

# 1. Introduction

## 1.1 Background

Entrepreneurs and new ventures are at the forefront of driving innovation and economic development (Krabel and Mueller, 2009; Lerner, 2009). Consequently, much research effort is being devoted to understanding how to secure the survival and growth of new ventures (Söderblom et al., 2015). For start-ups, an essential part of survival is to convince outside exchange partners of their potential (Gimmon and Levie, 2010). Important outside stakeholders include capital providers, such as business angels (BAs) (Maxwell et al., 2011), venture capitalists (Busenitz et al., 2005) and crowdfunders (Ahlers et al., 2015), as well as potential employees (Davila et al., 2003), customers (Reuber and Fischer, 2009), and partners (Hallen and Eisenhardt, 2012). These stakeholders enter exchange relationships with new ventures only when their evaluations of the quality of the ventures are positive (Maxwell and Lévesque, 2014). To make their decisions, potential exchange partners rely on the information they have about the ventures. However, a fundamental problem arises, which is that new ventures have better information about their own quality than outside stakeholders, making it difficult for outsiders to evaluate ventures' true underlying quality (Bapna, 2019; Bergh et al., 2014).

These information gaps—known as information asymmetries—are such a concern in transactions between parties that some researchers build their professional careers on investigating the topic. Indeed, the 2001 Nobel Prize in Economics was awarded to George Akerlof, Michael Spence, and Joseph Stiglitz for their work on asymmetric information in markets. According to Stiglitz (2002:469), information asymmetries are always present if “different people know different things,” with the “different things” relating to personally possessed private information. Whereas public information is freely available to society, private information is available to only small numbers of people, whom Spence (1973) describes as insiders. Because not everyone has private information, asymmetries occur between those who have it and those who want it to make informed—that is, better—decisions (Connelly et al., 2011). To conduct transactions and secure market functioning, it is fundamental for parties to resolve these imbalances (Akerlof, 1970).

Information asymmetries are particularly severe in entrepreneurship (Connelly et al., 2011). Entrepreneurs and new ventures lack proven track records; they face unverified market demand and their revenue potential is uncertain (Certo, 2003; Colombo, 2021; Higgins and Gulati, 2006; Shane and Stuart, 2002). These uncertainties stem mostly from the “liabilities of newness” and the related lack of legitimacy that confront new ventures (Söderblom et al., 2015). Even if new ventures provide information, investors often see it as inflated and less credible than information provided by incumbent companies (Plummer et al., 2016). Moreover, new ventures and start-ups tend to be small organizations or single entrepreneurships; they lack the resources (Stinchcombe, 1965) they need to withstand long periods of poor performance, making them particularly prone to dissolution and uncertainty (Stuart et al., 1999).

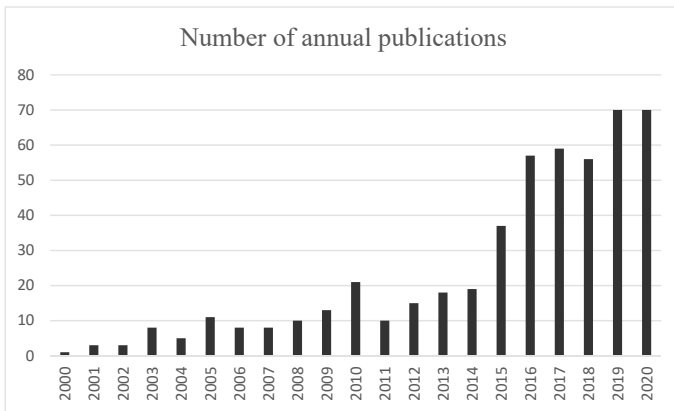
Therefore, new ventures must find ways to convince outside stakeholders of their potential (Busenitz et al., 2005). One major solution is *signaling*, which is an approach that enables new ventures and entrepreneurs to demonstrate their unobservable quality to outsiders. Signaling is explained by signaling theory (Spence, 1973), which identifies signalers, signals, and receivers (Connelly et al., 2011). Signalers are the informed parties that possess private information about their underlying quality that is not observable by outsiders. Signalers can decide to share this information via signals, which are observable actions that relate to unobservable attributes. Signals are received by receivers, who interpret them and transfer them to perceived meaning that the receivers use to make informed decisions (Connelly et al., 2011; Spence, 2002). Michael Spence (1973) cites the example of job applicants to explain how signals work: Because potential employers cannot detect the true value of applicants, the applicants can use their educational qualifications as signals to convince the employers of their quality. This approach works, because educational qualifications relate directly to the underlying quality of the candidates, such that low-quality candidates have not achieved the same educational degrees as high-quality candidates.

