Essays on Investors' Decision-Making in Equity-Based Crowdfunding

Daniel Berliner

UiA University of Agder

Doctoral Dissertations at the University of Agder 476

Daniel Berliner

Essays on Investors' Decision-Making in Equity-Based Crowdfunding

Dissertation for the degree philosophiae doctor (ph.d.)

University of Agder
School of Business and Law
2024

Doctoral dissertations at the University of Agder 476

ISSN: 1504-9272

ISBN: 978-82-8427-193-4

Printed by Make!Graphics

Kristiansand

Acknowledgement

This dissertation is a major milestone of a journey that started with a PhD proposal titled "Equity Crowdfunding - A Bridge Over the Valley of Death for Healthcare Innovations". It depicts my interest, enthusiasm, and curiosity for the entrepreneurial finance domain and the opportunities that the equity-based crowdfunding mechanism offers to help early-stage entrepreneurial ventures introduce innovative products into the market.

A substantial portion of my career has been involved in various activities within the entrepreneurial and innovative ecosystem in both Israel and worldwide. Through numerous interactions with entrepreneurs, I understood that capital shortage and fundraising are major hurdles they face in the process of bringing a product to market. My overarching goal in this dissertation was to deepen our understanding of ECF investors' decision-making, thus assisting early-stage ventures in reaching their goals and, hopefully, improving people's quality of life and well-being.

This dissertation stands as a milestone not merely in my academic journey but as a testament to the collaborative spirit of learning, research, and discovery. It reflects the collective wisdom, support, and encouragement of numerous individuals whose contributions have been invaluable.

First and foremost, I extend my deepest gratitude to my supervisors, my academic fathers, Professor Rotem Shneor and Professor Andreas Wald, whose insights, expertise, and patience have been the guiding lights throughout this process. Their unwavering support and constructive critique have shaped this work and contributed significantly to my growth as a researcher. I am highly indebted to Professor Tobias Otterbring and Professor Roy Mersland, the current and former directors of the PhD program at the Business School, and to Associate Professor Bjørn-Tore Flåten, head of the Department of Management and Vice Dean, for their support and guidance at different points of the process.

I am equally grateful to my dissertation evaluation committee members, Professor Trond Randøy, Professor Siri Terjesen, and Professor Simon Kleinert, for their invaluable feedback, rigorous examination, and encouragement towards my research endeavours. Their expertise and perspectives have been instrumental in refining my work and broadening my horizons.

A special thank you goes to Gunvor Guttormsen, the PhD Coordinator, for her support, guidance, and never-ending patience and to Diana Trydal Solli and the rest of the administrative team for facilitating the journey.

I am in great debt to my colleagues and peers at the School of Business and Law at the University of Agder, whose camaraderie and intellectual exchange have enriched my research experience, the discussions, debates, and collaborative projects we engaged in have been pivotal in the evolution of my ideas and research methodologies.

I owe a wholehearted thank you to Professor Kalanit Efrat for supporting, guiding, and encouraging me to take this path to become a researcher.

I would also like to acknowledge the support and trust of the PipelBiz and Fundit ECF platforms for making it possible to pursue this research and many others to come.

On a personal note, my heartfelt thanks to my family, especially my wife and daughters, Ortal, Tamar, and Alma, my parents, Carlos and Catalina, as well as my parents-in-law Shmuel and Eti Goldshmid, for their love, encouragement, and sacrifices. Their belief in my abilities and unwavering support have been my source of strength and motivation. To my friends, for their understanding, patience, and unwavering support, I am eternally grateful.

Finally, I dedicate this dissertation to my brother Arie Berliner, who passed away before being able to see the result, whose influence has been an inspiration in my journey.

Daniel Berliner.

Kristiansand, 2024.

Table of contents

List of figures and tables

1. Introduction

Equity crowdfunding (ECF) is a fast-growing source of equity financing for entrepreneurial ventures, complementary to existing actors within the entrepreneurial finance domain, such as business angels and venture capital funds (Hornuf & Schwienbacher, 2018; Tuomi & Harrison, 2017; Vismara, 2022). For example, in 2021, 573 (23%) of all investment rounds in the UK utilized ECF, making it the third most active actor, after business angels (BA), accounting for 602 deals (24%), and private equity and venture capital firms (VC) facilitating 1,359 deals (54%) (Beauhurst, 2022).

ECF can also be a disruptive form of bypassing traditional sources of equity financing, such as BA and VC, by raising capital from a large group of people (Drover et al., 2017; Lehner et al., 2015; Lukkarinen et al., 2016). As such, it aims to at least partially fill the gap of a chronic shortage of access to early-stage finance for SMEs often underserved by traditional financial institutions and channels across the world (Bruhn et al., 2017), with 26% of European SMEs indicating this as a major concern in 2023 (European Central Bank, 2023). Furthermore, the high-risk profile of early-stage entrepreneurial ventures, their sometimes-modest expected returns, and high transaction costs associated with due diligence and emissions made these highly innovative firms less attractive for BA and VC. At the same time, the needed capital is too large for friends and family to cover, as well as for VCs to cover alone. Therefore, ECF might have the potential to fill the equity gap for these early-stage entrepreneurial ventures (Hornuf & Schmitt, 2016; Mason et al., 2016). Indeed, between 2011 and 2021, the majority of companies (53%) utilizing ECF were at the seed stage compared to only 33% backed by VC firms (Beauhurst, 2022).

The 2012 Jumpstart Our Business Startup Act (JOBS Act), signed by the President of the United States, dramatically affected the entrepreneurial finance landscape by legalizing ECF, opening new opportunities to both entrepreneurs and investors. Entrepreneurs were allowed to sell limited amounts of equity in their companies, and investors were provided with new opportunities to diversify their investment portfolios (Stemler, 2013).

Since the 2012 JOBS Act and the legalization of ECF, the field of research for entrepreneurial financing has seen a growing interest among scholars from various academic stances. As an entrepreneurial finance tool, ECF is seeing a rapid growth

of interest among researchers and increasing popularity among entrepreneurs and investors (Short et al., 2017).

ECF has seen rapid growth in attention and volume since the JOBS Act. In 2020, companies around the world raised more than USD 1.5 Billion through ECF (Ziegler et al., 2021). While in 2011, only eight companies raised funds through ECF in the UK, in 2021, ECF facilitated 573 deals in the same market – making it the third largest actor after BA and VC, accounting for approximately 21% of deals, and hence playing a significant role in providing equity finance to early stage companies (Beauhurst, 2022). In a Delphi study focused on the European, North American, and Asian markets, Tiberius and Hauptmeijer (2021) support the above-forecasted trend, concluding that in the next 5 to 10 years, ECF markets are expected to grow in terms of volumes, number of investors, fundraisers, and platforms. Between 2011 and 2021, 435 UK companies secured funding from both ECF as well as from VCs (Beauhurst, 2022). This supports prior literature stating that throughout their business development journey, companies are in demand and peruse capital from both traditional (BAs and VCs) and alternative financial sources. Due to the lack of prior knowledge, research on ECF decision-making builds on prior literature on VCs' and BAs' decision-making (Block et al., 2018a; Cumming et al., 2019a; Wallmeroth et al., 2018).

Notwithstanding the major interest and acceptance of ECF among practitioners and academics, the related body of knowledge still presents ample opportunities for further investigations and developments (Cummings et al., 2020; Mochkabadi & Volkmann, 2020; Short et al., 2017). Potential gaps in the body of knowledge may result from the fact that ECF is a relatively new and evolving phenomenon (Agrawal et al., 2016; Belleflamme et al., 2014; Lehner et al., 2015; Lukkarinen et al., 2022). Thus, more inquiry is needed from both practical and theoretical perspectives (Block et al., 2018b; Cummings et al., 2020; Mochkabadi & Volkmann, 2020). Accordingly, the current dissertation addresses some of the related gaps.

Information asymmetry is a major concern for ECF investors since they rely on limited online platform data and signals shared by the venture, and many of them may lack the financial expertise and time to conduct extensive due diligence to assess the true quality of the proposal (Ahlers et al., 2015). BAs and VCs, on the other hand, meet entrepreneurs, conduct due diligence, and negotiate deal terms directly, gaining more firsthand information (Paul et al., 2007; Zacharakis &

Meyer, 2000), as well as extract premiums from imbalanced power in related negotiations.

Prior studies found that ECF investors use the platforms' discussion board, fundraiser updates, as well as pitch videos as means to reduce information asymmetry concerns (Block et al., 2018b; Estrin et al., 2018; Kleinert & Volkmann, 2019). Other studies found that online communication channels such as investor relations, webinars, and social media reduce perceived information asymmetries among ECF investors (Moritz et al., 2015) as well as in more mature firms (Blankespoor et al., 2014). In the due diligence process, ECF investors evaluate offerings based on their personal expertise and experience (Guenther et al., 2015). Most studies, thus far, focus on investors' actions to gain knowledge and reduce information asymmetry taking place on the ECF platform. Less research is available on whether and how ECF investors are actively engaged in search of information outside the ECF platform and how does it affects their funding behaviour.

A second gap relates to the potential effects of the macroeconomic environment on ECF investor decisions. Overall, research on the influence of macroeconomic and institutional factors on the decision-making criteria of alternative investors remains scarce. It has been demonstrated that the characteristics of a country's institutions can significantly affect the intentions and motivations of investors (Acemoglu et al., 2005; Scott, 2013), highlighting the necessity for further investigation to bridge the gap between macro-level conditions and micro-level outcomes, as well as to pinpoint effective policy orientations (e.g., Acs et al., 2016; Estrin et al., 2013; Haddad & Hornuf, 2019).

Nevertheless, the research available suggests that high rates of predicted IPO and GDP growth lead to investment in new projects, while financial uncertainty, as seen during the GFC (Global Economic Crisis), hinders early-stage venture investments (Cumming et al., 2005; Paik & Woo, 2014). Furthermore, strong property rights and tax incentives encourage BAs' investments in new ventures (Crum & Nelson, 2015; Mason & Harrison, 2002).

In ECF markets, less bureaucracy, shorter time, and lower costs in establishing a business are positively associated with ECF market development (Di Pietro & Butticè, 2020; Kukk & Laidroo, 2020). However, the effects of macro-level and institutional factors on individual ECF investors' decision-making criteria are less

explored. More specifically, major market shocks, such as the COVID-19 outbreak, may carry important effects into the ECF domain, especially because of its reliance on less sophisticated retail investors, and the grander notions of social mission of supporting SMEs that are often neglected by institutional investors in times of crises.

Regardless, most research on investor decision-making considers micro-level considerations and analyses. Here, investors' decision-making criteria were shown to differ according to their activity level and experience, as reflected in their portfolio size. Van Osnabrugge (1998), studying serial and non-serial BAs' decision-making criteria, found that serial angels are more concerned with market risks than agency risks. Harrison et al. (2015) categorized BA into three groups according to the number of investments in their portfolio: super angels, novice angels, and nascent angels, concluding that the groups differ in the emphasis given to various criteria.

The ECF literature suggests that crowd investors are not homogeneous and differ in their decision criteria and the signals they respond to (Ferretti et al., 2021; Goethner et al., 2021a; Hornuf et al., 2022; Wallmeroth, 2019). Goethner et al. (2021a) clustered ECF investors into three groups to study the differences between the groups' behaviour and decision-making criteria. They found that financial signals had greater effect size on investors with large portfolios compared with those with small portfolios. However, human capital was found to have a greater effect on investors with a small portfolio. In clustering ECF into four groups with different portfolio sizes, Ferretti et al. (2021) found that investors exhibited different preferences for firm age, team size, pre-money valuation, shares of equity offered, and indications of funds collected earlier.

However, a third gap may be linked to the understanding of ECF investors with different levels of experience and portfolio sizes. Such an approach highlights heterogeneity among ECF investors rather than simply comparing them to BAs and VCs. Here, a recent study on the European crowdfunding market found that 61% of ECF investors invested in more than one ECF campaign, while 39% only invested in one (Shneor et al., 2024)

2. Aims of the thesis

Based on the knowledge gap presented previously, this thesis aims to enhance our understanding of equity crowdfunding investors' decision-making within the entrepreneurial finance domain. The studies comprising this thesis and the research questions underlying them are depicted in Figure 1. Primarily, there was a need to review, compare, and synthesize the existing knowledge regarding traditional and alternative investors' decision-making criteria. Secondly, we examine the effects of campaign uncertainty, human capital, and their interaction on individual ECF investors' decisions and whether this is consistent under conditions of growing market uncertainties caused by the COVID-19 economic shock. Third, we explore how various signals influence investors' decision-making differently based on their activity levels as reflected in their portfolio size.

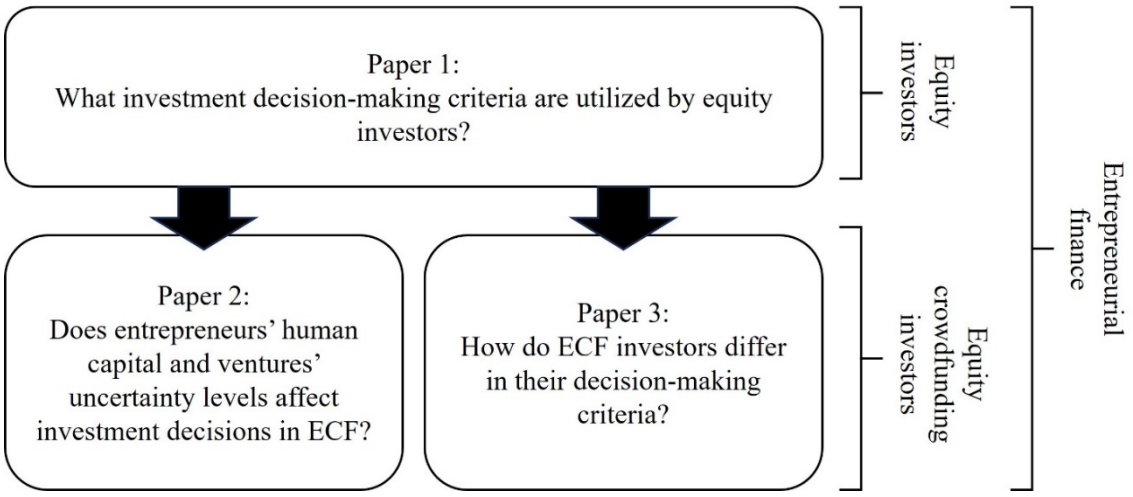

Figure 1: Equity investors and the focus of each research paper

3. Motivations: why study ECF investors?

ECF, BA, and VC represent both traditional and alternative sources of financing for entrepreneurial ventures with distinct characteristics, investment strategies, and roles in the entrepreneurial ecosystem. Co-investment practices often see BA and VC collaborating on deals, leveraging their individual strengths, with ECF platforms occasionally facilitating syndicate investments involving both individual and institutional investors (Mollick, 2014). The heterogeneity among these investor types is evident. VCs are professionally managed funds investing 'other peoples' money' and focusing mainly on startups in their growth stage, while BAs are active individuals investing their own capital in earlier-stage ventures (Mason & Harrison, 2008). ECF investors, by contrast, include a wider array of individuals, contributing smaller amounts of capital in the very early stage of the venture growth trajectory (Agrawal et al., 2015; Cumming & Vismara, 2017).

The approach to due diligence also varies significantly across these investor types. VCs conduct extensive due diligence, leveraging their resources and networks to thoroughly assess the potential of a startup, whereas BAs might rely more on personal judgment and experience and less on formalized processes (Fried & Hisrich, 1994; Van Osnabrugge, 2000; Wilson & Testoni, 2014). ECF offers a limited possibility for detailed due diligence by individual investors, who must instead rely on the platform's screening processes and the collective judgment of the crowd via discussion boards and announcements (Ahlers et al., 2015; Kleinert et al., 2022; Kleinert & Volkmann, 2019; Löher, 2017).

Contracting mechanisms also reflect these differences, with VCs typically emphasizing the ex-ante investment risk reduction approach, thus controlling and contracting prior to the investment. BA tend to take a hands-on role in the venture, emphasizing the use of the ex-post approach, having more flexible contracts, reflecting their personal investment style and the earlier stage of company development (Van Osnabrugge, 2000). In an ECF campaign, contract details are set by the company in agreement with the platforms. Thus investors cannot negotiate the terms and conditions of their investments and, unless otherwise specified in the campaign, may hold no voting rights on the board of directors (Cumming et al., 2019b).

As previously discussed, the contracting approach influences investors' post-investment activities. While VCs and BAs are actively engaged in the management

and mentoring of their portfolio companies, providing not just capital but also valuable expertise, networks, and strategic guidance (Gompers et al., 2020; Mason & Harrison, 2008; Tyebjee & Bruno, 1984). ECF investors are less involved in post-investment management but do influence the venture's success rates. Recent studies found that ECFs can increase public exposure to the campaign through their social networks (Di Pietro et al., 2018; Vismara, 2016) or by sharing their personal experience and expertise, similar to BAs and VCs roles (Wald et al., 2019).

Following prior studies and industry reports, we know that entrepreneurial ventures reach out and raise funds from VC, BA and ECF, and they, at times, also co-invest in these ventures (Beauhurst, 2022; Wang et al., 2019). In this context, a recent European crowdfunding market study showed that 72.4% of ECF investors are private individuals, while 27.6% are organizations (Shneor et al., 2024). In addition, the use of ECF affects the venture's success prospects in follow-up fundraising rounds (Capizzi et al., 2022; Coakley et al., 2022; Colombo & Shafi, 2021; Signori & Vismara, 2018). These investors play a key role in funding innovation and entrepreneurship, and they differ in their investment practices, motivations, and impact on portfolio companies. Understanding these differences is crucial for entrepreneurs seeking funding and for policymakers aiming to foster a vibrant startup ecosystem.

4. Research design

A scientific investigation's starting point is identifying a phenomenon in question. Once the phenomenon in question has been identified, the researcher must develop a structured plan to answer or test it rigorously. In deductive research, the process starts by developing hypotheses, determining testable measures, collecting relevant data, analyzing it, and finally drawing valid and plausible explanations from them (Bhattacherjee, 2012; Sekaran & Bougie, 2016).

The studies presented in this dissertation reflect a journey meant to answer my personal interest in understanding 'how ECF investors make decisions'. Moreover, better knowledge of ECF investors' decision-making criteria will assist early-stage entrepreneurs in their fundraising efforts and may eventually positively affect economic growth and well-being.

In the next section, I will discuss my journey towards answering the phenomenon in question, starting by understanding my perspective of reality (ontology) and the means by which to study it (epistemology).

4.1. Research philosophy

The main purpose of researchers within the social science realm is to produce scientific knowledge, thus discovering patterns and laws and proposing theories meant to extend our understanding while explaining social phenomena. However, in observing social phenomena and postulating possible explanations, social science researchers are constrained by their belief systems shaped by two sets of philosophical assumptions regarding the nature of reality (ontology) and how we study it (epistemology). Ontology is concerned with the nature of reality and how we see the world, questioning whether the world consists of social order or is it in constant change. The primary two schools of thought are realism and idealism, differing in the extent to which we can have objective knowledge of the nature of reality. Realism posits that an objective reality exists independent of human thought or perception. Therefore, the realist approach in social science assumes that social phenomena exist outside and irrespective of our conceptual schemes, perceptions, and beliefs, and can be discovered through scientific methods (Bhaskar, 1979; Sayer, 2000). On the other hand, idealism posits that reality is

mentally constructed, suggesting that the foundations of reality are fundamentally mental or spiritual in nature.

Epistemology deals with the nature and scope of knowledge, focusing on what is considered valid evidence and how researchers come to know what they know. The epistemological perspective ranges broadly on a continuum line between positivism and constructionism. Here, holding a positivist view, the social scientist believes that there is an objective truth that can be studied, understood, predicted, and controlled. The positivist paradigm holds that knowledge creation should be restricted to empirical observation and generalizability, relying on theories that can be tested. Constructionism, on the other hand, focuses on the subjective interpretations of social phenomena, thus claiming that there is no objective truth. Therefore, social scientists holding a constructionist view aim to understand how social actors construct knowledge about the world through their interaction with others (Bhattacherjee, 2012; Sekaran & Bougie, 2016).

It is well-established that there is a relationship between investors and entrepreneurs within the entrepreneurial finance domain (Foss et al., 2020). Entrepreneurial ventures that rely on external financing throughout their growth cycle face difficulties obtaining these funds due to their newness and lack of track record (Harrison & Baldock, 2015; Klein & Maldonado-Bautista, 2022). On the other hand, investors try to unveil the venture's success prospects through various decision-making criteria meant to address the information asymmetry problem (Berger & Udell, 1998; North et al., 2013).

In searching for my philosophical positioning, I adopt a mid-point between positivism and constructionism - the critical realist viewpoint (Sayer, 1997). Unlike positivism, critical realism posits that social reality has an objective existence but cannot be understood without prioritizing the conceptualization and pre-defining the study objectives. Critical realism distinguishes between the real, the actual and the empirical (Sayer, 1997). I will explain these three through the context of the entrepreneurial finance domain. First, the real refers to the actors' activities within the entrepreneurial finance domain and their characteristics, such as power, socialization, and education. That could be, for example, a) an entrepreneur or entrepreneurial venture seeking to raise funds, b) an investor or a group of investors searching for opportunities to invest in a company, c) ECF platforms enabling the interaction between actors, d) policymakers and regulators structures and powers.

The actual refers to the interaction between the actors, exercising their powers, knowledge, and experience. Within the entrepreneurial finance domain, the actual address is the interface and relationship between two or more actors engaged in activities. This could be seen in multiple dyadic activities, such as fundraising entrepreneurs presenting their venture to potential investors through pitches and ECF campaigns, as well as entrepreneurs' requests to ECF platform managers to present their offerings on their platform. Furthermore, the ecosystem is governed by laws and regulations established by policymakers exercising their powers and incentives, thus affecting all actors' activities and incentives.

The Empirical addresses our knowledge, referring either to the real or actual, with the understating that they are contingent. In addition, although we may know who the actors are and what the nature of their relationship is, we recognize that some structures may not be observable. Critical realist ontology, therefore, recognizes that actors' powers may or may not been activated in an interaction but could be in future ones, acknowledging a future different and dynamic outcome.

The study of social phenomena, such as the entrepreneurial finance domain, is the product of multiple interconnected components and forces that cannot be isolated and examined under controlled conditions, such as in natural sciences. Therefore, in holding a critical realist epistemological position, one should rely on the conceptualization of a phenomenon. In describing associations between concepts, critical realists seek to find possible connections between phenomena rather than definitive associations and rules.

Positivists argue that it is possible to apply the scientific method to study social phenomena, using mainly quantitative methods. In contrast, constructionists argue that social phenomena are inherently different and influenced by cultural, historical, and subjective factors, thus arguing in favour of the qualitative approach (Sekaran & Bougie, 2016). Unlike the previously mentioned methods, critical realism "reject(s) cookbook prescriptions of method(s)" (Sayer, 1997, p. 19), implying that it is the researcher's choice based on the nature of the study and its conceptualization (Bhaskar, 2008; Bhattacherjee, 2012; Sayer, 1997).

The first study presented in this dissertation is a literature review meant to collect current knowledge and constructs within the entrepreneurial finance domain. From an ontological perspective, this is meant to cover the real, i.e., what we know about the participating actors, as well as the macro-level factors affecting investment

decisions. The actual, i.e., what we know when these actors connect and exercise their power, such as investors-entrepreneurs and entrepreneurs-platform, and the effect of macro-level factors on them. The following two empirical studies utilize quantitative methodology to study investors' decisions. Study number 2 questions the effect of extreme uncertainty, such as the COVID-19 outbreak, on investors' decision-making. In the third study, we investigate the effect of signals on three groups of investors differing in their activity level. In both studies, we conceptualize our question and research boundaries while acknowledging that our empirical findings explain only a part of the phenomena, which is a product of multiple components and unobservable forces. Following a critical realist position, we acknowledge that our results, studying investors within the Israeli institutional ecosystem, among other factors, may differ from similar studies originating from other environments, thus recognizing the effect of unobservable forces. However, by utilizing quantitative approaches to studying the causal inference between constructs across large sample size, we strive to identify objective patterns across a multitude of subjective actions and thus, generalize our findings and inform decisions interested in broader objective results of multiple subjective actions (Mahoney & Goertz, 2006).

4.2. Context and data sources

The first paper presented here is a systematic literature review meant to gain a better understanding of equity investors' decision-making in early-stage entrepreneurial ventures. Data was collected on four databases: Google Scholar, Web of Science, Scopus, and EBSCO, and was limited to articles published in journals included in the AJG (2021) list to ensure high-quality peer-reviewed papers. This yielded a total of 153 papers published between 1983 and 2022 in 65 different journals across 16 disciplines.

To answer the research questions stated in the empirical studies, we utilized a proprietary dataset received directly from the management of the Israeli equity platform PipelBiz. The data contained a complete set of 14,130 investment decisions made by 8,732 unique investors in 49 technology-based ventures between July 2018 and December 2020. This included the campaign(s) invested, the amount investor invested in a specific campaign, and personal information such as the investor’s sex, age, and residence area. Following the strictest ethical

guidelines, the dataset did not include any personally identifying information. The dataset's timespan allowed us to utilize a natural experiment methodology, thus analyzing investors' behaviour before and after the COVID-19 outbreak in March 2020.

4.2.1. The Israeli context

Israel represents a relevant setting for the empirical studies comprising this dissertation. First, Israel belongs to the high-income group of countries (GEM, 2023) and, during 2022, presented GDP volumes of 522.03 Billion USD and per capita GDP volumes of 54,659.8 USD (WorldBank, 2022). Second, Israel is strongly associated with its innovation-driven entrepreneurial ecosystem and strong technological capabilities (Avnimelech & Schwartz, 2009; Bresnahan et al., 2001). Israelis are ranked first among the high-income countries in their entrepreneurial social and cultural norms, indicating they are willing to take risks and start a new business (GEM, 2023). Third, Israel has a growing and established ECF market, with 2022 volumes estimated at $29M. According to the Cambridge Centre for Alternative Finance (CCAF), Israel is ranked eighth globally with 57 USD per-capita volumes (Ziegler et al., 2021), overseen by dedicated regulation, which became effective in 2018 (Efrat et al., 2020). Currently, companies can openly offer shares to unaccredited Israeli investors as long as the activity is taking place on a dedicated and authorized platform. From a fundraising venture's perspective, the regulation limits the amount that can be raised through ECF to $1.6M per year. Furthermore, from the individual unaccredited investor's perspective, the regulator limits the maximum investment to $2.8K per campaign and $5.6K per year (ECN, 2017).

4.2.2. The PipelBiz platform

To answer the research question and test the hypotheses presented in the empirical studies, we used a proprietary dataset received directly from the management of the Israeli equity platform PipelBiz. The dataset consists of investor- and campaign-level data, consisting of a complete set of 14,130 investment decisions made by 8,732 unique investors in 49 technology-based ventures ECF campaigns between July 2018 and December 2020. PipelBiz began operations in 2015,

offering only securities to limited and accredited investors. However, in 2018, the platform was authorized to operate as an Offering Coordinator, thus allowing privately held companies to openly offer shares to unaccredited investors. The platform operates under the all-or-nothing model, implying that fundraising ventures will only receive the raised capital if the funding goal is reached (Cumming et al., 2020). All shares offered through the PipelBiz platform are categorized as common shares, and the minimum investment amount is set by the platform itself. In addition, the platform clearly states that the fundraising company pre-money valuation is set solely by the company and is not based on external auditing. In 2020, it was reported that PipelBiz had raised more than $20M for early-stage ventures since its establishment (Sasson, 2020).

4.3. Data analysis

In order to gain a clear representation and explanation of equity investors' decision-making criteria within the entrepreneurial finance domain, a systematic literature review method (SLR) was applied, as outlined by Tranfield et al. (2003). Following a thorough reading, the 153 papers selected for review went through a coding process (Braun & Clarke, 2006) based on a pre-set format covering each paper's dependent and independent variables, method, and study context, meant to reduce human error and bias (Briner & Denyer, 2012; Tranfield et al., 2003). Following, we employed two stages to organize the decision-making criteria equity investors utilize. First, we conducted a thematic analysis to organize the data and find patterns in the reviewed papers based on investor types, i.e., Venture Capital, Business Angels, Corporate Venture Capital, Government Venture Capital, and Equity Crowdfunding investors. This process yielded 997 variables across 91 distinct criteria, pertaining to eight key areas: entrepreneur/team, investor, product/service, financial outlook, industry/market, macro environment, and proposal quality. This categorization aligns with prior studies (e.g., Afful-Dadzie & Afful-Dadzie, 2016; Mason et al., 2017; Muzyka et al., 1996). Second, we conducted a comparative analysis of investors' decision-making criteria between equity investors, based on a predefined threshold for each type. Due to limited publications on certain investor types, such as corporate venture capital and governmental venture capital, we could not gain clear representation of their

decision-criteria and thus they were excluded, indicating a research gap for future exploration.

In the two empirical papers that follow the review, we utilized several statistical methods to test a series of hypotheses. In the second paper, we addressed the questions (a) whether entrepreneurs' human capital and the ventures' uncertainty levels affect investment decisions in ECF? (2) is there an interaction effect between the venture's human capital and uncertainty levels on investment decisions in ECF? And (3) whether these effects remain consistent considering the higher uncertainty levels following the outbreak of COVID-19?

First, we use a natural experiment setting to study the effect of the high uncertainty caused by an exogenous shock such as the COVID-19 outbreak on ECF investors' decision-making. A natural experiment is a valuable methodological observational approach that exploits naturally occurring phenomena in which the assignment of treatments to subjects has been determined by factors outside the control of the researchers, such as in the case of COVID-19 (Dunning, 2012; Leatherdale, 2019). This became possible due to our dataset timespan, including investments made between July 2018 and December 2020, including the first nine months since COVID-19's outbreak. Second, we conducted a k-means cluster analysis (Hair et al., 2018; Ketchen & Shook, 1996) of campaigns' uncertainty indicators to overcome multicollinearity issues among variables. The process yielded two distinct clusters labelled as 'high' and 'low' uncertainty level campaigns. Third, we employed a comprehensive factor analysis procedure to construct a single continuous measurement for human capital level, ensuring that all correlations in the correlation matrix were significant and that there is a good strength among variables. Lastly, in order to test the hypotheses presented in the paper, we ran multiple regression analyses with two dependent variables: the log transformation of investment amount and the log transformation of the share of investment.

Finally, in the third paper, we question how ECF investors differ regarding their investment decision-making criteria preferences? To answer this question, we divided our sample of 8,732 unique investors into three groups based on their activity level as reflected in their portfolio size: one-time investors (72%), occasional investors (25%) and serial investors (3%). We utilize a Kruskal-Wallis non-parametric test to compare the difference in the emphasis investors place on investment criteria between the three groups of investors. A non-parametric test was utilized by prior studies in the ECF domain to test for differences between

campaigns' information quality and investors' decision-making (Hecke, 2012). Additionally, we used the Bonferroni correction for significance values to reduce the probability of obtaining false-positive results due to multiple tests. In addition, we use Multinomial Logistic Regressions (MLR) to explore and compare the decision-making criteria utilized by the three investor groups. Thus, statistically predicting the probability of investors belonging to one of the groups (compared to another) (Heck et al., 2013).

5. Key findings

This section presents the key findings of each research paper and then proceeds to synthesize the findings. Table 2 presents a summary of the research questions, hypotheses, and key findings of each paper.

5.1. Paper I: What Influences Equity Investors' Decision-Making in Entrepreneurial Finance: A Systematic Literature Review 1983-2022

The first research paper reviews, compares, and synthesizes the existing body of knowledge on investment decision-making criteria utilized by traditional and alternative equity investors. Along their growth and development cycle, entrepreneurial ventures raise capital from various types of investors with different decision-making criteria (Baldock & Mason, 2015; Harrison, 2013; Mason & Harrison, 2015). The traditional financing escalator model outlines a linear funding trajectory. However, recent research shows that some alternative and traditional investors co-invest and interact. Thus, the changing nature of the entrepreneurial finance landscape calls for a thorough review of the decision-making criteria employed by both alternative and traditional investors (Bessière et al., 2020; Capizzi et al., 2022; Lim & Busenitz, 2020; Wright et al., 2015) to identify key factors impacting investors' decision-making as employed by both traditional and alternative players (Block et al., 2018b; Grilli et al., 2018).

Overall, we identified 91 aggregate factors, with 37 showing consistent and significant effects for BAs, VCs, and ECFs across studies. We find that VCs, BAs, and ECFs consider the expected financial rewards, ROI, and liquidity opportunities (i.e., future exit) highly important. These findings suggest that equity investors within the entrepreneurial domain are profit maximizers, expecting to liquify their investment within five to seven years.

5.1.1. Financial factors

BAs and ECFs have distinct approaches to equity ownership and funding goals. BAs are positively influenced by ownership percentage to the extent that BAs reject offers with unrealistically low ownership (Mason et al., 2017). ECF investors, however, are negatively affected, thus, lower ownership percentage on

offer is seen as a signal of the entrepreneur's commitment and confidence when retaining a higher share of ownership (Nitani et al., 2019).

