initial understanding of driving and inhibiting factors (see Table 1).

The CE and CE business studies provide more indirect evidence of some finance-related factors. Studies of operational drivers and barriers for CE business have generally argued that financing often serves as a barrier for CE actors and companies that needs to be overcome if they are to operate by, or transition to, circular principles [2, 3, 30–33]. These studies have suggested that, for example, a lack of capital for capital-intensive circular business models [20, 31], the need for funding and upfront costs for CE transformation [34, 35], and insufficient profitability [31, 36] complicate CE businesses. The most focused, yet rare,

Table 1 Synthesis of finance-related factors shaping CE business in the literature

Factor	Finding	Sources
Company size	SMEs find it more difficult to obtain financing for CE	[4, 19, 29–35]
	SMEs are more sensitive to extra costs	[19, 30]
	For SMEs, it is more difficult for them to obtain collateral for bank financing	[19, 33, 34]
	SMEs often have no time and/or knowhow to apply for financing	[29]
High upfront investment costs	High upfront investments (e.g., for technology, process implementations, innovation activities) are uncertain and sizable	[2–4, 17, 24, 30, 36–42]
	Lock-in for linear processes requires drastic changes and therefore sizable investments	[2, 36]
Circular business models' capital funding	CEBMs are seen as capital-intensive, with long payback times and unfamiliar risks	[2, 17, 19, 29, 43]
	PaaS, as an example, demands large amounts of working capital	[43]
The role of public financial support	Public financial incentives are crucial in the CE transition	[2, 3, 11, 17, 30, 33–35, 38, 41, 44–46]
	Investments which are otherwise not profitable can be made feasible with public support	[2, 42, 46]
	Taxation requires changes to accommodate transition to CE	[10, 18, 47]
Current valuation and profitability of circular business models	Traditional financiers, in particular, do not trust the value of CE business and require a precedent of profitability and risks	[3, 5, 15, 33, 43, 48]
	Traditional financial models do not take intangible assets and circular risk into account in valuations	[19, 48]
	The profitability of CEBMs is often risky and realized over a long period of time	[17, 15, 36, 41]

research area, and one that has only recently emerged, explicitly integrates financing and CE business [4, 11, 15, 20]. For example, Aranda-Usón et al. [11] presented public financial subsidies as a driver and inadequate cost and availability of funds as barriers, whereas Ghisetti and Montresor [20] mentioned public financing as a driver and, as barriers, the fact that SMEs have inadequate financial resources for CE and that CEBMs are complex from the financiers' point of view.

As our literature review uncovered that extant research knowledge focused on financing CE business is rare, that some knowledge comes from studies addressing CE drivers and barriers [e.g., 1, 2 and identifying financing in terms of economic and business drivers and barriers, and that only some studies examine CE and finance explicitly [e.g., 4, 11, we gathered and synthesized the finance-related factors that were identified to shape CE business (see Table 1). The finance-related factors were as follows: (1) company size (smaller companies have more difficulty obtaining financing), (2) high upfront investment costs (CE transition requires sizable and uncertain investments), (3) circular business models' capital funding (CEBMs are generally seen as capital-intensive and risky), (4) the role of public financial support (public incentives, such as taxation, are crucial for CE transition), and (5) the current valuation and profitability of circular business models (which traditional linear-based financial models are not fit to assess).

Methodology

Research Design and Process

As research knowledge of CE business financing is nascent, our research design follows a theory-developing, exploratory, qualitative procedure [49]. The research process and theorization followed the established procedure of systematic combining [25, 26], whereby empirical remarks and interpretations and theoretical insights and concepts are compared and developed further, via an abductive, iterative analysis process that resulted capturing and theorizing finance-related factor, barriers and drivers for CE business, as presented in Fig. 1.

This research process is argued to be optimal for theory development as it allows the discovery of new things by comparing and combining theory and empirical observations [25, 26]. In this study, during the analysis of the data, observations of new kinds of factors arose, which made it possible to reanalyze data, and develop interpretations, to capture and theorize the factors and drivers/barriers in a more detail.

Data Gathering and Data Characteristics

Our field study was conducted via gathering an extensive qualitative data set of over 30 interviews, 5 workshops, field observations, and over 200 media and report documents. Data types, sources, and amount are summarized in Table 2. To give an example of the breadth and depth of the data set, 1012 pages of written data (excluding the media documents) were analyzed. Data covered perspectives on CE business financing from company representatives, financiers, non-profit organizations (NPOs), government officials, legislative authorities, academics, and multiple other interest groups. This practice of multi-sourcing data allowed extensive triangulation of findings, contributing to the validity of the study [50]. The field study was conducted in Finnish context, in Europe: some data was more country specific, but some interviewees and documents covered more European or

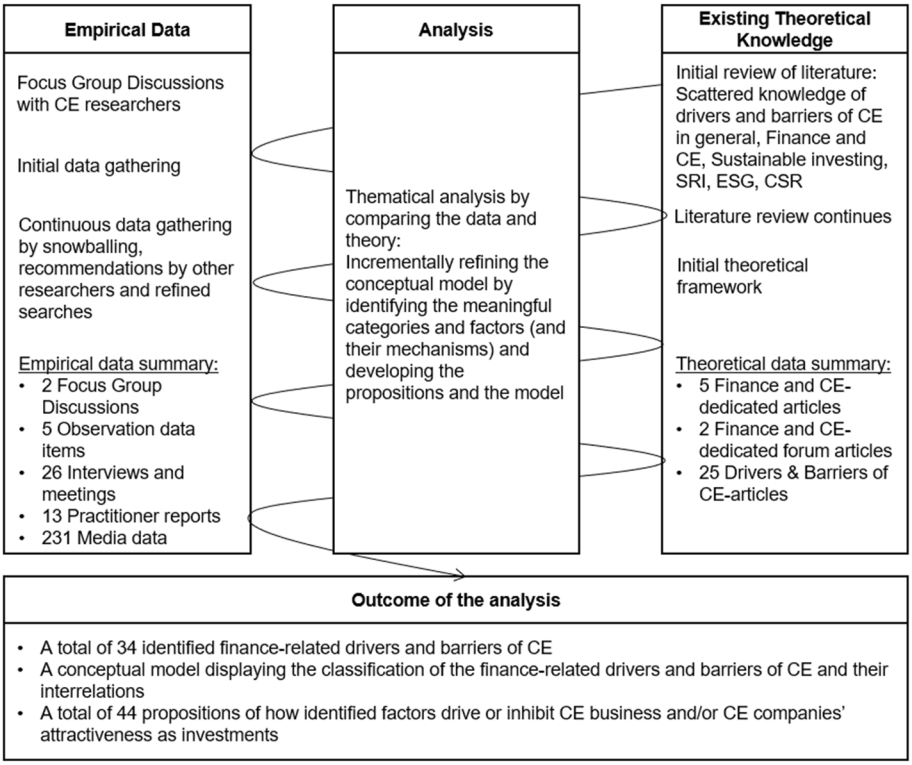

Fig. 1 The research process: design, data, and iterative analysis

global view. Data was collected until saturation was reached, and sufficient richness in the data set was ensured, as recommended by Saunders et al. [49] for qualitative studies.

