Sources of Leverage in Entrepreneur-Investor Bargaining

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The increasingly complex landscape of startup financing demands that entrepreneurs seek the most advantageous funding strategies to support their growth. This paper focuses on two elements of entrepreneur-investor negotiations: the number of potential investors and the contractual complexity surrounding investor protection. Our approach involves a vignette-based survey of active entrepreneurs and investors in the field, followed by a series of laboratory experiments that systematically analyze different bargaining conditions and contractual terms. Our results reveal that the beneficial (from the entrepreneur's perspective) effects of negotiating with multiple investors, suggested by classic bargaining models, are not universally applicable. Instead, these effects depend on factors such as investor size, substitutability, and the entrepreneur's outside options. Our findings also demonstrate that investor downside protections may disadvantage early-stage startups, but can be beneficial to later-stage startups. These insights offer guidance for entrepreneurs and their investors, as well as provide new micro-foundations for venture capital contracting theories and for models of bargaining under uncertainty.

Key words: Innovation, Bargaining, Experiments

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1. Introduction

The increasingly complex landscape of startup financing demands that entrepreneurs seek the most advantageous funding strategies to support their growth. Two distinct trends that have emerged recently are (1) the proliferation of opportunities for entrepreneurs to connect and negotiate with investors, and (2) a surge in contract complexity, particularly in contractual provisions that shield investors from potential losses. These developments not only highlight the intricate nature of the current fundraising ecosystem, but also underscore the need for entrepreneurs to adopt a more calculated and strategic approach to the fundraising process.

Prior work in finance, innovation and technology management, and entrepreneurship has examined questions related to entrepreneurial financing (See Azoulay and Shane 2001, Da Rin et al. 2013, Kerr and Nanda 2015, Lerner and Nanda 2020, for comprehensive review articles). Much of this research has focused on examining whether venture capital investments help or hurt innovation (Kortum and Lerner 2000, Da Rin et al. 2013, Ewens et al. 2018), on documenting the common financial instruments found in various industrial sectors (Kaplan and Strömberg 2003, Fu et al. 2023), and on understanding the interplay between equity contracts and governance (Kaplan and Strömberg 2001, Bengtsson 2011, Wasserman 2012). While these studies help researchers (and policy-makers) better understand the key patterns and trends in entrepreneurial financing, they often stop short of examining the more micro-level trade-offs and choices faced by entrepreneurs and offer little to no guidance for effective fundraising strategies. This paper aims to start filling this gap, by examining entrepreneurial financing through a more prescriptive, operational lens, by systematically varying elements of founder-investor agreements, and evaluating the resulting bargaining processes and equity splits.

To gain insight into the factors that contribute to successful entrepreneurial fundraising we focus on the bargaining that occurs between an entrepreneur and one or multiple potential investors. The bargaining literature is vast (Nydegger and Owen 1974, Roth and Rothblum 1982, Murnighan et al. 1988, Roth 1995, Frechette et al. 2003, Güth and Kocher 2014) but fails to directly address the unique dynamics of entrepreneurial fundraising. This is because the literature overlooks scenarios with high downside risk, a defining feature of entrepreneurship (Kortum and Lerner 2000, Kerr and Nanda 2015), and because it does not consider contractual agreements, such as Preferred Stock contracts, typically found in entrepreneurial ventures (Kaplan and Strömberg 2004, Da Rin et al. 2013, CB Insights 2021). Nonetheless, classic multi-party bargaining models, such as the Nash-in-Nash framework, can be extended to incorporate these factors.

The Nash-in-Nash framework (Horn and Wolinsky 1988) predicts that both the increase in the number of potential investors, and the downside protection for investors offered by Preferred Stock contracts, should increase the entrepreneur's equity share. The Nash-in-Nash logic is that, keeping the maximal investment amount constant, the entrepreneur is better off with two investors, because the entrepreneur can leverage the ability to walk away and still obtain funding from the other investor. Further, the model posits that entrepreneurs can use the reduction in investor risk as a source of leverage for retaining a larger share of the startup. In this paper, we experimentally examine these theoretical arguments by systematically varying the number of investors, and the type of equity agreement (Common vs. Preferred Stock contract).

As a first step, to validate the Nash-in-Nash logic we conducted a vignette-based survey of active entrepreneurs and investors.[1] We asked them to assess several negotiation scenarios with a

[1] To do this, we partnered with a network of entrepreneurs in the clean energy sector, as well as with a targeted recruitment platform and recruited 119 people with entrepreneurial experience. Their entrepreneurial experience ranged from 6 months to 30 years, and included a range of industrial sectors and different types of entrepreneurial involvement (survey details are in Appendix A.1).

single investor vis-à-vis two investors. The results, reported in Table 1, support some of the Nash-in-Nash logic, but also reveal a disconnect between the theoretical understanding derived from the Nash-in-Nash predictions and real-world practice. The survey results suggest that, consistent with the Nash-in-Nash logic, startups with no intrinsic value are expected to do better with two investors (42.9%) than with one investor (18.5%). The proportion of respondents who report that two investors are better for the entrepreneur in this case is significantly larger than the proportion who report that one investor is better ($p \ll 0.01$).[2] At the same time, more than 50% of respondents either believe the opposite of the Nash-in-Nash predictions, or expect no differences in outcomes. In addition, the survey responses suggest that the relative advantages of negotiating with multiple investors may diminish as the startup becomes more mature and valuable. For a startup with some intrinsic value, respondents were equally split regarding when entrepreneurs can be expected to do better. A non-parametric sign test indicates that the effect of intrinsic value of the startup on the respondents' assessments was statistically significant (two-sided test, $p = 0.046$).

Table 1 Field Survey

Entrepreneur does better ...	Vignette 1: Startup has no intrinsic value	Vignette 2: Startup has some intrinsic value
...negotiating with single investor	18.5%	36.1%
...negotiating with two investors	42.9%	36.1%
...about the same	38.7%	27.7%

Note: Columns may not sum to 100% due to rounding. The order in which vignettes were displayed was randomized.

Together, the survey results suggest that the power dynamics in entrepreneur-investor bargaining may be more complex than suggested by classic bargaining models. To better understand the factors driving the negotiation processes and outcomes, we conducted a series of behavioral experiments, systematically examining the number of investors involved in the negotiation process, as well as the contract used to divide ownership.

The first question that we investigated was whether the number of investors affects the share retained by the entrepreneur. Our data suggest that, contrary to the Nash-in-Nash logic, negotiating with multiple investors is not always beneficial for the entrepreneur. Instead, we find that the ability of the entrepreneur to leverage multiple investors critically depends on the type of investor. With two *complementary* investors both of whom are needed for the entrepreneur to reach the funding goal, we find that a single large investor is preferred by the entrepreneur. However, two

[2] To do this test, we first drop those respondents who report no expected difference between one and two investors. We then calculate the proportion who report that two investors is better for the entrepreneur and test the null hypothesis that the fraction is equal to 0.5.

substitutable investors, who can each provide the full funding if they want to, may be preferred to a single large investor. This result emerges from a strategic negotiation behavior, wherein the entrepreneur sets off competition between the two substitutable investors by repeatedly asking each investor for the full amount, until one of the investors agrees to the offer.

In the next set of experiments, we endow entrepreneurs with a stronger outside option. This is to represent negotiation scenarios in which a startup has already found a product-market fit and can persist even without investment. In this more balanced bargaining environment, we continue to see that multiple investors do not necessarily benefit the entrepreneur. Indeed, with a larger outside option, entrepreneurs tend to ask for smaller investment amounts, even when investors are substitutable and could provide the full funding. This leads to more split investments, which in turn disadvantages the entrepreneur. This result is consistent with our survey of entrepreneurs (Table 1), which also showed that a stronger outside option should lower the benefits of negotiating with multiple investors.

Finally, we turn to the question of whether offering investors downside protection helps entrepreneurs retain larger ownership. The contractual provisions offering such protection vary across industries and tend to change over time (Bengtsson 2011, Da Rin et al. 2013, CB Insights 2021), but an approach that is both simple and common is to offer investors equity in the form of Preferred (rather than Common) Stock. Under Preferred Stock contracts, investors are typically repaid before the entrepreneur receives any money (Metrick and Yasuda 2010).

Examining the effects of Preferred vs. Common Stock, we found that Preferred Stock contracts disadvantage the entrepreneur when the entrepreneur has no other outside options. In this scenario, investors' shares do not significantly vary with contract, which goes against the bargaining model predictions. However, in the more balanced bargaining environment, where the startup has some intrinsic value, Preferred Stock contracts help entrepreneurs retain a larger share, consistent with the model predictions. A plausible mechanism driving these results is that a non-zero outside option changes the bargaining dynamics and puts the entrepreneur on a more equal footing with the investor(s), since the entrepreneur now risks losing that outside option. This provides a potential argument for the entrepreneur retaining a larger share with Preferred Stock (in contrast to the case in which the entrepreneur has no outside options and no money to put at risk).

The finding that early-stage startups may be seriously disadvantaged if they offer investors large downside protections is in line with the field data presented in Ewens et al. (2022), who show the potential negative effects of complex equity division instruments on startup success. It is also consistent with some of the practitioner advice to investors, to offer "founder-friendly" term sheets that avoid aggressive payback clauses, and to be more accepting of Common Stock deals (Altman 2013). Our results provide a plausible mechanism for these results and recommendations: we also find that Preferred Stock contracts may lead to more aggressive investor behaviors and tip the balance of negotiation dynamics towards investors.

Together, our findings help develop insights for entrepreneurs seeking investment opportunities. The conventional wisdom that more investors is better, while consistent with classical bargaining models, is not uniformly true according to our data. The effects of having access to multiple investors are quite nuanced and depend on various factors, including the size, number and substitutability of investors, and the entrepreneur's outside options. Therefore, entrepreneurs should carefully consider their individual circumstances when considering their negotiation strategies and terms. Especially in the early stages, entrepreneurs should focus on identifying multiple investors but avoid splitting investments among many small investors. More mature startups are better positioned to leverage their outside options with a single than with multiple investors, regardless of investor size. Further, while early-stage entrepreneurs should be cautious about downside protection in the term sheet, more mature startups will generally see a fairer reflection of their startup value in the contractual terms.

In addition to the practical implications of our results, our study is the first (to our knowledge) to bridge two strands of literature: the venture capital literature in finance and the bargaining literature in economics and operations management. We contribute to the finance literature in two ways. First, we add to the understanding of the conditions under which multiple investors may benefit or hinder entrepreneurs in retaining a larger share of their startup. In doing so we highlight the importance of investor substitutability which has not been previously emphasized. Second, we show the potentially negative impact of excessive investor downside protection on startup success, particularly for early-stage startups, suggesting a causal pathway for the empirically observed negative effects of complex term sheets on startup performance.

We also contribute to the bargaining literature, by showing how the Nash-in-Nash model can be revised to be more reflective of the observed bargaining dynamics. In particular, we highlight the need to distinguish between hard and soft leverage in negotiations, with the hard leverage of outside options leading to robust improvements, while the soft leverage of being able to go to a second investor may not always be useful. We also discuss the importance of context-specific off-equilibrium beliefs when modeling multi-party negotiations. Finally, we introduce a simple framework that links each party's risk in negotiations with the expected outcomes. These insights help researchers looking to build more accurate models of bargaining in uncertain (and potentially asymmetric) environments, often found in innovation and entrepreneurship contexts.

2. Literature

Entrepreneur-investor contracting has not received much attention in the operations management literature (Krishnan and Ulrich 2001, Kavadias and Hutchison-Krupat 2020); indeed, a recent review has identified both contract design and entrepreneurship as two areas that remain understudied from an operational perspective (Kavadias and Ulrich 2020). To bridge this gap, our work draws on the extensive research in finance and entrepreneurship, as well as on the bargaining literature in economics and operations management.

2.1. Finance and Entrepreneurship

The relevant finance and entrepreneurship literature can be organized into three distinct streams: the literature that documents the prevalence of different types of investors, the literature covering different contracting models, as well as the literature that studies strategic interactions between startups and investors.

Types of Investors Historically, the investment landscape in entrepreneurship involved mainly two types of investors: smaller-scale angel investors and angel funds, and larger, often industry-focused venture capital (VC) firms (Kaplan and Lerner 2016). Both groups sometimes invest in syndicated fashion (Kaplan and Strömberg 2004), yet there is considerable competition to invest in high-quality startups (Hong et al. 2020). More recently, the investor landscape has seen a broadening of investor types with increasingly disparate characteristics. This is in part due to the rise of startup accelerators, incubators and similar entrepreneurial programs that have significantly reduced the barriers to matching startups with prospective investors (Cohen et al. 2019). For example, Amore et al. (2023) document the emergence of micro VCs, which are – similar to classic VCs – professionally managed funds, but tend to make smaller investments (typically under $100K) and are less likely to syndicate (CB Insights 2015). Together, these trends present an opportunity for a more strategic approach to fundraising, as startups navigate an increasingly large and diverse array of funding options (Akerlof and Holden 2019, Halac et al. 2020).

In addition to capital, investors often contribute to startups by offering strategic guidance, industry insights, and network access (Hsu 2004, Wasserman 2012). Thus, multiple investors who can contribute with complementary inputs are often desirable, especially for early-stage startups. At the same time, there has been an increase in startup ownership by nontraditional investors such as mutual funds, hedge funds, and other large institutional players, which, compared to more specialized VC firms, are less knowledgeable about any particular industry (Strachan 2021). Multiple investors participating in a funding round can therefore act either as complements, with each investor providing unique, synergistic contributions, or as substitutes, where their primary role is capital provision and they can interchangeably fill in for one another (Hochberg et al. 2015, Hellmann et al. 2021). Our investigation will consider both scenarios: one where investors act as substitutes and one where they are complements.

Contracting Models The literature further documents a multitude of different contracting models, frequently including protective clauses for investors (Da Rin et al. 2013). Particularly common are convertible preferred equity contracts, an ownership model that provides a (fixed) multiple return on investment in low-exit scenarios, yet converts to common equity in high-exit scenarios. Game-theoretic models explain the popularity of Preferred Stock contracts with their ability to align player incentives (Schmidt 2003, Hellmann 2006, De Bettignies 2008). At the same time, the inherent complexity of these contracts can make it difficult to understand valuations and cash flow rights (Gornall and Strebulaev 2020), and some contract structures have been linked to lower startup performance (Ewens et al. 2022). Indeed, a recent trend is towards more founder-friendly contracts with simpler term sheets (Y Combinator 2023). One of our research questions is to examine how investors and founders integrate the downside protections of Preferred Stock into their agreements.

Strategic Interactions and Startup Ownership Firm ownership and financing is also one of the classic microeconomic questions, popularized as the "theory of the firm" (Grossman and Hart 1986, Hart and Moore 1990). Studies in this stream assume take-it-or-leave-it behavior, bypassing any bargaining or negotiation dynamics. Studies that take a more cooperative approach to bargaining are Hellmann and Wasserman (2017), Hossain et al. (2019) and Kagan et al. (2020). Different from us they study ownership allocation *within* the entrepreneurial team and not *between* the entrepreneur and investors.

Akerlof and Holden (2019) and Halac et al. (2020) examine how a project owner (equivalent to the entrepreneur in our case) would choose potential investors to fund a project. Similar to us, they examine the relative allocation of payoffs among the project owner and the investors, where investors are allowed to vary in size. Different from our investigation, both papers assume leader-takes-all behaviors and do not consider bargaining dynamics. Further, both are theoretical models, while we combine theory with data. Ewens et al. (2022) tests the predictions of a dynamic matching model in an empirical data set that includes both equity splits and exit valuations and find that investors generally receive greater ownership stakes relative to what would be optimal for maximum value creation. They also find that this outcome is profit-maximizing from the investors' point of view. A key observation in Ewens et al. (2022) is that the bulk of the excess profits received by investors is due to liquidation preferences. Our study provides a possible causal mechanism for this observation: we show that liquidation preferences are not fully accounted for in the negotiations, leading to inflated investor ownership.

2.2. Bargaining

Bargaining problems (both structured and unstructured) have attracted significant interest in the academic literature (Roth 1995). Most of these studies examine the problem of splitting a pie of a given size, and do not consider the relevant features of the entrepreneurial setting such as multiple investors, size of investment, uncertainty, or equity contract types.

Cooperative Bargaining The early experimental economics literature focused mainly on testing Nash solution predictions for bilateral negotiations with complete information (Nydegger and Owen 1974, Roth and Rothblum 1982, Murnighan et al. 1988). Two features of the entrepreneurial setting, that the entrepreneur may bargain with multiple investors, and that the size of the pie (value of startup equity) is both endogenous and uncertain, have attracted relatively little attention. The studies of multilateral bargaining in economics (see, e.g., Frechette et al. 2005b,a) focus on legislative bargaining and have highly structured bargaining formats in order to test features of interest to these models. Embrey et al. (2021) is related in that, like us, they study bargaining over risky pies where risk exposure is asymmetric; but they do not consider multilateral bargaining or different contracts. No studies that we are aware of examine the types of equity division contracts that are prevalent in entrepreneurial practice (Common vs. Preferred Stock), or compare the outcomes of single vs. multiple investor bargaining.

Applications in Operations Management While there has been extensive research on bargaining in operations management – much of it has focused on the supply chain context (Davis and Leider 2018, Davis and Hyndman 2019, Davis et al. 2022). Somewhat surprisingly, some of the results that hold in the (more abstract and sterile) economic setting do not carry over to the more contextualized supply chain setting. For example, Embrey et al. (2021) study bargaining over "risky pies", where one party is a residual claimant and the other receives a fixed payment. They find that residual claimants are able to negotiate a high premium compensating them for risk exposure. In contrast, Davis and Hyndman (2019) find that the party carrying inventory risk is not fully compensated for that risk. Together, these results suggest that the institutional context (i.e., operational environment) matters, even for problems that are mathematically equivalent.

The scenarios examined in our study include negotiations with *multiple* investors. This is an understudied problem in the literature, with the closest being Lovejoy (2010) and Leider and Lovejoy (2016) who study simultaneous bargaining with horizontal competition within a supply chain tier. Different from these studies, which assume single sourcing/contracting within a tier, entrepreneurs may contract with multiple investors. To analyze the multiple investor case we adopt the "Nash equilibrium in Nash bargains", or simply "Nash-in-Nash" framework, which takes a cooperative bargaining approach in the bilateral bargaining stage, and embeds it in a larger strategic game across all participants (Davidson 1988, Horn and Wolinsky 1988). Different from this literature we focus on the entrepreneurial setting, and use both analytical and experimental tools to answer our research questions.

3. Study Design and Overview of Experiments

The remainder of this paper examines theoretically and experimentally several scenarios in entrepreneur-investor equity negotiations. In this section we present our study design, which includes the experimental treatments, the key comparisons, as well as a brief preview of results.

3.1. Study Design

We examine negotiation scenarios defined by two factors: the number of investors (one or two) and contract type (Common or Preferred Stock). The single investor scenario can be reflective of a large venture capital firm, or can represent an angel or investor syndicate where a lead investor or representative handles negotiations on behalf of a group of smaller investors. In contrast, in the two investor case, each investor acts independently. For scenarios with two investors we are further interested in investor substitutability, i.e., whether each investor alone can provide the full investment and can thus act as a substitute for the second investor, or alternatively, investors are complements and are both needed for the venture to launch at maximum scale. We examine both substitutable and complementary investor scenarios, as each may occur, given the heterogeneity of investor types reported in the literature (See §2.1).

We study the effects of the number of investors and of contract type within two distinct environments: one in which the entrepreneur has no outside options if the negotiations fail, and a second one in which the entrepreneur can still launch the business, though at a lower scale if the negotiations fail. The assumption that the entrepreneur is "penniless" and has no outside options is standard in the contracting literature (Bolton and Dewatripont 2004, Aghion and Holden 2011) and in the more recent game-theoretic work on capital assembly (Akerlof and Holden 2019, Halac et al. 2020). However, the presence and size of outside options is a key determinant of outcomes in the bargaining literature (see §2.2); to arrive at robust conclusions we therefore examine scenarios in which one of the parties (in our case the entrepreneur) has a smaller or a larger outside option.

To be more specific, our experiments are organized into a six (negotiation scenarios, varied between-subject) $\times$ two (contracts, varied within-subject) design.[3] The six negotiation scenarios are further subdivided into two treatment arms varying whether the entrepreneur has a positive outside option if then negotiations break down (PoorEnt, RichEnt) and three treatment conditions

[3] The sequence of contracts (Common $\longrightarrow$ Preferred) or (Preferred $\longrightarrow$ Common) was randomized in the SI treatments; we found no order effects.

Table 2 Overview of Research Questions and Sections

Question	Treatment arm	Treatment conditions	Contracts	Section
How do the number & substitutability of investors affect equity division?	PoorEnt	SI, TI-C, TI-S	Common Stock	§4
	RichEnt	SI, TI-C, TI-S	Common Stock	§5
How does contract type affect equity division?	PoorEnt & RichEnt	SI, TI-C	Common & Preferred Stock	§6
What are the key bargaining dynamics & processes?	PoorEnt & RichEnt	SI, TI-C, TI-S	Common & Preferred Stock	§7

within each arm, varying the number and type of investors (SI, TI-S, TI-C). In total, 386 subjects participated in our study across 32 independent sessions.

Table 2 presents an overview of our research questions and of the conditions used to examine each question. In §4 we begin by examining early-stage ventures in which the entrepreneur goes into the negotiations without any outside options (PoorEnt). Within this treatment arm, we examine three different conditions: a condition in which the entrepreneur negotiates with a single, large investor able to provide the full investment (SI), a condition in which each investor provides complementary inputs needed for full investment (TI-C), and a condition in which each investor can act as a substitute for the other, and if needed can provide the full investment alone (TI-S). In §5 we repeat our analysis and experiments for the case that the entrepreneur has a non-zero outside option (RichEnt). As before we focus on three treatment conditions: SI, TI-C and TI-S, with the treatment being randomly assigned to participants. In §6 we examine the effects of contracts within each environment.[4] Finally, in §7 we examine the negotiation process data to better understand the observed outcomes.

3.2. Summary of Theoretical Predictions and Preview of Results

For each treatment arm and condition, we will first develop analytical benchmarks. To do so, we extend the classic Nash-in-Nash model (Horn and Wolinsky 1988, Davidson 1988) to incorporate uncertainty, the multiple investor case and the different contracts (Common/Preferred Stock). The model predictions can be summarized as follows. First, the entrepreneur should receive a strictly larger share in the TI-C condition relative to SI, with the TI-S condition being in between. Second, to compensate the entrepreneur for investor downside protection, the entrepreneur should earn a larger share with Preferred Stock contracts, relative to Common Stock contracts.