Ventures' funding goals affect investors differently. ECFs respond positively, seeing them as a sign of a growth-focused venture (Lukkarinen et al., 2016; Vismara, 2016). In contrast, BAs react negatively, possibly due to their differing investment amounts and deal structures (Levie & Gimmon, 2008; Mason & Harrison, 2015). BAs invest more per deal, while ECFs invest smaller amounts on average (Lukkarinen et al., 2016; Vismara, 2016). In ECF, entrepreneurs are in control, setting the deal's terms, and investors can choose to opt in or out without compromising on the sum raised and the ownership stake sold.

5.1.2. Entrepreneur and top management team

The review highlighted that equity investors emphasize the importance of a venture’s human capital but prioritize different attributes. VCs and BAs value the TMT's track record, venture development ability, and dyadic relationships. VCs also emphasize leadership capabilities, formal education, marketing, presentation skills, and risk management, while BAs don't prioritize these attributes. This reflects the different roles VCs and BAs play post-investment. BAs are more hands-on as active board members, while VCs typically take a board-supervision role (Croce et al., 2018; Gorman & Sahlman, 1989; Paul et al., 2007; Wetzel, 1983). This suggests that BAs rely on their business experience to fill potential gaps in the TMT, while VCs seek a fully capable and experienced managerial team.

5.1.3. Product or service factors

Investors differ regarding the emphasis they place on the product's innovativeness and ability to meet customers' needs. Our findings indicate that a product's ability to meet customers' needs and its innovativeness have positive and significant effects on BAs' evaluations but are nonsignificant for VCs. Ventures with innovative products but no clear market acceptance represent high-risk investment opportunities. This aligns with Berger and Udell's (1998) view of the financial growth cycle, where companies become more transparent and less risky as they mature. As a result, VCs are more available in later stages of the venture's growth cycle when issues related to innovativeness and customer needs have been resolved and proven.

5.2. Paper II: Venture Uncertainty, Market Uncertainty and Human Capital in Equity Crowdfunding: Evidence from a Natural Experiment

This study provides empirical evidence on the impact and interaction effect between ventures' human capital traits, its uncertainty level, and market uncertainty levels on equity crowdfunding investors' decisions. We find that campaign uncertainty levels are negatively associated with amounts invested, while positively associated with share of investment, indicating that ECF investors compensate for taking greater risks by acquiring larger shares of ownership in the relevant ventures. Second, we show that a venture's human capital attributes are positively associated with amounts invested, while negatively associated with share of investment. Third, regarding the interaction effect, we find that human capital moderates the effects of uncertainty on investment decisions by serving as a risk mitigator. Fourth, we provide evidence that high market uncertainty, as caused by an exogenous economic shock, affects ECF investors' decision-making. Campaigns in the period following the outbreak are characterized by higher uncertainty levels and lower human capital levels. Fifth, while human capital has a positive association with amounts invested before and after the COVID-19 outbreak, it only had a negative effect on share of investment before the outbreak, but not after it.

5.3. Paper III: Decision-Making Criteria Among Serial, Occasional, and One-Time Equity Crowdfunding Investors when Evaluating Technology-Based Ventures

In this study, we examine how various signals influence investors' decision-making, based on their activity level as reflected in their portfolio size. In this study, we provide evidence that ECF investors are not a homogeneous group and that they differ in their emphasis on different signals and investment decision-making criteria. Specifically, we show that ECF investors with different levels of investment experience and portfolio size differ in their relative preferences.

First, the study showed that companies with high human capital have a higher probability of attracting occasional investors over the one-time investors' group, emphasizing the effect of human capital as a costly signal of venture quality, on

occasional investors' decisions. These findings support the literature implying that one-time investors rely less on the companies' and team quality signals, either because they have private information about the venture or invest for non-financial reasons such as commitment to the relationship with the entrepreneur, and therefore rely less on public signals in their decision-making (e.g., Agrawal et al., 2015; Angerer et al., 2017; Kuppuswamy & Bayus, 2018).

Second, and similarly, follow-on campaigns were found to have a higher probability of attracting occasional versus one-time investors. Emphasizing that one-time investors are inclined to invest in the company's first ECF round, and occasional investors tend to invest once the company gained legitimacy by prior investment round(s) thus associated with being a less risky investment (Coakley et al., 2022; Ralcheva & Roosenboom, 2020).

Third, the results show that even when controlling for other variables, the minimum ticket continues to be a barrier to entry, as a lower minimum ticket significantly predicts one-time investors' behaviour, while a higher ticket predicts investments by occasional and serial investors.

The analysis also revealed that entrepreneurs' intentional signals such as target amount, company's pre-money valuation, and equity retained by entrepreneurs do not have significant and statistical predictive power on investors' behaviour. Similarly, campaigns mentioning the existence of a future exit scenario – a costless intentional signal does not predict investors' behaviour.

In summary, this study's findings support and suggest further nuance to prior studies showing an association between entrepreneurs' human capital and investment decisions (e.g., Barbi & Mattioli, 2019; Piva & Rossi-Lamastra, 2018; Wang et al., 2020). More specifically, our results indicate that occasional investors prefer ventures with larger teams with greater industry and professional experience.

	Paper 1	Paper 2	Paper 3
Title	What Influences Equity Investors' Decision-Making in Entrepreneurial Finance: A Systematic Literature Review 1983-2022	Venture Uncertainty, Market Uncertainty and Human Capital in Equity Crowdfunding: Evidence from a Natural Experiment.	Decision-Making Criteria Among Serial, Occasional, and One-Time Equity Crowdfunding Investors when Evaluating Technology-Based Ventures
Type	Review	Empirical	Empirical
Research question(s)	1. What investment decision-making criteria are utilized by traditional and alternative equity investors? 2. How do investment decision-making criteria differ between equity investors?	1. Does entrepreneurs' human capital and the ventures' uncertainty levels affect ECF investment decisions? 2. Is there an interaction effect between the venture's human capital and uncertainty levels? 3. Are these effects consistent, considering the higher uncertainty following the outbreak of COVID-19?	1. How do ECF investors differ in terms of their investment decision-making criteria preferences?
Hypothesis 1	-	a) ECF investors' decisions are negatively associated with the uncertainty level of a prospective investment. **Partly supported.** b) ECF campaigns launched before the COVID-19 outbreak are associated with lower uncertainty levels than campaigns launched after the outbreak. **Supported.**	Serial and occasional investors will exhibit stronger preferences for venture campaigns that present: (a) higher share of equity retained. **Partly supported;** (b) higher goal amounts. **Partly supported**; (c) higher pre-campaign valuations. **Partly supported**; (d) higher minimum tickets than one-time investors. **Supported**
Hypothesis 2	-	ECF investors' decisions are positively associated with the levels of human capital of the fundraising venture's team. **Supported.**	Occasional investors will exhibit a stronger preference for firms running follow-on campaigns, than serial and on-time investors. **Partly supported.**
Hypothesis 3	-	The negative effect of uncertainty on ECF investors' decisions will be moderated by the venture team's human capital levels. **Supported.**	Serial investors will exhibit stronger preferences for ventures presenting an exit plan in their ECF campaign than one-time and occasional investors. **Partly supported.**
Hypothesis 4	-	ECF campaigns launched before the COVID-19 outbreak are associated with higher levels of human capital than campaigns launched after the outbreak. **Supported.**	Serial and occasional investors will exhibit stronger preferences for better human capital qualifications of the entrepreneur than one-time investors. **Partly supported.**
Hypothesis 5	-	The negative effect of high market uncertainty on ECF investors' decisions will be moderated by the levels of the venture team's human capital both before and after the outbreak of COVID-19. **Partly supported.**	-
Key findings	- Investors are highly heterogeneous regarding their decision criteria. - investors share similarities regarding expected financial rewards. - Investors differ regarding ownership level and capital requested. - Investors emphasize the importance of human capital but prioritize different attributes. - Investors differ regarding the emphasis on the product's innovativeness and ability to meet customers' needs.	- Campaign uncertainty levels and ventures' human capital attributes affect investors' decisions. - Human capital moderates the effects of uncertainty on investment decisions. - High market uncertainty levels affect ECF investors' decision-making	- investors differ in their response to signals based on their on-site activity level. - Costly signals of venture quality significantly predict ECF investors' portfolio size decisions. - Campaigns' minimum ticket is a significant predictor of investors' behaviour. - ECF investors with different levels of investment experience and portfolio size differ in their relative preferences.

Table 1: Summary of research questions, hypotheses, and key findings

6. Contributions

The papers presented in this dissertation are meant to enhance the body of knowledge regarding equity crowdfunding investors' decision-making criteria within the entrepreneurial finance domain. The first paper seeks to accumulate knowledge regarding the decision-making criteria of traditional and ECF investors. This led us to the second research paper, in which we investigate the impact of the venture's human capital traits, and its uncertainty level on ECF investors' decisions. And specifically, the effect of increased uncertainty caused by an exogenous economic shock, such as the outbreak of the COVID-19 crisis on ECF decision-making. In the third paper, we delve into the question of whether ECF investors are homogenous in their decision-making criteria. This section will present the aggregated contribution to academic literature and theory, as well as to the various stakeholders and practitioners in the domain, i.e., entrepreneurs, investors, platform managers and policymakers.

6.1. Paper I

A comparison between three types of equity investors' decision-making criteria revealed that different types of investors predominantly exhibit heterogeneous preferences of criteria they use in their investment decision-making. By and large, all investors consider the expected financial rewards, ROI, and liquidation opportunities (i.e., future exit) as highly important, suggesting that equity investors within the entrepreneurial domain are profit maximizers. However, they differ regarding the mechanism and evaluation criteria towards that goal.

First, the three equity investor types we studied in the first paper, namely BAs, VCs, and ECFs, invest in different stages along the venture growth cycle. Each considers that the more advanced and mature the venture is, the more information becomes available to evaluate the risks associated with an investment. In the early stages, when ventures are still developing the product or service, less information is available regarding market acceptance and whether customers' needs have been resolved and proven. At this stage, BAs employ criteria meant to reveal the true quality of the product or service under development, relying on their extensive business experience, usually being former entrepreneurs themselves, as well as human capital traits such as experience, ability to develop the venture, and the

ability to form a close relationship with the entrepreneur. Post-investment, BAs tend to take a hands-on position as active board members and accordingly will look to fill potential gaps in the venture's management to bring them into successful operations towards scaling up the business.

VCs, however, tend to invest in more mature ventures, usually in the growth and expansion stage, and thus are more transparent and less risky. At this stage, ventures have gained market and customers' acceptance thus VCs employ criteria such as leadership, marketing, and presentation skills that are meant to identify ventures with the most capable management team to accelerate sales and rapid growth.

ECF investors invest in the early stages of the venture development, thus characterized as a high-risk investment. Furthermore, ECFs, unlike BAs and VCs, rely on limited online platform data and signals shared by the venture, leading to the second difference between investors, which is the availability of information and negotiation capabilities. Here, BAs and VCs meet the entrepreneurs, gain more firsthand information, conduct due diligence, and directly negotiate contract deals. This includes the amount to be invested and the percentage of ownership associated with it, reflecting future returns. Hence, we see that BAs tend to favour deals offering high ownership levels over those with lower ones, compensating for the risk taken by the BAs, while extracting premiums thanks to imbalanced power in negotiation. ECF investors can either opt in or out of investment conditions offered to them. While having limited information, ECF investors seem to favour ventures offering low total ownership level reading it as a signal of the entrepreneurs' commitment and confidence in the venture. Additionally, having limited information, ECFs primarily focus on the entrepreneurs' education and experience as observable human capital signals of their capability to successfully develop the venture.

6.2. Paper II

The literature review study emphasized the centrality of human capital, venture, and campaigns' uncertainty signals in ECF investors' decision-making, but we lack information regarding the possible interaction effect between them. Additionally, we found that our knowledge regarding the effect of macroeconomic factors on ECF investors' decision-making criteria is limited. To address these gaps, in the

second paper we posit three research questions. The first question is whether entrepreneurs' human capital and the ventures' uncertainty levels affect investment decisions in ECF? And whether there is an interaction effect between the venture's human capital and uncertainty levels on investment decisions in ECF? Following, we ask whether exogenous economic shock, such as the outbreak of the COVID-19 crisis, introduced additional uncertainty to capital markets and whether the effect remains consistent in light of higher uncertainty? To the best of our knowledge, this is the first attempt to use a natural experiment setting to study the effect of high market uncertainty caused by exogenous shock on investors' decision-making.

Overall, we find that uncertainty was negatively associated with investments, while human capital was positively associated with it. We also find that human capital moderates the effects of uncertainty on investment decisions. Finally, we find that this interaction effect is also evident in high uncertainty conditions as analyzed both before and after the COVID-19 outbreak. Moreover, post-COVID-19 outbreak, ventures' uncertainty level increased, and their human capital levels decreased compared to the pre-outbreak period.

Furthermore, from a methodological perspective, in the second paper's analysis, we present unique composite measures of venture uncertainty and human capital while minimizing biases of any individual indicator, which may better reflect complex perceptions influenced by multiple indicators rather than any individual ones. Additionally, we compare our findings in two different periods, reflecting both controllable (endogenous) and uncontrollable (exogenous) uncertainties before and after the COVID-19 outbreak.

6.3. Paper III

The literature review also raised questions regarding the homogenous nature of ECF investors' decision-making criteria. While most studies have addressed ECF investors as a homogenous group, recent research has indicated that ECF investors differ in their motivation to invest, respond differently to signals and employ different decision-making criteria (Ferretti et al., 2021; Goethner et al., 2021a; Hornuf et al., 2022; Wallmeroth, 2019). Earlier research on business angels' decision-making supports such a notion. Van Osnabrugge (1998) found differences in investment decision criteria between serial and non-serial BA, and Harrison et

al. (2015) show differences in the emphasis given to various investment criteria by three groups of BAs based on their investment experience level. Therefore, the third paper focuses on differentiating between ECF investors based on their investment experience and activity level, as reflected in their portfolio size, to study what affects each type of investor's investment decisions. Specifically, it examines how various signals influence investors' decision-making differently based on their relative portfolio size. Overall, we find evidence that ECF investors react to signals of venture quality, while signals of entrepreneurs' intentions play a lesser role in investors' decisions to expand their portfolio size beyond one investment.

Quality signals in our study include human capital and prior validation signals, and both are considered costly to acquire and verifiable (Bhattacharya & Dittmar, 2004). We operationalize costly entrepreneurs' intentions signals by their imposed self-restriction on the supply of capital to the campaign (Hornuf & Neuenkirch, 2017). These signals were found to have no significant effect on investors' portfolio size decisions. Costless intentional signals, such as statements about a potential exit strategy, were found to be nonsignificant, supporting Anglin et al.'s (2018) view that in situations where costly and objective information is available, investors will rely less on costless signals that might be seen as 'cheap talk' (Austen-Smith & Banks, 2000).

Second, this study provides evidence that ECF investors are not a homogeneous group and differ in their emphasis on different signals and investment decision-making criteria. Specifically, we show that ECF investors with different levels of investment experience and portfolio size differ in their relative preferences. Thus, ventures with larger teams that have more significant industry and professional experience levels are preferred. These indicators significantly predict whether investors belong to the occasional investors rather than the one-time investors. This again links to one-time investors' likely origination from the fundraiser's close social circle, which may be less concerned with the formal credentials of an entrepreneur they know personally. Other indicators, such as education and entrepreneurial experience, were found not to influence investors' decisions or predicting investors' activity level. The former finding may be explained by a need for a certain minimum level of human capital to influence the extent of investment (as in amount), which helps distinguish between symbolic and utilitarian investments by single-time investors. Accordingly, team size, industry and

professional background may be viewed as added benefits that are preferred by more active investors.

As such, our results contribute to the literature on investor behaviour in ECF (Lukkarinen et al., 2022; Nguyen et al., 2019; Shafi, 2021; Zafar et al., 2021) and the growing body of literature on the heterogeneity of ECF investors and its implications (Feola et al., 2021; Ferretti et al., 2021; Goethner et al., 2021a; Hornuf et al., 2022; Wallmeroth, 2019).

The two empirical studies presented here offer additional contributions to the body of knowledge on ECF decision-making. Most studies on ECF decision-making used data from European-based platforms (e.g., Block et al., 2018b; Piva & Rossi-Lamastra, 2018; Shafi, 2021). The studies presented here are among the first to utilize data from Israel, a less explored country, presenting unique social and cultural characteristics and attitudes towards entrepreneurship and entrepreneurial activity.

6.4. Summary contribution

Equity crowdfunding is already a vital fundraising mechanism for early-stage entrepreneurial ventures. ECF improves these ventures' likelihood of raising equity by enabling them to access new types of crowd investors who otherwise will not be active within the entrepreneurial finance realm (Bollaert et al., 2021; Cumming et al., 2021; Vismara, 2022). The overarching goal of this dissertation is to address gaps in the literature regarding ECF investors' decision-making criteria. Understanding the decision-making criteria of investors is crucial for the success of early-stage entrepreneurial ventures in securing equity crowdfunding.

In the first paper, we review, compare, and synthesize the existing knowledge regarding traditional and alternative investors' decision-making criteria, acknowledging that these players interact and collaborate along the ventures' "financing cycle" (Beauhurst, 2022; Bollaert et al., 2021; Murzacheva & Levie, 2020). Here, we show that VC, BA and ECF predominantly exhibit heterogeneous criteria preferences in their investment decision-making. While all players highlight the expected financial rewards, they operationalize different investment strategies and decision-making criteria regarding other factors such as the venture's human capital, product or service innovativeness, and industry characteristics.

Here, our findings may become helpful in informing entrepreneurs of the different players' decision-making criteria and assist them in finding the most appropriate finance source based on their development stage and needs.

The second paper follows a recent stream in the literature studying the effect of economic shocks, such as COVID-19, on individual uncertainty and investment behaviours (Brown & Rocha, 2020; Brown et al., 2020; Cumming & Reardon, 2022). Here, we posit that ventures' human capital will moderate investors' decisions considering both venture and market uncertainty. We found support and show that human capital moderates the effects of uncertainty on investment decisions and that the effect is also evident in high uncertainty conditions as analyzed both before and after the COVID-19 outbreak.

The third paper extends earlier findings from studies showing that BAs' decision-making criteria differ based on their experience and activity level (Harrison et al., 2015; Van Osnabrugge, 1998) when examining ECF investors that vary with respect to their experience levels. Such investigation is warranted since recent research has indicated that ECF investors differ in their motivation to invest, respond differently to signals and employ different decision-making criteria (Goethner et al., 2021a; Hornuf et al., 2022; Wallmeroth, 2019). Therefore, ECF investors' decision-making criteria may also differ based on their investment activity level. Our analysis revealed that investors respond differently to signals based on their on-site activity level. We show that costly signals of venture quality significantly predict investors' portfolio size decisions and that the minimum ticket significantly predicts investors' behaviour.

7. Limitations and implications for further research

The studies presented in this dissertation have limitations that should be acknowledged. The first study covers peer-reviewed academic journals found on four electronic databases, therefore, might ignore contributions found in additional databases. Second, we have limited our search to publications in the English language; therefore, we might fail to find data and sources published in other languages and regions. Third, by focusing on the equity markets, we have not examined other sources of finance available to entrepreneurial ventures, such as debt markets. Fourth, though addressed in this study, equity crowdfunding research is still less mature than research covering other channels, and findings may reflect early industry dynamics, as it remains to be seen if this industry will maintain its uniqueness or will gradually revert to old habits and practices as players court big investors as well.

The two empirical papers in this thesis are based on a dataset received from PipelBiz, an Israeli equity crowdfunding platform. PipelBiz, like many platforms, has some industry specialization and therefore attracts investors that might differ in their behaviour and decision-making from other platforms' investors. We encourage future studies to include multiple platforms to examine the generalization of the results. Second, the investors in our sample are all from Israel, which is strongly associated with its innovation-driven entrepreneurial ecosystem (Bosma et al., 2021), ranking 10th on the Global Entrepreneurship Monitor's Entrepreneurial Spirit Index (GEM, 2018). These unique social and economic characteristics regarding entrepreneurship and entrepreneurial activity might affect investors' behaviour and attitude towards new venture creation and, thus, their investment decisions. Here, we recommend future research to consider similar analyses in less entrepreneurially oriented markets and across countries and regions with different institutional constellations. Finally, our interpretation of investors' behaviour and decision-making criteria is indirect. Thus, we infer from campaigns' characteristics and investors' decisions on their decision-making criteria. Future research may confront such insights with primary data collection directly from investors, either qualitatively or quantitatively, to confirm our assumptions and ensure that our statistical results do not camouflage other effects that may be in place.

8. Dissemination of papers

Paper	Authorship	Conferences/seminars	Status
What Influences Equity Investors' Decision-Making in Entrepreneurial Finance: A Systematic Literature Review 1983-2022	Daniel Berliner Rotem Shneor Andreas Wald	2020, 18th Interdisciplinary European Conference on Entrepreneurship Research (IECER), Utrecht University School of Economics, The Netherlands.	Under review in *Venture Capital Journal*
Venture Uncertainty, Market Uncertainty and Human Capital in Equity Crowdfunding: Evidence from a Natural Experiment	Daniel Berliner Rotem Shneor Vincenzo Capizzi	2022, 17th European Conference on Innovation and Entrepreneurship (ECIE22), Cyprus	Under revision in *International Small Business Journal*
Decision-Making Criteria Among Serial, Occasional, and One-Time Equity Crowdfunding Investors in Evaluating Technology-Based Ventures	Daniel Berliner Rotem Shneor Andreas Wald	2023, Babson College Entrepreneurship Research Conference (BCERC) Knoxville, Tennessee, USA 2023, The 2nd International Conference for Alternative Finance Research, Gdansk, Poland	Under review in *Technological Forecasting and Social Change*

Table 2: Dissemination of papers

9. References

Acemoglu, D., Johnson, S., & Robinson, J. A. (2005). Institutions as a fundamental cause of long-run growth. Handbook of economic growth, 1, 385-472. https://doi.org/10.1016/S1574-0684(05)01006-3

Acs, Z. J., Audretsch, D. B., Lehmann, E. E., & Licht, G. (2016). National systems of entrepreneurship. Small Business Economics, 46(4), 527-535. https://doi.org/10.1016/j.respol.2013.08.016

Afful-Dadzie, E., & Afful-Dadzie, A. (2016). A decision making model for selecting startup businesses in a government venture capital scheme. Management Decision, 54(3), 714-734. https://doi.org/10.1108/MD-06-2015-0226

Agrawal, A., Catalini, C., & Goldfarb, A. (2015). Crowdfunding: Geography, social networks, and the timing of investment decisions. Journal of Economics & Management Strategy, 24(2), 253-274. https://doi.org/10.1111/jems.12093

Agrawal, A., Catalini, C., & Goldfarb, A. (2016). Are syndicates the killer app of equity crowdfunding. California Management Review, 58, 111-124. https://doi.org/10.1525/cmr.2016.58.2.111

Ahlers, G. K. C., Cumming, D., Günther, C., & Schweizer, D. (2015). Signaling in equity crowdfunding. Entrepreneurship Theory and Practice, 39(4), 955-980. https://doi.org/10.1111/etap.12157

AJG. (2021). Academic Journal Guide 2021 https://charteredabs.org/academic-journal-guide-2021-view/

Angerer, M., Brem, A., Kraus, S., & Peter, A. (2017). Startup funding via equity crowdfunding in Germany: a qualitative analysis of success factors. The Journal of Entrepreneurial Finance 19(1), 1-34. http://dx.doi.org/10.57229/2373-1761.1290

Anglin, A. H., Short, J. C., Drover, W., Stevenson, R. M., McKenny, A. F., & Allison, T. H. (2018). The power of positivity? The influence of positive psychological capital language on crowdfunding performance. Journal of Business Venturing, 33(4), 470-492. https://doi.org/10.1016/j.jbusvent.2018.03.003

Austen-Smith, D., & Banks, J. S. (2000). Cheap talk and burned money. Journal of Economic Theory, 91(1), 1-16. https://doi.org/10.1006/jeth.1999.2591

Avnimelech, G., & Schwartz, D. (2009). Structural changes in mature Venture Capital industry: Evidence from Israel. Innovation, 11(1), 60-73. https://doi.org/10.5172/impp.453.11.1.60

Baldock, R., & Mason, C. (2015). Establishing a new UK finance escalator for innovative SMEs: the roles of the Enterprise Capital Funds and Angel Co-Investment Fund. Venture Capital, 17(1-2), 59-86. https://doi.org/10.1080/13691066.2015.1021025

Barbi, M., & Mattioli, S. (2019). Human capital, investor trust, and equity crowdfunding. Research in International Business and Finance, 49, 1-12. https://doi.org/10.1016/j.ribaf.2019.02.005

Beauhurst. (2022). The State of UK Equity Crowdfunding in 2022. https://www.beauhurst.com/blog/uk-equity-crowdfunding/

Belleflamme, P., Lambert, T., & Schwienbacher, A. (2014). Crowdfunding: Tapping the right crowd. Journal of Business Venturing, 29(5), 585-609. https://doi.org/10.1016/j.jbusvent.2013.07.003

Berger, A. N., & Udell, G. F. (1998). The economics of small business finance: the roles of private equity and debt markets in the financial growth cycle. Journal of Banking & Finance, 22(6-8), 613-673. https://doi.org/10.1016/S0378-4266(98)00038-7

Bessière, V., Stéphany, E., & Wirtz, P. (2020). Crowdfunding, business angels, and venture capital: an exploratory study of the concept of the funding trajectory. Venture Capital, 22(2), 135-160. https://doi.org/10.1080/13691066.2019.1599188

Bhaskar, R. (2008). A realist theory of science (1st ed.). Routledge. https://doi.org/https://doi.org/10.4324/9780203090732

Bhattacharya, U., & Dittmar, A. (2004). Costless versus costly signaling in capital markets: Theory and Evidence. FIRS Conference on Banking, Insurance and Intermediation in Capri in May 2004,

Bhattacherjee, A. (2012). Social science research: Principles, methods, and practices. USA.

Blankespoor, E., Miller, G. S., & White, H. D. (2014). The role of dissemination in market liquidity: Evidence from firms' use of Twitter™. The Accounting Review, 89(1), 79-112. https://doi.org/10.2308/accr-50576

Block, J., Colombo, M., Cumming, D., & Vismara, S. (2018a). New players in entrepreneurial finance and why they are there. Small Business Economics, 50(2), 239-250. https://doi.org/10.1007/s11187-016-9826-6

Block, J., Hornuf, L., & Moritz, A. (2018b). Which updates during an equity crowdfunding campaign increase crowd participation? Small Business Economics, 50(1), 3-27. https://doi.org/10.1007/s11187-017-9876-4

Bollaert, H., Lopez-de-Silanes, F., & Schwienbacher, A. (2021). Fintech and access to finance. Journal of Corporate Finance, 68, 101941. https://doi.org/10.1016/j.jcorpfin.2021.101941

Bosma, N., Hill, S., Ionescu-Somers, A., Kelley, D., Guerrero, M., & Schott, T. (2021). GEM global report 2020/2021. L. B. School. https://www.gemconsortium.org/report/gem-20202021-global-report

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Bresnahan, T., Gambardella, A., & Saxenian, A. (2001). 'Old economy'inputs for 'new economy'outcomes: Cluster formation in the new Silicon Valleys. Industrial and Corporate Change, 10(4), 835-860. https://doi.org/10.1093/icc/10.4.835

Briner, R. B., & Denyer, D. (2012). Systematic review and evidence synthesis as a practice and scholarship tool. Handbook of evidence-based management: Companies, classrooms and research, 112-129. https://doi.org/10.1093/oxfordhb/9780199763986.013.0007

Brown, R., & Rocha, A. (2020). Entrepreneurial uncertainty during the Covid-19 crisis: Mapping the temporal dynamics of entrepreneurial finance. Journal of Business Venturing Insights, 14, e00174. https://doi.org/10.1016/j.jbvi.2020.e00174

Brown, R., Rocha, A., & Cowling, M. (2020). Financing entrepreneurship in times of crisis: exploring the impact of COVID-19 on the market for entrepreneurial finance in the United Kingdom. International Small Business Journal, 38(5), 380-390. https://doi.org/10.1177/0266242620937464

Bruhn, M., Hommes, M., Khanna, M., Singh, S., Sorokina, A., & Wimpey, J. S. (2017). MSME Finance Gap: Assessment of the Shortfalls and Opportunities in Financing Micro, Small, and Medium Enterprises in Emerging Markets.

Capizzi, V., Croce, A., & Tenca, F. (2022). Do Business Angels' Investments Make It Easier to Raise Follow-on Venture Capital Financing? An Analysis of the Relevance of Business Angels' Investment Practices. British Journal of Management, 33(1), 306-326. https://doi.org/10.1111/1467-8551.12526

Carpentier, C., & Suret, J.-M. (2015). Angel group members' decision process and rejection criteria: A longitudinal analysis. Journal of Business Venturing, 30(6), 808-821. https://doi.org/10.1016/j.jbusvent.2015.04.002

Coakley, J., Lazos, A., & Liñares-Zegarra, J. M. (2022). Seasoned equity crowdfunded offerings. Journal of Corporate Finance, 77, 101880. https://doi.org/10.1016/j.jcorpfin.2020.101880

Colombo, M. G., & Shafi, K. (2021). Receiving external equity following successfully crowdfunded technological projects: An informational

mechanism. Small Business Economics, 56(4), 1507-1529. https://doi.org/10.1007/s11187-019-00259-1

Croce, A., Guerini, M., & Ughetto, E. (2018). Angel Financing and the Performance of High-Tech Startups. Journal of Small Business Management, 56(2), 208-228. https://doi.org/10.1111/jsbm.12250

Croce, A., Tenca, F., & Ughetto, E. (2017). How business angel groups work: Rejection criteria in investment evaluation. International Small Business Journal, 35(4), 405-426. https://doi.org/10.1177/0266242615622675

Crum, M., & Nelson, T. E. (2015). Stabilizing institutions for new venture investment decisions. Journal of Enterprising Communities: People and Places in the Global Economy, 9(4), 344-360. https://doi.org/10.1108/JEC-05-2013-0014

Cumming, D., Deloof, M., Manigart, S., & Wright, M. (2019a). New directions in entrepreneurial finance. Journal of Banking & Finance, 100, 252-260.

Cumming, D., Fleming, G., & Schwienbacher, A. (2005). Liquidity risk and venture capital finance. Financial Management, 34(4), 77-105. https://doi.org/10.1111/j.1755-053X.2005.tb00119.x

Cumming, D., Meoli, M., & Vismara, S. (2019b). Investors' choices between cash and voting rights: Evidence from dual-class equity crowdfunding. Research Policy, 48(8), 103740. https://doi.org/10.1016/j.respol.2019.01.014

Cumming, D., Meoli, M., & Vismara, S. (2021). Does equity crowdfunding democratize entrepreneurial finance? Small Business Economics, 56, 533-552. https://doi.org/10.1007/s11187-019-00188-z

Cumming, D., & Reardon, R. S. (2022). COVID-19 and entrepreneurial processes in US equity crowdfunding. Journal of Small Business Management, 1-24. https://doi.org/10.1080/00472778.2022.2051178

Cumming, D. J., Leboeuf, G., & Schwienbacher, A. (2020). Crowdfunding models: keep-it-all vs. all-or-nothing. Financial Management, 49(2), 331-360. https://doi.org/10.1111/fima.12262

Cumming, D. J., & Vismara, S. (2017). De-segmenting research in entrepreneurial finance. Venture Capital, 19(1-2), 17-27. https://doi.org/10.1080/13691066.2016.1225910

Cummings, M. E., Rawhouser, H., Vismara, S., & Hamilton, E. L. (2020). An equity crowdfunding research agenda: Evidence from stakeholder participation in the rulemaking process. Small Business Economics, 54, 907-932. https://doi.org/10.1007/s11187-018-00134-5

Di Pietro, F., & Butticè, V. (2020). Institutional characteristics and the development of crowdfunding across countries. International Review of Financial Analysis, 71, 101543. https://doi.org/10.3390/jrfm13120326

Di Pietro, F., Prencipe, A., & Majchrzak, A. (2018). Crowd equity investors: An underutilized asset for open innovation in startups. California Management Review, 60(2), 43-70. https://doi.org/10.1177/0008125617738260

Drover, W., Busenitz, L., Matusik, S., Townsend, D., Anglin, A., & Dushnitsky, G. (2017). A review and road map of entrepreneurial equity financing research: venture capital, corporate venture capital, angel investment, crowdfunding, and accelerators. Journal of Management, 43(6), 1820-1853. https://doi.org/10.1177/0149206317690584

Dunning, T. (2012). Natural experiments in the social sciences: A design-based approach. Cambridge University Press. https://doi.org/https://doi.org/10.1017/CBO9781139084444

ECN, E. C. N. (2017). Review of Crowdfunding Regulation 2017.

