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FINANCIAL DRIVERS AND INHIBITORS OF CIRCULAR ECONOMY BUSINESS

Master of Science Thesis
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ABSTRACT

Arttu Saarinen: Financial Drivers and Inhibitors of Circular Economy Business
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Despite the finance industry's growing interest towards and crucial role in pursuing sustainable development, scholars' interest in the connection of finance and sustainability, the Circular Economy's nature as a possible enabler of sustainable development, and the research presenting multiple financial barriers to Circular Economy Business, there has been significantly little interest and detailed research about how finance can affect the large-scale transition to a more Circular Economy. The main purpose of this study was to contribute to filling that gap in the literature and hereby provide researchers and practitioners answers through the following objective. The two-fold objective of this study was to identify what financial factors drive and/or inhibit transitioning to and operating by CE principles and how, and what characteristics of CE business and CE companies drive and/or inhibit their attractiveness as an investment or a debtor and how.

Towards addressing the research objective, an explorative and qualitative study of the underlying issues was carried out. As a choice of analysis methodology, an iterative thematic analysis utilizing systematic combining and an extremely diverse set of both primary and secondary data was conducted. The data set consisted of Focus Group Discussions, observation data, secondary interviews and meetings, practitioner research reports and media data, originally produced between 2013 and 2020. The sources of data included experts amongst both practitioners and researchers from various relevant stakeholder groups: e.g. academics, CE company executives, regulators, legislators, financiers, NPOs and different kinds of interest groups were represented in the data.

As a result, a framework of the identified financial factors affecting both transitioning to and operating by CE principles and CE business's attractiveness as investment was constructed. Also, a total of 44 propositions were derived on how each factor drives and/or inhibits the said subjects, indicating that there currently are more financial inhibitors than drivers to CE. The factors and the propositions were categorized into Sources of financing, Criteria for financing and Subjects of financing, of which the Criteria for financing contained the most driving and/or inhibiting factors.

The study provides also pragmatic guidance on what practitioners can do to contribute to CE becoming a better-established paradigm of operation. To address regulators and legislators, the role of the public sector in making the playing field level for CE businesses using financial incentives, public funding organizations, procurement, legislation, and taxation is highlighted. For company executives operating by or planning to operate by CE principles, the results imply that they should pay significant attention to the profitability and financial viability of their Circular Business Models and to recognizing and mitigating the risks typical to CE business, such as market, technology, cash flow, supply chain, regulatory and end-client credit risk. For financiers, it is implied that the currently used financial risk and value assessment models used are in the need of renewing due to their unfitness for assessing CE business and that CE contains a potential business opportunity to be exploited. For the agenda of future research, it is recommended that the specifics behind the prevailing financial models' unfitness to CE, the means to distribute investments, other resources and risks fairly within Circular supply chains and the relationship between Socially Responsible Investing and CE are investigated further.

Keywords: Circular Economy Business, finance, funding, sustainability, sustainable investing, drivers and inhibitors

TIIVISTELMÄ

Arttu Saarinen: Kiertotalousliiketoiminnan rahoitukselliset ajurit ja esteet
Diplomityö
Tampereen yliopisto
Tuotantotalouden diplomi-insinöörin tutkinto-ohjelma
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Huolimatta rahoitusalan kasvavasta kiinnostuksesta kestävää kehitystä kohtaan, rahoitusalan suuresta roolista kestävän kehityksen tavoittelussa, akateemikkojen kiinnostuksesta rahoituksen ja kestävyyden välistä suhdetta kohtaan, kiertotalouden luonteesta kestävän kehityksen mahdollistajana ja tutkimuksista, joiden mukaan monet rahoitukseen liittyvät tekijät ovat hidasteita kiertotalousliiketoiminnalle, rahoituksen vaikutusta laajamittaiseen kiertotaloustransitioon on tutkittu merkillisen vähän. Tämän tutkimuksen tarkoituksena oli täydentää aiheeseen liittyvää tietämystä ja tuottaa erilaisille kiertotalouteen liittyville toimijoille vastauksia seuraavan tavoitteen mukaisesti. Tutkimuksen tavoitteena oli tunnistaa mitkä rahoitukseen liittyvät tekijät edistävät ja/tai estävät kiertotalousperiaatteiden mukaan toimimista ja ko. toimintamalliin siirtymistä sekä mitkä tekijät kiertotalousliiketoiminnassa ja -yrityksissä edistävät ja/tai vähentävät niiden houkuttelevuutta sijoituskohteena tai lainoitettavana kohteena.

Tutkimuksen tavoitteen toteuttamiseksi suoritettiin eksploratiivinen ja kvalitatiivinen tutkimus. Tutkimuksen metodologinen toteutustapa oli iteratiivinen, systemaattista yhdistelyä hyödyntävä temaattinen analyysi. Analysoitu aineisto oli todella monimuotoinen, sisältäen sekä primääristä että sekundääristä dataa, ja edustaen sekä akateemisia että käytännön asiantuntijoita relevanteista sidosryhmistä. Aineistossa kuultiin muun muassa tutkimuslaitosten, yritysten, sääntelijöiden, lainsäätäjien, rahoittajien, voittoa tavoittelemattomien yhdistysten ja erilaisten etujärjestöjen edustajia.

Tutkimuksen tuloksena muodostettiin viitekehys tunnistetuista rahoitukseen liittyvistä tekijöistä, jotka vaikuttavat sekä kiertotalousperiaatteiden mukaan toimimiseen ja ko. toimintamalliin siirtymiseen että kiertotalousliiketoiminnan houkuttelevuuteen sijoituskohteena. Lisäksi mekanismeista näiden tekijöiden taustalla johdettiin yhteensä 44 propositiota, joita tarkastelemalla nähdään, että tällä hetkellä kiertotalousliiketoimintaan vaikuttavat rahoitukseen liittyvät tekijät ovat enimmäkseen hidasteita kiertotaloudelle. Tekijät ja propositiot kategorisoitiin aihepiirin mukaan rahoituksen lähteisiin, rahoituksen kriteereihin sekä rahoitettaviin kokonaisuuksiin, joista rahoituksen kriteereihin liittyi eniten erillisiä vaikuttavia tekijöitä.

Tutkimuksen tuloksena muodostettiin myös tietoa keinoista, joilla käytännön asiantuntijat ja toimijat voivat edesauttaa kiertotalouden tulemista vallitsevammaksi toimintamalliksi. Sääntelijöiden ja lainsäätäjien kannalta korostetaan julkisen sektorin roolia yhdenvertaisen toimintaympäristön mahdollistajana kiertotalousyrityksille ja yhdenvertaistamisen keinoina rahallisia avustuksia, julkisia rahoitusorganisaatioita, hankintatoimea, lainsäädäntöä ja verotusta. Kiertotalousliiketoimintaa harjoittaville tai siihen siirtymistä harkinneille yritysjohtajille todetaan, että kiertotalousliiketoiminnassa on syytä huolehtia erityisesti liiketoimintamallin kannattavuudesta ja taloudellisesta kestävyydestä sekä kiertotalousliiketoimintaan tyypillisesti liittyvien riskien (mm. markkina, teknologia-, kassavirta- toimitusketju- ja sääntelyriskit sekä loppukäyttäjään liittyvä luottoriski) tunnistamisesta ja minimoimisesta. Rahoittajien näkökulmasta esille tuodaan, että nykyisin käytössä olevat riskin ja arvon valuaatioon käytettävät mallit kaipaavat uudistusta niiden ja kiertotalousliiketoiminnan yhteensopimattomuuden takia ja että kiertotalousliiketoiminnan rahoituksessa on rahoittajille hyödyntämätöntä liiketoimintapotentiaalia. Tutkimuksen pohjalta tunnistettiin suositeltaviksi jatkotutkimuksen aiheiksi tarkat syyt rahoitusalan nykyisten valuaatiomallien ja kiertotalousliiketoiminnan yhteensopimattomuuteen, keinot jakaa sijoituksia, muita resursseja ja riskiä oikeellisesti kiertotalouden toimitusketjuissa sekä yhteys vastuullisen sijoittamisen ja kiertotalouden välillä.

Avainsanat: Kiertotalousliiketoiminta, kiertotalous, rahoitus, vastuullinen sijoittaminen, ajurit ja esteet

PREFACE

These almost 50 000 words and enclosed figures and tables efficiently conclude both the 9 months-long journey of creating this thesis, and the approximately 5,5 years-long journey of studying to become a Master of Science. Both journeys had their own relevant groups of stakeholders, the most important of which deserve special acknowledgments.

From the point of view of creating this thesis, I would like to thank Leena Aarikka-Stenroos and Valtteri Ranta for the valuable input and feedback in the execution of the study and in writing the Thesis itself. I would like to thank also other CICAT2025-researchers and everyone in the CITER CIRQ-research team for both originally producing most of the utilized data set and for facilitating an encouraging and stimulative working environment for the research process. Conducting the research as a part of a university research group and a serious research project made the Thesis process more motivational and rewarding than I ever pictured it to be, and I am really glad that I was given an opportunity to do so.

From the point of view of the past years of studying overall, I would firstly like to thank my beloved Roosa and my family, for the continuous support, care and love. Special thanks also belong to the many dear friends I have made along the way: particularly Lauluyhtye Sulottaret, Hiki-Hockey and Postia-group had a special role in my scholarly and especially recreational activities, and were among the most significant factors in making these years memorable. There is a lot I learned during the time as a university student, but having all the aforementioned people around makes it clear that the obtained know-how is still only the second-best entity resulting from these years.

Tampere, 14th February 2021

Arttu Saarinen

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LIST OF SYMBOLS AND ABBREVIATIONS

B2B	Business-to-Business
B2C	Business-to-Consumer
CE	Circular Economy
CEBM	Circular Economy Business Model
CIM	Circular Innovation Models
COM	Circular Output Models
CUM	Circular Use Models
CSR	Corporate Social Responsibility
EI	Eco-Innovation
ESG	Environmental, Social and Governance
PaaS	Product-as-a-Service
PSS	Product-Service System
SME	Small- and Medium-sized Enterprise
SRI	Socially Responsible Investing

1. INTRODUCTION

1.1 Background of the study

Despite the finance industry's growing interest towards pursuing sustainable development and values (Global Sustainable Investment Alliance 2018; Knoepfel 2004; WWF 2018), scholars' interest in the connection of finance and sustainability (Carolina Rezende de Carvalho Ferreira et al. 2016; Friede et al. 2015), finance industry's crucial role in sustainability transformation (Schaefer 2012; Weber et al. 2014) and Circular Economy's nature as a possible enabler of sustainable development (Geissdoerfer et al. 2017), there has been significantly little interest and detailed research about financing Circular Economy Business and CE overall and how finance can affect the transformation to more Circular Economy. As transition to a more Circular Economy and driving its financing can contribute to sustainability transformation greatly, and as the finance industry is interested in enabling the said contribution, it is critical to learn more of the financial drivers and inhibitors of CE business to encourage the financing of CE as a paradigm.

So far there are (as we are aware of) two peer-reviewed articles dedicated to financing CE: the works of Aranda-Usón et al. (2019) and Ghisetti & Montresor (2020), who both also point out the lack of academic empirical research on the subject. Aranda-Usón et al. (2019) study the characteristics of the financial resources invested in circular activities in companies. Ghisetti & Montresor (2020) study if and how CE practices adopted and applied by SMEs correlate with the financing decisions they make. Therefore, given the largely significant role of finance in every company's business, there clearly is a gap in the research of how the relatively novel concept of Circular Economy and finance overall intertwine and how different aspects of finance relate to transitioning to and operating by CE principles.

Even though there is only little detailed research about finance and CE, there are a lot of hints about the role of finance in CE in academic and practitioners' literature. On many occasions, financing and/or some financial factor has been mentioned as a barrier or a difficult thing for CE actors or companies which needs to be overcome to follow or transition to circular principles (e.g. Fischer and Pascucci 2017; Jesus and Mendonca 2018; Ormazabal et al. 2018; Rizos et al. 2016). For example, lack of capital for the capital-

intensive Circular Business Models, funding and upfront costs of CE transformation and insufficient funds for CE innovations have been mentioned as difficulties in CE business. In the literature review of this study those references are discussed further in detail, but at this point, it is clear that additional research is needed on what financial drivers and inhibitors there are related to 1) transitioning to and operating by Circular Economy principles and 2) CE companies' attractiveness as an investment or a debtor and what are the mechanisms behind those financial drivers and inhibitors. This study attempts to target those specific gaps in the academic literature.

This study was conducted as a part of the research project Circular Economy Catalysts: From Innovation to Business Ecosystems (CICAT2025). It is a joint research project of 6 Finnish schools of higher education, studying multiple kinds of actors throughout the society. It aims to in general facilitate the transition from linear to Circular Economy and to support Finland's strategic objective to become a global leader in Circular Economy by 2025. It pursues to identify drivers and barriers affecting Circular Economy and to search solutions for companies, regulators and other stakeholders to support the transition. This particular study contributes finance's role to the project's work package studying business-related catalysts: other work packages study technology, policymaking, legislation, stakeholder relations, art, and linguistics.

1.2 Circular Economy Principles and Business

In recent decades, people have slowly but surely been becoming more and more aware of global sustainability issues and what can they and other actors of the society do about them. In recent years, also large corporations and the finance industry have started to pay attention and assess how global environmental risks will affect the macroeconomic performance of companies, sectors, countries and global financial markets. Meanwhile, also policymakers are trying to figure out the tools to enable meeting climate and sustainable development targets. (WWF 2018) Yet, all those specific interest groups, large corporations, finance industry and policymakers, have a common conflict of interest: they should greatly diminish consumption, pollution and virgin material use, while selling more products, creating shareholder value, maintaining economic growth and keeping people happy.

Towards that end, the concept of *Circular Economy* (CE) comes in especially useful. Maybe the most advanced and informed definition so far of the concept was made by Kirchherr et al. (2017): according to their literature review of 114 definitions, it is an economic system that replaces the traditional linear, "end-of-life" economic model by reduc-

ing, reusing, recycling and recovering materials in production, distribution and consumption processes. It aims to accomplish sustainable development, meaning simultaneously creating environmental quality, economic prosperity and social equity to benefit current and future generations. CE operates in three levels: micro (products, companies, consumers), meso (eco-industrial parks) and macro (city, region, country, global) levels.

The perhaps most cited, traditional model in the literature of applying Circular Economy consists of three principles, which are called 3R principles (see e.g. Ghisellini et al. 2016; Murray et al. 2017; Su et al. 2013). The name '3R' derives from verbs *Reduce, Reuse* and *Recycle*: by applying these three methods economic system becomes more circular instead of linear. Another widely used synonym for principles making the economic system more circular is *closing the loop*: by applying these principles, the products, components and materials loop through their lifecycles as many times as possible, instead of going linearly from material to waste. This is illustrated in Figure 1, which represents CE principles against the linear economy model, both adapted to technical materials. *Reducing* describes actions and strategies which are targeted in reducing material use, energy use and environmental effects overall. *Reusing* describes actions and strategies which allow the products to be used again for the same purpose they were originally produced. *Recycling*, possibly the most well-known principle, in turn describes actions and strategies towards reprocessing waste materials into products or materials, either for original or other purposes.

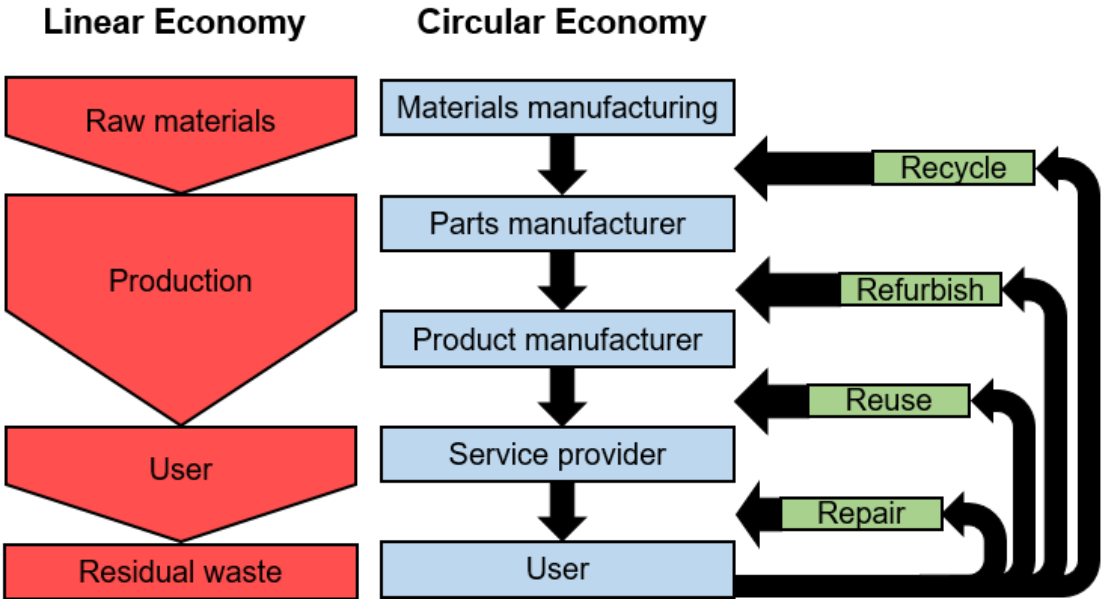

Figure 1. *Linear Economy vs. Circular Economy: Loop-closing principles illustrated. Adaption for technical materials. (adapted from van Buren et al. 2016; Ellen MacArthur Foundation 2014)*

The 3R principles have gained more loop-closing principles (Rs) in the more recent literature, with a purpose to define CE more specifically. For example, some definitions include 4 Rs (e.g. previously mentioned Kirchherr et al. 2017), 6 Rs (e.g. Sihvonen and Ritola 2015), or even 9 Rs (e.g. van Buren et al. 2016; Potting et al. 2017). The 9 Rs, which is the most specific model adding 6 principles to the original 3, includes the following principles (original 3R marked with an asterisk):

1. **Refuse:** preventing the use of raw materials
2. **Reduce*:** reducing the use of raw materials
3. **Reuse*:** product reuse (second-hand, sharing of products) for a similar purpose
4. **Repair:** maintenance and repair
5. **Refurbish:** refurbishing a product
6. **Remanufacture:** creating new products from old products or parts of them
7. **Repurpose:** product reuse for a different purpose
8. **Recycle*:** processing and reuse of materials
9. **Recover energy:** incineration or residual flows. (van Buren et al. 2016)

As can be seen, they all have similar aims as the original 3R: to reduce waste, material usage and energy usage and overall try to extract as much value as possible of existing products, components and materials that would otherwise go to waste in making new products, components and materials.

A significant factor to consider in the CE principles is their hierarchical order, which is also referred to as the waste hierarchy. For each mentioned model of Rs the earlier the

principle is mentioned (i.e. the earlier the product is in its lifecycle), the better the principle is in capturing value and the less it produces waste. (van Buren et al. 2016; Kirchherr et al. 2017; Potting et al. 2017; Sihvonen and Ritola 2015) So, for example, according to the waste hierarchy, it is better to repair or refurbish a product instead of recycling it, if it just is possible. The idea behind the hierarchy is reasonable: the less processing must be done to the product, component or material for it to be usable again, the less it entails resource usage.

Circular Economy as a solution for sustainable growth

CE could very well be a solution (or at least a part of it) when trying to solve the question of how to maintain economic growth and environmental prosperity at the same time. By its nature, CE is heavily tied to the concept of sustainability and especially its environmental dimensions. CE's aim is by definition to simultaneously pursue environmental values and economic prosperity (Kirchherr et al. 2017). Multiple authors (e.g. Ghisellini et al. 2016; Lieder and Rashid 2016) have also pointed out the same and stated that CE has a crucial role in decoupling environmental pressure from economic growth. To contribute to the decoupling of those issues, CE must be beneficial for both 1) environmental sustainability and 2) economic prosperity.

As for CE and environmental sustainability, many scholars have researched the subject (e.g. Geissdoerfer et al. 2017; Murray et al. 2017). According to Geissdoerfer et al.'s (2017) literature review, most of the scholars view CE as at least beneficial driver or even necessary condition for achieving a sustainable society, especially regarding environmental sustainability. Sustainability was defined by them (based on e.g. Elkington 1997) as an equal integration of three pillars: social, economic and environmental pillars, also known as *triple bottom line* considering 'people, profit and planet'. They and e.g. Kirchherr et al. (2017) state that by most authors, CE focuses greatly on economic and environmental dimensions, but does not consider social dimensions as much. Also, the scholars' perspective to sustainability is said to vary from specific sets of issues to very holistic view, whereas CE's perspective is usually simplified to resource input and waste and emission output, meaning that for example biodiversity or land use is not seen to be significantly affected by CE. But, as noted previously, by diminishing resource inputs and waste and emission outputs, CE is commonly viewed as a largely beneficial driver or even a necessary condition for sustainable development. (Geissdoerfer et al. 2017)

As for CE, economic growth and economic feasibility overall, even more scholars have included economic prosperity as an essential part of CE than environmental sustainability (Kirchherr et al. 2017). Ellen MacArthur Foundation (2013, e.g. 2014) has researched

the economic benefits of CE comprehensively and lists the following things to be enabled by CE. **New business opportunities:** CE business models and circular principles open new market areas in the fields of e.g. reverse logistics, sales platforms, component remanufacturing and recycling systems. **Material savings:** component and material recovery from existing products and "waste" can significantly reduce the material costs of companies. **Mitigation of material price volatility and supply risks:** as materials could be produced from existing products, the dependence on the virgin materials and their relatively volatile prices would be reduced. **Employment benefits** (also pointed out by van Buren et al. 2016): all R-principles would create demand for new kinds of workforce, especially in the service sector.

The benefits of CE to economic growth and prosperity have been researched also empirically: for example Hysa et al. (2020) found in their study that CE had positive effects on economic growth on the EU level. On a company level, Ungerman & Dědková (2020) found that the involvement in CE activities was profitable for the studied companies in all but one partial segment of one of the 6 studied industry sectors, covering all major industry sectors in the Czech Republic. Deriving from these results, they stated that companies' involvement in CE activities add to the overall prosperity of the society. To conclude the CE's contribution to society, CE seems to be greatly beneficial for both 1) environmental sustainability and 2) economic prosperity. Therefore, it could be the solution to the problem of maintaining economic growth while not damaging the environment.

1.3 Objective of the study

This study aims to contribute to the rapidly growing field of academic Circular Economy literature by targeting the research gap between Circular Economy business and finance. As said, the relationship between finance and Circular Economy has been frequently mentioned as a barrier in transitioning to and maintaining circular business models and principles and creating CE innovations (Fischer and Pascucci 2017; Ormazabal et al. 2018; Rizos et al. 2016), but the details and factors resulting in this have not been researched systematically in detail**. Therefore, the first point of view to the two-fold objective of this study is to identify what factors about finance drive and/or inhibit transitioning to and operating by CE principles and how.**

In addition to providing solutions to CE companies, this study aims to shorten the gap between investors, other financiers and CE as an investment. Despite that financial industry is nowadays pursuing sustainable values to an increasing extent (Global Sustainable Investment Alliance 2018; Knoepfel 2004; WWF 2018) and that the connection between sustainability and finance has been studied (Carolina Rezende de Carvalho

Ferreira et al. 2016; Friede et al. 2015), there is significantly little academic research done on what opportunities would CE offer to the financial industry from the viewpoints of both business and sustainability objectives. A great amount of studies has been done researching the performance of sustainable investing (Friede et al. 2015; Viviers and Eccles 2012) and effects of corporate social responsibility on company performance (Brammer and Millington 2008; McWilliams and Siegel 2000), but as far as I am aware of, there are no academic studies done on if and how sustainable investors and other financiers could benefit from CE. **Therefore, the second point of view to the objective of this study is to review what factors of CE business and CE companies drive and/or inhibit their attractiveness as an investment or a debtor and how.**

Concluding these two point of views**, the objective of this study is to identify what financial factors drive and/or inhibit transitioning to and operating by CE principles and how, and what characteristics of CE business and CE companies drive and/or inhibit their attractiveness as an investment or a debtor and how**. To address the first point of view of the objective of this research, or in other words, to identify what factors about finance affect transitioning to and operating by CE principles are, the following research question is asked:

> **RQ1: What financial factors affect transitioning to and operating by CE principles?**

To clarify further and deepen the understanding about the mechanisms behind the identified factors, the following research question is asked:

> **RQ2: How do the identified factors drive and inhibit transitioning to and operating by CE principles?**

To address the second point of view of the objective of this research, or in other words, to identify what factors about CE business and CE companies affect their attractiveness as an investment and/or a debtor, the following research question is asked:

> **RQ3: What factors related to specifically CE business and CE companies affect their attractiveness as an investment and/or a debtor?**

To clarify further and deepen the understanding about the mechanisms behind the identified factors, the following research question is asked:

> **RQ4: How do the identified factors drive and inhibit CE companies' attractiveness as an investment and/or debtor?**

To conclude, with these 4 research questions, which can be grouped as 2 groups of 2 questions related to the same issues, the main thematical area of the study of financing

CE is reviewed from 2 sides of a coin. The first side is how finance and funding affect CE companies and CE as a paradigm, or in other words, the CE practitioner perspective. The second side is how CE is regarded in the eyes of the financiers, or in other words, the financier perspective.

Towards answering these 4 research questions an explorative and qualitative study with an abductive approach to theory is conducted, utilizing thematic analysis and systematic combining in the analysis phase. As the study's purpose is to address a thematical area with little previous academical attention focused on it, the explorative aim of the study is justified, since exploratory research is an effective means to ask open questions about the subject and clarify the understanding of a subject which has not been researched to a great extent before (Saunders et al. 2016). Similarly, because there does not exist any previously developed theoretical frameworks of the thematical area on hand, a qualitative study was seen as more suitable for finding a larger scale of factors affecting financing CE and therefore for answering the research questions asking "what" and "how".

To increase the understanding of the underlying research questions as much as possible, the method called systematic combining is utilized in the analysis phase. The method introduced by Dubois & Gadde (2002, 2014) allows the researcher to go back and forth from result data to theory, gather new data during the analysis process and increase one's understanding from both theory and the insights discovered in the data throughout the analysis process. The iterative and revisitative nature of the method makes it more fruitful in mapping undiscovered thematical areas than a standard linear research process. As the factors to be mapped are fundamentally descriptions summarizing the diverse sets of insights regarding the underlying issues, thematical analysis is chosen as a method of analysis since it is a method capable of producing a thematic description of a diverse data set (Saunders et al. 2016).

As the aim of the study is explorative and as the purpose of it is to gather the most relevant knowledge available of the thematical area, there is no strict scope and/or limitations assigned to it beforehand of the data gathering and data analysis. The principle in the data gathering is that the data is taken into account if it is considered to contain insights relevant from the point of view of the research questions. Instead of having a pre-described scope and limitations, the data-driven scope and limitations applicable for the findings are recognized during the data analysis and are discussed better in detail in Chapter 6.4: *Quality and limitations of the study*.

1.4 Structure of the study

In the first chapter, Chapter 1: *Introduction*, background and the motivation for the subject of this study is discussed first. Then, moving on to an introduction of Circular Economy in general and the state of its research regarding it as a concept, CE's main principles are presented and the character of CE as an enabler of sustainable economic growth is explained. Next, the objective of the study is reviewed, as is the structure of the study after that.

In Chapter 2: *Sustainability and Circular Economy in Finance*, the theoretical background and the existing literature relevant from the point of view of the research questions is reviewed. The first three subchapters assess finance literature regarding sustainability, whereas the fourth subchapter discusses CE literature in which financial themes have been mentioned on some level. First, the concept of Socially Responsible Investing is reviewed and therefore academic finance literature's perspective on integrating sustainability in investment decisions is elaborated. Next, the concept of Corporate Social Responsibility is introduced and discussed, continuing the review of finance literature regarding sustainability with an emphasis on company-level knowledge. Then, as a final piece of literature review's finance literature section, the Environmental, Social and Governance factors are introduced, elaborating on a more general framework for assessing the sustainability of an investment. Next, the fourth subchapter reviews the CE literature in which financial themes have been assessed. In the final subchapter, the synopsis of the literature review is formulated and an initial theoretical framework for the analysis is created.

In Chapter 3: *Research Methodology*, the methodological choices and the basis for them are reviewed, reflecting them on the purpose and the research questions of the study. First, research design and strategy are reviewed, explaining the explorative, qualitative and abductive nature of the study. Then, the methods of data gathering and the characteristics of the utilized data are discussed per each data type. Next, the methods of data analysis are reviewed: the fitness of thematic analysis and systematic combining (Dubois and Gadde 2002, 2014) as methods for this study are rationalized and the implementation of the methods such as software used is presented. Lastly, the methodological reliability and validity of the study are critically assessed.

In Chapter 4: *Financial Drivers and Inhibitors of Circular Economy Business and Circular Companies' Attractiveness as* An Investment, the results of the thematic analysis of data are reviewed. The insights of the data regarding those financial factors are reported cat-

egorizing them into three categories: Sources of financing, Criteria for financing and Subjects of financing. Because the research questions are so closely intertwined with each other, the insights are not differentiated in the reporting by research questions and are all concurrently within their respective categories. And, as all these three categories and factors within them are also heavily interrelated to each other, the categorization should not be considered as thematical areas isolated from one another but a categorization to assist in having an overall perception of the underlying issues.

In Chapter 5: *Discussion*, the results of the thematical analysis of data reported in the previous chapter are summarized and discussed while also analyzing their relations and cause-and-effect relationships to one another. The results of the analysis are also reflected by comparing them to the academic literature reviewed in Chapter 2. A summarization of the factors is presented first, continuing to the discussion of the factors categorized similarly to Chapter 4, to Sources of financing, Criteria for financing and Subjects of financing. Per each category, a group of propositions is derived, proposing how each factor or a specific group of factors drives or inhibits CE and/or CE companies' attractiveness as investments and/or debtors based on the result data and the academic literature.