The main data types were (1) interviews/meeting transcripts and notes (gathered within an extensive CICAT2025[1] research project during the period 2018–2022); (2) media documents/data (such as newspaper articles and podcasts containing expert interviews and presentations, till 2022); and (3) finance-related report documents and practitioner reports (gained via Google and Google Scholar searches with selected key words and snowballing, ranging from 2012 to 2021). These include reports written by, for example, legislature-representative organizations, NPOs, commercial banks, consultancies, research facilities, academics, and joint working groups of all the previous, and communication reports from the European Union. The reports contained many detailed insights on CE financing in general and different aspects of it.

The data sources all together allowed us to capture the viewpoints and expertise on CE financing from diverse stakeholders, including CE companies and executives, the European Union, Public Innovation Fund Sitra, Business Finland (a Finnish technology industry umbrella organization), NPOs, and Finnish ministries and municipalities. To give an example, an observation and stakeholder workshop held in August 2020 involved top-level CE experts in Finland who worked in academia, finance, companies/business, non-profit organizations, government, municipalities, and other organizations.

[1] The joint project of Finnish Universities, Circular Economy Catalysts: From Innovation to Business Ecosystems (CICAT2025), aims to facilitate the transition from a linear to a circular economy in Finland.

Table 2 Summary of empirical data sources used in the study

Data-generating technique	Data source and amount	Date range	Citation code
Focus group discussion/interviews	Focus group discussions ($n=2$) with academics	6/2020	FGD
Individual interviews	Interviews ($n=11$) with company actors (CEOs and top management from enterprises, SMEs and start-ups)	6/2015–10/2021	CI
	Interviews ($n=4$) with researcher actors	7–9/2019	RI
	Interviews ($n=11$) with other CE expert actors (financiers, regulator experts, industry experts)	7/2018–1/2020	EI
Media documents	Newspaper articles ($n=227$)	2014–2022	NA
	Podcasts ($n=2$)	8–9/2020	PC
Report documents	Research and workshop reports ($n=11$)	2012–2019	RWR
	EU Commission communication reports ($n=2$)	2014–2015	ECCR
Observation	Workshop discussions ($n=1$)	8/2020	WSD
	Workshop presentation and notes ($n=1$)	8/2020	WSP
	Pre-workshop orientation materials ($n=1$)	8/2020	PWSM
	Workshop commentary ($n=1$)	8/2020	WC
	Workshop-induced initiative ($n=1$)	8/2020	WII
Total	$N=277$ data sources		

Data Analysis

For analysis, we used thematic coding, which provides a systematic, logical, orderly, yet flexible way to examine different sizes of qualitative data sets; allows the development of patterns and theorization of the phenomenon under research; and combines rounds of deductive and inductive analysis [49]. For thematic coding, the qualitative data analysis software ATLAS.ti was used. First, the data was read line by line, and citations containing insights related to the research questions were highlighted. Thereafter, one or multiple thematic codes were attached to the citation.

As we followed systematic combining procedure in our analysis [25, 26], the initial categorization of factors (as seen in Table 1) evolved continuously, as the thematic analysis of the empirical data generated new emerging themes and factors, and existing ones were broadened and refined. For example, when reading through a data item, we spotted a citation saying that taxation favors linear over CE businesses. Since another citation had previously mentioned that altering the taxation would encourage the financing of CE, the new citation was identified as related to the same theme, taxation. Such factors were then conceptualized under the same theme or category. At the end of the thematic analysis, all data items had gone through multiple identification, coding, theorization, and conceptualization rounds of identified factors, drivers and barriers for CE business financing resulted in the final model (Fig. 2) and related propositions.

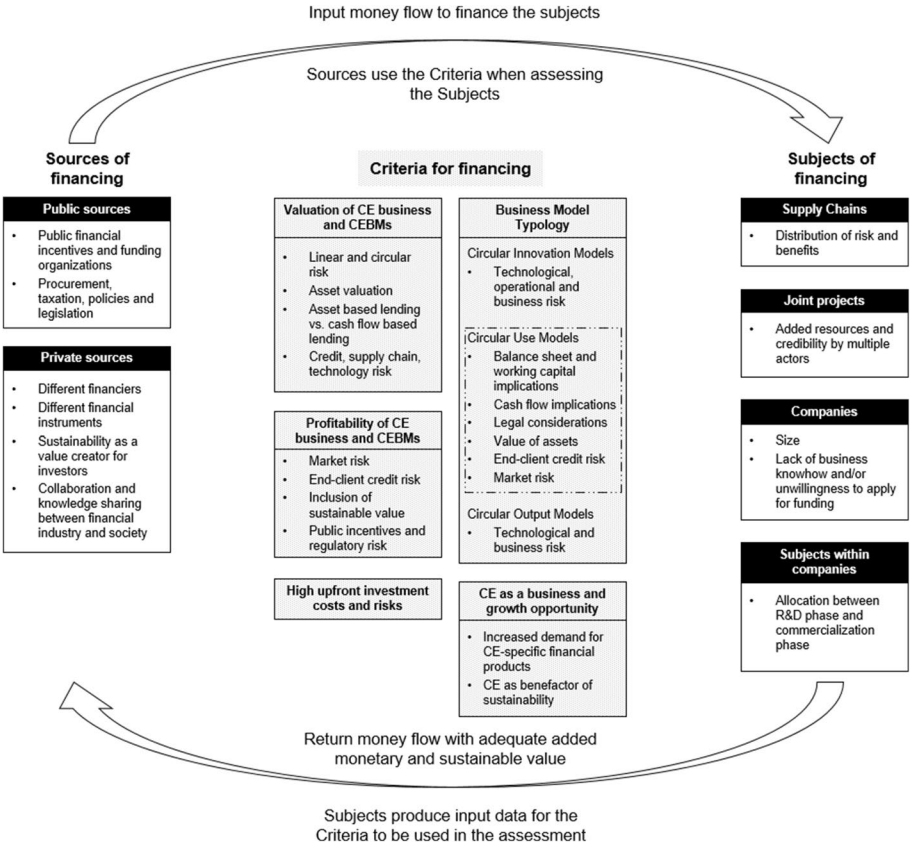

Fig. 2 Conceptual model: the key factors shaping the financing of CE businesses and their interrelations

Results

Our explorative analysis identified diverse driving and inhibiting factors for financing CE business. We categorized them into the thematic areas of *sources of financing*, *criteria for financing*, and *subjects of financing*, which resonate with general financing-related aspects suggested by, for example, Oliner and Rudebusch [51] and Sudek [52]. The three thematic categories for multiple factors shaping CE business include the following:

1) *Sources of financing* referring to different options of possible financing for a CE company or CE transition, such as banks, different kinds of investors, financial instruments, and public financial incentives
2) *Criteria for financing* referring to the aspects that financiers consider when reviewing CE and CEBMs on a higher level, as potential investments, such as CEBMs' valuation and risk models and profitability and the nature of CE compared to linear business
3) *Subjects of financing* referring to different subjects that can be financed, ranging from whole CE supply chains to single companies, and different projects and phases of product development within them

Our findings on the key factors shaping the financing of CE businesses are summarized in the conceptual model (Fig. 2). The model proposes the three thematic categories, factors per each category, and their interrelations.