Efrat, K., Gilboa, S., & Berliner, D. (2020). Israeli Crowdfunding: a reflection of its entrepreneurial culture. In Advances in Crowdfunding (pp. 341-372). Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-46309-0_15

Estrin, S., Gozman, D., & Khavul, S. (2018). The evolution and adoption of equity crowdfunding: entrepreneur and investor entry into a new market. Small Business Economics, 51(2), 425-439. https://doi.org/10.1007/s11187-018-0009-5

Estrin, S., Korosteleva, J., & Mickiewicz, T. (2013). Which institutions encourage entrepreneurial growth aspirations? Journal of Business Venturing, 28(4), 564-580. https://doi.org/10.1016/j.jbusvent.2012.05.001

European Central Bank. (2023). Survey on the Access to Finance of Enterprises (SAFE) (28th ed.) https://www.ecb.europa.eu/stats/ecb_surveys/safe/html/ecb.safe202306~58c0da48d6.en.html

Feeney, L., Haines Jr, G. H., & Riding, A. L. (1999). Private investors' investment criteria: insights from qualitative data. Venture Capital, 1(2), 121-145. https://doi.org/10.1080/136910699295938

Feola, R., Vesci, M., Marinato, E., & Parente, R. (2021). Segmenting "digital investors": evidence from the Italian equity crowdfunding market. Small Business Economics, 56, 1235-1250. https://doi.org/10.1007/s11187-019-00265-3

Ferretti, R., Venturelli, V., & Pedrazzoli, A. (2021). Do multiple competing offerings on a crowdfunding platform influence investment behavior? Journal of Behavioral and Experimental Finance, 30, 100506. https://doi.org/10.1016/j.jbef.2021.100506

Foss, N., Klein, P., & Murtinu, S. (2020). Entrepreneurial finance under Knightian uncertainty: Pathways for achieving cognitive overlap. Working paper.

Fried, V. H., & Hisrich, R. D. (1994). Toward a Model of Venture Capital Investment Decision Making. Financial Management, 23(3), 28-37. https://doi.org/10.2307/3665619

GEM. (2018). Global Report 2017/18 M. G. Wellesley.

GEM. (2023). Global Entrepreneurship Monitor 2022/2023 Global Report: Adapting to a "New Normal". London GEM.

Goethner, M., Luettig, S., & Regner, T. (2021a). Crowdinvesting in entrepreneurial projects: disentangling patterns of investor behavior. Small Business Economics, 57(2), 905-926. https://doi.org/10.1007/s11187-020-00332-0

Goethner, M., Luettig, S., & Regner, T. (2021b). Crowdinvesting in entrepreneurial projects: disentangling patterns of investor behavior. Small Business Economics, 905-926. https://doi.org/10.1007/s11187-020-00332-0

Gompers, P. A., Gornall, W., Kaplan, S. N., & Strebulaev, I. A. (2020). How do venture capitalists make decisions? Journal of financial economics, 135(1), 169-190. https://doi.org/10.1016/j.jfineco.2019.06.011

Gorman, M., & Sahlman, W. A. (1989). What do venture capitalists do? Journal of Business Venturing, 4(4), 231-248. https://doi.org/10.1016/0883-9026(89)90014-1

Grilli, L., Mazzucato, M., Meoli, M., & Scellato, G. (2018). Sowing the seeds of the future: Policies for financing tomorrow's innovations. Technological Forecasting and Social Change, 127, 1-7. https://doi.org/10.1016/j.techfore.2017.10.021

Guenther, C., Hienerth, C., & Riar, F. (2015). The due diligence of crowdinvestors: thorough evaluation or gut feeling only? Academy of management proceedings,

Haddad, C., & Hornuf, L. (2019). The emergence of the global fintech market: Economic and technological determinants. Small Business Economics, 53(1), 81-105. https://doi.org/10.1007/s11187-018-9991-x

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2018). Multivariate Data Analysis (8th Edition ed.). Cengage Learning EMEA. https://books.google.no/books?id=VvXZnQEACAAJ

Hall, J., & Hofer, C. W. (1993). Venture capitalists' decision criteria in new venture evaluation. Journal of Business Venturing, 8(1), 25-42. https://doi.org/10.1016/0883-9026(93)90009-T

Harrison, R. (2013). Crowdfunding and the revitalization of the early stage risk capital market: catalyst or chimera? , 15(4), 283-287. https://doi.org/10.1080/13691066.2013.852331

Harrison, R., Mason, C., & Smith, D. (2015). Heuristics, learning and the business angel investment decision-making process. Entrepreneurship & Regional Development, 27(9-10), 527-554. https://doi.org/10.1080/08985626.2015.1066875

Harrison, R. T., & Baldock, R. (2015). Financing SME growth in the UK: meeting the challenges after the global financial crisis. Venture Capital, 17(1-2), 1-6. https://doi.org/10.1080/13691066.2015.1050241

He, V. F., Tröbinger, M., & Murray, A. (2024). The crowd beyond funders: An integrative review of and research agenda for crowdfunding. Academy of Management Annals, 18(1), 348-394. https://doi.org/10.5465/annals.2022.0064

Heck, R. H., Thomas, S., & Tabata, L. (2013). Multilevel modeling of categorical outcomes using IBM SPSS. Routledge.

Hecke, T. V. (2012). Power study of anova versus Kruskal-Wallis test. Journal of Statistics and Management Systems, 15(2-3), 241-247. https://doi.org/10.1080/09720510.2012.10701623

Hornuf, L., & Neuenkirch, M. (2017). Pricing shares in equity crowdfunding. Small Business Economics, 48, 795-811. https://doi.org/10.1007/s11187-016-9807-9

Hornuf, L., & Schmitt, M. (2016). Success and failure in equity crowdfunding. CESifo DICE Report, 14(2), 16-22.

Hornuf, L., Schmitt, M., & Stenzhorn, E. (2022). The local bias in equity crowdfunding: behavioral anomaly or rational preference? Journal of Economics & Management Strategy, 31(3), 693-733. https://doi.org/10.1111/jems.12475

Hornuf, L., & Schwienbacher, A. (2018). Market mechanisms and funding dynamics in equity crowdfunding. Journal of Corporate Finance, 50, 556-574. https://doi.org/10.1016/j.jcorpfin.2017.08.009

Ketchen, D. J., & Shook, C. L. (1996). The application of cluster analysis in strategic management research: an analysis and critique. Strategic management journal, 17(6), 441-458. https://doi.org/10.1002/(SICI)1097-0266(199606)17:6%3C441::AID-SMJ819%3E3.0.CO;2-G

Klein, P. G., & Maldonado-Bautista, I. (2022). Entrepreneurship, sustainability, and stakeholder theory. In Handbook on the Business of Sustainability. Edward Elgar Publishing. https://doi.org/10.4337/9781839105340.00012

Kleinert, S., Bafera, J., Urbig, D., & Volkmann, C. K. (2022). Access denied: How equity crowdfunding platforms use quality signals to select new ventures. Entrepreneurship Theory and Practice, 46(6), 1626-1657. https://doi.org/10.1177/10422587211011945

Kleinert, S., & Volkmann, C. (2019). Equity crowdfunding and the role of investor discussion boards. Venture Capital, 21(4), 327-352. https://doi.org/10.1080/13691066.2019.1569853

Kukk, M.-L., & Laidroo, L. (2020). Institutional Drivers of Crowdfunding Volumes. Journal of Risk and Financial Management, 13(12), 326. https://doi.org/10.3390/jrfm13120326

Kuppuswamy, V., & Bayus, B. L. (2018). Crowdfunding creative ideas: the dynamics of project backers. In D. Cumming & L. Hornuf (Eds.), The economics of Crowdfunding: Startups, portals and investor behavior (pp. 151–182). Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-66119-3_8

Leatherdale, S. T. (2019). Natural experiment methodology for research: a review of how different methods can support real-world research. International Journal of Social Research Methodology, 22(1), 19-35. https://doi.org/10.1080/13645579.2018.1488449

Lehner, O. M., Grabmann, E., & Ennsgraber, C. (2015). Entrepreneurial implications of crowdfunding as alternative funding source for innovations. Venture Capital, 17(1-2), 171-189. https://doi.org/10.1080/13691066.2015.1037132

Levie, J., & Gimmon, E. (2008). Mixed signals: why investors may misjudge first time high technology venture founders. Venture Capital, 10(3), 233-256. https://doi.org/10.1080/13691060802151820

Lim, J. Y.-K., & Busenitz, L. W. (2020). Evolving human capital of entrepreneurs in an equity crowdfunding era. Journal of Small Business Management, 58(1), 106-129. https://doi.org/10.1080/00472778.2019.1659674

Löher, J. (2017). The interaction of equity crowdfunding platforms and ventures: an analysis of the preselection process. Venture Capital, 19(1-2), 51-74. https://doi.org/10.1080/13691066.2016.1252510

Lukkarinen, A., Shneor, R., & Wallenius, J. (2022). Growing pains and blessings: manifestations and implications of equity crowdfunding industry maturation. Decision Support Systems, 157, 113768. https://doi.org/10.1016/j.dss.2022.113768

Lukkarinen, A., Teich, J. E., Wallenius, H., & Wallenius, J. (2016). Success drivers of online equity crowdfunding campaigns. Decision Support Systems, 87, 26-38. https://doi.org/10.1016/j.dss.2016.04.006

Mahoney, J., & Goertz, G. (2006). A tale of two cultures: Contrasting quantitative and qualitative research. Political analysis, 14(3), 227-249. https://doi.org/10.1093/pan/mpj017

Mason, C., Botelho, T., & Harrison, R. (2016). The transformation of the business angel market: empirical evidence and research implications. Venture Capital, 18(4), 321-344. https://doi.org/10.1080/13691066.2016.1229470

Mason, C., Botelho, T., & Zygmunt, J. (2017). Why business angels reject investment opportunities: Is it personal? International Small Business Journal, 35(5), 519-534. https://doi.org/10.1177/0266242616646622

Mason, C., & Harrison, R. (2002). Barriers to investment in the informal venture capital sector. Entrepreneurship & Regional Development, 14(3), 271-287. https://doi.org/10.1080/08985620210142011

Mason, C. M., & Harrison, R. T. (2008). Measuring business angel investment activity in the United Kingdom: a review of potential data sources. Venture Capital, 10(4), 309-330. https://doi.org/10.1080/13691060802380098

Mason, C. M., & Harrison, R. T. (2015). Business angel investment activity in the financial crisis: UK evidence and policy implications. Environment and Planning C: Government and Policy, 33(1), 43-60. https://doi.org/10.1068/c12324b

Maxwell, A. L., Jeffrey, S. A., & Lévesque, M. (2011). Business angel early stage decision making. Journal of Business Venturing, 26(2), 212-225. https://doi.org/10.1016/j.jbusvent.2009.09.002

Mitteness, C., Sudek, R., & Cardon, M. S. (2012). Angel investor characteristics that determine whether perceived passion leads to higher evaluations of funding potential. Journal of Business Venturing, 27(5), 592-606. https://doi.org/10.1016/j.jbusvent.2011.11.003

Mochkabadi, K., & Volkmann, C. K. (2020). Equity crowdfunding: a systematic review of the literature. Small Business Economics, 54(1), 75-118. https://doi.org/10.1007/s11187-018-0081-x

Mollick, E. (2014). The dynamics of crowdfunding: An exploratory study. Journal of Business Venturing, 29(1), 1-16.

Moritz, A., Block, J., & Lutz, E. (2015). Investor communication in equity-based crowdfunding: a qualitative-empirical study. Qualitative Research in Financial Markets. https://doi.org/10.1108/QRFM-07-2014-0021

Murzacheva, E., & Levie, J. (2020). Entrepreneurial finance journeys: embeddedness and the finance escalator. Venture Capital, 22(2), 185-214.

Muzyka, D., Birley, S., & Leleux, B. (1996). Trade-offs in the investment decisions of European venture capitalists. Journal of Business Venturing, 11(4), 273-287. https://doi.org/10.1016/0883-9026(95)00126-3

Nguyen, T., Cox, J., & Rich, J. (2019). Invest or regret? an empirical investigation into funding dynamics during the final days of equity crowdfunding campaigns. Journal of Corporate Finance, 58, 784-803. https://doi.org/10.1016/j.jcorpfin.2019.07.011

Nitani, M., Riding, A., & He, B. (2019). On equity crowdfunding: investor rationality and success factors. Venture Capital, 21(2-3), 243-272. https://doi.org/10.1080/13691066.2018.1468542

North, D., Baldock, R., & Ullah, F. (2013). Funding the growth of UK technology-based small firms since the financial crash: are there breakages in the finance escalator? Venture Capital, 15(3), 237-260. https://doi.org/10.1080/13691066.2013.804755

Paik, Y., & Woo, H. (2014). Economic downturn and financing innovative startup companies. Managerial and Decision Economics, 35(2), 114-128. https://doi.org/10.1002/mde.2646

Paul, S., Whittam, G., & Wyper, J. (2007). Towards a model of the business angel investment process. Venture Capital, 9(2), 107-125. https://doi.org/10.1080/13691060601185425

Petty, J. S., & Gruber, M. (2011). "In pursuit of the real deal": A longitudinal study of VC decision making. Journal of Business Venturing, 26(2), 172-188. https://doi.org/10.1016/j.jbusvent.2009.07.002

Piva, E., & Rossi-Lamastra, C. (2018). Human capital signals and entrepreneurs' success in equity crowdfunding. Small Business Economics, 51, 667-686. https://doi.org/10.1007/s11187-017-9950-y

Ralcheva, A., & Roosenboom, P. (2020). Forecasting success in equity crowdfunding. Small Business Economics, 55, 39-56. https://doi.org/10.1007/s11187-019-00144-x

Sasson, U. (2020, 07.02.2020). PipelBiz expends its operation - crowdfunding in the real estate market Calcalist. Retrieved 26 February 2023 from https://www.calcalist.co.il/articles/0,7340,L-3790250,00.html

Sayer, A. (1997). Critical realism and the limits to critical social science. Journal for the theory of social behaviour, 27(4), 473-488. https://doi.org/10.1111/1468-5914.00052

Scott, W. R. (2013). Institutions and organizations: Ideas, interests, and identities. Sage publications.

Sekaran, U., & Bougie, R. (2016). Research methods for business: A skill building approach. john wiley & sons.

Shafi, K. (2021). Investors' evaluation criteria in equity crowdfunding. Small Business Economics, 3-37. https://doi.org/10.1007/s11187-019-00227-9

Shneor, R., Wenzlaff, K., Boyko, K., Baah-Peprah, P., Odorovic, A., & Okhrimenko, O. (2024). European Crowdfunding Market Report 2023. https://doi.org/10.5281/zenodo.10617956

Short, J. C., Ketchen Jr, D. J., McKenny, A. F., Allison, T. H., & Ireland, R. D. (2017). Research on crowdfunding: Reviewing the (very recent) past and celebrating the present. Entrepreneurship Theory and Practice, 41(2), 149-160. https://doi.org/10.1111/etap.12270

Signori, A., & Vismara, S. (2018). Does success bring success? The post-offering lives of equity-crowdfunded firms. Journal of Corporate Finance, 50, 575-591. https://doi.org/10.1016/j.jcorpfin.2017.10.018

Stemler, A. R. (2013). The JOBS Act and crowdfunding: Harnessing the power—and money—of the masses. Business Horizons, 56(3), 271-275. https://doi.org/10.1016/j.bushor.2013.01.007

Tiberius, V., & Hauptmeijer, R. (2021). Equity crowdfunding: Forecasting market development, platform evolution, and regulation. Journal of Small Business Management, 1-33.

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. British Journal of Management, 14(3), 207-222. https://doi.org/10.1111/1467-8551.00375

Tuomi, K., & Harrison, R. (2017). A comparison of equity crowdfunding in four countries: Implications for business angels. Strategic Change, 26(6), 609-615. https://doi.org/10.1002/jsc.2172

Tyebjee, T. T., & Bruno, A. V. (1984). A model of venture capitalist investment activity. Management Science, 30(9), 1051-1066. https://doi.org/10.1287/mnsc.30.9.1051

Van Osnabrugge, M. (1998). Do serial and non-serial investors behave differently?: An empirical and theoretical analysis. Entrepreneurship Theory and Practice, 22(4), 23-42. https://doi.org/10.1177/104225879802200402

Van Osnabrugge, M. (2000). A comparison of business angel and venture capitalist investment procedures: an agency theory-based analysis. Venture Capital, 2(2), 91-109. https://doi.org/10.1080/136910600295729

Vismara, S. (2016). Equity retention and social network theory in equity crowdfunding. Small Business Economics, 46, 579-590. https://doi.org/10.1007/s11187-016-9710-4

Vismara, S. (2018). Signaling to overcome inefficiencies in crowdfunding markets. In D. Cumming & L. Hornuf (Eds.), The Economics of

Crowdfunding (pp. 29-56). Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-66119-3_3

Vismara, S. (2022). Expanding corporate finance perspectives to equity crowdfunding. The Journal of Technology Transfer, 47(6), 1629-1639. https://doi.org/10.1007/s10961-021-09903-z

Wald, A., Holmesland, M., & Efrat, K. (2019). It is not all about money: obtaining additional benefits through equity crowdfunding. The Journal of Entrepreneurship, 28(2), 270-294. https://doi.org/10.1177/0971355719851899

Wallmeroth, J. (2019). Investor behavior in equity crowdfunding. Venture Capital, 21(2-3), 273-300. https://doi.org/10.1080/13691066.2018.1457475

Wallmeroth, J., Wirtz, P., & Groh, A. P. (2018). Venture capital, angel financing, and crowdfunding of entrepreneurial ventures: A literature review. Foundations and Trends in Entrepreneurship, 14(1), 1-129. http://dx.doi.org/10.1561/0300000066

Wang, W., Chen, W., Zhu, K., & Wang, H. (2020). Emphasizing the entrepreneur or the idea? The impact of text content emphasis on investment decisions in crowdfunding. Decision Support Systems, 136, 113341. https://doi.org/10.1016/j.dss.2020.113341

Wang, W., Mahmood, A., Sismeiro, C., & Vulkan, N. (2019). The evolution of equity crowdfunding: insights from co-investments of angels and the crowd. Research Policy, 48(8), 1-11. https://doi.org/10.1016/j.respol.2019.01.003

Wetzel, W. E., Jr. (1983). Angels and informal risk capital. Sloan Management Review (pre-1986), 24(4), 23-34.

Wilson, K. E., & Testoni, M. (2014). Improving the role of equity crowdfunding in Europe's capital markets. Available at SSRN 2502280. http://dx.doi.org/10.2139/ssrn.2502280

WorldBank. (2022). World Development Indicators

Wright, M., Hart, M., & Fu, K. (2015). A nation of angels: Assessing the impact of angel investing across the UK. Report by the Enterprise Research Centre. https://www.enterpriseresearch.ac.uk/wp-content/uploads/2019/11/ERC-Angels-Report.pdf

Zacharakis, A. L., & Meyer, G. D. (2000). The potential of actuarial decision models: can they improve the venture capital investment decision? Journal of Business Venturing, 15(4), 323-346. https://doi.org/10.1016/S0883-9026(98)00016-0

Zafar, S., Waddingham, J., Zachary, M., & Short, J. (2021). Search behavior and decision confidence in equity crowdfunding: an information search process

model perspective. Journal of Small Business Management. https://doi.org/10.1080/00472778.2020.1861285

Ziegler, T., Shneor, R., Wenzlaff, K., Suresh, K., Paes, F. F. d. C., Mammadova, L., Wanga, C., Kekre, N., Mutinda, S., & Wang, B. (2021). The 2nd Global Alternative Finance Market Benchmarking Report.

Paper II:
Venture Uncertainty, Market Uncertainty and Human Capital in Equity Crowdfunding: Evidence from a Natural Experiment

Daniel Berliner, Rotem Shneor, Vincenzo Capizzi

Abstract

Building on signalling theory, this study provides empirical evidence on the impact of the venture's human capital traits, its uncertainty level, and market uncertainty levels on equity crowdfunding investors' decisions. We test these effects using a natural experiment by analyzing data from before and after the COVID-19 outbreak. We do so by using a proprietary dataset of 13,362 individual investor-investment decisions from the Israeli PipelBiz platform (between July 2018 and December 2020). Overall, we find that uncertainty was negatively associated with investments, while human capital was positively associated with it. We also find that human capital moderates the effects of uncertainty on investment decisions. Finally, we find that this interaction effect is also evident in high uncertainty conditions as analyzed both before and after the COVID-19 outbreak. Moreover, post-COVID-19 outbreak, ventures' uncertainty level increased, and their human capital levels decreased compared to the pre-outbreak period.

Keywords: Equity crowdfunding, Signalling theory, Human capital, Market uncertainty, COVID-19, Natural experiment

1. Introduction

Entrepreneurial finance literature argues that early-stage ventures send signals to potential investors to reduce information asymmetries and better present their ventures' quality and success prospects (Berger & Udell, 1998; Spence, 1973). Equity Crowdfunding (ECF) is a growing online fundraising mechanism enabling entrepreneurs to "make an open call to sell a specified amount of equity or bond-like shares in a company on the internet" (Ahlers et al., 2015, p. 955). While ECF shares some similarities with traditional players in entrepreneurial finance, such as business angels (BA) and venture capital (VC), it has unique characteristics differentiating it from them as well (Brown et al., 2018; Le Pendeven et al., 2021; Lukkarinen, 2020).

In ECF, the open call is often initiated by an entrepreneur who may be a stranger to the potential investor. And while ECF investors include both sophisticated/accredited and unsophisticated/unaccredited investors (Wang et al., 2019), the significant latter group often does not have sufficient experience in performing in-depth due diligence checks of the ventures under consideration, and therefore must rely on openly-sent signals to evaluate investment opportunities (Bonini & Capizzi, 2019; Kshetri, 2018), or rely on the platform's own screening procedures and quality checks (Tuomi & Harrison, 2017). As a result, the decision to invest in a venture through an ECF campaign is often perceived as a relatively high-risk investment (Estrin et al., 2018; Walthoff-Borm et al., 2018).

Since crowd investors experience high uncertainty levels with regard to a venture's true quality and its future prospects (Ahlers et al., 2015; Signori & Vismara, 2018), fundraising entrepreneurs need to communicate signals unveiling information that may better inform the investor in her decision-making processes (Ahlers et al., 2015; Chen et al., 2009). In this context, earlier research has emphasised both the investment terms (e.g., Harrison & Baldock, 2015; Knockaert et al., 2010; Leland & Pyle, 1977; Mason & Stark, 2004) and the venture's human capital as critical indicators for investors' decision-making (e.g., Mason & Stark, 2004; Mitteness et al., 2012; Muzyka et al., 1996; Pintado et al., 2007; Unger et al., 2011). Furthermore, recent studies in the ECF context also confirm that both investment terms and human capital are important signals of ventures' quality for crowd investors (e.g., Ahlers et al., 2015; Barbi & Mattioli, 2019; Coakley et al., 2022; Piva & Rossi-Lamastra, 2018). And that the importance of these signals becomes

even more pronounced as the ECF industry and its stakeholders mature through time (Lukkarinen et al., 2022).

Nevertheless, earlier studies tended to treat uncertainty (as assessed from investment terms) and human capital (as assessed by the entrepreneurial team members' experience and knowledge) as factors independently impacting investors' decisions. In the current study, we argue for an interaction effect between these indicators, where human capital moderates the effects of uncertainty on investment decision-making. Here, we build on earlier notions suggesting that human capital may serve as an uncertainty mitigator, assuming that higher capacities and skills of the venture's team enhance their ability to deal with problems and adverse situations, which are acquired through experience and diversity (Baum & Silverman, 2004; Hsu, 2007). In this respect, we follow earlier calls for investigation of interaction effects between different signals originating from the same sender in the context of entrepreneurial finance (Colombo, 2021; Unger et al., 2011), as well as the call to study the selection criteria of investors active within non-traditional domains of finance (Fraser et al., 2015).

Accordingly, we address the following research questions. First, we examine (1) whether entrepreneurs' human capital and the ventures' uncertainty levels affect investment decisions in ECF? Second, we test (2) whether there is an interaction effect between the venture's human capital and uncertainty levels on investment decisions in ECF? Finally, since exogenous shock, such as the outbreak of the COVID-19 crisis in early 2020, introduced additional uncertainty to capital markets (Andersen et al., 2007; Campello et al., 2010; Lee & McKibbin, 2004), we also examine (3) whether these effects remain consistent in light of higher uncertainty following the outbreak of COVID-19?

We answer these questions by analysing a proprietary dataset of 13,362 investment decisions made by 8,683 unique unaccredited investors on PipelBiz, Israel's biggest equity crowdfunding platform. This includes decisions made between July 2018 and December 2020 in a market where ECF has exhibited ongoing growth and where clear regulation overseeing ECF practice has been in place since 2018 (Efrat et al., 2020).

Overall, when using investment amount as our dependent variable, our findings follow expectations. First, we find a negative association between the venture's uncertainty levels and amounts invested by each investor. Second, we show a

positive association between human capital levels and amounts invested. Third, we confirm that human capital moderates the association between uncertainty level and investment amount by reducing its negative impact. Fourth, when splitting our sample, most of these associations are also evident also during high uncertainty conditions as after the COVID-19 outbreak. The one exception is that uncertainty level has no effect on amounts before the COVID-19 outbreak but has a negative effect after it. The latter finding suggests that investors are usually more concerned with human capital, but under higher market conditions, they also consider more closely issues related to venture uncertainty as captured by the investment terms the venture offers.

However, when using an individual investor's share of investment (out of total investments made by all investors) as our dependent variable, we reveal several different effects. Here, we find that the share of investment is positively associated with uncertainty levels and negatively associated with human capital. Moreover, we confirm that human capital moderates the association between uncertainty and share of investment by reducing its positive impact. We interpret this as a situation in which investors who invest in ventures with high uncertainty levels tend to require a higher share of ownership to compensate for risks taken. The risk mitigation power of human capital reduces their need to trade risk with higher stakes in the business, which is further enhanced in the interaction term identified.

Our paper presents several contributions. First, we provide evidence about an interaction effect between campaign uncertainty levels and human capital, where human capital moderates the effects of uncertainty on ECF investment decisions. Second, unlike earlier studies that have mostly focused on analysis at the aggregate campaign level, we present findings about the effects of uncertainty and human capital at the individual investors' decision level. Third, we presented our findings based on a unique large dataset from a context previously unexplored, namely the Israeli ECF market. Fourth, we use alternative composite measures for uncertainty levels and human capital, while earlier studies have used each indicator separately, while ignoring their close interrelations. Finally, we provide evidence that high uncertainty caused by exogenous shock effect ECF investors' decision-making. Here, profiles of ventures fundraising through ECF before and following the COVID-19 outbreak differ significantly. Campaigns in the period following the outbreak are characterized by higher uncertainty levels and lower human capital levels, when compared to those pitched before the outbreak.

The rest of the paper is organized as follows. The next section provides the literature review and hypothesis development. This is followed by a presentation of our methodological choices and analyses. The empirical results are then summarized and discussed. And the paper concludes by highlighting the study's contributions, limitations, and implications.

2. Literature review

In general, investment in entrepreneurial ventures incorporates a significant degree of risk. And while risk-taking may have both positive (profit/benefit) and negative (loss) results, investors wish to maximise the former and minimise the latter. Unsurprisingly, concerns with adverse risks associated with potential agency and market risks (Berger & Udell, 1998; Das & Teng, 2001; Fiet, 1995) have played central roles in entrepreneurial finance literature.

To address related concerns, literature has often drawn on signalling theory to explain entrepreneurs' communication with prospective investors (Bafera & Kleinert, 2022). Signalling theory addresses the challenges of reducing information asymmetries between two actors holding incomplete and different information through successful communication towards gaining desirable outcomes (Connelly et al., 2011; Spence, 1973). A signal is the action the signaller takes to communicate positive information regarding an endeavour to a receiver, encouraging their reaction in the form of a desirable outcome. According to Connelly et al. (2011), signals should be observable to potential receivers and costly to the signaller to be effective.

The specific context of ECF incorporates a combination of uncertainties for investors, including both the inherent endogenous uncertainties about a young firm's ability to successfully commercialise and grow, the time it may take, as well as the potential of fraudulent behaviour by entrepreneurs and other moral hazard problems (Agrawal et al., 2014; Daskalakis & Yue, 2017; Lin, 2017; Shneor & Torjesen, 2020). Unsurprisingly, compared to other crowdfunding models, ECF is often viewed as representing the highest risk for investors (Shneor, 2020) thanks to the greater uncertainty associated with such investments. Nevertheless, devoting much time and effort in intensive communications between small-sum investors and fundraisers makes little economic sense, leading such investors to seek

relevant information in a plethora of digital media and communication channels (Moritz et al., 2015) and drawing relevant signals from them.

Hence, to mitigate related concerns, recent studies show that entrepreneurs can improve their capital-raising outcomes by actively signalling their startups' quality and reducing uncertainties and information asymmetries. Some of these signals include whether the company holds patents (Piva & Rossi-Lamastra, 2018), the share of equity being offered (Ahlers et al., 2015; Kleinert et al., 2020), successful prior funding rounds (Barbi & Mattioli, 2019; Kleinert et al., 2020), a venture's age (Barbi & Mattioli, 2019; Mohammadi & Shafi, 2018), the number of team members (Ahlers et al., 2015; Barbi & Mattioli, 2019), the company's pre-money valuation (Hornuf & Neuenkirch, 2017; Mohammadi & Shafi, 2018), and the entrepreneurial team's experience and education, often referred to as a human capital signal (Ahlers et al., 2015; Le Pendeven et al., 2021; Piva & Rossi-Lamastra, 2018).

2.1. Signalling theory

In the realm of entrepreneurial finance, signalling theory tackles the issue of information asymmetry between investors and entrepreneurs. During their fundraising efforts, entrepreneurs transmit signals that signify the quality of their venture, its prospects, and their intentions to potential investors. The investors, however, have to estimate the venture's likely future outcomes based on incomplete information regarding the venture's quality and the commitments of the founding team (Colombo, 2021; Connelly et al., 2011; Klein & Maldonado-Bautista, 2022). Therefore, investors employ various decision-making criteria to address the information asymmetry problem for the purpose of reducing uncertainties associated with their investments.

2.2. Uncertainty and decision-making

Uncertainty plays a pivotal role in entrepreneurial finance, shaping the decisions and strategies of investors. In the realm of startups and new ventures, uncertainty is an inherent characteristic, stemming from both the entrepreneur's actions (endogenous) and external factors such as market and environmental conditions (exogenous) (Huang & Pearce, 2015; Packard et al., 2017).

Knight (1921) distinguishes between uncertainty and risk. While risk is categorised as either relying on somewhat known probabilities or on statistical calculations based on past knowledge. Uncertainty is the assumption that it is often impossible to infer from past events, as each situation is unique and has no known probabilities or outcomes in advance. Recent works further elaborate on the subject and distinguish between Known, Unknown, and Unknowable (unknown unknowns) risks (KuU). Known risks are defined as situations where conditions are specified, and probabilities are known or can be inferred from past activities, similar to Knight's (1921) definition of risk. Unknown and Unknowable risks differ based on whether events can be defined in advance. Therefore, Unknown risks are those where scenarios are known but probabilities cannot be assigned to them, while Unknowable risks refer to unknown and unanticipated events and, therefore, unknown probabilities for their occurrence. Examples of such extreme exogenous events (unknown unknowns) are the 2008 global financial crisis, the September 11th terror attack, climate disasters, and recently, the COVID-19 pandemic and economic crisis, leading to a higher level of uncertainty, also referred to as extreme uncertainty (Diebold et al., 2010; Kleindorfer, 2010; Packard et al., 2017).

The term uncertainty is most relevant when describing the condition in which investors are requested to make decisions, oftentimes based on an abstract idea, non-existent markets and products not yet fully developed and tested. In evaluating a proposal and its outcome, investors need to consider the controllable (endogenous) factors, such as agency and moral risks and information asymmetry between investors and entrepreneurs. Uncertainty level is determined by the reliability and completeness of information as provided by fundraisers, and the extent to which it is being perceived as reliable and complete by the investor. Thus, reduced information asymmetry between entrepreneurs and investors leads to decreased uncertainty levels (Ahlers et al., 2015; Barrero et al., 2017; Foss et al., 2020; Leland & Pyle, 1977).

Decisions, including those related to finance and investment, are made under conditions of uncertainty (Foss et al., 2020; Vismara, 2018). Therefore, decision-makers will search for ways to reduce the controllable (endogenous) uncertainty by gathering credible information about the venture, while entrepreneurs can leverage signals to convey their qualities to potential investors (Bafera & Kleinert, 2022). When perceived as credible by investors, these signals can significantly

reduce the uncertainty associated with the intrinsic value of an investment opportunity (Connelly et al., 2011).

The ECF literature consistently posits that to bridge the information gap and reduce uncertainty between potential investors and fundraising entrepreneurs, the entrepreneurs need to effectively convey the venture's true quality and their dedication and future intentions. Specifically, signals provided in the form of financial indicators and human capital can serve as helpful informational cues when assessing the uncertainty associated with such investments.

