



The technology bias in entrepreneur-investor negotiations

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ABSTRACT

Entrepreneur-investor negotiations are pivotal for ventures in need of funding. However, to date, little is known about the dynamics of these negotiations. We investigate a critical feature of this phenomenon by examining the role of technology, via cognitive heuristics, in shaping entrepreneur and investor perceptions and subsequent negotiation outcomes. In a controlled laboratory setting, we simulate 103 negotiations between entrepreneurs and investors. We hypothesize and find that there is a pervasive technology bias that influences the perceptions of both parties of the negotiation and, consequently, negotiation outcomes. Our findings offer unique insights into the relationships of technology, cognitive heuristics, and negotiations. We discuss the implications for both practitioners and theoreticians in the areas of technology, decision making, negotiation, and entrepreneurial financing.

1. Introduction

The ability of entrepreneurs to secure resources is a key challenge facing entrepreneurial ventures seeking to get off the ground and grow (Irwin, Gilstrap, Drnevich, & Tudor, 2019; Sullivan & Ford, 2014). The literature has identified several types of resources that are key to entrepreneurial ventures, including human, social, financial, physical, technology, and organizational resources (Brush, Greene, & Hart, 2001; McDowell, Harris, & Geho, 2016; Wu, 2007). While each of these resources is important to entrepreneurial venture success, a great breadth of the literature has focused on financial resources (Denis, 2004; Drover et al., 2017). The importance of financial resources is derived, in part, from the ability to use funding to procure other resources needed by the venture (Cai, Hughes, & Yin, 2014). Thus, financing is a pivotal resource needed by entrepreneurs to secure success (Desa & Basu, 2013; Ebbers & Wijnberg, 2012; Mata, 1994), and acquisition of capital is central for a venture to grow from an idea into a productive firm (Brown & Lee, 2019).

Numerous financing options exist for entrepreneurs to pursue (Angerer, Niemand, Kraus, & Thies, 2018; Burgelman & Hitt, 2007; De Clercq, Fried, Lehtonen, & Sapienza, 2006). In 2017 alone, venture capitalists (VCs) in the United States invested \$71.9B in 5052 ventures (MoneyTree, 2018), angel investors contributed \$23.9B to 61,560 ventures (Sohl, 2018), and crowdfunding contributed \$919.3M to

177,300 ventures (Statista, 2018). Of course, not all ventures are created equal, and those deemed more valuable are likely to be more effective at securing financial backing (MacMillan, Seigel, & Narasimha, 1985; Robinson, 1987). If an entrepreneurial investor perceives a proposed venture to have more potential for growth, and therefore provides them with a better return, the investor will likely be more eager to invest in the start-up (Ganzach, 2000; Tyebjee & Bruno, 1984). Similarly, if an entrepreneur perceives a venture to have more potential for success, they will likely expect to be effective in acquiring funding (Anglin et al., 2018). While those principles follow intuitive logic, our understanding of how entrepreneur's and investor's negotiation behavior affects this process is incomplete. Thus, due to the critical role of resource acquisition in the success of startup ventures, in this study, we seek to gain insight into whether perceptions of technology impact the negotiation between entrepreneurs and venture investors. Specifically, we posit that over-optimism about emerging technologies can influence perceptions of success potential more for some ventures than for others.

The investment decision represents a pivotal point for both the entrepreneur (seeking external funding) and the investor (seeking a profitable investment) (Eckhardt, Shane, & Delmar, 2006; Lagazio & Querci, 2018). As many entrepreneurs operate under significant resource constraints (Desa & Basu, 2013), being able to acquire outside capital is often the only way they can successfully get their small businesses off the ground, which has been shown to influence the

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likelihood of business failure (Beckman, Burton, & O'Reilly, 2007; Shane & Stuart, 2002). Furthermore, the entrepreneur risks the time lost during the process of seeking financing, the possibility of not receiving financing or not getting fully funded, the negative reputation of a failed venture, and the possible debts that such a failure could create, among others (Ucbasaran, Shepherd, Lockett, & Lyon, 2013).

Due to the inherent uncertainty associated with early stage investment, the decision by an investor to fund a project can result in a variety of outcomes, ranging from receiving a significant return to losing the entire investment (Mason & Harrison, 2002). These risks deter investment in projects deemed too risky or underdeveloped by investors (Lerner, 1995; Lerner, 1998). The risks faced by investors are most prominently related to the direct return of an investment (MacMillan et al., 1985; Robinson, 1987), but they can also involve the costs of missed opportunities in alternative investments (MacMillan, Zemmann, & Narasimha, 1987). To understand the investment decision, the entrepreneurship literature has examined various factors that influence early-stage funding decisions.

The characteristics of the project, the entrepreneur(s), and the investor(s) all factor into the venture financing decision (Rai & Lin, 2019; Schwienbacher, 2007; Shane & Cable, 2002). The decision to invest is also based on individual factors, such as investor experience (Freear, Sohl, & Wetzel, 2002; Kaustia & Knüpfer, 2008; Lahti, 2011; Van Osnabrugge, 1998), investor/entrepreneur information (Gompers, 1995; Hsu, 2007), entrepreneur passion (Cardon, Sudek, & Mitteness, 2009; Liguori, Bendickson, & McDowell, 2018; Mitteness, Sudek, & Cardon, 2012; Sudek, 2006), venture characteristics (Fiet, 1995; Nagy & Obenberger, 1994; Ueda, 2004), investor characteristics and preferences (Khanin, Baum, Turel, & Mahto, 2009; Khanin & Turel, 2012; Mahto, Ahluwalia, & Walsh, 2018), market characteristics (Fiet, 1995; Fried & Hisrich, 1994), entrepreneur's social network (Shane & Cable, 2002; Shane & Stuart, 2002), business model/plan (Galbraith, DeNoble, & Ehrlich, 2009), and capital structure and financing types (Cassar, 2004; Heuven & Groen, 2012). However, these characteristics only provide a partial picture of the investment decision.