In Chapter 6: *Conclusions*, the study is concluded by analyzing its results, implications to stakeholders and quality. First, the successfulness of the study is assessed by comparing the results to the objective and research questions of the study. Then, the implications of the findings are presented, first from the perspective of academic theory and the from the perspective of three relevant practitioner groups: regulators and legislature representatives, company executives and financiers. Next, the quality and limitations of the study are assessed. Lastly, the key topics requiring further research in the future identified in the study are presented.

2. SUSTAINABILITY AND CIRCULAR ECONOMY IN FINANCE

In this chapter, literature concerning the research questions and research problems is critically reviewed and the concepts necessary for conducted research are defined. First, the concept of sustainable finance in general and how it divides into multiple conceptual approaches are explained. Second, the most relevant approaches and concepts of sustainable finance are reviewed more in detail in their own subchapters, and their relationship and applicability to CE financing and investing are assessed. Third, existing literature about CE and finance together is reviewed more systematically and financial themes from the CE literature are recognized and discussed. These themes also act as loosely defined initial theoretical framework for the thematical analysis of empirical data later.

There is little academic literature about themes of Circular Economy and finance together, as later in Chapter 2.4 is noted more in detail. The lack of academic literature about the connection of CE and finance was also a source of motivation for this study to be conducted in the first place. Due to the lack of academic literature concerning the themes together, the theoretical background for this study was partly based on the larger conceptual area of sustainable finance and investing. The area aims to the most relevant financial themes related to environmental sustainability, and therefore finance in CE companies, at least when CE is reviewed as an instrument of environmental sustainability.

The viewpoint of considering financing CE as a part of sustainable finance was seen fit for this study since according to Geissdoerfer et al. (2017), in literature CE is almost always considered as an at least beneficial and in many cases, a necessary part of sustainable development and its environmental dimensions. According to another definition derived from a literature review of 114 definitions of CE, CE is a system facilitating sustainable development, among other things (Kirchherr et al. 2017 p. 224). Therefore, it is justified to interpret financing CE to be a part of financing sustainability.

Sustainable finance and investing can be viewed as an umbrella term of a manifold and complex area of connecting sustainability to finance and investing. As, for example, Schaefer (2012), Eccles & Viviers (2011), Soppe (2009) and Sparkes (2001) state, there is no widely recognized, standardized definition for sustainable finance as a term either in practice or in academia. But, in his attempt of definition, Soppe (2009 p. 10) defines sustainable finance as follows: *“Sustainable finance deals with institutional policies, or*

systems of analysis, where all financial decisions aim at a long term integrated approach to optimize a firm's social, environmental and financial mission statement." In a more recent and more detailed effort to define the concept, Schoenmaker (2017 p. 8) states that *"sustainable finance considers how finance (investing and lending) interacts with economic, social and environmental issues"*. According to him, traditional finance considers financial sector separate from the environment and society, whereas sustainable finance combines traditional all-financial focus with social and environmental factors. To summarize, these two quite similar definitions could be combined by stating that **sustainable finance combines considering three factors in making financial decisions as an investor and/or as a lender: financial, social and environmental returns**.

Even though there is no unambiguous, standardized framework or definition for sustainable finance as a coherent entity, there exists a lot of more developed theoretical concepts recognized in the literature which bridge different aspects of sustainability to finance. Independently they are not comprehensive enough to cover the whole field of sustainable finance, but together they form an entity that covers most of the larger conceptual and theoretical knowledge of the field. Some examples of these concepts are Socially Responsible Investment, Responsible Investment, Ethical Investment, Corporate Social Responsibility and Environmental, Social and Governance factors. The key information of the concepts relevant to this study is summarized next in Table 1.

Table 1. *Concepts related to Sustainable Finance*

Concept	Abbreviation	Definition sources	Definition
Socially Responsible Investing	SRI	Sparkes 2001, Sparkes & Cowton 2004, Renneboog et al. 2008, USSIF 2020, EUROSIF 2020	SRI is integrating ESG factors in investment decision-making process to create 1) long-term financial profits and 2) sustainably positive impact to society
Corporate Social Responsibility	CSR	Rahman 2011, Dahlsrud 2008, Marrewijk 2003	CSR integrates social and environmental aspects to traditional business operations and a company's overall behavior
Environmental, Social and Governance factors	ESG	Author (adapted from Knoepfler 2004, PRI 2020, UNEP FI 2020, WFE 2018)	Environmental, Social and Governance factors are a (loosely conceptualized) categorization of sustainability issues relevant to investing decisions

On many occasions, the concepts are overlapping and cause conceptual confusion (Eccles and Viviers 2011; Sparkes 2001) and therefore it is important to clarify how they

relate to each other and how are they defined in this study. This is done next: in the following subchapters, these concepts and the aspects about them relevant for this study are reviewed more in detail.

2.1 Socially Responsible Investing

Socially Responsible Investing (SRI) is one of the most well-known concepts in the literature about considering sustainable values in the finance industry and academia. For example, according to Eccles & Viviers (2011), it was the most used name in their sample of academic literature (n=190) that describe investment processes involving some consideration of Environmental, Social and Governance (ESG) issues in making investment decisions. As Circular Economy can be viewed as a benefactor of especially the environmental dimension of sustainability, a lot of norms that apply to SRI also apply in financing and investing in CE.

Definition

By an older academic definition, SRI is a name of an investment process that integrates social, environmental and ethical factors, in addition to financial ones (Renneboog et al. 2008; Sparkes 2001; Sparkes and Cowton 2004). A more recent suggestion to name similar investment practices was made by Eccles & Viviers (2011): they reasoned that *Responsible Investment* would be more descriptive since the social dimension accounts for only one-third of ESG factors. In older literature especially the term *Ethical Investing* has been used interchangeably with SRI, but nowadays it is usually used to describe investing done by churches, non-profit organizations and other similar parties following their ethical guidelines (Sparkes and Cowton 2004). Other names used of the same concept include, for example, Social Investment, Green Investment and Sustainable Investment. Socially Responsible Investment, Sustainable Investment and Responsible Investment have been the most up-and-coming names for the concept after the turn of 2010s (Viviers and Eccles 2012). In this study, the term Socially Responsible Investment and the abbreviation SRI are used since they are the most favored in academic literature.

In practice, the definition and the name of the concept have also evolved in some amount, although fundamentally the idea is the same. Eurosif (2020) explains the abbreviation SRI to be Sustainable and Responsible Investment, while US SIF (2020) goes with Sustainable, Responsible and Impact investing and Global Sustainable Investment Alliance (2018) with Sustainable Investment. But despite a bit different naming, the definitions of all three organizations' concepts are the same and align well with the academic definition: according to them, **SRI is integrating ESG factors in investment decision**

making to create 1) long-term financial profits and 2) sustainably positive impact to society.

Socially Responsible Investing in practice

SRI is also a very well-known and used concept in the finance industry and literature. According to Global Sustainable Investment Alliance (2018), at the beginning of 2018, 48.8 % of total assets under management in Europe were managed by sustainable principles. In the US, the corresponding figure was 25.7 %. In the five largest markets of Sustainable Investing (Europe, US, Australia and New Zealand, Japan, and Canada), assets under sustainable management totaled $30.7 trillion. But even though there is a huge amount of assets that are claimed to be managed sustainably, there is no established theoretical framework to value the sustainability part of different investments. In other words, SRI can't be taken into account (at least unambiguously between different market actors) when calculating the attractiveness and the monetary value of an investment using traditional finance theory (Berry and Junkus 2013).

There are several ways to manage assets according to SRI principles in practice. GSIA (2018) classifies different SRI strategies into 7 groups, which are introduced in Table 2. Note that these strategies are very similar to ESG investing strategies introduced later in Chapter 2.3: the difference between SRI investing and ESG investing is discussed more in detail at that point.

Table 2. *Main SRI strategies and their proportion of all socially responsible investments by GSIA (2018). Note: the total is higher than 100 % since some managers apply more than one strategy to a given pool of assets.*

	Strategy	Explanation	SRI AUM-%
1.	Negative/Exclusionary Screening	The exclusion from a portfolio of certain companies or sectors based on specific ESG criteria	64.4 %
2.	ESG Integration	The systematic and explicit integration of ESG factors in financial analysis	57.2 %
3.	Corporate Engagement and Shareholder Action	The use of shareholder power to influence corporate behavior	32.1 %
4.	Norms-based Screening	Screening of investments against standards issued by e.g. OECD and UN	15.2 %
5.	Positive/Best-in-Class Screening	The inclusion in a portfolio of certain companies or sectors based on positive ESG performance	6.0 %
6.	Sustainability Themed Investing	Investment of themes related to sustainability, e.g. clean energy or green technology	3.3 %
7.	Impact/Community Investing	Investments targeted for solving social or environmental problems, including investing in communities like NPOs, churches, animal welfares etc.	1.4 %

As can be seen from Table 2, the exclusionary screening, ESG integration and corporate engagement strategies are used more frequently than norms-based screening, best-in-class screening, sustainability-themed investing and impact investing strategies. It is not in the scope of this study to interpret why some strategies are more popular than the others, but one might argue that the former strategies are probably easier to integrate into practice (e.g. sustainability-themed investing might derail funds from their original

area of expertise) and more likely have a smaller trade-off in terms of exchanging financial profits to sustainable values (e.g. impact investing might be interpreted as philanthropy instead of investing, as it targets communities) than the latter.

SRI's effect on performance

While there is no straightforward way of determining the monetary value of sustainability of socially responsible assets, academics have tried to assess the value of SRI assets by evaluating their performance. According to Junkus & Berry (2015), there are two opposite views of the matter recognizable in academic literature, which both have their own supporters and reasonable facts supporting them. The first one is called "do good, but not well" (pay in lower returns to pursue sustainability) and the second one "doing well by doing good" (pursuing sustainability leads to greater returns).

The strongest arguments supporting the first one – inferior performance of SRI assets – include 1) the diminishing portfolio diversification opportunities deriving from the exclusion of non-SRI compliant assets or industries and 2) additional costs incurring from SRI screening and analysis. The arguments supporting the second one – superior performance of SRI assets – include that 1) SRI compliant companies are able to attract better employees, 2) adapting to external SR constraints forces company to be more innovative, 3) SRI compliant companies are able to attract customers who favor sustainable companies and to increase their margin because of it and 4) by complying with SR constraints and monitoring the company usually behaves better overall.

It is difficult to differentiate the truth between these views: in their meta-analysis of 190 SRI performance studies over 35 years (1975-2009), Viviers & Eccles (2012) noted that 56.23 % of those studies indicated no significant difference when comparing SRI mutual funds' performance to non-SRI funds and broad market indices, 23.44 % indicated better performance for SRI funds and 20.31 % indicated worse performance. Although, it is worth noting that most of the studies that indicated underperforming belonged to the earlier section of the timeframe. Not depending on whether the performance of SRI assets actually is better or worse than regular ones, according to Renneboog et al. (2008) the investors would anyway be willing to sacrifice some of the profits to pursue sustainable objectives.

SRI's relation to Circular Economy

The relationship between SRI and Circular Economy is very rarely discussed in the academic literature. SRI by definition strives to achieve sustainable and positive action to society (e.g. Eccles and Viviers 2011; Global Sustainable Investment Alliance 2018) in addition to financial profits, whereas CE is widely seen as a benefactor for sustainability

and especially its environmental dimensions (Geissdoerfer et al. 2017). Thus, they both are strongly connected to the overall concept of sustainability in a positive sense.

Therefore, it could be argued that CE should be a concept in which socially responsible investors would be interested to invest in and that the relationship of CE and SRI would be an interesting research topic. Nonetheless, it seems that there are no published academic research papers about the relationship between SRI and CE. The lack of research on the subject is an interesting gap in academic literature and partially the motivation for this study: as CE is in principle also a financially feasible concept for investors and companies and allows economic growth (Ellen MacArthur Foundation 2013; Hysa et al. 2020; Kirchherr et al. 2017), in addition to its positive effects on environment and sustainability, it would seem to be a good match with Socially Responsible investors.

2.2 Corporate Social Responsibility

Corporate Social Responsibility (CSR) is another well-known and well-researched concept in the field of Sustainable Finance in academic literature. It is closely related to SRI described in the previous chapter and ESG factors in Chapter 2.3.

Definition

Like in the case of SRI, the definitions for the term vary a little and an unambiguous definition adapted widely in the literature does not exist (Dahlsrud 2008; Marrewijk 2003; Rahman 2011), but the key idea behind the concept is relatively uniform. Marrewijk (2003 p. 102) defines CSR as follows: "*company activities—voluntary by definition—demonstrating the inclusion of social and environmental concerns in business operations and in interactions with stakeholders*". In turn, in their literature reviews Rahman (2011 pp. 173–174) and Dahlsrud (2008 p. 5) conclude modern CSR definitions to include dimensions introduced in Table 3:

Table 3. *CSR dimensions by Rahman (2011) and Dahsrud (2008)*

Rahman 2011	Dahlsrud 2008
1. Obligation to the society 2. Stakeholders' involvement 3. Improving the quality of life 4. Economic development 5. Ethical business practice 6. Law abiding 7. Voluntariness 8. Human rights 9. Protection of environment 10. Transparency and accountability	1. The environmental dimension 2. The social dimension 3. The economic dimension 4. The stakeholder dimension 5. The voluntariness dimension

By combining these three definitions, it can be concluded that **CSR integrates environmental, social and governance aspects voluntarily to traditional business operations and a company's overall governance and behavior.** This is very similar to SRI, which integrates ESG factors into investment decision making and analysis.

Relation to other Sustainable Finance concepts

CSR relates very closely to the concept of Corporate Sustainability (CS) and is often used interchangeably with the term (Marrewijk 2003). The lack of clear distinction between the concepts has been confusing for both researchers and practitioners: traditionally the term CSR has been used of mostly social issues, whereas CS has related to environmental issues, but recently the terms have been converging (Montiel 2008). In this study, the term CSR has been used since it seems to be more widely used in sustainable finance literature.

CSR's connection to sustainable finance derives from its connection to Socially Responsible Investing. Sparkes (2002 p. 42) stated that "*CSR and SRI are in essence mirror images of each other*" and that SRI approaches businesses ' responsibility to society from the investor side, whereas CSR's approach originates from the actions of the companies. According to Soppe's (2009) view, sustainable finance is the connection between SRI and CSR. He compares traditional finance and sustainable finance: traditional finance is the connection between the supply of financial products (investors) and the demand for them (companies), whereas sustainable finance is a connection between

supply for sustainable financial products (SRIs) and the demand for them (CSR compliant companies). On the other hand, CSR compliant companies are also on the supply side of the markets: SRI investors are looking for sustainable investment opportunities, and CSR compliant companies are the supply for them. Also, the company does not have to be CSR compliant to begin with: many SRI investors use their voting rights by "shareholder activism" to improve CSR in the company invested in (Sparkes and Cowton 2004).

CSR's connection to ESG factors (which are reviewed next in Chapter 2.3) is very strong: according to Buniamin & Ahmad (2015) the terms CSR and ESG are used interchangeably in many studies (see e.g. De La Cuesta and Valor 2013) and by looking at their definitions used in this study it is noticeable how close they are to each other. CSR is integrating social and environmental aspects into companies' operations, whereas ESG factors are used in measuring those and governmental aspects: it can be argued that ESG factors are one way to categorize issues related to CSR. Also, Buniamin and Ahmad (2015) point out that in many cases when studying a smaller entity within CSR or ESG concepts (e.g. environmental or governance issues) the studies are applicable within the both disciplines and both have often been used as a proxy for the other.

CSR's effect on performance

CSR factors' effects on companies' financial performance and value have been assessed varyingly, similar to SRI assets' performance: some consider it to be additional costs diminishing company's performance (see e.g. Lioui and Sharma 2012), some think that doing well on CSR leads to doing well otherwise on business (see e.g. Brammer and Millington 2008) as well while some think that the effect is neutral (see e.g. McWilliams and Siegel 2000). This variance in results about performance was also discussed by Brammer & Millington (2008), who account for the variance to varying conceptualizations of CSR, varying measures of CSR, varying measures of financial performance and different timeframes across the studies.

A debate closely related to questions whether a company should focus on CSR and whether it is financially profitable to do so is about company's purpose, introduced by for example Renneboog et al. (2008) and Marrewijk (2003). By the traditional view introduced by Friedman (1970), a company's purpose is to gain and maximize value for its *shareholders*, but by being CSR compliant a company focuses on maximizing value for its *stakeholders*, a concept formulated by Freeman (1984). Stakeholders include, for example, employees, customers, local communities and the environment in addition to shareholders. It is highly likely that companies must adapt CSR values increasingly in

the future if they have not done it already. For example in Germany, the legislation requires companies to take all their stakeholders into account (Allen et al. 2007) and by following continuous news about companies responding to the public's accusations of racism, pollution, irresponsible handling of customers' personal data etc. it is easy to claim that demand for companies' social responsibility is not going to decrease. Therefore, it is easy to agree with Brammer & Millington's (2008) and Allen et al.'s (2007) view on CSR's and stakeholder orientation's value to the company: being a better CSR performer and stakeholder-oriented company often means performing better financially in the long run.

CSR's relation to Circular Economy

In academic literature, CSR and Circular Economy are relatively rarely discussed together, despite the seemingly similar and strong connection to environmental issues and sustainability of them both. To recap, by CSR's definition one of its most important dimensions is the environmental one (Dahlsrud 2008; Rahman 2011), whereas CE is widely seen as a benefactor to sustainability and its environmental dimensions (Geissdoerfer et al. 2017). Still, it seems that there has been little academic literature published dedicated merely to CSR's and CE's relationship, although some mentions together do exist.

For example Oncioiu et al. (2018) have connected CSR and CE together and trivially see that environmental and economic dimensions of sustainability belong to Circular Economy and that CSR is the component of sustainable development through which sustainability links to Circular Economy. A similar conceptual model was used by Daú et al. (2019), who saw CSR as an enabler in Circular Economy transformations in their study of health care supply chains, in addition to necessary technological enablers. Esken et al. (2018) state that CE is a more holistic and specific form of CSR and that CSR concerns more strategic level of operations. Also Agyemang et al. (2019) and De Mattos & De Albuquerque (2018) perceive CSR to be a driver for CE, but do not elaborate further on why that is. The idea behind Oncioiu et al. (2018), Daú et al. (2019) and Esken et al. (2018) is quite straightforward: sustainability is a high-level strategic concept that is pursued in companies, and CE is an operational level tool that benefits sustainability and its environmental dimensions. **CSR, in turn, combines the two: it is a concept within which CE can be used to pursue overall sustainability in companies.** Thus, it is important to acknowledge that CE could be very attractive and feasible concept for companies pursuing better overall CSR performance.

2.3 Environmental, Social and Governance factors

Taking *Environmental, Social and Governance* (ESG) factors into account when making financial decisions is another well-known concept related closely to sustainable finance, SRI and CSR. It was introduced in a large scale first by United Nations Global Compact Initiative in 2004 in their report "Who Cares Wins" (Knoepfel 2004), written in cooperation with 23 large, global financial institutions and Swiss government. Together with United Nations Environment Programme Finance Initiative the initiatives formed Principles of Responsible Investment in 2006 (Kell 2018; Schaefer 2012; United Nations Environment Programme Finance Initiative 2020). It is an independent (yet strongly in cooperation with UN) organization which works to understand the implications of ESG issues on investment and support its international investor network in incorporating these issues in their operations (Principles of Responsible Investment 2020). Nowadays the PRI's signee network consists of half of world's institutional investors with $83 trillion assets under management (United Nations Environment Programme Finance Initiative 2020), being arguably amongst the most used sustainable investment tools by practitioners, if not the most.

Definition

Despite ESG being a very known and relatively established concept, there is no widely accepted, uniform framework or view neither in academia nor in practice of what exactly is included in the three pillars of ESG (Eccles and Stroehle 2018). But, as relevant ESG issues differ largely depending on the company and the environment it operates in (Knoepfel 2004), it might not be possible or even necessary to create one omnipotent framework applicable for all markets and companies in the world. In Table 4 there are some examples of different ESG issues by their pillar.

Table 4. *Examples of ESG issues (adapted from Knoepfel 2004; World Federation of Exchanges 2018)*

Environmental	**Social**	**Governance**
Climate Change	Workplace health & safety	Board structure & accountability
Toxic waste reduction	Employee turnover	
Emissions	Injury rate	Accounting & disclosure practices
Energy Usage, Intensity & Mix	Community relations	Data privacy
Water Usage	Human rights issues in the company & its supply chain	Management of corruption & bribery issues

Instead of widely accepted frameworks, there are a lot of different NGOs and ESG data vendors that all have their own views on what is included in ESG factors and how are they measured. This is problematic since the different frameworks and measurement procedures lead to different evaluations on ESG matters on the same companies, which confuses investors and therefore makes sustainable investment decisions more complicated (Eccles and Stroehle 2018). In this study, the primary focus is on Circular Economy, from the viewpoint of which mainly environmental pillar of sustainability and ESG is concerned. Therefore, there was no need to conceptualize or categorize ESG factors further than to conclude that **ESG factors are a categorization of sustainability issues (to Environmental, Social and Governance issues) that are reviewed when making investment decisions.**

ESG in practice

In practice, ESG factors are applied in investment decision making in many ways. According to van Duuren et al. (2016), there are 5 main strategies of incorporating ESG values and information in investing: **1) negative screening**, meaning excluding particular companies or industries, **2) positive screening**, meaning selecting particular companies based on superior ESG performance, **3) best-in-class investing,** meaning selecting e.g. the best 25 % ESG rated companies of particular industries, **4) activism**, meaning e.g. filing petitions and voting on annual general meetings of shareholders and **5) engagement**, meaning meeting and trying to influence the board and other stakeholders within a company to pursue better performance on ESG issues.

As can be noticed, the 5 main strategies of ESG factor incorporation introduced by van Duuren et al. (2016) are very similar to 7 strategies of Socially Responsible Investing by GSIA (2018) introduced in Chapter 2.1. Also, the definitions of both SRI and ESG investing are not explicitly defined and established throughout academic and practitioner universe and they have been used interchangeably. Therefore, it is a matter of preference if they are considered the same or a different concept. But, by comparing the strategies and the definitions for SRI by GSIA (2018) and for ESG by van Duuren et al. (2016), it can be noticed that ESG integration is included as one of the 7 strategy groups of SRI and that SRI is a larger concept overall. Thus, ESG is viewed as a concept included in SRI, and not as a synonym of it. In this literature review, they are viewed as separate concepts according to what is presented in original media of information, while acknowledging they overlap on some amount in practice and in academia.

When reviewing how do different kinds of investors use these strategies and incorporate ESG factors in their decision making, some insights have emerged. In their study, van

Duuren et al. (2016) studied how conventional (i.e. not green, ESG etc. concentrated fund) fund asset managers (who can be interpreted as a quite typical professional investor) account for ESG factors in their investment process. They found that 92 % of asset managers surveyed (n=126) had already incorporated ESG information in their investment process. The finding supports the view of UNEP FI and PRI (2020; 2020) presented earlier in this chapter, who claim that half of professional investors in the world are committed to Principles of Responsible Investment and therefore to incorporating ESG factors in investment decisions. Van Duuren et al. (2016) also found that ESG analysis was conducted mostly on company level (versus sector and country-level) and the most used strategy was negative screening (i.e. the exclusion of companies performing poorly on ESG issues), although ESG information was considered overall in more holistic terms than just exclusions. Also, it was found that professional investors emphasize governance factors over environmental and social ones.

When comparing to a similar analysis of retail investors (also known as individual investors) executed by Berry & Junkus (2013), there are some similarities and some differences between professional and retail investors' habits of incorporating ESG issues in investment decision making. Like professional investors, also retail investors like to take a more holistic approach to companies and assess them on their overall ESG performance, rather than on single misconducts. Also, investors appreciated doing positive actions more than not doing negative actions: companies that were doing positive things on ESG issues were ranked higher than companies avoiding doing negative things. The most significant difference between retail and professional investors was their different emphases on ESG pillars: retail investors were most concerned with environmental issues, whereas professional investors thought that governance issues are the most relevant ones.

ESG's effect on performance

The question of performance of ESG investing seems very similar to SRI investing: as mentioned earlier, SRI investing is by definition integrating ESG factors in investment decision making. Nevertheless, there are a great number of studies about SRI's performance (see e.g. Viviers and Eccles 2012, who studied 190 studies on SRI asset performance) and relation of company's performance in ESG matters to company financial performance (see e.g. Friede et al. 2015, who studied 60 review studies, combining over 2200 empirical ESG studies in total) separately. Although Friede et al.'s study uses SRI assets' performance as one of the 7 proxies representing company financial performance, they pointed out that reviews studying SRI assets' performance differed significantly from studies using some of the other 6 proxies and must be treated as a separate

group. Therefore, the studies and the disciplines of SRI investing and ESG factors' relation to company performance can be interpreted to study different enough topics overall to allow separate examination.

As a result, Friede et al. (2015) found that especially company-focused empiric ESG-studies suggested positive relation of ESG performance and company financial performance. This would support the "doing well by doing good"-perspective of SRI and ESG investing. They also pointed out that any single factor of environmental, social or governance or any category within them did not correlate significantly better with company financial performance than the others: overall ESG performance seemed to matter more. So, this results in that previously discussed investing emphases of retail investors on environmental factors (Berry and Junkus 2013) and of professional investors on governance factors (van Duuren et al. 2016) is not justifiable by investment performance to either direction, at least according to Friede et al. (2015).

Also, it was noticed how the reviews of portfolio studies reported an abnormally low level of positive findings compared to reviews of company-level studies. In other words, the studies like Viviers & Eccles' (2012) which reviewed SRI assets' performance reported lower performance than studies assessing ESG factors' effects on single companies. 56.7 % of a total of 568 non-portfolio studies yielded positive results, whereas only 15.5 % of 155 portfolio studies did the same. The rest of the result distribution is as follows: of non-portfolio studies, 5.8 % was negative, 18.8 % neutral and 18.7 % mixed. Of portfolio studies, 11.0 % was negative, 36.1 % was neutral and 37.4 % was mixed. Friede et al. (2015) reason that the diversification of the portfolios and management fees of the mutual funds hide the positive effects of ESG, which is important to acknowledge when reviewing portfolio studies. As authors also mention and what is clear to common sense, it is important for diffusion of sustainable investing principles and sustainable practices in companies that investors and managers are not falsely assuming negative relation between performing well on ESG matters and performing well financially. Even if the investors would be willing to pay some premium (Renneboog et al. 2008) to pursue sustainable objectives, companies and investments have to be in principle also financially profitable. If there is no or even positive difference in profitability when favoring sustainable options, there should be no reason to choose the sustainably inferior option, which would lead to more sustainable choices.

Relation to Circular Economy

In general, Circular Economy can be seen as a promotional concept to ESG factors, and vice versa, although they are not commonly used together in research papers or other

documents. But, for example, world-leading financial data vendor MSCI classifies their circular economy index as an ESG related index: the name of the index is “MSCI World Select ESG Circular Economy and Renewable Energy Index” (MSCI 2019). Also, when BlackRock announced their Circular Economy fund, it was reported in the media under ESG themed news (Bowman 2019). It could be argued that the lack of comparison of the concepts in the academic literature derives from differing use purposes: ESG issues and frameworks are commonly used by finance industry (practitioners), who pursue to assess the overall quality of companies sustainability issues, whereas Circular Economy relates strongly to companies everyday operations. So, one could argue that the distance between the concepts is so long that academic, conceptual encounter has not yet happened.

Even though the relationship between ESG and CE has not (at least yet) been properly reviewed academically, CE’s and ESG’s natures as drivers for sustainability makes it important to review the most practitioner-used, sustainability-related concept in the finance industry when studying financing of CE. There could be a great opportunity for CE companies if the relationship would be reviewed more in detail: as there is a lot of financiers’ attention directed to ESG issues, shifting that attention even a little bit towards CE might draw a lot of capital in transition to more circular society.

2.4 Circular Economy and Finance

In this chapter, first the current state of research regarding CE, finance and sustainable finance is reviewed. Then, the objective of the literature review is introduced, the articles included in the review are summarized in a table and its findings are discussed on a general level. Lastly, the themes emerging from the literature review are identified and discussed more in detail.

2.4.1 Overview

As concepts of CE and sustainable finance have lately received a great amount of attention separately by both scholars and practitioners, it is remarkable how little academic research has been focused on the subjects together. The same applies to overall financing CE, without having the emphasis of sustainability in finance. The finance industry has made a great effort to pursue sustainable values, having $30.7 trillion in assets under management in the beginning of 2018 by one or multiple sustainable investment strategies, and the amount is growing (Global Sustainable Investment Alliance 2018). The role of the finance industry in sustainability transition is indirect but crucial because of its strong influence in institutions being financed (Weber et al. 2014). CE, on the other hand,

is seen by scholars as a beneficial driver or even a necessary condition for sustainability (Geissdoerfer et al. 2017). The connection of sustainability, finance and investment is still an interesting topic for scholars (Carolina Rezende de Carvalho Ferreira et al. 2016) and has been one for a long time (Viviers and Eccles 2012). Finance and different financial aspects have also been noted as a significant barrier in implementing and maintaining CE principles (e.g. Fischer and Pascucci 2017; Ormazabal et al. 2018; Rizos et al. 2016) but without further clarification. Despite all attention towards the topics conceptually very near each other, there is clearly a gap in the academic literature about how finance and CE affect one another.

Circular Economy and Finance in the academic literature

The aim of this section of the literature review was 1) to gain insights and knowledge of existing academic and practitioner literature regarding topics of how CE and finance have been depicted together and how CE and finance affect each other and 2) to build an initial theoretical framework to address the research questions of this study. Towards this end, the relevant literature was searched and analyzed, focusing especially on their findings of financial drivers and barriers regarding transitioning to and operating by CE principles. The articles included in this part of the literature review and their findings are summarized in Table 5. Most of the articles, 18 of the total of 25, are reviewing barriers and drivers of CE as a whole, usually from the perspective of a specific focus area, such as industry or market area. Other article types included in the review are finance and CE-dedicated articles, finance and CE-dedicated forum articles, finance and Eco-Innovation-dedicated articles and market review from CE point of view. Since the relationship between CE and finance is scarcely researched academically, the selection was done solely on a basis that the selected articles had some insights that could be interpreted as discussion of financial drivers or barriers of CE.