First, earlier ECF research suggests that fundraising success is negatively associated with ownership share on offer or positively associated with ownership share retained by the entrepreneurs (e.g., Ahlers et al., 2015; Battaglia et al., 2022; Vismara, 2016). This is explained by the view that a higher ownership proportion retained by the entrepreneur can be read as a signal of the entrepreneur's commitment and self-confidence in the venture's future success prospects (Nitani et al., 2019). Accordingly, offering a larger share of ownership may signal lower commitment and lower self-confidence, hence leading to greater uncertainties.

Second, earlier ECF studies also find that the amounts raised in an ECF campaign are positively associated with the target goal amount set for the campaign (e.g., Lukkarinen et al., 2022; Troise et al., 2022; Vismara, 2016). This is explained by the view that setting higher fundraising goals may signal ambition and growth-orientation, therefore increasing the venture's perceived future value (Lukkarinen et al., 2016), especially when considering that the campaign has been quality-checked by the platform before its approval for publication (Tuomi & Harrison, 2017). At the same time, research also shows that target amounts are negatively associated with the likelihood of success in terms of reaching target goals (e.g., Ahlers et al., 2015; Troise et al., 2022; Vulkan et al., 2016). Taken together, one can assume that higher campaign goals reduce investors' uncertainty, as it requires greater efforts from entrepreneurs to convince a greater number of investors, in addition to passing the preliminary checks by the platform.

Third, and similarly, research shows that higher levels of ventures' pre-campaign valuations are associated with higher amounts raised, but a lower likelihood of campaign success overall (Coakley et al., 2022; Estrin et al., 2022; Johan & Zhang, 2022). This is explained by the view that higher valuation implies that more shares are made available at a set price (Hornuf & Schwienbacher, 2017). This increases

the dispersion of ownership among more investors, and hence reducing the influence of any individual investor on the entrepreneur and relevant strategic decision-making, while raising agency risks that may de-motivate investors (Estrin et al., 2022).

Fourth, ECF research shows that a venture's ability to successfully raise funds prior to a specific campaign (Estrin et al., 2022; Kleinert et al., 2020; Mamonov & Malaga, 2018), or at an early stage of it (Estrin et al., 2022; Lukkarinen et al., 2016; Vulkan et al., 2016), both are positively associated with the campaign's success overall. This has been explained as a signal indicating third-party endorsements (Kleinert et al., 2020), enhancing investor confidence and trust (Lukkarinen, 2020), especially when the fundraising venture has already successfully navigated the due diligence processes of professional investors (Mamonov & Malaga, 2018).

Fifth, while entrepreneurial finance research has suggested that having exit plans enhances the likelihood of investments by BAs (Sudek, 2006; White & Dumay, 2020) and VCs (Fried & Hisrich, 1994), early ECF literature often finds no such effects (Ahlers et al., 2015; Vismara, 2016). This was mostly explained as 'cheap talk' of ventures at a very early stage when using ECF for fundraising (Ahlers et al., 2015). However, since recent literature points towards a growing sophistication of both ECF investors and fundraising ventures (Lukkarinen et al., 2022), new evidence suggests a positive association between exit plans and funding success (Kleinert et al., 2020) and that plans of listing on a secondary market increase investor participation in the primary market (Lukkarinen & Schwienbacher, 2023), one can expect that exit and other foreseeable liquidation opportunities may carry growing impact on investor decisions, as risk reduction indicators.

Bringing the above insights together, we suggest that ECF campaigns offering a higher share of ownership, setting lower funding goals, higher valuations, low levels of prior funding, and not stating exit opportunities can be characterized as representing investments with higher uncertainty levels. On the other hand, campaigns offering small ownership shares, setting higher funding goals, lower valuations, having successful prior funding records, and those stating exit opportunities can be characterized as investments with lower uncertainty level. Hence, in accordance with the above, we hypothesize the following:

> **Hypothesis 1a:** ECF investors' decisions are negatively associated with the uncertainty level of a prospective investment.

Exogenous shocks lead to higher levels of uncertainty. Unanticipated exogenous events are mostly associated with long-term uncertainty, leaving investors vulnerable due to the uncontrollable nature of events, forcing them to reevaluate their investment criteria and actions (Barrero et al., 2017; Diebold et al., 2010; Packard et al., 2017).

Several studies have examined the effects of global crises on economic markets, financial institutions, households, and investors. Lee and McKibbin (2004) showed that following the SARS epidemic, uncertainty concerning the affected economies' future led foreign investors to lose confidence and decrease their investments. Campello et al. (2010), found that during the 2008 financial crisis, 86% of financially constrained firms in the US had to reduce their investment activity. Hoffmann et al. (2013) found that during the financial crisis, individual investors' return expectations and risk tolerance has decreased, and uncertainty levels increased. Mason and Harrison (2015) discovered that business angels (BAs) amplified their investment count but diminished the amount invested per transaction. Block and Sandner (2009) reported a downturn in the average funding secured per round by firms in advanced stages during the GFC, which was further intensified by the then-unfavorable IPO markets.

Similarly, the COVID-19 outbreak increased uncertainty levels to its highest degree as measured by the economic policy uncertainty (EPU) index (see figure 1), developed by Baker et al. (2016). Indeed, uncertainty levels were viewed as greater than during the 2008 crisis and similar to those experienced during the Great Depression between 1929-1933. These were evaluated based on real-time stock market volatility measurements, newspaper-based measures of economic uncertainty, and a survey of perceived business-level uncertainty (Baker et al., 2020a; Baker et al., 2020b). Accordingly, the COVID-19 macroeconomic uncertainty shock raised concerns regarding its long-term implications for the economy, leading to decreased industrial production and employment rates. Concerning investments, equity transactions, and especially the accessibility of seed funding for startups who are the most vulnerable to extreme uncertainty conditions decreased dramatically during that period (Baker et al., 2020a; Brodeur et al., 2021; Brown & Rocha, 2020; Brown et al., 2020; Cowling et al., 2012).

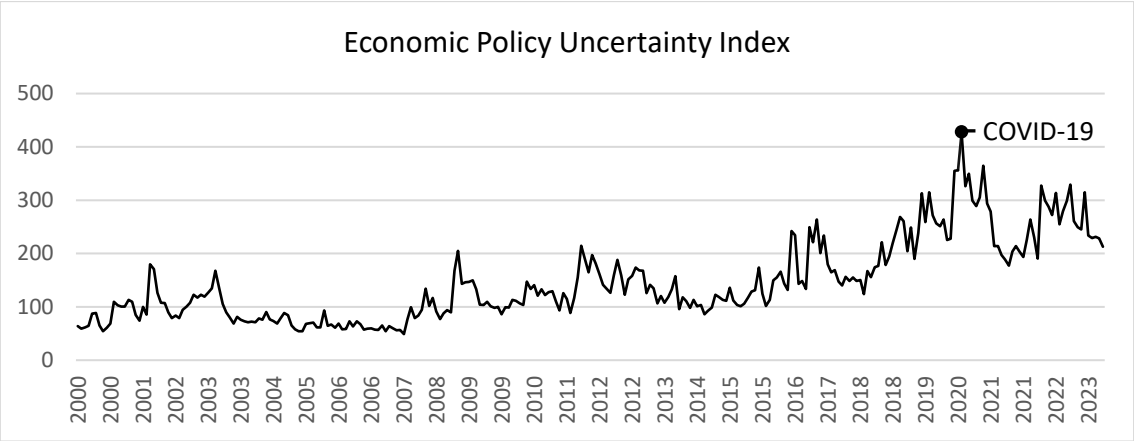

Figure. 1 Economic Policy Uncertainty Index

In the context of ECF, the Cambridge Alternative Finance Benchmarking Reports recorded a fall in global volumes from $1.5 billion in 2018 to $1 billion in 2019, bouncing back to $1.5 billion by the end of 2020 (Ziegler et al., 2021). Similarly, Cumming et al. (2021) found that ECF volumes in the US remained stable overall with only a moderate decrease during the early days of the COVID-19 outbreak. Gama et al. (2023) found a negative association between daily COVID-19 cases and campaign success in peer-to-peer lending. Under such conditions fundraising entrepreneurs needed to recalibrate their offerings, while reflecting compensations for the greater market uncertainties. Such compensations may manifest in offering higher ownership share, settling for more conservative valuations, opting for leaner operations and hence aiming for lower sum goals, as well as reducing expectations for exit plans in foreseeable future, to name a few. Accordingly, due to the (endogenous) uncertainties associated with ECF more broadly and the extreme (exogeneous) uncertainty associated with COVID-19's macro-economic effects (Packard et al., 2017), we hypothesise that overall uncertainty of fundraising ventures in ECF will increase. Accordingly, we suggest the following hypotheses:

> **Hypothesis 1b:** ECF campaigns launched before the COVID-19 outbreak are associated with lower uncertainty levels compared to campaigns launched after the outbreak.

2.3. Human capital

Human capital is regarded as the set of knowledge and skills at a person's disposal (Becker, 2009; Piazza-Georgi, 2002). Becker (2009) distinguished between education as a form of investment in general human capital, and work experience as a form of specific human capital, using both to explain the relation between work skills and business outcomes. Similarly, Colombo and Grilli (2005) identified two human capital forms coining the terms "wealth effect" addressing education, and "capability effect" addressing experience. The general-wealth effect was proxied by the entrepreneur's education, academic degrees, and age. While specific-capabilities effect was proxied by the entrepreneur's industry-specific experience in the new venture's sector or other managerial experiences. Addressing productivity and success, Becker (2009) states that these two forms of human capital complement and reinforce each other. Here, schooling education mainly provides theoretical knowledge and analytical skills, while real-life professional experience provides practical insight into the business environment and operations, while developing discipline and abilities of working along customers, employees, and other relevant stakeholders.

Human capital, in the form of education, experiences, and skills, is a key factor in new ventures' performance (Colombo & Grilli, 2005; Piazza-Georgi, 2002). The entrepreneurial finance literature has long addressed the emphasis VCs and BAs put on the venture teams' human capital traits when making investment decisions (e.g., Mason & Stark, 2004; Mitteness et al., 2012; Muzyka et al., 1996; Pintado et al., 2007; Unger et al., 2011), positively associating human capital with the venture's likelihood of success and survival (Gimmon & Levie, 2010; Prohorovs et al., 2019; Unger et al., 2011).

Research on the role of human capital in ECF investors' decision-making begins with Ahlers et al. (2015) who showed positive associations between the number of board members and their education and successful campaign outcomes. Later, Piva and Rossi-Lamastra (2018) found that business education and, to a lesser degree, industry-related education were positively associated with campaign outcomes. Moreover, several studies show that ventures where the entrepreneurs held higher degrees at the master's or PhD levels were associated with more positive campaign outcomes (D'Agostino et al., 2022; Kleinert et al., 2020).

In terms of professional and work experience, research presents inconsistent results, which can be linked to use of different measurements. Here, some found that the founding team members' work experience, either industry-specific or other, was not significantly associated with campaign outcomes, but their entrepreneurial experience was positively associated with campaign outcomes (Piva & Rossi-Lamastra, 2018; Troise et al., 2022). Others found that ventures with team members with professional business or finance experience were more likely to achieve positive campaign outcomes (Barbi & Mattioli, 2019). However, one of the more consistent findings across studies suggests a positive association between the venture's team size and CF campaign outcome (Ahlers et al., 2015; Coakley et al., 2022; D'Agostino et al., 2022; Troise et al., 2022; Vulkan et al., 2016), as capturing the breadth of human capital that may be at the venture's disposal. Accordingly, we suggest the following hypothesis:

> **Hypothesis 2:** ECF investors' decisions are positively associated with the levels of human capital of the fundraising venture's team.

In addition to its direct effect on ECF investors' decisions, human capital may also exert an indirect effect when moderating the effect of uncertainty. Such effect may originate in the understanding that human capital in the form of both knowledge and experience may enhance the venture's team's ability to address adversities and challenges, as well as adjust to change and react well to risks (Bartel & Lichtenberg, 1987; Becker, 2009). In surveying BAs in the UK, Harrison and Mason (2017) found that the venture's founding team's human capital, in the form of knowledge and experience, has a risk reduction effect. Zacharakis and Meyer (1998) underlined the founding team's characteristics' importance in easing concerns with other uncertainties when information is limited. Moreover, and in the same spirit, earlier works argued that experienced entrepreneurs possess strategic skills that positively impact success (Baum & Silverman, 2004) and are better capable of dealing with problems and adverse situations (Hsu, 2007). Surprisingly, and to the best of our knowledge, this effect has not yet been examined in the ECF context. Hence, in line with the above, we suggest the following hypothesis.

> **Hypothesis 3:** The negative effect of uncertainty on ECF investors' decisions will be moderated by the levels of the venture team's human capital.

However, increasing uncertainties following the COVID-19 outbreak have led ventures to massive layoffs and salary cuts (Brown & Cowling, 2021; Kalogiannidis & Chatzitheodoridis, 2021). These trends are likely to have hit fundraising ventures as well, which may have experienced even greater pressures to present leaner budgets, leading them towards opting for less costly personnel, shrinking numbers of highly skilled employees, or reducing the number of costly experienced advisors in their management teams and boards. Accordingly, we hypothesize the following:

> **Hypothesis 4:** ECF campaigns launched before the COVID-19 outbreak are associated with higher levels of human capital than campaigns launched after the outbreak.

At the same time, under growing uncertainties following the COVID-19 outbreak, one may also assume that investors would further rely on human capital as a risk mitigation factor. This may be especially relevant, as previously acquired knowledge, education, and experience are unlikely to be affected by the pandemic directly but may become more valuable in tackling the challenges it may bring with it on the firm's path towards growth and survival. We therefore present hypothesis 5:

> **Hypothesis 5:** The negative effect of high market uncertainty on ECF investors' decisions will be moderated by the levels of the venture team's human capital both before and after the outbreak of COVID-19.

Figure 2 presents our overall theoretical model including all outlined hypotheses above.

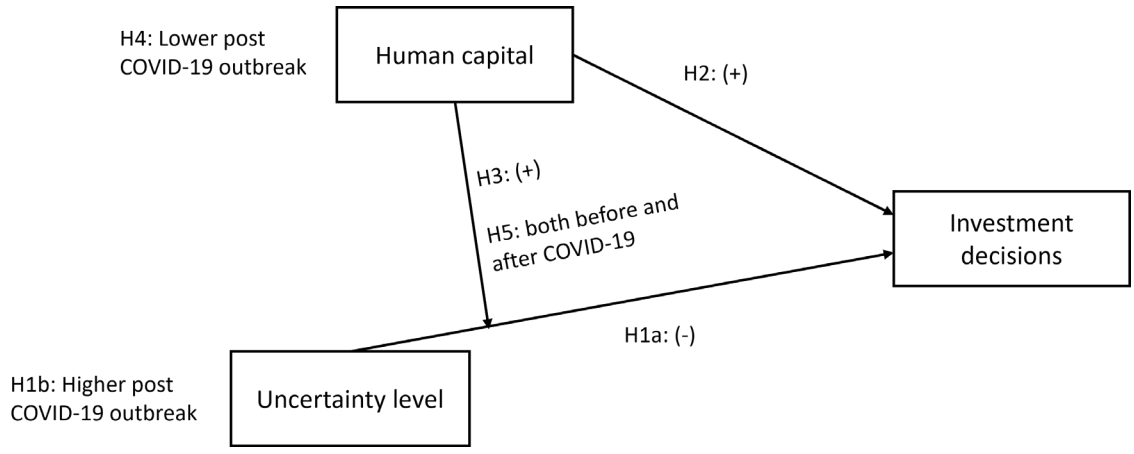

Figure 2. Conceptual model

3. Data and methodology

3.1. Natural experiment

A natural experiment is a type of observational study that exploits naturally occurring phenomena in which the assignment of treatments to subjects has been determined by factors outside the control of the researchers such as natural disasters, policy changes, or economic fluctuations. Natural experiments serve as a valuable methodological approach for investigating naturally occurring situations as they unfold in the real world (Dunning, 2012; Leatherdale, 2019). Prior studies utilised COVID-19 as a natural experimental setting to evaluate its impact on public behaviour and mental health (Duncan et al., 2022; Prati & Mancini, 2021). In this study, we use the COVID-19 outbreak in March 2019, and its significant implications for economic uncertainties to study its effect on ECF investors' decision-making.

3.2. Context

Israel represents an interesting and relevant setting to conduct the natural experiment outlined in the current study. First, similar to other economies, the Israeli economy reacted strongly to the outbreak of COVID-19 in terms of a major increase in unemployment, as well as stock market volatility rates. On March 13, 2020, The Tel Aviv Volatility Index (VTA35) reached a peak, representing a one-day sharp increase of 58% in volatility (see figure 3), reflecting the concerns and pressure of investors from the spread of the coronavirus and its consequences on the global economy (Cafri, 2020). In the months before the crisis, unemployment rates in Israel stood at 3.3%, and with the outbreak of the coronavirus epidemic in March 2020 and the following restrictions, the average unemployment rate reached 16.4%. Unsurprisingly, the Israeli economy faced great uncertainty regarding the scope of the health crisis, its extent and its consequences on the capacity of the various industries to return to normal activity (Flug et al., 2021). However, Israel has reacted relatively fast to the COVID-19 outbreak, and by the end of March 2021, Israel was ahead of other OECD countries, having 55% of its population fully vaccinated (Rosen et al., 2021). Additionally, the Israeli government has allocated $42 billion in public support for businesses, including grants for coverage

of fixed costs during the crises and reduced municipal business taxes for SMEs and the self-employed (Kaplinski, 2021).

Second, Israel is strongly associated with its innovation-driven entrepreneurial ecosystem (GEM, 2018), ranking 10th globally on the Bloomberg 2018 Innovation Index and 10th on the Global Entrepreneurship Monitor's Entrepreneurial Spirit Index (GEM, 2018).

Third, Israel has a growing ECF market with 2022 volumes estimated at $29M, overseen by dedicated regulation, which became effective in 2018 (Efrat et al., 2020). Currently, companies can openly offer shares to unaccredited Israeli investors as long as the activity is taking place on a dedicated and authorised platform. From a fundraising venture's perspective, the regulation limits the amount that can be raised through ECF to $1.6M per year. Furthermore, from the individual unaccredited investor's perspective, the regulator limits the maximum investment to $2.8K per campaign and $5.6K per year (ECN, 2017).

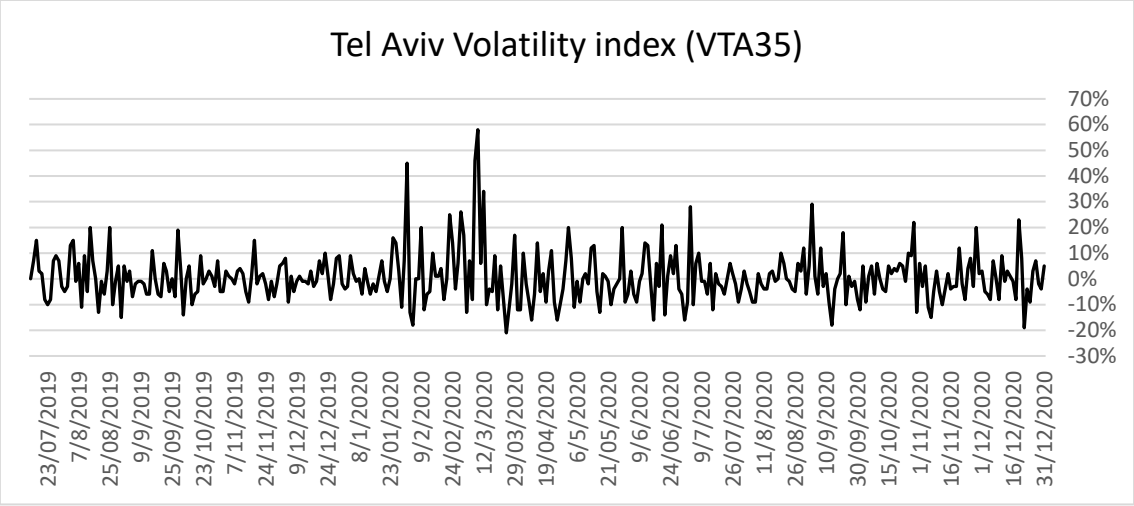

Figure 3. Tel Aviv Volatility index (VTA35)

3.3. Sample and variables

Our sample consists of the complete set of 13,362 investment decisions made by 8,683 unique unaccredited investors in 49 technology-based ventures ECF campaigns between July 2018 and December 2020 on the Israeli-based equity platform PipelBiz. The platform began its operations in 2015, offering securities to limited and accredited investors only. However, in 2018, the platform was authorized to operate as an Offering Coordinator, thus allowing privately held

companies to openly offer shares to unaccredited investors. The platform operates under the 'all-or-nothing' model, implying that fundraising ventures will only receive the funds raised if the funding goal was reached (Cumming et al., 2020). In 2020, it was reported that PipelBiz has raised more than $20M for early-stage ventures since its establishment (Sasson, 2020).

3.3.1. Individual investor-level decisions

Earlier research mostly assessed investment decisions at the aggregate level using the campaign level of analysis (e.g., Coakley et al., 2022; Nitani et al., 2019; Vismara, 2016; Vulkan et al., 2016). The current study is one of a handful that examines such decisions at the individual investor level. For capturing investment decisions in the ECF context, we use two measures. The first, funding amount measured by the log value of the monetary investment made by an individual investor in a particular campaign, as used in earlier research (Barbi et al., 2023; Hervé et al., 2019). The second, share of investment is the log value of the percentage an individual's investment out of total investments made by all investors in a particular campaign.

3.3.2. Capturing campaigns' uncertainty levels

Following earlier discussions, we have used the indicators identified in previous research to assess the uncertainty associated with each ECF campaign, including: (1) the share of equity on offer measured as the minimum percentage of ownership on offer for all investors in the specific campaign (e.g., Ahlers et al., 2015; Battaglia et al., 2022; Vismara, 2016); (2) the goal amount measured as the monetary value of the minimum goal amounts in USD (e.g., Lukkarinen et al., 2022; Troise et al., 2022; Vismara, 2016); (3) the pre-campaign valuation was measured as the monetary value in USD (e.g., Coakley et al., 2022; Estrin et al., 2022; Johan & Zhang, 2022); (4) indications of successful prior financing was measured with a dichotomous variable carrying the value 1 if information about prior financing was provided and 0 if not (Estrin et al., 2022; Kleinert et al., 2020; Mamonov & Malaga, 2018); and (5) presentation of an exit plan was measured with a dichotomous variable carrying the value 1 if any form of exit plan was mentioned in the campaign, and 0 if not (Kleinert et al., 2020).

Since all these indicators are likely to be highly intercorrelated, we cluster campaigns into two distinct clusters labelled as 'high' and 'low' uncertainty level campaigns. To assign these values we used a cluster analysis procedure (Ketchen & Shook, 1996), and more specifically, the k-means clustering algorithm method. This approach divides the data to a pre-specified number of clusters according to the minimum distance within clusters and maximum distance between clusters (Hair et al., 2018).

Accordingly, the 'high-uncertainty' campaigns' cluster is comprised of 8,547 observations, representing 63.96% of the sample. This cluster offered a higher share of equity (3.177%), aimed to raise lower funding amount ($186,400), had a lower pre-money valuation, presented fewer exit opportunities, and provided less evidence on prior funding. The 'low-uncertainty' campaigns' cluster is comprised of 4,815 observations, representing 36.04% of the sample. This cluster offered a lower share of equity (1.624%), targeted higher funding amounts ($208,768), had a higher pre-money valuation, presented exit opportunities, and provided more evidence on prior funding. A one-way ANOVA revealed a statistically significant difference ($p<0.001$) between all clustering variables. Table 1 provides descriptive statistics on each cluster and the significance of differences using ANOVA.

Table 1: Two-clusters solution

	Mean (SD)	Mean (SD)	ANOVA F value	Sig.
Clustering variables	Cluster 1 (n=8547)	Cluster 2 (n=4815)		
Target Min ($)	186,400.049 (87507.063)	208,768.608 (96929.341)	186.0337	0.000
Company Valuation ($)	5,571,783 (2,025,720)	13,293,281 (2,169,825)	42493	0.000
Min Equity Offered (%)	3.177 (2.525)	1.624 (0.820)	1720.015	0.000
Exit opportunity	0.216 (0.412)	0.315 (0.465)	160.7682	0.000
Prior Financing	0.289 (0.453)	0.533 (0.499)	829.4047	0.000
Cluster label	High uncertainty level	Low uncertainty level		

Table 1: Two-clusters solution

3.3.3. Human capital measurements

Since earlier literature has measured human capital using different measures, we have opted for creating a single continuous measure involving multiple items that

jointly load on a single factor. Accordingly, we have followed a factor analysis procedure. To ensure our data lends itself to such analyses, we first ensured that both the Bartlett's test of sphericity, testing the overall significance of all correlations in the correlation matrix, was significant ($\chi 2$ (6) = 20034.426, $p<0.001$), as well as that the KMO measure of sampling adequacy indicated that the strength of the relationships among variables was good (KMO=0.784).

For constructing a single human capital factor we have used the following items: (1) a dummy variable for professional experience, indicating that at least one team member has previous working experience in the field of business or finance (Barbi & Mattioli, 2019; Lukkarinen et al., 2016), (2) industry experience is a dummy variable indicating whether at least one team member has previously worked in the same sector in which the venture operates (Barbi & Mattioli, 2019; Lukkarinen et al., 2016; Piva & Rossi-Lamastra, 2018), (3) entrepreneurial experience is a dummy variable indicating that at least one team member worked for an entrepreneurial venture in the past (Piva & Rossi-Lamastra, 2018), and (4) the number of team members (using the log value), captured the number of people working for the venture (Ahlers et al., 2015; Barbi & Mattioli, 2019). All four items we used loaded highly on a single factor, achieving a Cronbach's alpha of 0.811, which is above the 0.7 recommended threshold (Hair et al., 2018).

3.3.4. Control variables

We control for several variables. First, to capture variables associated with the investor's characteristics, we include investor age at the time of investment and Gender (Hervé et al., 2019). To control for the product characteristics we include two dummy variables product certification by an expert intermediary (Bapna, 2019; Mohammadi & Shafi, 2018), and product protectability capturing whether the company has protected its intellectual property via patents (Ahlers et al., 2015; Mohammadi & Shafi, 2018; Ralcheva & Roosenboom, 2020). We further control for company age, as a proxy for the firm's developmental stage (Barbi & Mattioli, 2019; Hervé et al., 2019; Lukkarinen et al., 2016). Finally, we further control for founder employment capturing whether the founder is fully employed by the venture or not.

Descriptive statistics of all variables are reported in Table 2, and a correlation matrix is provided in Table 3.

Table 2: Descriptive Statistics, Equality of Variance, and Equality of Means Tests

Variable	Period (before/after Covid outbreak)	Mean	Std. Dev	Levene's Test for Equality of Var		t-test for Equality of Means				
				F	Sig.	Equal variances	t	df	Sig. (2-tail)	Mean Difference
Gender	Full sample	0.139	0.346							
	Before	0.138	0.345	0.210	0.647	assumed	-0.229	13360	0.819	-0.001
	After	0.140	0.347			not assumed	-0.229	13292.863	0.819	
Log_Investor_Age	Full sample	1.560	0.158							
	Before	1.548	0.157	0.957	0.328	assumed	-8.749	13360	0.000	-0.024
	After	1.572	0.159			not assumed	-8.751	13298.294	0.000	
Log_Company_age	Full sample	3.038	0.542							
	Before	2.864	0.653	1606.219	0.000	assumed	-37.537	13360	0.000	-0.335
	After	3.199	0.340			not assumed	-36.737	9513.186	0.000	
ComCEO	Full sample	0.622	0.485							
	Before	0.732	0.443	1859.508	0.000	assumed	25.864	13360	0.000	0.212
	After	0.520	0.500			not assumed	25.981	13332.435	0.000	
Product Certification	Full sample	0.493	0.500							
	Before	0.553	0.497	5.501	0.019	assumed	13.517	13360	0.000	0.116
	After	0.437	0.496			not assumed	13.515	13280.045	0.000	
Product Protectability	Full sample	0.623	0.485							
	Before	0.459	0.498	2584.072	0.000	assumed	-39.724	13360	0.000	-0.315
	After	0.775	0.418			not assumed	-39.464	12583.343	0.000	
HC_Factor	Full sample	0.000	0.928							
	Before	3.105	0.575	3657.366	0.000	assumed	33.035	13360	0.000	0.511
	After	2.595	1.109			not assumed	33.757	10579.764	0.000	
Uncertainty level	Full sample	0.640	0.480							
	Before	0.556	0.497	1209.428	0.000	assumed	-19.640	13360	0.000	-0.161
	After	0.717	0.450			not assumed	-19.568	12973.590	0.000	
HC X Uncertainty	Full sample	1.801	1.513							
	Before	1.690	1.590	1284.151	0.000	assumed	-8.130	13360	0.000	-0.212
	After	1.903	1.431			not assumed	-8.098	12943.559	0.000	
Log_Inv_amount_USD	Full sample	2.6434	0.3807							
	Before	2.633	0.392	34.368	0.000	assumed	-2.949	13360	0.003	-0.019
	After	2.653	0.370			not assumed	-2.943	13126.141	0.003	
Log_Share_investment	Full sample	-3.012	0.460							
	Before	-3.045	0.478	119.035	0.000	assumed	-7.910	13360	0.000	-0.063
	After	-2.982	0.440			not assumed	-7.885	13036.375	0.000	
COVID	Full sample	0.519	0.500							

Notes: Full sample N = 13362, Before COVID-19 outbreak, N = 6430, After COVID-19 outbreak, N= 6932

Table 3: Correlation Matrix – Full sample

		1	2	3	4	5	6	7	8	9
1	Gender	1								
2	ComCEO	-0.010	1							
3	Log_Company_age	-0.029**	0.220***	1						
4	HC_Factor	-0.015	0.109***	0.119***	1					
5	Uncertainty level	0.001	-0.300***	-0.143***	-0.037***	1				
6	Product Certification	-0.013	0.438***	0.124***	0.112***	-0.509***	1			
7	Product Protectability	0.029**	-0.011	0.147***	-0.220***	-0.083***	-0.178***	1		
8	COVID-19	0.002	-0.218***	0.309***	-0.275***	0.168***	-0.116***	0.325***	1	
9	Log_Share_Investment	-0.046***	0.067***	0.052***	-0.089***	0.094***	-0.046***	-0.060***	0.068***	1
10	Log_Inv_amount_USD	-0.044***	0.075***	-0.001	0.072***	-0.095***	0.110***	0.080***	0.026**	0.718***

Notes: N =13362, Significance: * P ≤ 0.05, ** P ≤ 0.01, *** P ≤ 0.001

Table 3: Correlation Matrix – Full sample

Table 4: Regression Analysis; DV: Log inv Amount

	Full Sample			Before Covid-19 Outbreak			After Covid-19 Outbreak		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Constant	1.814***	1.789***	1.737***	1.745***	1.614***	1.352***	1.722***	1.689***	1.5321***
	(0.037)	(0.038)	(0.040)	(0.053)	(0.061)	(0.082)	(0.060)	(0.059)	(0.062)
Gender (0=male)	-0.091***	-0.090***	-0.090***	-0.095***	-0.094***	-0.096***	-0.088***	-0.086***	-0.083***
	(0.009)	(0.009)	(0.009)	(0.014)	(0.014)	(0.014)	(0.012)	(0.012)	(0.012)
LInvAge	0.529***	0.520***	0.522***	0.560***	0.566***	0.571***	0.490***	0.478***	0.482***
	(0.020)	(0.020)	(0.020)	(0.031)	(0.031)	(0.031)	(0.027)	(0.026)	(0.026)
Com CEO	0.041***	0.042***	0.046***	-0.012	-0.012	-0.024	0.077***	0.090***	0.104***
	(0.008)	(0.008)	(0.008)	(0.015)	(0.015)	(0.015)	(0.010)	(0.010)	(0.010)
Certificate	0.089***	0.068***	0.074***	0.034**	0.040***	0.048***	0.126***	0.053***	0.069***
	(0.007)	(0.008)	(0.008)	(0.010)	(0.011)	(0.011)	(0.010)	(0.013)	(0.013)
Protect	0.065***	0.068***	0.070***	0.016	0.024*	0.039**	0.151***	0.167***	0.176***
	(0.007)	(0.007)	(0.007)	(0.011)	(0.011)	(0.012)	(0.010)	(0.011)	(0.011)
LComAge	-0.033***	-0.053***	-0.055***	0.006	-0.002	0.005	-0.012	-0.006	0.007
	(0.006)	(0.007)	(0.007)	(0.009)	(0.010)	(0.011)	(0.013)	(0.013)	(0.013)
HC factor		0.040***	0.056***		0.041***	0.113***		0.046***	0.078***
		(0.004)	(0.005)		(0.009)	(0.017)		(0.004)	(0.006)
Uncertainty level		-0.037***	0.049*		0.017	0.327***		-0.107***	0.072**
		(0.008)	(0.023)		(0.012)	(0.066)		(0.012)	(0.025)
Uncertainty X HC			-0.029***			-0.096***			-0.065***
			(0.007)			(0.020)			(0.008)
Covid-19	0.017*	0.047***	0.048***						
	(0.007)	(0.008)	(0.008)						
R^2	0.074	0.083	0.084	0.053	0.056	0.060	0.120	0.144	0.153
R^2 change		0.011	0.001		0.003	0.003		0.024	0.008
N	13362	13362	13362	6430	6430	6430	6932	6932	6932

Unstandardized coefficients are reported, with standard errors in parentheses. Significance noted as: * $P \leq 0.05$, ** $P \leq 0.01$, *** $P \leq 0.001$

Table 5: Regression Analysis; DV: Log Share inv

	Full Sample			Before Covid-19 Outbreak			After Covid-19 Outbreak		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Constant	-0.053***	-3.885***	-3.955***	-0.084***	-0.040	-0.1246	-0.028	0.048	-0.161*
	(0.008)	(0.046)	(0.049)	(0.010)	(0.066)	(0.089)	(0.015)	(0.073)	(0.077)
Gender (0=male)	-0.010***	-0.098***	-0.098***	-0.013***	-0.118***	-0.119***	-0.006	-0.074***	-0.071***
	(0.002)	(0.011)	(0.011)	(0.003)	(0.015)	(0.015)	(0.003)	(0.015)	(0.015)
LInvAge	0.076***	0.550***	0.552***	0.086***	0.615***	0.616***	0.062***	0.413***	0.418***
	(0.005)	(0.025)	(0.025)	(0.006)	(0.034)	(0.034)	(0.007)	(0.033)	(0.033)
ComCEO	0.005**	0.138***	0.143***	-0.022***	-0.101***	-0.105***	0.015***	0.186***	0.204***
	(0.002)	(0.009)	(0.009)	(0.003)	(0.016)	(0.016)	(0.003)	(0.013)	(0.013)
Certific	-0.016***	-0.068***	-0.060***	-0.025***	-0.130***	-0.127***	-0.010***	-0.040*	-0.018
	(0.002)	(0.010)	(0.010)	(0.002)	(0.012)	(0.012)	(0.003)	(0.016)	(0.016)
Protect	-0.011***	-0.127***	-0.125***	-0.008***	-0.086***	-0.082***	-0.005	-0.058***	-0.046***
	(0.002)	(0.009)	(0.009)	(0.002)	(0.012)	(0.013)	(0.003)	(0.013)	(0.013)
LComAge	0.003	0.046***	0.044***	0.017***	0.288***	0.290***	0.000	0.016	0.034*
	(0.001)	(0.008)	(0.008)	(0.002)	(0.011)	(0.012)	(0.003)	(0.016)	(0.017)
Uncertainty level		0.077***	0.193***		0.249***	0.349***		-0.036*	0.203***
		(0.010)	(0.027)		(0.013)	(0.072)		(0.015)	(0.031)
HC Factor		-0.057***	-0.036***		-0.282***	-0.259***		0.001	0.044***
		(0.004)	(0.006)		(0.010)	(0.019)		(0.005)	(0.007)
Uncertainty X HC			-0.039***			-0.031			-0.087***
			(0.009)			(0.022)			(0.010)
COVID-19	0.005**	0.055***	0.057***						
	(0.002)	(0.009)	(0.009)						
R^2	0.029	0.080	0.082	0.076	0.250	0.2507	0.017	0.068	0.078
R^2 Change		0.051	0.001		0.174	0.000		0.051	0.011
N	13362	13362	13362	6430	6430	6430	6932	6932	6932

Unstandardised coefficients are reported, with standard errors in parentheses. Significance noted as: * $P \leq 0.05$, ** $P \leq 0.01$, *** $P \leq 0.001$

4. Results

Tables 4 and 5 present the results of the regression analyses. Table 4 reports the results when using the log transformation of investment amount as the dependent variable, and table 5 presents the results when using the log transformation of the share of investment as the dependent variable.