Our experimental results offer only partial support for the above predictions. First, in §4 we show that the entrepreneur receives a lower share in TI-C relative to SI, and a weakly larger share

[4] Note that we do not examine the combination of TI-S and Preferred contracts. This is because Preferred Stock contracts introduce a very large number of contingencies for the TI-S scenario, making it exceedingly complex to explain to experimental participants. See §6 for details.

in TI-S relative to the other two treatments.[5] That is, while from the entrepreneur's perspective, the treatment conditions are ranked SI $\leq$ TI-S $\leq$ TI-C in theory, they are ranked TI-C $<$ SI $\leq$ TI-S in our data. In other words, multiple investors only benefit of the entrepreneur when the investors are substitutable. This pattern of results continues to hold in the RichEnt treatment arm in §5; however, TI-C performs somewhat weaker from the entrepreneur's perspective. Second, in §6 we find that, contrary to theory, Preferred Stock contracts do not increase the entrepreneur's share in the PoorEnt treatment arm; however, consistent with theory, they do so in the RichEnt treatment arm. The analysis of bargaining processes in §7 shows that these outcomes arise from differences in investor aggressiveness in initial offers, as well as from more strategic entrepreneur behavior when investors are substitutable.[6]

4. Early Stage Startups (PoorEnt)

In this section we examine scenarios where the entrepreneur has no outside options if the negotiations fail. This is to represent the bargaining dynamics that is tipped towards the investors, as is often the case for an early-stage startup. We compare three scenarios: Single investor (SI), Two complementary investors (TI-C) and Two substitutable investors (TI-S). We do so under Common Stock contracts (Preferred Stock contracts are deferred to §6).

4.1. Theory

We first outline the basic setting and then provide details specific to each negotiation institution. There is an entrepreneur and a set of potential investors, $\mathcal{I}$. The entrepreneur seeks investment of up to e units of capital from one or more investors from the set $\mathcal{I}$. Each investor, i, has an initial endowment of $\bar{I}^t \leq e$ and can make any investment amount from the set I^t, where $t \in \{\text{SI, TI-C, TI-S}\}$ denotes the bargaining institution. We assume that $0 \in I^t$, which simply means that an investor is not obligated to invest. The entrepreneur engages in simultaneous bilateral negotiations with each investor i over the share, s_i^t, that investor i will receive in exchange for an investment of I_i^t. Denote by $\mathcal{I}' \subseteq \mathcal{I}$ to be the set of investors with which the entrepreneur reaches an agreement. The entrepreneur must satisfy the constraints that $\sum_{i\in\mathcal{I}'} I_i^t \leq e$ and $0 \leq \sum_{i\in\mathcal{I}'} s_i^t \leq 1$. That is, investment must be no greater than e and the entrepreneur cannot give away more than the entire business.

If an investment has been agreed to, i.e., $\sum_{i\in\mathcal{I}'} I_i^t > 0$, the startup may succeed or fail. Let α be the random variable representing startup success. With probability p the startup succeeds and

[5] "Lower/larger" means that the differences between conditions are statistically significant. "Weakly lower/weakly larger" means that the differences are significant for a subset of comparisons.

[6] Theory also predicts that a larger outside option should increase the entrepreneur's share as we go from the PoorEnt setting of §4 to the RichEnt setting of §5. While not unexpected, this is supported in our data.

$\alpha = \alpha_H$; in this case, the value of the startup is $V = \alpha_H \sum_{i\in\mathcal{I}'} I_i^t$. With probability $1-p$, the startup fails and $\alpha = a_L$, where $\alpha_L < \alpha_H$; in this case, $V = \alpha_L \sum_{i\in\mathcal{I}'} I_i^t$. Denote by $\mu_\alpha = \mathbb{E}[\alpha]$ the expected value of the multiplier α.[7] The realized payoff to investor j, who reached an agreement with the entrepreneur is:

$$s_j^t \alpha \sum_{i\in\mathcal{I}'} I_i^t + \bar{I}^t - I_j^t. \tag{1}$$

The realized payoff to the entrepreneur is then:

$$\left(1 - \sum_{i\in\mathcal{I}'} s_i^t\right) \alpha \sum_{i\in\mathcal{I}'} I_i^t. \tag{2}$$

To solve for equilibria, we require expected profits. To this end, given agreed upon shares, $\boldsymbol{s} = (s_e, \boldsymbol{s}_i)$, and investments, $\boldsymbol{I}$, we denote the expected profits for the investor(s) by $\pi_i(\boldsymbol{I}, \boldsymbol{s})$ and for the entrepreneur by $\pi_e(\boldsymbol{I}, \boldsymbol{s})$. These are calculated by taking expectations of realized profit in (1) and (2) over α.

Finally, any investor who does not reach an agreement with the entrepreneur holds onto their initial capital, $\bar{I}^t$, and if the entrepreneur cannot secure investment from *any* investor, then the entrepreneur earns 0. That is, the entrepreneur has an outside option of $d_{\mathrm{e}} = 0$.

The characterization of equilibria for these bargaining problems depends on (p, α_H, α_L) and, following the Nash bargaining framework, on the relative bargaining power of the players, indexed by $\theta_i \in [0,1]$ to denote the relative bargaining power of investor i when bargaining with the entrepreneur. Equal bargaining power is given by $\theta_i = 1/2$. We separately characterize equilibria for all three bargaining institutions. In the single investor case, the equilibrium is always unique. In the two investor cases, multiple equilibria are possible, and we will provide further discussion below. To the extent possible, the theoretical results below will focus on parameterizations that give rise to a unique equilibrium. Further, we will assume equal bargaining powers. A more complete characterization of the equilibria under general μ_α and general bargaining powers is relegated to Appendix A.2. Lastly, we assume risk neutrality (see Appendix A.2.3 for the risk-averse case).

Bargaining with a Single Investor (SI) In this case, there is a single investor, who we will refer to as Investor 0. In this case, we assume that $\bar{I} = e$ and that the set of feasible investments, $I = [0, e]$ (when there is no scope for confusion, we will drop the treatment superscript), although under risk neutrality, efficiency will always lead to full investment. Denote by I_0 the amount invested by Investor 0. The value of the business becomes $V = \alpha I_0$.

[7] While more complex valuation techniques with richer representations of uncertainty are sometimes used in practice, the "Method of Multiples" with a fixed failure probability is one of the most common valuation methods used in practice (Metrick and Yasuda 2010). Further, note that we do not model potential information asymmetries between the entrepreneur and the investors, nor do we consider moral hazard. That is, α is determined by a random draw whose distribution, and realization, are common knowledge among the negotiators.

Investor 0 and the entrepreneur bargain over the size of the investment made by the investor, I_0, and the share of the startup, s_0, that the investor will receive in exchange for making the investment. The entrepreneur's share is given by $s_{\mathrm{e}} = 1 - s_0$. Let d_{e} and d_0 denote the disagreement point of the entrepreneur and Investor 0, respectively; i.e., their respective profits if the negotiation breaks down. As stated above, an investor who does not invest keeps their endowment; hence, $d_0 = e$. Additionally, given the assumption that the startup is worthless absent strictly positive investment, we have $d_{\mathrm{e}} = 0$.[8] Given our assumptions, the expected profit of the entrepreneur is $\pi_{\mathrm{e}}(I_0, s_0) = \mu_\alpha I_0(1 - s_0)$, while the expected profit of the investor is $\pi_0(I_0, s_0) = \mu_\alpha I_0 s_0 + e - I_0$. If a deal is settled, the investment I_0 and the share s_0 maximize the following Nash product:

$$\max_{I_0 \in [0,e],\ s_0 \in [0,1]} \ [\pi_0(I_0, s_0) - d_0]\,[\pi_{\mathrm{e}}(I_0, s_0) - d_{\mathrm{e}}] \qquad \pi_0(I_0, s_0) \geq d_0,\ \pi_{\mathrm{e}}(I_0, s_0) \geq d_{\mathrm{e}}. \tag{3}$$

Solving (1), we obtain the following bargaining outcome.

PROPOSITION 1 **(Single investor)**. *The investor invests $I_0^{SI} = e$. The shares are as follows:*

$$s_0^{SI} = \frac{\mu_\alpha + 1}{2\mu_\alpha} - \frac{d_e}{2e\mu_\alpha}, \quad s_e^{SI} = 1 - s_0^{SI} = \frac{\mu_\alpha - 1}{2\mu_\alpha} + \frac{d_e}{2e\mu_\alpha}.$$

Proposition 1 reproduces the standard result from the Nash Bargaining literature: converted to expected profits, the shares equalize the negotiators' gains from negotiating minus their disagreement payoffs.

Bargaining with Two Complementary Investors (TI-C) In this setting, the set of investors is $\mathcal{I} = \{\text{Investor 1, Investor 2}\}$; each investor has an endowment of $\bar{I} = e/2$ and the set of feasible investments for each investor is $I = [0, e/2]$. That is, each investor has an endowment of half the total desired investment and can invest up to their endowment. The value of the startup after the bargaining is $V = \alpha(I_1 + I_2)$.[9]

With multiple investors, each one (Investors $i = 1, 2$) engages in separate bilateral bargaining with the entrepreneur about the investment amounts I_i and the shares, s_i, received in exchange for their investment. We adopt the Nash-in-Nash solution approach to determine the negotiation outcome; i.e., the negotiation outcomes are derived as a Nash equilibrium of two simultaneous Nash bargaining problems. We denote the outcome of each bargaining unit i (the bargaining between the entrepreneur and Investor i) by (I_i, s_i) and the collective outcomes by $\boldsymbol{I} = (I_1, I_2)$ and $\boldsymbol{s} = (s_1, s_2)$.

[8] Although in this section we assume that $d_e = 0$, in §5 we will examine scenarios with $d_e > 0$; therefore, we formulate propositions for a general d_e.

[9] We focus on the two investor case because it captures many of the first-order bargaining dynamics relative to the single investor case, for example the improved bargaining position of the entrepreneur with multiple investors. However, much of the theoretical analysis can be readily extended to an arbitrary number of investors.

Then, the expected profit of the entrepreneur is $\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s})=\mu_\alpha(I_1+I_2)(1-s_1-s_2)$ and the expected profit of Investor i is $\pi_i(\boldsymbol{I},\boldsymbol{s})=\mu_\alpha(I_1+I_2)s_i+{}^{e}/_{2}-I_i$.

With two investors, it is still the case that the startup is worthless if the entrepreneur fails to agree with *both* investors. However, the entrepreneur's disagreement point versus any one of the two investors is not zero. This non-zero disagreement point is because the entrepreneur may still earn a profit from agreement with the other investor. Hence the entrepreneur will have a disagreement point versus each investor i, denoted by d_{e}^{-i}, which will depend on the shared *beliefs* about what would happen if the entrepreneur and that investor disagreed. We make the assumption common in the literature that the agreement with Investor j is the same, *whether or not the entrepreneur agreed with Investor i* (Yürükoğlu 2022).[10] Then $d_{\mathrm{e}}^{-1}=\pi_{\mathrm{e}}(0,I_2,0,s_2)$ is the profit of the entrepreneur when Investor 2 is the only investor. Similarly $d_{\mathrm{e}}^{-2}=\pi_{\mathrm{e}}(I_1,0,s_1,0)$. Further, the disagreement point of Investor i is $d_i={}^{e}/_{2}$ since each investor has ${}^{e}/_{2}$ units of capital as the endowment. Then, the investments $\boldsymbol{I}$ and the shares $\boldsymbol{s}$ maximize the Nash products simultaneously for each $i=1,2$:

$$\begin{aligned}\max_{I_i\in[0,e/2],\ s_i\in[0,1]}\quad & [\pi_i(\boldsymbol{I},\boldsymbol{s})-d_i]\left[\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s})-d_{\mathrm{e}}^{-i}\right]\\ & \pi_i(\boldsymbol{I},\boldsymbol{s})\geq d_i,\ \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s})\geq d_{\mathrm{e}}^{-i},\ i\in\{1,2\}.\end{aligned}\tag{4}$$

Solving (2), we obtain the following proposition:

Proposition 2 **(Two complementary investors)**. *Both investors invest the endowed capital in equilibrium; i.e., $I_i^{TI-C}={}^{e}/_{2}$ for $i\in\{1,2\}$. The equilibrium shares are as follows:*

$$s_i^{TI-C}=\frac{\mu_\alpha+1}{5\mu_\alpha}-\frac{d_e}{5e\mu_\alpha},\ i=1,2,\quad s_e^{TI-C}=1-s_1^{TI-C}-s_2^{TI-C}=\frac{3\mu_\alpha-2}{5\mu_\alpha}+\frac{2d_e}{5e\mu_\alpha}.$$

Bargaining with Two Substitutable Investors (TI-S) Finally, in this setting, we assume that there are two complementary investors. Specifically, $\mathcal{I}=\{\text{Investor 1, Investor 2}\}$; each investor has an endowment of $\bar{I}=e$ and the set of feasible investments for each investor is $I=[0,e]$. That is, each investor has the ability, if she so chooses, to invest the full amount of the entrepreneur's desired investment. Of course, the total investment is still restricted to $I_1+I_2\leq e$.

Identical to the TI-C scenario, investors $i=1,2$ engage separately in bilateral bargaining with the entrepreneur about the investment amounts I_i and the shares, s_i, received in exchange for their investment. Then, the expected profit of the entrepreneur is $\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s})=\mu_\alpha(I_1+I_2)(1-s_1-s_2)$ and the expected profit of Investor i is $\pi_i(\boldsymbol{I},\boldsymbol{s})=\mu_\alpha(I_1+I_2)s_i+e-I_i$.

Denote by d_{e}^{-i} the disagreement point of the entrepreneur when bargaining with Investor i. Then $d_{\mathrm{e}}^{-1}=\pi_{\mathrm{e}}(0,I_2,0,s_2)$ is the profit of the entrepreneur when Investor 2 is the only investor (with

[10] This assumption is plausible given that the process and the outcome of the negotiation between the entrepreneur and investor i are not observable to investor j. It is, however, an assumption, and the validity of the assumption can be evaluated with our experimental data.

simultaneous bargaining Investor 2 would not be aware of a potential disagreement with Investor 1; thus, neither the negotiated outcome nor the disagreement payoff can condition on the possibility that a disagreement has occurred). Similarly $d_{\mathrm{e}}^{-2} = \pi_{\mathrm{e}}(I_1, 0, s_1, 0)$. Further, the disagreement point of Investor i is $d_i = e$ since each investor has e units of capital as the endowment.

Note that not all the endowments of both investors can be invested, since the startup only needs e units of capital at this stage. That is, at most one investor can invest all the endowment. Therefore, there is an additional constraint that $I_1 + I_2 \leq e$. Then, the investments $\boldsymbol{I}$ and the shares $\boldsymbol{s}$ maximize the following Nash product simultaneously:

$$\begin{aligned} \max_{I_i \in [0,e],\ s_i \in [0,1]} \quad & [\pi_i(\boldsymbol{I}, \boldsymbol{s}) - d_i] \left[\pi_{\mathrm{e}}(\boldsymbol{I}, \boldsymbol{s}) - d_{\mathrm{e}}^{-i}\right] \\ & \pi_i(\boldsymbol{I}, \boldsymbol{s}) \geq d_i,\ \pi_{\mathrm{e}}(\boldsymbol{I}, \boldsymbol{s}) \geq d_{\mathrm{e}}^{-i},\ i \in \{1, 2\}, \\ & I_1 + I_2 \leq e. \end{aligned} \tag{5}$$

Solving the problem, we have the following proposition.

Proposition 3 **(Two substitutable investors)**. *Consider* $(I_1^{TI-S}, I_2^{TI-S}, s_1^{TI-S}, s_2^{TI-S})$ *such that* $I_1^{TI-S} + I_2^{TI-S} = e$, $I_i^{TI-S} \geq 0$, *and*

$$s_i^{TI-S} = \frac{I_i^{TI-S}\left(I_i^{TI-S} + e\right)\left(\mu_\alpha + 1\right)e - 4d_e(e + I_i^{TI-S})}{\mu_\alpha e\left(4e^2 - I_1^{TI-S} I_2^{TI-S}\right)},\ i = 1, 2. \tag{6}$$

If $\mu_\alpha \geq \max_{i=1,2}\left\{\frac{4e^3 + 2e(I_i^{TI-S})^2 - d_e(e + I_i^{TI-S})I_i^{TI-S}}{4e^3 - 2e^2 I_i^{TI-S}}\right\}$, *then* $(I_1^{TI-S}, I_2^{TI-S}, s_1^{TI-S}, s_2^{TI-S})$ *is an equilibrium bargaining outcome with Investor i investing* I_i^{TI-S} *for the share of* s_i^{TI-S}.

A straightforward comparison of s_e^t, $t \in \{\text{SI, TI-C, TI-S}\}$, yields the following corollary.

Corollary 1 **(Comparison of entrepreneur's share)**. *The entrepreneur's equilibrium share satisfy that* $s_e^{TI-C} \geq s_e^{TI-S} \geq s_e^{SI}$, *with at least one strict inequality.*

4.2. Experiment Design

Experimental Setup & Parameters To examine whether the leverage that is available in theory is exploitable in practice, we conducted a laboratory experiment. Subjects were recruited at a large public US university. At the beginning of each session, subjects were assigned the role of either an entrepreneur or an investor. Subjects kept that role for the duration of the experiment. For brevity, we will refer to subjects by their role: entrepreneur or investor.

Consistent with our theoretical development in Section 4.1 we set $\alpha_L = 1$, such that the value of the firm in the low state of the world is exactly equal to the investment. We set $e = 200$, such that the total available investment is 200 in all treatments. Further, we set the probability of success (i.e., that $\alpha = \alpha_H$) to be $p = 0.2$, and the multiplier $\alpha_H = 11$. A low value of p and a high value of

α_H are reflective of the entrepreneurial context in which there is a small probability of large profits and a large probability of failure. The expected return on investment is $\mathbb{E}[\alpha] = 0.2 \times 11 + 0.8 \times 1 = 3$; thus the expected size of the pie is also held constant at $200 \times 3 = 600$ in all treatments, provided that all agreements are secured. These parameters were chosen to (a) produce noticeable differences in the anticipated treatment effects (between 9.7 and 18.1 point difference in equity percentage) and (b) facilitate calculations and intuition building for untrained participants in the lab.

The experiment consists of three between-subject treatment conditions, corresponding to the three negotiation scenarios introduced in §4.1: SI, TI-C and TI-S. The difference between TI-C and TI-S is whether each investor can alone provide 200 units, the maximum amount of funding. In TI-C each investor can only provide up to 100 units, i.e., half of the maximum funding, while in TI-S each of the two investors can become the sole investor and exclude the second investor by unilaterally providing 200 units. The entrepreneur's outside option is $d_e = 0$ in all conditions, while the investors' outside options are simply their initial endowments in the respective condition: 200 in SI, 100 in TI-C and 200 in TI-S.[11]

Negotiation Format In each condition (SI, TI-C, TI-S), the entrepreneur engages in bilateral negotiations with each investor present. In particular, in the two investor treatments (TI-C and TI-S), investor i cannot see the offers (or any agreement) made between the entrepreneur and investor j. The negotiation format is semi-structured: players can make or accept offers specifying a share of the realized startup value (between 0 and 100%) that the investor will receive in exchange for their investment. In the SI and TI-C treatments, investments are all or nothing. That is, if the investor and entrepreneur reach an agreement, it is for the full amount of their endowment. In the TI-S treatment, each investor can invest up to their endowment in increments of 50, subject to the restriction that the total amount invested cannot exceed 200. That is, an offer in the TI-S treatment is a pair (s, I) where s is the share of the startup that the investor receives and $I \in \{50, 100, 150, 200\}$ is the amount that the investor invests. No structure is placed on who may propose first, or on the order or proposals. Players may not exchange verbal messages during the negotiations. At the end of each round the results of all negotiations are announced to all players in a dyad/triad.

In each period, the players in a negotiation dyad/triad have 90 seconds in the SI treatment or 180 seconds in the TI treatments to reach an agreement.[12] If no agreement is reached with any investor,

[11] A subset of our experimental sessions included a further training phase, in which participants negotiated over a fixed pie. This was done to facilitate comprehension and allow participants to familiarize themselves with the bargaining environment. We examine our results with and without considering these sessions, and find that they are robust to their inclusion.

[12] We chose 90 seconds based on the bilateral bargaining times commonly used in the experimental literature (Isoni et al. 2022). We opted for a doubling of the bargaining time in the TI treatments, relative to SI. The rationale for this design choice is that the TI treatments included two bilateral negotiations, between the entrepreneur and investor i, as well as between the entrepreneur and investor j.

then all players receive their outside options: zero for the entrepreneur and the initial endowment (either 200 or 100) for the investor(s). In the two investor cases, the entrepreneur can secure deals with zero, one or both investors. If negotiations succeed with only one investor, then the excluded investor receives their initial endowment, while the entrepreneur and investor who did reach an agreement are paid according to the terms of the agreement and the realized value of the startup. In the TI-S treatment, this investor also retains any portion of their initial endowment that they chose not to invest. The complete set of experimental instructions is reproduced in Appendix A.4.

Experimental procedures and protocols The experiment was programmed in oTree (Chen et al. 2016) and conducted virtually via Zoom, using a protocol that was adapted from Zhao et al. (2020) and Li et al. (2020). Further details are provided in Appendix A.4. Each subject was limited to one session and, within a session, participated in several rounds of the same treatment. At the beginning of each round subjects were randomly matched into a dyad (SI treatments) or triad (TI treatments).[13] Subjects were paid for one randomly selected round and we did not reveal the realized startup value in any round until after all rounds were completed. This was to avoid wealth effects. Average dollar earnings were $17.38 (min. $5; max. $48.40).