Table 5. *Articles of the literature review and their findings of financial barriers or drivers of CE*

Author(s), year	Research Type	Research Context	Financial barriers of CE	Financial drivers of CE
Ghisetti & Montresor, 2020	Finance and CE-dedicated	Empirical survey study of 2318 cross-sectional European SMEs	Crowding out effect: riskier financial sources such as VCs and business angles seem to divert companies from CE activities to other activities. Certain CE business models include "circular" risk, which can be unpleasant for external financiers.	Direct support of policymakers is crucial for promotion of CE. All self-, public and debt financing is important for SMEs approaching CEBMs. Larger size and older age appear positively correlated with adoption of CE practices.
Aranda-Uson et al., 2019	Finance and CE-dedicated	Empirical survey study (PLS-SEM model) applied to 87 Spanish companies	N/A	The quality, availability and low cost of financial resources are positively related to level of CE and investments to it. The availability of public funds and subsidies is important for environmental R&D projects and therefore CE.
Aboulamer et al., 2020	Finance and CE-dedicated / Forum Article	Conceptual / practitioner paper	Traditional financial valuation cannot take CE into account: intangible assets such as processes, trust and reliability cannot serve as collaterals. Private capital doesn't understand value of circular business models.	New kinds of investors: the demand for CE principles grows as young millennials turn into largest group of investors and other stakeholders. Also other private investors who see the value of CE business models, beyond traditional valuation models.
Dewick et al., 2020	Finance and CE-dedicated / Forum Article	Conceptual / practitioner paper	Contestable understanding of concepts, inadequate information and fuzzy indicators. Inadequate private & public investing so far, although progress done on this account.	Private investors starting new funds and therefore leading by example and spreading awareness.
Scarpellini et al., 2018	Finance and Eco-Innovation-dedicated	Empirical survey study (PLS-SEM model) applied to 87 Spanish companies	N/A	Eco-innovative investments require adequate financial resources in terms of quantity, quality, typology and availability to be viable. Public financial incentives also emphasized.
Russell et al., 2020	Barriers of CE	Empirical multi-case analysis of 12 bottom-up CE initiatives in Amsterdam and Rotterdam	Lack of external financial support, especially in the later stages of implementation. High upfront investment costs, in the early stages of implementation.	External financial support, especially in the early stages of implementation. The promise of a win-win situation, both environment- and economic-wise, and profitability of the CE initiative, especially in the later stages of implementation.

Jia et al., 2020	Barriers of CE	Literature review	Financial constraints are the main obstacles in Reverse Logistics projects: IT and technology systems need a lot of working capital, cost concerns are a significant challenge for business recovery and infrastructure requires big investments.	N/A
Demirel & Danisman, 2019	Barriers of CE	Empirical survey study of 5100 European SMEs	Investment threshold to circular EI is very high (10% of rev.) for SMEs to gain economic growth returns. Current policies (among them the financial ones), grants and funding for driving CE are not sufficient.	Sufficient policy interventions in the form of demand (e.g. standards, taxes) and supply (e.g. tax credits, grants, loans to support CE) side.
Garcés-Ayerbe et al., 2019	Barriers of CE	Empirical survey study of 10618 European SMEs	Survey: Companies undertaking CE activities: 22.92% of them had issues in accessing finance (3rd highest barrier). Companies who deciced not to undertake CE activities: 21.98% had issues in accessing finance (2nd), 21.55% had no clear idea about investment (3rd) required.	N/A
Caldera et al., 2019	Barriers of CE	Empirical interview study of 20 Australian manufacturing SMEs	Lack of financial resources as one of two major barriers: the absence of immediate quantifiable benefits, large capital costs and diminishing sales from price premium of green product make investment unattractive.	N/A
Agyemang et al., 2019	Barriers of CE	Empirical study involving both survey and interview methods of Pakistan's automobile industry	Cost and financial constraints mentioned as barriers by 20% of respondents: too sizable and uncertain initial investments. Also lack of financial resources, access to capital and availability of public funds for CE transformation seen unavailable, scarce and inaccessible.	N/A
Hart et al., 2019	Barriers of CE	Literature review concerning built environment	High upfront investment costs, low virgin material prices, poor business cases and limited funding.	Whole Life Costing and new valuation techniques. Fragmented approach in investments.
Kiefer et al., 2019	Barriers of CE	Empirical survey study of 430 persons in Spanish industrial SMEs	Higher liquidity and current ratios might lead to lock-in of past success, which leads to lower probability to adopt or develop radical EIs i.e. do radical changes to operations.	Internal financial sources are drivers for systemic and radical EIs (comparing to external financing, such as debt or equity).

Jesus & Mendonca, 2018	Barriers of CE	Literature review	Academic literature: High upfront investment costs, high initial costs and market uncertainty limit new investments, large capital requirements, significant transaction costs, high initial costs, uncertain return and profit. Grey literature: cost of developing and implementing innovations, overcoming linear economic lock-ins.	Marketplace-originated drivers could change the perception of the environment from a source of costs to business opportunities. New financial tools i.e. green financial innovation.
Ormazabal et al., 2018	Barriers of CE	Empirical survey study of 95 northern Spanish SMEs	Lack of financial resources and financial support (from public organizations) seen as critical barriers.	N/A
Kirchherr et al., 2018	Barriers of CE	Empirical study of 208 survey respondents and 47 expert interviews in EU	High upfront investment costs as the 5th most pressing barrier, which is speculated to originate from hesitant company culture. Limited funding for circular business models as the 10th most pressing barrier.	Public financial support and government intervention mentioned as an important driver to overcome barriers of high upfront investment costs and low virgin material costs, making CE investments more attractive.
Govindan & Hasanagic, 2018	Barriers of CE	Literature review from supply chain perspective	Weak economic incentives, major upfront investment costs for implementing CE, high short-term costs and low short-term benefits.	The role of government underlined as an important driver for overcoming upfront investment costs for the companies.
Fischer & Pascucci, 2017	Barriers of CE	Empirical multi-case analysis of 7 actors in Dutch textile industry	In PaaS business model, the assets stay on companies' balance sheets and growing amount of working capital is needed and small-scale entrepreneurs do not have sufficient resources for that. Also, banks evaluate loan applicants using traditional linear economy metrics, which are not favorable for companies using CE business models.	A new "dynamic earning model" is suggested to share risks and revenues of CE business, although juridical obstacles still on the way.
Masi et al., 2017	Barriers of CE	Literature review of meso-level supply chain configurations	Significant up-front investments and lack of access to funding brought up as barriers. Also managerial support for CE initiatives and lack of environmental awareness of managers mentioned as a barrier for investments.	Mix of non-market subsidies and preferential taxes mentioned as inhibitators for CE supply chains.
Moktadir et al., 2017	Barriers of CE	Empirical multi-case study of 2 companies in Bangladesh leather industry	N/A	Funding from government brought up as a part of governmental support: to ensure proper sustainable manufacturing practices government is pressured to fund for smooth implementation.

Rizos et al., 2016	Barriers of CE	Empirical multi-case study of 30 companies from EU participating in a GreenEcoNet online platform	Lack of capital cited as a barrier in 50% of the samples: lack of initial capital, lack of financial opportunities or alternatives to private funds and traditional bank funding referred. 20% of the SMEs report difficulties in getting traditional bank funding for green investments, since they are not thoroughly understood by bankers. Lack of governmental support also mentioned as a barrier.	N/A
van Buren et al., 2016	Barriers of CE	Empirical case study of Dutch logistics industry	Lack of investment power: businesses operating in circular business models require relatively high investments in the short term, while the benefits realize in the long term. Also, investments and profits are unevenly distributed in larger networks.	N/A
Rizos et al., 2015	Barriers of CE	Empirical multi-case study of 2 companies from EU participating in a GreenEcoNet online platform	Financial barrier seen as a critical barrier for SMEs. SMEs and especially young businesses face difficulties in obtaining collaterals for bank financing. Banks consider SME financing a risky investment.	Governmental financial support and access to finance and funding seen as a significant driver for SMEs to implement green practices and/or innovation.
Su et al. , 2013	Barriers of CE	Literature review of Chinese national CE transformation	Insufficient financial support from banks and inadequate public tax incentives prevent enterprises from innovating more environmentally friendly technologies.	China’s government should promote economic incentives to stimulate the principles of the CE. E.g. pricing reforms, and preferential tax policies, environmental taxes, insurance for liability resulting from environmental damage, cap and trade system, and environmental labeling.
Oncioiu et al., 2018	Market review from CE POV	Empirical survey study of 384 Romanian SMEs	Low level of future investments due to SMEs' small turnover.	N/A

Existing peer-reviewed empirical academic literature of CE and finance together, as far as we are aware of, is limited to only 2 articles: the pieces of Aranda-Usón et al. (2019) and Ghisetti & Montresor (2020). Aranda-Usón et al.'s (2019) article is a micro-level review of the characteristics of financial resources applied by companies to introduce circular principles in business: the quality, the availability and the source of resources and the division of the resources to different activities. Ghisetti & Montresor's (2020) article is also a micro-level analysis, investigating the extent to which the adoption of CE practices by SMEs affects the choices they make in their financing, concentrating mostly on the sources of finance, such as self-, public and debt financing. As can be noted, the articles are very recently published, underlining the novelty of the subject. Both articles also point out the lack of research in the areas of CE and finance and therefore strengthen the presumption of the research gap addressed in this study.

In this literature review, also 2 forum articles dedicated to the relationship between CE and finance were discovered from peer-reviewed journals. In this study the name "forum article" is used of papers published in peer-reviewed and merited academic journals (in this case, Journal of Industrial Ecology and Thunderbird International Business Review) but which are not compliant with the basic structure and requirements of an academic, empiric research paper. For example, they do not have sections on methodology, results and conclusions etc. and are written in the form of practitioner literature. Nevertheless, they were included in this literature review because of the valuable insight they offered, while acknowledging that they are not peer-reviewed academic articles.

The forum articles of Dewick et al. (2020) and Aboulamer et al. (2020), opposingly to the empirical articles introduced in the previous chapter, concentrate on the macro-level ideas and illustrations on how to finance the transition to Circular Economy. Dewick et al.'s (2020) article reviews CE as a concept from financial point of view and what kind of barriers CE as a concept has before changes in investing in it in large scale could happen. Aboulamer et al.'s (2020) article in turn reviews how capitalism as an economic model can or cannot support the transition to Circular Economy. They also examine how traditional financial market theory and investor theory applies to CE business models, especially from the viewpoint of valuation and value creation.

While there has been little academic research dedicated to CE and finance together, financial topics have been very frequently mentioned in articles examining barriers and drivers of CE and its implementation in general. For the sake of clarity, articles' homogeneous nature and their usual interpretation of finance as a barrier of CE, they are called

barriers of CE-articles in this study. All 19 barriers of CE-articles and summaries of their findings of specifically financial barriers and drivers are introduced in Table 5. The findings are reviewed more in detail later in this chapter, but mostly they describe financial aspects as barriers or difficult things for CE companies, and financial drivers are usually tools or other ways to overcome the mentioned barriers and not so much individual drivers.

In this literature review and in Table 5, there is also one article including a market review from CE point of view (Oncioiu et al. 2018) and one article about the connection between finance and eco-innovations (Scarpellini et al. 2018). These articles were included in the review as well since they contained insights about the relationship between finance and CE and what financial barriers to CE exist and therefore contributed towards the aim of the review.

CE in itself has been a widely practitioner-led conceptual area of research (Korhonen et al. 2018) and the connection between finance and CE is not an exception to this. For example, Ellen MacArthur Foundation (2013) and a multidisciplinary working group of e.g. financiers and academics, FinanCE (2016), have studied how CE and finance affect each other and especially the latter report is very comprehensive by its nature. However, since practitioner literature is not peer-reviewed academical knowledge, it was not included in the literature review and it is instead examined more in detail in the empirical part of this study, as a part of the data set.

2.4.2 Financial factors emerging from the literature review

In the literature review, multiple themes related to CE business and business in general emerged that affect CE companies' financing and funding. The most influential aspects seem to be company size's effect on especially external financiers, high upfront investment costs demanded by CE transformation, circular business models and their capital funding, the role of public financial incentives and support in CE transformation, and valuation and profitability of Circular Business and Circular Business Models. Themes and their key insights are also summarized below in Figure 2 in Chapter 2.5.

Company size's effect on financing was mentioned having an effect on companies' financing multiple times (Caldera et al. 2019; Demirel and Danisman 2019; Ghisetti and Montresor 2020; Oncioiu et al. 2018; Ormazabal et al. 2018; Rizos et al. 2015, 2016). Generally, SMEs were interpreted to have more difficulties in financing their transformation to and operating by CE principles than larger companies. As Ghisetti & Montresor (2020) mention, this is not a problem related to only CE companies: SMEs are generally more constrained financially than larger companies, no matter how they operate (Beck

and Demirguc-kunt 2006). Nevertheless, it is an aspect that is important to assess because of for example 99 % of European companies are SMEs (European Commission 2011) and therefore they have a great impact on sustainability transformation. As said, they also have the most difficulties with financial barriers. Thus, it is important to review what aspects regarding their size makes finance a barrier for CE and how they could be overcome.

It seems that one reason for financing to be more difficult for SMEs than large companies is because the investments and efforts required by CE transformation are more significant to them than large companies. For example, Ghisetti & Montresor (2020) note that the upfront cost of investments and delayed payback periods of business models like Product-as-a-service burden smaller companies more than large ones because of their sensitivity to extra costs. Demirel & Danisman (2019) underline the same: according to them, the investment threshold for circular innovations can be even 10 % of revenues for SMEs, whereas for larger companies the costs are not as significant.

Another reason for smaller companies' difficulties in finding financing is their difficulties in applying for traditional financing. SMEs, especially younger ones, find it difficult to obtain the high collaterals required for bank financing (Ghisetti and Montresor 2020; Rizos et al. 2015). The issue is also not specific to CE SMEs and instead applies to all kinds of SMEs: both Ghisetti & Montresor (2020) and Rizos et al. (2015) base their claims on works of Hyz (2011) and Müller and Tunçer (2013), who both examine SMEs in general. But, evidence of the phenomenon's applicability to CE companies has been acquired also empirically: in the survey conducted by Rizos et al. (2016), more than 20 % of SMEs reported difficulties in applying for traditional bank financing.

Also, another mentioned reason for difficulties in financing deriving from the smallness of companies is the lack of management's and staff's time and understanding in applying for governmental or EU grants and/or other subsidies (Ghisetti and Montresor 2020; Rizos et al. 2015, 2016). Like other reasons introduced previously, this is also not a CE-specific cause for difficulties but applies for CE-companies as well.

High upfront investment costs were perhaps the most often cited financial barrier of CE in the literature (Agyemang et al. 2019; van Buren et al. 2016; Demirel and Danisman 2019; Govindan and Hasanagic 2018; Hart et al. 2018; Jesus and Mendonca 2018; Jia et al. 2020; Kirchherr et al. 2018; Masi et al. 2017; Russell et al. 2020). To conclude the findings, the financial resources needed for investments in especially the initial stages of CE transformation and implementation are both uncertain and sizable, which were considered as barriers for CE transformation. Also, the uncertainty of the future income cash

flows and immediate quantifiable financial benefits made the upfront investment costs seem even more unappealing for companies, since the profitability of the investment was unclear (Hart et al. 2018; Russell et al. 2020). The profitability and feasibility of general business case of investment also affected external financing, in addition to company's own investment decision: with worse profitability, it was more difficult to attract external financing for investments (Russell et al. 2020).

Investments are in many cases targeted to the technology required by CE principles (Jia et al. 2020; Masi et al. 2017), supporting infrastructure and processes for CE such as reverse logistics (van Buren et al. 2016; Hart et al. 2018; Jia et al. 2020), implementation of circular business models (Kirchherr et al. 2018) and circular innovation activities (Jesus and Mendonca 2018), amongst other changes in the organization. One explanation for the need for the large investments is that the operations of the company have been originally built with linear economical thinking instead of circular (i.e. linear economy lock-in), and therefore the scale of the CE investment projects is abnormally large (Agyemang et al. 2019; Jesus and Mendonca 2018; Kirchherr et al. 2018; Rizos et al. 2015).

Related to the issue of high upfront investment costs, Kirchherr et al.'s (2018) speculate with an idea that the management's perception of high investment costs demanded by CE might actually be derived from hesitant company culture. They bring up the possibility that for many managers who doubt the profitability and overall feasibility of CE business models, the seemingly rational excuse of CE investments being too expensive is an easy way to justify shooting down CE initiatives. Also Masi et al. (2017) mention managerial support for CE investments as a significant driver for CE initiatives. Therefore, at least on some occasions, it can be questioned if high upfront investment costs are truly as big a problem as it has been implied in the literature. But despite the possible impact of managers' doubts about CE, the upfront investment costs are still a significant barrier to overcome in CE transformation.

Circular business models' capital funding was also mentioned multiple times in the literature (Fischer and Pascucci 2017; Ghisetti and Montresor 2020; Kirchherr et al. 2018; Russell et al. 2020). As Ghisetti and Montresor (2020) mention, different kinds of circular business models are different in the terms of risk and therefore a singular and detailed best way to finance different business models cannot be found. Nevertheless, circular business models have been discussed together in the literature, as they do have enough common principles to be addressed together in the general level. To combine

the views of the previous studies, circular business models were seen as capital-intensive business models with long payback times and high and unfamiliar risks and therefore they were perceived as mostly barriers of CE.

For example, Product-as-a-Service (PaaS) business models have been described as an example of a business model that requires a lot of capital to get started and to maintain (Fischer and Pascucci 2017). In PaaS business models, the assets to be leased have to be acquired in advance to their lease periods, but the income is not immediate since the asset is not sold but leased. Therefore, the assets burden PaaS-company's balance sheet for their whole lifecycle, which leads to a substantial need for working capital, especially when compared to linear business models.

The role of public financial incentives and support was another aspect that was mentioned as an important factor in CE transformation (Aranda-Usón et al. 2019; Demirel and Danisman 2019; Govindan and Hasanagic 2018; Kirchherr et al. 2018; Masi et al. 2017; Moktadir et al. 2018; Rizos et al. 2015, 2016; Scarpellini et al. 2018; Su et al. 2013). Not surprisingly, most scholars found that the availability and the amount of public financial incentives for CE purposes had a positive effect on companies' funding of CE activities. Respectively, lack of financial subsidies was mentioned as a barrier in some studies (Agyemang et al. 2019; Demirel and Danisman 2019; Su et al. 2013). To combine these two views, it can be concluded that public financial incentives are very important for CE transformation, if not a necessary condition for it, especially in the large scale.

The types of different public financial subsidies naturally depend greatly on the country of operation, but Demirel and Danisman (2019) summarized a few general examples and divided them into supply and demand-side policies. Supply-side policies include for example tax credits, grants and loans to support CE, whereas demand-side policies include environmental standards and laws and taxes, amongst other similar tools. The origins of subsidies also vary depending on the origin country of the company and naturally the company itself: in the study of Spanish SMEs Aranda-Usón et al. (2019) found that 75 % of the subsidies were originated from regional administration and national government, whereas local administration and EU originated a total of 7.8 % of subsidies (the other sources were not elaborated further).

Public subsidies can be targeted for many purposes: for example, Govindan and Hasanagic (2018) and Kirchherr et al. (2018) describe public financial incentives as an effective means to overcome the barrier of high upfront investment costs required by the CE transformation. Scarpellini et al. (2018) and Demirel and Danisman (2019) in turn highlight the role of public financial subsidies in companies' eco-innovation activities,

which relates directly to the amount and quality of their circular innovations. Kirchherr et al. (2018) mentions them also as a way to overcome lower virgin material prices and to make CE economically viable. In these and in other purposes, it can be argued that the need for public subsidies derives from the need to diminish the risks of CE transformation: they offer support to the uncertain stages of CE implementation (Russell et al. 2020) and contribute to the (in many cases doubtful) profitability of the CE initiatives (Hart et al. 2018; Russell et al. 2020).

Some studies indicated that the role of public financial subsidies and support would be greater for SMEs due to their nature as more financially constrained companies than larger ones (Ormazabal et al. 2018; Rizos et al. 2015, 2016). Although, the CE initiatives would naturally be overall more feasible in the terms of risk and profitability also in the larger companies if they had public financial support at their disposal.

Valuation and profitability of Circular Business and Circular Business Models were also mentioned as a financial barrier to the circular economy, especially in the cases of making investment decisions and when attracting external financing (Aboulamer et al. 2020; Fischer and Pascucci 2017; Ghisetti and Montresor 2020; Rizos et al. 2016; Russell et al. 2020). As previously mentioned in the sections about high upfront investment costs and public financial subsidies, the profitability of the CE business initiatives is in many cases uncertain, realizes in a long period of time or is even known beforehand to be nonexistent (e.g. Govindan and Hasanagic 2018; Jesus and Mendonca 2018; Russell et al. 2020). This is naturally in conflict with the basic principles of making investments: investment should be in some way financially viable for it to be an investment worth making. Therefore, making investments in CE strictly based on financial profit might not always be viable without financial subsidies or other measures of value for investment.

In addition to the known uncertainty of CE business making it more difficult and costly to finance CE, it has been presented that traditional business and investment valuation models are not fit in valuing Circular business. It has been claimed that they are built to assess the value of linear business: they do not take certain intangible circular assets into account, such as company's processes, trust between the company and its customers and the reliability of the company's business model (Aboulamer et al. 2020) and they can't assess "circular risk" (i.e. risks that derive from Circular Business Models) properly (Ghisetti and Montresor 2020). As these intangible assets may contribute to most of the value and these "circular risks" to most of the risk of circular business or company, by using traditional financial models these businesses cannot be valued truly.

Another valuation-related insight that has come up as a barrier for valuing CE properly is the novelty of the business models. Aboulamer et al. (2020) present that investors require a track record for business models to reveal business models' actual quality, ability to create value and potential issues in practice. They claim that circular business models lack the longevity of proven business models, and as they are considered riskier than traditional business models, it translates into a higher cost of capital and negative financing decisions for CE companies. They also bring up that it would help if some larger companies would adopt circular business models successfully and therefore show example of business models' effectiveness. Also Rizos et al. (2016) and Fischer and Pascucci (2017) present the same idea, without elaborating as far as Aboulamer et al. (2020): bankers are doubtful in granting financing to business models that have not been proven by a successful example. Moreover, the outdated valuation models have been associated with more traditional financiers such as banks: financiers from the private markets such as venture capitals and private equity companies are allegedly better equipped to understand the potential of circular business models (Aboulamer et al. 2020).

2.5 Synopsis of the literature

Towards answering the two aims of this study (i.e. recognizing the financial factors affecting transitioning to and operating by CE principles and affecting CE business's and CE companies attractiveness as investments) considering the answers that are identified specifically in the academic literature, a literature review of relevant academic research areas was conducted. The review consisted of two major approach angles to literature: how CE and sustainability is approached in the finance & investing literature (Chapters 2.1, 2.2 and 2.3), and how finance and investors are approached in the CE literature (Chapter 2.4).

To summarize the insights from academic literature found related to sustainability, Circular Economy and finance, the five factors illustrated in Figure 2 were brought up. In the figure, there is also a more detailed description of the mechanisms behind the factors per each factor, as recognized in the literature. Although it can be argued that some of the factors were brought up more frequently and as more significant than others, the factors are not in any specific order, as there is neither basis systematic enough nor the need for arranging them further at this point of the study.

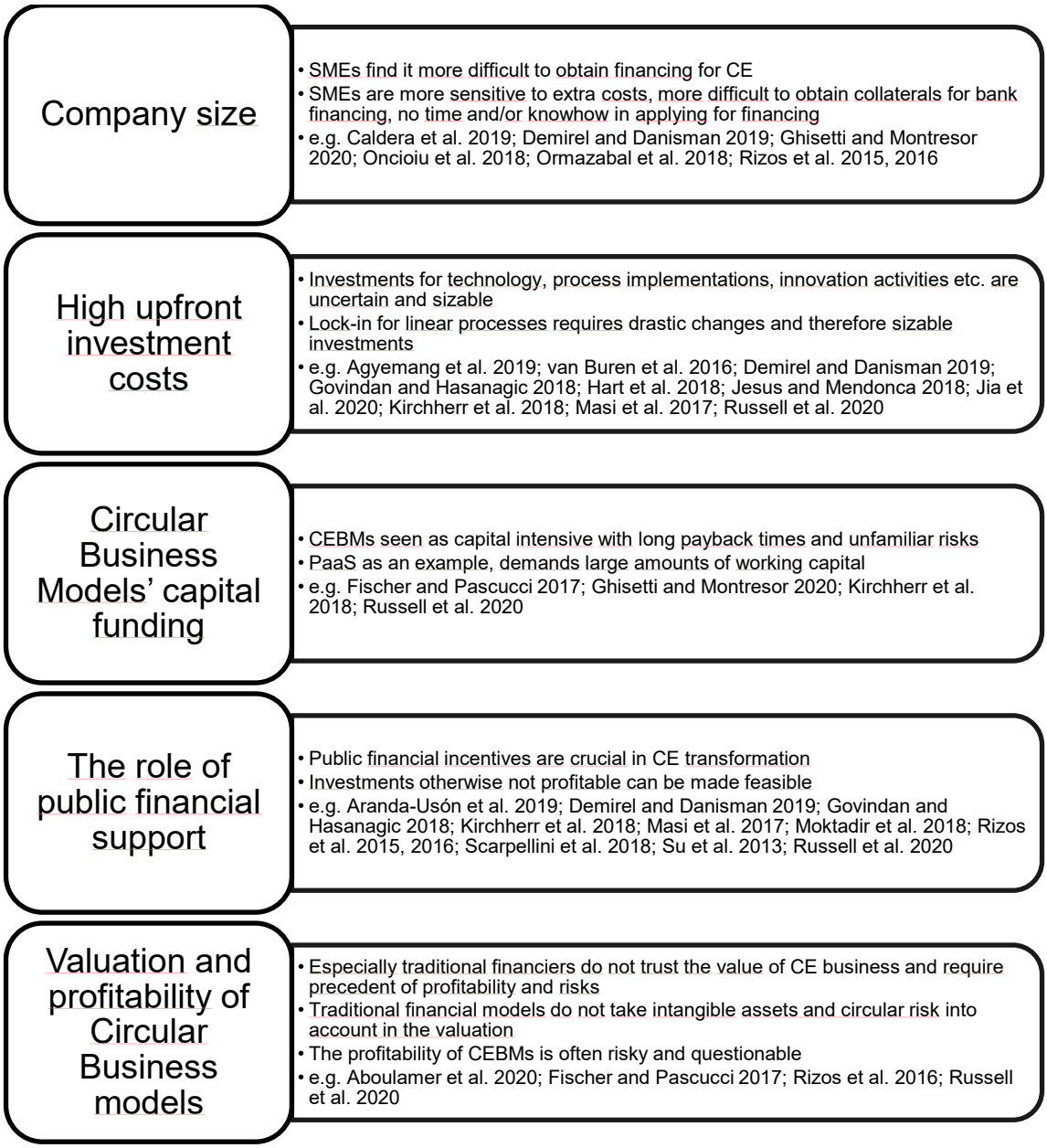

Figure 2. *Summary of most significant financial factors affecting transitioning to and operating by CE principles identified in the academic literature*

As can be interpreted from Figure 2, most of the insights highlighted here were derived from the literature concerning how finance and investors were viewed in the CE literature (Chapter 2.4). It is alarming how little the question of how CE relates to concepts of sustainable finance has been addressed in the finance or CE literature. By reviewing the concepts themselves, it is clear how interrelated the concepts are: for example, one of the most important aims of CE is to reduce waste use, which in turn is a textbook example of a positive Environmental factor in Environmental, Social and Governance (ESG) framework. **Therefore, one of the themes to be looked out in the data is *ESG, sustainability and CE as themes pursued by investors,* in addition to the themes included in Figure 2.**

These factors identified in the literature review form the “loose basis” for thematic analysis of the empirical data set. They are used as initial themes to be looked for in the data, and in Chapter 5 (Discussion) it is compared how the themes and mechanisms behind them are interpreted in the literature and in the data. By exploring the research data, more insights from these identified themes are expected to stand out. But, as these themes are not meant to be a strictly defined theoretical framework to be empirically tested in the analysis but only a loose basis for it, more similar themes and insights about them are expected to be found from the data as well.

3. RESEARCH METHODOLOGY

In this chapter, the methodological choices made in this study and the basis for them are reviewed. The research design and execution are discussed, as is the gathering and the analysis of the data in all phases of the study, and the reliability and the validity of the methodological choices and the analysis. The research questions this study was aimed to clarify are 1) what financial factors affect companies transitioning to and operating by CE principles and 2) how do the identified factors drive and inhibit transitioning to and operating by CE principles, and 3) what factors related to specifically CE business and CE companies affect their attractiveness as an investment and/or a debtor and 4) how do the identified factors drive and inhibit CE companies' attractiveness as an investment and/or debtor. The research process and design were designed and carried out to answer these questions based on the knowledge gained from the literature review.

3.1 Research Design & Strategy

The thematical area and the research questions regarding this study were academically highly unexplored subjects, which guided the formulation of research design towards an exploratory study. This was due to that an exploratory nature of research is an effective point of view to ask open questions about a subject and clarify one's understanding of the unclear issue on hand (Saunders et al. 2016).

Exploratory research is fit for a topic with few previous academic studies also because of its flexibleness and its adaptableness to change (Saunders et al. 2016). The understanding of the studied concepts increased exponentially throughout the analysis of the data, and the theoretical framework defined in the literature review had to be revised continuously, as is presented next in Figure 3.