Some identified financial factors driving and inhibiting CE business result directly from CE principles or CE businesses themselves, such as public financial incentives directed for CE businesses. Some originate from the nature of the companies, organizations, or mechanisms and are not strictly CE-specific; rather, they relate to CE through some causal mechanism, such as company size. Some do not relate to finance directly but can affect it through some proxy, such as consumers' unwillingness to pay premium for circular products, affecting the profitability of CE business. Next, we discuss each category and its factors in detail.

Sources of Financing

The data clearly shows that, for society to make a large-scale transition toward a CE, the financing should come also from the private sector, including commercial banks, stock markets, mutual funds, and financial markets in general (ECC-2, WSD, PWSM, RWR-3). The public sector's role is crucial, since it can (1) create a level playing field for CE businesses by using financial incentives, funding, financial instruments de-risking investments for the private sector, policies, legislation, and reporting standards (e.g., ECC-1–2, RWR-1, RWR-3, NA-1, NA-9); (2) act as an example to the private sector in procurement (e.g., RWR-2, RWR-3, WSD, EI-11, EI-7, and NA-8); and (3) strengthen the status, and spread awareness, of CE among businesses, consumers, and investors by promoting and investing in it (e.g., ECC-1, WSD, RI-4, RWR-3), among other things.

Among different typologies of financiers, especially traditional bank finance and capital markets are named in the data as those with which CE businesses have most difficulty obtaining financing (e.g., RWR-6, RWR-5); indeed, some reports indicate that traditional bank lending and capital market financial assessment methods are not fit to assess CE business (more in the "Criteria for Financing" section, RWR-3, RWR-5, and NA-1). Furthermore, CE businesses, business models, and markets are often quite novel and innovative, which is seen in traditional bank financing as an increased risk for the bank, as a creditor. As stated in the Japan/EU Joint Workshop on G20 Resource Efficiency Dialogue Report, "Innovation and straightforward bank finances are not a 'happy marriage'" (RWR-3) since traditional banks are relatively risk-aversive.

According to the data, CE investments can be regarded as one of the subcategories of sustainable investing and should therefore benefit from this megatrend (e.g., WSD, PWSM, RWR-6, RWR-3). As Astrid Schomaker, Director of Global Sustainable Development on the European Commission, said in the Japan/EU Joint Workshop on G20 Resource Efficiency Dialogue, "sustainable finance is a major enabler – perhaps the major enabler – of a circular economy" (RWR-3). Moreover, impact finance is suggested as a possible bridge between non-profitable stages and the growth stage for a company since impact investors are less concerned about profiting from the venture (RWR-6). Nevertheless, the data does not clearly reveal how impact investors and investors in general view CE as part of the sustainable investing asset universe or how much CE companies have benefited from impact investors so far. To date, there are very few strictly CE-concentrated financiers in the financial markets (EI-1). None of the CE companies researched mentioned that their financing originates from sustainable (private) investors. A possible reason for the disconnect between sustainable investors and CE financing is that CE projects and companies are invisible, or scarcely visible, to

institutional investors, due to their relatively small size and the lack of tools to assess their impact and profitability. Possible means to overcome these problems are to (1) develop a taxonomy to assess CE businesses and (2) structure CE investments into a larger instrument that would cross the investing threshold of institutional investors (PWSM).

Some financial instruments targeted toward sustainable development already exist—and benefit it greatly—such as green bonds (WSD, RWR-3). However, it was noted that, for most CE companies, the minimum issue sizes of green bonds are too large by a considerable margin, making it impossible to use them (RWR-3). According to the data, financing CE would require new kinds of financial instruments and a renewed legal framework to support them better (RWR-4, RWR-1, RWR-2, WSD, PWSM, NA-5, NA-9). For example, no financial instrument or legal framework is currently available to finance collaboration within whole circular value chains and to ensure an even distribution of both risks and profit within them (RWR-2, RWR-3, EI-7). Also, according to the European Commission (RWR-1), new kinds of risk-sharing instruments whereby the public sector attracts private investors by insuring private sector investments would benefit the transition to CE greatly by distributing the risks which are typical of CE.

Significant factors necessary for the large-scale transition to a CE presented widely in the data sets were cooperation and knowledge sharing between the financial industry (i.e., the sources of finance) and other social actors (RWR-4, RWR-1, RWR-2, WSD, RWR-3, RWR-9, and NA-4). As the President of Japan Waste Research Foundation, Shigemoto Kajihara, remarked, the "circular economy is a very broad and comprehensive concept. The shift to a circular economy needs to happen as the result of an enormous number of independent actions at different stages of value chains" (RWR-3). Several of the reviewed data sources remarked that creating effective assessment tools and legal and policy frameworks to assess the profitability and risks of CB will require collaboration between private and public sector actors (RWR-1 and RWR-3). It was also suggested that financiers could be possible strategic knowledge partners of their CE company customers by increasing their expertise in regard to CE business and CEBMs, for example by leveraging their core competencies and developing the profitability of CEBMs and the creditworthiness of CE companies' end clients (RWR-7, RWR-4, and RWR-6).

Criteria for Financing

According to the data, the most significant factor affecting financing of CE business is that current valuation practices used by financiers, such as financial risk assessment and valuation and pricing tools, are locked into linear business and not fit for CE business (RWR-1, RWR-2, WSP, RWR-6, RWR-3, and RWR-5). This lack of suitability results in an incorrect assessment of the profitability, risks, and overall value of CE investment, which, in turn, leads to either unreasonably high costs of capital or decisions to deny financing to CE companies, making it a very significant barrier for CE. To be more specific, lack of fit relates mostly to overall credit risk (RWR-1), assessing linear and circular risk (RWR-4, RWR-1, RWR-2, RWR-3, and RWR-9), asset valuation as collaterals in asset-based lending, preferring asset-based lending over cash flow-based lending (RWR-8, RWR-6, and RWR-5), not valuing intangible assets (e.g., contracts and customer relationships) (RWR-3, RWR-5), supply/value chain risk and profitability (RWR-7, RWR-2, and RWR-3), and failure to properly understand technology risk on the part of the financial industry (RWR-1 and WSP).