Another prominent area of research that has been applied to investment decisions is the judgment and decision making literature related to cognitive heuristics. Heuristics, or biases, are miscalculated judgments that often result in decision making that is less than optimal (Tversky & Kahneman, 1973). Indeed, early stage investors often rely on subjective criteria or “gut” feelings when making decisions (Aernoudt, 1999; Baty & Sommer, 2002; Morrisette, 2007). Multiple types of heuristics influence decision making by distorting information that is used in decision processing. While several venture characteristics are known to influence funding decisions, heuristics also play an important role in entrepreneurial investment decision making - an area of the literature where our understanding of how entrepreneur's and investor's negotiation behavior affects this process is incomplete (Harrison, Mason, & Smith, 2015; Shepherd, Williams, & Patzelt, 2015). Indeed, Zider (1998) estimated that one type of entrepreneurial investor, VCs, only spend approximately 5% of their time negotiating on investments. Despite the small amount of time spent on this activity, negotiation is nonetheless a crucial activity for both parties.

To explore this area, we seek to gain insight into how cognitive heuristics, specifically those regarding technology, impact the negotiation between entrepreneurs and venture investors. Specifically, we propose that technology will have a significant effect on how both entrepreneurs and investors process information during funding negotiations and on the outcomes of those negotiations. To accomplish this goal, we utilize a laboratory study using business students from two major universities from the United States between 2016 and 2017. This approach allows us the control necessary to determine the effects of technology on negotiations and to test our hypotheses. Using a controlled laboratory setting, we find a significant technology bias in negotiations. We find that techno-optimism influences both value perceptions and higher negotiation outcomes for entrepreneurs with value

partially mediating the relationship.

Our study makes three primary contributions. First, we contribute to the venture funding literature by further examining the relationship between entrepreneur and investor negotiations. To date, much of this literature focuses on the value proposition delivered to investors in the way of a business' potential projected success (Payne, Davis, Moore, & Bell, 2009). There is a void in the literature, however, with respect to the effect of the negotiations between the parties. By examining the negotiations and their outcomes, this research adds an important element to our understanding of the capital acquisition process. Second, we add to the literature concerning cognition in decision making and the common judgment biases influencing decision makers by exploring perceptual distortions in the context of financial acquisition. Specifically, we explore the role played by technology in influencing judgments about perceived venture value and the corresponding negotiations in which the entrepreneurs engage to acquire capital. Recent research has shown that technology invokes over-optimism (Clark, Robert, & Hampton, 2016). However, the literature has not tested this effect in specific business contexts or the specific mechanisms that explain how this over-optimism is actually demonstrated. Thus, we extend the decision making and judgment heuristics literature by further exploring the role played by technology in over-optimism and by explore this phenomenon in an entrepreneurial financing context. Third, we contribute to the technology and innovation literature by exploring how perceptions impact negotiated outcomes regarding financing. Perceptions of technology have implications both for entrepreneurs and investors and for researchers studying the effects of technology in decision making.

2. Theory and hypotheses

2.1. Technology bias in decision making

Entrepreneurial financing, at its core, involves individuals providing funds (investors) and individuals seeking funds (entrepreneurs) to reach an agreement about the terms of financing. To negotiate such a contract requires both parties to present information to the other side and to process the information they receive. The heuristic-systematic model (Chaiken, 1980) suggests that such decisions are likely to be made in one of two ways: a high-effort and highly systematic process or a faster, more automatic (heuristic) route that bypasses extensive effort and processing. While important decisions, such as investing, may motivate focused logical judgements about the potential of investment in a venture (Kumar & Goyal, 2016), or what Chaiken refers to as systematic processing, an abundance of evidence suggests that this is often not the case (e.g., Potesman & Serbin, 2003; Stroe, Parida, & Wincent, 2018). When decision makers are in situations that have at least some familiar elements, they often opt for heuristic processing because the familiar elements are taken as information that can be leveraged as a cognitive shortcut. This processing often contradicts economic rationality. Nonetheless, the entrepreneurial literature is teeming with examples of how investors defer to more subjective criteria of intuition to make decisions when evaluating ventures (Aernoudt, 1999; Baty & Sommer, 2002; Morrisette, 2007). Much of the evidence of such “irrational” decisions is rooted in work by Tversky and Kahneman (1973), which established that individuals often apply judgmental heuristics to decisions as a result of limited ability or willingness to process information systematically.

One example, where the availability heuristic and salience bias operate within an increasingly important context, is the “technology effect”, which consists of a learned tendency to be overly optimistic about technology and its ability to solve problems and create value (Clark et al., 2016). Indeed, technology often seems to be celebrated above all else (Feenberg, 1991), leading to biases toward technology for both novices and experts alike (Elsbach & Stigliani, 2019). The irrational buildup leading to the .com bubble exemplifies this issue (Saade,

2015). Furthermore, perceptions of technology have been found to impact several phenomena, such as learning modes (Linton & Walsh, 2013), investment (Lockett, Murray, & Wright, 2002; Lowe & Ziedonis, 2006), and attitudes (Mordini, 2007; Moynihan & Lavertu, 2012).

The technology effect suggests that individuals implicitly associate technology with success and are thus biased in their perceptions about the benefits of technology (Clark et al., 2016). Such implicit associations have been shown to be powerful determinants of cognition and behaviors (Greenwald, Poelman, Ulmann, & Banaji, 2009) and are leveraged in fast heuristic mental processes. The result is overconfidence in the merits of technology, especially in instances where there is uncertainty about a technology or an emerging technological industry, as is typical for a technology venture. A lack of concrete data or an established track record creates an environment where systematic processing is less likely and heuristic processing is more likely (Chaiken, 1980). In short, optimism about a new venture's prospects is likely to permeate the thinking and behaviors of both the entrepreneur and their business partners. Due to excessive techno-optimism on both sides of the negotiation table, we expect better negotiated outcomes for technology entrepreneurs in comparison to similar (equally promising) low-technology entrepreneurs.

H1. Technology entrepreneurs will negotiate more successfully with investors compared with non-technology entrepreneurs, *ceteris paribus*.