Hypotheses Based on our theoretical analysis (§4.1), the entrepreneur obtains the largest share in the two-investor scenario with substitutable investors (TI-C), and the smallest share in the single investor scenario (SI). In particular, under our parameterization, the theoretical prediction for entrepreneur's share is 33.3% in SI and 46.7% in TI-C (Based on Propositions 1-2). The theoretical prediction for the two-investor scenario with substitutable investors (TI-S) depends on the specific investment amounts from each investor; however, regardless of the investment amounts, in equilibrium TI-S is always weakly preferred to SI, and weakly dominated by TI-C (i.e., ranges between 33.3% and 46.7%, see Proposition 3). Thus, we can formulate the following hypothesis:

H1 (PoorEnt share comparison): *From the entrepreneur's perspective, the negotiation scenarios are ranked as follows: SI$\leq$TI-S$\leq$TI-C, with at least one strict inequality.*

4.3. Results

Table 3 provides a summary of results. Consider first the frequency of agreements in the left panel of Table 3. We decompose agreements into subcategories for full/efficient investment ($I_T = 200$), partial/inefficient investment ($I_T \in (0, 200)$) and disagreement ($I_T = 0$). For full agreement, we also further decompose into the specific investment combination. As can be seen, full agreements are

[13] The number of rounds played by each subject varies by treatment (between 6 and 10); this was done to ensure that each experimental session would last no longer than 90 minutes. The analysis presented in the main text uses two-sided comparisons of subject-level averages to test hypotheses. However, controlling for round and experimental session does not affect the direction or significance of our results.

Table 3 Summary of Agreements and Shares in PoorEnt Treatments

		Frequency of (dis-)agreements (%)			Entrepreneur share (%)			Entrepreneur share comparisons ($p-$value)		
		SI	TI-C	TI-S	SI	TI-C	TI-S	SI vs TI-C	SI vs TI-S	TI-C vs TI-S
Agreement	**Investment**									
Efficient	All	**82.92**	**77.08**	**72.22**	43.30	34.81	50.02	0.006	0.054	0.010
Exclusionary	$(200, 0)$	82.92	-	46.80	43.30	-	55.66	-	0.000	-
Asymmetric	$(150, 50)$	-	-	16.65	-	-	35.63	-	-	-
Symmetric	$(100, 100)$	-	77.08	8.77	-	34.81	40.24	-	-	0.460
Inefficient	All	**17.08**	**22.92**	**27.78**						
Partial	$0 < I_T < 200$	-	20.93	26.95		71.86	50.93	-	-	0.020
Disagreement	$I_T = 0$	17.08	2.08	0.83	-	-	-	-	-	-

Note: $p-$values are based on $t-$tests on subject averages of the average entrepreneur share by treatment for the relevant classification of the agreement.

achieved between 72% and 83% of the time. Not surprisingly, full agreement is less common in TI treatments, and especially in TI-S where the investors can invest partial amounts. At the same time, negotiating with multiple investors has the advantage that complete disagreement is exceedingly rare in both the TI treatments (between 0.83 and 2.08% of the time). The entrepreneur is almost always able to secure at least a partial investment. Finally, in the TI-S treatment, exclusionary agreements where one investor invests the full 200 units of capital are the most common outcome (47.17% of the time).

Consider next the middle panel, showing the final share negotiated by the entrepreneur. Focusing on efficient agreements, the results show that the two complementary investor case (TI-C) leads to the worst possible outcome for the entrepreneur. Both the large single investor (SI) and the multiple investor scenario where each investor could, theoretically, provide the total investment on their own (TI-S) are significantly better, as can be seen in the right panel of the table where we report tests of equality of entrepreneurs' shares across institutions ($p = 0.054$ and $p = 0.010$). Zooming into the TI-S treatment, the entrepreneur's share is especially high for exclusionary agreements (55.66%, on average), which is significantly higher than the entrepreneur's shares in the SI treatment ($p = 0.000$). Looking at symmetric cases where each investor invests 100 units of capital, the entrepreneur's share is higher under TI-S than under TI-C, but the difference is not statistically significant ($p = 0.460$); however, this is at least partially due to the relatively low frequency of symmetric agreements in the TI-S treatment. In sum, negotiating with two investors may hurt or benefit the entrepreneur, depending on the types of investors (complementary or substitutable) and on the type of agreement reached (exclusionary or not).

Result 1 *H1 is partially supported. Contrary to H1, negotiating with two investors who cannot each provide the full funding alone (TI-C) is worse for the entrepreneur than negotiating with a single* *large investor (SI). However, entrepreneurs benefit from negotiating with two large investors (TI-S), due to the prevalence of exclusionary contracts in which one investor provides the full investment amount.*

5. Later-Stage Startups (RichEnt)

In this section, we focus on startups that have some intrinsic value even in the absence of outside investors, which translates into more balanced bargaining positions. In what follows we briefly highlight the key theoretical insights and then delve into the experimental results.

5.1. Theory

The startup now has a strictly positive value, $d_e > 0$, even if the entrepreneur does not receive any investments. Specifically, we consider values of d_e that allow both the entrepreneur and investor(s) to achieve gains from reaching an agreement. (If d_e were too high, there would be no gains from bargaining possible.) The analyses in Propositions 1-3 and Corollary 1 continue to hold for these scenarios. That is, the entrepreneur's share continues to be the lowest in the SI case, and the highest in the TI-C case, with the TI-S case being in between.[14]

5.2. Experimental Design and Hypotheses

We followed the exact same protocol as in §4 (PoorEnt). We recruited subjects from the same student subject pool, ensuring that they did not participate in the PoorEnt wave of experiments. The instructions were modified to indicate the presence of the entrepreneur's outside option, d_e (disagreement outcome). As before, subjects negotiated under Common and Preferred Stock contracts (Preferred Stock contracts will be analyzed in §6). The entrepreneur's outside option, d_e chosen for this treatment arm was 160. This is close to the investors' outside option of 200, resulting in similar bargaining powers between the entrepreneur and the investor(s). At the same time, it is substantially smaller than the expected value of the venture under full investment (kept at 600 units, as in §4), resulting in an incentive for both parties to come to an agreement.[15] Under this parameterization, our comparative static on the preferred number and type of investors remains unchanged relative to the PoorEnt scenario:

H2 (RichEnt share comparison): *From the entrepreneur's perspective, the negotiation scenarios are ranked as follows: SI$\leq$TI-S$\leq$TI-C, with at least one strict inequality.*

[14] With two or more investors, there is a possibility of receiving less than full investment. Therefore, the question of how to model the disagreement outcome for the entrepreneur is important. We assume that the entrepreneur puts their disagreement outcome at risk in proportion to the amount invested. That is, if they agree to an investment of half the maximum investment, then the disagreement payoff is reduced by half; i.e., $d_e/2$.

[15] To account for the possibility of partial investments, the outside options of both parties are pro-rated. For example, in the TI-S case, if the entrepreneur only secures 100 out the maximum of 200 units, then the entrepreneur retains half of their outside option, i.e., 80 units, and the investor retains 100, i.e., half of their endowment.

Table 4 Summary of Agreements and Shares in RichEnt Treatments

		Frequency of (dis-)agreements (%)			Entrepreneur share (%)			Entrepreneur share comparisons ($p-$value)		
		SI	TI-C	TI-S	SI	TI-C	TI-S	SI vs TI-C	SI vs TI-S	TI-C vs TI-S
Agreement	**Investment**									
Efficient	All	**77.60**	**72.53**	**53.77**	48.35	34.37	42.54	0.000	0.098	0.051
Exclusionary	$(200, 0)$	77.60	-	31.75	48.35	-	51.55	-	0.325	-
Asymmetric	$(150, 50)$	-	-	11.85	-	-	26.25	-	-	-
Symmetric	$(100, 100)$	-	72.53	10.17	-	34.37	35.50	-	-	0.807
Inefficient	All	**22.40**	**27.47**	**27.47**						
Partial	$0 < I_T < 200$	-	23.30	42.40		68.05	49.34	-	-	0.008
Disagreement	$I_T = 0$	22.40	4.17	3.83	-	-	-	-	-	-

Note: $p-$values are based on $t-$tests on subject averages of the average entrepreneur share by treatment for the relevant classification of the agreement.

5.3. Results

Table 4 replicates our earlier analysis for the RichEnt treatment arm. Examining the left panel, the bargaining environment appears considerably more challenging, with efficient agreements being less common in RichEnt than in PoorEnt ($p = 0.007$) and, conversely, both partial agreements and disagreements more common in RichEnt than in PoorEnt ($p = 0.007$ and $p = 0.756$).[16] Although not predicted by the theory, this is not a surprising result. Given the entrepreneur's outside option, the range of agreements with payoff increases for both parties is substantially smaller, and the parties are less eager to enter an agreement with a risky outcome, where each party can lose money.

Next, consider the middle panel. As in the PoorEnt case (§4), entrepreneurs are worse off in TI-C scenario relative to SI ($p = 0.000$) and relative to TI-S ($p = 0.051$). However, different from the PoorEnt treatment arm, the entrepreneur earns a lower share in TI-S relative to SI ($p = 0.098$). These results highlight that negotiating with two investors is relatively less advantageous when the entrepreneur is rich. This is consistent with one of the insights from the field survey (reported in §1), which showed that real-world entrepreneurs and investors also expect the startup's ability to leverage multiple investors to be reduced as the startup becomes more valuable.

As before, it is also informative to examine the more detailed breakdown of agreements. There are some notable similarities and differences relative to the PoorEnt treatments. First, exclusionary agreements where a single investor invests the full 200 units of capital are still common and for such agreements, the entrepreneur earns a share that is similar to the SI treatment ($p = 0.325$). However, such exclusionary agreements are significantly less common than in the PoorEnt treatment ($t-$test, $p = 0.001$). Moreover, the entrepreneur's share under an exclusionary agreement

[16] The tests comparing agreements between PoorEnt and RichEnt are $t-$tests using subject averages (focusing on entrepreneurs only to avoid double counting).

in the TI-S treatment is substantially larger than the corresponding share of any other efficient agreement (i.e., where total investment is 200). The most notable difference is the substantially more frequent chance of an inefficient agreement in the TI-S treatment. Indeed, this is now the most frequent outcome, occurring 42.4% of the time, suggesting that entrepreneurs were either uninterested in or unable to seek full investment. We will return to this behavior in §7, when we analyze the underlying bargaining processes.

Result 2 *Similar to the PoorEnt setting, negotiating with two investors does not generally benefit the entrepreneur. When the entrepreneur can negotiate with two substitutable investors (TI-S) and when the negotiated outcome excludes one investor, the entrepreneur's share is statistically indistinguishable from the single investor case (SI). In the remaining cases, a single large investor (SI) is preferred. Further, entrepreneurs obtain smaller investments relative to PoorEnt.*

6. Contracts

We have so far focused on bargaining under Common Stock contracts. Next, we will examine how contract type (Common/Preferred) affects bargaining outcomes. For investors, Preferred Stock contracts eliminate the risk of losing money as they are fully protected on the downside. This means that investors should, in theory, be willing to accept a lower share in order to receive the same expected return as with Common Stock. As in the previous sections, we first briefly highlight the key theoretical insights before presenting the experimental results.

6.1. Theory

With Preferred Stock contracts, investors receive downside protection in the form of liquidation preferences. While many different types of provisions are possible (see §2.1), we set downside protection to be *exactly equal* to the investment amount. This means, in the high state of the world ($\alpha = \alpha_H > 1$), the value V is divided according to the negotiated shares as long as the investors' share is sufficient to cover their investment amount. If it is not, investor(s) receive their investment amount back. Further, in the low state of the world ($\alpha = \alpha_L = 1$) investor(s) receive their investment back. Thus, under Preferred Stock contracts investor(s) are insured against potential losses in both states of the world.[17]

To distinguish between contracts, we use s_i^j and I_i^j (resp., $\tilde{s}_i^j$ and $\tilde{I}_i^j$) to denote the equilibrium share and investment amount for Common Stock (resp., Preferred Stock) contracts with

[17] In practice, the extent to which the investor is protected from potential losses (sometimes referred to as "Liquidation Multiple") may be set endogenously by the negotiators. To simplify the analysis and the experiment, we assume an exogenous liquidation multiple of 1. We also note that Preferred Stock contracts in practice often entail increased control and voting rights for the investors. We do not examine control issues and focus solely on the surplus allocation properties of contracts.

$i \in \{e, 0, 1, 2\}$ and $j \in \{SI,\ TI-C\}$.[18] Much of the analysis is analogous to the Common Stock contracts. Therefore, we only present the main results below. Detailed formulation and analysis are in Appendix A.2.2.

Single Investor (SI) Under Preferred Stock contracts Investor 0 is paid up to I_0 before the entrepreneur receives any proceeds. This is true in both states of the world. Recall that the low state multiplier $\alpha_L = 1$ in our experimental implementation. Thus, in the low state of the world, Investor 0 receives exactly I_0 while the entrepreneur receives nothing. The following proposition summarizes the bargaining outcome.

PROPOSITION 4 **(Single investor bargaining)**. *The investor invests $\tilde{I}_0^{SI} = e$. The shares are as follows:*

$$\tilde{s}_0^{SI} = \frac{\alpha_H + 1}{2\alpha_H} - \frac{d_e}{2e\alpha_H p}, \quad \tilde{s}_e^{SI} = 1 - \tilde{s}_0^{SI} = \frac{\alpha_H - 1}{2\alpha_H} + \frac{d_e}{2e\alpha_H p}.$$

Two Complementary Investors (TI-C) Under Preferred Stock contracts both investors, if they choose to invest, receive at least their endowments back in both states of the world.[19] The following proposition summarizes the equilibrium bargaining outcomes in these scenarios.

PROPOSITION 5 **(Two investor bargaining)**. *There exists an equilibrium bargaining outcome in which both investors invest; i.e., $\tilde{I}_i^{TI-C} = e/2$ for $i \in \{1, 2\}$. The equilibrium shares are as follows:*

$$\tilde{s}_i^{TI-C} = \frac{\alpha_H + 1}{5\alpha_H} - \frac{d_e}{5e\alpha_H p},\ i = 1, 2, \quad \tilde{s}_e^{TI-C} = 1 - \tilde{s}_1^{TI-C} - \tilde{s}_2^{TI-C} = \frac{3\alpha_H - 2}{5\alpha_H} + \frac{2d_e}{5e\alpha_H p}.$$

Propositions 2 and 5 provide existence results for two investor scenarios. For the parameter values used in our experiments, these equilibria are also unique. Details are provided in Appendix A.2.

6.2. Experimental Design and Hypotheses

The Preferred Stock contract was examined as part of the SI and TI-C treatments. In particular, in these treatments the contract type – Common or Preferred – was a within-subject manipulation, used in half of the experimental rounds. We examine contracts in a within-subjects design to have more power to detect potential differences between the Common Stock and Preferred Stock variations (Charness et al. 2012). Given our theoretical analysis above and the parameterization used in our experiments, the theoretical prediction for entrepreneur's share under Common (resp.,

[18] We do not examine the combination of Preferred Stock contracts and TI-S. This is to limit the complexity of negotiations for experimental participants, given that Preferred Stock contracts and TI-S would introduce a very large number of contingencies for possible splits.

[19] We assume that each investor is always first compensated out of the profit of the entrepreneur and then, if needed, is compensated out the profit of the other investor. In Appendix A.2.2 we show that the latter scenario cannot occur in equilibrium so that we can restrict attention to the case where the investor who is protected will be compensated out of the profit of the entrepreneur.

Preferred Stock) is 33.3% (resp., 45.5%) under SI PoorEnt, 46.7% (resp., 56.4%) under TI-C PoorEnt, 46.7% (resp., 63.6%) under SI RichEnt, 57.3% (resp., 70.9%) under TI-C RichEnt. Thus, we hypothesize the following:

H3 (Contracts): *Holding the size of the entrepreneur's outside option and the number of investors constant, the entrepreneur obtains a smaller share under Common Stock contracts than under Preferred Stock contacts.*

6.3. Results

As before, we provide results on agreement rates and entrepreneur shares. The results are summarized in Table 5. Consider first the frequency of (dis-)agreements reported in the left part of the table. Agreement rates are somewhat higher under Preferred relative to Common Stock contracts if we consider the PoorEnt treatment arm ($p = 0.091$). Further, consistent with the results in §5 we observe a drop in agreement rates in RichEnt relative to PoorEnt for both the SI and TI-C scenarios under Preferred Stock contracts (SI: $p < 0.001$; TI-C: $p = 0.762$).

The middle panel of Table 5 shows the final shares obtained by the entrepreneur in each scenario. Several observations are in order. First, unsurprisingly, in three out of four pairwise comparisons, the entrepreneur's share goes up as the entrepreneur's outside option goes up (Common Stock: SI: $p = 0.027$, TI-C: $p = 0.918$; Preferred Stock: SI: $p < 0.001$, TI-C: $p = 0.568$). This is a useful manipulation check that confirms that negotiations respond to the presence of outside options consistent with what bargaining theory would predict. Second, recall that H3 states that the entrepreneur's share should be higher under Preferred Stock than under Common Stock. We find only partial support for this hypothesis. Indeed, the contract effect depends on whether the entrepreneur is poor (zero outside option) or rich (positive outside option). In the PoorEnt case, the shares are at most 1.5 percentage points apart between contracts conditional on the number of investors ($p = 0.837$ and $p = 0.590$, $p = 0.948$ for pooled comparison). In contrast, when the entrepreneur is rich, the entrepreneur negotiates a significantly higher share under Preferred than under Common Stock contracts ($p = 0.087$ and $p = 0.017$, $p = 0.007$ for pooled comparison). These results suggest that the entrepreneur's outside option serves as an important moderator on the effect of contracts on equity division.

Result 3 *H3 is partially supported. Preferred Stock contracts lead to higher entrepreneur shares only when the entrepreneur has a strong outside option.*

Table 5 Summary of Agreements and Shares with Common and Preferred Stock Contracts

		Frequency of agreements (%)		Entrepreneur share (%)		Entrepreneur share comparisons (p-value)
		Common	Preferred	Common	Preferred	Common vs. Preferred
Treatment arm	**Condition**					
PoorEnt	SI	82.92	87.84	44.30	42.97	0.837
	TI-C	77.08	79.29	34.81	36.09	0.590
	Pooled	80.72	84.58	41.13	41.22	0.948
RichEnt	SI	77.60	76.00	48.35	52.28	0.087
	TI-C	72.53	77.78	34.37	38.71	0.017
	Pooled	74.97	76.92	42.49	46.61	0.007

Note: The $p-$values are derived from paired $t-$tests on subject averages of the average entrepreneur share by contract type for the relevant treatment condition/arm.

7. Insights From the Bargaining Process

In this section, we delve into the bargaining process in order to better understand the drivers of our results in §4-6. We begin by reproducing the standard result in the bargaining literature (Tversky and Kahneman 1974, Galinsky and Mussweiler 2001) that first offers typically have an anchoring effect on negotiated outcomes. Building on this result, we then show that there are noticeable treatment differences in opening offers, which, combined with anchoring, go a long way to explaining our key findings.

7.1. Anchoring

Table 6 reports the results of a series of random effects regressions analyzing how first offers (of both investors and entrepreneurs) affect the likelihood of successfully reaching an agreement and also on the investors' shares conditional on an agreement. Here we focus on SI and TI-C treatment conditions, in which bargaining is one-dimensional (negotiators only negotiate equity percentage, and not the investment size). Anchoring results in the TI-S condition, where bargaining is multi-dimensional and includes the investment made by each investor i, are similar and are omitted here for brevity (See Appendix A.5.1 for the analysis of anchoring in the TI-S condition). Note that because we focus on bilateral negotiations between individual investor i and the entrepreneur we use investor i share (as opposed to entrepreneur share) as our measurement.

Table 6 suggests strong anchoring effects for both agreements and shares. Higher opening offers to investors by entrepreneurs are significantly positively associated with agreement, while higher opening demands by investors are negatively (and, for SI, significantly) associated with agreements. That is, the more generous the entrepreneur, the more likely is an agreement, while the more demanding the investor, the less likely is an agreement. Turning now to the agreed investor shares, we see that both the offers made to and the demands made by investors are significantly positively associated with the investor's final share. These regression results show that players generally face a trade-off in bargaining. The more generous they are to their bargaining partner, the more likely are they to reach an agreement, but the less favorable the agreement will be to themselves.

Table 6 Anchoring Effects of Initial Offers on Agreements and Investor Shares

	SI		TI-C	
Dep. Var.:	Agreement Reached	Investor i's Share	Agreement Reached	Investor i's Share
Initial Offer to Investor i by Entrepreneur	0.005^{***} (0.001)	0.291^{***} (0.047)	0.007^{***} (0.002)	0.399^{***} (0.057)
Initial Demand by Investor i	-0.006^{***} (0.001)	0.384^{***} (0.051)	-0.001 (0.001)	0.129^{***} (0.046)
Constant	1.076^{***} (0.051)	17.894^{***} (3.785)	0.767^{***} (0.106)	17.889^{***} (3.340)
R^2	0.138	0.421	0.048	0.390
N	1342	1104	838	724

Note: Random effects regression coefficients are reported (Standard errors in parentheses). All regressions include controls for treatment variables and standard errors are corrected for clustering at the session level. *, ** and *** denotes significance at the 10%, 5% and 1% level, respectively. The number of observations (N) corresponds to the number of interactions in which both negotiators (entrepreneur and investor i) made at least one offer.

Result 4.1: *There are strong anchoring effects: first offers predict both the likelihood of agreement and the final share received conditional on an agreement. Negotiators face a trade-off. A more aggressive opening offer increases the chance of disagreement, but, conditional on an agreement, leads to a more favorable outcome.*

7.2. Bargaining Process: Initial Offers in PoorEnt and RichEnt

We next examine the initial offers made by investors and entrepreneurs in PoorEnt and RichEnt. In PoorEnt offers were one-dimensional and consisted of the share offered to the investor in exchange for an investment of 200 (in SI) or 100 (in TI-C). In contrast, bargaining in TI-S was multi-dimensional: players negotiated over both an amount to invest (50, 100, 150 or 200) and a share received by each investor. In Table 7 we report summary statistics on these opening offers.

Consider first panel (a), which reports the distribution of investment amounts for subjects' first offers. As can be seen, all four investment amounts are offered first at least some of the time. One striking difference for entrepreneurs is the apparent differences in the distribution for the PoorEnt and RichEnt variations. When the entrepreneur is poor, over 50% of first offers are exclusionary, asking for the full investment from a single investor. In contrast, in RichEnt that frequency goes down to 24.53% ($p = 0.011$), with entrepreneurs asking for smaller investments of 50 or 100 units. In contrast, investors' first offers are quite similar across treatment arms, and investors generally tend to prefer smaller investments.