Regarding which factors affect CE businesses' actual profitability and what risks are related to it, the most significant factors presented in the data were market risk, end-client credit risk, regulatory risk deriving from public incentives, and inclusion of added sustainable value in

the profitability assessment. The data indicated that CE businesses often contain significant market risk because there is not (at least yet) enough demand for circular products, inhibiting profitability (CI-3, RI-2, ECC-1, RWR-2, CI-6, and RWR-9). As stated in the ING Bank (RWR-6) report, "the circular economy won't succeed if the end-user does not benefit from it, both financially as well as in terms of customer experience or from a sustainability angle." In the report's interpretation, the lack of demand is caused by consumers' general lock-in to conventional ownership models: their unwillingness to pay premium for circulated products (RI-2, PWSM, RWR-9, and CI-7), their unfamiliarity with, for example, product leasing and other circular models of ownership, product usage, and disposal (RWR-7 and RWR-2), and the lack of incentives for consumers to move toward purchasing circular products (RWR-6). However, data from two industry actors (CI-3 and CI-6) also indicated that a change toward circular principles in the mindset of the consumers is underway.

Another significant factor mentioned in the data which affects the profitability of CE and CEBMs was the credit risk of the end-user of the service: It was indicated that end-user credit risks greatly add to the risk of financing PSS-type businesses, especially in consumer markets (RWR-8 and RWR-6: "Whereas a onetime sales transaction has no such risk, a PSS with on-going transactions creates the risk of customers defaulting on their obligation to pay for the service" (RWR-8). The same report also noted that, because the asset is being used by the end-user at the time of the possible default, it is more difficult to recover it from the end-user in the event of default. ING Bank's report (RWR-6) also stated that PSS models often attract customers who only use PSS because they cannot afford to purchase the product, making them less creditworthy clients than usual consumers.

With public financial support and incentives (e.g., moving the taxation burden toward materials or differentiating between renewable and non-renewable materials in taxation), it would be possible to increase the monetary profitability of a CE company as an investment (PWSM, RWR-3, RWR-11, and NA-11). However, it is worth noting that, according to the data, public financial incentives come with an increased regulatory risk: Profitability based on subsidies determined by political decision making is considered risky and unattractive to external financiers (PWSM).

The data contain several appeals for the assessment of businesses' profitability and viability to include their sustainable impact in a concrete way, as doing so would make CE business much more competitive than linear businesses (RWR-7, RWR-8, WC, PWSM, RWR-6, RWR-3, PC-1, and NA-10). As stated in the Japan/EU Joint Workshop G20 Resource Efficiency Dialogue report (RWR-3):

> Currently, shareholders look mainly at financial gains based on conventional indicators. It is important to move towards more integrated reporting that accounts for different kinds of value for society, beyond financial value. In other words, circular economy adds value that is not considered when investment decisions are made.

However, the inclusion of sustainable value is by no means straightforward: Currently, there are no standardized and effective tools to measure sustainable impact and its monetary value, or how well a subject of financing follows circular principles (PWSM and RWR-6).

According to the FinanCE Working Group's report (RWR-2), each business model typology has its own financing characteristics and, therefore, should be individually reviewed in discussions of financing CE. The data revealed that different kinds of CEBMs were discussed: The more comprehensive approach to reviewing different kinds of CEBMs has only been applied in a few practitioner research papers (RWR-2 and RWR-5), whereas product-as-a-service-type (PaaS) business models and their characteristics are mentioned from the viewpoint of finance separately from other CEBM typologies on several different occasions

(RWR-7, WSP, WC, RWR-6, and RWR-3). The practitioner research reports (RWR-2 and RWR-5) categorize business model typologies into three groups: circular innovation models (CIMs), circular use models (CUMs), and circular output models (COMs). This categorization is used in this study, and PaaS models are seen to be included in CUMs. CUMs and PaaS received the most attention within the data set (seven occurrences), making them the most important business model typology regarding finance, whereas CIMs and COMs were only briefly mentioned in a single report (RWR-2) from the viewpoint of finance.

To summarize, CIMs come with significant technological, operational, and business risks (RWR-2). The factors affecting the financing of CUMs, especially PaaS models, are balance sheet implications and working capital requirements, cash flow implications, legal considerations, value of assets, end-client credit risk, and market risk (RWR-2 and RWR-5), the most important of which are discussed further in later sections of this paper. COMs sometimes contain moderate technological and business risk (RWR-2).

High upfront investment costs and risks were among the factors recognized in the literature reviewed. However, after analyzing the data, it can be concluded that high upfront investment costs and risks are not a single factor or factor group but, rather, a characteristic related to other factors also discussed in this study. In the data, the factor "high upfront investment costs and risks" is mostly associated with either the costs of acquiring assets to be used in PSS models (RWR-2, RWR-6, and RWR-5) or the costs associated with process and technology investments in relation to building new production facilities, supply and value chain arrangements, and fitting existing processes and equipment to new innovations (RWR-10, RWR-2, and RWR-9).

According to the data, one of the factors which particularly affects the attractiveness of CE in the eyes of financiers is the perception that financing CE and CE companies could increase the demand for different financial products greatly and therefore be a great business opportunity for the financial sector (RWR-4, RWR-6, and RWR-3). This factor was discussed unanimously in the practitioner research reports which reviewed CE's implications for financial sector actors (RWR-4, RWR-6, and RWR-3), whereas in other data sources, it was not mentioned. According to the data, the business opportunities which CE may offer the financial industry would derive from (1) the transition to PSS models and their capital and other financing demand (RWR-4); (2) investments in, for example, the technology, R&D operations, and process implementations required in a CE transition (RWR-4); and (3) CE's nature as a sustainable operating paradigm (RWR-6).

Subjects of Financing

Regarding subjects of financing CE business—containing multiple entities—it is highlighted across the data that, to achieve a large-scale CE transition, collaboration between different actors is necessary (RWR-4, RWR-1, RWR-2, WSD, RWR-3, RWR-9, and NA-3), with collaboration within circular supply chains and joint projects no exception (CI-3, RWR-8, RWR-2, PWSM, and NA-12). The key issue presented in the data as inhibiting the effective financing of circular value chains is that no legal framework or financial instrument exists to distribute investments, incentives, value, resources, risks, and profits fairly in entities containing multiple parties and complex structuring (RWR-2, PWSM, RWR-3, and RWR-9). Moreover, the data suggests that financing the whole circular value chain would lower the risk for financiers since more than one company would be responsible for the success of the value chain's business (RWR-2 and RWR-5).