While previous research has demonstrated that technology is generally associated with success (even among industry experts) (Tichy, 2004), the mechanisms that connect technology as a concept with perceptions of future behaviors or positive outcomes are not entirely clear. One possible underlying mechanism is individual over-optimism toward technology (Clark et al., 2016; Feenberg, 1991). In the context of negotiations for start-up financing, we suspect that technology-infused startups will be perceived as having more valuable products and services than low technology startups, even when verifying evidence is lacking, thus manifesting as a form of irrational over-optimism. Further, over-optimism about startup technologies will drive perceptions of value in at least two ways. First, the technology bias will be displayed in entrepreneur-investor negotiations, in part due to what is referred to as the availability heuristic (Tversky & Kahneman, 1973). This phenomenon occurs when decisions are made as a result of the ease with which individuals are able to recall information. A major factor that increases the ease with which individuals recall information is related to how much individuals receive and the intensity or vividness of that information (Fiske & Taylor, 1991). Common examples of vivid information are stories published in media reports, with such stories impacting various decisions from consumer purchasing (Cornelissen, Pandelaere, Warlop, & Dewitte, 2008), to ethical decision making (Hayibor & Wasieleski, 2009) to stock market investments (Kliger & Kudryavtsev, 2010). Thus, we see a disproportionate number of reports of technology successes relative to failures (Golder & Tellis, 1993). This unbalanced exposure to relevant information causes us to believe that technology creates more value than it actually does and is more likely to succeed than it actually is.

Second, the salience bias also drives techno-optimism. Salient events are easier to recall because they are the events that are more dramatic (Hossain & Morgan, 2006) or relevant because they change the status quo (John, Acquisti, & Loewenstein, 2010). Due to a general reluctance to publicize technology failures (Levinthal & March 1993; McGrath, 1999) and a natural tendency to pay attention to successes, we overvalue contexts characterized by technology. As an example, consider the enthusiasm among members of the media and consumers every time a new version of the iPhone is released by Apple, Inc. Additionally, we are captivated by stories of recent (e.g., Snapchat) and historic (e.g., Apple's Mac) successes and tend to forget failures (e.g., Apple's iTunes Ping). These stories offer and reinforce reference points that influence perceptions during negotiations (Bottom, 1998; Kahneman & Tversky, 1979). According to the availability and salience

heuristics, the vividness, relevance, and ease of recalling these stories make individuals less likely to process conflicting information and to instead rely on judgmental heuristics. This phenomenon leads us to suggest that both entrepreneurs and investors will experience some degree of techno-optimism, leading them to perceive more value with a technology-related venture than a non-technology related venture.

H2a. Entrepreneurs will overvalue technology products relative to non-technology products.

H2b. Investors will overvalue technology products relative to non-technology products.

Perceived value is a pivotal factor in entrepreneurial negotiation, as discrepancies often exist between the perceptions of entrepreneurs and investors (Artinger, Vulkan, & Shem-Tov, 2015). Following the arguments of the technology bias (Clark et al., 2016; Elsbach & Stigliani, 2019; Feenberg, 1991; Saade, 2015), placing a more optimistic value on technology than on non-technology should lead to greater negotiation leverage for technology entrepreneurs relative to their non-technology counterparts. For example, Kristensen and Gärling (1997) found that value estimates strongly influence each negotiator's reservation price or the lowest acceptable outcome (Blount, Thomas-Hunt, & Neale, 1996), and that these cutoff points rise and fall in reaction to new information and new cognitive evaluation. Basic negotiation mechanics prescribe that higher reservation prices lead to higher negotiation outcomes (Huber & Neale, 1986; White & Neale, 1984).

Additionally, in an effort to remain consistent with perceptions of the value of a venture, we suggest that the higher value placed on technology ventures will impact the degree to which technology entrepreneurs succeed in achieving positive negotiation outcomes with investors. Further evidence in the cognitive decision making literature, specifically what is referred to as the confirmation bias, supports this assertion (Kahneman, Slovic, & Tversky, 1982). This bias results from an individual's desire to avoid dissonant behavior (Jonas, Schulz-Hardt, Frey, & Thelen, 2001), thus promoting behavior that is consistent with previous perceptions. In the case of the entrepreneur-investor negotiation, the more value the investor and entrepreneur perceive in technology, the more they will act on those perceptions, thereby improving the technology entrepreneurs negotiating position. Therefore, we expect the relationship between technology and negotiation outcomes to operate via the higher perceived value of the technology-related ventures.

H3a. The entrepreneur's value perception of the new venture will be positively related to the entrepreneur's negotiated outcome.

H3b. The investor's value perception of the new venture will be positively related to the entrepreneur's negotiated outcome.

As prior literature suggests, many factors, such as feelings about the negotiation process or outcomes (Curhan, Elfenbein, & Xu, 2006), perceptions of fairness (Colquitt, Conlon, Wesson, Porter, & Ng, 2001), and personal assessment of self-worth (White, Tynan, Galinsky, & Thompson, 2004) influence the perception of value and consequently negotiated outcomes (Caputo, 2013). Therefore, we expect perceived value to be just one factor that may mediate the relationship between the presence of technology and negotiated outcomes. Thus, technology makes us optimistic about outcomes, in part due to higher product valuations (Clark et al., 2016; Elsbach & Stigliani, 2019). Since technology is a specialized and often complicated area (Farrukh, Phaal, & Probert, 2003), it is likely that the information asymmetry gap would be large and would favor the entrepreneur. Information asymmetry (Akerlof, 1970; Spence, 1973) is common in many venture-financing decisions, and it is a known driver of negotiation outcomes (Fisher, Frederickson, & Pfeffer, 2002; Scholes, Wright, Westhead, Burrows, & Bruining, 2007). Therefore, without appropriate signals to offer information and reduce the information gap (Connolly, Certo, Ireland, & Reutzel, 2011), investors are left to make decisions via the heuristic

processing route, and these decisions are often based on “gut” feelings and intuition (Aernoudt, 1999; Baty & Sommer, 2002; Morrisette, 2007).