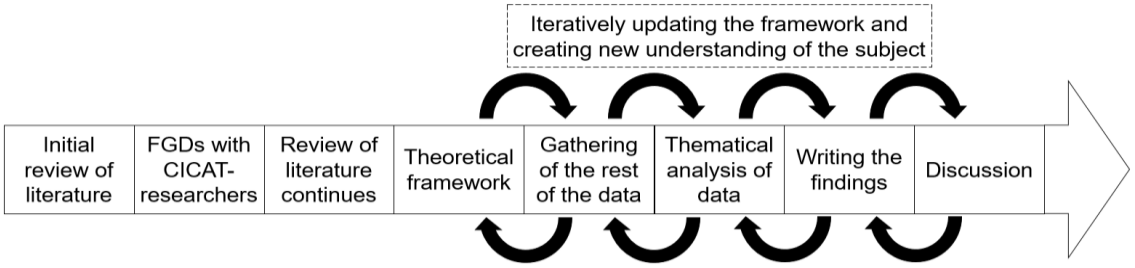

Figure 3. *The research process of this study exercising systematic combining by Dubois & Gadde (2002, 2014)*

The method of revision is defined as systematic combining, as presented by Dubois & Gadde (2002, 2014). They introduced that when discovering new things, this kind of abductive research approach is more fruitful than a standardized, linear research process. They found that when constantly going back and forth between theory and the empirical observations, the researcher can expand his understanding of both theory and the empirical data.

Exploiting systematic combining is naturally an example of abductive approach to theory. As presented by Suddaby (2006), abductive approach moves back and forth between data and theory, therefore combining inductive and deductive approach. This study was an example of this approach: during the analysis of the data, observations of new kinds of factors related to the research questions arose, which made it possible to review the already analyzed data and interpret it better with more insights of the phenomenon. Therefore, the new bit of theory formed from the data inductively was either proved or falsified deductively with new data. Many of the factors recognized in this study are very much subjects to interpretation, e.g. because of the mixed vocabulary used in the data and highly varying backgrounds of the people speaking in the data, which made this particular research design exceptionally useful.

Because there has been so little research on the topic on hand, both qualitative and quantitative, the methodological choice of this study was decided to be qualitative. The understanding of the key concepts around the topic is still very much in its infancy, and therefore qualitative research design is fit for the study: qualitative methods are effective in creating a picture of the subjective meanings around the phenomenon (Saunders et al. 2016), which correspondingly is an effective means to answer the research questions containing words “what” and “how” and related to highly subjective conceptual areas of Circular Economy and finance. Also, a lot of insightful, high-quality qualitative data has already been produced during the CICAT2025 research project (of which this study was a part of), which also supported choosing qualitative research design over quantitative.

3.2 Data Gathering and Data Characteristics

The data sources utilized in this study are summarized in Table 6. The data is divided into primary and secondary data, and the number of data of a certain type is presented. The data is discussed more in detail in the following subchapters, according to if its primary or secondary data.

Table 6. *Summary of data sources utilized in the study*

Data type	Number of data sources	
Primary data:		
Focus Group Discussions with researchers	Focus Group Discussions	2
Observation	Workshop discussions	1
	Workshop presentation & notes	1
	Pre-workshop orientation materials	1
	Workshop commentary	1
	Workshop-induced initiative	1
Secondary data:		
Secondary interviews and meetings	Interviews	19
	Meetings	7
Practitioner Reports	Research & workshop reports	11
	EU Commission communication report	2
Media data	Podcasts	2

As can be seen from Table 6, most of the data utilized in this study are secondary data: 7 data items are primary data, and 41 items are secondary data. Although different items are not comparable to each other e.g. in length and in the number of insights, it is nevertheless clear that most of the findings of this study are based on secondary data. Primary and secondary data have been treated equally: even though there are relatively more targeted insights to the specific questions addressed in this study in the primary data, they have not been given special status over secondary data. All of the data utilized in the study was relatively novel: the dates the data were produced ranged from 2013 to 2020, with an emphasis on the last three years, 2018-2020. This was expected, as CE is a relatively novel concept in itself.

3.2.1 Primary data

The primary data utilized in this study consisted of two Focus Group Discussions (FGDs) and five observation data items. As a common characteristic for both types of primary data items utilized, all the data sources were Finnish experts on the field of Circular Economy, as described further in detail next in their respective subchapters.

All FGDs were conducted with the researchers contributing to the CICAT2025-research project (which this study also was a part of), and they took place on 3.6.2020 (researchers from project Work Package 1 studying CE business catalysts) and on 8.6.2020 (researchers from project Work Package 2 studying CE Ecosystems and Agency). Both discussions were approximately 2 hours long.

The FGDs took place relatively early on the study, after a short initial literature review about the subject. The purpose of the FGDs was two-fold: firstly, they were going to be part of the study data set on some, at that point unknown level. Secondly, the most important purpose of them was to refine the findings of the literature review to form an initial picture of how CE and finance relate to each other, what had already been discovered and what to search for during the rest of the literature review and in the data gathering later. It was also confirmed again that the subject indeed was meaningful from the point of view of CE transition and therefore required further studying.

The FGDs were semi-structured. The thematical structure of the discussions was based on the initial literature review and was also refined for the second discussion based on the first one. After the second discussion, the refined thematical structure also formed the first initial version of the final result of this study, i.e. the framework which is presented in Figure 5 in Chapter 5. Therefore, even though the primary data was not differentiated per se in the further iterations of data analysis, it had a very important role in the beginning of the study in creating the basis for the following research work. The discussion structures are available for review in the Appendix.

The observation data was obtained from a workshop of Finnish Government Strategic CE Initiative Theme Group which was held on 12.8.2020. The said Theme Group consists of top-level CE experts in Finland, with backgrounds in academia, finance, companies/business, non-profit organizations, government, municipalities and other organizations. The workshop itself lasted for 3 hours, during which e.g. financing CE and different CEBMs and their drivers and inhibitors were discussed.

3.2.2 Secondary data

As said before, most of the data utilized in this study are secondary data. The secondary data utilized divides into 3 categories: secondary interview/meeting transcripts and notes, practitioner reports and media data. The further classification of data and the amounts of data within these categories further classification is presented in Table 6. Even though the different types of data were of different length, contained different amounts of insights i.e. were not similar in their characteristics, all the secondary data was treated equally and was used as a part of the research data set.

With the exception of one interview, all secondary interviews and meetings were all data that was originally collected and created for other purposes within the CICAT2025-research project (the larger entity which this study is a part of). All the secondary interviews were part of studies for other research papers within the project and were held during the time period 27.6.2019-22.1.2020. The key topics of the interviews are some other areas within CE research scene (e.g. textile ecosystem, strategic renewal process, Circular Economy Business Models), but in each of them finance has on some level been brought up as a relevant factor during the conversation in transitioning to and/or operating by CE principles. The exception was an interview conducted as a part of CEBM study on 29.6.2015 by Valtteri Ranta, in which aspects of financing CEBMs were discussed.

The secondary meeting notes were all constructed by Leena Aarikka-Stenroos (the Consortium leader of the CICAT2025 project) during the stakeholder group conversations which were a part of the preparation of the research project. The meetings were held during the time period 12.7.2018-7.8.2018. The stakeholders Aarikka-Stenroos discussed with were representatives of many very important interest groups of society in Finland: the parties represented included e.g. European Union, Public Innovation Fund Sitra, a public organization for innovation funding Business Finland, Finnish Technology Industry umbrella organization, non-profit organizations, Finnish ministries and municipalities. In all these discussions, the objective was to discuss what aspects of CE could and should be researched within the large research project and in each of them finance was brought up as one.

The practitioner reports utilized in this study were obtained by either snowballing using the articles of the literature review and the practitioner reports themselves or by searching with selected keywords from Google Scholar and Scopus search engines. They were dated in range 2014-2019. The research reports are divided broadly into two categories: communication reports of the European Union and research and workshop reports written by e.g. legislature representative organizations, NPO organizations, commercial banks, consultancies, research facilities, academics and joint working groups of all the previous. These reports contained perhaps the most detailed insights about the subjects of the study, as many of them concentrated primarily on financing CE and different aspects of it. However, all of them still studied financing CE on a rather general level and/or elaborated on only few smaller subjects within the thematical area of financing CE. Therefore, both this study and further research are needed to learn more and more comprehensively about how CE affects financing companies and vice versa.

The media data utilized in the study consisted of two podcast recordings. Both of the podcasts were obtained from the recommendations of the CICAT2025 researchers: they

were recommended due to their content regarding both sustainable finance in general and how it relates to financing CE. Towards these two subjects, both of them provided valuable insights. The podcasts were dated on 2020.

3.3 Data Analysis

The data set utilized in this study was chosen to be analyzed using thematic analysis. According to Saunders et al. (2016) and Braun & Clarke (2006), it provides a systematic, logical, orderly and yet flexible way to analyze different sizes of qualitative data sets, providing rich descriptions, explanations and theories of the phenomenon under research. It is presented to be capable of comprehending large and disparate amounts of data, integrating and finding the key insights and patterns within different types of data, and producing a thematic description of the data (Saunders et al. 2016). As the data utilized in this study is very diverse in the terms of type (e.g. Focus Group Discussions, interviews, workshop observation, meetings, research reports and podcasts) and source (e.g. companies, financiers, NPOs, joint working groups and academics), the thematic analysis is a well-justified selection for this study. Also, it is noted that thematic analysis is fit for many kinds of approaches to theory, including a combination of a deductive and inductive approach (Saunders et al. 2016) such as systematic combining utilized in this study, which further supports the selection of the thematic analysis.

The thematic analysis was performed utilizing two software: ATLAS.ti and Microsoft Excel. With qualitative data analysis software ATLAS.ti, the data was read through and citations containing insights related to the research questions were highlighted and a thematic code or multiple codes was attached to the citation. Having done that, different codes (themes) and their combinations i.e. the citations containing the insights of certain themes were available for comparison across different data items effortlessly. This effortless comparison was the key contributor in the success of the thematic analysis: each citation containing relevant information was able to be iterated over in one click of a button, and no further searching within the documents was needed. After the analysis was completed, a matrix of all data items and the codes attached to the items was exported as a table, which was formatted with Excel and then attached to this report (see Appendix A).

As presented, in this study systematic combining introduced by Dubois & Gadde (2002, 2014) was applied. In practice it was most visible in the data analysis: the theoretical framework and the themes evolved continuously, simultaneously with the understanding of the subject. First, the initial themes to be searched for in the data were derived from the literature review (see Figure 2) and the Focus Group Discussions. Then, the thematic

analysis of the result data was executed. During the analysis, new themes emerged from the data and the existing ones were broadened, refined, and modified according to the insights of the data from the point of view of the research questions. In practice, this happened by reading through the data, identifying a new or existing theme related to finance by recognizing a reference to finance (in that citation or a previous one related to the same theme), and then comparing the identified citation and its implications to the previous citations and their implications. For example, when reading through a data item a citation was spotted saying that taxation is favoring linear business over CE. Since previously it had been mentioned in another citation that by altering the taxation the financing of CE would be encouraged, the new citation was identified to be related to the similar financial theme of taxation, implicating the same as the other citation mentioned but from a bit different approach. Simultaneously with the analysis of data, new data was discovered, originating from both the data itself and its sources and by new searches based on the increased understanding of the subject. In the end of the thematic analysis, all data items had been iterated through and reviewed multiple times, similarly to the thematic framework and the themes that it contains.

The results of the thematic analysis can be viewed tabled in Appendix A, which contains all the themes of the thematic framework and the amounts of occurrences of the themes in the result data. The amounts of occurrences were used as a guide to interpret the relevance of each theme, but since all the data items are not comparable to each other, more definitive conclusions could not be made based on the amounts themselves. However, the analysis of the data did not end after the initial thematic analysis, which the table of Appendix A was the result of, but continued iteratively throughout the reporting of the results, writing the discussion and drawing conclusions, systematically combining new understanding to the existing and resulting to the final framework and the propositions regarding each theme presented in Chapter 5: *Discussion*.

3.4 Methodological Reliability and Validity

To assess the quality of the study and the methodological choices made in it, the reliability and the validity of the methodological choices and the analysis must be reviewed. Reliability means the ability to replicate the conducted study consistently: if another researcher could replicate the research design and achieve the same results, the study would be deemed reliable. Reliability divides into internal and external reliability: internal reliability means consistency and mitigating of biases within the study, e.g. between the creation of different data items, whereas external reliability means that the data collection and analysis techniques utilized in the study would generally produce similar results if

replicated. Validity in turn assesses if the appropriateness of the measures used and the accuracy and the generalisability of the findings. (Saunders et al. 2016).

The most significant factor contributing to the reliability of this study is the variety of people and researchers that have originally collected and constructed the data utilized. According to Saunders et al. (2016), one possible way of ensuring the reliability of the study is to have multiple different researchers collecting and constructing the data. The collection of the secondary data and its admittance to the final data set was mostly conducted by a single researcher, but in the collaboration with other researchers of the CICAT2025 research project, enhancing the reliability of the data collection. And, as almost all the data items were originally constructed by different academics, practitioners or other parties conducting research, researcher bias in the construction of the result data is minimized.

Towards the validity of the study, especially two methods were utilized. The first one is extensive triangulation, from the viewpoints of using two different methods for data collection and having a very diversified data set overall within both data types. According to Saunders et al. (2016), having more than one method for data collection is involved in the triangulation: in this study, collecting both primary data from the Focus Group Discussions and secondary data from observation, research reports, secondary interviews and other sources fulfill this requirement. Also, having diverse sources of data contribute to triangulation (Saunders et al. 2016). In this study, the sources of data varied very extensively, including e.g. academics, company representatives, financiers, NPOs, government officials, legislative representatives of different levels and multiple interest groups, making the data set very rich in the terms of different points of view.

The second one is the saturation of data in the data analysis phase. There were no limits or objectives regarding the amount or the characteristics of the data items. Instead, as recommended by Saunders et al. (2016) in the case of qualitative studies, new data was collected and analyzed until the new data items seemed to only confirm the previous findings instead of revealing new themes or significantly more insightful aspects about the existing ones. By doing that, the bias related to the sample size was mitigated and the sufficient richness of the data set from the point of view of the research questions was ensured.

4. FINANCIAL DRIVERS AND INHIBITORS OF CIRCULAR ECONOMY BUSINESS AND CIRCULAR COMPANIES' ATTRACTIVENESS AS AN INVESTMENT

In this chapter, the financial factors driving and inhibiting transitioning to and operating by CE principles are reviewed based on the conducted thematical analysis of the result data set. As discussed more in detail in Chapter 3.2 Data Gathering and Data Characteristics, the data set consists of multiple data sources including primary data, such as Focus Group Discussions with CE researchers and observation data, but mostly secondary data such as expert workshop materials, secondary research interviews, practitioner reports, podcasts etc. Through these results of the thematical analysis, the research questions 1 (*What financial factors affect transitioning to and operating by CE principles?*), 2 (*How do the identified factors drive and inhibit transitioning to and operating by CE principles?*), 3 (*What factors related to specifically CE business and CE companies affect their attractiveness as an investment and/or a debtor?*) and 4 (*How do the identified factors drive and inhibit CE companies' attractiveness as an investment and/or debtor?*) are answered.

The factors are categorized into three groups: factors related to **Sources of financing**, **Criteria for financing** and **Subjects of financing**. **Source of financing** refers to different options where financing, funding or another sort of monetary support can or could be found for a CE company or CE transition, such as traditional banks, institutional investors, alternative investors, financial instruments, public financial incentives etc. **Criteria for financing** refers to the aspects that investors and other 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 business compared to linear. **Subject of financing** in turn refers to different subjects that can be financed, ranging from whole CE supply chains to singular companies and different projects and phases of product development within them. Within these categories, the factors are analyzed further one by one, while also reviewing the singular factor's relationships with the other identified factors. A summary of the categorization and the chapters regarding the themes are presented in Figure 4.

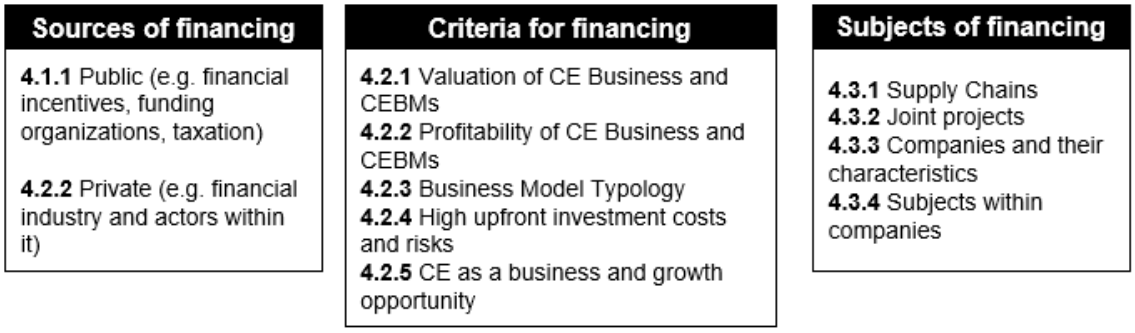

Figure 4. *Categorization of financial themes affecting CE transition and CE's attractiveness as an investment and/or a debtor derived from the result data*

When reviewing financial factors driving and inhibiting CE and CE companies' attractiveness as an investment, it is important to acknowledge that some of the factors result from CE principles or CE business themselves directly. On the other hand, some of the factors relate to in some other way to the nature of the companies, organizations or mechanisms under discussion in the data and are not strictly CE-specific, but they relate to CE through some causal mechanism. An example of a non-strictly-CE-specific factor would be company size: in general, SMEs find it more difficult to obtain financing for their operations. But, as a lot of CE-born companies and companies transitioning to CE principles struggling with issues related to finance are SMEs, it is a factor worth discussing when reviewing what factors affect the transition to CE in general in the society.

Also, it is important to acknowledge that some financial factors or mechanisms behind them do not relate to or affect finance directly or strictly to just finance but can affect it through some proxy or causal mechanism. For example, the profitability of a lot of Circular business models is not yet viable for investors due to that customers are not willing to pay a premium for Circular products. This is not strictly a financial mechanism, yet it is an important aspect affecting Circular business's attractiveness as an investment.

4.1 Sources of financing

In the following subchapters, factors related to sources of financing are reviewed from the viewpoint of research questions based on the thematical analysis of the data. In this study, the category "Sources of financing" includes anything related to the sources of financing, financial incentives or any other financial methods which can be of use to CE businesses.

An important aspect about categorizing the origins of finance is that is the funding internal or external funding. In the result data, internal funding was not discussed except in only a couple of occasions and therefore it is not justified to review it in detail in this study.

Thus, when in this study sources of financing are discussed, external sources of financing are meant by it. Nevertheless, as there were few mentions about internal financing in the same context as external financing, there were no notions that the issues discussed in the data would not be applicable to internal financing as well. For example, internally funded CE projects must be justified to the company's leadership similarly as a company has to prove its CEBMs profitability to external financiers in order to obtain financing. Therefore, the results of this study can at least partly be applied to internal financing as well.

4.1.1 Public

When reviewing different sources and originators of financing and financial subsidies and directive methods, the most significant categorization from the viewpoint of CE is whether finance or methods related to it originate from the public or private sector. In the data it is clearly pointed out that for a large scale transition towards CE, the financing has to originate mainly from the private sector, including commercial banks, stock markets, mutual funds and financial markets in general (European Commission 2015; Finnish Government Strategic CE Initiative Theme Group 2020a; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). But, the public sector's role is crucial as well, since the public sector has to **1)) create an even 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. European Commission 2014a, 2015, 2019; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019), **2) act as an example to the private sector in procurement** (e.g. FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020b; Jalonen et al. 2018; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Pietikäinen 2018) and **3) strengthen the status and spread the awareness of CE amongst businesses, consumers and investors by promoting and investing in it** (e.g. European Commission 2014a; Finnish Government Strategic CE Initiative Theme Group 2020b; Heikkilä 2019; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019), among other things. Towards these ends, several factors and mechanisms driving and inhibiting them can be recognized. In the following sections, these factors and mechanisms are discussed according to what was recognized in the data.

Public financial incentives and funding organizations

As mentioned in the previous section, **the public sector has an important role in the transition to CE in creating a level playing field for CE businesses with public financial incentives and public funding organizations, amongst other things.** The crucial importance of public financial incentives and funding organizations was recognized in data amongst both legislative and policy-making actors (e.g. European Commission 2014a, 2014b, 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Pietikäinen 2018) and company and research actors (e.g. Finnish Government Strategic CE Initiative Theme Group 2020c; Harlin 2019; Heikkilä 2019; Ojala 2019). Public actors had clearly realized that the large scale transition towards sustainable CE requires a lot of actions and changes in the financial policies and a lot of financial support due to the different nature of CE business compared to linear, whereas many of the researched companies had received some kind of financial support or funding for their CE activities, especially for R&D and innovation activities, and deemed it very important for their CE related operations.

According to the data, there are a lot of different public actors that offer financial incentives and funding in the market for CE companies. These actors operate at multiple levels: on an international level (e.g. European Union-funds etc.), on a national level (e.g. Business Finland, a Finnish public organization for innovation funding, trade and investment promotion) or regional level (e.g. municipal support for waste management). Incentives and funding in turn can be repayable (e.g. corporate loans) or non-repayable (e.g. innovation grants or R&D funding). At least in Finland, researched companies have experienced the availability of public funding relatively sufficient. But, many of the researched companies point out that public funding in Finland is targeted mainly towards R&D and innovation activities in companies and in research facilities and that the commercialization phase would require additional funding compared to what is now available (Alhainen 2019; Finnish Government Strategic CE Initiative Theme Group 2020d, 2020c; Mäki 2019). It was seen that there is a discontinuity area between developing CE related innovations and getting them on the commercial markets.

Availability of public funding was seen mostly as a positive factor, but some researched actors expressed their concerns about the possible **crowding-out effect of private financing resulting from supporting businesses with public financial support** (CICAT2025 Ecosystems and Agency Work Package 2020; Finnish Government Strategic CE Initiative Theme Group 2020a; Tasa and Honkanen 2018). It was pointed out that receiving public financial support or financing might lead to either 1) an actual situation or 2) an impression in the eyes of the private financiers that the business would

not be profitable or otherwise viable without the support, which in turn repels possible financiers. For example, in the Finnish Government Strategic CE Initiative Theme Group workshop (2020a) it was mentioned that at least half of the funding of the venture has to be private (i.e. venture has to go through demanding assessment of private financiers) in order to ensure that a venture has a financially viable basis and that profitability based on subsidies under political decision-making are very risky in the long term. Also, in Focus Group Discussion with CICAT2025 Ecosystems and Agency Work Package researchers (2020), the researchers pointed out that a couple of companies had mentioned that after they had received funding from Business Finland (a Finnish public organization for innovation funding, trade and investment promotion), they felt that other financiers presumed that they were dependent on the subsidies from Business Finland and could not operate on their own. Nevertheless, as only a couple of researched actors mentioned it, the positive outcomes of public financial support and funding can be interpreted to outdo the crowding-out effect.

Procurement, policies, taxation and legislation

Generally, according to the data public procurement processes, financial policies, legislation and taxation are still quite strongly locked in favoring linear businesses and processes instead of circular ones (Finnish Government Strategic CE Initiative Theme Group 2020b; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Tikkanen et al. 2018). A lot of changes are required for large-scale CE transition, as public sector is expected to be the role model in procurement and even the playing field for CE businesses with policies, taxation and legislation. These aspects are not strictly financial: nevertheless, they have a major impact on CE businesses' business environment and their ability to operate profitably and financially viably. Thus, they have a major impact on how CE business is seen in the eyes of investors, bankers and other financiers.

One significant example of policy locked-in for linear economy that is brought up multiple times in result data is **taxation burden distribution between labor and resources**. Currently, taxation is directed heavily towards labor and income of workers. At the same time, resources are taxed significantly more lightly. (Cura 2019; Ellen MacArthur Foundation 2013; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Tikkanen et al. 2018). For example, according to Japan/EU Joint Workshop G20 Resource Efficiency Dialogue (2019) 51 % of taxes in Europe comes from labor and only 6 % from resource use. Thus, use of labor is penalized in taxation, whereas from the viewpoint of CE it should be rewarded since a lot of CE business models and principles are heavier on labor than resources (FinanCE Working Group 2016; Tikkanen et al. 2018),

and since labor is essentially a renewable resource. Moving the tax burden from labor and income towards non-renewable resources would level the playing field for CE businesses by making CE business more profitable and therefore encourage the transition to CE.

Another problem related to taxation is that **renewable and non-renewable materials are not differentiated in taxation**: their tax percentages are the same, and therefore it costs the same to use non-renewable and renewable resources (Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Tikkanen et al. 2018). As a result of this, renewable and circular resources are in many cases more expensive than non-renewable and virgin resources, since usually it requires a lot of processing to recycle or otherwise produce circular materials and the additional processing has to be priced into the goods. And as customers are usually not willing to pay a premium for circular goods compared to new virgin goods (Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019), it decreases the demand for circular products greatly. In the data it was presented that the value-added taxes (VAT) system should be changed to prefer circular products and materials over new ones (Finnish Government Strategic CE Initiative Theme Group 2020d; Heikkilä 2019; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). This would create lots of demand for circular products and materials both in business-to-business and business-to-consumer commerce.

As said previously, the public sector has an important role in transition to CE in acting as an example to the private sector in the decisions made in public procurement. Currently, at least in Finland, **the public sector procurement processes are seen to be locked in favoring conventional linear business and that they are not fit to assess circular solutions**. To be more accurate, the public sector's incentives are misaligned with circular business and they seem to favor price over sustainability factors in decision-making in public competitive bidding processes (European Commission 2014b; Finnish Government Strategic CE Initiative Theme Group 2020d). To shift public procurement's focus from linear to circular solutions, the procurement processes would have to be changed to favor circular solutions over price and possibly other factors as well. The methods of the change introduced included e.g. penalties for choosing non-circular solutions and even making circularity a strict condition in public procurement contracts.

But, simply changing low-level procurement process phases and scoring systems is not enough: in Finnish Government Strategic CE Initiative Theme Group discussion (Finnish Government Strategic CE Initiative Theme Group 2020a), multiple public procurement specialists pointed out that CE should be a key goal for the whole political decision-

making chain, ranging from city mayors to purchasing specialists, instead of just the purchasing specialists. Only then a large-scale change to favoring CE solutions in public procurement could truly be achieved.

4.1.2 Private

As mentioned in the beginning of the previous chapter, both public and private sectors have their own roles as financiers and actors of change in the transition to CE. While the public sector's role is to lead by example and facilitate the change by modifying the business environment of CE companies and the private financial sector, the private sector's larger volumes of financing is actually the source from which the majority of funding for CE has to originate from to achieve a large-scale transition to CE in the society and to make it the mainstream operating model (European Commission 2015; Finnish Government Strategic CE Initiative Theme Group 2020a; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). This is logical: private financial markets are much larger in volume and therefore without the contribution of the private sector, financing CE on larger scale becomes impossible with only public sector-originated funding (Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). In this chapter, the relevant factors from the viewpoint of research questions regarding private financial markets as a source of financing CE and mechanisms behind them are discussed more in detail.

Different kinds of private financiers

There are a lot of different kinds of private financiers on the financial markets for the use of CE companies and CE businesses. CE businesses do not hold a special status among companies trying to obtain financing from private markets: all possible financiers are in their use like they are for any other businesses. And as any other businesses, also CE companies require different kinds of financiers depending on their situations: for example for a company with an unproven and therefore risky technology product, equity finance would be a better fit than bank finance because of the riskiness of the financing (ING Bank 2015). However, ING Bank (2015) has listed the most relevant sources of private financing for CE to be the following:

1. Bank finance
2. Capital markets
3. Foundations and Impact Investors
4. Venture Capital, Private Equity
5. Near banks and larger corporations like Google, Apple, Amazon etc.
6. Crowdfunding

On these typologies of investors, especially traditional bank finance and capital markets have been mentioned in the result data as the ones with which CE companies and CE Business Models have most difficulties in obtaining financing (e.g. ING Bank 2015; Sustainable Finance Lab 2018). This is particularly problematic for the sake of CE transition since these two typologies are naturally the largest in volume and therefore have the most potential in financing CE businesses. The problems with these financier typologies relate mostly to profitability, valuation and risk assessment of CE business and CE Business Models, which are discussed more in detail in Chapter 4.2.1: *Valuation of Circular Business and Circular Business Models*. In this chapter, the problems specific to different financier types are reviewed in general level.

When reviewing traditional bank financing, capital markets financing and CE, a couple of issues arise from the result data. The first and most significant one is **that traditional bank lending and capital markets procedures and financial assessment methods are not fit to assess CE and CE Business Models: they do not take into account some of the key elements of different CEBMs, such as intangible assets, customer relationships and contracts and therefore cannot price the risk correctly** and value other aspects such as tangible collaterals instead (Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Sustainable Finance Lab 2018). But, the assessment of profitability, value and risk of CE business is reviewed in Chapter 4.2.1: *Valuation of Circular Business and Circular Business Models* and it will not be reviewed further at this point.

Another issue about traditional bank financing is that **CE businesses, business models and markets are often quite novel and innovative, which in traditional bank financing is seen as an increased risk for the bank as a creditor**. As said in Japan/EU Joint Workshop on G20 Resource Efficiency Dialogue Report*, "Innovation and straightforward bank finances are not a 'happy marriage'"* (2019) since traditional banks are relatively risk aversive in their lending operations. The effect of novelty and innovativeness of CE companies to traditional bank finance naturally applies to other kinds of companies as well, but as CE markets and businesses are generally still relatively immature, it needs to be discussed in the case of CE financing in general as well.