Joint CE (e.g., R&D) projects were principally seen as a driving force for both the overall transition to CE and its financing. According our data, if multiple actors participate in a joint CE project,

the project is more likely to (1) invest in CE R&D and apply for funds to finance CE overall and (2) receive a positive financing decision from external financiers, when compared to acting alone (CI-3).

When reviewing companies as financeable subjects, it was pointed out that smaller companies have more difficulties obtaining financing for CE activities than larger ones (RWR-7, ECC-1, CI-5, RI-4, RWR-5, and NA-7) and that this is generally the case for companies regardless of industry (RWR-7). Nevertheless, as SMEs make a large contribution to an overall transition to CE (ECC-2), it is important to study further why they encounter difficulties. Our data sources clearly indicated several rationales for difficulties: smaller businesses can struggle to finance their CE activities due to their greater dependence on external finance (RWR-7, RWR-1, and RWR-5), the larger magnitude of changes in their business (RI-4), inability to establish an innovation portfolio (RWR-5), inability to issue green bonds (RWR-3), and lack of knowhow or resources to apply for funding or make their business more attractive to external financiers (PWSM, EI-1, EI-7, and EI-10).

Regarding subjects within companies, the data sources emphasized that currently available funding for CE is largely allocated to R&D activities, but that commercialization activities need more financing (WC, EI-3, EI-7, and NA-1). Two reasons for this situation were suggested: first, that CE as a concept, and related technologies and products, are in early stages of development and therefore require considerable R&D activity to become viable; and second, that the public organizations which finance many CE projects and companies in Finland are bound by their operating principles to funding only R&D and product development phases. This, in turn, generates conflict when many companies (especially start-ups and small companies) need financial support to fund the commercialization phase (FGD-1, FGD-2).

Discussion

Next, we summarize our key findings on sources, criteria, and subjects via propositions (see Table 3) and discussion follows. Table 3 presents a total of 44 propositions that are developed from our findings to propose how each finance-related factor is proposed to drive and/or inhibit CE business. Most (35 of 44) can be interpreted as inhibitors of CE, whereas five can be both and only four are plain drivers, implying strongly that finance-related matters currently mostly inhibit CE business.

Factors Related to Sources of Financing

Currently, most of the 13 factors related to sources of financing are inhibitors of large-scale CE transition. However, the mechanism behind many of the factors may well be subject to change in the future in favor of transitioning to and operating by CE principles (e.g., 1c, 1d, 1e, 1f, 1 g, 1i, 1 k, 1 l). For example, taxation-related factors (1c, 1d) were identified in documents and discussions all meant to guide political decision-makers (RWR-2, RWR-11, WSP, RWR-3). Thus, they should be noted by decision-making parties.

The role of the public sector in financing CE and creating a level playing field for CE businesses is crucial (1a). For example, creating a taxation system preferring labor over material use and differentiating between renewable and non-renewable materials (1c, 1d; RI-2, RWR-4, RWR-3, RWR-11, and NA-11), and a legal framework making it possible to finance circular value chains as a whole (1i, 2 h, 3a; RWR-2, PWSM, RWR-3, RWR-9), would greatly advance

Table 3 Propositions derived from the data analysis

Factor category		Proposition derived from the factor	Driver/inhibitor
Sources of finance			
Public source	1a	Public sector's role is crucial in (1) creating a level playing field for CE businesses, (2) acting as an example in procurement, and (3) strengthening the status and awareness of CE	D/I
	1b	Public financial support can cause crowding out of private money	I
	1c	Taxation burden distribution between labor and material use favors material use (i.e., linear economy)	I
	1d	Taxation should differentiate between renewable and non-renewable resources to encourage CE	I
	1e	Public sector procurement processes are locked in to favoring conventional linear business	I
Private source	1f	Traditional bank lending and capital market procedures and financial assessment methods are not fit to assess CE and CE business models	I
	1 g	Traditional bank financing sees novel and innovative (CE) business models as risky due to, for example, the lack of historical evidence of their profitability	I
	1 h	Impact financing aids the financing of CE but is too scarce a source of financing to meet the needs of large-scale CE transition	D
	1i	New kinds of financial instruments and a legal framework to support them are needed to effectively finance CE (e.g., supply chain financing)	I
	1j	Green bonds are effective in financing sustainability but are often inaccessible for CE companies due to their small size	I
	1 k	Sustainable investors have not yet discovered CE companies as potential large-scale investments	I
	1 l	CE companies have not yet exploited their nature as sustainable investments in the eyes of sustainable investors	D/I
	1 m	Collaboration between financial industry and other actors of society is required for large-scale CE transition (e.g., in creating assessment tools, financial instruments, legislation, knowledge partnerships)	D/I
Criteria for financing			
Valuation of circular business and circular BMs	2a	Current valuation, risk assessment, and pricing tools are locked in to linear business and not fit to assess CE	I
	2b	Current financial models do not assess circular risks correctly, such as cash flow risks, technology risks, market risks, and supply chain risks	I
	2c	Current financial models do not assess linear risks correctly, such as high resource prices and their volatility, supply risks, regulatory risks, reputational risks, and risk of inclusion of externalities in the resource pricing	I

Table 3 (continued)

Factor category		Proposition derived from the factor	Driver/inhibitor
	2d	Asset-based lending is currently overemphasized in lending decisions, whereas CE would benefit from cash flow-based lending	I
	2e	Using circular assets as collateral presents a legal issue due to losing ownership through legal accession	I
	2f	Financiers appreciate historical data over forecasts, which derails the financing of novel CE businesses and business models	I
	2 g	CE business often incorporates technological risk, which is not well understood in the financial industry	I
	2 h	Current financial models are not fit to assess whole supply chains due to their complexity; however, doing so is often required to assess the value of the CE and CE business models	I
Profitability of circular business and circular BMs	2i	CE businesses often present significant market risk due to the low demand for circular products	I
	2j	Consumers are not used to or willing to pay a premium for recycled or otherwise circular products over new ones	I
	2 k	Consumers are used to owning products, which favors the linear operating model of selling goods instead of PSS models	I
	2 l	Consumers are used to throwing products away after use instead of circulating them, which breaks the circular cycle of materials	I
	2 m	PSS models often incorporate significant end-client credit risk	I
	2n	Including adding sustainable value in profitability assessment would benefit CE greatly	D/I
	2o	Profitability originating from public incentives contains regulatory risk	I
Business model typology	2p	Circular innovation models (CIMs) often come with significant technological, operational, and business risks	I
	2q	Circular use models (CUMs) (PSS models) are significantly affected by balance sheet implications and working capital requirements, cash flow implications, legal considerations, value of assets, end-client credit risk, and market risk	I
	2r	Circular output models (COMs) contain moderate technological and business risks related to the cost of extraction	I
High upfront investment costs	2 s	High upfront investment costs and risks are mostly derived from the acquisition of assets in PSS models	I
	2t	High upfront investment costs and risks are often associated with the transition of non-CE companies to CE principles	I