In panel (b), we report the share offered to (or demanded by) the investor for the first time each type of offer is made. Consider the SI and TI-C conditions in the first two rows. On average, entrepreneurs offer investors 36.97% of the pie in exchange for an investment of 200 in SI and 23.78% in exchange for an investment of 100 TI-C; thus, while the funding amount is halved,

Table 7 Opening Offers

(a) Frequency of Proposed Investment Amount

Treatment condition	Proposed investment	Entrepreneur's Proposal			Investor i's Proposal		
		PoorEnt	RichEnt	PoorEnt vs. RichEnt p-value	PoorEnt	RichEnt	PoorEnt vs. RichEnt p-value
SI	200	100.00%	100.00%	-	100.00%	100.00%	-
TI-C	100	100.00%	100.00%	-	100.00%	100.00%	-
TI-S	50	20.47%	35.38%	0.082	40.00%	36.63%	0.329
	100	18.71%	28.77%	0.316	18.89%	21.40%	0.718
	150	8.77%	11.32%	0.852	12.78%	16.05%	0.199
	200	52.05%	24.53%	0.011	28.33%	25.93%	0.972

Note: $p-$values are obtained by estimating marginal affects of treatment arm (RichEnt vs PoorEnt) on likelihood of observing a proposal of a given investment amount. Analysis is performed using random effects multinomial regressions.

(b) Proposed Share to Investor for First Offer for Each Investment Amount

Treatment condition	Proposed Investment	Entrepreneur's Proposal			Investor i's Proposal		
		PoorEnt	RichEnt	PoorEnt vs. RichEnt p-value	PoorEnt	RichEnt	PoorEnt vs. RichEnt p-value
SI	200	36.97	40.30	0.348	70.77	65.13	0.313
TI-C	100	23.78	23.31	0.807	44.29	44.54	0.989
TI-S	50	21.38	19.65	0.734	38.65	45.17	0.134
	100	29.73	27.30	0.682	47.74	50.56	0.516
	150	30.20	30.89	0.871	50.30	59.52	0.036
	200	35.75	37.40	0.771	57.85	68.19	0.025

Note: $p-$values are obtained from $t-$tests on the subject average of first offers for each investment amount.

the share offered to each investor drops by less than half as we go from SI to TI-C. A similar pattern emerges if we look at investors' first offers. Further, the final share obtained by investor i is 46.70% in SI PoorEnt and 32.60% in TI-C PoorEnt (51.65% in SI RichEnt and 32.82% in TI-C RichEnt, see Tables 3-4), which is close to the midpoint between the entrepreneur's and investor's opening offers, suggesting that both parties make substantial concessions to get to an agreement. These comparisons suggest that the main results in §4-§5 are well explained by the investors' and entrepreneurs' initial negotiation strategies (opening offers), and not by the differences in bargaining dynamics.

Next, consider the TI-S condition. Unsurprisingly, the higher the proposed investment amount, the higher the share offered/demanded. Entrepreneurs appear to offer between 22 and 28% in exchange for an investment of 100 units, which is comparable to their first offer in the TI-C treatment. However, when seeking an investment of 200 units, they offer about 31% share, which is 5-9 percentage points lower than they offered in the SI treatments. Thus, entrepreneurs are more aggressive in their opening offers when seeking full investment by a single investor. This suggests that they anticipate having more leverage, in the form of an additional investor also capable of offering full investment, that is not present in the SI treatment.

Comparing investors' opening offers in TI-S with their opening offers in the SI and TI-C conditions, we see that investors are less demanding in TI-S PoorEnt (for an investment of 100 units they demand 40% in TI-S, while they demand 44% in TI-C; for an investment of 200 units they demand 59% in TI-S, while they demand nearly 71% in SI). On the other hand, in RichEnt their offers are roughly similar between TI-C and SI. Furthermore, investors demand a larger share when the entrepreneur is rich than when they are poor, with the difference being significant for TI-S when investment amounts are 150 or 200. The more aggressive investor demands for larger offers also explains the preference of entrepreneurs to receive smaller investments.

Result 4.2: *Opening offers of both parties largely explain the differences in final outcomes in SI and TI-C. Poor entrepreneurs prefer larger investments, while rich entrepreneurs prefer smaller investments. Investors prefer smaller investments. Investors bargain more aggressively when the entrepreneur is rich.*

7.3. Bargaining Strategies in TI-S

We next unpack the bargaining strategies in TI-S. In particular, Results 1 and 2 in §4-5 suggest that the access to multiple investors only helps the entrepreneur when it is coupled with the ability to receive full funding from each investor. In this section we examine what specific bargaining strategies lead to this result.

Table 8 shows the results of a series of random effects regressions, in which we examine the effects of the sum total of the initial investment requests made by the entrepreneur (I_T) on the final investment amount (first column), the final share obtained by the entrepreneur (second column) and the entrepreneur's expected profit (third column). The results suggest that both the amount invested and the entrepreneur's final share increase with the size of the initial request I_T. At the same time, the second column of Table 8 shows that, consistent with Table 7, the higher the final investment amount I_T, the more equity is received by the investor, and the less is received by the entrepreneur. Thus, there is a trade-off between the size of the amount requested and the share received. However, the last column shows that, on balance, entrepreneurs still benefit from requesting the maximum possible amount: the expected profit resulting from that strategy is higher than all other strategies.[20]

We provide further evidence of the sophistication of entrepreneurial strategies in TI-S in Appendix A.5.2, where we examine spillover effects from negotiating with one investor to the other. In particular, we show that the TI-S condition allows entrepreneurs to behave more strategically and leverage the less aggressive of the two investors to receive the full funding from that investor.

[20] Tests comparing the coefficients on "Initial $I_T = 400$" with initial amounts of 150, 200, 250, 300 and 350 yield $p-$values of 0.001, $\ll 0.001$, 0.020, 0.635, 0.084, respectively.

Table 8 The Influence of Initial Entrepreneur Bargaining Position and Outcome Metrics

	Investment Amount		Entrepreneur's Share		Entrepreneur's Expected Profit	
Initial Ent Share	0.227	(0.165)	0.366^{***}	(0.069)	1.667^{***}	(0.305)
Initial $I_T = 150$	−18.317	(14.562)	2.296	(2.461)	11.145	(14.081)
Initial $I_T = 200$	17.607	(12.522)	6.420^{*}	(3.847)	23.488	(20.472)
Initial $I_T = 250$	42.303^{***}	(16.389)	10.249^{***}	(3.288)	67.429^{***}	(23.584)
Initial $I_T = 300$	38.605^{***}	(6.077)	19.301^{***}	(4.780)	110.029^{***}	(18.612)
Initial $I_T = 350$	10.174	(34.393)	10.267	(6.817)	83.737^{**}	(36.997)
Initial $I_T = 400$	37.171^{***}	(7.292)	23.009^{***}	(3.746)	130.998^{***}	(29.797)
Final $I_T = 50$			−5.766	(5.418)		
Final $I_T = 100$			-23.263^{***}	(5.073)		
Final $I_T = 150$			-33.578^{***}	(4.012)		
Final $I_T = 200$			-38.010^{***}	(3.038)		
RichEnt	−15.702	(13.844)	-6.738^{*}	(3.899)	−17.627	(26.071)
Constant	140.545^{***}	(12.656)	60.510^{***}	(5.578)	138.516^{***}	(29.062)
R^2	0.123		0.576		0.373	
N	326		326		326	

Note: Results are based on a random effects regressions. Standard errors are corrected for clustering at the session level. *, ** and *** denotes significance at the 10%, 5% and 1% level, respectively.

Result 4.3: *The advantage of TI-S is largely explained by the entrepreneurs requesting the maximum possible amounts and playing the two investors against each other until one of the investors is awarded the full contract.*

7.4. Differences Across Contracts

We conclude this section by examining the bargaining dynamics that cause the differences between Common vs. Preferred Stock contracts. Table 9 shows summary statistics on first offers for each role and for each of our treatment conditions in the SI/TI-C treatment arm. There are several interesting observations. First, consistent with theory, entrepreneurs' first offers to investors were generally lower under Preferred Stock contracts than under Common Stock contracts ($p < 0.05$ in three out of four comparisons). The only scenario in which entrepreneurs do not increase their demands with Preferred (relative to Common) Stock contracts is SI-PoorEnt. This is consistent with Result 3 in §6, which also reports that Preferred Stock contracts disadvantage entrepreneurs in the PoorEnt treatment arms, with the effect being particularly stark in the SI condition.

Second, investors' opening demands were either approximately the same (SI) or significantly higher (TI-C) for Preferred relative to Common Stock contracts. In particular, in TI-C, investors increased their demands from an average of 44.29% to 49.59% in PoorEnt ($p = 0.004$) and from 44.54 to 49.38% ($p \ll 0.01$) in RichEnt. That is, despite their reduced theoretical bargaining power with Preferred Stock contracts, investors adopted more extreme opening positions in the two investor (TI-C) setting. While we cannot provide definitive evidence for the driver of this behavior, it is consistent with peer-induced fairness (Ho and Su 2009, Ho et al. 2014) – each investor's desire to outcompete the other investor, resulting in more aggressive bargaining positions. Conversely, the absence of a peer investor in the SI scenarios may lead to less aggressive investor behaviors.

Table 9 First Offers (Share to Investor) by Bargaining Environment and Player Role

(a) SI

	Entrepreneur's First Offer			Investor i's First Offer		
	Common	Preferred	$p-$value	Common	Preferred	$p-$value
PoorEnt	36.97	39.70	0.303	70.77	71.60	0.858
RichEnt	40.30	34.25	$\ll 0.01$	65.13	66.71	0.500

(b) TI-C

	Entrepreneur's First Offer			Investor i's First Offer		
	Common	Preferred	$p-$value	Common	Preferred	$p-$value
PoorEnt	23.78	20.48	$\ll 0.01$	44.29	49.59	0.004
RichEnt	23.31	20.30	0.031	44.54	49.38	$\ll 0.01$

Note: $p-$values are derived from random effects regressions of first offers on treatment indicators, with standard errors corrected for clustering at the session level.

Result 4.4: *Insufficient reflection of contract type in the share allocation (Result 3 in §6) is explained by insufficient adjustment of entrepreneurs' opening offers in SI PoorEnt scenario, and by more aggressive opening offers by investors, particularly in TI scenarios.*

8. Integrated Discussion, Conclusions and Limitations

Taken together our results offer mixed support for the Nash-in-Nash model predictions. While entrepreneurs' shares tend to increase with a larger outside option, other predictions receive only partial support in the data, highlighting the richness and complexity of entrepreneur-investor negotiations. Contrary to model predictions, neither access to multiple investors nor a Preferred Stock contract necessarily increases the entrepreneur's share. Instead, both effects depend on the specifics of the entrepreneurial setting. Substitutable investors who can each provide full funding can help improve the entrepreneur's position, relative to the single investor scenario. In contrast, complementary investors who cannot provide the full funding alone may disadvantage the entrepreneur. Further, downside protection for investors ("Preferred Stock") is only reflected in the equity division when the entrepreneur is "rich". In this section, we propose a revised theory that helps reconcile these results with our original predictions (§8.1), discuss how our results complement the empirical finance literature (§8.2), as well as address limitations and suggest potential extensions (§8.3).

8.1. Improving Predictive Validity of Nash-in-Nash Models

Our theoretical development in §4-5 made two important assumptions. First, we assumed equal bargaining powers, i.e., $\theta_i = 0.5$ across all treatments. Second, we assumed that the agreement outcome between the entrepreneur and investor i is the same whether or not the entrepreneur agreed with investor j (Horn and Wolinsky 1988, Yürükoğlu 2022). The latter is what gives the entrepreneur theoretical leverage in the TI treatments (since the entrepreneur can walk away from one negotiation without any adverse effect on the other negotiation). While both of these assumptions are common in the literature, they may oversimplify the bargaining dynamics. Relaxing these assumptions and (i) estimating θ_i from the data and (ii) examining alternative off-the-equilibrium-path beliefs may help improve model fit. Moreover, finding that the best-fitting θ_i is close to 0 or 1 could indicate model misspecification because random assignment of subject roles should induce roughly equal bargaining power across experimental roles. Lastly, if the revised equilibrium-belief model improves fit, we would conclude that this revised model offers greater validity for generating hypotheses in the entrepreneurial setting.

To examine model fit, we compute Mean Squared Errors (MSE) between the predicted shares and the negotiated shares observed in the data. We focus on the PoorEnt case here, but the key takeaways are analogous for the RichEnt case. We examine the fit for three theoretical benchmarks: the Nash-in-Nash model predictions under the default assumption of equal bargaining power ($\theta_i = 0.5$ for all i) used in our theoretical development in Section 4.1, the Nash-in-Nash model where we use the best-fitting bargaining powers, which we denote by $\hat{\theta}_i$ (Revised model (i)), and the revised Nash-in-Nash model with alternative belief modeling (Revised model (ii)). In particular, to reconcile the finding that entrepreneurs fail to leverage multiple investors in TI-C, model (ii) assumes that disagreement with one investor implies disagreement with the other investor in TI-C. Analogously, to reconcile the finding that entrepreneurs outperform their theoretical benchmarks in TI-S, we give entrepreneurs more leverage and assume that disagreement with one investor still allows for full investment with the other investor in TI-S. (Model details are in Appendix A.3).

Our estimation results are in Table 10. Consider first the SI and TI treatments. The original model, i.e., our normative theory with $\hat{\theta}_i = 0.5$ fits the data the worst. For the SI treatment, the best fit is obtained by model (ii) with $\hat{\theta}_i = 0.355$. This is substantially below 0.5, implying that entrepreneurs have relatively more leverage. In the TI treatments, MSE is larger relative to the SI case indicating a poorer fit. Further, for TI-C treatments the corner case $\hat{\theta}_i = 1$ achieves the best fit, indicating full bargaining power for the investors. Similarly, for TI-S, $\hat{\theta}_i = 0.192$, indicating minimal power for the investor. These results point to fundamental flaws in the descriptive validity of classic Nash-in-Nash theory, particularly in the multiple investor case. However, as shown in the last row of Table 10, the revised Nash-in-Nash model with alternative beliefs (model (ii)) performs substantially better, reducing MSE and resulting in more plausible $\hat{\theta}_i$ estimates.[21]

[21] While we do not report estimates for Preferred Stock contracts, the same general patterns emerge, but the estimates of θ_i are higher, indicating more investor bargaining power, consistent with our previous results.

Table 10 Model Fit (Common Stock Contracts and PoorEnt Treatments Only)

		SI		TI-C		TI-S	
Model	Description	MSE	$\hat{\theta}_i$	MSE	$\hat{\theta}_i$	MSE	$\hat{\theta}_i$
Original model (§4.1)	Nash-in-Nash, Equal bargaining powers	0.055	0.500	0.102	0.500	0.169	0.500
Revised model (i)	Nash-in-Nash, Best fitting bargaining powers	0.040	0.355	0.066	1.000	0.102	0.192
Revised model (ii)	Nash-in-Nash, Best fitting bargaining powers	No change		0.045	0.462	0.091	0.472

Notes: The investor's bargaining power $\hat{\theta}_i$ is either set to 0.5 (Original predictions) or set to the bargaining power with the best fit for a given treatment (Revised models (i) and (ii)). In SI, $\hat{\theta}_i$ denotes the bargaining power of the single investor. In these treatments, models (i) and (ii) predictions coincide because there is no possibility of partial disagreement, and therefore no belief model. In the TI treatments, $\hat{\theta}_i$ denotes the average bargaining power of the two investors.

8.2. Risk Exposure and Contracts

While our Results 1-2 suggest important refinements for models of multilateral negotiations (discussed in §8.1), Result 3 complements the entrepreneurial finance literature, particularly studies of contract structure and entrepreneurial exits (Gornall and Strebulaev 2020, Ewens et al. 2022, and references therein). In particular, our investigation of equity contracts in §6 suggests a causal mechanism for one of the key results in Ewens et al. (2022), that excessive liquidation preferences tend to lower both the entrepreneur's profits and the value of the venture (even after controlling for the quality of the entrepreneur and of the investors). Our results suggest that this may be due to the unique bargaining dynamics created by investor downside protections making it difficult for entrepreneurs to argue for a larger share, particularly when they have no other outside options.

Why is it difficult for early-stage startups to see a fair reflection of investor liquidation preferences in their contractual terms? One possibility (not considered in our theoretical development) is that some bargaining scenarios may lead to asymmetries in exposure to potential losses between the two bargaining parties. In particular, when the entrepreneur has no other outside options (PoorEnt treatment arm), they cannot lose money even in the "bad" state of the world, because their initial endowment is zero. In this scenario, Common and Preferred Stock contracts yield a similar share for the entrepreneur. In contrast, when the entrepreneur has a nonzero outside option (RichEnt treatment arm), they face a real possibility of losing money. In this case, Preferred Stock correctly accounts for the increased risk of the entrepreneur, increasing their share. The differences in risk exposure are summarized succinctly in Table 11. As can be seen, on the off-diagonal the entrepreneur and investor(s) have similar downside risk exposures, while along the main diagonal, their risk exposures are asymmetric. Our results suggest that contracts may compensate for such imbalance by reallocating some of the equity to the party with greater risk exposure.

Table 11 Risk Exposure of Entrepreneur and Investor(s) Under Various Scenarios

			Contract Type	
			Common Stock	Preferred Stock
Entrepreneur's Outside Option	$d_e = 0$	Entrepreneur	Not exposed	Not exposed
		Investor(s)	Exposed	Not exposed
	$d_e > 0$	Entrepreneur	Exposed	Exposed
		Investor(s)	Exposed	Not exposed

Note: "Exposed" means that the party faces the risk of earning a final payoff lower than their outside option (i.e., if they had simply refused an agreement).

8.3. Limitations and Future Work

Our investigation does not consider several bargaining features that may play a role in negotiations. First, in our experiment, bargaining outcomes are public once bargaining is completed, but the bilateral offer exchange is private. It may be interesting to explore behavior in a setting where the offer exchanges with the other investor can be observed by other prospective investors. This may also be more reflective of entrepreneurial pitch competitions and other large events where offers to invest can be made publicly and observed by everyone. Second, our experiments do not examine the matching process between entrepreneurs and investors (Bengtsson and Hsu 2010, Ewens et al. 2022). Future studies may be able to extend our setting by including a matching market, in which a heterogeneous set of investors is endogenously matched with a heterogeneous set of founders (See, for example, Leider and Lovejoy 2016, for similar matching experiments in the supply chain context). Other interesting extensions include richer negotiation settings where investors receive some control rights in addition to equity, as well as settings with informational asymmetries about the value of the startup, or settings with a collaborative stage (in addition to the negotiation stage), where the parties invest costly effort into the venture.

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Supplementary Materials (Electronic Companion)

A.1. Field Survey

A.1.1. The Vignettes

The survey contained the following vignette for the case in which the startup had no intrinsic value without investment.[22]

> An entrepreneur has a business that she/he would like to launch. However, to launch the business, the entrepreneur needs capital from investor(s). In exchange for the investment the entrepreneur must offer the investor(s) some ownership in the business.
>
> The entrepreneur is currently negotiating with investors about how much ownership in the business the investor(s) will receive in exchange for their investment. In particular, imagine the following two scenarios:
>
> - **Scenario A**. An investor is offering 200 units of capital. If the entrepreneur is not able to agree with the investor, then the entrepreneur cannot launch the company and gets 0 profit.
> - **Scenario B**. Two investors are offering 100 units of capital each. If the entrepreneur is not able to agree with any investor, then the entrepreneur cannot launch the company and gets 0 profit. If the entrepreneur can agree with only one investor, then the size of the investment is 100. in this case, the entrepreneur can launch the business at a smaller scale.
>
> The business is in its early stages, so even if the entrepreneur can obtain capital, there is only a small chance that the business succeeds. However, if the business succeeds, its value will grow substantially.
>
> In which scenario, **A** or **B** do you expect the entrepreneur to keep a **larger share** of the business?

We also asked respondents a variation on this vignette where the startup was valuable even without investment. The text read:

> Imagine a similar scenario as before. However, rather than receiving 0 profit if the negotiations with the investors break down, the entrepreneur **may now be able to make a profit even if the negotiations break down**. This is because the venture is now valued at 160

[22] Note also that we randomized the order. The example here assumes that the "PoorEnt" case was seen first followed by the "RichEnt".

units, and can be sold to another company, generating a profit for the entrepreneur.

As before, consider the following two scenarios:

- **Scenario A**. An investor is offering 200 units of capital. If the entrepreneur is not able to agree with the investor, then the entrepreneur can sell the company for 160 units.
- **Scenario B**. Two investors are offering 100 units of capital each. If the entrepreneur is not able to agree with either investor, then the entrepreneur can sell the company for 160 units. If the entrepreneur can agree with only one investor, then the business will be launched at a smaller scale. In that case the entrepreneur can sell the other half of the business and earn 80 units from that transaction.

As in the previous question, the business is in its early stages, so even if the entrepreneur can obtain capital, there is only a small chance that the business succeeds. However, if the business succeeds its value will grow substantially higher than its current valuation of 160 units.

In which scenario, **A** or **B** do you expect the entrepreneur to keep a **larger share** of the business?

A.1.2. Respondent Characteristics

Table A1 Characteristics of Survey Respondents

Gender		Age		Experience		Years Exp.	
Male	46.2%	Average	41.6	Founder	76.5%	4 +	37.0%
Female	51.3%	Max	89	Investor	21.0%	3	16.0%
Other	2.5%	Min	17	Employee	30.3%	2	21.0%
						1 −	26.1%

Notes: 1. Numbers in the "Experience" column do not sum to 100% because respondents could select all options for which they had experience, and many respondents had experience in more than one category.
2. Numbers in the "Years Exp." column do not sum to 100% due to rounding.

A.2. Theory

We present the results and the proofs with the general bargaining powers of the investor(s) relative to the entrepreneur. Specifically, let $\theta_0 \in (0,1)$ denote the bargaining power of the single investor relative to the entrepreneur (i.e., the entrepreneur's bargaining power is $1-\theta_0$) in the SI setting. Let $\theta_i \in (0,1)$, $i \in \{1,2\}$, denote the bargaining power of Investor i relative to the entrepreneur (i.e., the entrepreneur's bargaining power is $1-\theta_i$) in the TI setting. To obtain the results when the investor(s) have equal bargaining power relative to the entrepreneur, we set $\theta_i = 1/2$, $i \in \{s,1,2\}$. Recall that α follows a two-point distribution: $\alpha_H > 1$ w.p. $p \in (0,1)$ and $\alpha_L \leq 1$ w.p. $1-p$.

