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

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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.

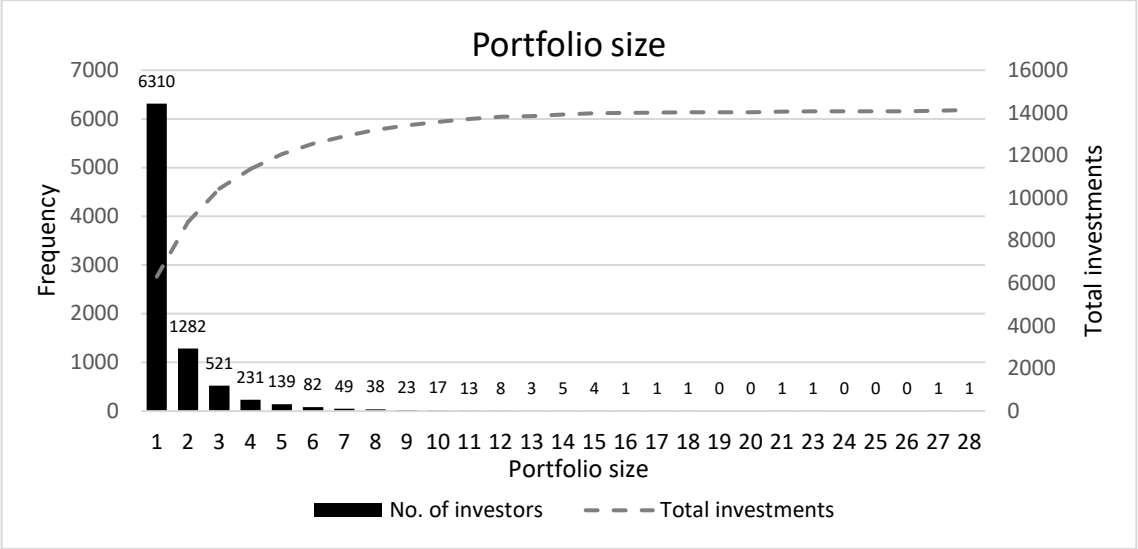

Figure 1. Portfolio sizes by frequency

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.

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