Table 3 (continued)

Factor category		Proposition derived from the factor	Driver/inhibitor
CE as a business opportunity for finance industry	2u	Financing CE could increase the demand for different financial products, posing a business opportunity for the financial sector	D
	2v	CE would help financial industry companies to achieve their overall sustainability objectives	D
Subjects of financing			
Subjects containing multiple legal entities	3a	There is no means to distribute investments, incentives, value, resources, risk, and profits fairly in multiple-party entities (e.g., supply chains)	I
	3b	Participating in a joint CE project (e.g., an R&D project) promotes the likelihood of a positive financing decision and decreases the risks of CE transition comparing to acting alone	D
Companies	3c	SMEs usually have more difficulties obtaining financing for their CE (and other) activities than large ones	I
	3d	Smaller companies are generally more dependent on external financing; that is, it is easier for larger companies to finance their CE activities through their own earnings	I
	3e	For smaller companies, the relative magnitude of CE transition is greater, increasing its relative risks	I
	3f	For SMEs, it is not possible to create a diversified innovation portfolio, making it riskier to invest in CE innovation and R&D	I
	3 g	For SMEs, it is not possible to issue green bonds, making the money flows targeted at sustainable finance inaccessible to them	I
	3 h	CE companies, especially tech-related start-ups and young businesses, often lack the knowhow or resources to apply for funding or make their businesses financeable	I
Subjects within companies	3i	In some regional contexts, available funding allocations heavily prioritize R&D activities, whereas commercialization activities need more financing	D/I

the financing of CE businesses. The role of the public sector and financial incentives for CE transition, in particular, was also widely recognized in the literature [see, e.g., 2, 11, 30, 33, 34, 41, 44–46, 53, and the findings of this study both support those views and elucidate the reasons behind them. Without the direct and indirect financial support of the public sector, its collaboration with other social actors, and other public sector efforts to create a level playing field for CE businesses, large-scale CE transition cannot be achieved.

Another recognizable group of propositions relates to sustainable and impact investing (1 h, 1j, 1 k, 1 l). The literature indicated enormous interest in sustainable finance among both academics and practitioners, and many frameworks (e.g., ESG, CSR, SRI) are in place to guide sustainable investors [e.g., 20, 21. However, it was shown that little research has connected CE to these frameworks or sustainable investing overall, despite its sustainable nature. A similar disconnect between sustainable investing and CE was recognizable in the data. CE was discussed as one of the great beneficiaries of the sustainable investing megatrend in high-level expert group conversations and a commercial bank research report (e.g., PWSM, WSD, RWR-6, and RWR-3); however, no company-level sources mentioned having been financed by sustainable investors or that their company's sustainable nature had helped them in obtaining financing. One interviewed financier (EI-1) mentioned that their company has a CE fund, the first of its kind in the world, implying that financing CE by sustainable investors is still in its infancy. Therefore, it is proposed that sustainable investors and CE companies have not yet found each other on a large scale (1 k, 1 l), leaving much potential unused for both groups which could help them achieve their objectives.

A very significant factor in financing CE is the collaboration between the financial industry, public sector, and other actors of the society (1 m; RWR-4, RWR-1, WSD, RWR-3, RWR-9, and NA-4). This significance derives from the capability of collaboration to disable and decrease the large number of inhibitors which emerged from this study. For example, everything related to new kinds of financial instruments, methods, and risk and value assessment tools requires a regulatory framework which allows them to be used (1 m, 3a), which simply cannot be achieved without the collaboration of the finance industry, public sector, and other actors of society.

It also seems that CE is not favored by private financiers due to the crowding out of private money, poor fit of the current financial assessment methods to CE business models, and riskiness of novel and innovative CE business models (1b, 1 g, 1f; PWSM, RWR-3, EI-8, and NA-1). These factors are not necessarily unique to CE business, and it is difficult to find a solution to them: The need for public financial support and novel and innovative business models does, inevitably, imply some risk for private financial industry actors looking for low-risk profits.

Factors Related to Criteria for Financing

A total of 22 propositions were derived from factors related to criteria for financing, 19 of which can be viewed as inhibitors of CE. There are exceptions in the case of three propositions (2n, 2u, 2v) where the factors can be interpreted as drivers; however, this interpretation is mostly based on their potential to become driving forces of CE in the future, rather than being such forces now.

Data indicated that current financial models are not fit to assess the typical risks related to CE businesses and, moreover, underplay the risks typical of linear businesses (2a, 2b, 2c, 2 g, 2e). Our findings confirm and explain previous findings [33, 43, e.g., 48], indicating that circular and linear risks and assets are not assessed correctly through traditional financial models and/or by traditional financiers. The current

operating methodology in the financial industry does not favor CE business (2d, 2f, 2 h): The use of asset-based lending (RWR-7 and RWR-5), the requirement for historical data proving the profitability of the business models (RWR-2, RWR-5, and RWR-6), and the inability to assess the value of circular value chains all clearly inhibit any large-scale CE transition (RWR-2, PWSM, RWR-3, and RWR-9). Financiers' requirement for historical data has also been recognized in the literature. For example, Aboulamer et al. [48] demonstrated that there is frequently not enough historical data to determine the stability of cash flows of circular business models.

The first significant group of factors related to the actual profitability of CE businesses derives from the market risk caused by prevailing customer behavior, which is largely locked into the linear operating model (2i, 2j, 2 k, 2 l, 2 m). Other propositions related to the profitability of CE businesses suggest that the inclusion of sustainable value in profitability calculations would benefit CE greatly (2n; RWR-7, RWR-8, PWSM, WC, RWR-6, RWR-3, PC-1, and NA-10) and that profitability originating from public financial incentives contains regulatory risk (2o; PWSM). The literature also referred to the relevance of factors related to the actual profitability of CE businesses, although not in the same depth as this study. Studies have suggested that the profitability of CE businesses is, in many cases, uncertain, realized over a long period of time, and, in some cases, known to be nonexistent in monetary measures [e.g., 17, 36, 41. Moreover, in some cases, consumers think that for example recycled products are worse than new ones [33]. Consumers and business customers, however, perceive diverse values (from direct economic benefits, such as savings or indirect economic benefits, such as image benefits) [54] that companies could use in their sales argumentation, to increase potential customers' understanding on benefits that they will get for the price and thus attractivity of the CE solutions over linear ones.