One seemingly very viable option to be the source of financing for CE businesses and companies would be different kinds of impact investors and impact funds, due to their sustainability goals and CE's nature as a sustainable operating model. Impact investors are investors that look for either primarily for sustainable impact for their investments instead of monetary profit or both monetary profit and sustainable impact, the latter being

the most ruling school of thought. For example ING Bank (2015) brings them up as possible aid through the non-profitable stages of a company (a stage in which many circular businesses are): **impact finance could be the bridge between non-profitable stages to growth stage for a company since they are less concerned about profiting from the venture.**

But **the financial resources impact investors can offer is scarce from the viewpoint of large-scale CE transition**. For example, as the manager of a CE fund at Taaleri Tero Luoma mentioned in his interview (2020), the first CE concentrated Private Equity fund was founded in 2016 and it still is a pioneering fund in its kind. Most of the financing for companies on a large scale still originates from bank lending and capital markets instruments (Circle Economy and Sustainable Finance Lab 2016a) and therefore it can be argued that impact funds cannot fulfill the financing needs of a large-scale CE transition. Nevertheless, they have an important role as examples to other actors of the financial industry for example in raising awareness, creating assessment frameworks for circular businesses and financing pioneering CE companies.

Financial instruments and innovative financial solutions

Regarding existing financial instruments that financial markets offer, there are some instruments that are targeted towards sustainable development and CE and benefit them greatly, such as green bonds (Finnish Government Strategic CE Initiative Theme Group 2020b; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). And as in the case of different kinds of private financiers, also different existing financial instruments can freely be used by CE companies just like by any other companies. But, **existing instruments have some issues related to them from the viewpoint of CE and many of the researched actors have brought up that in some situations, financing CE would require new kinds of financial instruments and renewed legal framework to support them** (Ellen MacArthur Foundation 2013; European Commission 2019; FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020b, 2020a). Examples of these kinds of situations that were presented in the data are value and supply chain financing and financing CEBMs more different from linear business models, such as the Product-as-a-Service model.

Firstly, issues regarding financial instruments and innovative financial solutions do not apply only to the private finance sector, but in this thesis, they are reviewed as a part of the private financial sources since in the data they are mostly applied to the private financial sector. An exception to this which was presented in the data is **risk-sharing**

financial instruments which include public-private collaboration. According to European Commission (2019), these new kinds of instruments in which the public sector attracts private investors by insuring private sector's investments would benefit the transition to CE greatly: they would re-distribute technology, commercialization, sustainable development and market risks that are commonly associated with CE business and ventures.

In the data, green bonds were brought up as an efficient instrument in financing CE and sustainable development in general (Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). Nevertheless, they have a profound issue built in them: if a single company wants to issue a bond**, the size of the bond must be minimum of millions of euros, making them unattainable for SMEs to use as their financing instrument** (Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). For larger companies, green bonds can be a very good option for financing CE operations and/or transition, but SMEs which make up most of the CE company universe cannot use them.

The most common example of the need for new kinds of financial instruments mentioned in the data was a situation in which a whole value or supply chain or a project within these chains should be financed (FinanCE Working Group 2016; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Pietikäinen 2018). When companies are moving towards more circular operating models, collaboration is needed within the supply chains or value chains and that collaboration should be the subject of financing. However, **currently there are no financial instruments (or legal framework) available for financing these value or supply chains and for an even distribution of both risks and profit within them** (FinanCE Working Group 2016; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). This would benefit CE greatly since the total risk of a supply chain could be significantly lower than the risk of a singular company (FinanCE Working Group 2016), which as a quality of a financeable subject would result in both easier access to and lower costs of financing.

Sustainability and CE as value creators for investors

As was brought up in the data, sustainability and ESG issues have become mainstream operating models and buzzwords in recent years in both investment and finance universe (e.g. CICAT2025 Ecosystems and Agency Work Package 2020; Johtajuussymposium-podcast 2020; Lappalainen et al. 2020) and in companies (e.g. FinanCE Working Group 2016; Ojala 2019). According to the data, **CE investments can be discussed as one of the subcategories of sustainable investing and therefore it should benefit from this megatrend** (e.g. Finnish Government Strategic CE Initiative Theme Group 2020a,

2020b; ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019): as said in the Japan/EU Joint Workshop on G20 Resource Efficiency Dialogue by Astrid Schomaker, Director of Global Sustainable Development on European Commission: "*Sustainable finance is a major enabler – perhaps the major enabler of a circular economy"* (2019).

When reviewing the sustainability of a company, sustainable investors review primarily two things: 1) the realized sustainable potential of a company and 2) the unrealized sustainable potential of a company. Therefore, the investments do not necessarily focus on companies that are already doing well on the sustainability issues but also on companies that are moving towards more sustainable operating models and procedures. Also, when assessing the sustainable impact of a company the amount of impact depends greatly on which factors are included in the analysis and how are they weighted: some investors value environmental issues such as CO2 emissions and water usage, whereas some investors might value social issues such as diversity and employment. Therefore, it is very difficult to come up with just one framework which could effectively assess every company there is (Lappalainen et al. 2020).

Although ESG issues and sustainability in general is a recognizable theme in the data and CE is said to benefit from their popularity (ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019), it is still not elaborated clearly in the data how sustainable and impact investors view CE per se as a part of the sustainable investing asset universe and how much CE companies have benefited from impact investors so far. As mentioned previously in the section about impact investors, there are not many strictly CE-concentrated financiers in the financial markets, at least yet. Any of the CE companies researched in this study did not mention their financing to be originated from sustainable investors or that CE as a sustainable paradigm would have been the reason that they got financed. Therefore, it can be argued that according to this data set **sustainable investors might not have discovered CE companies and businesses as investment opportunities yet in a large scale**. The same applies vice versa: **CE companies and businesses have not exploited their nature as sustainable investments in full capacity yet**. Although, this applies only to the private financiers: researched companies had attracted some financing from public actors due to their CE nature.

Possible reasons for discontinuity area between sustainable investors and CE financing is how **CE projects and companies are too invisible for institutional investors due to their relatively small size and the lack of tools for assessing their impact and profitability**: large investors do not have the time to assess investments that are below their investing minimum threshold and if the companies cross the threshold, they rather

invest in some other sustainable asset because they can assess them with the tools they have already available (i.e. the tools for assessing linear investments). Possible means to outdo these problems would be to 1) develop a taxonomy to assess CE businesses and 2) structure the CE investments into a larger instrument that would cross the investing threshold is understandable for institutional investors. (Finnish Government Strategic CE Initiative Theme Group 2020a).

Collaboration and knowledge sharing between the financial industry and other actors of society

A significant factor affecting the large scale transition to CE presented widely in the data set was co-operation and knowledge sharing between the financial industry (i.e. the sources of finance) and other actors of the society (Ellen MacArthur Foundation 2013; European Commission 2019; FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020b; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Preston 2012). **Generally, the collaboration and knowledge sharing between the financial industry and other actors of society were viewed as not only benefitting but also necessary action to achieve large scale transition to CE**. It is also important to acknowledge that the said co-operation and knowledge sharing are in no way an act restricted to the collaboration of just financial actors, but as this study is about financing CE they are reviewed from the point of view of financial actors. As the President of Japan Waste Research Foundation, Shigemoto Kajihara, remarked: *"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."* (Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). From the financing viewpoint, collaboration and knowledge sharing could solve or at least help to solve multiple issues, such as the lack of tools for assessing CE businesses' profitability and risks and the lack of CE companies' know-how in applying for funding and creating financially viable business models.

As is discussed widely in this study and more in-depth in Chapter 4.2.1: *Valuation of Circular Business and Circular Business Models*, the current financial models assessing the profitability and the risks of investments are currently not aligned with circular businesses. In the data it has been remarked that **creating effective assessment tools and frameworks for assessing profitability and risks of Circular Business will require collaboration between 1) private sector and public sector and 2) between private sector actors** (European Commission 2019; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). Especially the legal and policy frameworks supporting the proper assessment of CE business and financing CE would need the dialogue between

financial sector and policymakers. For example, in the Netherlands the three largest banks of the country have shared the definitions of circularity and joint guidelines that identify CE business models (Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019), which is a good step towards common CE financial assessment frameworks.

In the data it has been mentioned that **banks and other financiers could be possible strategical knowledge partners or advisors of their CE company customers by increasing their expertise of CE business and CEBMs** (Circle Economy and Sustainable Finance Lab 2016a; Ellen MacArthur Foundation 2013; ING Bank 2015). Firstly, as financiers are naturally experts on assessing the profitability of business models and creditworthiness of businesses, by becoming experts in also circular business models they could help their customers in structuring long-term business models and validating and improving their business models to be more profitable and therefore more attractive to financiers (Circle Economy and Sustainable Finance Lab 2016a; Ellen MacArthur Foundation 2013; ING Bank 2015). Secondly, as for example PSS models require an extensive credit risk assessment for the end customers of a CE company, banks could offer credit assessment of the end customers as a service for their CE company customers (ING Bank 2015). By advising their customers on financial issues, financiers could benefit CE companies greatly while creating more business for themselves as well.

4.2 Criteria for financing

In the following subchapters, factors related to criteria for financing are reviewed from the viewpoint of research questions based on the thematical analysis of the data. In this study, in category “Criteria for financing” includes everything related to factors characteristic to CE business and CE Business Models which affect decision-making processes of the investors or other financiers, affecting CE businesses’ potentiality of obtaining financing.

4.2.1 Valuation of Circular Business and Circular Business Models

In the data, **two very critical factors related to decision-making processes in investing and lending operations of financiers brought up were 1) how the profitability of CE companies and businesses is perceived by financiers and 2) how profitable CE companies and businesses in reality are.** The first factor relates mostly to the widely adapted assessment tools and valuation models used by financiers, whereas the

second factor relates to the actual, realizable business potential of CE business in general. Although sustainability and ESG performance have been mentioned as important aspects which majority of the investors look for in their investments, in most of the investment decisions everything comes down to the question of the return and the risk of the investment: if the investment doesn't produce adequate profits with moderate risks in return for the invested capital, no reasonable financier is going to invest (Finnish Government Strategic CE Initiative Theme Group 2020a). In other words, if for some reasons the profitability of the CE business and CE Business Models is perceived incorrectly or if they really are not profitable, they most likely will not be financed and therefore cease to exist, as most of the financiers are looking to profit off the capital they provide. In this chapter, these reasons i.e. the factors and mechanisms related to perceived profitability of CE business and CEBMs are discussed more in detail and the reasons related to the real profitability of CE business and CEBMs is reviewed in the next chapter, Chapter 4.2.2: *Profitability of Circular Business and Circular Business Models*.

It needs to be noted at this point that not all factors presented in this chapter are related to only the valuation of CE businesses, same as not all factors presented next in Chapter 4.2.2: *Profitability of Circular Business and Circular Business Models* relate to only the real profitability of CE businesses. The perceived profitability and the real profitability relate very closely to each other and there is no clear distinction between them, at least not on all factors presented in this study. Some factors, for example different kinds of risks, are both difficult to value for financiers and affecting the real profitability of CE businesses. This study's categorization of whether the factors are related to the valuation or the real profitability of CE businesses has been done based solely on how they are generally presented in the data.

Financial assessment tools

According to the data, the most significant financial factor affecting the transitioning to and operating by CE principles is how valuation and profitability of Circular Business and Circular Business Models are assessed with current financial and risk models and tools. It is seen that **current investment tools and practices used by financiers, such as financial risk assessment, valuation and pricing tools, are locked-in to linear business and are not fit for assessing Circular Economy Business** (European Commission 2019; FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020d; ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Sustainable Finance Lab 2018). This results in an incorrect assessment of CE investment's profitability, risks and overall value, which in turn leads

to either unreasonably high costs of capital or denied financing decisions for CE companies. Now when unreasonably high costs and capital and denied financing decisions apply generally to CE as a concept and to most companies in the CE universe, it is a massively significant barrier in the way of large-scale CE transition in the society.

To be more specific, lack of fitting financial assessment tools relates mostly on overall credit risk, assessing linear and circular risk, asset valuation as collaterals in asset-based lending and alternative bases for lending, supply chain risk and technology risk. These more specific factors are discussed further in the following subchapters.

Financial assessment tools: Credit risk

A first concept significant to financing CE presented in the data related to incorrect or lacking financial assessment tools is assessing credit risk of CE companies and businesses. To recap, assessing credit risk is a process in which financiers assess the overall creditworthiness of a debtor. Therefore, in assessing credit risk financiers assess all the risks associated with a business and its ability to pay its debts back in time to the financier. The more risks a business is incorporated into, the higher required rate of return (i.e. risk premium) it has on its financing, or in other words, the more expensive the financing is to the business. From the financing point of view (from the point of view of this study), all the risks incorporated to CE are also somehow incorporated to credit risk of CE. For example, European Commission (2019) has listed risks related specifically to CE businesses' credit risk to be the following: market risks, value chain risks, operational risks, cash flow risks, legal risks and client risks. These risks have been brought up in the data also separately in multiple occasions and are reviewed more in detail on this and next chapters.

Nevertheless, in the data and in discussion about financing CE the term credit risk has been used in mixed ways and it might cause confusion amongst especially non-financial actors. For example, in some occasions the term credit risk has been used to describe the credit risk of the clients/end users (see e.g. FinanCE Working Group 2016) and in some occasions the credit risk of the CE companies (see e.g. ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). Therefore, when reviewing financing CE and discussing about it, it is important to acknowledge that **credit risk is a top-level concept used by financiers to gather together impacts of all other risks to assess the creditworthiness of a debtor, not a singular type of risk**.

Financial assessment tools: Circular risk vs. linear risk

Two factors which were presented in the data to be incorrectly assessed by the current financial models were opposite concepts of circular and linear risk. Circular risk is a fairly

new concept presented in the data quite uniformly as the risks resulting from specifically circular business models: for example increased cash flow risks, technology risks, market risks and supply chain risks are included in the summarizing concept of circular risk (European Commission 2019; FinanCE Working Group 2016). As said, it is a novel and fairly rare and specialized concept: circular risk was used only on the CE and finance-specialized practitioner research papers of the data set (see Circle Economy and Sustainable Finance Lab 2016a; European Commission 2019; FinanCE Working Group 2016). In the data, it was seen that **current financial models do not assess circular risks correctly** (European Commission 2019; FinanCE Working Group 2016). As the fitness of current financial models to the more specific circular risks is assessed more in detail in other subchapters, they are not discussed here further. However, when reviewing financing CE business, it is important to acknowledge the existence of this kind of concept and its usage.

The other side of the opposite concepts is linear risk: the summarizing concept of linear risk includes the risks associated with continuing the current, unsustainable linear operating model. Examples of these risks include high resource prices and price volatility, supply risks, regulatory risks, reputational risks and possible future pricing of externalities into the resource prices. Like its opposite circular risk, linear risk was used only in the CE and finance-specialized practitioner research reports and is therefore also a fairly novel and unknown concept (see Ellen MacArthur Foundation 2013; European Commission 2019; FinanCE Working Group 2016; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). In the data it was pointed out that **not only circular risks unfamiliar to financiers need to be assessed correctly in the cases of CE businesses: also, the linear risk has to be taken into account in the risk evaluations of regular, linear businesses** (Ellen MacArthur Foundation 2013; European Commission 2019; FinanCE Working Group 2016; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Preston 2012). By acknowledging linear risks and taking them into account in risk and pricing models (i.e. by making linear models pay for the linear risks), the benefits of CE models and disadvantages of linear models would be better recognized in everyday business situations in companies, which would in turn advance the transition to CE (European Commission 2019; FinanCE Working Group 2016).

Financial assessment tools: Assets vs. cash flows as collaterals in lending

A significant factor presented in the data to be incorrectly assessed from the point of view of financing CE is how assets and cash flows are treated as collaterals in lending decision making processes. Generally, there are three kinds of bases for lending: asset-

based, cash flow-based and relationship-based lending. In asset-based lending, financiers valuate and use the underlying physical assets of the company as a basis for the lending decision. In cash flow-based lending, financiers valuate the future cash flows of the company using e.g. historical financial statements and data, customer contracts, accounts receivables and other indicators of future cash flows and use them as a basis for the lending decision. In relationship-based lending, financiers and debtors establish a closer relationship to the customer and base their lending decision on hard (e.g. financial statements) and soft (e.g. skills and networks of the management), often proprietary information about the customer. Naturally, lending decisions are not made using just one basis: usually the valuation is a combination of the three, but with an emphasis on a certain basis. (Circle Economy and Sustainable Finance Lab 2016a; Sustainable Finance Lab 2018).

In the data, it was seen that currently **using asset-basis in lending is overemphasized in the financing decisions, whereas from the point of view from CE it would be better to value future cash flows over assets** (ING Bank 2015). The usage of cash flow-based decision making would be better for CE due to mainly two reasons: 1) circular assets' value is often miscalculated in the financial models and 2) circular assets as collaterals pose some legal challenges. Although, because novel and innovative CE companies and their business models often lack the financial track record needed to obtain financing, the cash flow-based lending is not currently unproblematic either. (ING Bank 2015; Sustainable Finance Lab 2018).

It was presented in the data that asset collateral values are often miscalculated in financial decisions regarding CE Business Models. There exists **an issue how especially lower value assets are valued down to near to zero or zero value by financiers after they have been acquired for CE businesses**. This is problematic since a lot of CE businesses core business is to lease the assets to the customers and therefore, they are the only significant assets they possess. In circular supply chains, a great amount of value is captured in the upcycling process or second-hand markets, and this value is not captured fully by valuations made using the traditional financial assessment models but is instead valued to zero or near zero (ING Bank 2015). Towards this end, new valuation methods capable of evaluating market prices and future value of products after use phases are needed (Circle Economy and Sustainable Finance Lab 2016a).

But, **the practice of how the assets' value is written down to nearly zero is not entirely without a basis, at least from the financiers perspective**: **the circular assets (in PSS models) sometimes have value only when they are part of the circular value chain,** and if that circular supply chain would go bankrupt assets would fall on

financiers' hands without significant value. (Circle Economy and Sustainable Finance Lab 2016a; Sustainable Finance Lab 2018). This problem is encountered especially with assets without already developed and effective second-hand markets, as CE is not limited to only cars, medical equipment etc. which can relatively easily and cheaply be liquidated (FinanCE Working Group 2016; ING Bank 2015).

To illustrate this effect, in the data a PSS model was presented in which the product to be offered as a service was washing machines. If the PSS company would first acquire 10 000 washing machines to lease for their clients, then distribute them and go bankrupt, the financier would be in trouble. First, it would have to collect the washing machines from the clients, which would be a very costly operation. Secondly, the financier would have to store the machines somewhere and then sell them, which would also be a time-consuming and costly operation. To overcome this problem, a buyback agreement with the manufacturer was brought up as a possible solution: if the manufacturer would commit to buying the machines back for some price in the case of bankruptcy, they would be usable as assets for the loan. Another way of overcoming the problem of low residual and therefore collateral value of circular assets is making them modular, flexible, movable, durable and otherwise worth more and increase their liquidity. (Sustainable Finance Lab 2018).

Using circular assets as collaterals contains also a legal issue that affects their usability and value as collaterals. **It is an issue of losing ownership through legal accession: In some cases, the parts of the larger good are owned automatically by the owner of the larger good, which makes it impossible for CE companies to technically own their assets, making them less valuable as collaterals**. For example, if immovable parts such as lighting, air conditioning etc. become superstructure of a building and therefore the property of the real estate owner when they are installed inside the building. Thus, the manufacturer cannot retain the ownership of the assets even if it would like to and therefore assets cannot be claimed by the financier in the case of default. There is the possibility to use legal agreements to use as an intermediary of the assets' value, but it will not hold if the client of the service defaults and therefore is not an infallible solution. (ING Bank 2015).

But, as said, cash flow-based lending is not entirely unproblematic from the viewpoint of CE either. A lot of CE business models and companies are novel and highly innovative, meaning that there often is no financial track record available neither for the company nor the business model itself. **Therefore, as financiers usually appreciate historical data over forecasts of the future businesses containing risk in their valuation models, a lot of circular businesses struggle with obtaining finance** (FinanCE Working

Group 2016; ING Bank 2015; Sustainable Finance Lab 2018). In this situation, CE companies should somehow build robustness to their future cash flows and means to present it to the financiers: for example, already made client contracts and customer relationships are presented as an effective means to prove the potentiality of future cash flows to the financiers. In addition, commitment from possible other value chain members and contracts with them shows that other businesses have trusted the reviewed company as well (Sustainable Finance Lab 2018). Also, the valuation models used by the financiers should be modified to fit novel CE debtors better: financiers should be able to first build trust with the client by getting to know them, their technologies, management, customer base and business models better than currently and integrate this knowledge in their valuation models and lending decisions, instead of valuing only historical, "hard" financial data (Circle Economy and Sustainable Finance Lab 2016a).

Financial assessment tools: Other kinds of circular risks

In the data, other risks associated strongly with CE business that are currently being misinterpreted by current financial models used by financiers included technology risk and supply chain risk. It was presented in the data that **CE business and novel CE business models often incorporate technological risk which is not understood well by the financial industry** (European Commission 2019; Finnish Government Strategic CE Initiative Theme Group 2020c). The technological risk derives from that moving to circularity often requires significant changes in the production processes and product design to enable recyclability and reusability of the product, utilization of waste streams and the usage of recycled materials. An increasing factor to the technological risk is that technologies required by CE are quite novel and innovative and therefore often lack track record: financial industry actors do not have the knowledge or the resources to assess this risk correctly. Methods to outcome this risk presented in the data are 1) obtaining access to experts who can better assess the technological risk and 2) developing and applying risk-sharing financial instruments with both public and private actors to share the risk. (European Commission 2019). Unrelated to the incorrect assessment of the risks, technology risk was also presented as a factor inhibiting CE transition in other way: technological risk caused by the lock-in for current linear processes and technologies causes resistance to change in the companies, hampering with not only financing but overall popularity of CE in the investment decisions (Finnish Government Strategic CE Initiative Theme Group 2020c).

Another risk related to specifically CE business mentioned in the data as a risk currently incorrectly assessed by the current financial tools is supply chain risk (or in other words, value chain risk). In CE business and operating models, usually collaboration between a

large number of actors and enabling parties (e.g. the company itself, renewable and recycled material providers, possible side-stream buyers) are required for the model to work. This in turn means that to assess the risks and the profitability of a CE business, the whole supply or value chain's ability to deliver profits must be assessed instead of a single company. As said in the report of Circle Economy and Sustainable Finance Lab (2016a), "*From a financial risk perspective this level of collaboration means an increase in interdependence between companies: the success of the individual company depends on other actors in the chain. Risk exposure depends on the resilience of the network instead of that of a single company.*". Generally, in the data it was presented that **it will require more extensive analysis to analyze whole supply chains instead of singular companies and financial industry currently lacks the correct tools and resources to assess the risks and profitability of whole supply or value chains** (Circle Economy and Sustainable Finance Lab 2016a; FinanCE Working Group 2016; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019).

It has to be noted that the difficulties of assessing value creation in CE value chains is not only a factor related to financial assessment tools or finance overall inhibiting CE transition: it is also difficult for the value chains themselves to distribute risks and value correctly among the chains (Finnish Government Strategic CE Initiative Theme Group 2020a). Nevertheless, it is also a factor related to the lack of financial assessment tools to assess CE and therefore discussed in this chapter.

4.2.2 Profitability of Circular Business and Circular Business Models

According to the data another **very critical factor related to decision-making processes in investing and lending operations is how profitable CE companies and businesses are, what risks are related to them and what other factors affect their actual profitability.** Despite the growing popularity of sustainable and impact investing, especially private financiers are looking for profit for their investments in addition to performing well on ESG matters. So, for CE companies to obtain financing from them, they must be at least somewhat profitable in addition to their sustainable value. In the previous chapter the factors possibly affecting the financiers' perception about CE businesses' profitability were discussed, whereas in this chapter under revision are the factors which were brought in the data as more realistic drivers or inhibitors of CE businesses' profitability, not accountable for e.g. the lack of measurement tools or other indirect reason.

The most significant factors and mechanisms presented in the data to drive or inhibit transitioning to or operating by CE principles related to real profitability of CE business

and CEBMs are the following: market risk, end-client credit risk, inclusion of added sustainable value in the profitability assessment and regulatory risk deriving from public incentives. These factors are discussed further in detail in the following subchapters.

Market risk

A significant risk affecting the financing of CE and therefore transitioning to and operating by CE principles is market risk regarding circular products and business models. In the data, it was presented that **CE business often contains significant market risk because there is not (yet) enough demand for circular products, inhibiting the profitability of CE as a concept and therefore its financeability** (Alhainen 2019; CICAT2025 Ecosystems and Agency Work Package 2020; Cura 2019; European Commission 2014a; FinanCE Working Group 2016; Ojala 2019; Preston 2012). The lack of demand is interpreted to be caused by consumers' general lock-in for conventional ownership models, their unfamiliarity for e.g. leasing of products and other circular models of ownership and product usage and the lack of incentives for consumers to move to purchase circular products. As said in the ING Bank (2015) 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"*. A few more specific mechanisms behind this were recognizable in the data and they are discussed next.

Firstly, as a very significant factor in the data it is noted that **consumers are not used to nor willing to pay a premium for recycled or otherwise circular products but expect a discount of them compared to new products** (CICAT2025 Ecosystems and Agency Work Package 2020; Cura 2019; Finnish Government Strategic CE Initiative Theme Group 2020a; Ojala 2019; Preston 2012). Currently, a lot of circular products are more expensive than new or virgin ones because they require a lot of processing to get them back to circulation e.g. by recycling or repairing, and the cost of the processing has to be included in the price for the product to be profitable. As consumers simply value used products less than new ones by convention, they rather purchase the new one with less expensive price than the circular one with the more expensive price and therefore the drive down the demand for circular products.

Secondly, **consumers are said to be used to purchasing the products new and wanting to own them, instead of leasing them**. This is due to just the convention of how things have always been done: it would require additional motivation and increasing awareness among the consumers to change the mindset of consumers to adapt to circular ownership models. (Circle Economy and Sustainable Finance Lab 2016a).

Thirdly, it was brought up in the data regarding the market risk of CE is that **consumers are used to throwing products away after use instead of keeping them in the circular use loop** (FinanCE Working Group 2016). To overcome this issue, it was presented that there would have to be some incentive or incentives in place for the consumers to retain the products in the loop: the incentive would have to outdo the possible additional effort of the consumer to retain the product in the loop (ING Bank 2015).

Despite all the factors discussed in the previous subchapters, in the data it has also been presented that the required **change towards circular principles in the mindset of the consumers is on its way, even though not yet complete**. It was brought up by two Finnish textile industry actors (Alhainen 2019; Ojala 2019) that by stubbornly communicating the sustainable value of circular products, they have witnessed an ongoing change in the consumers' mindsets towards circularity and overall sustainability.

End-client credit risk

Another significant factor mentioned in the data to affect the profitability of CE and CE-BMs was the credit risk of the end-user of the service. This factor was seen to affect the overall creditworthiness of businesses using especially PSS-kind of business models: other circular business models were not mentioned in this context. In two practitioner research reports the factor was mentioned, **it was presented that end-user credit risks add the risk of financing PSS-kind of businesses greatly, especially in B2C-markets** (Circle Economy and Sustainable Finance Lab 2016b; ING Bank 2015). This derives from the nature of the PSS business models: as said in the joint report of Circle Economy and Sustainable Finance Lab (Circle Economy and Sustainable Finance Lab 2016b): "*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*". In the same report, it is 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 get it back from the end-user in the case of default. In ING Bank's report (2015) it is also noted that it adds to the risk that PSS-models often attract customers which use PSS only because they cannot afford the purchase of the product, making them less creditworthy clients than usual consumers.

To at least partly overcome the issue of increased end-user credit risk, a couple of measures are presented in the data. Firstly, new end-users could be serviced with second (or more) cycle assets, which are already past their payback period and therefore are not as valuable to the PSS company. After proving their creditworthiness, they could be served first cycle assets in their next contract period. (Circle Economy and

Sustainable Finance Lab 2016b). Secondly, banks as financiers could be used as a partner which would assess the creditworthiness of the end-user and mitigate the risk themselves, as assessing credit risk is one of their core competencies (ING Bank 2015).

Inclusion of sustainable impact in the profitability assessment

A very significant factor presented in the data affecting the profitability of CE and CEBMs is how sustainable impact should in the future be included in the profitability assessment of subjects of investment. Sustainable impact would not necessarily have to be given a strict monetary value to enable for taking it into account in the monetary profitability assessment, but in the data it is widely called for that **a practice in including the sustainable impact in some concrete way in the assessment of businesses' (investments') profitability and viability would make CE and CEBMs much more competitive when compared to linear businesses** (Circle Economy and Sustainable Finance Lab 2016a, 2016b; Finnish Government Strategic CE Initiative Theme Group 2020c, 2020a; ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Lappalainen et al. 2020). As said in the Japan/EU Joint Workshop G20 Resource Efficiency Dialogue report (Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019), "*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 taken into account when investment decisions are made*."

But, inclusion of sustainable value is not at all straightforward: **currently, there are no standardized and effective tools to measure the positive and negative sustainable impact and their costs and even how well a project or other subject of investment follows circular principles** (Finnish Government Strategic CE Initiative Theme Group 2020a; ING Bank 2015). And as the founder and CEO of Upright Project, a startup that measures companies' net sustainable impact, Annu Nieminen (Lappalainen et al. 2020) remarks in a podcast episode, the net sustainable impact depends materially on which factors are chosen to be prioritized in the evaluation. Therefore, it might not be possible to create a singular framework to measure all the companies' sustainable impact fairly and comparably which is called for in the result data to promote CE's competitiveness.

Public incentives and regulatory risk

One factor presented in the data to increase the profitability of CE and its viability as an investment and therefore level out the playing field for CE businesses was public financial incentives and subsidies, including e.g. taxation changes, R&D funding and other incentives. These means of public incentives are reviewed more in detail in Chapter

4.1.1: *Public*, but are briefly brought up here as well because the incentives and subsidies concern greatly the real profitability of CE and CEBMs. To summarize, **with public financial support and incentives (e.g. moving the taxation burden towards materials or differentiating renewable and non-renewable materials in taxation), it would be possible to increase the monetary profitability of a CE company as an investment** (e.g. Finnish Government Strategic CE Initiative Theme Group 2020a; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Tikkanen et al. 2018). However, public financial incentives come with increased regulatory risk: profitability based on subsidies under political decision making is considered risky and unattractive to external financiers (CICAT2025 Ecosystems and Agency Work Package 2020; Finnish Government Strategic CE Initiative Theme Group 2020a).