In negotiations, the party who possess more information than their counterpart tends to experience better outcomes (Rackman, 1999). Thus, the information asymmetry, which technology often presents (Gharbi, Sahut, & Teulon, 2014), should strengthen the technology entrepreneur's position, conversely weakening the position of investors and leading to more favorable outcomes for the entrepreneur. Indeed, Balakrishnan and Koza (1993) found that investors typically have less information about a venture than the entrepreneur, and the resultant uncertainty impacts financing decisions in their favor. Therefore, we expect technology entrepreneurs to achieve greater negotiation success than their non-technology counterparts for multiple reasons, one of which is techno-optimism. However, because information asymmetry, and potentially other mechanisms, do not operate through perceived value, we predict that while perceived value will mediate the technology-outcome relationship, it will do so only partially.

H4. The relationship between technology and higher negotiated outcomes for entrepreneurs will be partially mediated by the higher value placed on technology products relative to non-technology products.

Taken together, our hypotheses argue that the presence of technology directly impacts negotiated outcomes between entrepreneurs and investors. Furthermore, technology is directly related to perceived value, a result of the overoptimistic biases technology promotes. Consequently, perceived value is also directly related to negotiation outcomes between entrepreneurs and investors. Thus, the perceived value mediates, at least partially, the relationship between technology and negotiation outcomes. These hypothesized relationships are shown in Fig. 1, with H1, H2a and H2b, and H3a and H3b labeled specifically, and H4 pertaining to the collection of relationships.

3. Methods

3.1. Participants and procedure

To assess the impact of the concept of technology on negotiations, we used a laboratory experiment approach following the recommendations outlined in Hsu, Simmons, and Wieland (2016). Using 212 business school students (56% male, 79% undergraduates) from two large public U.S. universities (one university in the Southeast and one university in the West), we collected data from 106 negotiations. The students were recruited through an offering of course credit for their participation. This approach follows previous work using students to assess decision making in entrepreneurial contexts (e.g., Chen, Yao, & Kotha, 2009; Davis & Peake, 2014; Sapienza & Korsgaard, 1996). Two negotiation dyads failed the manipulation check (failed to correctly identify the industry of the start-up), and one dyad did not finish the negotiation exercise, resulting in 103 usable data points. A single administrator conducted each session to ensure consistency across the sample. Approximately half of the negotiation dyads (52%) involved a scenario where a technology entrepreneur negotiates funding, ownership, and control terms with a VC. The other half involved a similar

scenario for a non-technology startup. Following Clark and colleagues (Clark et al., 2016), we selected Medical Devices as a high-technology context and Restaurants as a low-technology context. Some advantages of this choice are that the two industries have comparable ratings for general importance, benefit to society, integrity, and ethical approval, thus excluding potential reputation effects. Further, the past financial returns in these industries were comparable (Clark et al., 2016). Importantly, respondents rated these industries as very high and very low on the range of their technology orientation. Examples of materials are available in Appendix A.

Participants were assigned to the role of entrepreneur or VC in the high- or low-technology context. We chose VCs in the role of the entrepreneurial investor because they are a salient and highly studied provider of early-stage financing. By definition, VCs are professional investors who strive to identify, invest, and then profitably exit high growth-high return ventures in need of equity injections (Burgelman & Hitt, 2007; De Clercq et al., 2006; Sohl, 2003). In each role, participants were given instructions regarding their negotiation task, followed by a brief questionnaire to collect demographics and assess product value perceptions of their assigned condition. The participants received a description of the startup company, which included projected future firm performance that was identical across conditions. The participants then completed the negotiation, followed by a brief questionnaire to collect the negotiated outcomes and a manipulation check.

3.2. Dependent variable

Entrepreneurs and VCs were provided confidential score tables that equate negotiated terms to point amounts (see Appendix A). We measured *negotiation score* as the aggregate score of the entrepreneur across the three outcome elements: amount of capital, ownership, and control. Each of these measurements are commonly used when examining entrepreneurial success (capital (e.g., Ko and McKelvie, forthcoming), ownership (e.g., Vismara, 2016), and control (e.g., Gompers, 1995)). All three of these variables, to a greater or lesser extent, factor into entrepreneurial decision making (Shepherd et al., 2015).

An aggregated scoring table – such as the table we used in the present study – is a common means of measuring performance in negotiation research (e.g., Carnevale & De Dreu, 2005). Central to this approach is enhancing control over the study to avoid potentially spurious effects. The use of multiple outcomes with different scores allotted for various levels of the outcome is common practice in laboratory negotiation research, as it allows parties to identify differences in preference for certain outcomes. This approach allows parties to engage in logrolling, whereby parties can trade low preference outcomes for ones that are of higher importance. Utilizing this method also helps to avoid the perception of a negotiation being a zero-sum endeavor. Moreover, aggregating subjects' scores for the three outcomes allows for a more accurate assessment of performance, in general, and has been used in multiple contexts (e.g., Carnevale & Isen, 1986; Pruitt, 1991; Pruitt & Lewis, 1975).

3.3. Independent variable

Following prior entrepreneurship research (e.g., Mason & Harrison,

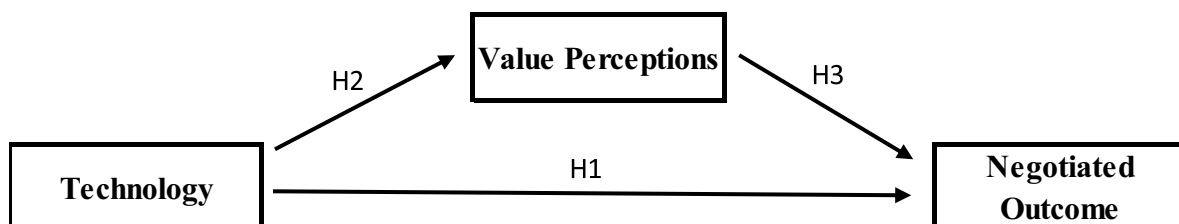


Fig. 1. Partial mediation model of technology's impact on venture finance negotiations.