Perhaps, the simplest means to address the profitability of CE companies would be to improve CE companies' business models: For example, young CE companies and start-ups often lack the knowhow to make their businesses profitable (3 h). One possible solution is ING Bank's (RWR-6) idea about financiers becoming knowledge partners to CE companies. Moreover, including the added CE-related sustainable value in the profitability calculation would greatly increase the attractiveness of CE in the eyes of financiers (2n). However, the fundamental question remains of how sustainable value could be made equal to monetary value in investing.

Let us speculate about the impact on large-scale transition to the CE of the propositions related to the valuation (2a–2 h) and profitability (2i–2o) of CE businesses: The valuation models used in the financial industry and underlying profitability of the businesses are generally the basis of every financing decision. If CE businesses are wrongly assessed by the models or not profitable, then, inevitably, they do not access the financing they need or do so on undesirable terms. Therefore, incorrect financial assessment models and the lack of profitability are very significant inhibitors of CE business and large-scale CE transition overall.

When reviewing the propositions related to circular business model typologies (2p, 2q, and 2r), each typology has its own challenges, but that CUMs are associated with most finance-related issues (2q; RWR-2 and RWR-6). These issues have, at least to some degree, been addressed when reviewing the other propositions; however, it was rarely mentioned that the issue is related specifically to PSS models and instead was associated with CE businesses in general. As CIMs and CUMs are shown to have few financial issues (RWR-2), future research into financing different CE business model typologies should clearly differentiate between them. In the literature, business model typologies were differentiated only on one occasion: Fischer and Pascucci [43] found that PaaS models are affected by growing balance sheet and working capital requirements, which has also been pointed out in this study.

The literature emphasizes high upfront investment costs: It was demonstrated that investments in technology, innovation activities, and process implementations, for example, are sizable and that their payback is often uncertain [2, 17, 30, 36–42]. However, in data, the high upfront investment costs were not as commonly referred to. Studies have shown that there is a barrier of high upfront investment costs and risks when acquiring assets to be leased for PSS models (2 s; RWR-2 and RWR-5) and when transitioning to CE principles from a linear operating model (2t; RWR-10, RWR-2, and RWR-9). However, as the conversation about financing CE develops, it is clearly focusing more on the profitability and risks of investments than on their size and timing.

The business opportunity for the finance industry posed by the CE has been strongly demonstrated in this study (e.g., RWR-4, RWR-6, and RWR-3). As effectively financing CE would require different kinds of financial products (1i; RWR-4, NA-5), it would naturally create a demand for both new and traditional kinds of such products (2u; RWR-4). Moreover, as PSS models, in particular, require a great deal of working capital (RWR-2 and RWR-5), companies using such a model need more financing to meet that requirement, which also creates demand for the financial sector. The demand does not guarantee that the business will be profitable for financiers. However, as the demand for the finance industry created by CE companies is estimated to be very strong, the financial sector can attempt to exploit the opportunity, as by having CE companies as clients, financiers could more easily achieve their own sustainability objectives (2v; RWR-6, NA-2, NA-3): CE companies enable building a sustainable customer portfolio for financiers and could be used as references to enhance the financiers' reputation. In the literature, no references were made to possible business opportunities for the financial industry posed by CE companies, making this a very valuable finding.

Factors Related to the Subjects of Financing

The smallest number of propositions (9) related to the subjects of financing, only one of which is plainly a driver of CE. Moreover, these propositions are not as CE-specific as in the other categories: For example, issues regarding the small size of the companies (3c, 3d, 3e, 3f, 3 g, and 3 h) are issues for smaller companies in general, not just small CE companies.

Firstly, the data revealed that there is no means available to distribute investments, value, risk, and profits fairly when a complex circular value chain consists of multiple legal entities (3a; RWR-2, PWSM, RWR-3, RWR-9). This is naturally a very complex issue: As calculating and distributing risks, added value, and responsibilities is difficult, even for single companies, it would require enormous amounts of coordinative work to ensure a fair framework is in place in circular value chains, which would, in turn, make the chain very rigid and inefficient in a competitive business environment.

Regarding CE projects, it is proposed that participating in joint R&D and other projects which aim to promote, develop, and apply CE principles in companies and society is a major driver for CE (3b; CI-3, FGD-1, and NA-12). This is expected: It is what the projects aim to do, and, as moving to CE principles is a drastic change for a linear company, it is easy to imagine the attractiveness of an introduction to CE principles and their applicability as part of a joint R&D project, without having to change the whole chain of operations of the company at once.

A review of the propositions related to single companies shows repeated claims that financing CE activities is significantly more difficult for SMEs than for large, financially self-sufficient companies (3c, 3d, 3e, 3f, 3 g; RWR-7, RWR-1, RWR-3, RWR-5, RI-4, and NA-7). The reasons behind this are evident, as smaller companies usually require more significant investments

relative to their size, rely on a smaller customer base, and are, overall, regarded as much riskier by financiers. In the literature, similar results were found: It was pointed out that SMEs have more difficulty obtaining financing than large ones, are more sensitive to extra costs, and have more difficulties in obtaining collateral for bank financing [19, 29–34]. It was also pointed out that SMEs' difficulties in obtaining financing are in no way unique to CE companies [19], and the data offered no evidence suggesting otherwise. However, it is valuable to note these findings in regard to the concept of CE financing. CE is a young concept; hence, many CE-centric businesses are young and small. Findings also reveal that start-ups and young tech-related businesses often lack the knowhow or resources to apply for funding or make their businesses financeable (3 h). This proposition often applies to SMEs in general but is more a result of a company's immaturity and the inexperience in business and financing: innovative CE companies can be skilled technologically but lack the business knowhow to design a financeable business model (PWSM, EI-1, EI-7, EI-10). These issues were not mentioned in the literature. A possible solution to this issue is strongly linked to proposition 1 m: Having financiers and entrepreneurs work together to create profitable business models could mitigate, at least, the issue.

The only proposition related to the subjects of financing within companies indicates that, particularly in the research context of this study, Finland, allocation of available public and semi-public funding is heavily biased toward R&D activities, even though commercialization activities require more funding (3i; WC, EI-3, EI-7, NA-1). The proposition is both a driver and an inhibitor: It is good that funding is available for R&D activities, but it should not be at the expense of commercialization activities. No similar findings were found in the earlier literature.

Conclusions

Theoretical Contributions

This study has examined CE business finance through an extensive qualitative field study by accumulating over 270 data sources and generating a conceptual model and set of propositions that capture and explain the key factors that shape CE business financing. Our findings provide contributions to several research streams, which we discuss next.