Assumption EC.1. *Assume that the expected investment multiplier $\mu_\alpha = \alpha_H p + \alpha_L(1-p) \geq 2$.*

In the analysis, if the bargaining unit between the entrepreneur and Investor i is indifferent among multiple investment levels in equilibrium, we assume that the largest investment level is made. In Section A.2.1, we consider the scenario of the Common Stock contracts. In Section A.2.2, we consider the scenario of the Preferred Stock contracts with $\alpha_L = 1$.

A.2.1. Common Stock Contracts

We consider the setting of Common Stock contracts in this section.

A.2.1.1. The Single Investor Model The investment I_0 and the share s_0 maximize the following Nash product:

$$\max_{I_0\in[0,e],\ s_0\in[0,1]} \left[\pi_0(I_0,s_0)-d_0\right]^{\theta_0}\left[\pi_{\mathrm{e}}(I_0,s_0)-d_{\mathrm{e}}\right]^{1-\theta_0} \tag{A-1}$$
$$\pi_0(I_0,s_0)\ge d_0,\ \pi_{\mathrm{e}}(I_0,s_0)\ge d_{\mathrm{e}}.$$

The following proposition is Proposition 1 under general bargaining powers.

Proposition A1 **(Single investor)**. *The investor invests $I_0^{SI}=e$. The share of the investor is*

$$s_0^{SI}=\frac{(\mu_\alpha-1)\theta_0+1}{\mu_\alpha}-\frac{\theta_0 d_e}{e\mu_\alpha}.$$

The corresponding entrepreneur's share is

$$s_e^{SI}=1-s_0^{SI}=\frac{(\mu_\alpha-1)(1-\theta_0)}{\mu_\alpha}+\frac{\theta_0 d_e}{e\mu_\alpha}.$$

Proof of Proposition A1. Recall that $d_0=e$. We also have that the expected profit of the entrepreneur is

$$\pi_{\mathrm{e}}(I_0,s_0)=\mu_\alpha I_0(1-s_0);$$

the expected profit of investor s is

$$\pi_0(I_0,s_0)=\mu_\alpha I_0 s_0+e-I_0.$$

Solving the problem (A-1) above, we have that,

$$\pi_0(I_0,s_0)-d_0=\theta_0\left(\pi_{\mathrm{e}}(I_0,s_0)+\pi_0(I_0,s_0)-d_{\mathrm{e}}-d_0\right); \tag{A-2}$$
$$\pi_{\mathrm{e}}(I_0,s_0)-d_{\mathrm{e}}=(1-\theta_0)\left(\pi_{\mathrm{e}}(I_0,s_0)+\pi_0(I_0,s_0)-d_{\mathrm{e}}-d_0\right).$$

Recall that $\mu_\alpha>2$, and we have that

$$I_0^{SI}=\arg\max_{I_0\in[0,e]}\left\{\pi_{\mathrm{e}}(I_0,s_0)+\pi_0(I_0,s_0)-d_{\mathrm{e}}-d_0\right\}=e.$$

By Eq. (A-2), we have that

$$s_0^{SI}=\frac{(\mu_\alpha-1)\theta_0+1}{\mu_\alpha}-\frac{\theta_0 d_{\mathrm{e}}}{e\mu_\alpha}.$$

■

A.2.1.2. The Two Complementary Investor Model The investments I_i and the share s_i maximize the following Nash product simultaneously:

$$\max_{I_i \in [0, e/2],\ s_i \in [0,1]} \left[\pi_i(\boldsymbol{I}, \boldsymbol{s}) - d_i\right]^{\theta_i} \left[\pi_{\mathrm{e}}(\boldsymbol{I}, \boldsymbol{s}) - d_{\mathrm{e}}^{-i}\right]^{1-\theta_i} \tag{A-3}$$
$$\pi_i(\boldsymbol{I}, \boldsymbol{s}) \geq d_i,\ \pi_{\mathrm{e}}(\boldsymbol{I}, \boldsymbol{s}) \geq d_{\mathrm{e}}^{-i}.$$

The following proposition is Proposition 2 under general bargaining powers.

Proposition A2 **(Two complementary investors)**. *There are two types of equilibrium bargaining outcomes: both investors investing and only one investor investing.*

- *In the both-investor-investing equilibrium, the investors invest the endowed capital; i.e., $I_i^{TI-C} = e/2$ for $i \in \{1, 2\}$. The equilibrium share of investor i is*

$$s_i^{TI-C} = \frac{(3 - 2\mu_\alpha)(2 - \theta_i)}{\mu_\alpha(4 - \theta_1\theta_2)} + \frac{\mu_\alpha - 1}{\mu_\alpha} - \frac{d_e(2\theta_i - \theta_1\theta_2)}{e\mu_\alpha(4 - \theta_1\theta_2)}. \tag{A-4}$$

- *If $\mu_\alpha < \frac{2-\theta_i}{1-\theta_i} - \frac{2d_e\theta_i}{e(1-\theta_i)}$, the one-investor-investing equilibrium exists. The equilibrium investment level $I_i^{TI-C} = e/2$ and $I_j^{TI-C} = 0$ for $i, j \in \{1, 2\}$ and $i \neq j$, and the equilibrium share of Investor i is*

$$s_i^{TI-C} = \frac{(\mu_\alpha - 1)\theta_i + 1}{\mu_\alpha} - \frac{2d_e\theta_i}{e\mu_\alpha}.$$

Proof of Proposition A2. Recall that the expected profit of the entrepreneur is

$$\pi_{\mathrm{e}}(\boldsymbol{I}, \boldsymbol{s}) = \mu_\alpha(I_1 + I_2)(1 - s_1 - s_2), \tag{A-5}$$

and the expected profit of Investor i is

$$\pi_i(\boldsymbol{I}, \boldsymbol{s}) = \mu_\alpha(I_1 + I_2)s_i + e/2 - I_i. \tag{A-6}$$

The disagreement point of the entrepreneur when negotiating with Investor 1 is

$$d_{\mathrm{e}}^{-1} = \pi_{\mathrm{e}}(0, I_2, 0, s_2) = \frac{d_{\mathrm{e}}(e - I_2)}{e} + \mu_\alpha I_2(1 - s_2),$$

which is the sum of the prorated outside option and the profit of the entrepreneur when Investor 2 is the only investor. Similarly, the disagreement point of the entrepreneur when negotiating with Investor 2 is

$$d_{\mathrm{e}}^{-2} = \pi_{\mathrm{e}}(I_1, 0, s_1, 0) = \frac{d_{\mathrm{e}}(e - I_1)}{e} + \mu_\alpha I_1(1 - s_1).$$

The disagreement point of Investor i is $d_i = e/2$ since the investor has $e/2$ units of capital as the endowment.

We first solve the bargaining problem between the entrepreneur and Investor 1 as specified in (A-3). Following the similar analysis as in the proof of Proposition A1, we have that

$$\begin{aligned}\pi_1(\boldsymbol{I},\boldsymbol{s})-d_1&=\theta_1\left(\pi_1(\boldsymbol{I},\boldsymbol{s})+\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s})-d_1-d_{\mathrm{e}}^{-1}\right);\\ \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s})-d_{\mathrm{e}}^{-1}&=(1-\theta_1)\left(\pi_1(\boldsymbol{I},\boldsymbol{s})+\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s})-d_1-d_{\mathrm{e}}^{-1}\right).\end{aligned}\tag{A-7}$$

Note that the best-response investment level

$$I_1(I_2,s_2)=\arg\max_{I_1\in[0,e]}\left\{\pi_1(\boldsymbol{I},\boldsymbol{s})+\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s})-d_1-d_{\mathrm{e}}^{-1}\right\}=\begin{cases}e/2 & \text{if } \mu_\alpha(1-s_2)\geq 1;\\ 0 & \text{otherwise.}\end{cases}\tag{A-8}$$

By Eq. (A-7), the best-response share for Investor 1 is

$$s_1(I_2,s_2)=\begin{cases}\frac{\theta_1\left[\mu_\alpha e^2(1-s_2)-e^2-2d_{\mathrm{e}}(e-I_2)\right]+e^2}{\mu_\alpha e(e+2I_2)}. & \text{if } \mu_\alpha(1-s_2)\geq 1;\\ 0 & \text{otherwise.}\end{cases}\tag{A-9}$$

Similarly, we have that the best-response investment level and share for Investor 2 are

$$I_2(I_1,s_1)=\begin{cases}e/2 & \text{if } \mu_\alpha(1-s_1)\geq 1;\\ 0 & \text{otherwise;}\end{cases}\tag{A-10}$$

$$s_2(I_1,s_1)=\begin{cases}\frac{\theta_2\left[\mu_\alpha e^2(1-s_1)-e^2-2d_{\mathrm{e}}(e-I_1)\right]+e^2}{\mu_\alpha e(e+2I_1)} & \text{if } \mu_\alpha(1-s_1)\geq 1;\\ 0 & \text{otherwise.}\end{cases}\tag{A-11}$$

Solving the system of the best-response functions Eqs. (A-8) through (A-11), we have that if $\mu_\alpha \geq \max\left\{\frac{3}{2}-\frac{d_{\mathrm{e}}(2\theta_1-\theta_1\theta_2)}{2e(2-\theta_1)},\ \frac{3}{2}-\frac{d_{\mathrm{e}}(2\theta_2-\theta_1\theta_2)}{2e(2-\theta_2)}\right\}$ (note that this condition is satisfied by Assumption EC.1), there exists an equilibrium in which both investors invest $I_i^{TI-C}=e/2$ with the share for Investor i as

$$s_i^{TI-C}=\frac{(3-2\mu_\alpha)(2-\theta_i)}{\mu_\alpha(4-\theta_1\theta_2)}+\frac{\mu_\alpha-1}{\mu_\alpha}-\frac{d_{\mathrm{e}}(2\theta_i-\theta_1\theta_2)}{e\mu_\alpha(4-\theta_1\theta_2)}.$$

Similarly, we have that, if $\mu_\alpha<\frac{2-\theta_i}{1-\theta_i}-\frac{2d_{\mathrm{e}}\theta_i}{e(1-\theta_i)}$, there exists an equilibrium in which Investor i is the only investor with the investment level $I_i^{TI-C}=e/2$ in equilibrium and the share for Investor i is

$$s_i^{TI-C}=\frac{(\mu_\alpha-1)\,\theta_i+1}{\mu_\alpha}-\frac{2d_{\mathrm{e}}\theta_i}{e\mu_\alpha}.$$

■

A.2.1.3. The Two Substitutable Investor Model Since the startup only needs e units of capital at this stage, at most one investor can invest all the endowment. Therefore, there is an additional constraint that $I_1+I_2\leq e$ imposed on the bargaining problem. Then, the investments $\boldsymbol{I}$ and the shares $\boldsymbol{s}$ maximize the following Nash product simultaneously:

$$\begin{aligned}\max_{I_i\in[0,e],\ s_i\in[0,1]}\quad & \left[\pi_i(\boldsymbol{I},\boldsymbol{s})-d_i\right]^{\theta_i}\left[\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s})-d_{\mathrm{e}}^{-i}\right]^{1-\theta_i}\\ & \pi_i(\boldsymbol{I},\boldsymbol{s})\geq d_i,\ \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s})\geq d_{\mathrm{e}}^{-i},\ i\in\{1,2\},\\ & I_1+I_2\leq e.\end{aligned}\tag{A-12}$$

Solving the problem, we have the following proposition.

Proposition A3 **(Two substitutable investors)**. *Consider* $(I_1^{TI-S}, I_2^{TI-S}, s_1^{TI-S}, s_2^{TI-S})$ *such that* $I_1^{TI-S}+I_2^{TI-S}=e$, $I_i^{TI-S}\geq 0$, $i=1,2$, *and*

$$s_1^{TI-S}=\frac{I_1^{TI-S}\Big(I_1^{TI-S}e\theta_1(1-\theta_2+\mu_\alpha\theta_2)-e^2\Big(\theta_1\big(2-\mu_\alpha(1-\theta_2)-\theta_2\big)-1\Big)-d_e\Big(\theta_1(1-\theta_2)e+I_1^{TI-S}\theta_1\theta_2\Big)\Big)}{\mu_\alpha e(e^2-I_1^{TI-S}I_2^{TI-S}\theta_1\theta_2)},$$

$$s_2^{TI-S}=\frac{I_2^{TI-S}\Big(I_2^{TI-S}e\theta_2(1-\theta_1+\mu_\alpha\theta_1)-e^2\Big(\theta_2\big(2-\mu_\alpha(1-\theta_1)-\theta_1\big)-1\Big)-d_e\Big(\theta_2(1-\theta_1)e+I_2^{TI-S}\theta_1\theta_2\Big)\Big)}{\mu_\alpha e(e^2-I_1^{TI-S}I_2^{TI-S}\theta_1\theta_2)}; \tag{A-13}$$

if $\mu_\alpha \geq \max_{i=1,2}\left\{\frac{e^3+e^2I_i^{TI-S}-2e^2I_i^{TI-S}\theta_i+e(I_i^{TI-S})^2\theta_i-d_e\left(eI_i^{TI-S}(\theta_i-\theta_1\theta_2)+(I_i^{TI-S})^2\theta_1\theta_2\right)}{e^3-e^2I_i^{TI-S}\theta_i}\right\}$, *then* $(I_1^{TI-S}, I_2^{TI-S}, s_1^{TI-S}, s_2^{TI-S})$ *is an equilibrium bargaining outcome with Investor* i *investing* I_i^{TI-S} *for the share of* s_i^{TI-S}*.*

- *If* $\mu_\alpha < 1+\frac{1}{1-\theta_1}-\frac{d_e\theta_1}{e(1-\theta_1)}$, *there exists an equilibrium with the investment:* $I_1^{TI-S}=e$ *and* $I_2^{TI-S}=0$, *and the share of investor i:* $s_1^{TI-S}=\frac{e+e(\mu_\alpha-1)\theta_1-d_e\theta_1}{e\mu_\alpha}$ *and* $s_2^{TI-S}=0$.
- *If* $\mu_\alpha < 1+\frac{1}{1-\theta_2}-\frac{d_e\theta_2}{e(1-\theta_2)}$, *there exists an equilibrium with the investment:* $I_1^{TI-S}=0$ *and* $I_2^{TI-S}=e$, *and the share of investor i:* $s_1^{TI-S}=0$ *and* $s_2^{TI-S}=\frac{e+e(\mu_\alpha-1)\theta_2-d_e\theta_2}{e\mu_\alpha}$.

Proof of Proposition A3. Recall that the expected profit of the entrepreneur is

$$\pi_{\rm e}(\boldsymbol{I},\boldsymbol{s})=\mu_\alpha(I_1+I_2)(1-s_1-s_2),$$

and the expected profit of Investor i is

$$\pi_i(\boldsymbol{I},\boldsymbol{s})=\mu_\alpha(I_1+I_2)s_i+e-I_i.$$

The disagreement point of the entrepreneur when negotiating with Investor 1 is

$$d_{\rm e}^{-1}=\pi_{\rm e}(0,I_2,0,s_2)=\frac{d_{\rm e}(e-I_2)}{e}+\mu_\alpha I_2(1-s_2),$$

which is the sum of the prorated outside option and the profit of the entrepreneur when Investor 2 is the only investor. Similarly, the disagreement point of the entrepreneur when negotiating with Investor 2 is

$$d_{\rm e}^{-2}=\pi_{\rm e}(I_1,0,s_1,0)=\frac{d_{\rm e}(e-I_1)}{e}+\mu_\alpha I_1(1-s_1).$$

The disagreement point of Investor i is $d_i=e$ since the investor has e units of capital as the endowment.

We first solve the bargaining problem between the entrepreneur and Investor 1. Following the similar analysis as in the proof of Proposition A1, we have that

$$\pi_1(\boldsymbol{I},\boldsymbol{s})-d_1=\theta_1\left(\pi_1(\boldsymbol{I},\boldsymbol{s})+\pi_{\rm e}(\boldsymbol{I},\boldsymbol{s})-d_1-d_{\rm e}^{-1}\right); \tag{A-14}$$

$$\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_{\mathrm{e}}^{-1} = (1-\theta_1)\left(\pi_1(\boldsymbol{I},\boldsymbol{s}) + \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_1 - d_{\mathrm{e}}^{-1}\right).$$

Note that the best-response investment level

$$I_1(I_2,s_2) = \arg\max_{I_1\in[0,e], I_1+I_2\le e}\left\{\pi_1(\boldsymbol{I},\boldsymbol{s}) + \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_1 - d_{\mathrm{e}}^{-1}\right\} = \begin{cases} e - I_2 & \text{if } \mu_\alpha(1-s_2)\ge 1;\\ 0 & \text{otherwise.}\end{cases} \tag{A-15}$$

By Eq. (A-14), the best-response share for Investor 1 is

$$s_1(I_2,s_2) = \begin{cases} \frac{\theta_1[\mu_\alpha e(1-s_2) - e - d_e] + e}{\mu_\alpha e^2}(e - I_2). & \text{if } \mu_\alpha(1-s_2)\ge 1;\\ 0 & \text{otherwise.}\end{cases} \tag{A-16}$$

Similarly, we have that the best-response investment level and share for Investor 2 are

$$I_2(I_1,s_1) = \begin{cases} e - I_1 & \text{if } \mu_\alpha(1-s_1)\ge 1;\\ 0 & \text{otherwise;}\end{cases} \tag{A-17}$$

$$s_2(I_1,s_1) = \begin{cases} \frac{\theta_2[\mu_\alpha e(1-s_1) - e - d_e] + e}{\mu_\alpha e^2}(e - I_1) & \text{if } \mu_\alpha(1-s_1)\ge 1;\\ 0 & \text{otherwise.}\end{cases} \tag{A-18}$$

Solving the system of the best-response functions Eqs. (A-15) through (A-18), we have that for $(I_1^{TI-S}, I_2^{TI-S}, s_1^{TI-S}, s_2^{TI-S})$ such that $I_1^{TI-S} + I_2^{TI-S} = e$, $I_i^{TI-S}\ge 0$, $i = 1,2$, and

$$s_1^{TI-S} = \frac{I_1^{TI-S}\left(I_1^{TI-S} e\theta_1(1-\theta_2+\mu_\alpha\theta_2) - e^2\left(\theta_1\left(2-\mu_\alpha(1-\theta_2)-\theta_2\right)-1\right) - d_e\left(\theta_1(1-\theta_2)e + I_1^{TI-S}\theta_1\theta_2\right)\right)}{\mu_\alpha e(e^2 - I_1^{TI-S} I_2^{TI-S}\theta_1\theta_2)},$$

$$s_2^{TI-S} = \frac{I_2^{TI-S}\left(I_2^{TI-S} e\theta_2(1-\theta_1+\mu_\alpha\theta_1) - e^2\left(\theta_2\left(2-\mu_\alpha(1-\theta_1)-\theta_1\right)-1\right) - d_e\left(\theta_2(1-\theta_1)e + I_2^{TI-S}\theta_1\theta_2\right)\right)}{\mu_\alpha e(e^2 - I_1^{TI-S} I_2^{TI-S}\theta_1\theta_2)}; \tag{A-19}$$

if $\mu_\alpha \ge \max_{i=1,2}\left\{\frac{e^3 + e^2 I_i^{TI-S} - 2e^2 I_i^{TI-S}\theta_i + e(I_i^{TI-S})^2\theta_i - d_e\left(eI_i^{TI-S}(\theta_i - \theta_1\theta_2) + (I_i^{TI-S})^2\theta_1\theta_2\right)}{e^3 - e^2 I_i^{TI-S}\theta_i}\right\}$, then $(I_1^{TI-S}, I_2^{TI-S}, s_1^{TI-S}, s_2^{TI-S})$ is an equilibrium bargaining outcome with Investor i investing I_i^{TI-S} for the share of s_i^{TI-S}.

If $\mu_\alpha < 1 + \frac{1}{1-\theta_1} - \frac{d_e\theta_1}{e(1-\theta_1)}$, there exists an equilibrium with the investment: $I_1^{TI-S} = e$ and $I_2^{TI-S} = 0$, and the share of investor i: $s_1^{TI-S} = \frac{e + e(\mu_\alpha - 1)\theta_1 - d_e\theta_1}{e\mu_\alpha}$ and $s_2^{TI-S} = 0$.

If $\mu_\alpha < 1 + \frac{1}{1-\theta_2} - \frac{d_e\theta_2}{e(1-\theta_2)}$, there exists an equilibrium with the investment: $I_1^{TI-S} = 0$ and $I_2^{TI-S} = e$, and the share of investor i: $s_1^{TI-S} = 0$ and $s_2^{TI-S} = \frac{e + e(\mu_\alpha - 1)\theta_2 - d_e\theta_2}{e\mu_\alpha}$. ■

A.2.2. Preferred Stock Contracts

We consider the setting with Preferred Stock contracts and $\alpha_L = 1$. In this case, Assumption EC.1 reduces to $\alpha_H p + (1-p)\ge 2$. It follows that $\alpha_H \ge 1 + \frac{1}{p} > 2$.

A.2.2.1. The Single Investor Model The investment I_0 and the share s_0 maximize the following Nash product with $\pi_e(I_0,s_0) = E[\min\{\alpha(1-s_0),\alpha-1\}]\, I_0$ and $\pi_0(I_0,s_0) = E[\max\{\alpha s_0,1\}]\, I_0 + e - I_0$:

$$\max_{I_0\in[0,e],\ s_0\in[0,1]} \ [\pi_0(I_0,s_0)-d_0]^{\theta_0}\,[\pi_e(I_0,s_0)-d_e]^{1-\theta_0} \tag{A-20}$$
$$\pi_0(I_0,s_0)\ge d_0,\ \pi_e(I_0,s_0)\ge d_e.$$

The following proposition is Proposition 4 under general bargaining powers.