2004), *technology* was manipulated in half of our sample through our descriptions of the startup company. Participants negotiated terms either for medical devices (*tech* = 1) or a restaurant consulting company (*tech* = 0). In both cases, negotiation materials stated five-year revenue estimates that were identical across the technology (medical devices) and non-technology (restaurant consulting) conditions. Thus, if participants considered the startup to have a promising versus a bleak outlook, it would be attributable to their perceptions based on their mental model of imagined expectations rather than the stated factual outlook. Further, the technology and non-technology industries are comparable across a number of reputation and financial performance metrics (Clark et al., 2016).

3.4. Mediating variable

We hypothesized that in a negotiation context, techno-optimism is likely to operate through perceptions of product value. We measured *product value* through the pre-negotiation questions, “How much value do you think your product has?” and “How much value do you think the company's product has?” for the entrepreneur and VC, respectively. Responses were provided on a seven-point Likert scale ranging from extremely low (1) to extremely high (7).

3.5. Control variables

Participant *gender* (male = 1; female = 0) was used as a covariate in our analysis, as past research has shown gender differences in negotiation outcomes (Mazei et al., 2015; Stuhlmacher & Walters, 1999), over-optimism (e.g., Barber & Odean, 2001) and general risk taking (Byrnes et al., 1999). We also controlled for *graduate* student status (*graduate* = 1; *undergraduate* = 0) and self-perception of *negotiation skill* on a seven-point Likert scale (1 = extremely low; 7 = extremely high) with the question, “How confident are you in your negotiation skill?” We controlled for these factors because one's perception of experience and skill has been shown to affect entrepreneurial decision making (Zacharakis & Shepherd, 2001).

4. Results

Table 1 contains descriptive statistics and correlations. Consistent with prior negotiations research, perception of negotiation skill correlated positively with one's own negotiated outcome, while the negotiation skill of the opponent correlated negatively with one's negotiated outcome (Maddux, Mullen, & Galinsky, 2008; Weingart, Thompson, Bazerman, & Carroll, 1990). We also observed positive correlations between the high technology condition and perceptions of product value for both the entrepreneur and the VC. Interestingly, the VC's perceived negotiation skill correlated negatively with the technology condition. Neither gender nor graduate status were correlated with any other variables.

In Hypothesis 1, we predicted that the general concept of technology, when invoked in a capital negotiation context, would lead to

more successful outcomes for the negotiating entrepreneur. Our results ($\beta = 1103.99$, $p = 0.000$) supported this hypothesis as displayed in Model 2 of Table 2. Post hoc predictive margins show that a typical technology entrepreneur would expect to achieve a 12% higher total negotiation score than a comparable non-technology entrepreneur (10,158 to 9054; scores are a combination of capital, equity, and control agreements). This finding provides theoretical support that individuals have an implicit bias that favors technology over non-technology.

In Hypothesis 2a and 2b, we predicted a specific mechanism whereby technology, and its attendant, techno-optimism, will influence the cognition and, eventually, the behavior of both entrepreneurs and VCs. We asserted and found that, indeed, both sides of the negotiating table perceived the value of a new technology startup's product to be higher than that of a new low-technology startup's product, despite being provided identical figures regarding expected firm performance across conditions. While entrepreneurs placed a higher value on their firm's products than VCs, both entrepreneurs ($\beta = 0.77$, $p = 0.000$) and VCs ($\beta = 0.65$, $p = 0.002$) valued technology products approximately 13% higher than low-technology products (see Models 8 and 10 in Table 3). These findings extend the literature related to the availability of information and how the ability to easily recall technological successes disposes investors toward becoming overly optimistic in the value created by technology. These results are displayed in Fig. 2 in the form of post hoc predictive margins.

Continuing the logical progression of our partial mediation model, we also predicted that perceptions of product value, both of the entrepreneur (Model 3) and the VC (Model 4), would influence the negotiation success of the entrepreneur. Affirmative results are shown in Table 2, both for entrepreneurs ($\beta = 273.55$, $p = 0.048$) and VCs ($\beta = 403.15$, $p = 0.002$). To better grasp the relative importance of the influence of the perceptions of the entrepreneur versus the VC, we also tested them jointly (Model 5), finding that VC's value perception ($\beta = 359.93$, $p = 0.007$) is a better predictor of the negotiated outcome than the entrepreneur's value perception ($\beta = 175.05$, $p = 0.204$).

Finally, in Hypothesis 4, we sought to determine whether and to what extent the effect of technology on negotiated outcomes operates through the mediating effect of product value perceptions. We found (Model 6) that VC perceptions of product value partially mediated the influence of technology on negotiated outcomes ($\beta = 266.84$, $p = 0.039$), but entrepreneur value perceptions did not ($\beta = 31.14$, $p = 0.822$). As hypothesized, the effect was only one of partial mediation, as technology maintained a strong independent influence ($\beta = 907.21$, $p = 0.002$) on negotiated outcomes even with the inclusion of value perceptions as mediating variables.

5. Discussion

This study was designed to build upon our understanding of the pivotal stage of securing startup funding. In this process, we contribute to the literature on venture funding (e.g., Eckhardt et al., 2006; Lagazio & Querci, 2018), biases in decision making (e.g., Potesman & Serbin,

Table 1
Descriptive statistics and correlations.

	Variables	Mean	SD	1	2	3	4	5	6	7
1	Technology	0.53	0.50							
2	Gender of Ent	0.56	0.50	−0.04						
3	Gender of VC	0.53	0.50	−0.21	0.28					
4	Graduate student	0.20	0.40	0.13	−0.14	−0.11				
5	Value perception of Ent	6.23	0.99	0.42	0.03	−0.06	0.12			
6	Value perception of VC	5.28	1.03	0.29	−0.04	−0.10	−0.14	0.24		
7	Negotiation skill of Ent	5.24	1.35	0.17	0.13	0.01	0.02	0.16	0.05	
8	Negotiation skill of VC	5.37	1.23	−0.20	−0.04	0.15	−0.07	−0.15	−0.01	−0.10

Note: Technology = 1 for high-tech condition and 0 for low-tech; Gender = 1 for male and 0 for female; Correlations of 0.20 or greater are significant at $p < 0.05$

Table 2
Negotiated outcomes (of the entrepreneur) regressions (H1, H3a and H3b, and H4).