4.1. Control variables

Model 1 reports the unique effects of the control variables, which are largely in line with the findings of previous research (Barbi et al., 2023; Hervé et al., 2019). A negative coefficient of Gender and a positive coefficient of age (p-value < 0.001), show that, on average, males and older investors invest larger amounts than female and younger investors. Founder's employment was found to have a significant and positive affect on the investment amount (p-value < 0.001), and investment share (p-value < 0.01). Product External certification and product protectability were found to have a positive and significant effect on investment amount (p-value<0.001), while a negative and significant effect on the share of investment (p-value<0.001). Firm age was found to be positively associated with investment amount (p-value < 0.001).

4.2. Uncertainty level

In model 2 we introduce the independent variables. The campaign's uncertainty level was found to be negatively associated with investment amount (coefficient = -0.037, p-value < 0.001), while positively associated with the share of investment (coefficient = 0.077, p-value < 0.001). This evidence partly supports H1a.

4.3. Human capital

Human capital was found to be positively and significantly associated with investment amount (coefficient = 0.040, p-value < 0.001), while having a negative and significant association with investment share (coefficient = -0.057, p-value < 0.001). This evidence partly supports H2.

4.4. Interaction effect

In model 3 we introduce the interaction effect, hypothesising that human capital will moderate the effect of uncertainty on investment decision-making. We find a negative moderation effect when using the investment amount as a dependent variable (coefficient= -0.029, p-value < 0.001), as well as when using the share of investment as a dependent variable (coefficient= -0.039, p < 0.001), hence confirming H3.

To facilitate the interpretation of the moderation effects, we used the PROCESS SPSS path analysis macro (Hayes, 2017) for graphical representation. Figures 4 and 7 present the interactions when using the full sample, and when using investment amount and share of investment as dependent variables, respectively. Figure 4 shows that investment amounts in low-uncertainty campaigns increase when human capital levels are high to a greater extent than in high-uncertainty campaigns. Figure 7 shows that investment shares in high-uncertainty campaigns decrease when human capital levels are high to a greater extent than in low-uncertainty campaigns. Both cases present a reduction in the effect of uncertainty thanks to human capital, where higher amounts are invested in low-uncertainty campaigns, and a lower share of ownership is required in high-uncertainty campaigns to compensate for risks taken.

4.5. High market uncertainty: COVID-19

We use a natural experiment setting to study the effect of the high uncertainty caused by an exogenous shock on ECF investors' decision-making. For this purpose, we divide our sample into two sub-samples: before and after the COVID-19 outbreak. We use March 2020 as our critical splitting point, the date when the Israeli government enforced the first lockdown and social distancing policies (TOI, 2020). As a result, we ended up with 6,430 observations from the period before the COVID-19 outbreak and 6,932 observations from the period after the COVID-19 outbreak.

H1b suggested that campaigns launched before the COVID-19 outbreak are associated with lower uncertainty when compared to campaigns launched after the COVID-19 outbreak. Table 2 shows that the mean scores of campaigns' uncertainty level was 0.556 and 0.717, before and after the outbreak, respectively.

Since equality of variance between the two scores was disconfirmed, we test for significance of mean differences under the assumption of unequal variances. Our findings indicate that uncertainty levels were significantly higher after the COVID-19 outbreak ($t(12973.590) = -19.568$, $p < 0.001$). Thus, H1b is supported.

H4 suggested that campaigns launched before the COVID-19 outbreak are associated with higher human capital levels when compared to campaigns launched after the COVID-19 outbreak. Table 2 shows that the mean scores of campaigns' human capital were 3.105 and 2.595, respectively, before and after the outbreak. Since equality of variance between the two scores was again disconfirmed, we test for significance of mean differences under the assumption of unequal variances. Our findings indicate that human capital levels were significantly higher before the COVID-19 outbreak ($t(10597.764) = 33.757$, $p < 0.001$). Thus, H4 is supported.

H5 suggested that the team's human capital moderates the effects of the campaign's uncertainty levels on investment decisions. In models 6 and 9, we introduce the interaction term. First, when considering investment amount as the dependent variable, we find a moderation effect both before (coefficient= -0.096, p-value<0.001) and after (coefficient= -0.065, p-value<0.001) the COVID-19 outbreak. Second, when considering the share of investment as the dependent variable, we find a moderation effect after the COVID-19 outbreak (coefficient= -0.087, p-value<0.001) but not before it (coefficient= -0.031, n.s.). Hence, partially supporting H5.

Again, we provide graphical representations of the interaction effects to facilitate the interpretation of the moderation effects. Figures 5 and 6 represent the interaction effects before and after the COVID-19 outbreak, when using investment amount as the dependent variable. In both periods we see that investment amounts in low-uncertainty campaigns increases when human capital levels are high to a greater extent than in high-uncertainty campaigns. Figures 8 and 9 represent the interaction effects before and after the outbreak, when using share of investment as the dependent variable. In Figure 8, we see that the decrease in share of investment thanks to improved human capital does not differ between high and low uncertainty campaigns before the COVID-19 outbreak. However, Figure 9, on the other hand, shows that after the outbreak the share of ownership decreases with higher human capital of high-uncertainty campaigns, but increases with higher human capital in low-uncertainty campaigns. This indicates that under

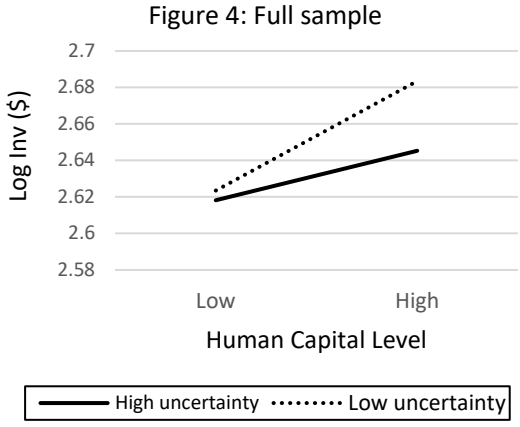

Fig. 4 Human capital and uncertainty level interaction effect. **Note:** The graph is based on values shown in Table 4, model 3. Dependent variable: log investment amount.

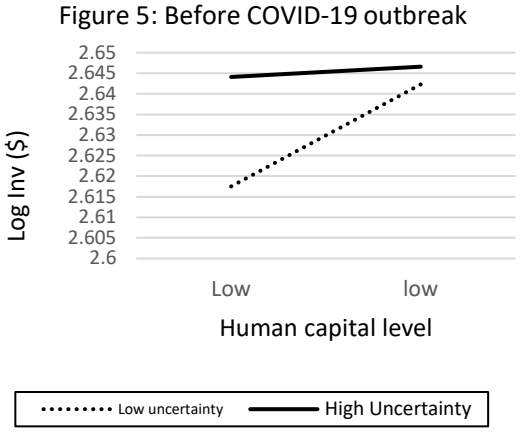

Fig. 5 Human capital and uncertainty level interaction effect. Note: The graph is based on values shown in Table

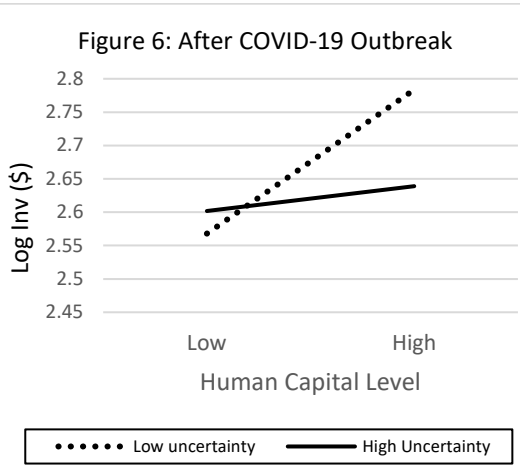

Fig. 6 Human capital and uncertainty level interaction effect. Note: The graph is based on values shown in Table

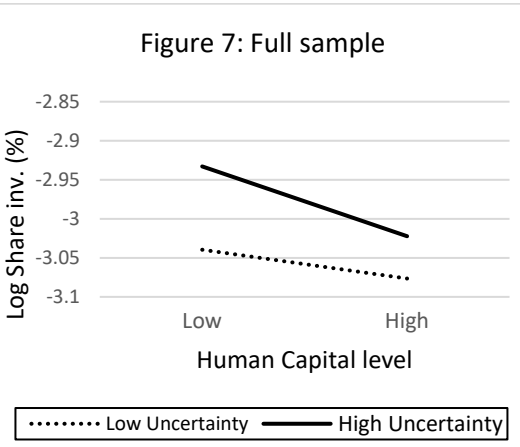

Fig. 7 Human capital and uncertainty level interaction effect. Note: The graph is based on values shown in Table 5, model 3. Dependent variable: Log share of investment.

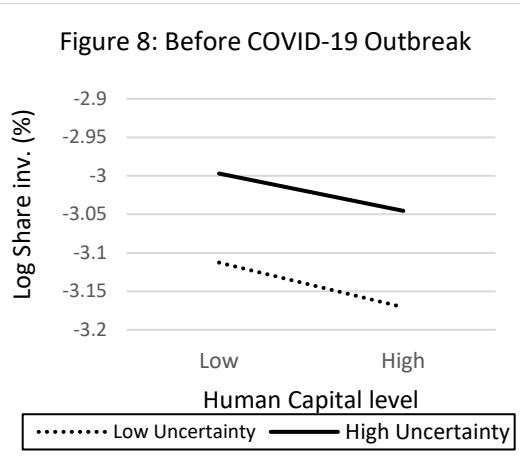

Fig. 8 Human capital and uncertainty level interaction effect. Note: The graph is based on values shown in Table 5, model 6. Dependent variable: Log share of investment.

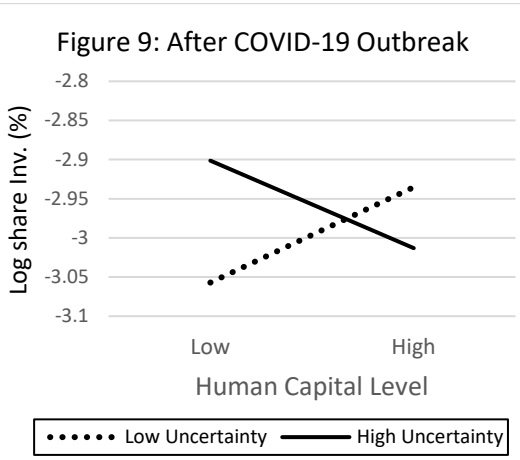

Fig. 9 Human capital and uncertainty level interaction effect. Note: The graph is based on values shown in Table 5, model 9. Dependent variable: Log share of investment.

higher uncertainty conditions human capital serves as an uncertainty reduction indicator moderating the need to compensate for uncertainty level with higher equity stakes, but also as a value accelerator in low uncertainty campaigns leading investors to acquire higher ownership stakes for leveraging the unique combination of low uncertainty and high human capital in otherwise adverse market conditions.

5. Discussion

Our analyses of key factors affecting ECF investor decisions present several interesting findings. First, we find that campaign uncertainty levels are negatively associated with amounts invested. This supports earlier findings using data both at the individual investor (Barbi et al., 2023) and aggregate campaign levels (e.g., Estrin et al., 2022; Kleinert et al., 2020; Lukkarinen et al., 2022; Vismara, 2016). Furthermore, we show that uncertainty levels are positively associated with share of investment, indicating that ECF investors compensate for taking greater risks by acquiring larger shares of ownership in the relevant ventures. Nevertheless, we do so while referring to a composite measure of various uncertainty indicators rather than individual indicators, as was done in earlier studies, while better capturing overall venture uncertainty perceptions without bias towards specific indicator effects.

Second, we show that a venture's human capital attributes are positively associated with amounts invested. This also supports earlier findings mostly identifying such associations at the aggregate campaign levels (e.g., Ahlers et al., 2015; Battaglia et al., 2022; Piva & Rossi-Lamastra, 2018; Troise et al., 2022). Additionally, we find that human capital levels are negatively associated with share of investment, indicating that ECF investors acknowledge the added value of human capital to firm valuations, leading them to be satisfied with lower share of ownership in firms having teams with a strong human capital profile. Here, again we do so while referring to a composite measure of human capital rather than different individual indicators separately, while minimising measurement bias due to any specific indicator effects.

Third, we present findings regarding the interaction effect between uncertainty level and human capital on ECF investment decisions. Here, we find that human capital moderates the effects of uncertainty on investment decisions by serving as

a risk mitigator (Harrison & Mason, 2017; Zacharakis & Meyer, 1998). Accordingly, when available it leads to greater amounts invested, and the taking of a lower share of total investments by individual investors. To the best of our knowledge, the current study is one of the first to document such effect in the ECF context.

Fourth, we provide evidence that high uncertainty, as caused by an exogenous shock, effects ECF investors' decision-making. Here, we present evidence that the profiles of ventures using ECF before and following the COVID-19 outbreak differ significantly. Campaigns in the period following the outbreak are characterised by higher uncertainty levels and lower human capital levels. The former may be explained by the general rising cost of equity capital under conditions of increased uncertainties (Ke, 2022; Liu & Wang, 2022). And the latter can be explained by the reasoning that growing market uncertainties results in lower investments in human resources, layoffs, and salary cuts (Brown & Cowling, 2021; Kalogiannidis & Chatzitheodoridis, 2021), which may leave ventures with weaker teams overall.

Fifth, when comparing the above-mentioned effects before and after the COVID-19 outbreak we find different results. While human capital has a positive association with amounts invested before and after the outbreak, it only had a negative effect on share of investment before the outbreak, but not after it. Seen together with the finding above about lower levels of human capital after the outbreak, one can assume that this reduction in human capital has weakened its effect on the share of investments taken up by ECF investors after the outbreak.

Next, when considering the uncertainty level associated with the venture as an investment object, we see a negative effect on amounts invested after the outbreak but not before it. Furthermore, we find it has a positive effect on share of investment before the outbreak but a negative effect after it. Here, again, taken together with the finding that uncertainty levels have increased after the outbreak, one can assume there is less willingness to invest, which translates both into lower amounts invested and taking up lower shares of investment. Before the outbreak, or under normal circumstances, uncertainties indeed have led to taking larger shares if investment to compensate for risks taken. However, when both venture and environmental uncertainties are enhanced at the same time as following the outbreak, investors may tend to limit their exposure to the risk by limiting the share of ownership they take as well.

Finally, when examining the uncertainty reduction moderation role of human capital on investment decisions, we find it to be evident both before and after the COVID-19 outbreak with respect to amounts invested. However, while we find the same effect on share of investment taken by investors after the outbreak, we do not find evidence for such effect before the outbreak. This indicates a further growing importance of human capital under conditions of greater market uncertainties, as an element not only helping to mitigate firm level uncertainties, but also market level uncertainties.

6. Conclusions

The current study sought to examine the potential effects of campaign uncertainty, human capital, and their interaction on individual investors' decisions in the ECF context. Furthermore, it also tested these effects' consistency under conditions of growing market uncertainties as caused by an exogenous economic shock. Overall, we find that the venture's uncertainty level is negatively associated with investment decisions, that human capital is positively associated with them, and that it further moderates the concerns with venture uncertainties in such decisions.

Our findings make several contributions. First, we present evidence that a venture's human capital does not only effect investors decision directly, but also moderates the effect of venture uncertainties on such decisions. We show that these effects hold also under conditions of growing market uncertainty. Second, to the best of our knowledge, this is a first attempt to use a natural experiment setting to study the effect of high market uncertainty caused by exogenous shock on investors decision-making. Third, most studies on ECF decision-making used data from European-based platform (Block et al., 2018; Piva & Rossi-Lamastra, 2018; Shafi, 2021), this is one of the first studies utilizing data from a less explored context. Forth, while prior research focused on campaign-level analysis, our analysis is at the individual investor level, suggesting new composite measures for human capital and campaign uncertainty, as well as comparing our findings in two different time periods reflecting both controllable (endogenous) and uncontrollable (exogenous) uncertainties, before and after the COVID-19 outbreak. Finally, we present composite measures of venture uncertainty and human capital, while minimizing biases of any individual indicator, which may better reflect complex perceptions influenced by multiple indicators rather than any individual ones.

Nevertheless, the current study also has several limitations that should be acknowledged and serve as fruitful grounds for future research. First, this study uses a large dataset from a concrete context, which may represent limitations on the generalizability of the findings into other contexts. Accordingly, future studies may revisit our hypotheses based on data collected in different national contexts, platforms, and with respect to different investment crowdfunding models (such as lending, invoice trading, real-estate investments, or bonds). Second, while our primary focus was on examining the interaction effect of human capital and uncertainty on investment decisions, other interaction effects that may be relevant remain outside the scope of the current study. In particular it may be worth exploring potential interactions of social capital with uncertainty as well as with human capital on investment decisions, as social capital has been identified as a critical asset underlying crowdfunding dynamic (Cai et al., 2021).

Finally, our findings may also present relevant insights for practitioners. First, entrepreneurs considering ECF fundraising should, to the extent possible, design their offerings in a manner conducive to more positive investor reactions. This includes elements contributing to uncertainty reduction such as offering lower ownership shares, attempting at raising higher amounts of funding, presenting realistically high pre-campaign valuations, providing information about prior funding successes, and presenting long-term exit plans. Additionally, entrepreneurs should pay special attention towards enhancing their human capital endowments thanks to its direct and indirect effects on investment decisions by clearly highlighting the team's educational background, industry, and entrepreneurial experiences, as well as in recruiting relevant members to strengthen existing teams when necessary. Such information should be clearly stressed in campaign presentations and messaging. Second, the same insights can also inform platform design and campaign advice provided by platform managers to aspiring fundraisers. Here, platforms may create easier and more appealing visualizations of human capital indicators, as well as investment terms and financial indicators, making such information more easily available to prospective investors. Finally, platforms may create automatic content generators for promotional efforts, extracting information these specific information points from the campaign texts, for a more effective promotions of campaigns.

7. References

Agrawal, A., Catalini, C., & Goldfarb, A. (2014). Some simple economics of crowdfunding. Innovation policy and the economy, 14(1), 63-97. https://doi.org/10.1086/674021

Ahlers, G. K. C., Cumming, D., Günther, C., & Schweizer, D. (2015). Signaling in equity crowdfunding. Entrepreneurship Theory and Practice, 39(4), 955-980. https://doi.org/10.1111/etap.12157

Andersen, T. G., Bollerslev, T., Diebold, F. X., & Vega, C. (2007). Real-time price discovery in global stock, bond and foreign exchange markets. Journal of international Economics, 73(2), 251-277. https://doi.org/10.1016/j.jinteco.2007.02.004

Bafera, J., & Kleinert, S. (2022). Signaling theory in entrepreneurship research: A systematic review and research agenda. Entrepreneurship Theory and Practice, 10422587221138489. https://doi.org/10.1177/10422587221138489

Baker, S. R., Bloom, N., & Davis, S. J. (2016). Measuring economic policy uncertainty. The Quarterly Journal of Economics, 131(4), 1593-1636. https://doi.org/10.1093/qje/qjw024

Baker, S. R., Bloom, N., Davis, S. J., & Terry, S. J. (2020a). Covid-induced economic uncertainty. National Bureau of Economic Research. https://doi.org/10.3386/w26983

Baker, S. R., Bloom, N., & Terry, S. J. (2020b). Using disasters to estimate the impact of uncertainty. National Bureau of Economic Research. Https://doi.org/10.3386/w27167

Bapna, S. (2019). Complementarity of signals in early-stage equity investment decisions: Evidence from a randomised field experiment. Management Science, 65(2), 933-952. https://doi.org/10.1287/mnsc.2017.2833

Barbi, M., Febo, V., & Giudici, G. (2023). Community-level social capital and investment decisions in equity crowdfunding. Small Business Economics, 1-36. https://doi.org/10.1007/s11187-022-00724-4

Barbi, M., & Mattioli, S. (2019). Human capital, investor trust, and equity crowdfunding. Research in International Business and Finance, 49, 1-12. https://doi.org/10.1016/j.ribaf.2019.02.005

Barrero, J. M., Bloom, N., & Wright, I. (2017). Short and long run uncertainty. National Bureau of Economic Research. https://doi.org/10.3386/w23676

Bartel, A. P., & Lichtenberg, F. R. (1987). The comparative advantage of educated workers in implementing new technology. The Review of Economics and statistics, 1-11. https://doi.org/10.2307/1937894

Battaglia, F., Busato, F., & Manganiello, M. (2022). A cross-platform analysis of the equity crowdfunding Italian context: the role of intellectual capital. Electronic Commerce Research, 22(2), 649-689. https://doi.org/10.1007/s10660-020-09453-w

Baum, J. A., & Silverman, B. S. (2004). Picking winners or building them? Alliance, intellectual, and human capital as selection criteria in venture financing and performance of biotechnology startups. Journal of Business Venturing, 19(3), 411-436. https://doi.org/10.1016/S0883-9026(03)00038-7

Becker, G. S. (2009). Human capital: A theoretical and empirical analysis, with special reference to education. University of Chicago press.

Berger, A. N., & Udell, G. F. (1998). The economics of small business finance: the roles of private equity and debt markets in the financial growth cycle. Journal of Banking & Finance, 22(6-8), 613-673. https://doi.org/10.1016/S0378-4266(98)00038-7

Block, J., Hornuf, L., & Moritz, A. (2018). Which updates during an equity crowdfunding campaign increase crowd participation? Small Business Economics, 50, 3-27. https://doi.org/10.1007/s11187-017-9876-4

Block, J., & Sandner, P. (2009). What is the effect of the financial crisis on venture capital financing? Empirical evidence from US Internet start-ups. Venture Capital, 11(4), 295-309. https://doi.org/10.1080/13691060903184803

Bonini, S., & Capizzi, V. (2019). The role of venture capital in the emerging entrepreneurial finance ecosystem: future threats and opportunities. Venture Capital, 21(2-3), 137-175. https://doi.org/10.1080/13691066.2019.1608697

Brodeur, A., Gray, D., Islam, A., & Bhuiyan, S. (2021). A literature review of the economics of COVID-19. Journal of economic surveys, 35(4), 1007-1044. https://doi.org/10.1111/joes.12423

Brown, R., & Cowling, M. (2021). The geographical impact of the Covid-19 crisis on precautionary savings, firm survival and jobs: Evidence from the United Kingdom's 100 largest towns and cities. International Small Business Journal, 39(4), 319-329. https://doi.org/10.1177/0266242621989326

Brown, R., Mawson, S., Rowe, A., & Mason, C. (2018). Working the crowd: Improvisational entrepreneurship and equity crowdfunding in nascent entrepreneurial ventures. International Small Business Journal, 36(2), 169-193. https://doi.org/10.1177/0266242617729743

Brown, R., & Rocha, A. (2020). Entrepreneurial uncertainty during the Covid-19 crisis: Mapping the temporal dynamics of entrepreneurial finance. Journal of Business Venturing Insights, 14, e00174. https://doi.org/10.1016/j.jbvi.2020.e00174

Brown, R., Rocha, A., & Cowling, M. (2020). Financing entrepreneurship in times of crisis: exploring the impact of COVID-19 on the market for entrepreneurial finance in the United Kingdom. International Small Business Journal, 38(5), 380-390. https://doi.org/10.1177/0266242620937464

Cafri, N. C. (2020). Who is afraid of the coronavirus? The fear index breaks records. Retrieved October 1st from https://www.tase.co.il/he/content/news-lobby/20200312_b

Cai, W., Polzin, F., & Stam, E. (2021). Crowdfunding and social capital: A systematic review using a dynamic perspective. Technological Forecasting and Social Change, 162, 120412. https://doi.org/10.1016/j.techfore.2020.120412

Campello, M., Graham, J. R., & Harvey, C. R. (2010). The real effects of financial constraints: Evidence from a financial crisis. Journal of financial economics, 97(3), 470-487. https://doi.org/10.1016/j.jfineco.2010.02.009

Chen, X.-P., Yao, X., & Kotha, S. (2009). Entrepreneur passion and preparedness in business plan presentations: a persuasion analysis of venture capitalists' funding decisions. Academy of management journal, 52(1), 199-214. https://doi.org/10.5465/AMJ.2009.36462018

Coakley, J., Lazos, A., & Liñares-Zegarra, J. M. (2022). Equity crowdfunding founder teams: campaign success and venture failure. British Journal of Management, 33, 286-305. https://doi.org/10.1111/1467-8551.12494

Colombo, M. G., & Grilli, L. (2005). Founders' human capital and the growth of new technology-based firms: A competence-based view. Research Policy, 34(6), 795-816. https://doi.org/10.1016/j.respol.2005.03.010

Colombo, O. (2021). The use of signals in new-venture financing: a review and research agenda. Journal of Management, 47(1), 237-259. https://doi.org/10.1177/0149206320911090

Connelly, B. L., Certo, S. T., Ireland, R. D., & Reutzel, C. R. (2011). Signaling theory: a review and assessment. Journal of Management, 37(1), 39-67. https://doi.org/10.1177/0149206310388419

Cowling, M., Liu, W., & Ledger, A. (2012). Small business financing in the UK before and during the current financial crisis. International Small Business Journal, 30(7), 778-800. https://doi.org/10.1177/0266242611435516

Cumming, D. J., Leboeuf, G., & Schwienbacher, A. (2020). Crowdfunding models: keep-it-all vs. all-or-nothing. Financial Management, 49(2), 331-360. https://doi.org/10.1111/fima.12262

Cumming, D. J., Martinez-Salgueiro, A., Reardon, R. S., & Sewaid, A. (2021). COVID-19 bust, policy response, and rebound: equity crowdfunding and

P2P versus banks. The Journal of Technology Transfer, 1-22. https://doi.org/10.1007/s10961-021-09899-6

D'Agostino, L. M., Ilbeigi, A., & Torrisi, S. (2022). The role of human capital in Italian equity crowdfunding campaigns. The International Journal of Entrepreneurship and Innovation, 14657503221094444. 10.1177/14657503221094444

Das, T. K., & Teng, B.-S. (2001). Trust, control, and risk in strategic alliances: An integrated framework. Organisation studies, 22(2), 251-283. https://doi.org/10.1177/0170840601222004

Daskalakis, N., & Yue, W. (2017). User's perceptions of motivations and risks in crowdfunding with financial returns. Available at SSRN 2968912.

Diebold, F. X., Doherty, N. A., & Herring, R. J. (2010). The known, the unknown, and the unknowable in financial risk management: measurement and theory advancing practice. Princeton University Press. https://doi.org/https://doi.org/10.1515/9781400835287

Duncan, M. J., Riazi, N. A., Faulkner, G., Gilchrist, J. D., Leatherdale, S. T., & Patte, K. A. (2022). Changes in Canadian adolescent time use and movement guidelines during the early COVID-19 outbreak: A longitudinal prospective natural experiment design. Journal of Physical Activity and Health, 19(8), 566-577. https://doi.org/10.1123/jpah.2021-0691

Dunning, T. (2012). Natural experiments in the social sciences: A design-based approach. Cambridge University Press. https://doi.org/https://doi.org/10.1017/CBO9781139084444

ECN, E. C. N. (2017). Review of Crowdfunding Regulation 2017.

Efrat, K., Gilboa, S., & Berliner, D. (2020). Israeli Crowdfunding: a reflection of its entrepreneurial culture. In Advances in Crowdfunding (pp. 341-372). Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-46309-0_15

Estrin, S., Gozman, D., & Khavul, S. (2018). The evolution and adoption of equity crowdfunding: entrepreneur and investor entry into a new market. Small Business Economics, 51(2), 425-439. https://doi.org/10.1007/s11187-018-0009-5

Estrin, S., Khavul, S., & Wright, M. (2022). Soft and hard information in equity crowdfunding: network effects in the digitalisation of entrepreneurial finance. Small Business Economics, 58, 1761-1781. https://doi.org/10.1007/s11187-021-00473-w

Fiet, J. O. (1995). Risk avoidance strategies in venture capital markets. Journal of Management Studies, 32(4), 551-574. https://doi.org/10.1111/j.1467-6486.1995.tb00788.x

Flug, K., Aviram-Nitzan, D., Margalit, Y., Gordon, G., Zaken, R., Kedar, Y., Chai, I., Portal, R. K., & Hirsh, Z. (2021). Review of The Labor Market in Israel During The Covid-19 Pandemic.

Foss, N., Klein, P., & Murtinu, S. (2020). Entrepreneurial finance under Knightian uncertainty: Pathways for achieving cognitive overlap. Working paper.

Fraser, S., Bhaumik, S. K., & Wright, M. (2015). What do we know about entrepreneurial finance and its relationship with growth? International Small Business Journal, 33(1), 70-88. https://doi.org/10.1177/0266242614547827

Fried, V. H., & Hisrich, R. D. (1994). Toward a Model of Venture Capital Investment Decision Making. Financial Management, 23(3), 28-37. https://doi.org/10.2307/3665619

Gama, A. P. M., Emanuel-Correia, R., Duarte, F. D., & Augusto, M. (2023). The COVID-19 impact on crowdfunding performance: evidence from a peer to-peer lending platform. Applied Economics Letters, 1-5. https://doi.org/10.1080/13504851.2023.2178616

GEM. (2018). Global Report 2017/18 M. G. Wellesley.