Proposition A4 **(Single investor)**. *The investor invests $\tilde{I}_0^{SI} = e$. The share of the investor is*

$$\tilde{s}_0^{SI} = \frac{\theta_0(\alpha_H-1)+1}{\alpha_H} - \frac{\theta_0 d_e}{e\alpha_H p}.$$

The corresponding entrepreneur's share is

$$\tilde{s}_e^{SI} = 1-\tilde{s}_0^{SI} = \frac{(\alpha_H-1)(1-\theta_0)}{\alpha_H} + \frac{\theta_0 d_e}{e\alpha_H p}.$$

Proof of Proposition A4. Recall that $d_0 = e$. Also, we have that $\alpha_H > 2$. We focus on the scenario where $s_0 \ge 1/\alpha_H$. Otherwise, the investor does not have incentives to invest. Thus, the expected profit of the entrepreneur should be

$$\pi_e(I_0,s_0) = E[\min\{\alpha(1-s_0),\alpha-1\}]\, I_0 = \alpha_H(1-s_0)I_0 p,$$

and the expected profit of investor s should be

$$\pi_0(I_0,s_0) = E[\max\{\alpha s_0,1\}]\, I_0 + e - I_0 = \alpha_H s_0 I_0 p + e - I_0 p.$$

Solving the problem (A-20) above, we have that,

$$\pi_0(I_0,s_0) - d_0 = \theta_0\left(\pi_e(I_0,s_0)+\pi_0(I_0,s_0)-d_e-d_0\right); \tag{A-21}$$
$$\pi_e(I_0,s_0) - d_e = (1-\theta_0)\left(\pi_e(I_0,s_0)+\pi_0(I_0,s_0)-d_e-d_0\right).$$

Recall that $\alpha_H > 2$, and we have that

$$\tilde{I}_0^{SI} = \arg\max_{I_0\in[0,2e]} \{\pi_e(I_0,s_0)+\pi_0(I_0,s_0)-d_e-d_0\} = e.$$

By Eq. (A-21), we have that

$$\tilde{s}_0^{SI} = \frac{\theta_0(\alpha_H-1)+1}{\alpha_H} - \frac{\theta_0 d_e}{e\alpha_H p}.$$

■

A.2.2.2. The Two Complementary Investor Model In this case, both investors simultaneously negotiate with the entrepreneur. The bargaining outcome is a pair of the share s_i for Investor i in return for the investment I_i. With the downside protection for the investors, when the return of the startup is realized as $\alpha_L = 1$, the investors are able to recover their investment. That is, in addition to the negotiated $\alpha_L s_i$, Investor i is able to recover his potential loss $\alpha_L(1-s_i)$ from the entrepreneur. Thus, both investors obtain their investment back and the entrepreneur earns zero. When the return of the startup is realized as α_H, the protection for the investors is invoked only if one investor negotiated for a share that is significantly low. In such an event, the investor who invoked the protection will first be compensated by the profit of the entrepreneur, and then by the profit of the other investor (if the other investor invests as well).

Therefore, the expected profit of the entrepreneur is

$$\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) = \alpha_H(I_1+I_2)p - \sum_{i=1}^{2} \max\left\{\alpha_H(I_1+I_2)s_i - \Big(I_{3-i} - \alpha_H(I_1+I_2)(1-s_i)\Big)^+, I_i\right\}p, \tag{A-22}$$

and the expected profit of Investor i is

$$\begin{aligned}\pi_i(\boldsymbol{I},\boldsymbol{s}) &= \max\left\{\alpha_H(I_1+I_2)s_i - \Big(I_{3-i} - \alpha_H(I_1+I_2)(1-s_i)\Big)^+, I_i\right\}p + I_i(1-p) + \frac{e}{2} - I_i \\ &= \max\left\{\alpha_H(I_1+I_2)s_i - \Big(I_{3-i} - \alpha_H(I_1+I_2)(1-s_i)\Big)^+, I_i\right\}p + \frac{e}{2} - I_i p. \end{aligned}\tag{A-23}$$

The disagreement point of the entrepreneur when negotiating with Investor 1 is

$$d_{\mathrm{e}}^{-1} = \pi_{\mathrm{e}}(0, I_2, 0, s_2) = \frac{d_{\mathrm{e}}(e-I_2)}{e} + \alpha_H I_2 p - \max\left\{\alpha_H I_2 s_2, I_2\right\}p,$$

which is the sum of the prorated outside option and the profit of the entrepreneur when Investor 2 is the only investor. Similarly, the disagreement point of the entrepreneur when negotiating with Investor 2 is

$$d_{\mathrm{e}}^{-2} = \pi_{\mathrm{e}}(I_1, 0, s_1, 0) = \frac{d_{\mathrm{e}}(e-I_1)}{e} + \alpha_H I_1 p - \max\left\{\alpha_H I_1 s_1, I_1\right\}p.$$

The disagreement point of Investor i is $d_i = {}^{e}\!/\!_{2}$ since the investor has ${}^{e}\!/\!_{2}$ units of capital as the endowment.

Then, the investments $\boldsymbol{I}$ and the shares $\boldsymbol{s}$ maximize the following Nash product simultaneously:

$$\begin{aligned}\max_{I_i\in[0,e],\ s_i\in[0,1]} \quad & \left[\pi_i(\boldsymbol{I},\boldsymbol{s}) - d_i\right]^{\theta_i} \left[\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_{\mathrm{e}}^{-i}\right]^{1-\theta_i} \\ & \pi_i(\boldsymbol{I},\boldsymbol{s}) \ge d_i,\ \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) \ge d_{\mathrm{e}}^{-i}.\end{aligned}\tag{A-24}$$

We first establish a lemma, which helps us simplify the profits in Eqs. (A-22) and (A-23).

Lemma A1. *In any equilibrium bargaining outcome* $(\boldsymbol{I}, \boldsymbol{s})$*, the following conditions are satisfied:*

$$\alpha_H(I_1+I_2)(1-s_i) \geq I_{3-i},\ \ i=1,2.$$

Proof of Lemma A1. It is easy to observe that the result holds if only one investor invests in equilibrium. The following proof focuses on the case where both investors invest in equilibrium.

We first observe that $\alpha_H(I_1+I_2)(1-s_i) < I_{3-i}$ when the entrepreneur's profit is not enough to cover the compensation to protect investor $(3-i)$. Since $\alpha_H > 1$ and $s_1+s_2<1$, we note that $\alpha_H(I_1+I_2)(1-s_i) < I_{3-i}$ can hold for at most one bargaining unit. We next prove the lemma by showing that in any bargaining outcome $(\boldsymbol{I}, \boldsymbol{s}) = (I_1, I_2, s_1, s_2)$, if $\alpha_H(I_1+I_2)(1-s_1) < I_2$ and $\alpha_H(I_1+I_2)(1-s_2) \geq I_1$, then $(\boldsymbol{I}, \boldsymbol{s})$ is not feasible for the bargaining problem between the entrepreneur and Investor 1.

Since $\alpha_H(I_1+I_2)(1-s_1) < I_2$ and $\alpha_H(I_1+I_2)(1-s_2) \geq I_1$, by Eqs. (A-22), we have

$$\begin{aligned}
\pi_{\mathrm{e}}(\boldsymbol{I}, \boldsymbol{s}) =& \alpha_H(I_1+I_2)p - \max\left\{\alpha_H(I_1+I_2) - I_2, I_1\right\}p - \max\left\{\alpha_H(I_1+I_2)s_2, I_2\right\}p \\
=& \alpha_H(I_1+I_2)p - \left(\alpha_H(I_1+I_2) - I_2\right)p - I_2 p \\
=& 0,
\end{aligned}$$

Note that the disagreement point of the entrepreneur is that

$$d_{\mathrm{e}}^{-1} = \pi_{\mathrm{e}}(0, I_2, 0, s_2) = \frac{d_{\mathrm{e}}(e-I_2)}{e} + \alpha_H I_2 p - \max\left\{\alpha_H I_2 s_2, I_2\right\}p = \frac{d_{\mathrm{e}}(e-I_2)}{e} + (\alpha_H - 1)I_2 p > 0.$$

It follows that $\pi_{\mathrm{e}}(\boldsymbol{I}, \boldsymbol{s}) < d_{\mathrm{e}}^{-1}$ and therefore, $(\boldsymbol{I}, \boldsymbol{s})$ is not feasible for the bargaining problem between the entrepreneur and Investor 1. ■

By Lemma A1, we can further simplify the expected profit of the entrepreneur as

$$\pi_{\mathrm{e}}(\boldsymbol{I}, \boldsymbol{s}) = \alpha_H(I_1+I_2)p - \sum_{i=1}^{2} \max\left\{\alpha_H(I_1+I_2)s_i, I_i\right\}p, \tag{A-25}$$

and the expected profit of Investor i as

$$\pi_i(\boldsymbol{I}, \boldsymbol{s}) = \max\left\{\alpha_H(I_1+I_2)s_i, I_i\right\}p + \frac{e}{2} - I_i p. \tag{A-26}$$

The following proposition is Proposition 5 under general bargaining powers.

Proposition A5 **(Two complementary investors)**. *There are two types of equilibrium bargaining outcomes: both investors investing and only one investor investing.*

- *In the both-investor-investing equilibrium, the investors invest the endowed capital; i.e.,* $\tilde{I}_i^{TI-C} = e/2$ *for* $i \in \{1,2\}$*, and the equilibrium share of investor* i *is as follows.*

— *If* $\alpha_H \le \min\left\{\frac{1-2\theta_1\theta_2+\theta_1}{\theta_1-\theta_1\theta_2}+\frac{d_e}{ep}, \frac{1-2\theta_1\theta_2+\theta_2}{\theta_2-\theta_1\theta_2}+\frac{d_e}{ep}\right\}$,

$$\tilde{s}_1^{TI-C} = \frac{1-\alpha_H\theta_1\theta_2+\alpha_H\theta_1-\theta_1}{2\alpha_H(1-\theta_1\theta_2)} - \frac{d_e(\theta_1-\theta_1\theta_2)}{2\alpha_H pe(1-\theta_1\theta_2)}, \tag{A-27}$$

$$\tilde{s}_2^{TI-C} = \frac{1-\alpha_H\theta_1\theta_2+\alpha_H\theta_2-\theta_2}{2\alpha_H(1-\theta_1\theta_2)} - \frac{d_e(\theta_2-\theta_1\theta_2)}{2\alpha_H pe(1-\theta_1\theta_2)} \tag{A-28}$$

— *If* $\frac{1-2\theta_1\theta_2+\theta_1}{\theta_1-\theta_1\theta_2}+\frac{d_e}{ep} < \alpha_H \le \frac{2+3\theta_2-2\theta_1\theta_2}{2\theta_2-\theta_1\theta_2}+\frac{d_e}{ep}$

$$\tilde{s}_1^{TI-C} = \frac{1-\alpha_H\theta_1\theta_2+\alpha_H\theta_1+\theta_1\theta_2-\theta_1}{\alpha_H(2-\theta_1\theta_2)} - \frac{d_e(\theta_1-\theta_1\theta_2)}{\alpha_H pe(2-\theta_1\theta_2)}, \tag{A-29}$$

$$\tilde{s}_2^{TI-C} = \frac{2-\alpha_H\theta_1\theta_2+2\alpha_H\theta_2-3\theta_2}{2\alpha_H(2-\theta_1\theta_2)} - \frac{d_e(2\theta_2-\theta_1\theta_2)}{2\alpha_H pe(2-\theta_1\theta_2)} \tag{A-30}$$

— *If* $\frac{1-2\theta_1\theta_2+\theta_2}{\theta_2-\theta_1\theta_2}+\frac{d_e}{ep} < \alpha_H \le \frac{2+3\theta_1-2\theta_1\theta_2}{2\theta_1-\theta_1\theta_2}+\frac{d_e}{ep}$

$$\tilde{s}_1^{TI-C} = \frac{2-\alpha_H\theta_1\theta_2+2\alpha_H\theta_1-3\theta_1}{2\alpha_H(2-\theta_1\theta_2)} - \frac{d_e(2\theta_1-\theta_1\theta_2)}{2\alpha_H pe(2-\theta_1\theta_2)}, \tag{A-31}$$

$$\tilde{s}_2^{TI-C} = \frac{1-\alpha_H\theta_1\theta_2+\alpha_H\theta_2+\theta_1\theta_2-\theta_2}{\alpha_H(2-\theta_1\theta_2)} - \frac{d_e(\theta_2-\theta_1\theta_2)}{\alpha_H pe(2-\theta_1\theta_2)} \tag{A-32}$$

— *If* $\alpha_H > \max\left\{\frac{2+3\theta_1-2\theta_1\theta_2}{2\theta_1-\theta_1\theta_2}+\frac{d_e}{ep}, \frac{2+3\theta_2-2\theta_1\theta_2}{2\theta_2-\theta_1\theta_2}+\frac{d_e}{ep}\right\}$

$$\tilde{s}_1^{TI-C} = \frac{2-\alpha_H\theta_1\theta_2+2\alpha_H\theta_1+\theta_1\theta_2-3\theta_1}{\alpha_H(4-\theta_1\theta_2)} - \frac{d_e(2\theta_1-\theta_1\theta_2)}{\alpha_H pe(4-\theta_1\theta_2)}, \tag{A-33}$$

$$\tilde{s}_2^{TI-C} = \frac{2-\alpha_H\theta_1\theta_2+2\alpha_H\theta_2+\theta_1\theta_2-3\theta_2}{\alpha_H(4-\theta_1\theta_2)} - \frac{d_e(2\theta_2-\theta_1\theta_2)}{\alpha_H pe(4-\theta_1\theta_2)} \tag{A-34}$$

- *If* $\alpha_H < \frac{2-\theta_i}{1-\theta_i} - \frac{2d_e\theta_i}{ep(1-\theta_i)}$, *an equilibrium bargaining outcome in which only Investor i invests exists; i.e.,* $\tilde{I}_i^{TI-C} = e$ *and* $\tilde{I}_j^{TI-C} = 0$ *for* $i, j \in \{1,2\}$ *and* $i \ne j$, *and the equilibrium share of Investor i is*

$$\tilde{s}_i^{TI-C} = \frac{(\alpha_H-1)\theta_i+1}{\alpha_H} - \frac{2\theta_i d_e}{e\alpha_H p}.$$

Proof of Proposition A5. We solve the bargaining problem between the entrepreneur and Investor 1 as specified in (A-24) for the best-response investment level and the share of the investor. We first note that if $s_1 < \frac{I_1}{\alpha_H(I_1+I_2)}$, it follows that $\pi_1(\boldsymbol{I},\boldsymbol{s}) = e/2$ and the Nash product for the bargaining between the entrepreneur and Investor 1 in problem (A-24) is zero. In the following analysis, we restrict attention to the case where Investor 1's share $s_1 \ge \frac{I_1}{\alpha_H(I_1+I_2)}$ and later verify that the equilibrium bargaining outcome leads to a strictly positive Nash product. In this case, by the first order condition, we have that

$$\pi_1(\boldsymbol{I},\boldsymbol{s}) - d_1 = \theta_1\left(\pi_1(\boldsymbol{I},\boldsymbol{s}) + \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_1 - d_{\mathrm{e}}^{-1}\right); \tag{A-35}$$

$$\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_{\mathrm{e}}^{-1} = (1-\theta_1)\left(\pi_1(\boldsymbol{I},\boldsymbol{s}) + \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_1 - d_{\mathrm{e}}^{-1}\right).$$

Note that the best-response investment level

$$\tilde{I}_1(I_2,s_2) = \arg\max_{I_1\in[0,e]}\left\{\pi_1(\boldsymbol{I},\boldsymbol{s}) + \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_1 - d_{\mathrm{e}}^{-1}\right\} = \begin{cases} e/2 & \text{if } s_2 \le \frac{\alpha_H-1}{\alpha_H}; \\ 0 & \text{if } s_2 > \frac{\alpha_H-1}{\alpha_H}. \end{cases} \tag{A-36}$$

By Eq. (A-35), the best-response share for Investor 1 is

$$\tilde{s}_1(I_2,s_2) = \begin{cases} \frac{\theta_1[\alpha_H(e+2I_2)(1-s_2)-e-2\alpha_H I_2+2I_2]+e}{\alpha_H(e+2I_2)} - \frac{2d_{\mathrm{e}}(e-I_2)\theta_1}{e\alpha_H p(e+2I_2)} & \text{if } s_2 \le \frac{1}{\alpha_H}; \\ \frac{\theta_1[\alpha_H e(1-s_2)-e]+e}{\alpha_H(e+2I_2)} - \frac{2d_{\mathrm{e}}(e-I_2)\theta_1}{e\alpha_H p(e+2I_2)} & \text{if } \frac{1}{\alpha_H} < s_2 \le \frac{\alpha_H-1}{\alpha_H}; \\ 0 & \text{if } s_2 > \frac{\alpha_H-1}{\alpha_H}. \end{cases} \tag{A-37}$$

Similarly, we have that the best-response investment level and share for Investor 2 are

$$\tilde{I}_2(I_1,s_1) = \begin{cases} e/2 & \text{if } s_1 \le \frac{\alpha_H-1}{\alpha_H}; \\ 0 & \text{if } s_1 > \frac{\alpha_H-1}{\alpha_H}. \end{cases} \tag{A-38}$$

$$\tilde{s}_2(I_1,s_1) = \begin{cases} \frac{\theta_2[\alpha_H(2I_1+e)(1-s_1)-e-2\alpha_H I_1+2I_1]+e}{\alpha_H(2I_1+e)} - \frac{2d_{\mathrm{e}}(e-I_1)\theta_2}{e\alpha_H p(e+2I_1)} & \text{if } s_1 \le \frac{1}{\alpha_H}; \\ \frac{\theta_2[\alpha_H e(1-s_1)-e]+e}{\alpha_H(2I_1+e)} - \frac{2d_{\mathrm{e}}(e-I_1)\theta_2}{e\alpha_H p(e+2I_1)} & \text{if } \frac{1}{\alpha_H} < s_1 \le \frac{\alpha_H-1}{\alpha_H}; \\ 0 & \text{if } s_1 > \frac{\alpha_H-1}{\alpha_H}. \end{cases} \tag{A-39}$$

Solving the system of the best-response functions Eqs. (A-36) through (A-39), we have that there exists an equilibrium in which both investors invest $\tilde{I}_i^{TI-C} = e/2$ with the share for Investor i as follows.

- If $\alpha_H \le \min\left\{\frac{1-2\theta_1\theta_2+\theta_1}{\theta_1-\theta_1\theta_2} + \frac{d_{\mathrm{e}}}{ep}, \frac{1-2\theta_1\theta_2+\theta_2}{\theta_2-\theta_1\theta_2} + \frac{d_{\mathrm{e}}}{ep}\right\}$,

$$\tilde{s}_1^{TI-C} = \frac{1-\alpha_H\theta_1\theta_2+\alpha_H\theta_1-\theta_1}{2\alpha_H(1-\theta_1\theta_2)} - \frac{d_{\mathrm{e}}(\theta_1-\theta_1\theta_2)}{2\alpha_H pe(1-\theta_1\theta_2)},$$
$$\tilde{s}_2^{TI-C} = \frac{1-\alpha_H\theta_1\theta_2+\alpha_H\theta_2-\theta_2}{2\alpha_H(1-\theta_1\theta_2)} - \frac{d_{\mathrm{e}}(\theta_2-\theta_1\theta_2)}{2\alpha_H pe(1-\theta_1\theta_2)}$$

- If $\frac{1-2\theta_1\theta_2+\theta_1}{\theta_1-\theta_1\theta_2} + \frac{d_{\mathrm{e}}}{ep} < \alpha_H \le \frac{2+3\theta_2-2\theta_1\theta_2}{2\theta_2-\theta_1\theta_2} + \frac{d_{\mathrm{e}}}{ep}$

$$\tilde{s}_1^{TI-C} = \frac{1-\alpha_H\theta_1\theta_2+\alpha_H\theta_1+\theta_1\theta_2-\theta_1}{\alpha_H(2-\theta_1\theta_2)} - \frac{d_{\mathrm{e}}(\theta_1-\theta_1\theta_2)}{\alpha_H pe(2-\theta_1\theta_2)},$$
$$\tilde{s}_2^{TI-C} = \frac{2-\alpha_H\theta_1\theta_2+2\alpha_H\theta_2-3\theta_2}{2\alpha_H(2-\theta_1\theta_2)} - \frac{d_{\mathrm{e}}(2\theta_2-\theta_1\theta_2)}{2\alpha_H pe(2-\theta_1\theta_2)}$$

- If $\frac{1-2\theta_1\theta_2+\theta_2}{\theta_2-\theta_1\theta_2} + \frac{d_{\mathrm{e}}}{ep} < \alpha_H \le \frac{2+3\theta_1-2\theta_1\theta_2}{2\theta_1-\theta_1\theta_2} + \frac{d_{\mathrm{e}}}{ep}$

$$\tilde{s}_1^{TI-C} = \frac{2-\alpha_H\theta_1\theta_2+2\alpha_H\theta_1-3\theta_1}{2\alpha_H(2-\theta_1\theta_2)} - \frac{d_{\mathrm{e}}(2\theta_1-\theta_1\theta_2)}{2\alpha_H pe(2-\theta_1\theta_2)},$$
$$\tilde{s}_2^{TI-C} = \frac{1-\alpha_H\theta_1\theta_2+\alpha_H\theta_2+\theta_1\theta_2-\theta_2}{\alpha_H(2-\theta_1\theta_2)} - \frac{d_{\mathrm{e}}(\theta_2-\theta_1\theta_2)}{\alpha_H pe(2-\theta_1\theta_2)}$$

- If $\alpha_H > \max\left\{\frac{2+3\theta_1-2\theta_1\theta_2}{2\theta_1-\theta_1\theta_2}+\frac{d_e}{ep}, \frac{2+3\theta_2-2\theta_1\theta_2}{2\theta_2-\theta_1\theta_2}+\frac{d_e}{ep}\right\}$

$$\tilde{s}_1^{TI-C} = \frac{2-\alpha_H\theta_1\theta_2+2\alpha_H\theta_1+\theta_1\theta_2-3\theta_1}{\alpha_H(4-\theta_1\theta_2)} - \frac{d_e(2\theta_1-\theta_1\theta_2)}{\alpha_H pe(4-\theta_1\theta_2)},$$
$$\tilde{s}_2^{TI-C} = \frac{2-\alpha_H\theta_1\theta_2+2\alpha_H\theta_2+\theta_1\theta_2-3\theta_2}{\alpha_H(4-\theta_1\theta_2)} - \frac{d_e(2\theta_2-\theta_1\theta_2)}{\alpha_H pe(4-\theta_1\theta_2)}$$

It is easy to verify that the equilibrium shares satisfies that $\tilde{s}_i^{TI-C} \geq \frac{I_i^{TI-C}}{\alpha_H(I_1^{TI-C}+I_2^{TI-C})} = \frac{1}{2\alpha_H}$.