A central tenet of traditional signaling theory is that signals reduce information asymmetry only if two criteria are fulfilled: observability and costliness (Spence, 1973). First, if signals cannot be seen, that is, they are not observable by receivers, they cannot reduce information asymmetry, because the receivers are not able to interpret the signals. Second, signals must be costly. Costliness refers not only to money but also to time and

effort (Fisch, 2019); it is a condition that is crucial for the functioning of signals, because signals without cost could be faked or imitated and thereby fail to inform about the quality of the signalers (Bergh et al., 2014). Once again, education is an example that fulfills both criteria: It is observable (as some form of certificate, CV item, or verbal report) and it involves costs (study effort and monetary costs such as tuition fees).

Because signaling theory is intuitive in nature and easy to use, it is applied in a wide range of disciplines such as management, human resources, and entrepreneurship (Connelly et al., 2011). Moreover, because information asymmetries are particularly severe in the field of entrepreneurship, there have been many entrepreneurship signaling studies over the years (Colombo, 2021). The number of entrepreneurship publications that integrate signaling has risen continuously over the past two decades: Of the 502 entrepreneurship signaling studies that have been published, 312 appeared in the past five years, with 70 studies published in each of 2019 and 2020 (see Figure 1-1).

**Figure 1-1: Entrepreneurship publications that cite signaling, 2000–2020**



*Notes:* Source: Web of Science. TS = (Signal\* AND ["early stage" OR early-stage OR entrepreneur\* OR newness OR "new organization\*" OR "new firm\*" OR start-up\* OR startup\*]) AND SU = (Business & Economics).

## 1.2 Problem statement and research aim

With the intensified application of signaling theory to entrepreneurship, there are many signals that entrepreneurs and new ventures can use to demonstrate their quality to outside stakeholders. Scholars have investigated the effects of signals such as patents (Useche, 2014), founder education and experience (Ko and McKelvie, 2018), affiliations with reputable partners (Hoehn-Weiss and Karim, 2014), and board composition (Park et al., 2016). Whereas companies at later stages are able to leverage their reputations and resources to obtain a variety of credible signals, new ventures are capital-constrained and restricted in their issuance of quality signals (Anglin et al., 2018). For example, a mature venture that is planning an IPO in the near future might signal the prominence of its executives, directors, and underwriters to inform potential IPO investors about its quality (Pollock et al., 2010). In contrast, a young start-up might offer only statements of unrealized performance or financial forecasts to convince outside stakeholders (Ahlers et al., 2015; Vanacker et al., 2020); because neither of those statements are costly to create, they might be imitated by other companies (Anglin et al., 2018).

Entrepreneurship signaling studies show that new ventures must convince not only one, but multiple, groups of stakeholders, such as investors, customers, partners, and employees (e.g., Fischer and Reuber, 2007; Reuer and Ragozzino, 2012; Vanacker and Forbes, 2016). This requirement creates the need to carefully select the signals that are sent, because stakeholders have differing information needs and react to different kinds of signals (e.g., Hallen et al., 2020; Söderblom et al., 2015). Moreover, the contexts in which new ventures operate influence the signals they send (Yang et al., 2020). Because start-ups operate in diverse environments such as different countries (Bell et al., 2008) and industries (Doblinger et al., 2019), they must find signals that suit their particular environments (Hoenig and Henkel, 2015). For instance, in high-tech industries, information asymmetries are driven particularly by the technological uncertainty of ventures, such that signals such as technical white papers and high-quality source code are particularly relevant (Fisch, 2019).

Studies that apply signaling theory to the entrepreneurship context offer a wide range of surprising and important insights into the types of signals that are effective for various ventures, receivers, and environments. However, because of the explosion of such

research, the field has become fragmented, dispersed, and often contradictory to the ideas that underlie Spence's (1973) traditional signaling theory. The fragmented nature of the field makes it challenging for scholars and practitioners to draw generalizable conclusions and accrue new knowledge (Rauch, 2020). To address these concerns, there is a need for a holistic and integrated synthesis that organizes the often isolated, unconnected findings and provides direction on how the field should develop (Elsbach and van Knippenberg, 2020).