Variables	Controls	H1	H3a and H3b		H4	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Technology		1103.99 (259.93) ***				907.21 (284.56) **
Gender of Ent	−135.38 (284.20)	−134.23 (262.11)	−152.18 (280.02)	−99.39 (271.79)	−114.00 (271.14)	−112.52 (258.94)
Gender of VC	−171.65 (281.99)	23.96 (264.12)	−153.11 (277.88)	−80.33 (270.96)	−78.25 (270.07)	51.65 (261.12)
Graduate student	71.26 (334.95)	−68.48 (310.66)	−5.02 (332.08)	232.68 (324.01)	166.57 (327.06)	54.60 (314.31)
Value perception of Ent			273.55 (136.73) *		175.05 (136.93)	31.14 (138.34)
Value perception of VC				403.15 (126.00) **	359.93 (130.06) **	266.84 (127.59) *
Negotiation skill of Ent	315.68 (100.55) **	251.83 (93.94) **	286.38 (100.10) **	297.54 (96.24) **	280.74 (96.82) **	247.87 (93.04) **
Negotiation skill of VC	−411.93 (111.14) ***	−346.25 (103.66) **	−384.81 (110.30) ***	−413.28 (106.20) ***	−395.78 (106.73) ***	−355.77 (102.70) ***
Constant	10,353.66 (847.82) ***	9669.65 (798.34) ***	8671.77 (1184.91) ***	8224.82 (1048.34) ***	7376.71 (1237.70) ***	8191.05 (1209.29) ***
N	103	103	103	103	103	103
R ²	0.22	0.35	0.26	0.30	0.31	0.38

Table 3
Value perception regressions (H2a and H2b).

Variables	Controls: Ent	H2a and H2b: Ent	Controls: VC	H2a and H2b: VC
	Model 7	Model 8	Model 9	Model 10
Technology		0.77 (0.19) ***		0.65 (0.21) **
Gender of Ent	0.06 (0.21)	0.06 (0.19)	−0.09 (0.22)	−0.09 (0.21)
Gender of VC	−0.07 (0.21)	0.07 (0.19)	−0.23 (0.22)	−0.11 (0.21)
Graduate student	0.28 (0.24)	0.18 (0.23)	−0.40 (0.26)	−0.48 (0.25) †
Negotiation skill of Ent	0.11 (0.07)	0.06 (0.07)	0.04 (0.08)	0.01 (0.08)
Negotiation skill of VC	−0.10 (0.08)	−0.05 (0.08)	0.00 (0.09)	0.04 (0.08)
Constant	6.15 (0.62) ***	5.67 (0.59) ***	5.28 (0.65) ***	4.88 (0.64) ***
N	103	103	103	103
R ²	0.06	0.35	0.04	0.13

Note: Technology = 1 for high-tech condition and 0 for low-tech; Gender = 1 for male and 0 for female; Standard errors in parentheses.

† $p < 0.1$.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

2003; Tversky & Kahneman, 1973), and perceptions of technology (e.g., Clark et al., 2016; Elsbach & Stigliani, 2019) in negotiations between entrepreneurs and investors. To accomplish this goal, we leveraged theory regarding cognitive heuristics and biases in decision making (Kahneman et al., 1982; Tversky & Kahneman, 1973), specifically heuristics related to over optimism about technology (Clark et al., 2016; Elsbach & Stigliani, 2019), to make predictions about the effect of technology on startup capital success. We tested our predictions in a setting that is inexorably related to capital acquisition but lacks an empirical understanding of its complexity, namely, entrepreneur-investor negotiations.

In support of the predicted relationship between technology and startup capital acquisition, technology entrepreneurs negotiated more successful investment contracts for their startups. Techno-optimism was prevalent in both negotiation parties, leading to higher amounts of capital negotiated, percent ownership retained, and control over

decision making. Extending prior research on heuristics in decision making (Kahneman et al., 1982; Tversky & Kahneman, 1973), our results support the suggestion that technology influences the cognitive processes involved in negotiation for start-up capital. As evidenced by popular press and media attention given to technology firms and products (Golder & Tellis, 1993), the technology effect creates an implicit bias (Clark et al., 2016; Elsbach & Stigliani, 2019), whereby successes in the technology sector are made salient through exposure. Specifically, in the context of entrepreneur-investor negotiations, these findings suggest that the judgments of investors are influenced by this heuristic. Assuming these conditions are favorable for entrepreneurs seeking funding, these results suggest that technology entrepreneurs, when compared to their non-technology counterparts, have an automatic benefit in negotiations with investors for funding.

Consistent with past work on investment decisions, we found that multiple mechanisms contributed to improved negotiation outcomes for

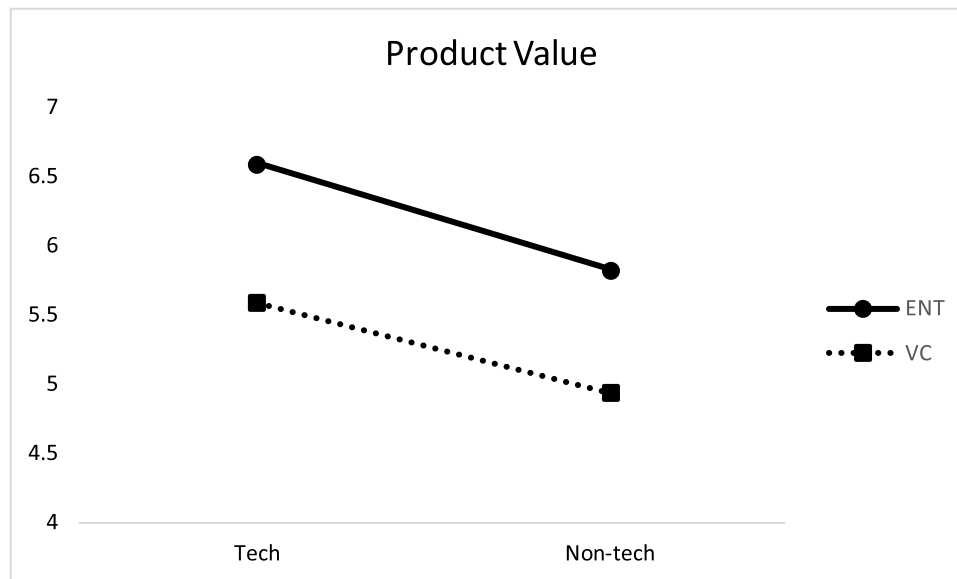


Fig. 2. Perceptions of product value for entrepreneurs and VCs.