4.2.3 Business Model Typology

According FinanCE Working Group's report (2016), **each Business Model Typology has its own characteristics about its financing and therefore should be reviewed as its own entity when discussing financing CE**. Generally in the result data, different kinds of CEBMs have been discussed varyingly: the more comprehensive approach to review different kinds of CEBMs have been applied only in a few practitioner research papers (FinanCE Working Group 2016; Sustainable Finance Lab 2018), whereas Product-as-a-Service(PaaS)-type of Business Models and their characteristics have been mentioned from the viewpoint of finance as individual notions on several different occasions across the data set (CICAT2025 2020; Circle Economy and Sustainable Finance Lab 2016b; Finnish Government Strategic CE Initiative Theme Group 2020d, 2020c; ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). Most of the content of this chapter is based on the aforementioned practitioner research reports, especially the FinanCE Working Group's report (FinanCE Working Group 2016), since other mentions in the data are only brief and general notions.

In the mentioned practitioner research reports (FinanCE Working Group 2016; Sustainable Finance Lab 2018), Business Model Typologies are categorized into three groups, Circular Innovation Models (CIM), Circular Use Models (CUM) and Circular Output Models (COM), according to the following definitions:

- *Circular Innovation Models* focus on the development (pre-use) phase of the products to optimize the circularity of them: for example, products' durability, reusability, recyclability and repairability can be improved, new materials can be sourced for the products and by-product, side streams and waste streams can be taken into use.

- *Circular Use Models* in turn focus on the use phase of the products: in them products' usage period is optimized for circularity by optimally using the product and maintaining its value. This in turn is done by retaining the ownership of the product and preserving its value during its lifetime by for example repairing it and delivering it for reuse when needed. For example, PaaS-Business Models are included in the Circular Use Models.
- *Circular Output Models* focus on the output and the value of the product in its after-use phase: the income of the company is generated through transforming products into materials or renewed products after their initial use period to add value, reduce costs and reduce waste. For example, recycling facilities can be included to operate in Circular Output Model.

This categorization is used also in this study: each Business Model Typology's relevant characteristics and their effects on financing CE are reviewed separately in the following subchapters.

Circular Innovation Models

Generally, there was not a lot of insights about CIM in the result data: the only discussion of it was in the FinanCE Working Group's research report (2016). The effect of the innovativeness of CE business in general, on the other hand, was mentioned on a couple of occasions and discussed in this study already in Chapter 4.1.2: *Private*, where it was concluded that innovativeness is considered risky by external financiers (Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019).

In the FinanCE Working Group's research report (2016), it is discussed that **Circular Innovation Models come with significant technological, operational and business risks**. Technological risk derives from the development and implementation of new technologies, which have no performance track record and therefore can result in uncertain investment costs, high upfront implementation costs and other risks. Operational risk in turn derives from the possible variations in the feedstock: some processes are based on the specific inputs and might be compromised if the feedstock is altered significantly. Business risk is presented to be a result of multiple factors:

1. Competition with existing materials and products
2. Uncertainty of input specifications and flexibility in operations
3. Uncertainty about product specifications, performance, customer acceptance and related regulations
4. Uncertainty about the residual value of new products

5. Risk of failing to develop cost-effective repair, reuse and remanufacture scheme. (FinanCE Working Group 2016).

It is also brought up that there is a significant difference in the risks of CIM depending on whether the innovation is product innovation or process innovation: product innovations often require additional investments, such as market research, new production technologies and marketing, whereas process innovations are considered as smaller projects containing investments regarding only the process, making them less risky than product innovations (FinanCE Working Group 2016).

Circular Use Models

In the data, Circular Use Models were in turn mentioned more often than the other Business Model Typologies: in the FinanCE Working Group's research report (2016) they were discussed significantly more in detail compared to Circular Input or Circular Output models, and especially the effect of PSS models in the financing of CE companies were mentioned as significant in numerous other data sources (CICAT2025 2020; Circle Economy and Sustainable Finance Lab 2016b; Finnish Government Strategic CE Initiative Theme Group 2020d, 2020c; ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019) as well. According to the analysis, PSS models were presented as the most significant Circular Use Models from the viewpoint of finance: in the FinanCE Working Group report (2016) all of financial implications of Circular Use Models were derived from the usage of PSS models, and all the other sources referred to only PSS models when discussing the effect of certain Circular Use Model on financing a company. Therefore, in this chapter the factors related to Circular Use Models are simultaneously the factors related to PSS models. According to the data, the factors affecting financing especially PSS models are *balance sheet implications and working capital requirements, cash flow implications, legal considerations, value of assets, end-client credit risk* and *market risk* (CICAT2025 2020; FinanCE Working Group 2016; Sustainable Finance Lab 2018). Balance sheet implications and working capital requirements, cash flow implications and legal considerations are discussed in the following subchapters. Value of assets, client-related risk and market-related have been discussed in Chapters 4.2.1: *Valuation of Circular Business and Circular Business Models* and 4.2.2: *Profitability of Circular Business and Circular Business Models*, so they are not reviewed again in this chapter.

Regarding the balance sheets of PSS companies, in the data it was seen that **PSS models result in larger and lower quality balance sheets and increased working capital**

requirements, increasing the capital-related expenses of a company when comparing to e.g. traditional sales models. The long-term ownership of the assets to be leased to the customers leads to a substantially larger balance sheet, which often cannot be financed by the company itself and therefore requires a third party financier. Also, as the cost of capital is usually a certain percentage of the borrowed capital, a growing balance sheet (i.e. growing working capital requirements) means increased capital expenses. Regarding the lower quality of the balance sheet, it is noted that the assets to be written in the balance sheets are principally in the possession of the clients: therefore, they are highly illiquid to be used as collaterals. The illiquidity of the assets in the balance sheet in turn usually leads to an increased proportional cost of capital. (CICAT2025 2020; FinanCE Working Group 2016; Sustainable Finance Lab 2018).

Regarding the cash flow implications included in PSS models, in the data it was presented that **PSS models can have both positive and negative effects regarding cash flows**. On the other hand, it puts pressure on the CE company's financing regarding high upfront costs (i.e. negative cash flows) resulting from the acquisition of the assets and technology etc. investments at the initialization of the business. The positive cash flows to make up for them in turn divide to a long period of time and contain some uncertainty. But, on the other hand, after the initialization phase PSS model binds clients better in customer relationships and results in more secure longer-term cash flows. (CICAT2025 2020; FinanCE Working Group 2016; Sustainable Finance Lab 2018). To overcome the issue of slowly occurring positive cash flows and increase overall financeability, cash flow optimization was presented as a powerful means to both assess and control the risk of the business model. For example shortening the overall payback period or charging higher fees on the early stages of the payback period are mentioned as effective ways to decrease the risk of a PSS model. (ING Bank 2015).

Regarding the legal considerations, in the data it was presented that **PSS models involve lengthier relationship with the client with more transactions related to the client and the asset than the regular sales model, which in turn leads to a need of more sophisticated contracts and legal interpretation and therefore increased legal risks.** Examples of these transactions might be different kinds of situations in which the asset would have to be repaired or replaced, i.e. in what situations the customer is responsible and in what situations the company. (FinanCE Working Group 2016). To overcome this problem, in the data it has been presented that 1) making the PSS contract as robust as possible (reflecting all the possible incurring situations and costs) and 2) communicating it effectively to the clients will decrease the legal risk of PSS models (Circle Economy and Sustainable Finance Lab 2016b).

Circular Output Models

In the data, Circular Output Models and the factors affecting financing CE related specifically to them did not receive a lot of attention. Like Circular Innovation Models, they were discussed only in the FinanCE Working Group's research report (2016), and even in the said report there were not a lot of insights related to them. Anyhow, in the report it is discussed that Circular Output Models sometimes contain technological risk related to the implementation and development of e.g. recycling facility or other machinery to extract materials from used products. Also, it is noted that there is a business risk related to the cost of extraction: for COM to be profitable, the costs of the extraction must be lower than the costs of using virgin materials. Other mentionable financing problems specific to COM have not been mentioned in the data: "*Besides the fact that these business models are different as they source their input materials from used products, no specific financing problems have been found for this business model category.*" (FinanCE Working Group 2016).

4.2.4 High upfront investment costs and risks

High upfront investment costs and risks related to the investments were one of the factors affecting financing CE recognized in the academic literature review of this study, and therefore it was selected as a part of the thematical analysis framework. However, after the analysis of the data, it can be concluded that according to the data **high upfront investment costs and risks are not that much a singular factor or a factor group, but more a characteristic related to many of the costs and risks previously discussed in this study**. Nevertheless, as high upfront investment costs and risks were recognized in the literature review as a factor affecting financing CE, its relationship to previously discussed costs and risks is reviewed briefly here.

In the data, the exact wording, **"high upfront investment cost and risks" is mostly associated with either the costs of acquiring assets to be used in PSS models** (FinanCE Working Group 2016; ING Bank 2015; Sustainable Finance Lab 2018) **or the costs associated to the process and technology investments regarding building new production facilities, supply and value chain arrangements and fitting the existing processes and equipment to new innovations** (CICAT2025 Ecosystems and Agency Work Package 2020; European Commission 2014b; FinanCE Working Group 2016; Preston 2012). An example of the former interpretation is presented in FinanCE Working Group's research report (2016): ".. *the company has to acquire the asset at the start of the lease period (i.e. in the form of an upfront investment)*". An example of the latter interpretation is presented in Chatham House's research report (Preston 2012):

"*But in the short term, there will inevitably be significant up-front investment costs and risks for businesses – e.g. retooling machines, relocating whole factories, building new distribution and logistics arrangements, and retraining staff. Attempting to transform a company's core business model is a risky task in itself and a strong business case will be needed*." As these factors in which high upfront investment costs and risks have been associated with have already been reviewed, they are not discussed here again more in detail.

Deriving from the aforementioned citations and other occurrences of the factor in the data, when the factor is reviewed more in-depth according to the contexts it is presented in, it can be argued that according to the data the factor of high upfront investment costs is actually a higher-level interpretation of the multiple different risks and investments which CE involves. Nevertheless, there is one significant aspect to the factor which is not presented in the more in-depth analysis of the aforementioned associations it is presented in (acquisition of PSS model assets and process/technology investments): **high upfront investment costs and risks were often brought up in the data as a factor inhibiting financing CE in the context of existing businesses transitioning to CE principles** (CICAT2025 Ecosystems and Agency Work Package 2020; European Commission 2014b; Preston 2012). Although, it has to be noted that the factor was not stated to apply only to transitioning companies even though they were the context in the factor was discussed.

4.2.5 CE as a business and growth opportunity for finance industry

One of the factors recognized in the data affecting financing CE and especially the attractiveness of CE in the eyes of financiers and investors was how CE could be a significant business and growth opportunity for financiers and the finance industry in general. In general, it was seen that **financing CE and CE companies could increase the demand of different financial products greatly and therefore be a great business opportunity for the financial sector** (Ellen MacArthur Foundation 2013; ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). The said factor was discussed quite unanimously in the data set in the practitioner research reports which reviewed CE's implications for financial sector actors (see Ellen MacArthur Foundation 2013; ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019), whereas in other data sources it was not mentioned at all. Despite that CE's nature as business opportunity for the finance industry itself was brought up quite strongly in the data sources it was discussed in, there was not a lot of in-depth discussion about

what mechanisms related to CE make it so. However, some insights were discovered: according to the data, the business opportunities implied for the financial industry by CE would derive from 1) *the transition to PSS models and their capital and other financing demand*, 2) *the investments in e.g. technology, R&D operations and process implementations required in a CE transition* and 3) *CE's nature as a sustainable operating paradigm*.

The positive effect of the transition to PSS models would simply be a result of increased demand of financing products suitable for PSS. As discussed in Chapter 4.2.3: *Business Model Typology*, PSS models have their own financial implications and if PSS models would become more in common, the demand for them would increase greatly: "*The leasing of goods in transactions in both the business-to-business (B2B) and the business-to-consumer (B2C) segment would likely become more common, requiring a commensurate uptick in services relating both to structuring and managing leasing arrangements.*" (Ellen MacArthur Foundation 2013).

The positive effect of investments in e.g. technology and R&D operations required for CE transition would be a result of increased demand of traditional financial products targeted for said investments. The reconfiguration of business and production processes would require significant external financing, which would in turn benefit the businesses of the financial sector. (Ellen MacArthur Foundation 2013).

The positive effect of CE's nature as a sustainable paradigm would be a result of its benefits for the financial industry's overall sustainability goals and of how sustainable businesses often are better customers for banks. In ING Bank's research report (2015) it is noted that the financiers themselves have sustainability objectives and CE companies and customers are an efficient way of helping in fulfilling them. In the same report, it is also presented that there is evidence of how sustainable companies are more innovative, creditworthy and have better financial performance, which makes them better customers. Thus, customers performing well sustainable-wise help financiers build healthier customer portfolios and therefore create better quality business for them. (ING Bank 2015).

The only negative subfactor of CE as a business opportunity for the finance industry mentioned in the data was that usually **CE is seen to mitigate price volatility of materials and goods, which would in turn decrease the demand for products used for hedging against these volatile material prices**. Although, it has to be noted that it was discussed in only one data source briefly and it was not emphasized as a significant effect. (Ellen MacArthur Foundation 2013).

4.3 Subjects of financing

In the following subchapters, factors related to subjects of financing are reviewed from the viewpoint of research questions based on the thematical analysis of the data. In this study, the category "Subjects of financing" includes different entities that can be financed, such as CE supply chains, CE companies and projects and productization phases within companies, consortiums and other organizational entities and the factors within them. Deriving from the analysis of the data, the most relevant financeable entities and/or entity groups regarding the research questions and overall financing CE are *Subjects containing multiple entities* (e.g. Supply Chains and joint projects), *Companies* and *Subjects within companies* (e.g. productization phase or development projects). These categories and the factors within them are reviewed next.

4.3.1 Subjects containing multiple legal entities

According to the analysis of the data, when reviewing relevant subjects of financing which include more than one company or legal entity, **the most significant entities from the viewpoint of financing CE are Circular supply chains and joint projects** (e.g. R&D projects or other development projects). As discussed also earlier in Chapter 4.1.2: *Private*, it is highlighted widely across the result data that to achieve a large-scale CE transition, collaboration between different actors is necessary (Ellen MacArthur Foundation 2013; European Commission 2019; FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020b; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Preston 2012) and according to the data, the collaboration within circular supply chains and joint projects is no exception to that (Alhainen 2019; Circle Economy and Sustainable Finance Lab 2016b; FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020a). In the following subchapters, it is discussed which aspects of Circular supply chains and joint projects between CE actors affect financing transitioning to and/or operating by CE principles and how, as presented in the data.

It is noticeable how the different data sources emphasize different things regarding subjects of financing containing multiple legal entities: in the Finnish data sources, usually joint projects (e.g. research projects, implementation projects) are brought up as an effective means to drive financing CE activities (e.g. Alhainen 2019; CICAT2025 2020; Ojala 2019) . On the other hand, practitioner research reports (which assess mostly the financier side of financing CE) concentrate on financing CE supply chains, without emphasizing the importance of joint CE projects considerably (Circle Economy and

Sustainable Finance Lab 2016b; FinanCE Working Group 2016; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Preston 2012).

Supply Chains

Firstly, it must be noted that in this study, the name “Supply Chain” was decided to be used of the concept discussed in the data with multiple different names. In the data, the names “Supply Chain”, “Value Chain”, “Value Network” and “Ecosystem” were used quite unanimously, at least in the context of financing. The name “Supply Chain” was used most frequently, and therefore it was chosen to be used in this study as well as a name describing all the occurrences of previously listed names of the concept.

In the data**, the key issue presented to inhibit the effective financing of circular supply chains is how to distribute investments, incentives, value, resources, risks and profits fairly in the entities containing multiple parties and complex structuring** (FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020a; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Preston 2012). It is presented in the data that currently there is no legal framework or financial instruments to support financing whole supply chains at once. Therefore, there is no means to distribute the investments, risks and profits fairly within the supply chain, making it an unappealing subject to invest in (FinanCE Working Group 2016; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). As there is no legal framework or financial instruments to support financing the supply chains at once, it is stated that there is also no economic instruments to support distributing the risk and the benefits within the chains, making them even more difficult to be financed (Finnish Government Strategic CE Initiative Theme Group 2020a).

Secondly, it was also presented in the data **that financing the whole circular value chain would lower the risk for financial institutions** and therefore lower the threshold to invest in CE. Since there would be more than one entity responsible for paying back the debt of the value chain, the success of the investment would not be dependable on the creditworthiness of just a singular company. (FinanCE Working Group 2016; Sustainable Finance Lab 2018).

Joint projects

According to the analysis of the data, joint projects are seen mostly as driving force for both the overall transition to CE and financing it. It was discussed rather scarcely and more detailed insights of the mechanisms behind it were not available in the data, but especially in the Finnish data sources it was presented that **by participating in a joint CE project of multiple actors it is more likely to 1) invest in CE R&D and apply for**

funds to finance it overall and 2) receive a positive financing decision from external financiers, when compared to acting alone (Alhainen 2019; CICAT2025 2020)**.** It is highlighted that collaborating in the joint projects is a driving force especially for smaller companies, which might be seen as too risky subjects of financing for the banks by themselves (CICAT2025 2020), might not have the funding, time or other resources to initiate a CE transition at all or might not have the know-how to apply for external funding (Alhainen 2019). Also, joining larger joint projects builds credibility and trustworthiness in the eyes of the financiers to the entities participating in it (Alhainen 2019).

4.3.2 Companies

As most of the financeable subjects are usually companies and as according to the data some of the CE companies' characteristics affect their financing significantly, it is essential to review companies as one of the categories of subjects of financing. In the following subchapters, it is discussed which characteristics and/or attributes (i.e. factors) of companies operating by or transitioning to CE principles can affect their financing and how.

Company Size

According to the data, a very significant factor affecting the financing of transitioning to and operating by CE principles in the companies was their size. It was generally presented that **smaller companies usually have more issues and obstacles in obtaining their financing for CE activities when compared to the larger ones** (CICAT2025 Ecosystems and Agency Work Package 2020; Circle Economy and Sustainable Finance Lab 2016a; European Commission 2014a; Harlin 2019; Heikkilä 2019; Sustainable Finance Lab 2018). It is also pointed out that this is not characteristic to only companies transitioning to or operating by CE principles but is generally the case for companies regardless of their industry (Circle Economy and Sustainable Finance Lab 2016a). Nevertheless, as SMEs make a large contribution to an overall transition to CE (European Commission 2015) and have most troubles in their financing (Circle Economy and Sustainable Finance Lab 2016a), it is important to study the reasons behind their issues further to review which factors affect the financing of transition to and operating by CE principles overall. To conclude the findings that are discussed more in detail in the following subchapters, issues making it more difficult for smaller businesses to obtain financing and finance their CE activities are *the greater dependability of external finance*, *the relatively larger magnitude of changes in business*, *inability to establish an innovation portfolio*, and *inability to issue green bonds*.

Firstly, according to the data it is noticeable how **smaller businesses are generally more dependent on external financing** (Circle Economy and Sustainable Finance Lab

2016a; European Commission 2019; Sustainable Finance Lab 2018). As said in the European Commission's research report (2019), "*While large businesses are often capable of financing the circular transition internally through retained earnings, young and fast growing firms are often dependent on external financing for growth.*" It is also pointed out that in addition to having their own resources for CE transition, larger companies are better suited for applying for external financing as well (Circle Economy and Sustainable Finance Lab 2016a).

Then, the analysis of the data showed that **for smaller businesses, the relative magnitude of the changes such as CE transition is noticeably more significant** (CICAT2025 Ecosystems and Agency Work Package 2020; Heikkilä 2019). It is presented that if an SME starts to e.g. implement a whole new, circular business model or otherwise include circular principles in its operations, it usually has to risk its whole core business in order to do that, whereas larger companies have the option to exploit smaller portions of its business and/or markets to execute trial runs with a certain change (Heikkilä 2019). Resulting from this, larger companies can operate the smaller trial segment of their business unprofitably, adjust it and learn from it to make it profitable, whereas smaller businesses do not have this option (CICAT2025 Ecosystems and Agency Work Package 2020).

Somewhat related to the previous issue, it was also presented in the data that **for smaller companies it is not possible to build a large and diversified innovation portfolio.** Therefore, it is riskier to invest in CE innovation for SMEs, whereas larger companies can diversify the risk by having a large innovation portfolio. This results in that it is riskier to finance SMEs than larger companies in their CE innovation activities. (Sustainable Finance Lab 2018)**.**

Another factor that was presented in the data to inhibit the financing of smaller companies in their efforts to transition to or operate by CE principles is that **for SMEs it is not possible to issue green bonds**. As bonds usually have a minimum threshold of millions of euros, they are too large to be of use for SMEs. They have been a popular instrument for large institutional financiers and investors for investing in sustainable activities, which CE can be included in. Thus, they could be an effective means to finance CE, but they are currently not available for many of the CE companies to use. (Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019).

Lack of know-how or unwillingness to apply for funding

According to the analysis of the data, another factor about companies affecting financing of transitioning to and operating by CE principles is **how often especially small and**

young businesses lack the know-how or the resources to apply for funding or to make their business more financeable and attractive to external financiers (CICAT2025 2020; CICAT2025 Ecosystems and Agency Work Package 2020; Finnish Government Strategic CE Initiative Theme Group 2020a; Luoma 2020; Pietikäinen 2018; Roiha 2018). This notion was presented especially in the data which was concerning Finland and Finnish companies. It was also remarked that this is a common problem for all kinds of Finnish companies trying to establish their business, not just CE companies or companies trying to transition to CE principles (Finnish Government Strategic CE Initiative Theme Group 2020a).

The mentioned issues are said to be a result of a lack of universal business know-how: often the entrepreneurs in the small companies are very technical and/or creative persons without business education and skills. Firstly, it is said that these people in the companies do not know where to obtain the financing from and how: they simply are not familiar with financial markets and how they operate, which results in that they do not necessarily find the right kinds of financing for them (CICAT2025 2020; CICAT2025 Ecosystems and Agency Work Package 2020; Roiha 2018). Secondly, it is pointed out that entrepreneurs often do not know how to be credible in the eyes of the financiers and create business attractive to the financiers from their often technology-oriented and innovative inventions: the product itself can be very viable, but if the company leadership cannot convince the financiers of their ability to run a business profitably, they are not going to be financed (Luoma 2020).

In addition to the previous, it was presented in the data **that sometimes it is the case that CE companies do not want to scale up and obtain external financing**. Firstly the reason for this can be that like many other companies focused around sustainability issues, these companies exist for their sustainable ambitions and to try to make the world better instead of growing large and making profit, which in a way inhibits the overall transition to CE. Another reason for the reluctance to apply for external funding is that sometimes a company cannot obtain debt financing for some reason, and equity financing is not an attractive option for the entrepreneur: equity financing would mean selling an equity stake of their company to an external party, which is unappealing for some entrepreneurs because they would lose a part of their companies. (CICAT2025 2020).

4.3.3 Subjects within companies

In the data, there was a lot of discussion about what kinds of issues relate to different subjects of financing within companies. They were discussed mostly on the Finnish data sources by multiple different kinds of actors (CICAT2025 2020; CICAT2025 Ecosystems

and Agency Work Package 2020; Circle Economy and Sustainable Finance Lab 2016a; Finnish Government Strategic CE Initiative Theme Group 2020a, 2020c; Mäki 2019; Pietikäinen 2018; Savolainen 2018; Tasa and Honkanen 2018): the primary insights was about how the funding previously obtained and currently available for CE and CE projects is divided between research & development (R&D) and commercialization phases of CE technologies and products. In the following subchapter, these insights are reviewed more in detail.

As a side note, it must be acknowledged that allocating funds between R&D and commercialization phase is not necessarily a question about how the funds are allocated within a company. Especially in start-ups and other small companies, the whole company can be in the R&D phase (e.g. developing a new technology) or in the commercialization phase (e.g. when the technology is ready for sales), and therefore it does not have to allocate its funding to either R&D or commercialization. However, as usually most of the companies have separate functions working on R&D and commercialization phases, in this study the allocation of funds between R&D and commercialization phases has been categorized as a factor related to subjects of funding within companies.

Allocation of funds between R&D and commercialization phases

As said, when reviewing the possible subjects of funding, the most discussion in the data was about how funds obtained for and currently available for transitioning to and/or operating by CE principles are allocated between R&D and commercialization activities in the companies. In the only practitioner report data source it was mentioned, Circle Economy and Sustainable Finance Lab's (2016a) joint research report, it was presented that usually most of the financing constraints of a company occur at the earlier phases, such as the R&D phase. However, in the Finnish practitioner & research data sources it was mentioned, it was presented that in Finland, **the emphasis of the currently available funding for CE was heavily allocated to R&D activities, whereas commercialization activities would need more financing** (CICAT2025 2020; CICAT2025 Ecosystems and Agency Work Package 2020; Finnish Government Strategic CE Initiative Theme Group 2020c; Mäki 2019; Pietikäinen 2018). In few data sources, it was presented that this is the situation especially in the case of public funding (CICAT2025 2020; Mäki 2019). It was concluded that to successfully finance the transition to and operating by CE principles, both the R&D phase and commercialization phase require adequate financing (Finnish Government Strategic CE Initiative Theme Group 2020a).

In the data, there was two reasons presented which might have caused the heavier funding allocation in R&D activities in Finland, both brought up in a Focus Group Discussion

of CICAT2025 researchers (2020). Firstly, the issue is that CE as a concept and the technologies and products related to it are in their early stages of development and therefore require a lot of research and R&D activities to become viable. Thus, the research and R&D phases related to CE currently are and perhaps need to be more comprehensively financed than the commercialization phases. Secondly, it was presented that the public organizations which support financially a lot of CE projects and companies in Finland can fund only the R&D and product development phases according to their operating principles. This in turn leads to a conflict on some level, when a lot of companies (especially startups and small companies) would need financial support to fund the commercialization phase. (CICAT2025 2020).

5. DISCUSSION

In this chapter, the results that emerged from the analysis and which were reported in detail in Chapter 4: *Financial Drivers and Inhibitors of Circular Economy Business and Circular Companies' Attractiveness as* An Investment, are summarized and discussed, reflecting them to the research questions. The chapter is divided correspondingly to Chapter 4: financial factors driving and inhibiting Circular Economy Business and CE companies' attractiveness are discussed first regarding the category of Sources of financing (Chapter 4.1), second regarding the category of Criteria for financing (Chapter 4.2) and third regarding the category of Subjects of financing (Chapter 4.3). The factors are discussed based on the results, but also reflected comparing them to academic literature assessed in Chapter 2: *Sustainability and Circular Economy in Finance*, in the case there was any discussion in the academic literature about the factor. The factors and their interrelations are summarized below in Figure 5.

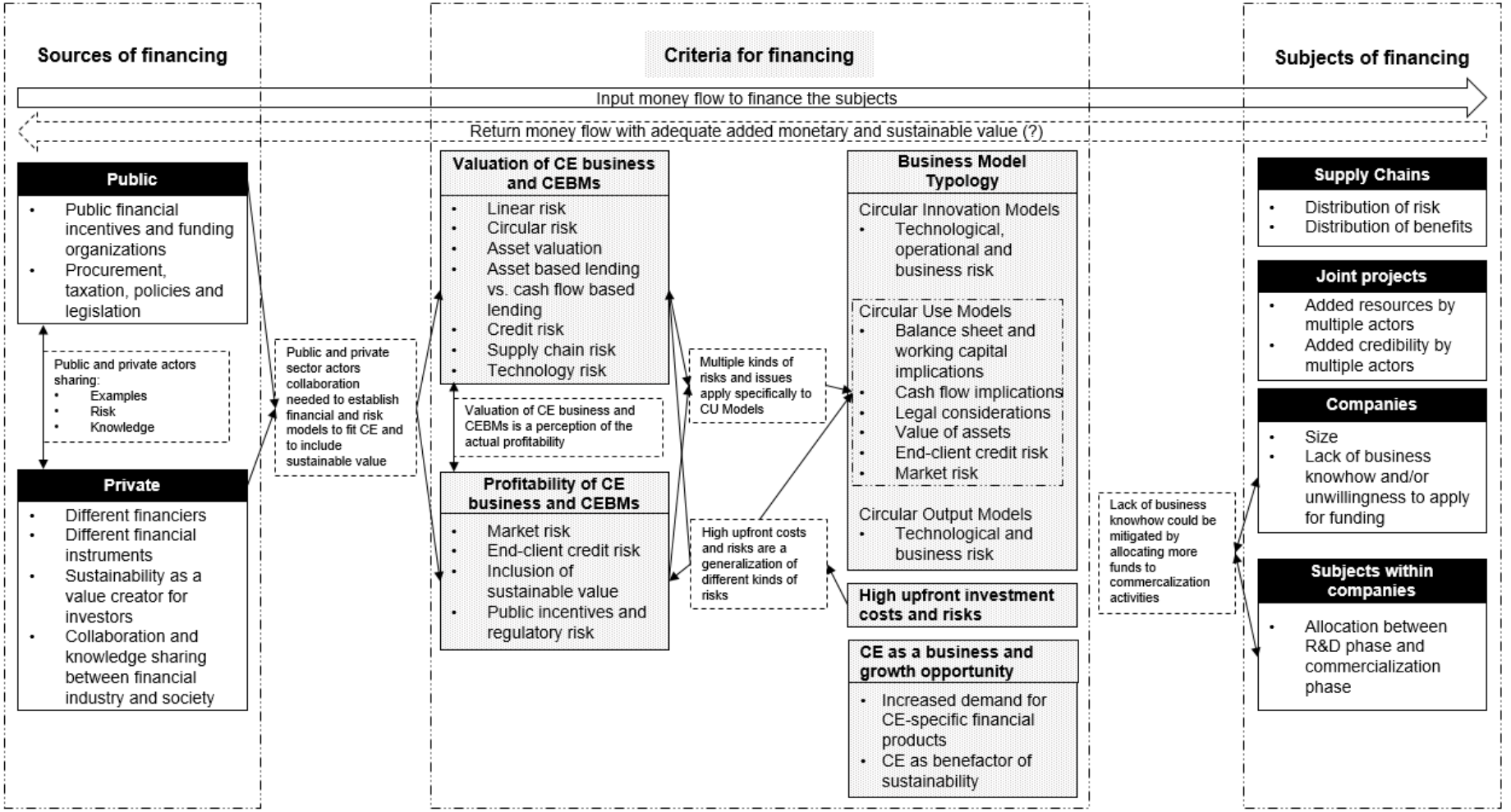

Figure 5. *Summary of the factors and their interrelations recognized in the study*

Of each factor to be discussed later in the corresponding subchapters, a proposition is made according to what was revealed in the analysis of the data. The propositions aim to answer briefly and compactly how the factor is proposed to drive and/or inhibit Circular Economy Business and Circular companies' attractiveness as an investment. In the case that the factor contributes towards the said objectives in different ways, the most significant one is brought up in the proposition. These propositions are summarized in the tables at the beginning of each chapter.