Accordingly, to guide future research, the first research aim of this dissertation is to offer a holistic, complete picture of entrepreneurship signaling work, through a systematic literature review of 99 studies, published between 1997 and 2020 in leading entrepreneurship and management outlets. Chapter 2 "takes stock" of how scholars integrate signaling theory in entrepreneurship studies and "moves forward" by suggesting directions for future research in the field. It poses two research questions:

*RQ1: How is signaling theory applied in entrepreneurship research?*

*RQ2: What are the implications for future research?*

By answering these research questions, Chapter 2 identifies research gaps in entrepreneurship signaling research that the remaining chapters further address. A key element of signaling theory, as outlined in Chapter 2, is the signal receiver. Entrepreneurship signaling literature investigates a wide range of receivers, ranging from investors (Ahlers et al., 2015) to employees (Söderblom et al., 2015) and partners (Hallen and Eisenhardt, 2012). However, there is a research imbalance, in that some types of receivers, such as venture capitalists (Blevins and Ragozzino, 2018; Shafi et al., 2020; Vanacker and Forbes, 2016) and IPO investors (Chen et al., 2018; Payne et al., 2013; Wang and Song, 2016) receive a large amount of research attention, whereas others, such as BAs, receive less. Chapter 2 also highlights that developments in digitalization and societal trends have fostered the appearance of completely new receivers, such as digital funding platforms, that so far have not been part of any signaling investigations. Because these receivers may react to signals in completely different ways, further exploration is required (Connelly et al., 2011). Chapter 2 also notes that receiver interpretation is a fundamental mechanism for explaining whether signals are effective for receivers. One identified signaling construct that influences how receivers react to signals is *receiver*

*relevance*, which is the extent to which receivers assign significance to signals. If signals are not significant for receivers, then they are not mitigating information asymmetries, and therefore, the signals cannot lead them to positively evaluate new ventures. Receiver investigations show that receiver relevance differs not only between different receiver groups—such as employees or customers (Hallen et al., 2020)—but also within the same receiver groups. For instance, receiver relevance differs within the group of early-stage capital providers, such that crowdfunders interpret signals differently than crowd investors (Scheaf et al., 2018), and venture capitalists interpret signals differently than institutional investors (Jia and Zhang, 2014). These studies indicate the need to dive deeper into the influencers of receiver relevance, because they ultimately determine whether receivers positively evaluate signals. However, as Chapter 2 shows, compared with other receiver investigations, receiver relevance is relatively less explored by entrepreneurship signaling research. Receiver studies often focus on receiver understanding (e.g., Luo et al., 2020; Vanacker and Forbes, 2016), that is, the ability of receivers to grasp and understand signals. Although such studies represent a crucial first step, it is important to go further to investigate how receivers interpret signals after they notice them. If receivers notice and understand signals but do not find them relevant, the signaling strategies of new ventures will not be successful.

Therefore, the second research aim of this dissertation is to shed more light on signal receivers. In particular, it aims to investigate less-explored and unexplored signal receivers and their interpretations of signals driven by the signaling construct of receiver relevance. Chapters 3 and 4 address this research aim, drawing on the findings of Chapter 2.

Chapter 3 investigates equity crowdfunding platforms (ECFPs) as important signal receivers for capital-seeking new ventures. So far, this receiver type has not been part of any signaling investigation, and there is no understanding of how this type of receiver attributes relevance to signals. By understanding how crowdfunding platforms select ventures, new ventures will have better chances of receiving financing (Ralcheva and Roosenboom, 2019). Crowdfunding platforms function differently than other capital providers (e.g., Ahlers et al., 2015); that is, they act as financial intermediaries rather than investors. Moreover, they use heterogeneous business models. Both of these characteristics may influence the relevance they attribute to signals. To investigate the

implications of this new digital funding platform, Chapter 3 takes a quantitative approach and is guided by the following research question:

*RQ3: How do equity crowdfunding platforms (ECFPs) select new ventures for funding campaigns?*

Chapter 4 sheds light on another important receiver group for early-stage ventures, that is, BAs. This receiver type has attracted some attention from entrepreneurship signaling researchers (e.g., Cardon et al., 2017; Ciuchta et al., 2018) but compared with research on other types of signal receivers, research on BAs is still relatively scarce (Colombo, 2021). This lack of attention is surprising, because for new ventures, BAs are the most important early-stage capital providers (Maxwell et al., 2011; Pandher, 2019). Receiver relevance investigations are particularly fruitful with regard to this investor type, because BAs differ from other investors in that they invest their own money outside institutional boundaries (Mitteness et al., 2012). In their business evaluations, they are guided by intrinsic motivations and goals and are seeking not only economic returns (Anglin et al., 2018) but also evidence of attention to important societal trends such as sustainability (Shepherd and Patzelt, 2011). Using qualitative background interviews and an online conjoint experiment, Chapter 4 investigates the relevance of sustainability signals for the decision making of BAs. It is guided by the following research question:

*RQ4: How does demonstration of sustainability affect business angels' (BAs') evaluations of new ventures?*

### **1.3 Rationale and methodological approach of the thesis**

This dissertation consists of five chapters. Chapter 1 introduces, and Chapters 2, 3, and 4 present three independent scientific studies that investigate separate but sequential research questions. All three studies relate to the overall topic “Signaling theory in entrepreneurship: Essays on its scientific application and receiver relevance.” Chapter 5 concludes. Figure 1-2 shows the structure of the thesis and the individual chapters.

Chapter 1, Section 1.1., describes the background and relevance of signaling theory and its application to entrepreneurship research. Section 1.2 describes the problems and research gaps that emerge from the application of signaling theory and depicts the research aim of the thesis, as well as the research questions of each of the three scientific

studies. Section 1.3 provides an overview of the structure of the thesis and the individual scientific studies.

Chapters 2, 3, and 4 each present an independent scientific study. Their headings have been slightly aligned to the overall headings of this thesis.

Chapter 2 is a conceptual paper entitled, “Signaling theory in entrepreneurship research: A systematic review and research agenda.” Section 2.1 outlines the aim of the article, which is to provide a taxonomy of signaling constructs that demonstrate how signaling theory is used in entrepreneurship and how the field can be moved forward. Section 2.2 describes the methodology of the study. The study uses a systematic and integrative literature review to shed light on its research question. First, it identifies leading and relevant entrepreneurship outlets and then performs a database search to identify relevant studies. Ultimately, it selects 99 studies and takes a narrative synthesis approach (Macpherson and Jones, 2010) to create a taxonomy of signaling constructs in entrepreneurship research. Section 2.3 shows the results of the analysis and presents the 17 signaling constructs derived from the analysis, in four key categories of signaling theory: signaler (Section 2.3.1), signal (Section 2.3.2), receiver (Section 2.3.3) and environment (Section 2.3.4). According to these results, Section 2.4 discusses the theoretical implications and provides six areas that future researchers should investigate to move the research forward. Section 2.5 concludes. The insights and implications derived from Chapter 2 provide a solid introduction to how entrepreneurship uses signaling theory and provides the foundation and motivation for Chapters 3 and 4.

Chapter 3 builds on and extends the findings of the study presented in Chapter 2. The title of this empirical article is “Access denied: How equity crowdfunding platforms use quality signals to select new ventures.” Section 3.1 introduces, outlining that the study investigates how new financial intermediaries that have emerged through digitalization in the entrepreneurial finance landscape—that is, ECFPs—are using signals to select ventures for a possible funding campaign. Because of the newness of these mediating platforms, Section 3.2 describes ECFPs in more detail; Section 3.2.1 explains their business model functioning; and Section 3.2.2 shows how their selection phase works. Section 3.2.3 describes the information asymmetries that platforms face, and Section 3.2.4 introduces signaling theory as a suitable solution. Section 3.2.5 presents the first hypothesis and demonstrates the importance of quality signals for ECFPs; Sections 3.2.6



and 3.2.7 show how signaling environments and receiver characteristics moderate the importance of quality signals and introduce four additional hypotheses. Section 3.3, pertaining to method, shows the quantitative approach of the study, with Section 3.3.1 describing the sample consisting of 78 decision makers from 50 different platforms in 22 different countries. Section 3.3.2 describes the research instrument and shows that in a metrical conjoint experiment, participants evaluated hypothetical start-ups that apply for a funding campaign on the platforms' webpage. Section 3.3.3 presents all variables, and Section 3.4 presents analysis and results, with Sections 3.4.1 showing baseline analysis of Hypotheses 1 and Sections 3.4.2. and 3.4.3 showing analysis of moderating Hypotheses 2 to 5. Section 3.4.4. provides robustness checks and Section 3.4.5 provides information about external validity. In conclusion, Sections 3.5.1 and 3.5.2, offer theoretical and practical implications, respectively, and Section 3.5.3 describes limitations and avenues for future research.