Similarly, we have that if $\alpha_H < \frac{2-\theta_i}{1-\theta_i} - \frac{2d_e\theta_i}{ep(1-\theta_i)}$, there exists an equilibrium in which Investor i is the only investor with the investment level $\tilde{I}_i^{TI-C} = e$ in equilibrium and the share for Investor i is

$$\tilde{s}_i^{TI-C} = \frac{(\alpha_H-1)\theta_i+1}{\alpha_H} - \frac{2\theta_i d_e}{e\alpha_H p}.$$

■

A.2.3. Model Robustness: Risk Aversion

For analytical tractability, the models above were solved under the assumption that all parties were risk neutral. However, it is natural to wonder how the results hold up, especially Corollary 1, if the parties involved are risk averse. Unfortunately, the model becomes analytically intractable to solve. We are able to show that, for the parameters that we implement in the experiment, so long as risk aversion is not too great, there will still be equilibria in which both investors choose to invest and that the entrepreneur's ranking from Corollary 1 still holds. The following illustrates an example for the comparison of the entrepreneur's share under SI and TI-C when $d_e = 0$. Specifically, let $u_i = x^{1-\rho_i}$ denote player i's utility function, where $\rho_i = 0$ indicates risk neutrality and $\rho_i > 0$ indicates risk aversion. In the experiment, as we outlined in Section 4.2, we assume that $e = 200$ and $(\alpha_H, \alpha_L, p) = (11, 1, 0.2)$. Table A2 gives the entrepreneur's share under various assumptions on risk preferences, assuming equal bargaining powers of the investor(s) relative to the entrepreneur.

As can be seen, in all cases, the entrepreneur earns the least when bargaining against a single investor and the most when bargaining with two investors simultaneously. Note that entrepreneur risk aversion is detrimental to their share, but the effects are largest in the single investor case where the entrepreneur's bargaining power is weakest. It is also interesting to note that investor risk aversion is also detrimental to the entrepreneur under the Common Stock contracts but beneficial to the entrepreneur under the Preferred Stock contract. Under the Common Stock contracts, by investing in the business, the investor is putting money at risk and, therefore, requires compensation for that risk. Moreover, disagreement would also be a better outcome compared to successfully negotiating and having the business be a failure. Roth and Rothblum (1982) showed that increased risk aversion could, counterintuitively increase a player's share when disagreement

Table A2 The Entrepreneur's Share Under Risk Aversion

(a) Common Stock contracts

Risk Parameters	SI-PoorEnt (%)	TI-C-PoorEnt (%)
$\rho_e = \rho_s = \rho_1 = \rho_2 = 0$	33.33	46.67
$\rho_e = 0;\ \rho_s = \rho_1 = \rho_2 = 0.25$	31.23	44.48
$\rho_e = 0.25;\ \rho_s = \rho_1 = \rho_2 = 0$	28.57	46.44
$\rho_e = 0.25;\ \rho_s = \rho_1 = \rho_2 = 0.25$	26.98	44.32

(b) Preferred Stock contracts

Risk Parameters	SI-PoorEnt (%)	TI-C-PoorEnt (%)
$\rho_e = \rho_s = \rho_1 = \rho_2 = 0$	45.46	56.36
$\rho_e = 0;\ \rho_s = \rho_1 = \rho_2 = 0.25$	49.15	58.45
$\rho_e = 0.25;\ \rho_s = \rho_1 = \rho_2 = 0$	38.96	55.78
$\rho_e = 0.25;\ \rho_s = \rho_1 = \rho_2 = 0.25$	42.80	57.83

is not the worst outcome. It seems that a similar result holds here. Under the Preferred Stock contracts, the investor's downside is protected and effectively the bargaining is regarding the state when the startup value is realized as α_H. In this case, the entrepreneur is able to take advantage of the risk aversion of the investors and gain a higher share when bargaining with a more risk-averse investor.

A.3. Theory with Alternative Belief

We discuss the models under alternative belief about the disagreement points in this appendix.

A.3.1. The Two Complementary Investor Model Under Common Stock Contract

In this section, we present the results and the proofs with the general bargaining powers of the investor(s) relative to the entrepreneur under the alternative disagreement point of the entrepreneur set as $d_e^{-i} = d_e$ under the Common Stock contract. All other model settings are the same as in Sections 4 and 5. We note that the alternative specification of the entrepreneur's disagreement point does not affect the result in the single investor bargaining problem. It only affects the two investor bargaining problem.

The investments I_i and the share s_i maximize the following Nash product simultaneously:

$$\max_{I_i \in [0,e],\ s_i \in [0,1]} \ [\pi_i(\boldsymbol{I}, \boldsymbol{s}) - d_i]^{\theta_i} \left[\pi_e(\boldsymbol{I}, \boldsymbol{s}) - d_e^{-i}\right]^{1-\theta_i} \tag{A-40}$$
$$\pi_i(\boldsymbol{I}, \boldsymbol{s}) \geq d_i,\ \pi_e(\boldsymbol{I}, \boldsymbol{s}) \geq d_e^{-i}.$$

PROPOSITION A6 **(Two complementary investors under alternative belief)**.

- *When* $\mu_\alpha \geq \max\left\{\frac{3-2\theta_1-\theta_1\theta_2}{2(1-\theta_1)} - \frac{d_e(\theta_1-\theta_1\theta_2)}{e(1-\theta_1)},\ \frac{3-2\theta_2-\theta_1\theta_2}{2(1-\theta_2)} - \frac{d_e(\theta_2-\theta_1\theta_2)}{e(1-\theta_2)}\right\}$*, there exists an equilibrium bargaining outcome in which both investors invest with* $I_i^{TI-C} = e/2$ *for* $i \in \{1, 2\}$*, and the equilibrium share of investor* i *is*

$$s_i^{TI-C} = \frac{1-2\theta_i+2\mu_\alpha\theta_i+(1-2\mu_\alpha)\theta_1\theta_2}{2\mu_\alpha(1-\theta_1\theta_2)} - \frac{d_e(\theta_i-\theta_1\theta_2)}{e\mu_\alpha(1-\theta_1\theta_2)}. \tag{A-41}$$

- *There exists an equilibrium bargaining outcome in which only Investor i invests when $\mu_\alpha < \frac{2-\theta_i}{1-\theta_i} - \frac{2d_e\theta_i}{e(1-\theta_i)}$. The equilibrium investment level $I_i^{TI-C} = e$ and $I_j^{TI-C} = 0$ for $i,j \in \{1,2\}$ and $i \neq j$, and the equilibrium share of Investor i is*

$$s_i^{TI-C} = \frac{(\mu_\alpha-1)\theta_i+1}{\mu_\alpha} - \frac{2d_e\theta_i}{e\mu_\alpha}.$$

Proof of Proposition A6. Recall that the expected profit of the entrepreneur is

$$\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) = \mu_\alpha(I_1+I_2)(1-s_1-s_2), \tag{A-42}$$

and the expected profit of Investor i is

$$\pi_i(\boldsymbol{I},\boldsymbol{s}) = \mu_\alpha(I_1+I_2)s_i + \frac{e}{2} - I_i. \tag{A-43}$$

The disagreement point of the entrepreneur when negotiating with Investor i is $d_{\mathrm{e}}^{-i} = d_{\mathrm{e}}$, which the value of the outside option when the entrepreneur does not reach agreement with either investor. The disagreement point of Investor i is $d_i = e/2$ since the investor has $e/2$ units of capital as the endowment.

We first solve the bargaining problem between the entrepreneur and Investor 1 as specified in (A-40). Following the similar analysis as in the proof of Proposition A1, we have that

$$\begin{aligned} \pi_1(\boldsymbol{I},\boldsymbol{s}) - d_1 &= \theta_1\left(\pi_1(\boldsymbol{I},\boldsymbol{s}) + \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_1 - d_{\mathrm{e}}^{-1}\right); \\ \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_{\mathrm{e}}^{-1} &= (1-\theta_1)\left(\pi_1(\boldsymbol{I},\boldsymbol{s}) + \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_1 - d_{\mathrm{e}}^{-1}\right). \end{aligned} \tag{A-44}$$

Note that the best-response investment level

$$I_1(I_2,s_2) = \arg\max_{I_1\in[0,e]} \left\{\pi_1(\boldsymbol{I},\boldsymbol{s}) + \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_1 - d_{\mathrm{e}}^{-1}\right\} = \begin{cases} e/2 & \text{if } \mu_\alpha(1-s_2) \geq 1; \\ 0 & \text{otherwise.} \end{cases} \tag{A-45}$$

By Eq. (A-44), the best-response share for Investor 1 is

$$s_1(I_2,s_2) = \begin{cases} \frac{\theta_1[\mu_\alpha(e+2I_2)(1-s_2)-e-2d_e]+e}{\mu_\alpha(e+2I_2)} & \text{if } \mu_\alpha(1-s_2) \geq 1; \\ 0 & \text{otherwise.} \end{cases} \tag{A-46}$$

Similarly, we have that the best-response investment level and share for Investor 2 are

$$I_2(I_1,s_1) = \begin{cases} e & \text{if } \mu_\alpha(1-s_1) \geq 1; \\ 0 & \text{otherwise;} \end{cases} \tag{A-47}$$

$$s_2(I_1,s_1) = \begin{cases} \frac{\theta_2[\mu_\alpha(2I_1+e)(1-s_1)-e-2d_e]+e}{\mu_\alpha(2I_1+e)} & \text{if } \mu_\alpha(1-s_1) \geq 1; \\ 0 & \text{otherwise.} \end{cases} \tag{A-48}$$

Solving the system of the best-response functions Eqs. (A-45) through (A-48), we have that if $\mu_\alpha \geq \max\left\{\frac{3-2\theta_1-\theta_1\theta_2}{2(1-\theta_1)} - \frac{d_{\mathrm{e}}(\theta_1-\theta_1\theta_2)}{e(1-\theta_1)}, \frac{3-2\theta_2-\theta_1\theta_2}{2(1-\theta_2)} - \frac{d_{\mathrm{e}}(\theta_2-\theta_1\theta_2)}{e(1-\theta_2)}\right\}$, there exists an equilibrium in which both investors invest $I_i^{TI-C} = e$ with the share for Investor i as

$$s_i^{TI-C} = \frac{1-2\theta_i+2\mu_\alpha\theta_i+(1-2\mu_\alpha)\theta_1\theta_2}{2\mu_\alpha(1-\theta_1\theta_2)} - \frac{d_{\mathrm{e}}(\theta_i-\theta_1\theta_2)}{e\mu_\alpha(1-\theta_1\theta_2)}.$$

Similarly, we have that, if $\mu_\alpha < \frac{2-\theta_i}{1-\theta_i} - \frac{2d_{\mathrm{e}}\theta_i}{e(1-\theta_i)}$, there exists an equilibrium in which Investor i is the only investor with the investment level $I_i^{TI-C} = e/2$ in equilibrium and the share for Investor i is

$$s_i^{TI-C} = \frac{(\mu_\alpha - 1)\,\theta_i + 1}{\mu_\alpha} - \frac{2d_{\mathrm{e}}\theta_i}{e\mu_\alpha}.$$

■

A.3.2. The Two Complementary Investor Model Under Preferred Stock Contract

In this section, we present the results and the proofs with the general bargaining powers of the investor(s) relative to the entrepreneur under the alternative disagreement point of the entrepreneur set as $d_{\mathrm{e}}^{-i} = d_{\mathrm{e}}$ under the Preferred Stock contract. All other model settings are the same as in Section 6. We note that the alternative specification of the entrepreneur's disagreement point does not affect the result in the single investor bargaining problem. It only affects the two investor bargaining problem.

Similar to the analysis before, we can show that the equilibrium bargaining share will not be too extreme such that in any equilibrium bargaining outcome $(\boldsymbol{I}, \boldsymbol{s})$, the following conditions are satisfied: $\alpha_H(I_1+I_2)(1-s_i) \geq I_{3-i},\ i=1,2$. Therefore, the expected profit of the entrepreneur is

$$\pi_{\mathrm{e}}(\boldsymbol{I}, \boldsymbol{s}) = \alpha_H(I_1+I_2)p - \sum_{i=1}^{2} \max\left\{\alpha_H(I_1+I_2)s_i, I_i\right\}p, \tag{A-49}$$

and the expected profit of Investor i as

$$\pi_i(\boldsymbol{I}, \boldsymbol{s}) = \max\left\{\alpha_H(I_1+I_2)s_i, I_i\right\}p + e - I_i p. \tag{A-50}$$

The (alternative) disagreement point of the entrepreneur when negotiating with Investor i is $d_{\mathrm{e}}^{-i} = d_{\mathrm{e}}$, and the disagreement point of Investor i is $d_i = e/2$ since the investor has $e/2$ units of capital as the endowment.

Then, the investments $\boldsymbol{I}$ and the shares $\boldsymbol{s}$ maximize the following Nash product simultaneously:

$$\max_{I_i\in[0,e],\ s_i\in[0,1]} \left[\pi_i(\boldsymbol{I}, \boldsymbol{s}) - d_i\right]^{\theta_i} \left[\pi_{\mathrm{e}}(\boldsymbol{I}, \boldsymbol{s}) - d_{\mathrm{e}}^{-i}\right]^{1-\theta_i} \tag{A-51}$$
$$\pi_i(\boldsymbol{I}, \boldsymbol{s}) \geq d_i,\ \pi_{\mathrm{e}}(\boldsymbol{I}, \boldsymbol{s}) \geq d_{\mathrm{e}}^{-i}.$$

PROPOSITION A7 **(Two complementary investors under alternative belief)**.

- *There exists an equilibrium bargaining outcome in which both investors invest; i.e.,* $\tilde{I}_i^{TI-C} = {}^e\!/_2$ *for* $i \in \{1,2\}$, *and the equilibrium share of investor i is as follows.*

  — *If* $\alpha_H \geq \max\left\{\frac{3}{2} + \frac{(1-\theta_1)\theta_2}{2(1-\theta_2)} - \frac{d_e(1-\theta_1)\theta_2}{ep(1-\theta_2)}, \frac{3}{2} + \frac{(1-\theta_2)\theta_1}{2(1-\theta_1)} - \frac{d_e(1-\theta_2)\theta_1}{ep(1-\theta_1)}\right\}$,

$$\tilde{s}_1^{TI-C} = \frac{\theta_1(2\alpha_H(1-\theta_2)+\theta_2-2)+1}{2\alpha_H(1-\theta_1\theta_2)} - \frac{d_e\theta_1(1-\theta_2)}{\alpha_H ep(1-\theta_1\theta_2)}, \tag{A-52}$$

$$\tilde{s}_2^{TI-C} = \frac{\theta_2(2\alpha_H(1-\theta_1)+\theta_1-2)+1}{2\alpha_H(1-\theta_1\theta_2)} - \frac{d_e(1-\theta_1)\theta_2}{\alpha_H ep(1-\theta_1\theta_2)} \tag{A-53}$$

- *If* $\alpha_H < \frac{2-\theta_i}{1-\theta_i} - \frac{2d_e\theta_i}{ep(1-\theta_i)}$, *an equilibrium bargaining outcome in which only Investor i invests exists; i.e.,* $\tilde{I}_i^{TI-C} = {}^e\!/_2$ *and* $\tilde{I}_j^{TI-C} = 0$ *for* $i,j \in \{1,2\}$ *and* $i \neq j$, *and the equilibrium share of Investor i is*

$$\tilde{s}_i^{TI-C} = \frac{(\alpha_H - 1)\theta_i + 1}{\alpha_H} - \frac{2\theta_i d_e}{e\alpha_H p}.$$

Proof of Proposition A7. We solve the bargaining problem between the entrepreneur and Investor 1 as specified in (A-51) for the best-response investment level and the share of the investor. We first note that if $s_1 < \frac{I_1}{\alpha_H(I_1+I_2)}$, it follows that $\pi_1(\boldsymbol{I},\boldsymbol{s}) = {}^e\!/_2$ and the Nash product for the bargaining between the entrepreneur and Investor 1 in problem (A-51) is zero. In the following analysis, we restrict attention to the case where Investor 1's share $s_1 \geq \frac{I_1}{\alpha_H(I_1+I_2)}$ and later verify that the equilibrium bargaining outcome leads to a strictly positive Nash product. In this case, by the first order condition, we have that

$$\begin{aligned}
\pi_1(\boldsymbol{I},\boldsymbol{s}) - d_1 &= \theta_1\left(\pi_1(\boldsymbol{I},\boldsymbol{s}) + \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_1 - d_{\mathrm{e}}^{-1}\right); \\
\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_{\mathrm{e}}^{-1} &= (1-\theta_1)\left(\pi_1(\boldsymbol{I},\boldsymbol{s}) + \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_1 - d_{\mathrm{e}}^{-1}\right).
\end{aligned} \tag{A-54}$$

Note that the best-response investment level

$$\tilde{I}_1(I_2,s_2) = \arg\max_{I_1\in[0,e]}\left\{\pi_1(\boldsymbol{I},\boldsymbol{s}) + \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_1 - d_{\mathrm{e}}^{-1}\right\} = \begin{cases} {}^e\!/_2 & \text{if } s_2 \leq \frac{\alpha_H-1}{\alpha_H}; \\ 0 & \text{if } s_2 > \frac{\alpha_H-1}{\alpha_H}. \end{cases} \tag{A-55}$$

By Eq. (A-54), the best-response share for Investor 1 is

$$\tilde{s}_1(I_2,s_2) = \begin{cases} \frac{\theta_1[\alpha_H(e+2I_2)(1-s_2)-e]+e}{\alpha_H(e+2I_2)} - \frac{2d_{\mathrm{e}}\theta_1}{\alpha_H p(e+2I_2)} & \text{if } s_2 \leq \frac{\alpha_H-1}{\alpha_H}; \\ 0 & \text{if } s_2 > \frac{\alpha_H-1}{\alpha_H}. \end{cases} \tag{A-56}$$

Similarly, we have that the best-response investment level and share for Investor 2 are

$$\tilde{I}_2(I_1,s_1) = \begin{cases} {}^e\!/_2 & \text{if } s_1 \leq \frac{\alpha_H-1}{\alpha_H}; \\ 0 & \text{if } s_1 > \frac{\alpha_H-1}{\alpha_H}. \end{cases} \tag{A-57}$$

$$\tilde{s}_2(I_1,s_1) = \begin{cases} \frac{\theta_2[\alpha_H(2I_1+e)(1-s_1)-e]+e}{\alpha_H(2I_1+e)} - \frac{2d_{\mathrm{e}}\theta_2}{\alpha_H p(e+2I_1)} & \text{if } s_1 \leq \frac{\alpha_H-1}{\alpha_H}; \\ 0 & \text{if } s_1 > \frac{\alpha_H-1}{\alpha_H}. \end{cases} \tag{A-58}$$

Solving the system of the best-response functions Eqs. (A-55) through (A-58), we have that there exists an equilibrium in which both investors invest $\tilde{I}_i^{TI-C} = {}^e\!/_2$ with the share for Investor i as follows.

- If $\alpha_H \geq \max\left\{\frac{3}{2} + \frac{(1-\theta_1)\theta_2}{2(1-\theta_2)} - \frac{d_\mathrm{e}(1-\theta_1)\theta_2}{ep(1-\theta_2)}, \frac{3}{2} + \frac{(1-\theta_2)\theta_1}{2(1-\theta_1)} - \frac{d_\mathrm{e}(1-\theta_2)\theta_1}{ep(1-\theta_1)}\right\}$,

$$\tilde{s}_1^{TI-C} = \frac{\theta_1(2\alpha_H(1-\theta_2)+\theta_2-2)+1}{2\alpha_H(1-\theta_1\theta_2)} - \frac{d_\mathrm{e}\theta_1(1-\theta_2)}{\alpha_H ep(1-\theta_1\theta_2)},$$
$$\tilde{s}_2^{TI-C} = \frac{\theta_2(2\alpha_H(1-\theta_1)+\theta_1-2)+1}{2\alpha_H(1-\theta_1\theta_2)} - \frac{d_\mathrm{e}(1-\theta_1)\theta_2}{\alpha_H ep(1-\theta_1\theta_2)}$$

It is easy to verify that the equilibrium shares satisfies that $\tilde{s}_i^{TI-C} \geq \frac{I_i^{TI-C}}{\alpha_H(I_1^{TI-C}+I_2^{TI-C})} = \frac{1}{2\alpha_H}$.

Similarly, we have that if $\alpha_H < \frac{2-\theta_i}{1-\theta_i} - \frac{2d_\mathrm{e}\theta_i}{ep(1-\theta_i)}$, there exists an equilibrium in which Investor i is the only investor with the investment level $\tilde{I}_i^{TI-C} = e/2$ in equilibrium and the share for Investor i is

$$\tilde{s}_i^{TI-C} = \frac{(\alpha_H - 1)\,\theta_i + 1}{\alpha_H} - \frac{2\theta_i d_\mathrm{e}}{e\alpha_H p}.$$

■

A.3.3. The Two Substitutable Investor Problem

In this section, we analyze the scenario where a poor entrepreneur (the disagreement point $d_\mathrm{e} = 0$ if neither investor invests) bargains with two investors, each with an endowment of $e = 200$ units of capital and the maximum investment the startup can receive is 200 units of capital. Similar to the previous section, we present the results and the proofs with the general bargaining powers of the investor(s) relative to the entrepreneur. All other model settings are the same as in Section 4. We analyze the bargaining with two investors under the Common Stock contract. We first formulate the problem as follows, with slight repetition in describing the problem setting as the one in Section 4.

In the two investor scenarios, investors $i = 1, 2$ engage separately in bilateral bargaining with the entrepreneur about the investment amounts I_i and the shares, s_i, received in exchange for their investment. We denote the outcome of each bargaining unit i (the bargaining between the entrepreneur and Investor i) by (I_i, s_i) and the collective outcomes by $\boldsymbol{I} = (I_1, I_2)$ and $\boldsymbol{s} = (s_1, s_2)$. Then, the expected profit of the entrepreneur is $\pi_\mathrm{e}(\boldsymbol{I}, \boldsymbol{s}) = \mu_\alpha(I_1 + I_2)(1 - s_1 - s_2)$ and the expected profit of Investor i is $\pi_i(\boldsymbol{I}, \boldsymbol{s}) = \mu_\alpha(I_1 + I_2)s_i + e - I_i$.

Denote by d_e^{-i} the disagreement point of the entrepreneur when bargaining with Investor i. Then $d_\mathrm{e}^{-1} = \max\{\pi_\mathrm{e}(0, I_2, 0, s_2), \pi_\mathrm{e}(0, e, 0, \frac{(\mu_\alpha-1)\theta_0+1}{\mu_\alpha})\}$ is maximum of the profit of the entrepreneur when Investor 2 is the only known investor and the profit of the entrepreneur when Investor 2 is the only unknown investor (due to the simultaneous bargaining). Similarly $d_\mathrm{e}^{-2} = \max\{\pi_\mathrm{e}(I_1, 0, s_1, 0), \pi_\mathrm{e}(e, 0, \frac{(\mu_\alpha-1)\theta_0+1}{\mu_\alpha}, 0)\}$. Further, the disagreement point of Investor i is $d_i = e$ since each investor has e units of capital as the endowment.