Gimmon, E., & Levie, J. (2010). Founder's human capital, external investment, and the survival of new high-technology ventures. Research Policy, 39(9), 1214-1226. https://doi.org/10.1016/j.respol.2010.05.017

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2018). Multivariate Data Analysis (8th Edition ed.). Cengage Learning EMEA. https://books.google.no/books?id=VvXZnQEACAAJ

Harrison, R., & Mason, C. (2017). Backing the horse or the jockey? Due diligence, agency costs, information and the evaluation of risk by business angel investors. International Review of Entrepreneurship, 15(3), 269-290.

Harrison, R. T., & Baldock, R. (2015). Financing SME growth in the UK: meeting the challenges after the global financial crisis. Venture Capital, 17(1-2), 1-6. https://doi.org/10.1080/13691066.2015.1050241

Hayes, A. F. (2017). Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. Guilford publications.

Hervé, F., Manthé, E., Sannajust, A., & Schwienbacher, A. (2019). Determinants of individual investment decisions in investment-based crowdfunding. Journal of Business Finance & Accounting, 46(5-6), 762-783. https://doi.org/10.1111/jbfa.12372

Hoffmann, A. O., Post, T., & Pennings, J. M. (2013). Individual investor perceptions and behavior during the financial crisis. Journal of Banking & Finance, 37(1), 60-74. https://doi.org/10.1016/j.jbankfin.2012.08.007

Hornuf, L., & Neuenkirch, M. (2017). Pricing shares in equity crowdfunding. Small Business Economics, 48, 795-811. https://doi.org/10.1007/s11187-016-9807-9

Hornuf, L., & Schwienbacher, A. (2017). Should securities regulation promote equity crowdfunding? Small Business Economics, 49(3), 579-593. https://doi.org/10.1007/s11187-017-9839-9

Hsu, D. H. (2007). Experienced entrepreneurial founders, organisational capital, and venture capital funding. Research Policy, 36(5), 722-741. https://doi.org/10.1016/j.respol.2007.02.022

Huang, L., & Pearce, J. L. (2015). Managing the unknowable: The effectiveness of early-stage investor gut feel in entrepreneurial investment decisions. Administrative Science Quarterly, 60(4), 634-670. https://doi.org/10.1177/0001839215597270

Johan, S., & Zhang, Y. (2022). Investors' industry preference in equity crowdfunding. The Journal of Technology Transfer, 47(6), 1737-1765. 10.1007/s10961-021-09897-8

Kalogiannidis, S., & Chatzitheodoridis, F. (2021). Impact of Covid-19 in the European Start-ups Business and the Idea to Re-energise the Economy. International Journal of Financial Research, 12(2), 56-61. https://doi.org/10.5430/ijfr.v12n2p55

Kaplinski, H. (2021). Governmental support programs in handling of the COVID-19 crisis in Israel and developed countries. https://fs.knesset.gov.il/globaldocs/MMM/737adcb4-07f8-ea11-8108-00155d0aee38/2_737adcb4-07f8-ea11-8108-00155d0aee38_11_17728.pdf

Ke, Y. (2022). The impact of COVID-19 on firms' cost of equity capital: Early evidence from US public firms. Finance Research Letters, 46, 102242. https://doi.org/10.1016/j.frl.2021.102242

Ketchen, D. J., & Shook, C. L. (1996). The application of cluster analysis in strategic management research: an analysis and critique. Strategic management journal, 17(6), 441-458. https://doi.org/10.1002/(SICI)1097-0266(199606)17:6%3C441::AID-SMJ819%3E3.0.CO;2-G

Klein, P. G., & Maldonado-Bautista, I. (2022). Entrepreneurship, sustainability, and stakeholder theory. In Handbook on the Business of Sustainability. Edward Elgar Publishing. https://doi.org/10.4337/9781839105340.00012

Kleindorfer, P. R. (2010). Reflections on decision making under uncertainty. The Known, the Unknown, and the Unknowable in Financial Risk Management: Measurement and Theory Advancing Practice, 164-193.

Kleinert, S., Volkmann, C., & Grünhagen, M. (2020). Third-party signals in equity crowdfunding: the role of prior financing. Small Business Economics, 54(1), 341-365. https://doi.org/10.1007/s11187-018-0125-2

Knight, F. H. (1921). Risk, uncertainty and profit. Signalman Publishing.

Knockaert, M., Clarysse, B., & Wright, M. (2010). The extent and nature of heterogeneity of venture capital selection behaviour in new technology-based firms. R&d Management, 40(4), 357-371. https://doi.org/10.1111/j.1467-9310.2010.00607.x

Kshetri, N. (2018). Informal institutions and internet-based equity crowdfunding. Journal of International Management, 24(1), 33-51. https://doi.org/10.1016/j.intman.2017.07.001

Le Pendeven, B., Bardon, T., & Manigart, S. (2021). Explaining academic interest in crowdfunding as a research topic. British Journal of Management. https://doi.org/10.1111/1467-8551.12585

Leatherdale, S. T. (2019). Natural experiment methodology for research: a review of how different methods can support real-world research. International Journal of Social Research Methodology, 22(1), 19-35. https://doi.org/10.1080/13645579.2018.1488449

Lee, J.-W., & McKibbin, W. J. (2004). Globalisation and disease: The case of SARS. Asian economic papers, 3(1), 113-131. https://doi.org/10.1162/1535351041747932

Leland, H. E., & Pyle, D. H. (1977). Informational asymmetries, financial structure, and financial intermediation. The Journal of Finance, 32(2), 371-387. https://doi.org/10.2307/2326770

Lin, L. (2017). Managing the risks of equity crowdfunding: lessons from China. Journal of Corporate Law Studies, 17(2), 327-366. https://doi.org/10.1080/14735970.2017.1296217

Liu, J., & Wang, H. (2022). Economic policy uncertainty and the cost of capital. International Review of Financial Analysis, 81, 102070. https://doi.org/10.1016/j.irfa.2022.102070

Lukkarinen, A. (2020). Equity crowdfunding: Principles and investor behaviour. In Advances in crowdfunding (pp. 93-118). Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-46309-0_5

Lukkarinen, A., & Schwienbacher, A. (2023). Secondary market listings in equity crowdfunding: The missing link? Research Policy, 52(1), 104648. https://doi.org/10.1016/j.respol.2022.104648

Lukkarinen, A., Shneor, R., & Wallenius, J. (2022). Growing pains and blessings: manifestations and implications of equity crowdfunding industry maturation. Decision Support Systems, 157, 113768. https://doi.org/10.1016/j.dss.2022.113768

Lukkarinen, A., Teich, J. E., Wallenius, H., & Wallenius, J. (2016). Success drivers of online equity crowdfunding campaigns. Decision Support Systems, 87, 26-38. https://doi.org/10.1016/j.dss.2016.04.006

Mamonov, S., & Malaga, R. (2018). Success factors in Title III equity crowdfunding in the United States. Electronic Commerce Research and Applications, 27, 65-73. https://doi.org/10.1016/j.elerap.2017.12.001

Mason, C., & Stark, M. (2004). What do investors look for in a business plan? a comparison of the investment criteria of bankers, venture capitalists and business angels. International Small Business Journal, 22(3), 227-248. https://doi.org/10.1177/0266242604042377

Mason, C. M., & Harrison, R. T. (2015). Business angel investment activity in the financial crisis: UK evidence and policy implications. Environment and Planning C: Government and Policy, 33(1), 43-60. https://doi.org/10.1068/c12324b

Mitteness, C., Sudek, R., & Cardon, M. S. (2012). Angel investor characteristics that determine whether perceived passion leads to higher evaluations of funding potential. Journal of Business Venturing, 27(5), 592-606. https://doi.org/10.1016/j.jbusvent.2011.11.003

Mohammadi, A., & Shafi, K. (2018). Gender differences in the contribution patterns of equity-crowdfunding investors. Small Business Economics, 50, 275-287. https://doi.org/10.1007/s11187-016-9825-7

Moritz, A., Block, J., & Lutz, E. (2015). Investor communication in equity-based crowdfunding: a qualitative-empirical study. Qualitative Research in Financial Markets. https://doi.org/10.1108/QRFM-07-2014-0021

Muzyka, D., Birley, S., & Leleux, B. (1996). Trade-offs in the investment decisions of European venture capitalists. Journal of Business Venturing, 11(4), 273-287. https://doi.org/10.1016/0883-9026(95)00126-3

Nitani, M., Riding, A., & He, B. (2019). On equity crowdfunding: investor rationality and success factors. Venture Capital, 21(2-3), 243-272. https://doi.org/10.1080/13691066.2018.1468542

Packard, M. D., Clark, B. B., & Klein, P. G. (2017). Uncertainty types and transitions in the entrepreneurial process. Organization Science, 28(5), 840-856. https://doi.org/10.1287/orsc.2017.1143

Piazza-Georgi, B. (2002). The role of human and social capital in growth: extending our understanding. cambridge Journal of Economics, 26(4), 461-479. https://doi.org/10.1093/cje/26.4.461

Pintado, T. R., De Lema, D. G. P., & Van Auken, H. (2007). Venture capital in Spain by stage of development. Journal of Small Business Management, 45(1), 68-88. https://doi.org/10.1111/j.1540-627X.2007.00199.x

Piva, E., & Rossi-Lamastra, C. (2018). Human capital signals and entrepreneurs' success in equity crowdfunding. Small Business Economics, 51(3), 667-686. https://doi.org/10.1007/s11187-017-9950-y

Prati, G., & Mancini, A. D. (2021). The psychological impact of COVID-19 pandemic lockdowns: a review and meta-analysis of longitudinal studies and natural experiments. Psychological medicine, 51(2), 201-211. https://doi.org/10.1017/S0033291721000015

Prohorovs, A., Bistrova, J., & Ten, D. (2019). Startup Success Factors in the Capital Attraction Stage: Founders' Perspective. Journal of East-West Business, 25(1), 26-51. https://doi.org/10.1080/10669868.2018.1503211

Ralcheva, A., & Roosenboom, P. (2020). Forecasting success in equity crowdfunding. Small Business Economics, 55, 39-56. https://doi.org/10.1007/s11187-019-00144-x

Rosen, B., Waitzberg, R., Israeli, A., Hartal, M., & Davidovitch, N. (2021). Addressing vaccine hesitancy and access barriers to achieve persistent progress in Israel's COVID-19 vaccination program. Israel journal of health policy research, 10(1), 1-20. https://doi.org/10.1186/s13584-021-00481-x

Sasson, U. (2020, 07.02.2020). PipelBiz expends its operation - crowdfunding in the real estate market Calcalist. Retrieved 26 February 2023 from https://www.calcalist.co.il/articles/0,7340,L-3790250,00.html

Shafi, K. (2021). Investors' evaluation criteria in equity crowdfunding. Small Business Economics, 3-37. https://doi.org/10.1007/s11187-019-00227-9

Shneor, R. (2020). Crowdfunding models, strategies, and choices between them. Advances in Crowdfunding: Research and Practice, 21-42. https://doi.org/10.1007/978-3-030-46309-0_2

Shneor, R., & Torjesen, S. (2020). Ethical considerations in crowdfunding. Advances in Crowdfunding: Research and Practice, 161-182. https://doi.org/10.1007/978-3-030-46309-0_8

Signori, A., & Vismara, S. (2018). Does success bring success? The post-offering lives of equity-crowdfunded firms. Journal of Corporate Finance, 50, 575-591. https://doi.org/10.1016/j.jcorpfin.2017.10.018

Spence, M. (1973). Job market signaling. The Quarterly Journal of Economics, 87(3), 355-374. https://doi.org/10.2307/1882010

Sudek, R. (2006). Angel investment criteria. Journal of Small Business Strategy, 17(2), 89-104.

TOI. (2020, March 15th). No more daycare, restaurants, gyms or shopping malls: The new virus regulations. Times of Israel. Retrieved January 18th, 2022 from https://www.timesofisrael.com/no-more-daycare-restaurants-gyms-or-prayer-quorums-the-new-virus-regulations/

Troise, C., Matricano, D., Sorrentino, M., & Candelo, E. (2022). Investigating investment decisions in equity crowdfunding: The role of projects' intellectual capital. European Management Journal, 40(3), 406-418. https://doi.org/10.1016/j.emj.2021.07.006

Tuomi, K., & Harrison, R. (2017). A comparison of equity crowdfunding in four countries: Implications for business angels. Strategic Change, 26(6), 609-615. https://doi.org/10.1002/jsc.2172

Unger, J. M., Rauch, A., Frese, M., & Rosenbusch, N. (2011). Human capital and entrepreneurial success: A meta-analytical review. Journal of Business Venturing, 26(3), 341-358. https://doi.org/10.1016/j.jbusvent.2009.09.004

Vismara, S. (2016). Equity retention and social network theory in equity crowdfunding. Small Business Economics, 46, 579-590. https://doi.org/10.1007/s11187-016-9710-4

Vismara, S. (2018). Information cascades among investors in equity crowdfunding. Entrepreneurship Theory and Practice, 42(3), 467-497. https://doi.org/10.1111/etap.12261

Vulkan, N., Åstebro, T., & Sierra, M. F. (2016). Equity crowdfunding: A new phenomena. Journal of Business Venturing Insights, 5, 37-49. https://doi.org/10.1016/j.jbvi.2016.02.001

Walthoff-Borm, X., Schwienbacher, A., & Vanacker, T. (2018). Equity crowdfunding: First resort or last resort? Journal of Business Venturing, 33(4), 513-533. https://doi.org/10.1016/j.jbusvent.2018.04.001

Wang, W., Mahmood, A., Sismeiro, C., & Vulkan, N. (2019). The evolution of equity crowdfunding: insights from co-investments of angels and the crowd. Research Policy, 48(8), 1-11. https://doi.org/10.1016/j.respol.2019.01.003

White, B. A., & Dumay, J. (2020). The angel investment decision: insights from Australian business angels. Accounting & Finance, 60(3), 3133-3162. https://doi.org/10.1111/acfi.12427

Zacharakis, A. L., & Meyer, G. D. (1998). A lack of insight: do venture capitalists really understand their own decision process? Journal of Business Venturing, 13(1), 57-76. https://doi.org/10.1016/S0883-9026(97)00004-9

Ziegler, T., Shneor, R., Wenzlaff, K., Suresh, K., Paes, F. F. d. C., Mammadova, L., Wanga, C., Kekre, N., Mutinda, S., & Wang, B. (2021). The 2nd Global Alternative Finance Market Benchmarking Report.

Paper III:
Decision-Making Criteria Among Serial, Occasional, and One-Time Equity Crowdfunding Investors when Evaluating Technology-Based Ventures

Daniel Berliner, Rotem Shneor, Andreas Wald

Abstract

Despite growing contrary evidence, most research has considered equity crowdfunding (ECF) investors as a homogenous group. Drawing on signalling theory, this study investigates decision-making criteria employed by three different groups of ECF investors: one-time, occasional, and serial investors. We use a dataset of 14,130 investment decisions made by 8,732 unique ECF investors evaluating technology-based ventures' campaigns on the Israeli equity platform PipelBiz. Our analysis revealed that investors differ in their response to signals based on their on-site activity level. We show that costly signals of venture quality significantly predict investors' portfolio size decisions and that the minimum ticket significantly predicts investors' behaviour. In addition, our study contributes to the literature on signal types and their impact on ECF investors' investment decisions. We conclude that by better understanding the differences between investors' investment decision criteria, both platforms and fundraisers can improve ECF campaigns' outcomes.

Keywords: Equity crowdfunding, signalling theory, entrepreneur confidence, entrepreneurial finance, investment

1. Introduction

Equity crowdfunding (ECF) allows entrepreneurs to raise funds from a large group of individual investors via an online platform (Ahlers et al., 2015). Early-stage entrepreneurial ventures are informationally opaque in nature. Therefore, the literature suggests that investors face severe information asymmetry problems limiting their ability to evaluate ventures' quality, when deciding to invest (Mochkabadi & Volkmann, 2020; Ughetto et al., 2021). While most studies have addressed ECF investors as a homogenous group, recent research has indicated that ECF investors differ in their motivation to invest, respond differently to signals and employ different decision-making criteria (Goethner et al., 2021a; Goethner et al., 2021b; Hornuf et al., 2022; Wallmeroth, 2019). Therefore, ECF investors' decision-making criteria may also differ based on their investment activity level.

Earlier entrepreneurial finance research supports such notion. Van Osnabrugge (1998) found differences in investment decision criteria between serial and non-serial business angels (BA) based on their investment experience. Harrison et al. (2015) show differences in the emphasis given to various investment criteria by three groups of BAs differing in their investment experience level. Similarly, analysis of initial coin offering (ICO) investors showed serial investors engaging in earlier campaign stages (Boreiko & Risteski, 2021).

Recent studies on equity crowdfunding investors' (ECFs) decisions and behaviour have identified the existence of heterogeneity among crowd investors, showing that different types of ECFs can have different investment motives and funding decisions (Ferretti et al., 2021; Goethner et al., 2021a; Goethner et al., 2021b). These studies clustered investors based on past-made investment decisions, where each group may differ by the amount they invested, the number of investors investing in the same campaign they invested in, comments they posted, and the level of project innovativeness presented in campaigns they invested.

Our study builds on the approach taken by prior research on BAs (Harrison et al., 2015; Van Osnabrugge, 2000) and ECFs (Hornuf et al., 2022). We focus on differentiating between ECF investors based on their investment experience and activity level, as reflected in their portfolio size. And we use such distinctions to study what effects each type of investor's investment decisions. Thus, placing the following research question: how do ECF investors differ in terms of their investment decision-making criteria preferences?

Previous studies on ECF investors excluded the most active investors as outliers (Goethner et al., 2021b), while others excluded the least active, one-time investors (Wallmeroth, 2019) from their sample. This suggests that while recent literature confirms that ECF are not a homogenous group, we still lack an understanding of decision-making criteria employed by both the least and most active investors.

We focus on ECF investors' decision-making criteria for the following reasons. First, based on previous research on ECF investors' activity, we note that ECF investors holding multiple investments in their portfolio account for a disproportionately large percentage of overall ECF investment activity. Second, ECF has the potential to fill the equity gap in the funding cycle for early-stage entrepreneurial ventures (Hornuf & Schmitt, 2016; Mason et al., 2016). Specifically, one of the unique contributions of ECF is the inclusion of new investors, who may have more limited resources and hence may be influenced by different criteria, or be engaged in fewer investment overall, while still contributing to a growing resource base that aspiring entrepreneurs can tap into. Accordingly, better understanding these investors' decision-making criteria may improve entrepreneurs' success rates in raising funds through ECF, as well as inform platforms in the guidance they provide to prospective fundraisers.

For addressing this challenge, we build on signalling theory (Connelly et al., 2011; Spence, 1973, 2002), and its application in the context of ECF (Ahlers et al., 2015; Kleinert & Mochkabadi, 2021; Vismara, 2018b, 2019). Relevant theoretical insights inform the formulation of our hypotheses, which are tested using a proprietary dataset received from the Israeli equity platform PipelBiz. Our sample consists of the complete set of 14,130 investment decisions made by 8,732 unique ECF investors in 49 technology-based ventures ECF campaigns.

Our key findings are that investors significantly differ in their preferences towards various investment decision-making criteria, based on their activity level and portfolio size. Overall, we show that occasional investors place more emphasis on firms' quality indicators, and human capital levels than one-time investors. Furthermore, ventures' prior validation in the form of follow-on campaign was found to statistically predict investors belonging to the occasional investors group versus the one-time investors, indicating they are more likely to invest in companies' consecutive rounds rather than in the first (and riskier) campaign. In general, we find that occasional and serial investors share many similarities with

respect to their preferences in a manner which is statistically different from the one-time investors.

Our study makes theoretical contributions to research on the pervasiveness of signals within the ECF domain in general, and especially in explaining their effect on ECF investors' decision-making criteria. We add to signalling literature by providing evidence that costly signals, capturing venture quality in terms of human capital and follow-on campaigns affect ECF investors' portfolio size decisions. Our theoretical contribution is in distinguishing between investor types, showing that investors respond differently to signals based on their investment activity level, as reflected by their on-site portfolio size.

By expanding our understanding on how signals affect decision-making of different ECF investors' segments, we provide practical recommendations meant to improve fundraising outcomes of entrepreneurs utilizing ECF. Additionally, our study insights may inform platform operators about how to effectively attract more investors, as well as guide fundraisers' efforts.

The remainder of the paper is structured as follows. First, we review the literature and develop our hypotheses. A description of our chosen methodology and the presentation of our findings follows. Finally, we discuss our results, and conclude with the study's limitations and implications for practitioners.

2. Literature review and hypotheses development

2.1. Signalling theory and ECF

Information asymmetries between entrepreneurs and potential investors are a major concern to early-stage entrepreneurial ventures, as they rely on external financing that affects their growth and survivability (Harrison & Baldock, 2015; Johan & Zhang, 2022). Within the entrepreneurial finance domain, signalling theory addresses the asymmetry in information between investors and entrepreneurs. In their fundraising activities, entrepreneurs share signals of venture quality and entrepreneurs' intentions, that are meant to convey their venture's true value and success prospects to potential investors. Investors, on the other hand, must make decisions based on incomplete information regarding the venture's true quality, as well as the founding team's commitment and future behavioural

intentions (Colombo, 2021; Connelly et al., 2011; Klein & Maldonado-Bautista, 2022; Stiglitz, 2000), thus raising agency associated risks (Eisenhardt, 1989).

The effectiveness of signals in conveying the message and achieving desired outcomes is determined by the signal being observable to potential receivers and costly to the signaler (Courtney et al., 2017). Observability refers to the extent to which the receiver is aware of the signal, thus, potentially able to react to it. Signal cost refers to the real costs the signaler bears associated with the action signalled, as well as the difficulties and risks in its imitation (Connelly et al., 2011; Spence, 2002). The traditional signalling theory (Spence, 1973) focused on the signal's costs to explain its impact and effectiveness in achieving the desired outcome (Colombo, 2021). The direct expression of cost in the literature is 'burned money', associated with self-imposed losses in future wealth (Austen-Smith & Banks, 2000).

An additional research stream addresses the ways managers of high-quality ventures can signal their venture's quality by risking their own wealth. As managers of a venture, who they know is of low-quality, will not be willing to risk their own capital in its activities (Busenitz et al., 2005; Prasad et al., 2000). Therefore, managers of high-quality ventures can signal their strong commitment to the venture's future success by retaining a large equity positions (Connelly et al., 2010; Leland & Pyle, 1977). Equity retained by the entrepreneurs is referred to as a signal of intent, indicative of future action (Connelly et al., 2011). Therefore, entrepreneurs with large equity share signal that their decision-making and future actions are aligned with the venture's best interests thus also consistent with the investors' preference, and reducing agency and moral hazard associated problems (Jensen & Meckling, 1976).

Although signalling theory focuses on the signal's cost as a means to differentiate between high and low-quality ventures (Connelly et al., 2011), another stream in the literature shows that costless signals can also communicate valuable information towards a desirable outcome (Colombo, 2021). Lin et al. (2013) show that in the peer-to-peer lending domain, borrowers' friends, which are costless signals, act as a quality signal, increasing the probability of successful funding. In the context of reward-based crowdfunding, Anglin et al. (2018), found that positive psychological terminology, which is regarded as a costless signal, had a positive effect on campaigns' success. Di Pietro et al. (2023), however, found that ECF campaigns using past statements (costly signals) had a positive effect on the

amount raised while statements referring to future intention (costless signals) had a negative effect.

The effectiveness of costless signals was found to increase in situations where information is limited, the audience is less sophisticated, and signals are sent simultaneously, thus receivers have limited ability to evaluate each signal independently (Lin et al., 2013; Loewenstein et al., 2014; Steigenberger & Wilhelm, 2018).

2.2. Investor types

Prior research has shown that ECF investors differ in their activity level, as reflected in the number of investments they made and portfolio size (Ferretti et al., 2021; Goethner et al., 2021a; Goethner et al., 2021b; Hornuf et al., 2022). Investors' activity ranges between the most active investors having a portfolio with 28 (Goethner et al., 2021b) and 41 investments (Ferretti et al., 2021), and the least active having made only one investment in ECF.

Investors' decision-making criteria was shown to differ according to their activity level and experience as reflected in their portfolio size. Van Osnabrugge (1998), studying serial and non-serial BA decision-making criteria, found that serial angels are more concerned with market risks than agency risks. Harrison et al. (2015) categorized BA into three groups according to the number of investments in their portfolio: super angels, novice angels, and nascent angels, concluding that the groups differ in the emphasis given to various criteria.

Earlier studies in ECF also suggest that crowd investors are not homogeneous and differ in their decision criteria and the signals they respond to (Ferretti et al., 2021; Goethner et al., 2021b; Hornuf et al., 2022; Wallmeroth, 2019). To study the differences between different investor groups' behaviour and decision-making criteria, Goethner et al. (2021b) clustered investors into three groups. The authors found that financial signals had greater effect size on investors with large portfolios compared with those with small portfolios. However, human capital was found to have a greater effect on investors with a small portfolio. Furthermore, when clustering Italian ECF investors into four groups with different portfolio size, Ferretti et al. (2021) found that investors exhibited different preferences for firm

age, team size, pre-money valuation, shares of equity offered. and indications of funds collected earlier.

Based on investors' portfolio size, Hornuf et al. (2022) divided their sample into four groups to study whether ECF investors are geographically biased in their investment decisions. Their findings show that investment decisions significantly differ between groups, according to the investors' level of experience, as reflected by the ECF investors' portfolio size, and their personal ties to the entrepreneur.

ECF investors gain experience regarding the ECF investment mechanism by investing in multiple companies over a period, thus formulating a diversified ECF portfolio. Consequently, the larger the portfolio, the more experienced the ECF investor is (Boreiko & Risteski, 2021; Hornuf et al., 2020). In this study we follow previous literature terminology addressing the most active investors as experienced investors, serial, or repeated investors (Kelly, 2007; Kelly & Hay, 1996; Morrissette, 2007; Van Osnabrugge, 1998).

Accordingly, we differentiate the three groups of ECF investors based on their activity level as reflected in their portfolio size. The first group is comprised of the least active investors, those that have only one investment in their portfolio (Harrison et al., 2015; Hornuf et al., 2022). The second group is comprised of investors with between two and five investments in their portfolio, as reflected by the average number of investments found in prior studies (Goethner et al., 2021b; Hornuf et al., 2022; Wallmeroth, 2019). The last group is comprised of the most active investors as shown in their portfolio size (Ferretti et al., 2021; Harrison et al., 2015). Thus, having six or more investments in their portfolio.

2.2.1. One-time investors

The least active investors are those with the smallest portfolio size including one company only. These investors are most likely to originate from the entrepreneurs' immediate social network, including family and friends (Angerer et al., 2017; Kuppuswamy & Bayus, 2018). Prior studies showed that funding from the entrepreneurs' close social circle is a major source of finance to early-stage ventures (Berger & Udell, 1998; Kim & Koh, 2023; Lee & Persson, 2016). These investors, often regarded as less sophisticated investors, tend to invest early in the campaign and their funding decisions seem to be based on social ties and relational

commitments with the entrepreneurs rather than on expected returns, and thus less affected by nuances in the information shared by the fundraisers (Agrawal et al., 2015).

Angerer et al. (2017) found that a key success factor in ECF campaigns is to secure capital from close networks, family and friends in the pre-financing stage, before the campaign is public. Brown et al. (2019) state that ECF is a relation-based form of entrepreneurial finance, and Hornuf et al. (2022) show that investors with personal connection to the entrepreneurs are more inclined to support local campaigns than more active investors. Furthermore, the relationship with the entrepreneur implies that investors may have access to private information and therefore, these investors may be less influenced by public information shared by the entrepreneurs (Agrawal et al., 2015; Polzin et al., 2018).

2.2.2. Serial investors

Highly active investors with large portfolios are referred to as serial investors. By diversifying their portfolio, investors can reduce costs associated with due-diligence activities. This may be particularly relevant for ECF, where investment amounts are relatively low (compared to BAs and VCs), and proper due-diligence costs are relatively high (Capizzi & Carluccio, 2016; Hornuf et al., 2020). In addition, by holding multiple assets in a portfolio, an investor can mitigate market and agency risks associated with investing in early-stage ventures. If one of the companies in the portfolio fails, the loss can be compensated by performance of other assets in the portfolio (Kirby & Worner, 2014).

Having a more diversified ECF portfolio suggests that these serial investors invest in various companies with no personal connection to the founders nor do they have private information prior to the investment. This reasoning aligns with the findings of Hornuf et al. (2022), showing that well-diversified investors will be less biased towards local companies than investors with personal ties to the fundraiser. Moreover, Ferretti et al. (2021) showed that serial investors rely on public information and diversify their portfolios because of the difficulty of identifying the ‘winner’ investment that will generate returns. The authors also found an association between serial investors' decisions and campaign quality signals such as team size, and pre-money valuation.

2.2.3. Occasional investors

The third group of occasional investors are selective and have only a few companies in their portfolios. These investors expect financial returns (Ferretti et al., 2021; Goethner et al., 2021b) but seem to rely on private information rather than public information in their decision-making (Ferretti et al., 2021); however, to a lesser degree than investors with close personal ties to the entrepreneur (Hornuf et al., 2022).

2.3. ECF investors' decision-making criteria

Investments in early-stage ventures are associated with a high level of information asymmetry between entrepreneurs and investors (Leland & Pyle, 1977). By lacking complete information regarding the ventures and entrepreneurs' true quality and intentions, investors are exposed to adverse selection and potential opportunistic behaviour by entrepreneurs. To reduce perceived risks associated with investments, ECF investors employ a set of decision-making criteria (Vismara, 2018a). However, a significant portion of ECF investors are considered as less sophisticated and as having little experience in evaluating business opportunities (Agrawal et al., 2016; Estrin et al., 2018). Moreover, ECF investors cannot negotiate the deal terms ex-ante or monitor the entrepreneur's actions ex-post to the same extent that BAs and VCs often do (Harrison et al., 2015; Hornuf et al., 2020). Therefore, in evaluating new investment opportunities, ECF investors base their decisions on signals as a proxy for the company's quality and the entrepreneur's intentional actions (Colombo, 2021; Connelly et al., 2011).

Prior studies in the context of ECF have shown that both venture quality and entrepreneurs' intentions' signals had significant effect on investors' decisions. These can be characterized as either costly or costless signals. In this study we operationalize four factors, each of which was previously shown to affect ECFs' decisions: (1) venture quality signals such as human capital (Barbi & Mattioli, 2019; Kleinert et al., 2020; Piva & Rossi-Lamastra, 2018), and (2) prior validation (Coakley et al., 2022b; Ralcheva & Roosenboom, 2020), intentional signals of (3) entrepreneurs' commitment and interest alignment (Ahlers et al., 2015; Nitani et al., 2019; Vismara, 2016), and costless signals as relating the entrepreneurs' intentions such as (4) indication of an exit strategy (Kleinert et al., 2020; Nitani et al., 2019).

The ECF literature has consistently argued that in order to reduce information asymmetry between prospective investors and fundraising entrepreneurs, the latter must find ways to successfully signal the venture's quality and its team's commitment and credibility (Mochkabadi & Volkmann, 2020). In the following, we discuss the four observable campaign features (Lukkarinen et al., 2022) often associated with signals of entrepreneur's commitment and self-confidence in the venture's future success prospects.

2.3.1. Entrepreneurs' commitment

2.3.1.1 Equity retention

In initiating an ECF campaign, founders decide about the share of equity they are willing to sell and the share of equity they want to retain. The equity entrepreneurs' retain is interpreted as a costly signal of confidence in the venture and its prospects, as entrepreneurs of low-quality ventures retaining a large share of equity will suffer future loss of personal wealth (Connelly et al., 2010; Vismara, 2016). Additionally, the equity retained by entrepreneurs is also referred to as a signal of intent, indicative of future action (Connelly et al., 2011). Therefore, entrepreneurs with large equity shares, signal that their decision-making and future actions are aligned with the venture's best interests and thus also consistent with the investors' preference, essentially reducing problems of agency and moral hazard (Jensen & Meckling, 1976). Such an approach also maintains sufficient room for future fundraising rounds, as well as for the possibility of onboarding more strategic and sophisticated investors in the future.

Prior studies on ECF campaigns' outcomes show mixed results. A negative association was found between the percentage of equity offered by the venture and the number of investors per campaign (Ahlers et al., 2015; Vismara, 2016), and the funding amount raised (Shafi, 2021; Vismara, 2016), suggesting that a higher ownership retained by the venture could be read by ECF investors as a positive signal of the entrepreneur's confidence in the ventures and its future success prospects. In contrast, Coakley et al. (2022c) found a positive effect between the percentage of equity offered and the total amount raised. The mixed results could be associated with different sample characteristics, geographies, investors' level of sophistication and maturity of the ECF mechanism (Lukkarinen et al., 2022).