technology entrepreneurs (Wang, Qureshi, Deeds, & Ren, 2019). In support of our predictions, both the entrepreneurs and the investors in the technology condition perceived the venture to have more value than in the non-technology condition, despite the presence of identical information about projected value in both conditions. In a similar manner to the societal enthusiasm awarded to technology successes, our results suggest that technology entrepreneurs and the investors with whom they negotiate for startup funding award technology firms as being more valuable than non-technology entrepreneurs and their investors. We build on expansive past research (e.g., Caputo, 2013) demonstrating that cognitive processes significantly influence the negotiation process. One particularly interesting aspect of our results is that the investor experiences more powerful over-optimism in technology. Technology influences the entrepreneur to perceive his or her product is more valuable than an entrepreneur who is not involved in technology, but the investor is even more prone to this irrational evaluation of value.

As expected, the perceived value of a venture was also indicative of capital negotiation success, specifically ventures that were perceived by entrepreneurs and investors as possessing greater value negotiated for higher amounts of capital, a greater percentage of ownership, and more decision making control. This finding adds to the literature on perceptions in negotiations (e.g., Artinger et al., 2015). Furthermore, considering these sequential relationships simultaneously, our results show that entrepreneur and investor overvaluation of the worth of technological products mediates the relationship between the venture type and negotiated capital acquisition specifics.

5.1. Theoretical contributions

Our analyses have several important theoretical implications. By demonstrating the relevance of the technology effect in a new and important context, namely, entrepreneur-investor negotiations, we contribute to the existing literature in several areas. We add to the judgmental heuristics literature (Kahneman et al., 1982; Tversky & Kahneman, 1973) in an important way by examining the role of technology in distorting perceptions in decision making. To the best of our

knowledge, we are the first group to directly test this phenomenon in the negotiation of capital. Thus, we add to the findings of Clark et al. (2016), who labeled the technology effect, and contribute to the increasing evidence that technology plays in perceptions (Elsbach & Stiglian, 2019). We also expand the literature into the context of entrepreneurial financing by examining the influence of technology on decision making within that transaction. Indeed, while the negotiation of financing is a key step in entrepreneurial venture growth, how perceptions impact this process has received limited attention in the literature (e.g., Anglin et al., 2018; Balakrishnan & Koza, 1993).

Integrating these perspectives, we extend our understanding of the technology effect and our understanding of its boundary conditions. Specifically, we explore one specific mechanism – perceptions of venture value – from perspectives of both the entrepreneur and the investor. Thus, we find that the technology effect operates mainly through the investor rather than the entrepreneur in such a negotiation. However, we observe only partial mediation, so the technology effect operates either directly or through other (still unknown) mediators. Therefore, we integrate several lines of literature, including venture funding (e.g., Eckhardt et al., 2006; Lagazio & Querci, 2018), biases in decision making (e.g., Potesman & Serbin, 2003; Tversky & Kahneman, 1973), and perceptions of technology (e.g., Clark et al., 2016; Elsbach & Stiglian, 2019), to explore the intersection of the technology effect and perceptions of value in entrepreneurial negotiating success.

5.2. Practical implications

Not surprisingly, entrepreneurs are exceedingly optimistic about their own company (Bolger, Pulford, & Colman, 2008; Camerer & Lovo, 1999), which is akin to the view that entrepreneurs have “rose colored glasses” about their ideas and capabilities (Simon, Houghton, & Aquino, 2000). Alternatively, this effect may, or may not, stem from the tech effect, which is strongest when decision makers lack familiarity with the technology. Thus, investor techno-optimism is reasonable, and we indeed observed this phenomenon in our study. The implication is that investors need to familiarize themselves more thoroughly to

achieve more favorable (and rational) negotiation outcomes, particularly because our analyses indicate that mediation occurs primarily through the investor rather than the entrepreneur. Concurrently, it is important for investors to understand that this irrational optimism toward technology occurs unconsciously and that efforts should be made to question whether technology prospects are influencing value projections. Studies show (e.g., Thompson & Nadler, 2000) that the primary means to overcoming such miscalculations is to make oneself aware of them. Thus, if investors are aware that techno-optimistic evaluations may be occurring, they may be able to become more consciously aware of how they are making valuations.

While the data herein may require caution to investors, they offer implications for entrepreneurs that can be leveraged. The success of entrepreneurial startups can be dependent upon the ability to acquire external financing. The findings from our experimental study suggest that technology entrepreneurs can leverage the technology effect to highlight the value of said technology to the investors they are negotiating with for capital. Conversely, it is just as important for entrepreneurs to understand the unconscious nature of this technology heuristic. If an entrepreneur enters negotiations for startup capital with blinders of overly inflated perception of the value of technology, he or she may underestimate the importance of other planning activities and more objective value criteria. Thus, as suggested by others, cognitive and situational awareness will improve performance for technology entrepreneurs (Cohendet & Pawlak, 2009). In contrast, as our analyses suggests, it may be difficult to overcome these biases; entrepreneurs need to support other aspects of their venture (e.g., human capital, financials, market demand, etc.) without relying on technology as a universal panacea to gain funding. In brief, while technology is a great asset, entrepreneurs seeking funding should have shored up other areas of potential weakness within their ventures, so they do not need to overly rely on technology.