5.1 Sources of financing and Circular Economy Business

When assessing the overall view of factors affecting financing transitioning to and operating by CE principles and CE companies' attractiveness as investments related to sources of financing, it can be observed that firstly, there are a moderate amount of them, and secondly, they are at least at the moment mostly inhibitors to the large-scale CE transition. The propositions derived from the analysis of data and the literature related to the factors are summarized below in Table 7. But it can also be observed that regarding many of the inhibiting factors, the mechanism behind the factor can and most likely will be a subject of change in the future to favor transitioning to and operating by CE principles (e.g. 1c, 1d, 1e, 1f, 1g, 1i, 1k, 1l). For example, taxation related factors (1c, 1d: the distribution of taxation burden between labor and material use and non-differentiation of renewable and non-renewable materials, both unfavorable from the viewpoint of CE), were both identified in the data either in the documents meant to guide political decision-makers (FinanCE Working Group 2016; Tikkanen et al. 2018) or in the citations of the political decision-makers and other groups that influence political decision making heavily (Finnish Government Strategic CE Initiative Theme Group 2020d; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). Thus, it can be argued that these factors are noted amongst the parties making decisions and therefore they at least should be subject to change on some schedule.

Table 7. *Summary of propositions related to sources of financing*

Factor category		Proposition derived from the factor	Driver / Inhibitor
Public	1a	Public sector's role is crucial in 1) creating an even 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 renewable and non-renewable resources to encourage CE	I
	1e	Public sector procurement processes are locked-in to favoring conventional linear business	I
Private	1f	Traditional bank lending and capital markets procedures and financial assessment methods are not fit to assess CE and CE Business Models	I
	1g	Traditional bank financing sees novel and innovative (CE) business models as risky due to e.g. the lack of historical evidence of their profitability	I
	1h	Impact financing aids in financing CE, but is too scarce a source of financing for needs of large-scale CE transition	D
	1i	New kinds of financial instruments and 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
	1k	Sustainable investors have not yet discovered CE companies as potential investments in large scale	I
	1l	CE companies have not yet exploited their nature as sustainable investments in the eyes of sustainable investors	D/I
	1m	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 etc., knowledge partnerships)	D/I

As is said in the first factor (1a) of Table 7, it can be concluded that overall the role of the public sector in financing CE is very crucial. Creating an even playing field for CE businesses in the world still favoring linear economy is a mission that relates to many other factors, reviewed both in this subchapter and the next two subchapters. For example, by creating a taxation system that would prefer labor over material use and that would differentiate renewable and non-renewable materials (1c, 1d; Cura 2019; Ellen MacArthur Foundation 2013; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Tikkanen et al. 2018), two of the inhibitors of financing CE could be nullified. By creating a legal framework that would make it possible to finance circular supply chains as a whole (1i, 2h, 3a; FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020a; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Preston 2012), another inhibitor could be made empty. The role of the public sector and especially the role of financial incentives to aid in CE transition was also widely recognized in the literature (see e.g. Aranda-Usón et al. 2019; Demirel and Danisman 2019; Govindan and Hasanagic 2018; Kirchherr et al. 2018; Masi et al. 2018; Moktadir et al. 2018; Rizos et al. 2015, 2016; Scarpellini et al. 2018; Su et al. 2013), and

the results of this study both supports the views presented in the literature and enlightens the reasons and mechanisms behind them. Without the direct and indirect financial support of the public sector, its collaboration with other actors of society and its other efforts in creating an even playing field for CE companies, a large-scale CE transition cannot be achieved.

Although the propositions related to taxation (1c, 1d) are not directly related to finance, they are heavily connected to the profitability of the CE companies. And as has been discussed in Chapter 4.2: *Criteria for financing*, the profitability of any venture or other subject of financing is the key to obtaining external financing, especially when the funding is tried to be obtained from private financial markets. By altering the taxation system to favor the usage of labor instead of material use and the usage of renewable materials over non-renewables, a significant leap towards better profitability and therefore better financeability of CE companies could be achieved. As was presented in the data (European Commission 2015; Finnish Government Strategic CE Initiative Theme Group 2020a; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019), private financial markets are much larger than public funding opportunities, and therefore by driving more private financing towards CE much wider impact could be done by political decision-makers than by e.g. only creating public financial incentives for CE. It must also be noted that the taxation related factors/propositions were not visible in the literature review of this study, and therefore contribute to this study as academically new information.

Another recognizable group of factors and propositions were the ones related to sustainable and impact investing (1h, 1j, 1k, 1l). In the literature review, it was pointed out that there is a massive interest towards sustainable investing and financing amongst both academics and practitioners and that there are a lot of frameworks (e.g. ESG, CSR, SRI) in place to achieve a more sustainable world through financing. Contradictory it was also presented that there has not been a lot of research connecting CE to these frameworks or sustainable investing overall, despite CE's nature as a sustainable paradigm of operation.

The similar phenomena were recognizable also in the data. CE was generally discussed as one of great beneficiaries of sustainable investing megatrend, since especially environmental sustainability belongs strongly in its core (e.g. Finnish Government Strategic CE Initiative Theme Group 2020a, 2020b; ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). However, all the data that presented CE as a beneficiary was originated from high-level expert group conversations and commercial bank research report. And, with the exception of one data item (Japan/EU Joint

Workshop G20 Resource Efficiency Dialogue 2019) mentioning ESG as a beneficial trend for CE, none of these reports mentioned the popular frameworks introduced in Chapter 2: *Sustainability and Circular Economy in Finance* such as ESG, CSR and SRI but discussed sustainable investing as a whole. None of the company level data sources mentioned that they had been financed by sustainable investors or that their company's sustainable nature had helped them in their efforts in obtaining financing. In one financier interview (Luoma 2020), it was mentioned that their company has a CE fund, which naturally is evidence of the contrary, that some CE companies have been financed by sustainable investors. But it was also pointed out that it is the first of its kind in the world, which would implicate that financing CE by sustainable investors is still in its infancy. Even though this study was not comprehensive enough to claim that CE companies generally have not obtained any financing from sustainable investors or otherwise as a result of their sustainable nature, propositions can be made based on it that sustainable investors and CE companies have not yet found each other in a larger scale and that the connection between them currently occurs mostly on theoretical and conceptual conversations (1k, 1l). It can also be speculated that perhaps ESG, SRI and CSR are at this point concepts rooted too much in the theoretical finance literature instead of CE vocabulary and that the theoretical connection between the CE and sustainable finance would have to be better established to expect the said concepts to occur in the CE-focused data.

Therefore, there lies a large amount of unused potential for both groups to aid them in achieving their objectives, which should be taken advantage of more efficiently. One possible way of utilizing this potential would be steering sustainable investors from green bonds to some other instruments more favorable for CE, such as CE funds or CE concentrated Private Equity/Venture Capital funding. Green bonds are popular amongst large investors, but, as proposed, they are often not available for CE companies due to CE companies' relatively small sizes (1j: Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). Financing singular circular companies is also too risky and small an investment for institutional investors, and therefore a larger offering of instruments suitable for driving large investors towards CE is called for (1i).

Another factor which was revealed in the analysis of data to be very significant from the viewpoint of financing CE is the collaboration between financial industry, public sector and other actors of the society (1m; Ellen MacArthur Foundation 2013; European Commission 2019; FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020b; Japan/EU Joint Workshop G20 Resource Efficiency

Dialogue 2019; Preston 2012). Instead of having an intrinsic value of its own, the significance of the collaboration derives from the collaboration's significance in disabling and decreasing the impact of a large number of other factors proposed in 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 utilized (1m, 3a). That framework and many other changes required for large scale CE transition simply cannot be achieved without the collaboration of the financial industry, public sector and other actors of society.

It also seems that at least currently, CE is not generally in the favor of private financiers due to the crowding out of the private money experienced in the data, poor fit of the current financial assessment methods to CE Business models and the riskiness of the novel and innovative CE Business Models (1b, 1f, 1g; CICAT2025 Ecosystems and Agency Work Package 2020; Finnish Government Strategic CE Initiative Theme Group 2020a; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Tasa and Honkanen 2018). The first two factors (1b, 1g) are not necessarily unique to CE business and are also difficult to come up with a solution for: the need for public financial support and novel and innovative business models do inevitably contain some risk for a private financial industry actor looking for high, liquid and low-risk profits. The reasons behind the poor fit of the financial assessment methods are reviewed better in Chapter 5.2.

5.2 Criteria for financing and Circular Economy Business

As can be seen when comparing Table 8 to the other proposition tables (Table 7, Table 9), the clearly largest group of financial factors driving and/or inhibiting CE transition are related to criteria for financing: a total of 22 propositions were derived from those factors. Although they are heavily connected and, in some cases, overlapping with each other, there is no denying that according to the analysis conducted in this study they are the most significant group of factors driving and inhibiting large-scale CE transition. And as also can be seen from Table 8, almost every one of them can be viewed as an inhibitor to CE. There are exceptions in the case of 3 propositions (2n, 2u, 2v) where the factors can be interpreted as drivers, but in all these 3 factors the interpretation has been mostly based on their potential of becoming driving forces of CE in the future, instead of being them now.

Table 8. *Summary of propositions related to criteria for financing*

Factor category		Proposition derived from the factor	Driver / Inhibitor
Valuation of Circular Business and Circular BMs	2a	Current valuation, risk assessment and pricing tools are locked-in to linear business and not fit for assessing 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 into the resource pricing	I
	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 collaterals contains a legal issue due to losing ownership through legal accession, which is difficult to value correctly	I
	2f	Financiers appreciate historical data over forecasts which derails financing from novel CE businesses and Business Models	I
	2g	CE business often incorporates technological risk which is not well understood in the financial industry	I
	2h	Current financial models are not fit to assess whole supply chains due to their complexity, whereas assessing whole supply chains would often be required to assess the value of CE and CE Business Models	I
Profitability of Circular Business and Circular BMs	2i	CE business often contains significant market risk due to the low demand for Circular products	I
	2j	Consumers are not used to nor willing to pay a premium for recycled or otherwise circular products over new ones	I
	2k	Consumers are used to owning the products, which favors linear operating model of selling goods instead of PSS-models	I
	2l	Consumers are used to throwing products away after use instead of circulating them, which breaks the circular cycle of materials	I
	2m	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 often come with significant technological, operational and business risks	I
	2q	Circular Use Models (PSS models) are affected significantly by balance sheet implications and working capital requirements, cash flow implications, legal considerations, the value of assets, end-client credit risk and market risk	I
	2r	Circular Output Models contain moderate technological risk and business risk related to the cost of extraction	I
High upfront investment costs	2s	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 were often associated with the transition of non-CE companies to CE principles	I
CE as a business opportunity for the finance industry	2u	Financing CE could increase the demand of different financial products posing a business opportunity for the financial sector	D
	2v	CE would benefit financial industry companies in achieving their overall sustainability objectives	D

The common theme amongst almost all the propositions related to the financial valuation of Circular Business and Circular Business Models is well concluded in proposition 2a: *"Current valuation, risk assessment and pricing tools are locked-in to linear business and not fit for assessing CE".* Firstly, the current financial models are not fit in assessing the typical risks related to CE business (2b, 2c, 2g, 2e): circular risks such as cash flow risks,

technology risks, market risks and supply chain risks and the risk related to losing ownership through legal accession and linear risks such as rising resource prices and their volatility, supply risks, regulatory risks, reputational risks and risk of inclusion of externalities into resource prices are generally not taken into account correctly when assessing CE business (e.g. European Commission 2019; FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020d; ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Sustainable Finance Lab 2018). The findings of this study confirm and explain better the previous academical findings discussed in the literature review: e.g. Aboulamer et al. (2020), Fischer & Pascucci (2017) and Rizos et al. (2016) presented that circular and linear risks and assets are not assessed correctly with traditional financial models and/or amongst traditional financiers.

Secondly, the current operating methodology and habits in the financial industry do not favor CE business (2d, 2f, 2h): the usage of asset-based lending (Circle Economy and Sustainable Finance Lab 2016a; Sustainable Finance Lab 2018), the requirement of historical data of profitability of the business models (FinanCE Working Group 2016; ING Bank 2015; Sustainable Finance Lab 2018) and the inability to assess the value of the circular supply chains all clearly inhibit the large-scale CE transition (FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020a; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Preston 2012). The requirement of historical data amongst financiers was also recognized in the literature review: e.g. Aboulamer et al. (2020) presented that in the case of many funding decisions, there is not enough historical data to determine the stability of the cash flows induced by the Circular Business Models.

To conclude and speculate the impact on the large-scale CE transition of all the propositions and their underlying factors related to the valuation of CE Business and CE Business Models (2a-2h): the valuation models used in the financial industry are generally the basis of every loan and funding decision made. That being said, if the CE businesses are wrongly assessed by the models (to be riskier/inferior in profitability than linear ones), the businesses inevitably do not access the financing they need either with the correct terms or at all. Therefore, incorrect financial assessment models are a very significant inhibitor of CE Business and large-scale CE transition overall.

When reviewing the propositions and their underlying factors related to the actual profitability of the CE Business and CE Business Models, the first significant group of factors derives from the market risk contained by CE Business, and more in detail the currently prevailing customer behavior (2i, 2j, 2k, 2l, 2m). According to the listed propositions (2i-

2m), there are multiple aspects that are unfavorable for the demand of circular products: consumers are not willing to pay a premium for circular products and expect a discount instead for used/recycled products (2j, e.g. CICAT2025 Ecosystems and Agency Work Package 2020; Cura 2019; Finnish Government Strategic CE Initiative Theme Group 2020a; Ojala 2019; Preston 2012), they are more comfortable with owning the products instead of leasing them (2k, e.g. Circle Economy and Sustainable Finance Lab 2016a) and they are used to throw the products away after they do not need them anymore (2l, e.g. FinanCE Working Group 2016), instead of recycling them or otherwise maintaining them inside the circular material loops. It has also been noticed that especially PSS models are often popular amongst consumer groups who cannot afford to purchase the goods and therefore who often have poor credit records, adding to the end-client credit risk of the service provider (2m, e.g. Circle Economy and Sustainable Finance Lab 2016b; ING Bank 2015).

The other factors/propositions related to the actual profitability of CE Business and CE Business Models are that the inclusion of sustainable value in the profitability calculations would benefit CE greatly (2n; Circle Economy and Sustainable Finance Lab 2016a, 2016b; Finnish Government Strategic CE Initiative Theme Group 2020c, 2020a; ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Lappalainen et al. 2020) and that profitability originating from public financial incentives contains significant regulatory risk (2o; CICAT2025 Ecosystems and Agency Work Package 2020; Finnish Government Strategic CE Initiative Theme Group 2020a). The proposition 2o can also be linked to the proposition 1b: in it it was pointed out that in many company-level data sources mentioned that the exploitation of public financial incentives can cause crowding out of private financiers, and the regulatory risk brought up in proposition 2o is the most likely the reason for it.

In the literature review of this study, there was some indication of the relevance of the factors related to the actual profitability of CE Business, although not in the same depth as in the results of this study. It was clearly presented that the profitability of CE Businesses is in many cases uncertain, realizes in a long period of time and is sometimes known to be nonexistent in monetary measures (e.g. Govindan and Hasanagic 2018; Jesus and Mendonca 2018; Russell et al. 2020). It was also mentioned that in some cases, the consumers think that recycled products are worse than new ones (Rizos et al. 2016). The reasons for the previous was not elaborated further, but by reviewing the findings of this study, the findings of the literature review were not only confirmed but also explained more in detail by the propositions 2i, 2j, 2k, 2l and 2m.

As maximizing profitability is generally the main precondition for any investment, it can be concluded that the significance of the propositions and factors related to the real profitability of the CE Business is major. Therefore, it is important that solutions are come up with that can overcome the inhibiting factors mentioned in the propositions. The first and perhaps the simplest means to address the profitability of the CE companies would be to improve CE companies' Business Models and overall business and therefore improve their profitability. As is presented later in Table 9 in proposition 3h and as was reviewed in the result section, Chapter 4.3.2: *Companies*, especially young CE companies often lack business know-how and might not know how to make their businesses profitable. To aid in that, e.g. ING Bank's (2015) idea about banks becoming experts in making CE Business Models profitable (due to having experience of similar clients) and overall financiers becoming the knowledge partners of CE companies could be a possible solution. By doing that or in any other way utilizing all possible business potential of CE companies is crucial in obtaining the funding for CE companies and therefore in contributing to the large-scale CE transition.

In the proposition 2n, a very efficient yet quite speculative solution for improving CE's profitability is provided. By the inclusion of the sustainable value in the profitability calculation or by overall valuing more the sustainable effect caused by CE, the attractiveness of CE in the eyes of the financiers would be greatly increased, and more funding would flow to CE Businesses. But even though sustainable investing is very popular amongst investors these days, the sustainable value created by CE is not enough to overcome its possible inferior profitability: the majority of the investing universe always looks for adequate monetary profits first. Therefore, the sustainable value created by investments would somehow need to be more emphasized in order to contribute better to the large-scale CE transition. However, the question of how sustainable value could be made equal to the monetary value in investing is a whole another matter.

The next group of propositions related to the Criteria for financing are about Business Model Typologies of CE companies (Circular Innovation Models, Circular Use Models and Circular Output Models). When reviewing the propositions (2p, 2q and 2r), it becomes clear that each Business Model Typology has its own challenges, but that Circular Use Models are incorporated with most risks and other financial issues. Circular Use Models (or at least PSS models) are affected significantly by balance sheet implications, working capital requirements, cash flow implications, legal considerations, value of assets calculations, end-client credit risk and market risk (2q; FinanCE Working Group 2016; ING Bank 2015).

When reviewing the previous list of issues, it can be noticed that all of these issues have been addressed at least on some level when reviewing the other propositions and/or factors, but there it was rarely mentioned that the issue is related to specifically PSS models and was accounted for CE Business generally. As the other Typologies (Circular Innovation & Circular Output Models) were presented in the data to have little financial issues to them (FinanCE Working Group 2016) and as PSS models were not separated from other Circular Business Models in the other data sources, it can be presented that in the future research about financing CE different Business Model Typologies should be clearly differentiated. Thus, it would be clear in which cases certain theories, findings and research in general would be applicable, since there unmistakably are differences in their applicability to each Business Model Typology.

In the literature reviewed in this study, Business Model Typologies were rarely differentiated, with a couple of exceptions to the rule. Fischer & Pascucci (2017) found that PaaS models are affected by growing balance sheet and working capital requirements, which was also pointed out in this study. Demirel & Danisman (2019) pointed out that to pursue Circular Eco-Innovation activities, the investing threshold is very high for SMEs, which in turn was not discussed in this study's result data in the case of innovation business models, although the difficulties of investing in CE for SMEs were pointed out (and which are discussed later in Chapter 5.3).

High upfront investment costs were largely visible in the literature review of this study: it was presented that investments for technology, innovation activities, process implementations and similar subjects are sizable and that their payback is often uncertain (Agyemang et al. 2019; van Buren et al. 2016; Demirel and Danisman 2019; Govindan and Hasanagic 2018; Hart et al. 2018; Jesus and Mendonca 2018; Jia et al. 2020; Kirchherr et al. 2018; Masi et al. 2017; Russell et al. 2020). However, in the result data, the high upfront investment costs were not as commonly referred to, at least not with that specific phrasing. It was presented that there is a barrier of high upfront investment costs when acquiring assets to be leased for PSS models (2s; FinanCE Working Group 2016; Sustainable Finance Lab 2018) and that there are a lot of costs and risks when transitioning to CE principles from a linear operating model (2t), but clearly as the conversation of financing CE goes more in-depth, the focus of the conversation is on the profitability and risks of the investments instead of their size and timing. Therefore, it can be presented that the concept of high upfront investment costs is mostly a top-level concept bundling issues associated with CE investments.

The possible business opportunity to finance industry posed by Circular Economy and its financing needs was also pointed out strongly in this study (e.g. Ellen MacArthur

Foundation 2013; ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). As effectively financing CE would require different kinds of financial products (1i; Ellen MacArthur Foundation 2013), it would naturally create a demand for both new and traditional kinds of financial products (2u; Ellen MacArthur Foundation 2013). And, as especially PSS models require a lot of working capital (2q; CICAT2025 2020; FinanCE Working Group 2016; Sustainable Finance Lab 2018), the companies utilizing one would need more financing to fulfill that requirement, also creating demand for the financial sector. Naturally in the financial sector the demand does not guarantee that the business is good and profitable for them, and when reviewing the propositions related to the multiple different kinds of risks, it is unquestionable that CE companies contain a lot of risk for their financiers. But, as the demand for the financial products and capital in total created for the financial sector by the CE companies can be estimated to be very strong, it would seem strange if the financial sector will not attempt to exploit the opportunity in the large scale by at least creating effective frameworks for assessing them.

In addition to adding the demand of the financial sector, it can also be argued that by having CE companies as their clients, financiers could more easily achieve their own sustainability objectives (2v; ING Bank 2015). As CE companies have a very positive effect on sustainability, they would be a valuable part of building a sustainable customer portfolio for banks and other financiers and could also be used as references as well to enhance the reputation of the financier. To conclude, by having the financial industry realize the unrealized potential of CE companies as customers both monetary-wise and sustainable-wise, it would contribute to the large-scale CE transition significantly. In the literature review of this study, no references were made to possible business opportunity to the financial industry posed by CE companies, making it an even more valuable finding.

5.3 Subjects of financing and Circular Economy Business

When reviewing the propositions related to subjects of financing, presented in Table 9, it can be noticed that the smallest amount of propositions (9) were derived from them amongst the 3 factor categories. Similarly to the case of the previously discussed categories, most of the propositions related to the subjects of financing can be interpreted as inhibitors to financing the transition to and operating by CE principles: only 1 out of 9 propositions is plainly a driver of CE. It can also be noticed that the propositions presented below are not as CE specific as in the previous chapters: for example, issues regarding financing resulting from the small size of the companies (3c, 3d, 3e, 3f, 3g and

3h) are issues for any similar kind of smaller company, not just for small CE companies. By taking the small number of propositions and their lesser CE-specificity into account, it can be presented that the financial factors related to the subjects of financing are the least significant to the large-scale CE transition of the three categories, although not in any case entirely insignificant.

Table 9. *Summary of propositions related to subjects of financing*

Factor category		Proposition derived from the factor	Driver / Inhibitor
Subjects containing multiple legal entities	3a	There is no means to distribute investments, incentives, value, resources, risk and profits fairly in the multiple-party entities (e.g. supply chains)	I
	3b	Participating in a joint CE project (e.g. R&D project) aids in getting a positive financing decision and decreases the risks of CE transition comparing to acting alone	D
Companies	3c	SMEs usually have more issues in obtaining financing for their CE (and other) activities than large ones	I
	3d	Smaller companies are generally more dependent on external financing, i.e. 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 the relative risks of it	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
	3g	For SMEs, it is not possible to issue green bonds	I
	3h	CE companies, especially tech-related startups and young businesses, often lack the know-how or resources to apply for funding and to make their businesses financeable	I
Subjects within companies	3i	In Finland, the emphasis of available funding is allocated heavily towards R&D activities, whereas commercialization activities would need more financing	D/I

When addressing the propositions related to subjects containing multiple legal entities, it must be noted that in the case of this study, they were divided to broadly two kinds: in operational Circular Supply Chains producing Circular goods, and in more lightly binding joint (usually R&D) projects regarding CE principles and technology. One proposition is derived from both of them. In the literature review, no findings related to either's thematical area were found.

Firstly, in the data it was noted that there is no means available to distribute investments, incentives, value, resources, risk and profits fairly when the supply chain of Circular products consists of multiple different legal entities and when the structure of the supply chain is complex (3a; FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020a; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Preston 2012). This is naturally a very complex issue: as calculating and distributing risks, added value and responsibilities is difficult even for singular companies, it would be very difficult to do it for multiple companies correctly at once in a circular supply chain. It would require enormous amounts of coordinative work to get a fair framework in place in which all the supply chain would be fairly treated, which respectively

would make the Circular Supply Chain very rigid and therefore at least partly inefficient in a competitive business environment. This issue interrelates heavily to proposition 1m: collaboration between different actors is needed for large-scale CE transition and finding efficient ways for financing Circular Supply Chains is a good example of it.

Regarding CE joint projects of multiple actors, it is proposed that participating in different joint R&D and other projects which aim to promote, develop and apply CE principles in companies and society overall is a major driver for CE (3b; Alhainen 2019; CICAT2025 2020). This is quite expected: the joint projects are succeeding in their primary objectives by benefitting especially SMEs in their efforts to pursue CE principles in their activities. As moving to CE principles is a rather drastic change in a linear company's operating procedures, it is easy to imagine the attractiveness to try it out and get an introduction to the principles and their applicability as a part of a joint R&D project, without having to change the whole chain of operations of the company at once. Participating in joint projects also adds companies' credibility in the eyes of the financiers: when many companies and entrepreneurs believe in a project and invest in it, its benefits are deemed more believable by the financiers as well. To conclude, to contribute to a large-scale CE transition, it is important that similar projects are facilitated in the future as well.

When reviewing the propositions related to singular companies as subjects of financing, one specific theme is repeated: financing CE activities is significantly more difficult for SMEs and smaller companies than for large, financially self-sufficient companies (3c, 3d, 3e, 3f, 3g; CICAT2025 Ecosystems and Agency Work Package 2020; Circle Economy and Sustainable Finance Lab 2016a; European Commission 2019; Heikkilä 2019; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Sustainable Finance Lab 2018). 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 much riskier in the eyes of financiers. These propositions also were expected beforehand, since they confirm the findings of the literature review. In the review it was pointed out that according to academic literature, SMEs have more difficulties in obtaining financing than large ones, they are more sensitive to extra costs and they have more difficulties in obtaining collaterals for bank financing (Caldera et al. 2019; Demirel and Danisman 2019; Ghisetti and Montresor 2020; Oncioiu et al. 2018; Ormazabal et al. 2018; Rizos et al. 2015, 2016).

In the literature review, it was also pointed out that the SME's problems in obtaining financing are in no way unique to CE companies (Ghisetti and Montresor 2020), and in the data there was no evidence suggesting otherwise. The said problems also are rather

difficult to come up with a solution, as there are unquestionably significant risks and obstacles in SMEs' financing comparing to larger companies. However, in the big picture of financing CE as a whole instead of financing singular companies, these findings are nevertheless valuable to recognize. CE is a very young concept, meaning that especially many CE-centric businesses are young as well and thus small in size. Therefore, it has to be acknowledged that these companies need to be aided in their financing somehow for better contribution for the large-scale CE transition.

Another proposition presented related to companies' characteristics as factors is that CE companies, especially tech-related startups and young businesses, often lack the know-how or resources to apply for funding or make their businesses financeable (3h). The proposition often applies for SMEs in general as well but is more a result of the immature age of the company and the inexperience of its staff in business and financing issues: often the staff can be very innovative and skilled technologically, but their business knowhow is not in a shape to create a financeable business model as they are not experts in it and/or have not done it before (CICAT2025 2020; CICAT2025 Ecosystems and Agency Work Package 2020; Finnish Government Strategic CE Initiative Theme Group 2020a; Luoma 2020; Pietikäinen 2018; Roiha 2018). In the literature review, similar issues in the context of CE companies were not mentioned. The issue and the possible solution for it links strongly to proposition 1m: "*Collaboration between the financial industry and other actors of society is required for large-scale CE transition (e.g. in creating assessment tools, financial instruments, legislation etc., knowledge partnerships*)". By having the financiers and the entrepreneurs work together educating the entrepreneurs in how to finance their business, the issue could be at least mitigated.

The only proposition related to the subjects of financing within companies was related to the productization phases: it is presented that in Finland the emphasis of available funding is allocated heavily towards R&D activities, whereas commercialization activities would require more funding (3i). The proposition's applicability is narrowed down to only Finland, since all the data contributing to this proposition is both Finnish and implies that the situation applies specifically in Finland (CICAT2025 2020; CICAT2025 Ecosystems and Agency Work Package 2020; Finnish Government Strategic CE Initiative Theme Group 2020c; Mäki 2019; Pietikäinen 2018). Also, it was implied (although not always explicitly expressed) that this applies for the public and semi-public funding available in Finland (e.g. Business Finland-originated funding).

The proposition is both a driver and an inhibitor of CE: naturally it is good that there is funding available for R&D activities, but not at the expense of the commercialization activities. Therefore, to aid in large-scale CE transition in Finland, there should be more

public and semi-public funding allocated for the commercialization activities of CE companies. In the literature review, there was no implication that similar issues exist for CE companies in general. This proposition evidently links to the proposition 3h (*CE companies, especially tech-related startups and young businesses, often lack the know-how or resources to apply for funding and to make their businesses financeable*) as well: if the companies would receive more funding to their commercialization operations, they would have more resources for obtaining external funding and developing financeable Circular Business Models.