Chapter 4 is entitled, "Attracting business angels: Does signaling sustainability pay off for new ventures?" It is an empirical study that uses the findings of Chapter 2 as a foundation. Section 4.1 introduces the aim of the study, which is to investigate the importance of sustainability signals for BAs. Section 4.2, pertaining to theory, portrays the economic-quality information asymmetries related to entrepreneurial finance (Section 4.2.1). Sections 4.2.2, 4.2.3, 4.2.4 and 4.2.5 explain the potential importance of sustainability quality, describe three types of sustainability signals, and present the five hypotheses of the study. Section 4.3, pertaining to method, introduces conjoint analysis as a quantitative approach of the study. Sections 4.3.1 describes the sample, which includes 68 active BAs from the largest German BA network who evaluated hypothetical start-up applications for potential financing. Section 4.3.2 introduces the research instrument and Section 4.3.3 displays the variables. Section 4.4 pertains to results; it shows the main effects of sustainability signals (Section 4.4.1), the interaction effects between sustainability signals (Section 4.4.2), effects of signalers industry (Section 4.4.3), and the receiver moderation (Section 4.4.4). Section 4.5 concludes by providing theoretical (Section 4.5.1) and practical implications (Section 4.5.2) and limitations and avenues for future research (Section 4.5.3).

Chapter 5, the final chapter of the thesis, presents the overall conclusions.

**Figure 1-2: Overview and structure of thesis**

<b>Chapter 1</b>		
<i>Introduction of the thesis</i>		
<b>1.1 Background</b>	<b>1.2 Problem statement and research aim</b>	<b>1.3 Rationale and methodological approach</b>
<b>Chapter 2</b>	<b>Chapter 3</b>	<b>Chapter 4</b>
<i>Signaling theory in entrepreneurship research: A systematic review and research agenda</i>	<i>Access denied: How equity crowdfunding platforms use quality signals to select new ventures.</i>	<i>Attracting business angels: Does signaling sustainability pay off for new ventures?</i>
<b>Conceptual study</b>	<b>Quantitative study</b>	<b>Quantitative study</b>
Systematic literature review of 99 entrepreneurship signaling studies	Experimental conjoint analysis with 78 decision makers from ECFPs	Experimental conjoint analysis with 68 BAs
<b>2.1 Introduction</b> <b>2.2 Methodology</b> <b>2.3 Literature review</b> 2.3.1 Signaler 2.3.2 Signal 2.3.3 Receiver 2.3.4 Environment <b>2.4 Discussion</b> 2.4.1 Distinct uses of signaling theory 2.4.2 Future research <b>2.5 Conclusion</b>	<b>3.1 Introduction</b> <b>3.2 Theory</b> 3.2.1 ECFPs' business model 3.2.2 ECFPs' pre-campaign phase 3.2.3 Information asymmetries for ECFPs 3.2.4 Signaling theory 3.2.5 Signals for ECFPs 3.2.6 Signaling environment 3.2.7 Receiver characteristics <b>3.3 Methodology</b> 3.3.1 Sample 3.3.2 Research instrument 3.3.3 Variables <b>3.4 Analysis and results</b> 3.4.1 Baseline analysis 3.4.2 Signaling environment 3.4.3 Receiver characteristics 3.4.4 Robustness checks 3.4.5 External validity <b>3.5 Discussion</b> 3.5.1 Theoretical implications 3.5.2 Practical implications 3.5.3 Limitations and future research	<b>4.1 Introduction</b> <b>4.2 Theory</b> 4.2.1 Information asymmetries about economic quality 4.2.2 Sustainability quality signals for BAs 4.2.3 Interactions between signals 4.2.4 Signaler characteristics 4.2.5 Receiver characteristics <b>4.3 Methodology</b> 4.3.1 Sample 4.3.2 Research instrument 4.3.3 Variables <b>4.4 Analysis and results</b> 4.4.1 Baseline analysis 4.4.2 Interactions between signals 4.4.3 Signaler characteristics 4.4.4 Receiver characteristics <b>4.5 Discussion</b> 4.5.1 Theoretical implications 4.5.2 Practical implications 4.5.3 Limitations and future research
<b>Chapter 5</b>		
<i>Conclusion of the thesis</i>		
<b>5.1 Summary</b>	<b>5.2 Contributions and implications</b>	<b>5.3 Limitations and avenues for future research</b>
<b>5.4 Concluding remarks</b>		