2.3.1.2 Total funding amount

Entrepreneurs must decide about the funding goal prior to starting a campaign. The total funding amount is a signal for project size, quality and the venture's degree of development (Hornuf & Schwienbacher, 2018a). Since equity campaigns follow the all-or-nothing (AON) model of fundraising, the funding goal is a costly and observable signal of entrepreneurs' confidence and commitment, as they bear the risk of getting nothing if a too-high funding goal is chosen (Hornuf & Neuenkirch, 2017), as too ambitious growth claims might reduce entrepreneurs' credibility and hamper their ECF campaigns' outcomes (Kleinert, 2023).

Previous research found mixed results regarding the funding goal effect on ECF investors. Most studies found a positive effect of funding goal on the number of investors (Hornuf & Schwienbacher, 2018a; Kleinert et al., 2020; Lukkarinen et al., 2016; Vismara, 2016) and amount raised (Coakley et al., 2022c; Lukkarinen et al., 2016; Shafi, 2021). However, setting high goals reduces overall campaign success rates (Piva & Rossi-Lamastra, 2018; Ralcheva & Roosenboom, 2020). Interestingly, Ahlers et al. (2015) found no significant effect of funding goal on either number of investors, funding amount, or speed of capital allocation. These results represent an outlier, due to this paper being the first to analyze ECF investors based on data collected in the earliest days of an immature ECF market. Later research documented growing sophistication of ECF investors as the industry matures (Lukkarinen et al., 2022).

2.3.1.3 Company pre-money valuation

Before starting a campaign, the founders decide on the company's pre-money valuation derived from the amount of capital they would like to raise and the equity they are willing to sell (Hornuf & Neuenkirch, 2017; Vulkan et al., 2016). The ventures' pre-money valuation is a highly observable and costly signal (Hornuf & Neuenkirch, 2017; Lukkarinen et al., 2022), and is associated with potentially lucrative investments (Hornuf & Neuenkirch, 2017). However, the pre-money valuation is a signal posing costs on the entrepreneurs, as they are likely to require supporting documentation, as well as involvement and validation by third-party professional advisors, which may include accountants, legal, and financial advisors. In ECF pre-money valuation, while essentially determined by the venture and its advisors, is nonetheless often influenced by inputs from the platform. While

platforms may not be involved in the specifics of the valuation calculations, they may decline to accept campaign proposals without adjustments to meet their understanding of proper valuations of ventures seeking to use their services.

The company's pre-money valuation was found to be important in ECF investors' decision-making (Estrin et al., 2022; Johan & Zhang, 2022; Lukkarinen et al., 2022). Previous studies show mixed results regarding the effect of a company's pre-money valuation on campaigns' outcomes. A negative effect was found on ECF campaign success in reaching the minimum funding goal, implying that ECF investors prefer companies offering lower pre-money valuation (Coakley et al., 2022c; Estrin et al., 2022). In such cases, high valuation is linked with an increased share price, which is itself associated with reduced future ROI per share, and hence might hinder investors' propensity to invest, and hamper the campaign's success prospects. A positive effect, however, was found on the total amount raised (Coakley et al., 2022c), suggesting that ECF investors read the high pre-money valuation signal as a potentially lucrative investment opportunity and thus invest more in these campaigns. A negative effect was also found on the campaign overfunding outcome, which is the amount of capital raised beyond the minimum funding target (Coakley et al., 2022c). This implies a combined signalling effect of funding target and company's pre-money valuation, thus a higher target and higher valuation are valuable signals of entrepreneurs' intentions.

2.3.1.4 Minimum ticket

The minimum ticket is the lowest amount of money an individual can invest in a campaign and is a highly visible signal on the campaign page (Lukkarinen et al., 2016). The minimum ticket size is decided by the platforms (in consultation with the fundraisers) and varies between those imposing small to very large minimum ticket amount (Hornuf & Schwienbacher, 2018a). Nevertheless, these are campaign specific and result from discussions between the fundraisers and the platform. Campaigns with a lower ticket size encourage investors to invest as it requires less liquid capital and risk smaller amounts, appealing to the less wealthy investors, and therefore, encouraging more investors to participate (Hornuf & Schwienbacher, 2018a); which is in tune with the logic of more democratized finance and the enlargement of the circle of potential investors (Butticè & Vismara, 2022; Wroldsen, 2013). A higher minimum investment ticket, in contrast, is a costly signal, raising the bar for most ECF investors, thus imposing self-restriction

on the supply of capital. Higher minimum ticket signals the founder's confidence in reaching the funding goal with fewer wealthy and perhaps sophisticated investors (Hornuf & Schwienbacher, 2017, 2018b; Schwienbacher, 2019).

Most previous studies found a negative association between the minimum ticket and the propensity of ECF investors to invest. Therefore, ECF investors are more motivated to invest in campaigns offering lower minimum ticket size. That is reflected in campaign outcomes such as the number of investors and the amount raised (Hornuf & Schwienbacher, 2018a; Lukkarinen et al., 2016). In contrast, a positive effect of the minimum ticket was found on the total amount invested and success by Hervé et al. (2019). This result may be linked to some unique circumstances of the French social context as representing a lower social trust society (Delhey & Newton, 2005) and a higher power distance culture (Hofstede, 2001) when compared to other studies that were conducted in Germany, Finland and the USA. In such environments, high minimum ticket price may be viewed as a signal of lower risk thanks to the size of the project overall, and the exclusion of less sophisticated investors.

Overall, the ECF literature has addressed the role of signals conveying the entrepreneurs' commitment to the venture's long-term goals and its effect on campaign success (Vismara, 2016). These costly signals of entrepreneurs' intentions reduce information asymmetry, thus affecting investors' propensity to invest in ECF campaigns (Ahlers et al., 2015; Ralcheva & Roosenboom, 2020; Shafi, 2021; Vismara, 2016). Therefore, we expect investors to respond positively to such signals in their investment decisions.

However, investors differ in their decision-making and their emphasis on different signals. Since one-time and occasional investors are most likely to originate from the entrepreneurs' own social network, including family and friends (Agrawal et al., 2015; Angerer et al., 2017; Kuppuswamy & Bayus, 2018), they enjoy direct access to the entrepreneur. As a result, they may have greater access to private information regarding the investment, and hence will rely less on public signals than those without such access (Agrawal et al., 2015). Since most serial investors do not originate from the entrepreneurs' close social networks and do not hold private information, they might rely more on public signals of entrepreneurs' commitment than the one-time investors. Since earlier research has shown that both serial and occasional investors do not follow herding trends (Ferretti et al., 2021), we submit that both may exhibit greater concern for commitment signals than one-time investors. Thus, serial investors will exhibit stronger preferences for

entrepreneurs' commitment indicators than one-time and occasional investors. Accordingly, we hypothesize:

> **Hypothesis 1:** Serial and occasional investors will exhibit stronger preferences for ECF campaigns that present: (a) higher share of equity retained; (b) higher goal amounts; (c) higher pre-campaign valuations; and (d) higher minimum tickets; than one-time investors.

2.3.2. Prior validation

Various signals can address reputational deficits faced by new ventures and their teams. Successful engagement with external investors through an ECF campaign can enhance a company's legitimacy, acting as a costly signal of quality and success (Coakley et al., 2022b; Ralcheva & Roosenboom, 2020). Subsequent campaigns can capitalize on earlier gained legitimacy, implying prior scrutiny by investors and reducing adverse selection issues (Coakley et al., 2022b). Follow-on campaigns have a higher likelihood of success than initial ones (Ralcheva & Roosenboom, 2020) with research showing that the probability of a follow-on campaign succeeding is significantly higher than first-time campaigns. Coakley et al. (2022b) also found that the number of investors, equity offered, and valuation gained between campaigns significantly affect the success rate of follow-on campaigns.

Since one-time investors are likely to originate from the close social circles of the fundraiser, they are likely to be much fewer in follow-on campaigns, as most of them have already invested their 'love money' (Berger & Udell, 1998; Hornuf & Schmitt, 2016) in the first original campaign. However, occasional, and serial investors are likely to capture a larger share of investors in follow-up campaigns. While both investors may be interested in legitimacy gains, as well as in valuation increases between rounds, it is likely that serial investors may still find such campaigns less appealing than occasional investors. This is due to possible dilution of ownership as well as concerns about possible inability to raise funds from professional investors despite the validation awarded by a previous successful ECF campaign. Furthermore, serial investors are more likely to be interested in diversifying their portfolio and its associated risks rather than deepening their hold on risky assets. In line with the above, we hypothesize:

Hypothesis 2: Occasional investors will exhibit a stronger preference for firms running follow on campaigns, than serial and on-time investors.

2.3.3. Announced exit strategy

An exit strategy serves as a potential future opportunity to convert an investment into cash (Cumming et al., 2005; Harrison et al., 2016). Such strategy is also in tune with investor preferences for opportunities for swift withdrawal from the investment, which reduces the perceived risk associated with the investment (Cumming et al., 2005). Entrepreneurs' proclamation of a future exit strategy incurs no verifiable cost, and thus qualifies as a costless "cheap talk" signal (Austen-Smith & Banks, 2000; Bhattacharya & Dittmar, 2004). The literature, however, suggests that in noisy environments like ECF, costless signals can have an impact (Bafera & Kleinert, 2022; Connelly et al., 2011), particularly in situations where information is limited, a considerable portion of the audience is less sophisticated, and signals are simultaneous, limiting independent signal evaluation (Lin et al., 2013; Loewenstein et al., 2014; Steigenberger & Wilhelm, 2018).

In the context of ECF, signalling of an exit strategy had mixed results regarding its effect on investors. Studies found that campaigns indicating an exit strategy attract more investors and achieve higher funding success rates (Kleinert, 2023; Kleinert et al., 2020; Nitani et al., 2019). However, others found a negative effect on the number of investors which may be explained as viewing such plans as ‘cheap talk’ attracting fewer investors (Ahlers et al., 2015), or, alternatively, may suggest attracting fewer but larger investors because of an appealing ROI. Regardless of explanation, this finding is reserved to the very early days of equity crowdfunding, while research that followed seems to suggest that, overall, ECF campaigns exhibiting an exit strategy have a higher chance of succeeding in fundraising (Kleinert et al., 2020).

When considering different types of investors, Agrawal et al. (2015) suggested that investors with social ties to entrepreneurs view their investment more as an emotional commitment than a profit-oriented endeavor. Hence, prospects of ROI may represent a lesser concern for one-time investors than occasional and serial ones. Since serial investors represent the group that is least likely to have social

ties with the entrepreneurs, their investment primarily hinges on potential returns (Ferretti et al., 2021). Accordingly, we posit:

> **Hypothesis 3:** Serial investors will exhibit stronger preferences for ventures presenting an exit plan in their ECF campaign, than one-time and occasional investors.

2.3.4. Human capital

Prior studies emphasized the importance of the entrepreneur's human capital signals in the form of professional background, experience, qualities, and skills (Bafera & Kleinert, 2022; Kleinert, 2023; Mason & Stark, 2004). The literature shows that human capital is a costly signal to acquire (Colombo, 2021), and in conditions of information asymmetry, the venture's human capital is a valuable signal to potential investors (Cohen & Dean, 2005).

Studying VC's decision criteria, Muzyka et al. (1996) and Pintado et al. (2007) found that entrepreneurs' track records and leadership potential are essential to the venture's success. In addition, entrepreneurs' professional experience has a positive effect on ECF campaigns' success and the number of engaged investors (Barbi & Mattioli, 2019; Piva & Rossi-Lamastra, 2018). Overall, entrepreneurs' human capital was a significant predictor of investment decisions in ECF (Goethner et al., 2021b; Kleinert et al., 2020; Troise et al., 2022).

When considering different investors, those having prior social ties with the entrepreneurs know their merits, based on existing relations with them. Based on these relations they may enjoy access to private information regarding the investment opportunity. However, even when private information may not contain special clues about investment prospects, it may also be overshadowed by emotional and relational commitments such investors may feel towards the fundraisers still compelling them to invest. At the same time, investors without prior social ties with the fundraisers will base their investment decisions on public signals regarding the entrepreneurial team members' formal qualities and qualifications. Accordingly, one can expect that serial and occasional investors may be more concerned with formal qualifications of the entrepreneur, than members of their close social circle. Therefore, we put forward the following hypothesis:

Hypothesis 4: Serial and occasional investors will exhibit stronger preferences for better human capital qualifications of the entrepreneur than one-time investors.

3. Data and methodology

3.1. Data and sample description

3.1.1. The PipelBiz platform

Israel represents a relevant setting for our study as it has a growing and established ECF market (Efrat et al., 2020). Our dataset consists of investor- and campaign level data, consisting of a complete set of 14,130 investment decisions made by 8,732 unique investors in 49 technology-based ventures' ECF campaigns which ran between July 2018 and December 2020 on the Israeli ECF platform PipelBiz. All data used was received directly from the platform. Pipelbiz began operations in 2015, offering only securities to limited and accredited investors. However, in 2018 the platform was authorized to operate as an Offering Coordinator, thus allowing privately held companies to openly offer shares to unaccredited investors. The platform operates under the all-or-nothing model, implying that fundraising ventures will only receive the raised capital if the funding goal is reached (Cumming et al., 2020). All shares offered through the PipelBiz platform are categorized as common shares and the minimum investment amount is set by the platform itself. In addition, the platform clearly states that the fundraising company pre-money valuation is set solely by the company and is not based on external auditing. In 2020, it was reported that PipelBiz had raised more than $20M for early-stage ventures since its establishment (Sasson, 2020).

3.1.2. Investors' portfolio size

Investors vary in their ECF portfolio size as indicated by the number of investments they made on the PipelBiz platform. Figure 1 shows investors' portfolio size, frequencies, and the total number of investments made by 8,732 unique investors. 72% of investors (6,310) made one investment only, accounting for 44% of the total investments made in our sample. 15% (1,282) of investors made two investments, accounting for 18% (2,564) of the total investments made.

6% (521) of investors made three investments, accounting for 11% (1,563) of the total investments. 3% (231) made four investments in ECF campaigns, accounting for 6% (924) of the total investments, and 1% (139) made five investments during that period, accounting for 5% (695) of the total investments made.

Regarding the three investigated groups, 72% (6,310) of investors were one-time investors. Occasional investors account for 25% (2,173) of investors, made in total 5,746 investments. Serial investors account for 3% (249) of our sample made in total of 2,074 investments, representing 15% of the total investments (see Table 1).

The majority of investors in our sample are male (83.9%), and the one-time investors' group had 1129 female investors, which is the highest compared to the other groups (17.9%). The average investor's age is 39 years.

3.1.3. Campaigns' characteristics

All campaign-level data for the 49 campaigns were received from Pipelbiz. 69% (33) of the campaigns were successful in reaching the desired goal, while 31% (16) failed. The highest funding ratio a successful campaign achieved was 1219%, raising capital from 414 investors, while the lowest funding ratio of a successful campaign was 103%, raising capital from 163 investors. The highest number of investors per successful campaign was 1,116, while the lowest number of investors in a successful campaign was 109. As shown in Table 1, the average campaign in our sample targeted $200,452 and offered, in exchange, an average of 2.78% of the equity in the company. The average pre-money company valuation was above $29m, and the average minimum amount for investment was more than $215. 28% of the campaigns mentioned having an exit strategy, and 20% were follow-on campaigns. Regarding the entrepreneurial team experience and education, 95.2% had at least one team member with professional experience, 87% had industry experience, 70% had specific industry experience, and 85% had entrepreneurial experience.

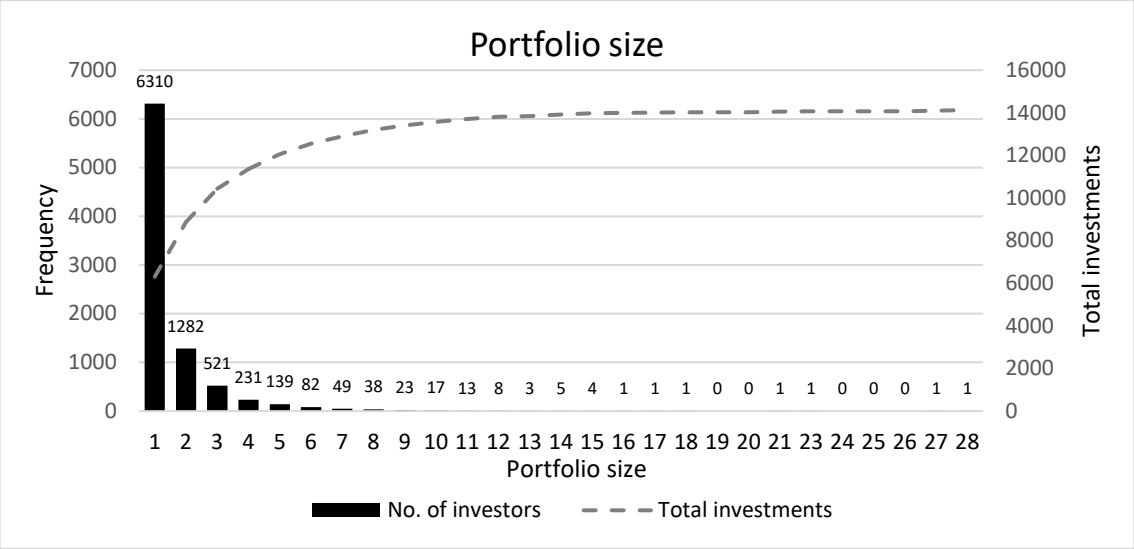

Figure 1. Portfolio sizes by frequency

Table 1: Descriptive statistics

Variables	N	Mean	Std. Deviation	Min	Max
Investors' activity level					
Total investments made	14130	1.618	1.523	1	28
Total no. of investors	8732				
Group A: One-time investors	6310 (72.3%)	1	0.000	1	1
Group B: Occasional investors	2173 (24.9%)	2.644	0.909	2	5
Group C: Serial investors	249 (2.9%)	8.329	3.198	6	28
Venture quality					
Min ticket (USD)	8732	215.219	164.365	118.740	713.867
Target min (USD)	8732	200452.502	89568.212	14271.646	342519.516
Company valuation (USD)	8732	29534509.588	15061557.034	2849600	70000000
Min Equity Offered (%)	8732	2.784	2.237	0.048	13.150
Announced exit strategy					
Planned exit (1/0)	8732	0.287	0.452	0	1
Prior validation					
Follow-on campaign (1/0)	8732	0.205	0.404	0	1
Human capital criteria					
Team members (number)	8732	6.137	3.007	2	10
Professional experience (1/0)	8732	0.952	0.213	0	1
Industry experience (1/0)	8732	0.866	0.341	0	1
Industry education (1/0)	8732	0.699	0.459	0	1
Entrepreneurial experience (1/0)	8732	0.847	0.360	0	1
Control & demographic variables					
Company age (days)	8732	1791.542	1806.537	17	6496
Gender (0=male)	7847	0.161	0.368	0	1
Investor's age (years)	8701	38.966	14.610	17	85

3.2. Model variables

Table 1 presents descriptive statistics of the model variables. All companies raising capital on the PipelBiz platform present information regarding the campaign's fundraising goal, equity offered, minimum investment amount, and the proposed idea. Additionally, the company discloses information regarding its pre-money

valuation, date of company establishment, team members' characteristics and experience.

To evaluate the emphasis investors place on the minimum amount of capital a company targets in a campaign, we include a continuous variable: target minimum (Hervé et al., 2019; Piva & Rossi-Lamastra, 2018; Shafi, 2021; Vismara, 2016). To capture the effect of the minimum ownership share offered by the entrepreneurs, we use the variable min equity (Coakley et al., 2022c; Mohammadi & Shafi, 2018; Vismara, 2016). The variable min ticket was used to evaluate the effect of the minimum amount an investor needs to invest in a campaign (Hervé et al., 2019; Lukkarinen & Schwienbacher, 2023; Lukkarinen et al., 2016). The company pre-money valuation captures indicators about the firm's developmental status and growth prospects to investors (Coakley et al., 2022c; Estrin et al., 2022; Johan & Zhang, 2022). To capture entrepreneurs' intentions, we added the planned exit, a binary variable reflecting whether such plans were mentioned in the campaign or not (Ahlers et al., 2015; Kleinert & Volkmann, 2019; Vismara, 2016). The variable follow-on campaign is also a binary variable to study investors' preferences towards previously validated campaigns (Coakley et al., 2022b; Estrin et al., 2022; Ralcheva & Roosenboom, 2020).

Moreover, we have operationalized five variables to capture the effects of the entrepreneurial team's human capital on investors' decisions. The number of team members was added to capture the amount of human capital (Ahlers et al., 2015; Barbi & Mattioli, 2019; Troise et al., 2022). Professional experience (Barbi & Mattioli, 2019; Kleinert, 2023; Piva & Rossi-Lamastra, 2018); industry experience (Barbi & Mattioli, 2019; Piva & Rossi-Lamastra, 2018; Shafi, 2021); industry education (Piva & Rossi-Lamastra, 2018); and entrepreneurial experience (Piva & Rossi-Lamastra, 2018) are all captured as binary variables reflecting the quality of human capital.

As controls, we include company age, calculated as the difference (in days) between the date the company was established and the date the campaign started (Barbi & Mattioli, 2019; Estrin et al., 2022; Ralcheva & Roosenboom, 2020). Data on investors' age (continuous) and gender (binary) was received from the Pipelbiz platform.

4. Empirical results

To test our hypotheses, we conducted two statistical analyses. We start by testing our hypotheses by using the Kruskal-Wallis non-parametric test to compare the difference in the emphasis investors place on each of the investment criteria between the three groups of investors. This was followed by a multinomial logistic regression (MLR) predicting the probability of investors belonging to each of the groups (compared to another). Table 2 presents the results of the non-parametric test and table 3 presents the results of the multinomial logistic regression. Table 4 (in the appendix) presents correlations between all independent variables. No multicollinearity issues were found, as all variables are well within the 0.7 level or lower.

4.1. Entrepreneur intentions' signals

Minimum ticket mean values were significantly lower ($p<0.001$) for the one-time investors ($203.448) compared to both occasional ($238.811) and serial investors ($4307.611). Additionally, the MLR results showed that higher low minimum ticket, significantly predicted higher probability to belong to either the occasional ($B=0.001$, $p<0.001$) or serial group ($B=0.002$, $p<0.001$), over the one-time group. Hence, H1(d) is supported.

The average minimum target in the one-time investors' group ($203,858.561) was significantly higher ($p<0.001$) than the average minimum target in the occasional investors' group ($190,553.090). However, no significant difference was recorded between one-time and serial investors. An MLR revealed that the minimum target did not significantly predict investors' probability to belong to either group of investors. Hence, only partially supporting H1(b).

Furthermore, one-time investors were found to have investments with a significantly lower average valuation than the ones in both occasional and serial investors' portfolios ($p<0.001$). The average pre-money valuation of a company in the one-time group was about $28.4m, $32.4m in the occasional, and $32.9m in the serial group. The MLR, however, revealed that company valuation did not significantly predict investors association to either group. Hence, again only partly supporting H1(c).

Table 2: Three-groups descriptive statistics and Kruskal-Wallis Test

Variables	Mean values (SD)			Kruskal-Wallis test and pairwise comparisons				
	Group A: One-time *(n=6310)*	Group B: Occasional *(n=2173)*	Group C: Serial *(n=249)*	*H* Value [ab]	A↔B Test Statistic (effect size)[ac]	B↔C Test Statistic (effect size)[ac]	A↔C Test Statistic (effect size)[ac]	Mean differences[d]
Venture quality								
Min ticket (USD)	203.448	238.811	307.611	112.710 ***	-615.335 ***	-188.193	-803.528 ***	A<B; A<C
	(147.642)	(190.961)	(245.410)		(0.562)	(0.584)	(0.748)	
Target min (USD)	203858.561	190553.090	200529.543	33.366 ***	343.278 ***	-195.695	147.583	A>B
	(88530.028)	(92340.172)	(84975.586)		(0.411)	(0.595)	(0.302)	
Valuation (USD)	28395655.714	32457752.744	32883748.803	106.253 ***	-617.557 ***	168.453	162.677 ***	A<B; A<C
	(14640467.764)	(15727845.163)	(15749636.386)		(0.563)	(0.545)	(0.658)	
Min equity (%)	2.903	2.453	2.663	84.119 ***	570.358 ***	-249.013	321.345	A>B
	(2.277)	(2.091)	(2.136)		(0.538)	(0.679)	(0.453)	
Announced exit								
Planned exit (1/0)	0.266	0.330	0.430	58.116 ***	-279.561 ***	-435.553 **	-715.115 ***	A<B<C
	(0.442)	(0.470)	(0.496)		(0.371)	(0.700)	(0.938)	
Validation								
Follow-on campaign	0.181	0.275	0.205	87.497 ***	-410.017 ***	305.254 *	-104.763	A<B; B>C
(1/0)	(0.385)	(0.446)	(0.404)		(0.453)	(0.758)	(0.256)	
Human capital criteria								
Team members (#)	5.942	6.607	6.988	96.086 ***	-530.465 ***	-357.683 +	-888.148 ***	A<B; A<C
	(2.960)	(3.075)	(3.010)		(0.519)	(0.834)	(0.792)	
Professional exp (1/0)	0.949	0.958	0.980	7.191 *	-39.268	-95.167	-134.435	n.s.
	(0.220)	(0.200)	(0.141)		(0.140)	(0.407)	(0.290)	
Industry exp	0.856	0.888	0.936	25.334 ***	-141.408 ***	-207.690	-349.099**	A<B; A<C
(1/0)	(0.351)	(0.315)	(0.246)		(0.262)	(0.614)	(0.473)	
Industry education	0.682	0.739	0.791	35.225 ***	-248.768 ***	-227.443	-476.212 **	A<B; A<C
(1/0)	(0.466)	(0.439)	(0.407)		(0.349)	(0.646)	(0.560)	
Entrepreneurial exp	0.844	0.851	0.888	3.835	-29.865	-160.026	-189.891	n.s.
(1/0)	(0.363)	(0.356)	(0.317)		(0.121)	(0.534)	(0.346)	
Control & demographic variables								
Company age (days)	1755.428	1901.075	1750.823	3.827	-53.672	324.624	270.952	n.s.
	(1743.034)	(1959.240)	(1961.604)		(0.163)	(0.786)	(0.414)	
Gender (0=male)	0.179	0.115	0.112	49.767 ***	254.245 ***	9.222	263.467 *	A>B; A>C
	(0.384)	(0.318)	(0.316)		(0.352)	(0.117)	(0.408)	
Investor's age (years)	38.902	38.687	43.004	19.272 ***	46.778	-733.178 ***	-686.400 ***	C>A; C>B
	(14.552)	(14.616)	(15.467)		(0.146)	(1.320)	(0.684)	
Population (%)	72.3	24.9	2.9					
Avg. no. of investment	1	2.644	8.329					
		(0.909)	(3.198)					

[a] ***p<0.001; **p<0.01; *p<0.05 +p<0.1; [b] Test statistic is adjusted for ties. [c] Significance values have been adjusted by the Bonferroni correction for multiple tests. [d] p<0.05

Table 3: Multinomial logistic regression analyses of predicting Investors preferences

	Group B versus A		Group C versus A		Group B versus C	
Predictors	B	S.E. (B)	B	S.E. (B)	B	S.E. (B)
Model 1						
Min Ticket (USD)	0.001***	0.000	0.002***	0.000	-0.002***	0.000
Target min (USD)	0.000***	0.000	0.000	0.000	0.000*	0.000
Valuation (USD)	0.000***	0.000	0.000*	0.000	0.000	0.000
Min Equity (%)	-0.016	0.016	0.032	0.043	-0.049	0.045
Model 2						
Planned exit (1/0)	0.307***	0.054	0.732***	0.131	-0.425**	0.136
Model 3						
Follow-on campaign (1/0)	0.540***	0.058	0.154	0.160	0.386*	0.164
Model 4						
Team members (#)	0.082***	0.010	0.099***	0.026	-0.017	0.027
Professional exp (1/0)	-0.084	0.155	0.111	0.551	-0.195	0.563
Industry exp (1/0)	0.240*	0.115	0.667^{+}	0.359	-0.427	0.369
Industry Edu. (1/0)	0.117^{+}	0.063	0.272	0.173	-0.155	0.179
Entrepreneurial exp (1/0)	-0.429***	0.100	-0.467^{+}	0.267	0.038	0.275
Model 5						
Company age (days)	0.000^{+}	0.000	0.000	0.000	0.000	0.000
Gender (0=male)	-0.527***	0.079	-0.691**	0.222	0.164	0.230
Investor's age (years)	0.001	0.002	0.021***	0.005	-0.020***	0.005
Model 6						
Min Ticket (USD)	0.001***	0.000	0.002***	0.000	-0.001*	0.000
Target min (USD)	0.000	0.000	0.000	0.000	0.000	0.000
Valuation (USD)	0.000	0.000	0.000	0.000	0.000	0.000
Min Equity (%)	0.002	0.018	0.074	0.053	-0.072	0.055
Planned exit (1/0)	-0.003	0.083	0.143	0.242	-0.145	0.248
Follow-on campaign (1/0)	0.523***	0.125	0.315	0.357	0.208	0.366
Team members (#)	0.042**	0.015	0.035	0.040	0.007	0.042
Professional exp (1/0)	0.548**	0.194	0.939	0.670	-0.391	0.685
Industry exp (1/0)	0.286*	0.126	0.533	0.380	-0.247	0.391
Industry Edu. (1/0)	0.018	0.071	0.178	0.210	-0.160	0.216
Entrepreneurial exp (1/0)	-0.508	0.123	-0.568	0.322	0.060	0.332
Company age (days)	0.000***	0.000	0.000	0.000	0.000	0.000
Gender (0=male)	-0.509***	0.080	-0.622**	0.223	0.113	0.231
Investor's age (years)	0.002	0.002	0.018***	0.005	-0.016**	0.005

Goodness-of-fit test for Model 1 Deviance $X^2_{88} = 259.144$ ($p = >0.001$); Model 2 Deviance n/a; Model 3 Deviance n/a; Model 4 Deviance $X^2_{38} = 90.221$ ($p<0.001$); Model 5 Deviance $X^2_{4938} = 4083.042$ ($p = 1.000$); Model 6 Deviance $X^2_{4916} = 3842.141$ ($p = 1.000$); $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

With respect to minimum equity on offer, we find it to be significantly higher in the one-time investor group (2.9%) compared to the occasional investor group (2.45%) (p<0.001), and no significant difference between one-time and serial investors. In examining the association between minimum equity and belonging to

one of the investors' groups, the MLR showed no statistical significance. This indicates that at a single variable level, one-time investors prefer investing in campaigns where entrepreneurs retain less of the equity, while on a multiple variable level, it seems that other variables have stronger effect on investors' decisions. Hence, again, only partially supporting H1(a).

4.2. Prior validation signals

The variable follow-on campaign was used to measure whether investors respond differently to the existence of a previous campaign led by the same company. Significant differences were found between one-time and occasional investors ($p<0.001$(, and between occasional and serial investors ($p=0.029$). On average, 18% of the one-time investors chose to invest in follow-on campaigns, compared to 27% of occasional investors, and 20% of serial investors. An MLR analysis revealed that the variable follow-on campaign is a strong predictor of belonging to the occasional versus the one-time investors' group ($B=0.523$, $p<0.001$), while no significance association was found between other groups. This indicates that one-time investors are inclined to invest in the company's first ECF round, and occasional tend to invest once the company gained legitimacy. The evidence partly supports H2.

4.3. Announced exit strategy

The average campaign mentioning a future exit opportunity was significantly lower for one-time investors (27%) than for occasional investors (33%) ($p<0.001$), and serial investors (43%) ($p=0.003$). Furthermore, it was also higher for serial investors than occasional investors ($p<0.01$). The MLR analysis, however, revealed no association between this indicator and belonging to one of the groups. The results indicate that while measuring on a single variable level, exit strategy seems to have a significant effect on investors' activity level, while when controlling for other indicators, this becomes irrelevant. These results only partly support H3.

4.4. Human Capital

Several indicators were used to capture human capital signals. First, the number of team members mentioned in a campaign was significantly different between ventures invested by one-time investors (5.9 team members) and occasional investors (6.6 team members) ($p<0.001$). Furthermore, the serial investors' group exhibited preference for even larger teams (7 team members), representing significant differences from one-time investors ($p<0.001$), and from occasional investors although to a lesser extent ($p<0.1$). The MLR showed that a ventures' number of team members is a strong and significant predictor of belonging to the occasional over the one-time investors' group ($B=0.042$, $p<0.01$), while no association was found between other groups. This shows that the more active investors positively respond and base their decisions to invest on ventures' team size quality signal. Supporting the understanding that companies with larger management teams possess higher human capital (Baum & Silverman, 2004).

Second, in terms of the average professional experience of the venture team, we don't find significant differences between the groups of investors. Conversely, the MLR shows that professional experience is a positive and significant predictor of investors belonging to the occasional investor group versus the one-time group ($B=0.548$, $p<0.01$). This, again, implies that one-time investors are less concerned with the venture's team experience while more active investors read it as a quality signal that may predict success. Third, when examining differences in terms of industry experience levels among team members, we find significant differences between one-time investors and the rest. More specifically, these investors invest in ventures with significantly lower levels of industry experience than ventures invested by both occasional ($p<0.001$) and serial investors ($p<0.01$). Additionally, the MLR exhibits that industry experience is a positive and significant predictor of investors belonging to the occasional over the one-time investors' group ($B=0.286$, $p<0.05$). The results strengthen prior knowledge regarding the importance investors place on teams' experience.