5.3. Future research opportunities

According to our analyses, the observed partial mediation suggests that the technology effect also influences outcomes directly and/or through still unidentified mediators. Therefore, future research should explore other possible paths through which the technology effect has either direct or indirect influence over entrepreneurs and investors. For example, does the perception of technology impact the willingness of potential entrepreneurs to pursue entrepreneurship, or to pursue financing (or even types of financing)? Additionally, perceptions of

dependence (e.g., Ganesan, 1994) or cultural factors (e.g., Cannon, Doney, Mullen, & Petersen, 2010) are potential mediators for future exploration.

Based on the knowledge that the technology effect can surface during negotiations, knowingly or unknowingly, future work should ascertain the ability to generalize this effect in real-world settings. While we simulated a negotiation between an entrepreneur and an investor, future research needs to confirm our findings using actual entrepreneurs and investors (versus students playing such roles). Future research could also explore other nuances in the technology effect in negotiations between entrepreneurs and venture investors, such as whether this effect is consistent among differing investors (e.g., angel investors (Wetzel, 1983) or crowd funders (Mollick, 2014)), in broader contexts within and beyond entrepreneurship (e.g., Does this effect hold in M&A deals (Das & Kapil, 2012), and in corporate governance (Daily, Dalton, & Cannella, 2003), etc.). Furthermore, as technology is a broad area, do certain types of technology (e.g., biomedical, telecommunications, etc.) have differing effects on negotiations? Would differing effects be a function of the investors reviewing the project?

6. Conclusion

We predict and indeed reveal a significant technology effect in entrepreneur-investor negotiations. Specifically, we test our conjectures using a controlled experimental context simulating negotiations between entrepreneurs and investors. We find that the impact of the technology effect influences not only negotiation success but also both parties' perceptions of the venture valuation being negotiated. We further find that these perceptions influence negotiation success, but while seemingly sequentially related, we were surprised to find that they are not strong mediators in the relationship between the technology effect and negotiation success. Our analyses offer some preliminary insights into the manner and magnitude of the impact of the technology effect on negotiations. Consequently, our findings have practical and theoretical implications for those engaging in and studying such negotiations.

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Appendix A

MedTech, Inc.

Background

You are an entrepreneur who recently founded MedTech, Inc., a U.S.-based medical technology company that specializes in medical devices. After receiving your MBA, you started working on a prototype of a new nanorobot that will improve numerous medical procedures and treatments. You are in the final stages of creating the prototype and are now ready to start producing it for commercial use. You have pitched the idea to medical doctors and believe there will be enough demand for the product to justify mass production. To begin production, you require significant outside capital.

You have scheduled to meet with an associate at Divvy Out Capital to negotiate for the seed money to get you started. To prepare for your meeting, you have performed some market analysis leading to the following estimates:

You estimate revenues the first 5 years as follows:

Year 1 = −\$100,000
 Year 2 = \$100,000
 Year 3 = \$250,000
 Year 4 = \$1,000,000
 Year 5 = \$2,000,000

You have learned that negotiating over multiple issues is the best way to achieve a favorable outcome. Thus, you have determined that the following matters should be considered:

1. Amount of capital
2. Percentage of ownership retained
3. Amount of control you will have in decision making (i.e., how “hands-off” the VC will be)

Negotiation

You will notice that issues differ in point values. You have determined that what is most important to you is getting the necessary capital, since you are confident that once up and running, the product will be successful. You are not as concerned about the ownership you retain or the control over decision making, but achieving a favorable outcome is still important. You want to achieve the best outcome you can but realize you are dependent on this outside capital to pursue this venture. Therefore, you are motivated to reach an agreement with this venture capital company.

Confidential success table for **MedTech, Inc.**

Issue	Terms in contract	Points
Amount of capital	\$1,500,000	6000
	\$1,250,000	5000
	\$1,000,000	4000
	\$750,000	2000
	\$500,000	1000
Ownership retained (MedTech)	80%	4000
	60%	3500
	50%	2500
	40%	2000
	35%	1500
Amount of control	MedTech, Inc.	
	5	4000
	4	3000
	3	2500
	2	2000
	1	1500
	Divvy Out Capital	

Divvy Out Capital

Background

You are an associate at Divvy Out Capital, a venture capital firm that invests in new ventures. You are meeting with the founder of MedTech, Inc., a technology company that specializes in medical devices. You know that the founder, who recently completed an MBA, is in the final stages of creating the prototype of a new nanorobot that will improve numerous medical procedures and treatments and is ready to start producing it on a larger scale.

You have scheduled to meet with the founder of MedTech to decide whether Divvy Out will provide venture capital. In preparation for the meeting, MedTech offered the following performance estimates, which seem realistic.

Estimated revenues for MedTech for the first 5 years:

Year 1 = −\$100,000
 Year 2 = \$100,000
 Year 3 = \$250,000
 Year 4 = \$1,000,000
 Year 5 = \$2,000,000

You know that in addition to determining whether and how much capital to invest, you will also be determining matters of ownership and decision making control.

Issues to consider

1. Amount of capital
2. Percentage of ownership retained by MedTech
3. Amount of control you will have in decision making (i.e., how “hands-on” Divvy Out will be)

Negotiation

You will notice that issues differ in point values. You have determined that the most important issues to you are the amount of capital you will agree to pay and the amount of ownership you will secure. You are less concerned about control over decision making, but realize it is wise for you to

have some oversight of those processes. You want to achieve the best outcome you can but realize there is tremendous potential upside in this venture. Therefore, you are motivated to reach an agreement with MedTech.

Confidential success table for Divvy Out Capital.

Issue	Terms in contract	Points
Amount of capital	\$1,500,000	1000
	\$1,250,000	2000
	\$1,000,000	4000
	\$750,000	5000
	\$500,000	6000
Ownership retained (MedTech, Inc.)	80%	1000
	60%	2000
	50%	3500
	40%	4000
	35%	5000
Amount of control	MedTech, Inc.	
	5	1500
	4	2000
	3	2500
	2	3000
	1	4000
Divvy Out Capital		

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