Firstly, our study contributes to the growing body of CE research by shedding light on financing CE business. Our explorative study of building a comprehensive business on CE business financing factors strengthens the nascent research on CE and financing and is among the first to put the concepts of CE and finance together. By creating a conceptual model of factors that are significant for CE financing (Fig. 2 and the propositions in Table 3) and reviewing the issue from points of view of both the companies and the financiers, we clarify and model the unexplored and very recently initiated research area of CE business financing [3, 4, 11, 20, 25, 36]. This newly developed understanding addresses CE business research with interests ranging from large and mature enterprises to SMEs and start-ups.

Secondly, our study contributes to CE driver and barrier research, which has noted finance to be a significant factor[1–3]. In our study, we have focused on financing-related drivers and barriers to improve the earlier driver and barrier research that has noted financing as an economic barrier but not studied it further. Our study is aligned with earlier insights on the most significant inhibitors for CE financing; it confirms and explains further how company size, the valuation and profitability of CEBMs, the role of public financial support, and CEBMs' capital funding significantly affect financing and investment in CE companies and ventures. The importance of high upfront investment costs, as presented in

the literature, was not deemed a significant factor per se [2]; rather, it has emerged as an umbrella term for many kinds of concerns and risks related to financing the CE.

Thirdly, our findings contribute to the related research field of SRI. By reviewing what affects CE companies' attractiveness as investments and/or debtors, and how this is done, our study sheds light on how sustainable investors view and assess CE companies and their business. The theoretical connection between CE and SRI was discovered to be absent in this study—at least in part. The study highlights the unused potential for both sustainable investors and CE companies by pointing out the lack of related remarks in the company-level data, which is a contribution to the SRI research.

Practical Implications

Our key findings, the conceptual model (Fig. 2), and propositions also provide pragmatic guidance for diverse practitioners, from company executives and financiers through regulators and legislature representatives, and explain the factors on which practitioners' actions can be based and reflected on as well as how to prepare for and overcome the factors shown to be inhibitors to CE businesses. For example, our study adds finance-specific insights to taxonomy initiative in EU [16].

Firstly, our model and propositions can increase regulators' and legislature representatives' knowledge of CE companies' operating environment and note their own enabler/inhibitor role. The overall importance of the public sector, public financial incentives, and public funding organizations in creating a level playing field for CE companies was highlighted throughout the data set and by all kinds of data sources, from European Commission reports through G20 Resource Efficiency reports to company and policy maker interviews. Another implication is that current public procurement policies should be refined. The study noted that, at least in Finland, public sector procurement processes currently favor conventional linear businesses and are not designed to assess circular solutions by companies. Lastly, regulators should carefully consider issues related to taxation: Balancing the scale of the taxation burden between labor and resources and differentiating between renewable and non-renewable materials in taxation would make CE financially much more viable as an operating principle.

For CE company executives, this study provides a comprehensive view of financial issues they might encounter and how to prepare for them, and how financiers see CE companies as investments. The most important learnings in this regard are that the profitability of a CE business is the key criterion for financing and that it is worth investing to make the business model financially viable. In many cases, companies themselves, when starting out, are not profitable and lack the knowhow and/or resources to make themselves financeable. Secondly, CE business seems to be affiliated with multiple risks that executives should be aware of: They are seen to contain significant amounts of market, technology, cash flow, supply chain, regulatory, and end-client credit risks which are not well understood in the financial industry, or the assessment frameworks used**.** Thus, these risks should be mitigated to the highest possible extent, and companies should be as informative as possible when explaining them and what actions have been taken to mitigate them when applying for financing. Thirdly, this study provides insights about what kinds of implications different business model typologies involve regarding financing: For example, CUMs (e.g., the PSS model) are impacted by most issues, as they are significantly affected by balance sheet implications, working capital requirements, cash flow implications, legal considerations, value of assets calculations,

end-client credit risk, and market risk. Lastly, executives can learn from our study how financiers may value CE as a part of the sustainable investment trend.

For financiers, this study clearly revealed that current risk assessment tools and frameworks cannot fully assess CE business and its risks. Our data sources and existing research knowledge very strongly argue that circular risks and linear risks are generally not considered correctly when CE businesses are assessed, implying that, in order to contribute to large-scale CE transition, financiers should update their assessment methodology greatly. Lastly, the CE transition seems to increase demand for financial products which are suitable for financing CE businesses and CE business models. The PSS model requires extensive financing, meaning considerable profit opportunities for financiers.

Limitations and Future Research

We are aware that our qualitative study may have limitations in both scope and quality, as well as some biases. Our study used diverse secondary data sets that were re-interpreted via the researchers' objectives [49]. Regarding the generalization and transferability of findings, our findings regarding CE finance factors stem mostly from European data, although a few items have a global scope. Other regional contexts, such as the USA or Asia, may provide different results [see, e.g., 55. It is also worth noting that the data was gathered for the study in pre-COVID times; however, this is not thought to affect the study's generalizability.

Future research in this field is recommended to increase our understanding of the single factors or groups of factors identified in this study by validating its results and refining the conceptual model accordingly. As most of the factors are interpreted as inhibitors of CE and the study does not clarify how they can be overcome, further explanation of overcoming them is required.

Moreover, the approaches of SRI, CSR, ESG, and CE have been separated, and more integrative studies are needed.

Furthermore, a couple of factors emerged in the findings whose mechanisms were not sufficiently explained in the data to allow a detailed description of the underlying issues. The first group of propositions that clearly implies a need for further research relates to the risk and valuation assessment models currently used in the financial industry, which are deemed to be unfit to assess CE business (2a, 2b, 2c, and 2d). For example, cash flow risks, technology risks, regulatory risks, market risks, and supply chain risks caused by the COM were presented as risks that are not properly valued by the current financial assessment models. However, what exactly the current financial models lack and how they could they improved, while still assessing risks and value fairly, was not elaborated on, making this a very fruitful subject of future research.

Yet another interesting future research theme stems from the proposition related to how to distribute investments, incentives, value, resources, risk, and profits fairly within multiple-party entities, such as supply chains (3a). The data indicated that no operating model and legal framework are currently in place to distribute these subjects fairly; however, again, there is still limited understanding of how the issue could be solved. As circular supply chains are at the core of CE as a paradigm, it is essential to study how to effectively finance them.

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Data Availability Data is available on request due to restrictions (to protect privacy of the informants). The data presented in this study are available on request from the corresponding author. Due to qualitative nature of the data, interviews are not publicly available, whereas studied reports and media articles are.

Declarations

Ethics Approval, Consent to Participate and for Publication The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards and is approved by Tampere University and followed also CICAT2025 project's ethical principles. Verbal informed consent was obtained prior to the interviews. Experts interviewed for this study do not oppose publishing the results.

Conflict of Interest The authors declare no competing interests.

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