Fourth, with respect to the education level of team members, we again find that one-time investors invest in ventures with significantly lower levels of industry education than ventures invested by both occasional ($p<0.001$) and serial investors ($p<0.01$). MLR results, however, show no significant prediction in the probability of belonging to one of the groups. Finally, when examining entrepreneurial

experience levels in venture teams, we find no significant differences or association between groups. The results show that investors do not interpret education and past entrepreneurial experience as a predictor for the venture success. This could be due to Israel being strongly associated with its innovation-driven entrepreneurial activity and entrepreneurs' high social status (GEM, 2018; Menipaz et al., 2023). The high social status of entrepreneurs might have a double-edged effect, seen by investors as 'cheap talk', thus depreciating the perceived effect of entrepreneurs' experience on venture success prospects.

Hence, overall, we find partial support for H4 depending on the measure used. The hypothesis is confirmed if measuring the difference in average human capital by team size, industry experience and education levels. However, the hypothesis is rejected when measuring human capital by levels of work and entrepreneurial experiences. Here, human capital factors as predictors of belonging to one of the investor groups suggest that team size, professional experience, and industry experience are positive and significant predictors of investors investing in more than one investment.

4.5. Investors' mobility between groups

In this study, we test our hypothesis based on investors' portfolio size by the end of 2020. This has the potential to bias our results due to the dynamic nature of investors' investment decisions, implying that all occasional or serial investors started as one-time investors. To achieve a better understanding of investors' behaviour and investment dynamics, we divided our sample into two sub-samples: before and after October 2019, which is the mid-point of the dataset timeframe. We focus on the first sample to understand how investors' investment evolve over time. The sample is comprised of 4,467 unique investors, of which 3,416 (76.5%) are one-time investors, 971 (21.8%) are occasional investors and 80 (1.7%) belong to the serial group. In comparing the first sample with the full one, we see that 415 (9.3%) of the one-time investors became occasional investors, and 20 investors (0.4%) became serial during the second half of our sample's timeframe. The low mobility of investors between groups and especially one-time investors becoming occasional or serial investors strengthens our understanding that individual investors differ in their decision-making criteria as reflected in their portfolio size.

These differences may be based on investors' personalities and preferences, opposing to just evolution over time.

5. Discussion and conclusion

In the current study, we sought to examine how various signals influence investors' decision-making differently, based on their relative portfolio size. Overall, we find evidence that ECF investors react to signals of venture quality, while signals of entrepreneurs' intentions play a lesser role in investors' decisions to expand their portfolio size beyond one investment. Quality signals in our study include human capital and prior validation signals, both considered as costly to acquire and verifiable (Bhattacharya & Dittmar, 2004). We operationalize costly entrepreneurs' intentions signals by their imposed self-restriction on the supply of capital to the campaign (Hornuf & Neuenkirch, 2017). These signals were found to have no significant effect on investors portfolio size decisions. Costless intentional signals such as statements about a potential exit strategy, were found to be nonsignificant, supporting Anglin, et al.'s (2018) view that in situations where costly and objective information is available, investors will rely less on costless signal, that might be seen as 'cheap talk' (Austen-Smith & Banks, 2000).

Second, this study provides evidence that ECF investors are not a homogeneous group, while differing in the emphasis they place on different signals and investment decision-making criteria. Specifically, we show that ECF investors with different levels of investment experience and portfolio size differ in their relative preferences. As such, our results contribute to the literature on investor behaviour in ECF (Lukkarinen et al., 2022; Nguyen et al., 2019; Shafi, 2021; Zafar et al., 2021) and the growing body of literature on the heterogeneity of ECF investors and its implications (Feola et al., 2021; Ferretti et al., 2021; Goethner et al., 2021b; Hornuf et al., 2022; Wallmeroth, 2019).

Our findings support and suggest further nuance to prior studies showing association between entrepreneurs' human capital and investment decisions (Barbi & Mattioli, 2019; Piva & Rossi-Lamastra, 2018). More specifically, our results indicate that ventures with larger teams that have greater industry and professional experience levels are preferred. These indicators significantly predict investors' belonging to the occasional investors over the one-time investors. This again links to one-time investors' likely origination from the fundraiser's close social circle,

which may be less concerned with the formal credentials of an entrepreneur they know personally. Other indicators such as industry, education and entrepreneurial experience were found to have no influence on investors' activity level. This latter finding may be explained by a need for a certain minimum level of human capital to influence the extent of investment (as in amount), which helps distinguish between symbolic and utilitarian investments by single-time investors. Accordingly, team size and industry background may be viewed as added benefits which are preferred by more active investors.

We find that signals associated with venture quality significantly differ between groups. Here, our findings support literature implying that one-time investors either have private information about the venture thanks to relations with the entrepreneur or invest for non-financial reasons such as commitment to relationship with the entrepreneur, and therefore rely less on public signals in their decision-making (e.g., Agrawal et al., 2015; Angerer et al., 2017; Kuppuswamy & Bayus, 2018). Specifically, the average minimum ticket was found to be significantly lower for the one-time investors compared to both occasional and serial investors and was found to be a significant predictor of the probability of belonging to one of the groups. Suggesting that even when accounting for the private information investors have, close friends and family will be either reluctant or unable to invest when barriers to entry are high. This supports the notion of love money in one-time investments by members of close social circle, often representing adherence to relational expectations and commitments than strategic financial thinking (Hornuf et al., 2022). A high entry ticket, however, attracts occasional and serial investors interpreting this signal as indicator of the founder's confidence in reaching the funding goal with fewer wealthy and perhaps sophisticated investors (Hornuf & Schwienbacher, 2017; Schwienbacher, 2019), that can also contribute from their experience and expertise (Wald et al., 2019).

Furthermore, prior validation by investors in a previously successful campaign was shown to influence investors decisions (Coakley et al., 2022b; Kleinert, 2023; Ralcheva & Roosenboom, 2020). We show that the signal significantly predicts investors' belonging to the occasional investors group versus the one-time investors. One-time investors' limited engagement in follow-up campaigns is likely to result from a situation where most of them participated in the original campaign, where their symbolic contribution for relational commitments was already made. Thus, occasional investors might be searching for opportunities with lower risk

levels. The lower share of follow-up campaigns in serial investors may be a result of their concern with dilution effects or interpretation of the campaign as failure to receive funding from traditional investors despite validation effects of the successful original campaign.

Looking across investor groups, the results suggest there are more similarities than differences between occasional and serial investors in terms of their investment decision-making criteria. And that these, however, are statistically different from the one-time investors' decisions. This can be explained either by the relative young nature of the ECF industry (Lukkarinen et al., 2022) where sophisticated investors did not have sufficient time to build up large portfolios of ECF investments, and hence fall both within the occasional and serial investor categories. Accordingly, clearer distinctions between these two groups may be easier to observe as the industry further develops, and the passage of time better allows certain occasional investors to move into the serial category.

Finally, our study supports the shift from treating ECF investors as a homogenous group and suggests that, at minimum, a clear distinction can be made between one-time and serial investors, as these exhibit significantly different preferences in their investment decision criteria. Moreover, we have outlined four critical types of signals towards which these groups of investors exhibit different preferences, including signals of venture quality and entrepreneurs' intentions.

5.1. Limitations and future research

The limitations of this study offer opportunities for future research. First, our sample was comprised of investors from one ECF platform. As many platforms have some industry specialization and therefore attract different types of investors (Cerpentier et al., 2022; Coakley et al., 2022a), future studies are encouraged to include multiple platforms to generalize the results. Second, investors in our sample are from Israel, which is a country exhibiting unique social and economic characteristics regarding its attitude towards entrepreneurship and entrepreneurial activity (Bosma et al., 2021). Therefore, future research may consider similar analyses in less entrepreneurially oriented markets. Third, while we build on earlier research associating single-time investors with members of the fundraisers' close social circle (Agrawal et al., 2015; Angerer et al., 2017; Kleinert et al., 2020), we do not test this assumption as we do not have access to such data. Indeed, single

time investors may be a more mixed group that involves random experimenters with ECF more broadly, as well as investors with niche interests in niche sectors and technologies. Accordingly, future research may combine primary data from investors or fundraisers about the nature or their relations at the time of campaign launch while further disaggregating the single-time investor group. Finally, we interpret investor preferences indirectly from characteristics of the campaigns in which they have invested in. Future research may confront such insights with primary data collection directly from investors, either qualitatively or quantitatively, to confirm our assumptions and ensure that our statistical results do not camouflage other effects that may be in place.

5.2. Implications for theory

The study provides further evidence for the merit of Signalling theory in explaining investor behaviour in ECF. It suggests ways in which campaign indicators are interpreted as signals by prospective ECF investors, and that costly quality signals influence investors' decision making while costless intentional signals do not. However, these interpretations also influence investors' behaviour differently. Such insight implies that signals' effects are not universal and depend on the relative importance assigned to them by different decision-makers faced with the same opportunity. From a theoretical perspective, this suggests that signalling theory may require combination with additional theories for explaining concrete decision-making actions. And such additional theories should reflect heterogeneity in decision-makers.

In the current study, we use portfolio size as a basis for acknowledging heterogeneity among ECF investors, as the decision makers in our analysis. Such heterogeneity was linked to several theories such as social and human capital theories. Social capital was considered with respect to the entrepreneurs' own social relations, as helping them to unlock resources from single-time investors, while human capital of investors as related to investment experience or savviness was seen as critical differentiator when interpreting venture quality and entrepreneurial intentions' signals. This implies that signal interpretation is filtered through prisms of social and human capital, and hence exerting different influences on different investors.

5.3. Implications for practice

Our findings inform both equity fundraisers' campaign design, as well as ECF platform developments. Fundraisers planning to run ECF campaigns may recognize the importance of segmenting different groups of investors and tailoring their promotional messaging and campaign content accordingly. More specifically, careful consideration of entrepreneurs' intentions and venture quality indicators, such as the presentation of exit plans, large and diversified teams, as well as stressing their industry experience and education, while appealing to all, may be especially effective in attracting serial investors. Furthermore, entrepreneurs running follow-on campaigns may invest more in converting some of the one-time investors from their first campaign into occasional investors. Finally, with respect to platform operators, our study may inform campaign page design, as well as messaging functionalities through automatic extraction and visualization of the most relevant influential information. Such visualizations and key indicators can be framed into information distributed to different members of their existing investors' network and differentiated based on their investment records.

6. References

Agrawal, A., Catalini, C., & Goldfarb, A. (2015). Crowdfunding: Geography, social networks, and the timing of investment decisions. Journal of Economics & Management Strategy, 24(2), 253-274. https://doi.org/10.1111/jems.12093

Agrawal, A., Catalini, C., & Goldfarb, A. (2016). Are syndicates the killer app of equity crowdfunding. California Management Review, 58, 111-124. https://doi.org/10.1525/cmr.2016.58.2.111

Ahlers, G. K. C., Cumming, D., Günther, C., & Schweizer, D. (2015). Signaling in equity crowdfunding. Entrepreneurship Theory and Practice, 39(4), 955-980. https://doi.org/10.1111/etap.12157

Angerer, M., Brem, A., Kraus, S., & Peter, A. (2017). Start-up funding via equity crowdfunding in Germany: a qualitative analysis of success factors. The Journal of Entrepreneurial Finance 19(1), 1-34. http://dx.doi.org/10.57229/2373-1761.1290

Anglin, A. H., Short, J. C., Drover, W., Stevenson, R. M., McKenny, A. F., & Allison, T. H. (2018). The power of positivity? The influence of positive psychological capital language on crowdfunding performance. Journal of Business Venturing, 33(4), 470-492. https://doi.org/10.1016/j.jbusvent.2018.03.003

Austen-Smith, D., & Banks, J. S. (2000). Cheap talk and burned money. Journal of Economic Theory, 91(1), 1-16. https://doi.org/10.1006/jeth.1999.2591

Bafera, J., & Kleinert, S. (2022). Signaling theory in entrepreneurship research: A systematic review and research agenda. Entrepreneurship Theory and Practice, 10422587221138489. https://doi.org/10.1177/10422587221138489

Barbi, M., & Mattioli, S. (2019). Human capital, investor trust, and equity crowdfunding. Research in International Business and Finance, 49, 1-12. https://doi.org/10.1016/j.ribaf.2019.02.005

Baum, J. A., & Silverman, B. S. (2004). Picking winners or building them? Alliance, intellectual, and human capital as selection criteria in venture financing and performance of biotechnology startups. Journal of Business Venturing, 19(3), 411-436. https://doi.org/10.1016/S0883-9026(03)00038-7

Berger, A. N., & Udell, G. F. (1998). The economics of small business finance: the roles of private equity and debt markets in the financial growth cycle. Journal of Banking & Finance, 22(6-8), 613-673. https://doi.org/10.1016/S0378-4266(98)00038-7

Bhattacharya, U., & Dittmar, A. (2004). Costless versus costly signaling in capital markets: Theory and Evidence. FIRS Conference on Banking, Insurance and Intermediation in Capri in May 2004,

Boreiko, D., & Risteski, D. (2021). Serial and large investors in initial coin offerings. Small Business Economics, 57(2), 1053-1071. https://doi.org/10.1007/s11187-020-00338-8

Bosma, N., Hill, S., Ionescu-Somers, A., Kelley, D., Guerrero, M., & Schott, T. (2021). GEM global report 2020/2021. L. B. School. https://www.gemconsortium.org/report/gem-20202021-global-report

Brown, R., Mawson, S., & Rowe, A. (2019). Start-ups, entrepreneurial networks and equity crowdfunding: A processual perspective. Industrial Marketing Management, 80, 115-125. https://doi.org/10.1016/j.indmarman.2018.02.003

Busenitz, L. W., Fiet, J. O., & Moesel, D. D. (2005). Signaling in venture capitalist—New venture team funding decisions: Does it indicate long–term venture outcomes? Entrepreneurship Theory and Practice, 29(1), 1-12. https://doi.org/10.1111/j.1540-6520.2005.00066.x

Butticè, V., & Vismara, S. (2022). Inclusive digital finance: the industry of equity crowdfunding. The Journal of Technology Transfer, 47(4), 1224-1241. https://doi.org/10.1007/s10961-021-09875-0

Capizzi, V., & Carluccio, E. M. (2016). Competitive frontiers in equity crowdfunding: the role of venture capitalists and business angels in the early-stage financing industry. In R. Bottiglia & F. Pichler (Eds.), Crowdfunding for SMEs (pp. 117-157). Palgrave Macmillan, London. https://doi.org/10.1057/978-1-137-56021-6_6

Cerpentier, M., Vanacker, T., Paeleman, I., & Bringmann, K. (2022). Equity crowdfunding, market timing, and firm capital structure. The Journal of Technology Transfer, 47(6), 1766-1793. https://doi.org/10.1007/s10961-021-09893-y

Coakley, J., Lazos, A., & Liñares-Zegarra, J. (2022a). Strategic entrepreneurial choice between competing crowdfunding platforms. The Journal of Technology Transfer, 47(6), 1794-1824. https://doi.org/10.1007/s10961-021-09891-0

Coakley, J., Lazos, A., & Liñares-Zegarra, J. M. (2022b). Seasoned equity crowdfunded offerings. Journal of Corporate Finance, 77, 101880. https://doi.org/10.1016/j.jcorpfin.2020.101880

Coakley, J., Lazos, A., & Liñares-Zegarra, J. M. (2022c). Equity crowdfunding founder teams: campaign success and venture failure. British Journal of Management, 33, 286-305. https://doi.org/10.1111/1467-8551.12494

Cohen, B. D., & Dean, T. J. (2005). Information asymmetry and investor valuation of IPOs: Top management team legitimacy as a capital market signal. Strategic management journal, 26(7), 683-690. https://doi.org/10.1002/smj.463

Colombo, O. (2021). The use of signals in new-venture financing: a review and research agenda. Journal of Management, 47(1), 237-259. https://doi.org/10.1177/0149206320911090

Connelly, B. L., Certo, S. T., Ireland, R. D., & Reutzel, C. R. (2011). Signaling theory: a review and assessment. Journal of Management, 37(1), 39-67. https://doi.org/10.1177/0149206310388419

Connelly, B. L., Hoskisson, R. E., Tihanyi, L., & Certo, S. T. (2010). Ownership as a form of corporate governance. Journal of Management Studies, 47(8), 1561-1589. https://doi.org/10.1111/j.1467-6486.2010.00929.x

Courtney, C., Dutta, S., & Li, Y. (2017). Resolving information asymmetry: Signaling, endorsement, and crowdfunding success. Entrepreneurship Theory and Practice, 41(2), 265-290. https://doi.org/10.1111/etap.12267

Cumming, D., Fleming, G., & Schwienbacher, A. (2005). Liquidity risk and venture capital finance. Financial Management, 34(4), 77-105. https://doi.org/10.1111/j.1755-053X.2005.tb00119.x

Cumming, D. J., Leboeuf, G., & Schwienbacher, A. (2020). Crowdfunding models: keep-it-all vs. all-or-nothing. Financial Management, 49(2), 331-360. https://doi.org/10.1111/fima.12262

Delhey, J., & Newton, K. (2005). Predicting cross-national levels of social trust: global pattern or Nordic exceptionalism? European sociological review, 21(4), 311-327.

Di Pietro, F., Grilli, L., & Masciarelli, F. (2023). Talking about a revolution? Costly and costless signals and the role of innovativeness in equity crowdfunding. Journal of Small Business Management, 61(2), 831-862. https://doi.org/10.1080/00472778.2020.1816435

Efrat, K., Gilboa, S., & Berliner, D. (2020). Israeli Crowdfunding: a reflection of its entrepreneurial culture. In Advances in Crowdfunding (pp. 341-372). Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-46309-0_15

Eisenhardt, K. M. (1989). Agency theory: An assessment and review. Academy of management review, 14(1), 57-74. https://doi.org/10.5465/amr.1989.4279003

Estrin, S., Gozman, D., & Khavul, S. (2018). The evolution and adoption of equity crowdfunding: entrepreneur and investor entry into a new market. Small Business Economics, 51(2), 425-439. https://doi.org/10.1007/s11187-018-0009-5

Estrin, S., Khavul, S., & Wright, M. (2022). Soft and hard information in equity crowdfunding: network effects in the digitalization of entrepreneurial finance. Small Business Economics, 58, 1761-1781. https://doi.org/10.1007/s11187-021-00473-w

Feola, R., Vesci, M., Marinato, E., & Parente, R. (2021). Segmenting "digital investors": evidence from the Italian equity crowdfunding market. Small Business Economics, 56, 1235-1250. https://doi.org/10.1007/s11187-019-00265-3

Ferretti, R., Venturelli, V., & Pedrazzoli, A. (2021). Do multiple competing offerings on a crowdfunding platform influence investment behavior? Journal of Behavioral and Experimental Finance, 30, 100506. https://doi.org/10.1016/j.jbef.2021.100506

GEM. (2018). Global Report 2017/18 M. G. Wellesley.

Goethner, M., Hornuf, L., & Regner, T. (2021a). Protecting investors in equity crowdfunding: An empirical analysis of the small investor protection act. Technological Forecasting and Social Change, 162, 120352. https://doi.org/10.1016/j.techfore.2020.120352

Goethner, M., Luettig, S., & Regner, T. (2021b). Crowdinvesting in entrepreneurial projects: disentangling patterns of investor behavior. Small Business Economics, 57(2), 905-926. https://doi.org/10.1007/s11187-020-00332-0 Harrison, R., Botelho, T., & Mason, C. (2016). Patient capital in entrepreneurial finance: a reassessment of the role of business angel investors. Socio-Economic Review, 14(4), 669-689. https://doi.org/10.1093/ser/mww024

Harrison, R., Mason, C., & Smith, D. (2015). Heuristics, learning and the business angel investment decision-making process. Entrepreneurship & Regional Development, 27(9-10), 527-554. https://doi.org/10.1080/08985626.2015.1066875

Harrison, R. T., & Baldock, R. (2015). Financing SME growth in the UK: meeting the challenges after the global financial crisis. Venture Capital, 17(1-2), 1-6. https://doi.org/10.1080/13691066.2015.1050241

Hervé, F., Manthé, E., Sannajust, A., & Schwienbacher, A. (2019). Determinants of individual investment decisions in investment-based crowdfunding. Journal of Business Finance & Accounting, 46(5-6), 762-783. https://doi.org/10.1111/jbfa.12372

Hofstede, G. (2001). Culture's consequences: Comparing values, behaviors, institutions and organizations across nations (2nd ed.). Sage Publications.

Hornuf, L., & Neuenkirch, M. (2017). Pricing shares in equity crowdfunding. Small Business Economics, 48, 795-811. https://doi.org/10.1007/s11187-016-9807-9

Hornuf, L., & Schmitt, M. (2016). Success and failure in equity crowdfunding. CESifo DICE Report, 14(2), 16-22.

Hornuf, L., Schmitt, M., & Stenzhorn, E. (2020). Does a local bias exist in equity crowdfunding? Max Planck Institute for Innovation & Competition Research Paper No. 16-07, CESifo Working Paper No. 8154. https://dx.doi.org/10.2139/ssrn.3555581

Hornuf, L., Schmitt, M., & Stenzhorn, E. (2022). The local bias in equity crowdfunding: behavioral anomaly or rational preference? Journal of Economics & Management Strategy, 31(3), 693-733. https://doi.org/10.1111/jems.12475

Hornuf, L., & Schwienbacher, A. (2017). Should securities regulation promote equity crowdfunding? Small Business Economics, 49(3), 579-593. https://doi.org/10.1007/s11187-017-9839-9

Hornuf, L., & Schwienbacher, A. (2018a). Internet-based entrepreneurial finance: lessons from Germany. California Management Review, 60(2), 150-175. https://doi.org/10.1177/0008125617741126

Hornuf, L., & Schwienbacher, A. (2018b). Market mechanisms and funding dynamics in equity crowdfunding. Journal of Corporate Finance, 50, 556-574. https://doi.org/10.1016/j.jcorpfin.2017.08.009

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of financial economics, 3(4), 305-360.

Johan, S., & Zhang, Y. (2022). Investors' industry preference in equity crowdfunding. The Journal of Technology Transfer, 47, 1737–1765. https://doi.org/10.1007/s10961-021-09897-8

Kelly, P. (2007). Business Angel Research: The Road Traveled and the Journey Ahead, Chapters. In Handbook of research on venture capital. Edward Elgar Publishing. http://dx.doi.org/10.4337/9781847208781.00021

Kelly, P., & Hay, M. (1996). Serial investors and early stage finance. Journal of Entrepreneurial and Small Business Finance, 5(2), 159-174.

Kim, Y., & Koh, T. K. (2023). Crowdfunding from friends: Tie strength and embeddedness. Decision Support Systems, 168, 113931. https://doi.org/10.1016/j.dss.2023.113931

Kirby, E., & Worner, S. (2014). Crowd-funding: an infant industry growing fast. The Research Department of the International Organization of Securities Commissions.

Klein, P. G., & Maldonado-Bautista, I. (2022). Entrepreneurship, sustainability, and stakeholder theory. In Handbook on the Business of Sustainability. Edward Elgar Publishing. https://doi.org/10.4337/9781839105340.00012

Kleinert, S. (2023). The Promise of New Ventures' Growth Ambitions in Early-Stage Funding: On the Crossroads between Cheap Talk and Credible Signals. Entrepreneurship Theory and Practice. https://doi.org/10.1177/10422587231164750

Kleinert, S., & Mochkabadi, K. (2021). Gender stereotypes in equity crowdfunding: the effect of gender bias on the interpretation of quality signals. The Journal of Technology Transfer, 1-22. https://doi.org/10.1007/s10961-021-09892-z

Kleinert, S., & Volkmann, C. (2019). Equity crowdfunding and the role of investor discussion boards. Venture Capital, 21(4), 327-352. https://doi.org/10.1080/13691066.2019.1569853

Kleinert, S., Volkmann, C., & Grünhagen, M. (2020). Third-party signals in equity crowdfunding: the role of prior financing. Small Business Economics, 54(1), 341-365. https://doi.org/10.1007/s11187-018-0125-2

Kuppuswamy, V., & Bayus, B. L. (2018). Crowdfunding creative ideas: the dynamics of project backers. In D. Cumming & L. Hornuf (Eds.), The economics of Crowdfunding: Startups, portals and investor behavior (pp. 151–182). Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-66119-3_8

Lee, S., & Persson, P. (2016). Financing from family and friends. The Review of Financial Studies, 29(9), 2341-2386. https://doi.org/10.1093/rfs/hhw031

Leland, H. E., & Pyle, D. H. (1977). Informational asymmetries, financial structure, and financial intermediation. The Journal of Finance, 32(2), 371-387. https://doi.org/10.2307/2326770

Lin, M., Prabhala, N. R., & Viswanathan, S. (2013). Judging borrowers by the company they keep: Friendship networks and information asymmetry in online peer-to-peer lending. Management Science, 59(1), 17-35. https://doi.org/10.1287/mnsc.1120.1560

Loewenstein, G., Sunstein, C. R., & Golman, R. (2014). Disclosure: Psychology changes everything. Annu. Rev. Econ., 6(1), 391-419. https://doi.org/10.1146/annurev-economics-080213-041341

Lukkarinen, A., & Schwienbacher, A. (2023). Secondary market listings in equity crowdfunding: The missing link? Research Policy, 52(1), 104648. https://doi.org/10.1016/j.respol.2022.104648

Lukkarinen, A., Shneor, R., & Wallenius, J. (2022). Growing pains and blessings: manifestations and implications of equity crowdfunding industry maturation. Decision Support Systems, 157, 113768. https://doi.org/10.1016/j.dss.2022.113768

Lukkarinen, A., Teich, J. E., Wallenius, H., & Wallenius, J. (2016). Success drivers of online equity crowdfunding campaigns. Decision Support Systems, 87, 26-38. https://doi.org/10.1016/j.dss.2016.04.006

Mason, C., Botelho, T., & Harrison, R. (2016). The transformation of the business angel market: empirical evidence and research implications. Venture Capital, 18(4), 321-344. https://doi.org/10.1080/13691066.2016.1229470

Mason, C., & Stark, M. (2004). What do investors look for in a business plan? a comparison of the investment criteria of bankers, venture capitalists and business angels. International Small Business Journal, 22(3), 227-248. https://doi.org/10.1177/0266242604042377

Menipaz, E., Gimmon, E., & Ben David, M. (2023). Entrepreneurship and Innovation in Israel - GEM 2022/2023: National Research Report.

Mochkabadi, K., & Volkmann, C. K. (2020). Equity crowdfunding: a systematic review of the literature. Small Business Economics, 54(1), 75-118. https://doi.org/10.1007/s11187-018-0081-x

Mohammadi, A., & Shafi, K. (2018). Gender differences in the contribution patterns of equity-crowdfunding investors. Small Business Economics, 50, 275-287. https://doi.org/10.1007/s11187-016-9825-7

Morrissette, S. G. (2007). A profile of angel investors. The Journal of Private Equity, 10(3), 52-66. http://dx.doi.org/10.3905/jpe.2007.686430

Muzyka, D., Birley, S., & Leleux, B. (1996). Trade-offs in the investment decisions of European venture capitalists. Journal of Business Venturing, 11(4), 273-287. https://doi.org/10.1016/0883-9026(95)00126-3

Nguyen, T., Cox, J., & Rich, J. (2019). Invest or regret? an empirical investigation into funding dynamics during the final days of equity crowdfunding campaigns. Journal of Corporate Finance, 58, 784-803. https://doi.org/10.1016/j.jcorpfin.2019.07.011

Nitani, M., Riding, A., & He, B. (2019). On equity crowdfunding: investor rationality and success factors. Venture Capital, 21(2-3), 243-272. https://doi.org/10.1080/13691066.2018.1468542

Pintado, T. R., De Lema, D. G. P., & Van Auken, H. (2007). Venture capital in Spain by stage of development. Journal of Small Business Management, 45(1), 68-88. https://doi.org/10.1111/j.1540-627X.2007.00199.x

Piva, E., & Rossi-Lamastra, C. (2018). Human capital signals and entrepreneurs' success in equity crowdfunding. Small Business Economics, 51, 667-686. https://doi.org/10.1007/s11187-017-9950-y

Polzin, F., Toxopeus, H., & Stam, E. (2018). The wisdom of the crowd in funding: information heterogeneity and social networks of crowdfunders. Small Business Economics, 50(2), 251-273. https://doi.org/10.1007/s11187-016-9829-3

Prasad, D., Bruton, G. D., & Vozikis, G. (2000). Signaling value to businessangels: the proportion of the entrepreneur's net worth invested in a new venture as a decision signal. Venture Capital: An international journal of entrepreneurial finance, 2(3), 167-182. https://doi.org/10.1080/13691060050135064

Ralcheva, A., & Roosenboom, P. (2020). Forecasting success in equity crowdfunding. Small Business Economics, 55, 39-56. https://doi.org/10.1007/s11187-019-00144-x

Sasson, U. (2020, 07.02.2020). PipelBiz expends its operation - crowdfunding in the real estate market Calcalist. Retrieved 26 February 2023 from https://www.calcalist.co.il/articles/0,7340,L-3790250,00.html

Schwienbacher, A. (2019). Equity crowdfunding: anything to celebrate? Venture Capital, 21(1), 65-74. https://doi.org/10.1080/13691066.2018.1559010

Shafi, K. (2021). Investors' evaluation criteria in equity crowdfunding. Small Business Economics, 3-37. https://doi.org/10.1007/s11187-019-00227-9

Spence, M. (1973). Job market signaling. The Quarterly Journal of Economics, 87(3), 355-374. https://doi.org/10.2307/1882010

Spence, M. (2002). Signaling in retrospect and the informational structure of markets. American Economic Review, 92(3), 434-459. https://www.jstor.org/stable/3083350

Steigenberger, N., & Wilhelm, H. (2018). Extending signaling theory to rhetorical signals: Evidence from crowdfunding. Organization Science, 29(3), 529-546. https://doi.org/10.1287/orsc.2017.1195

Stiglitz, J. E. (2000). The contributions of the economics of information to twentieth century economics. The Quarterly Journal of Economics, 115(4), 1441-1478. https://doi.org/10.1162/003355300555015

Troise, C., Matricano, D., Sorrentino, M., & Candelo, E. (2022). Investigating investment decisions in equity crowdfunding: The role of projects' intellectual capital. European Management Journal, 40(3), 406-418. https://doi.org/10.1016/j.emj.2021.07.006

Ughetto, E., Croce, A., Schwienbacher, A., Colombo, M., & Brem, A. (2021). Digital technologies and the changing entrepreneurial finance landscape: Status quo and perspectives for future research. Technological Forecasting and Social Change, 168, 120768. https://doi.org/10.1016/j.techfore.2021.120768

Van Osnabrugge, M. (1998). Do serial and non-serial investors behave differently?: An empirical and theoretical analysis. Entrepreneurship Theory and Practice, 22(4), 23-42. https://doi.org/10.1177/104225879802200402

Van Osnabrugge, M. (2000). A comparison of business angel and venture capitalist investment procedures: an agency theory-based analysis. Venture Capital, 2(2), 91-109. https://doi.org/10.1080/136910600295729

Vismara, S. (2016). Equity retention and social network theory in equity crowdfunding. Small Business Economics, 46, 579-590. https://doi.org/10.1007/s11187-016-9710-4

Vismara, S. (2018a). Information cascades among investors in equity crowdfunding. Entrepreneurship Theory and Practice, 42(3), 467-497. https://doi.org/10.1111/etap.12261

Vismara, S. (2018b). Signaling to overcome inefficiencies in crowdfunding markets. In D. Cumming & L. Hornuf (Eds.), The Economics of Crowdfunding (pp. 29-56). Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-66119-3_3

Vismara, S. (2019). Sustainability in equity crowdfunding. Technological Forecasting and Social Change, 141, 98-106. https://doi.org/10.1016/j.techfore.2018.07.014

Vulkan, N., Åstebro, T., & Sierra, M. F. (2016). Equity crowdfunding: A new phenomena. Journal of Business Venturing Insights, 5, 37-49. https://doi.org/10.1016/j.jbvi.2016.02.001

Wald, A., Holmesland, M., & Efrat, K. (2019). It is not all about money: obtaining additional benefits through equity crowdfunding. The Journal of Entrepreneurship, 28(2), 270-294. https://doi.org/10.1177/0971355719851899

Wallmeroth, J. (2019). Investor behavior in equity crowdfunding. Venture Capital, 21(2-3), 273-300. https://doi.org/10.1080/13691066.2018.1457475

Wroldsen, J. S. (2013). The crowdfund act's strange bedfellows: Democracy and start-up company investing. University of Kansas Law Review, 62, 357-401.

Zafar, S., Waddingham, J., Zachary, M., & Short, J. (2021). Search behavior and decision confidence in equity crowdfunding: an information search process model perspective. Journal of Small Business Management. https://doi.org/10.1080/00472778.2020.1861285