6. CONCLUSIONS

In this chapter, the study is concluded by assessing its results. First, the results are compared to the objective and research questions of the study and the fulfillment of the objective is reviewed. Then, the implications of the study are assessed, first from theoretical and second from the practical point of view. After that, the quality and limitations of the study and possible headings for future research are discussed.

6.1 Meeting the objective of the study

To recap, the two-fold objective of this study was to 1) identify what factors about finance drive and/or inhibit transitioning to and operating by CE principles and how and 2) identify what factors of CE business and CE companies drive and/or inhibit their attractiveness as an investment and/or a debtor and how. Towards building knowledge on that specific objective, an explorative and qualitative study was conducted, utilizing systematic combining (Dubois and Gadde 2002, 2014) and a significantly diverse set of both primary and secondary data, having an emphasis on the secondary data. Iteratively executed thematic analysis of the versatile set of data enabled the recognition of a large, cross-sectional set of financial factors and mechanisms behind them affecting transitioning to and operating by CE principles and CE companies' attractiveness as an investment and/or a debtor.

Research questions 1 and 2 were concerned about what financial factors drive and/or inhibit transitioning to and operating by CE principles (RQ1) and how (RQ2). With the careful thematic analysis of the data the insights contained in the data and the patterns between them were summarized and processed into the said financial factors (i.e. themes), answering the first research question. By analyzing the data further, interpreting the content of the insights and recognizing both mechanisms behind the factors and the interrelations between them, the second research question was answered. Towards answering the first two research questions, especially the data originated from companies, interest groups and other parties affiliated with the CE businesses themselves was most insightful.

Research questions 3 and 4 addressed what factors related to specifically CE business and CE companies drive and/or inhibit their attractiveness as an investment and/or a debtor (RQ3) and how (RQ4). The process of answering these questions was very similar to the first two. With the thematic analysis of data and by recognizing common themes

and patterns between them among the insights of the data, the factors driving and inhibiting companies' attractiveness as investments and/or debtors were recognized, answering the third research question. With a more in-depth analysis of the factors emerging from the data, the mechanisms behind the factors and the interrelations between them were interpreted, answering the fourth research question. Towards answering the research questions 3 and 4, especially the data originated from financiers, academics, research groups and parties somehow affiliated with finance or having experience of financing companies and other ventures was especially useful.

The research questions and the answers to them according to what was recognized in this study were very much associated to each other. Therefore, the findings were not categorized according to the research questions but were all discussed concurrently. However, all the research questions were deemed necessary since they embody both sides of the underlying issue: the financiers' and the subjects of financing' point of view. The financial factors affecting both transitioning to and operating by CE principles and the attractiveness of CE companies as investments and/or debtors (RQ1 & RQ3) were categorized as factors related to Sources of financing, Criteria for financing and Subjects of financing, as presented in Figure 5. The mechanisms behind the factors are presented in the form of a total of 44 propositions, presented in Tables 7, 8 and 9 (RQ3 & RQ4). Within all the categories significant insights emerged from the data, but factors related to the Criteria for financing were noticeably the most significant group of factors from the viewpoint of all the research questions.

Overall, the explorative study conducted managed well to find the answers to the research questions. The financial factors affecting both transitioning to and operating by CE principles and CE companies' attractiveness as investments and/or debtors were successfully mapped into a theoretical framework, worthy of expansion both in depth and in breadth in future research. The question of how the identified factors drive and inhibit the said subjects was successfully answered as well, but on a relatively general level, as was expected of an explorative study. Thus, even though a lot of insights were revealed by the study, more elaborative research on the subjects is certainly required to truly cover the underlying thematical area.

6.2 Theoretical implications

As concluded in the literature review of this study, the existing research of the concepts of CE and finance together and their many nuances is lacking and needs further elaboration (e.g. Dewick et al. 2020; Ghisetti and Montresor 2020). A few articles of research exist on the more detailed subjects related to financing and CE together (Aboulamer et

al. 2020; Aranda-Usón et al. 2019; Ghisetti and Montresor 2020) and even more research focused on the drivers and barriers of CE in general mention finance as a significant factor in the CE business (e.g. Demirel and Danisman 2019; Garcés-Ayerbe et al. 2019; Jia et al. 2020; Kirchherr et al. 2018; Russell et al. 2020). However, a broader picture of what specific factors about CE affects its financing and vice versa has not been constructed yet by the academic community. This study contributes strongly to that void by creating a theoretical framework of factors significant for financing CE, reviewing the issue from both the companies' and the financiers' point of view.

By comparing the framework built in this study (Figure 5 and Tables 7, 8 and 9) and the initial framework derived from the literature review (Figure 2), it is noticeable that perhaps the most significant inhibitors regarding financing CE had been recognized in the literature, at least on some level. This study both confirms and further explains how the valuation and profitability of CEBMs, the role of public financial support, CEBMs' capital funding and company size affects significantly relate to financing and investing in CE companies and ventures. The importance of high upfront investment costs was not deemed as significant factor as it was presented in the literature per se but is explained to be more of a frontage for many kinds of concerns and risks related to financing CE. Considering the findings related to the insights of the existing literature and the results built solely based on the data, the contribution of this study to academic CE literature is undeniably significant.

The findings of this study also contribute to a quickly expanding field of research of Socially Responsible Investing. As noted in the literature review, no existing research studying the relationship between CE and Socially Responsible Investing was discovered in the search of relevant literature. This study does not offer a distinct definition how CE and SRI relate to each other either, but by answering the research questions 3 and 4, i.e. by reviewing what affects CE companies' attractiveness as investments and/or debtors and how, it brings light on how sustainable investors view and assess CE companies and their business. As the at least partial absence of connection between CE and Socially Responsible Investing was discovered in this study amongst practitioners as well. The unutilized potential for both sustainable investors and CE companies is highlighted by pointing out the lack of remarks about them in the company level data, contributing to the research universe of Socially Responsible Investment.

To conclude: despite the wide range of insights provided in the study, by reviewing the findings it is clear that there is plenty of room and need for additional research of the subjects, especially in doing a more in-depth analysis of singular factors or their compilations. However, the main theoretical contribution of the study is what it was designed

to be: a general theoretical framework for both creating a general view of the underlying issue and a foundation for building the future research of CE and finance on.

6.3 Practical implications

The purpose of this study was to elaborate on the financial catalysts to the CE transition, a phenomenon that naturally requires concrete and effective actions amongst practitioners in order to become reality. By studying a diverse set of data originated mainly from the practitioners of the field and by deductively formulating discussion and conclusions based on that data, this study offers a wide catalogue of propositions on which the practitioners' actions can be based and reflected on. The practical implications of the said propositions concern mainly three groups of practitioners: regulators and legislature representatives, company executives and financiers.

Firstly, by reviewing the findings of this study, regulators and legislature representatives with objectives to contribute to the transition to a more Circular Economy have the possibility to increase their knowledge about CE companies' operating environment and how important their role is overall in enabling the transition. The overall importance of public financial incentives, public funding organizations and the role of the public sector in creating a level playing field for CE companies was highlighted throughout the data set and by all kinds of data sources utilized in this study (e.g. European Commission 2014a, 2014b, 2015; Finnish Government Strategic CE Initiative Theme Group 2020d; Harlin 2019; Heikkilä 2019; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Ojala 2019; Pietikäinen 2018).

Another implication for regulators would be to refine the current public procurement policies. In the study it was pointed out that at least in Finland, public sector procurement processes are locked in favoring conventional linear business and that they are entirely fit for assessing circular solutions (European Commission 2014b; Finnish Government Strategic CE Initiative Theme Group 2020d). By updating the public procurement policies to valuing Circularity, the playing field would be significantly more level for the CE companies.

Lastly, another key takeaway of this study for regulators would be issues related to taxation: by balancing the scale of taxation burden between labor and resources (Cura 2019; Ellen MacArthur Foundation 2013; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Tikkanen et al. 2018) and by differentiating renewable and non-renewable materials in taxation (Japan/EU Joint Workshop G20 Resource Efficiency

Dialogue 2019; Tikkanen et al. 2018), CE would be financially much more viable as an operating principle.

For company executives either already operating by CE principles or considering transitioning to operating by them, this study offers the possibility to get familiar with what kinds of financial issues they might encounter in their duties and how to prepare for them and how do the financiers see CE companies as investments and/or debt applicants. Firstly, by reviewing the findings of this study it can be concluded that the profitability of the CE business and CE Business Models is the key criteria when applying for funding and that making the business model financially viable is worth investing for. It was pointed out that in many cases the companies themselves are not profitable to begin with (e.g. Govindan and Hasanagic 2018; Jesus and Mendonca 2018; Russell et al. 2020) and lacked the know-how and/or resources for making their business financeable (CICAT2025 2020; CICAT2025 Ecosystems and Agency Work Package 2020; Finnish Government Strategic CE Initiative Theme Group 2020a; Luoma 2020; Pietikäinen 2018; Roiha 2018), making it difficult for them to obtain financing.

Secondly, with the help of this study company executives can review what kinds of risks financiers usually consider and emphasize in their decision-making regarding CE businesses and possibly mitigate them. CE businesses and Business Models are seen to contain significant amounts of market, technology, cash flow, supply chain, regulatory and end-client credit risk (CICAT2025 Ecosystems and Agency Work Package 2020; Circle Economy and Sustainable Finance Lab 2016b; FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020a; ING Bank 2015; Preston 2012), in addition to the less significant risks. And, it was pointed out that the risks associated with CE are not well understood in the financial industry and in the assessment frameworks used (e.g. European Commission 2019; FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020d; ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Sustainable Finance Lab 2018). The implication for the company executives would be to firstly mitigate these risks to the highest possible extent and secondly to be as informative as possible in explaining them and the actions done to mitigate them when applying for financing.

Thirdly, this study offers company executives insights about what kinds of implications different Business Model typologies involve regarding financing, assisting them in recognizing what kinds of risks and issues their own Business Model might incorporate. Each typology naturally contains some amount of risk, but according to the study Circular Use Models (e.g. PSS model) incorporates most implications and issues regarding finance. It was pointed out that Circular Use Models are affected significantly by balance sheet

implications, working capital requirements, cash flow implications, legal considerations, the value of assets calculations, end-client credit risk and market risk (FinanCE Working Group 2016; ING Bank 2015), implicating that in designing this kind of Business Model these issues have to be considered very carefully in order to make the Business Model viable.

Lastly, this study points out an opportunity for CE company executives in finding a financier that values sustainability and CE as an operating paradigm. CE was presented in the data as a beneficiary of the sustainable investment trend that has prevailed in the financial market for some time now (e.g. Finnish Government Strategic CE Initiative Theme Group 2020a, 2020b; ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). However, in the company level data of this study the utilization of sustainable investors by companies was absent. It was also mentioned that there are few CE-concentrated commercial funds in operation (Luoma 2020). However, even though there would not be many strictly CE-concentrated financiers available for co-operation, CE companies should nevertheless exploit their sustainable nature as an asset in acquiring financing and target sustainable investors in those efforts.

For financiers, this study firstly points out that the assessment tools and frameworks currently used in risk assessment and valuation are not deemed to be realistic in the cases of reviewing CE business. It was presented that circular risks and linear risks are generally not taken into account correctly when assessing CE businesses (Aboulamer et al. 2020; European Commission 2019; FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020d; Fischer and Pascucci 2017; ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Rizos et al. 2016; Sustainable Finance Lab 2018), implicating that in order to contribute to large-scale CE transition the financiers should update their assessment methodology greatly.

Lastly, in this study a major business opportunity is pointed out for the financiers. CE transition is seen as a phenomenon increasing the demand for both traditional and new kinds of financial products, suitable for financing CE businesses and CE Business Models. (Ellen MacArthur Foundation 2013; ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019). Especially PSS model requires extensive financing, meaning great profit opportunities for financiers. Therefore, by adapting to CE transition by e.g. modifying the assessment models to fit assessing CE businesses, financiers could be able to bring in a lot of new business.

6.4 Quality and limitations of the study

Thanks to the very insightful and rich data set and appropriately chosen methods of analysis, the quality of this study is on a high level when comparing its findings to its objective and research questions. With a qualitative and explorative study and with analysis of diverse data set containing data sources speaking on behalf of all interest groups relevant from the perspective of the thematical area researched, a well-defined theoretical framework explaining underlying issues was constructed successfully. However, like in any other study, biases and other limitations to both scope and quality of the study were acknowledged.

Firstly, as the study is qualitative and as it was conducted essentially by only one researcher, it can be exposed to researcher bias related especially the interpretation of the secondary data (Saunders et al. 2016). Therefore, when interpreting the results of the study, the possible researcher bias must be acknowledged accordingly. Also, as the data in itself is qualitative as well, the possible participant bias has to be taken into account (Saunders et al. 2016).

The perhaps most significant limitation to the study was how in-depth conclusions could be made of the insights and their interrelations according to the secondary data utilized. It is common in the use of secondary data that the data does not address the researcher's objectives perfectly (Saunders et al. 2016), and this study was not an exception to the rule. The limitation applies especially in the cases when a specific factor was mentioned scarcely or when it was presented mostly as a trivial fact without going into detail of the underlying mechanism. The study succeeded in creating a general framework of the underlying subjects, but in the mentioned cases it was not possible to derive as specific proposition as would have been hoped for from a certain issue based on the data, making some of the propositions a bit unelaborated. Also, the partly unspecific nature of the discussion of the researched factors in the data compelled the researchers to interpret the underlying issues and the mechanisms behind them more intensively to construct the propositions, exposing the study to heavier researcher bias.

Also, another limitation related to the secondary data was having a very diverse data set made it difficult to assess the amplitude of the singular issues and comparing their significance with each other. As different kinds of data incorporated different kinds of insights and implicated their gravity in varying ways, factors' seriousness could not be explicitly derived from the data. Therefore, even though the gravity of each factor has been verbally speculated in the discussion, a specific order for e.g. which proposition or implication is the most important cannot be made based on this study.

When assessing the limitations regarding the scope of this study, firstly the generalizability by market must be reviewed. Most of data utilized is originated from Finland or EU, with a few exceptions of items having global scope. Although it is not explicitly implicated in the data for it to apply only for certain regions, two conclusions can be made of it. Firstly, for the findings to be applicable, CE and sustainability have to be at least somewhat recognized concepts in the markets. Secondly, all the markets assessed in the data were presumed to be developed at least on some level and similar to the ones in Finland and in Europe. Therefore, it can be concluded that the findings are generalizable mostly on developed markets with an emphasis of being or becoming sustainable while doing business.

Another limitation regarding the scope of the study is related to the categorization between external and internal funding. In the result data, funding originating within a company or a venture was not discussed except for in a couple of occasions. Although it was never explicitly discussed that a certain insight would apply only in the case of external financiers, since an investment naturally has to be justified internally as much as externally, but nevertheless the findings can be confirmed to be applicable mostly in the cases of assessing external financing.

6.5 Future research

The purpose of this study was to exploratively fill a gap in the academic CE and finance literature, finding and explaining the connection points between them. This is done by constructing a theoretical framework of factors and mechanisms behind the factors and therefore by creating as general a description as possible of underlying issues and their interaction. Therefore, the findings of this study offer the academic community a very fruitful platform to continue the research and exploration of the thematical area, both in depth (e.g. by increasing the understanding of singular factors or groups of factors) and in breadth (e.g. by validating the results of this study and refining the theoretical framework accordingly). However, there are a few subjects which were deemed most interesting for future research from the perspective of this study and they are presented next.

Firstly, in the literature review it was presented that there has not been published any conceptual comparison or any other kinds of articles regarding CE and sustainable investing together. Also, the concepts of SRI, CSR and ESG were not presented at all in the data (except for one, somewhat vague mention of ESG and CE together). As CE is in principle a financially feasible concept for investors and allows economic growth (Ellen MacArthur Foundation 2013; Hysa et al. 2020; Kirchherr et al. 2017), in addition to its especially environmentally sustainable nature (Kirchherr et al. 2017), one could imagine

that the increasing number of sustainable investors would be very interested in learning more about how CE would fit in their investment strategies and the concepts well established in the finance literature.

Secondly, in the discovered findings there emerged a couple of factors the mechanisms behind of which were not explained enough in the data to allow a detailed description of the underlying issues. The first group of propositions that clearly implicates a need for further research was propositions related to the risk and valuation assessment models used currently in the financial industry, which are deemed to be unfit for assessing CE business (2a, 2b, 2c and 2d). For example, cash flow risks, technology risks, regulatory risks, market risks and supply chain risks caused by Circular operating model were presented as risks that are not righteously valued by the current financial assessment models (e.g. European Commission 2019; FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020d; ING Bank 2015; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Sustainable Finance Lab 2018). However, it was not elaborated on what exactly do the current financial models lack and how could they be improved while still assessing the risks and value fairly, making it a very fruitful subject of future research from the viewpoint of the positive contribution it could make towards large-scale CE transition.

Another proposition in the need for further elaboration is the proposition related to how to distribute investments, incentives, value, resources, risk and profits fairly within multiple-party entities, such as supply chains (3a). In the data it was presented that currently there is no operating model and legal framework in place to distribute the said subjects fairly (FinanCE Working Group 2016; Finnish Government Strategic CE Initiative Theme Group 2020a; Japan/EU Joint Workshop G20 Resource Efficiency Dialogue 2019; Preston 2012), but again suggestions or theories of how the issue could be solved were not made. As Circular supply chains are at the core of CE as a paradigm, it would be very essential to study how to effectively finance them from the perspective of creating more Circular world.

During the thematic analysis of data, some themes were left out of the final framework due to the lack of insights regarding them but would nevertheless be interesting subjects for future research. The first of them is that what differences there are in how different kinds of investors view CE as an investment. Aboulamer et al. (2020) argue that private capital such as private equity funds are better capable of understanding intangible value and assets of CE companies, and it would be interesting to validate if the claim holds and in what other ways the type of financier affects financing CE companies. The second of them is that in what ways it affects CE company’s financing if a company is born

operating by CE principles or transitioning towards them. In the Focus Group Discussions with CICAT researchers (2020) it was deemed to be a factor that would probably occur a lot in the data. However, the said characteristic of a company was not explicitly differentiated even once in the result data. That being said, it most likely is something that company level operatives take for granted and therefore could be an interesting subject for future research in the form of e.g. case studies researching both kinds of companies.

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APPENDIX A: TABLE OF INITIAL THEMATIC ANALYSIS OF THE DATA

Author, year	Author Organization(s)	Data Type	Valuation, profitability and risks of Circular Business	Source of financing	Public financial incentives and instruments	Sustainability and CE as themes pursued by investors	Subject of investment/funding	Innovative and novel financial instruments and solutions	Company size	High upfront investment costs and risks	Joint projects	Co-operation and knowledge sharing	Lack of knowhow or unwillingness to apply for funding	CEBM capital funding	Technology and product maturity	CE as business and growth opportunity	Managerial Support / Resistance to change	R&D orientation and CE tech as a part of it	CE as a survival mechanism	Company ownership structure	Born CE vs transition
CICAT2025, 2020	CICAT2025 Research Project	Researcher Focus Group Discussion	1	1	1	2	4	1	1	0	2	0	2	3	1	0	0	2	1	1	0
CICAT2025 Ecosystems and Agency Work Package, 2020	CICAT2025 Research Project	Researcher Focus Group Discussion	10	5	1	2	3	0	8	4	0	0	2	0	2	1	0	0	2	2	0
Luoma, 2020	Taaleri Private Equity Funds Ltd	Expert Interview	5	4	0	5	0	4	2	0	0	0	3	0	0	0	0	0	0	1	0
Ekokem Oy Ab repr., 2015	Ekokem Oy Ab (now acquired by Fortum)	Company Interview	1	1	3	0	3	0	0	0	1	0	0	0	0	0	0	0	1	0	0
Neste, 2019	Neste	Company Interview	2	0	0	1	3	0	2	2	0	0	0	0	0	0	4	3	0	1	0
Alhainen, 2019	Pure Waste	Company Interview	1	0	3	0	0	0	0	0	3	0	3	0	0	0	0	0	0	0	0
Mäkiö, 2019	Turun AMK	Researcher Interview	0	2	2	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Ilmonen, 2019	Lounais-Suomen Jätehuolto Oy	Company Interview	0	2	3	0	2	0	0	1	3	0	0	0	0	0	0	0	0	0	0
Käppi & Raatikainen, 2019	Nextiili	Expert Interview	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Cura, 2019	Lahden AMK	Researcher Interview	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0
Rissanen, 2019	Aalto University	Researcher Interview	0	2	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0
Harlin, 2019	Infinited Fiber Company	Company Interview	1	2	2	0	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0
Mäki, 2019	Finnish Textile & Fashion	Expert Interview	1	2	2	1	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0
Heikkilä, 2019	VTT	Expert Interview	2	0	3	0	2	0	1	1	1	0	0	1	0	0	0	0	0	0	0
Makkonen, 2019	UFF	Expert Interview	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ojala, 2019	Finlayson Oy	Company Interview	3	0	1	1	0	0	1	0	1	0	1	0	0	0	1	1	0	0	0
Pajunen & Silvennoinen, 2018	The Finnish Innovation Fund Sitra	Expert Call	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Nores, 2018	Technology Industries of Finland	Expert Meeting	2	1	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
Pietikäinen, 2018	European Parliament	Legislature Representative Meeting	1	1	3	0	1	2	0	0	0	0	1	0	1	0	0	0	0	0	0
Tasa & Honkanen, 2018	Ministry of Economic Affairs and Employment of Finland	Expert Meeting	1	2	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Savolainen, 2018	Business Finland	Expert Meeting	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0
Roiha, 2018	Kasvu Open	Expert Meeting	0	2	0	0	1	0	1	0	0	0	2	0	1	0	0	0	0	0	0
Jalonen, Riipinen & Aronen, 2018	Association of Finnish Municipalities	Expert Meeting	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Martikainen & Nieminen, 2020	Maki.VC Venture Capital Fund and Upright Oy	Company & Financier Podcast	7	3	0	7	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Finnish Government Strategical CE Initiative Theme Group, 2020a	Multiple companies, financiers, ministries, public organizations, NGOs etc.	Expert Theme Group Workshop, pre-workshop material	6	5	3	2	2	5	1	0	1	0	0	2	0	0	0	0	0	0	0
Finnish Government Strategical CE Initiative Theme Group, 2020b	Multiple companies, financiers, ministries, public organizations, NGOs etc.	Expert Theme Group Workshop transcription	36	25	25	14	16	8	7	7	6	0	5	0	5	1	4	2	1	1	0
Finnish Government Strategical CE Initiative Theme Group, 2020c	Multiple companies, financiers, ministries, public organizations, NGOs etc.	Expert Theme Group Workshop notes, presentation & commentary	7	3	8	2	4	1	2	1	0	0	1	0	0	0	0	0	0	0	0
Finnish Government Strategical CE Initiative Theme Group, 2020d	Multiple companies, financiers, ministries, public organizations, NGOs etc.	Expert Theme Group Workshop Induced Initiative Draft	3	2	2	1	2	0	0	1	0	1	1	1	0	0	0	0	0	0	0
European Commission, 2019	European Commission	Practitioner Research Report	6	2	4	4	0	1	0	0	2	0	2	0	0	0	1	0	0	0	0
FinanCE Working Group, 2016	Multiple finance industry companies, scholars etc.	Practitioner Research Report	8	5	4	3	0	5	1	5	4	0	0	3	1	0	0	0	0	0	0
Japan/EU Joint Workshop, G20 Resource Efficiency Dialogue, 2019	Public officials, legislature representatives, finance industry professionals, scholars etc.	Practitioner Workshop Report	21	10	16	17	1	12	4	1	4	17	1	2	0	6	2	0	1	0	0
Ellen MacArthur Foundation, 2013	CE dedicated NPO Foundation	Practitioner Research Report	5	1	1	0	1	4	0	0	1	1	0	1	0	5	0	0	0	0	0
Sustainable Finance Lab, 2018	Multiple university scholars	Practitioner Research Report	12	12	0	1	2	2	4	6	5	7	2	8	3	1	0	0	0	0	1
ING Bank, 2015	ING Bank	Practitioner Research Report	15	6	0	3	3	8	1	5	2	1	0	7	0	3	0	0	0	0	0
Circle Economy & Sustainable Finance Lab, 2016a	Multiple university scholars & NPO organization	Practitioner Research Report	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Circle Economy & Sustainable Finance Lab, 2016b	Multiple university scholars & NPO organization	Practitioner Research Report	5	4	0	0	1	1	2	1	0	2	0	2	1	0	0	0	0	0	0
European Commission, 2014a	European Commission	EU Commission communication report	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
European Commission, 2015	European Commission	EU Commission communication report	0	1	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Preston, 2012	Chatham House	Practitioner Research Report	2	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0
European Commission, 2014b	European Commission	Practitioner Research Report	4	1	5	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Tikkanen et al. 2018	Finnish Government	Practitioner Research Report	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aarikka-Stenroos et al. 2020	Tampere University and Taaleri	Researcher & Financier Podcast	1	1	0	3	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0

APPENDIX B: FOCUS GROUP DISCUSSION STRUCTURES

3.6.2020
Teemakeskustelu: Rahoituksen teemat CICAT2025-hankkeen sisällä, CITER

Teemakeskustelun runko

Rahoituksen esiintyminen jo tehdyssä tutkimuksessa: Yleiskuva

- Ketkä ovat tuoneet rahoitusta esille? Millaiset asiantuntijat/toimenkuvat; yritykset tai muut organisaatiot
- Mitä pääasioita eri tahot ovat nostaneet esille? (suuret linjat)
- Millaisissa tutkimustilanteissa rahoituksen teemat ovat tulleet esille? Esim. haastattelut, workshopit, kirjallisuus, sekundääridata?
- Mikä on ollut haastattelun/tilanteen teema kun rahoitus on tullut esille, missä kontekstissa ja mistä näkökulmasta sitä on käsitelty?

Eri teemojen vaikutus rahoituksen saamiseen, tarkennetaan yleiskuvaa jäsennellysti:
Kuinka seuraavien teemojen on mainittu vaikuttavan kiertotalouden rahoitukseen?

- Yrityksen koko
- Omistajuussuhteet (esim. perheyritys?)
- Liiketoimintamalli
- Teknologian kypsyys
- Kasvuhaluisuus / strategia
- Markkina
- Kestävyys / kiertotalouden periaatteet yrityksen luonteenpiirteenä, ESG-asiat (Sustainable Investing, Impact Investing, ESG Investing sijoittajan näkökulmasta)
- Rahoituksen kohde, esim. transformaation vaatima tai muu kiertotalouteen liittyvä investointi tai yleinen pääomarahoittaminen?
- Onko muita ominaisuuksia tullut esille?
- Nämä teemat ja / tai muut asiat drivereina tai barriereina?

Muut esille tulevat asiat

- Tutkijoiden omat näkemykset kiertotalouden rahoituksen drivereihin ja/tai barriereihin?
- Ajatuksia rahoituksen tutkimuksen research designiin: casetutkimus yrityscasejen kautta / asiantuntija- ja yrityshaastattelut eli haastattelututkimus, jossa myös focus group discussioneita / jokin muu?
- Tärkeiden informanttien tunnistaminen: mitkä organisaatiot ja/tai henkilöt olisivat tärkeitä haastateltavia tai muuten tutkittavia kohteita?
- Esille tulleet asiat kerätyssä aineistossa ja/tai tutkimustuloksissa, pääsy niihin
- Mahdolliset synergiaedut tulevassa tutkimuksessa

8.6.2020

Teemakeskustelu: Rahoituksen teemat CICAT2025-hankkeen sisällä, WP2 CE Ecosystems & Agency

Teemakeskustelun runko

Esittäytyminen

- Tutkijan tutkimuksen kohde, mitä yrityksiä ja organisaatioita haastatellut/tutkinut kiertotalouteen liittyen ja minkälaisia henkilöitä haastateltu/tutkittu niiden sisältä?
- Rahoituksen esiintyminen jo tehdyssä tutkimuksessa: Yleiskuva
- Ketkä ovat tuoneet rahoitusta esille? Millaiset asiantuntijat/toimenkuvat; yritykset tai muut organisaatiot
- Mitä pääasioita eri tahot ovat nostaneet esille? (suuret linjat)
- Millaisissa tutkimustilanteissa rahoituksen teemat ovat tulleet esille? Esim. haastattelut, workshopit, kirjallisuus, sekundääridata?
- Mikä on ollut haastattelun/tilanteen teema kun rahoitus on tullut esille, missä kontekstissa ja mistä näkökulmasta sitä on käsitelty?

Eri teemojen vaikutus rahoituksen saamiseen, tarkennetaan yleiskuvaa jäsennellysti:
Kuinka seuraavien teemojen on mainittu vaikuttavan kiertotalouden rahoitukseen?

- Yrityksen koko
- Omistajuussuhteet (esim. perheyrittäjyyden vaikutus?)
- Liiketoimintamalli
- Teknologian kypsyys
- Kasvuhaluisuus / strategia
- Markkina
- Kestävyys / kiertotalouden periaatteet yrityksen luonteenpiirteenä, ESG-asiat (Sustainable Investing, Impact Investing, ESG Investing sijoittajan näkökulmasta)
- Rahoituksen kohde, esim. transformaation vaatima tai muu kiertotalouteen liittyvä investointi tai yleinen pääomarahoittaminen?
- Onko muita ominaisuuksia tullut esille?
- Nämä teemat ja / tai muut asiat drivereina tai barriereina?

Muut esille tulevat asiat

- Tutkijoiden omat näkemykset kiertotalouden rahoituksen drivereihin ja/tai barriereihin?
- Ajatuksia rahoituksen tutkimuksen research designiin: casetutkimus yrityscasejen kautta / asiantuntija- ja yrityshaastattelut eli haastattelututkimus, jossa myös focus group discussioneita / jokin muu?
- Tärkeiden informanttien tunnistaminen: mitkä organisaatiot ja/tai henkilöt olisivat tärkeitä haastateltavia tai muuten tutkittavia kohteita?
- Esille tulleet asiat kerätyssä aineistossa ja/tai tutkimustuloksissa, pääsy niihin
- Mahdolliset synergiaedut tulevassa tutkimuksessa