Note that the full endowments of both investors cannot be invested simultaneously, since the startup only needs e units of capital at this stage. That is, at most one investor can invest the full endowment. Therefore, there is an additional constraint that $I_1 + I_2 \le e$. Then, the investments $\boldsymbol{I}$ and the shares $\boldsymbol{s}$ maximize the following Nash product simultaneously:

$$\begin{aligned} \max_{I_i\in[0,e],\ s_i\in[0,1]} \quad & [\pi_i(\boldsymbol{I},\boldsymbol{s}) - d_i]\left[\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) - d_{\mathrm{e}}^{-i}\right] \\ & \pi_i(\boldsymbol{I},\boldsymbol{s}) \ge d_i,\ \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s}) \ge d_{\mathrm{e}}^{-i},\ i\in\{1,2\}, \\ & I_1 + I_2 \le e. \end{aligned} \tag{A-59}$$

Solving the problem, we have the following proposition.

Proposition A8 **(Two substitutable investors under alternative belief)**.

- *Consider* (I_1, I_2, s_1, s_2) *such that* $I_1 + I_2 = e,\ I_i \ge 0,\ i = 1, 2,$ *and*

  □ *Case 1. When* $\frac{I_2(I_2\theta_2(1-\theta_1+\mu_\alpha\theta_1)-e(\theta_2(2-\mu_\alpha(1-\theta_1)-\theta_1)-1))}{e^2-I_1I_2\theta_1\theta_2} \le \min\{\mu_\alpha - 1, \frac{\mu_\alpha I_2 - e(\mu_\alpha-1)(1-\theta_2)}{I_2}\}$ *and* $\frac{I_1(I_1\theta_1(1-\theta_2+\mu_\alpha\theta_2)-e(\theta_1(2-\mu_\alpha(1-\theta_2)-\theta_2)-1))}{e^2-I_1I_2\theta_1\theta_2} \le \min\{\mu_\alpha - 1, \frac{\mu_\alpha I_1 - e(\mu_\alpha-1)(1-\theta_1)}{I_1}\}$, *we have that*

$$\begin{aligned} s_1 &= \frac{I_1\Big(I_1\theta_1(1-\theta_2+\mu_\alpha\theta_2) - e\Big(\theta_1\big(2-\mu_\alpha(1-\theta_2)-\theta_2\big)-1\Big)\Big)}{\mu_\alpha(e^2 - I_1I_2\theta_1\theta_2)}, \\ s_2 &= \frac{I_2\Big(I_2\theta_2(1-\theta_1+\mu_\alpha\theta_1) - e\Big(\theta_2\big(2-\mu_\alpha(1-\theta_1)-\theta_1\big)-1\Big)\Big)}{\mu_\alpha(e^2 - I_1I_2\theta_1\theta_2)}; \end{aligned} \tag{A-60}$$

  □ *Case 2. When* $\frac{I_2\theta_2(\mu_\alpha\theta_1-\theta_1+1)+I_2(1-\theta_2)}{e-I_1\theta_1\theta_2} \le \min\{\mu_\alpha - 1, \frac{\mu_\alpha I_2 - e(\mu_\alpha-1)(1-\theta_2)}{I_2}\}$ *and* $\frac{\mu_\alpha I_1 - e(\mu_\alpha-1)(1-\theta_1)}{I_1} < \frac{I_1(I_1\theta_1(1-\theta_2)-e((\mu_\alpha-1)\theta_1^2\theta_2-(\mu_\alpha-2)\theta_1-1))}{e(e-I_1\theta_1\theta_2)} \le \mu_\alpha - 1$, *we have that*

$$\begin{aligned} s_1 &= \frac{I_1\Big(I_1\theta_1(1-\theta_2) - e\Big((\mu_\alpha-1)\theta_1^2\theta_2 - (\mu_\alpha-2)\theta_1 - 1\Big)\Big)}{\mu_\alpha e(e - I_1\theta_1\theta_2)}; \\ s_2 &= \frac{I_2\theta_2(\mu_\alpha\theta_1 - \theta_1 + 1) + I_2(1-\theta_2)}{\mu_\alpha(e - I_1\theta_1\theta_2)}. \end{aligned} \tag{A-61}$$

  □ *Case 3. When* $\frac{\mu_\alpha I_2 - e(\mu_\alpha-1)(1-\theta_2)}{I_2} < \frac{I_2(I_2(1-\theta_1)\theta_2-e((\mu_\alpha-1)\theta_1\theta_2^2-(\mu_\alpha-2)\theta_2-1))}{e(e-I_2\theta_1\theta_2)} \le \mu_\alpha - 1$ *and* $\frac{I_1\theta_1(\mu_\alpha\theta_2-\theta_2+1)+I_1(1-\theta_1)}{e-I_2\theta_1\theta_2} \le \min\{\mu_\alpha - 1, \frac{\mu_\alpha I_1 - e(\mu_\alpha-1)(1-\theta_1)}{I_1}\}$, *we have that*

$$\begin{aligned} s_1 &= \frac{I_1\theta_1(\mu_\alpha\theta_2 - \theta_2 + 1) + I_1(1-\theta_1)}{\mu_\alpha(e - I_2\theta_1\theta_2)}; \\ s_2 &= \frac{I_2\Big(I_2(1-\theta_1)\theta_2 - e\Big((\mu_\alpha-1)\theta_1\theta_2^2 - (\mu_\alpha-2)\theta_2 - 1\Big)\Big)}{\mu_\alpha e(e - I_2\theta_1\theta_2)}. \end{aligned} \tag{A-62}$$

  □ *Case 4. When* $\frac{\mu_\alpha I_2 - e(\mu_\alpha-1)(1-\theta_2)}{I_2} < \frac{I_2(1-\theta_1\theta_2)+e(1-\theta_2)(\mu_\alpha-1)\theta_1\theta_2}{e(1-\theta_1\theta_2)} \le \mu_\alpha - 1$ *and* $\frac{\mu_\alpha I_1 - e(\mu_\alpha-1)(1-\theta_1)}{I_1} < \frac{I_1(1-\theta_1\theta_2)+e(1-\theta_1)(\mu_\alpha-1)\theta_1\theta_2}{e(1-\theta_1\theta_2)} \le \mu_\alpha - 1$, *we have that*

$$s_1 = \frac{I_1(1-\theta_1\theta_2) + e(1-\theta_1)(\mu_\alpha-1)\theta_1\theta_2}{\mu_\alpha e(1-\theta_1\theta_2)};$$

$$s_2 = \frac{I_2(1-\theta_1\theta_2)+e(1-\theta_2)(\mu_\alpha-1)\theta_1\theta_2}{\mu_\alpha e(1-\theta_1\theta_2)}. \tag{A-63}$$

In each of the four cases, (I_1, I_2, s_1, s_2) is an equilibrium bargaining outcome with Investor i investing I_i for the share of s_i.

- *If $\mu_\alpha < 1+\frac{1}{1-\theta_1\theta_2}$, there exists an equilibrium with the equilibrium investment as $I_1 = e$ and $I_2 = 0$, and the equilibrium share of investor i as $s_1 = \frac{1-\theta_1\theta_2+\mu_\alpha\theta_1\theta_2}{\mu_\alpha}$ and $s_2 = 0$;*
- *If $\mu_\alpha < 1+\frac{1}{1-\theta_1\theta_2}$, there exists an equilibrium with the equilibrium investment as $I_1 = 0$ and $I_2 = e$, and the equilibrium share of investor i as $s_1 = 0$ and $s_2 = \frac{1-\theta_1\theta_2+\mu_\alpha\theta_1\theta_2}{\mu_\alpha}$.*

Proof of Proposition A8. We first solve the bargaining problem between the entrepreneur and Investor 1. Following the similar analysis as in the proof of Proposition A1, we have that

$$\begin{aligned}\pi_1(\boldsymbol{I},\boldsymbol{s})-d_1 &= \theta_1\left(\pi_1(\boldsymbol{I},\boldsymbol{s})+\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s})-d_1-d_{\mathrm{e}}^{-1}\right); \\ \pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s})-d_{\mathrm{e}}^{-1} &= (1-\theta_1)\left(\pi_1(\boldsymbol{I},\boldsymbol{s})+\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s})-d_1-d_{\mathrm{e}}^{-1}\right).\end{aligned} \tag{A-64}$$

Note that the best-response investment level

$$I_1(I_2,s_2) = \arg\max_{I_1\in[0,e],I_1+I_2\le e}\left\{\pi_1(\boldsymbol{I},\boldsymbol{s})+\pi_{\mathrm{e}}(\boldsymbol{I},\boldsymbol{s})-d_1-d_{\mathrm{e}}^{-1}\right\} = \begin{cases} e-I_2 & \text{if } \mu_\alpha(1-s_2)\ge 1; \\ 0 & \text{otherwise.}\end{cases} \tag{A-65}$$

By Eq. (A-64), the best-response share for Investor 1 is

$$s_1(I_2,s_2) = \begin{cases} \frac{\theta_1[\mu_\alpha(e-I_2)(1-s_2)-e+I_2]+e-I_2}{\mu_\alpha e}. & \text{if } \mu_\alpha(1-s_2)\ge 1 \text{ and } \frac{\mu_\alpha I_2-e(\mu_\alpha-1)(1-\theta_2)}{\mu_\alpha I_2}\ge s_2; \\ \frac{\theta_1[\mu_\alpha e(1-s_2)-e+I_2-e(\mu_\alpha-1)(1-\theta_2)]+e-I_2}{\mu_\alpha e}. & \text{if } \mu_\alpha(1-s_2)\ge 1 \text{ and } \frac{\mu_\alpha I_2-e(\mu_\alpha-1)(1-\theta_2)}{\mu_\alpha I_2}< s_2; \\ 0 & \text{otherwise.}\end{cases} \tag{A-66}$$

Similarly, we have that the best-response investment level and share for Investor 2 are

$$I_2(I_1,s_1) = \begin{cases} e-I_1 & \text{if } \mu_\alpha(1-s_1)\ge 1; \\ 0 & \text{otherwise;}\end{cases} \tag{A-67}$$

$$s_2(I_1,s_1) = \begin{cases} \frac{\theta_2[\mu_\alpha(e-I_1)(1-s_1)-e+I_1]+e-I_1}{\mu_\alpha e}. & \text{if } \mu_\alpha(1-s_1)\ge 1 \text{ and } \frac{\mu_\alpha I_1-e(\mu_\alpha-1)(1-\theta_1)}{\mu_\alpha I_1}\ge s_1; \\ \frac{\theta_2[\mu_\alpha e(1-s_1)-e+I_1-e(\mu_\alpha-1)(1-\theta_1)]+e-I_1}{\mu_\alpha e}. & \text{if } \mu_\alpha(1-s_1)\ge 1 \text{ and } \frac{\mu_\alpha I_1-e(\mu_\alpha-1)(1-\theta_1)}{\mu_\alpha I_1}< s_1; \\ 0 & \text{otherwise.}\end{cases} \tag{A-68}$$

Solving the system of equations, we have that

- Case 1. When $\frac{I_2(I_2\theta_2(1-\theta_1+\mu_\alpha\theta_1)-e(\theta_2(2-\mu_\alpha(1-\theta_1)-\theta_1)-1))}{e^2-I_1I_2\theta_1\theta_2} \le \min\{\mu_\alpha-1, \frac{\mu_\alpha I_2-e(\mu_\alpha-1)(1-\theta_2)}{I_2}\}$ and $\frac{I_1(I_1\theta_1(1-\theta_2+\mu_\alpha\theta_2)-e(\theta_1(2-\mu_\alpha(1-\theta_2)-\theta_2)-1))}{e^2-I_1I_2\theta_1\theta_2} \le \min\{\mu_\alpha-1, \frac{\mu_\alpha I_1-e(\mu_\alpha-1)(1-\theta_1)}{I_1}\}$, we have that

$$s_1 = \frac{I_1\Big(I_1\theta_1(1-\theta_2+\mu_\alpha\theta_2)-e\Big(\theta_1\big(2-\mu_\alpha(1-\theta_2)-\theta_2\big)-1\Big)\Big)}{\mu_\alpha(e^2-I_1I_2\theta_1\theta_2)},$$

$$s_2 = \frac{I_2\Big(I_2\theta_2(1-\theta_1+\mu_\alpha\theta_1) - e\Big(\theta_2\big(2-\mu_\alpha(1-\theta_1)-\theta_1\big)-1\Big)\Big)}{\mu_\alpha(e^2 - I_1 I_2\theta_1\theta_2)}; \tag{A-69}$$

- Case 2. When $\frac{I_2\theta_2(\mu_\alpha\theta_1-\theta_1+1)+I_2(1-\theta_2)}{e-I_1\theta_1\theta_2} \le \min\{\mu_\alpha - 1, \frac{\mu_\alpha I_2 - e(\mu_\alpha-1)(1-\theta_2)}{I_2}\}$ and $\frac{\mu_\alpha I_1 - e(\mu_\alpha-1)(1-\theta_1)}{I_1} < \frac{I_1(I_1\theta_1(1-\theta_2)-e((\mu_\alpha-1)\theta_1^2\theta_2-(\mu_\alpha-2)\theta_1-1))}{e(e-I_1\theta_1\theta_2)} \le \mu_\alpha - 1$, we have that

$$\begin{aligned} s_1 &= \frac{I_1\Big(I_1\theta_1(1-\theta_2) - e\Big((\mu_\alpha-1)\theta_1^2\theta_2 - (\mu_\alpha-2)\theta_1 - 1\Big)\Big)}{\mu_\alpha e(e - I_1\theta_1\theta_2)}; \\ s_2 &= \frac{I_2\theta_2(\mu_\alpha\theta_1 - \theta_1 + 1) + I_2(1-\theta_2)}{\mu_\alpha(e - I_1\theta_1\theta_2)}. \end{aligned} \tag{A-70}$$

- Case 3. When $\frac{\mu_\alpha I_2 - e(\mu_\alpha-1)(1-\theta_2)}{I_2} < \frac{I_2(I_2(1-\theta_1)\theta_2-e((\mu_\alpha-1)\theta_1\theta_2^2-(\mu_\alpha-2)\theta_2-1))}{e(e-I_2\theta_1\theta_2)} \le \mu_\alpha - 1$ and $\frac{I_1\theta_1(\mu_\alpha\theta_2-\theta_2+1)+I_1(1-\theta_1)}{e-I_2\theta_1\theta_2} \le \min\{\mu_\alpha - 1, \frac{\mu_\alpha I_1 - e(\mu_\alpha-1)(1-\theta_1)}{I_1}\}$, we have that

$$\begin{aligned} s_1 &= \frac{I_1\theta_1(\mu_\alpha\theta_2 - \theta_2 + 1) + I_1(1-\theta_1)}{\mu_\alpha(e - I_2\theta_1\theta_2)}; \\ s_2 &= \frac{I_2\Big(I_2(1-\theta_1)\theta_2 - e\Big((\mu_\alpha-1)\theta_1\theta_2^2 - (\mu_\alpha-2)\theta_2 - 1\Big)\Big)}{\mu_\alpha e(e - I_2\theta_1\theta_2)}. \end{aligned} \tag{A-71}$$

- Case 4. When $\frac{\mu_\alpha I_2 - e(\mu_\alpha-1)(1-\theta_2)}{I_2} < \frac{I_2(1-\theta_1\theta_2)+e(1-\theta_2)(\mu_\alpha-1)\theta_1\theta_2}{e(1-\theta_1\theta_2)} \le \mu_\alpha - 1$ and $\frac{\mu_\alpha I_1 - e(\mu_\alpha-1)(1-\theta_1)}{I_1} < \frac{I_1(1-\theta_1\theta_2)+e(1-\theta_1)(\mu_\alpha-1)\theta_1\theta_2}{e(1-\theta_1\theta_2)} \le \mu_\alpha - 1$, we have that

$$\begin{aligned} s_1 &= \frac{I_1(1-\theta_1\theta_2) + e(1-\theta_1)(\mu_\alpha-1)\theta_1\theta_2}{\mu_\alpha e(1-\theta_1\theta_2)}; \\ s_2 &= \frac{I_2(1-\theta_1\theta_2) + e(1-\theta_2)(\mu_\alpha-1)\theta_1\theta_2}{\mu_\alpha e(1-\theta_1\theta_2)}. \end{aligned} \tag{A-72}$$

In each of the four cases, (I_1, I_2, s_1, s_2) is an equilibrium bargaining outcome with Investor i investing I_i for the share of s_i.

If $\mu_\alpha < 1 + \frac{1}{1-\theta_1\theta_2}$, there exists an equilibrium with the equilibrium investment as $I_1 = e$ and $I_2 = 0$, and the equilibrium share of investor i as $s_1 = \frac{1-\theta_1\theta_2+\mu_\alpha\theta_1\theta_2}{\mu_\alpha}$ and $s_2 = 0$;

If $\mu_\alpha < 1 + \frac{1}{1-\theta_1\theta_2}$, there exists an equilibrium with the equilibrium investment as $I_1 = 0$ and $I_2 = e$, and the equilibrium share of investor i as $s_1 = 0$ and $s_2 = \frac{1-\theta_1\theta_2+\mu_\alpha\theta_1\theta_2}{\mu_\alpha}$. ■

A.4. Experimental Protocol and Instructions

In this Appendix we provide details on our protocol for running experiments online as well as the instructions. As noted in the main text, we adapted the procedures suggested by Zhao et al. (2020) and Li et al. (2020). Specifically, the steps from recruiting to payment were as follows:

1. Participants were recruited from the general subject population using the University's recruiting platform (SONA). Subjects were explicitly told that the study would be online and that

they would be emailed a Zoom link 1-2 hours before the scheduled time. When participants connected to the Zoom meeting, they were held in a waiting room until they could be checked in.

2. 15 minutes before the start of the session, one experimenter began to check in participants one at a time, checking their ID and changing their name to "User x", where x is a number. After check-in, the participant's video was turned off and the participant was placed in a breakout room that was also monitored by another experimenter.
3. Once all participants were checked-in, general instructions were provided to all participants. Specifically, they were told that they would be placed in one of two (SI) or three (TI) breakout rooms, where they would be asked to turn on their video feed.[23] Participants were informed that they would never interact with another participant in the same breakout room. That is, all entrepreneurs were placed in the same breakout room, and similarly for those in the role of Investor 1 and Investor 2. Each breakout room was also monitored by an experimenter.
4. Subjects then read the instructions specific to the experiment and answered the comprehension questions. The experimenter in each breakout room was there to handle questions. If necessary, temporarily moving a participant to a private breakout room to answer questions or provide assistance.
5. Subjects participated in the main experiment in their respective breakout room.
6. At the conclusion of the experiment, all breakout rooms were closed and participants were asked to complete a separate survey with their name and address so that payments could be processed. This was done in order to de-link decisions from the experiment and personally identifying information. After participants completed the survey, they were free to leave the Zoom meeting.
7. Consistent with IRB guidelines, subjects were then mailed (within one business day) a debit card with the amount earned in the experiment.

A.4.1. Experimental Instructions

Below we reproduce the instructions for the SI-PoorEnt Treatment. The instructions for the remaining treatments and Preferred Stock contracts are analogous. The reproduced text omits the quiz questions as well as the additional measurements (risk aversion and fairness norm elicitation). The entrepreneur's view of instructions is shown (The investor's view is analogous). Indentation and fonts have been adapted for clarity of exposition.

[23] Requiring subjects to display their video is mentioned by Li et al. (2020) as an important factor in ensuring that participants remain attentive throughout the experiment.

This study is about startup ownership. There are two parties: the entrepreneur and the investor, who must together decide how to divide the ownership of the startup. You will participate in 10 rounds of this study. In each round you will be the entrepreneur. n each round you will be matched at random with another person participating in this session, and that person will be the investor. Each round will consist of an interactive negotiation exercise between you and the investor. In each round you will have an opportunity to earn ”points”. At the end of the study one of the 10 rounds will be selected at random. Then, your point earnings from that round will be converted to US Dollars at the rate of 2 cents per point, and added to your participation payment of 8USD.

The investor has 200 points that she/he can invest in your startup. However, the share of the startup that the investor will receive in exchange for her/his investment is not known. Rather, you and the investor will negotiate the share that the investor receives. Then, the following can happen:

- Negotiations succeed. If negotiations succeed, there are two possible outcomes:
  - Startup succeeds: If the startup succeeds, it will be worth $200 \times 11 = 2200$ points, and that value will be divided between you (the entrepreneur) and the investor depending on the outcome of the negotiations.
  - Startup fails: If the startup fails, the value of the investment is multiplied by 1. This means, if the startup fails, it will be worth $200 \times 1 = 200$ points, and that value will be divided between you (the entrepreneur) and the investor depending on the outcome of the negotiations.
- Negotiations fail. If the negotiations fail, the investor gets to keep her/his 200 points and you (the entrepreneur) receive zero.

Note: the investor cannot invest partial amounts (any amount less than 200 points). In other words, either all 200 points are invested or nothing is invested.

As mentioned on the previous screen, it is possible that the startup fails. In particular,if the investor and the entrepreneur come to an agreement, there is an 80% chance that the startup fails and a 20% chance that it succeeds. If the startup fails, its value is equal to 200 points. If the startup succeeds, the value of the investment is multiplied by 11 as explained on the previous screen. That is, the startup will be worth $200 \times 11 = 2200$ points. Once the startup value is known, it will be divided between the investor and the entrepreneur according to the outcome of the negotiations.

For example, suppose you have accepted an offer that gives the other participant (the investor) 65 percent of the startup and gives you (the entrepreneur) 35 percent of the startup. Then, if the startup succeeds, the other participant (the investor) will receive $2200 \times 0.65 = 1430$ points, and you will receive the remainder; i.e., 770 points. In contrast, if the startup fails, the investor will receive $200 \times 0.65 = 130$ points and you will receive 70 points.

Alternatively, suppose you made an offer that gives the other participant (the investor) 25 percent of the startup and gives you (the entrepreneur) 75 percent of the startup, and that offer has been accepted. Then, if the startup succeeds, the other participant (the investor) will receive receive $2200 \times 0.25 = 550$ points, and you will receive the remainder, 1650 points. In contrast, if the startup fails, the investor will receive $200 \times 0.25 = 50$ points and you will receive 150 points.

[...Subjects complete quiz questions...]

On the next screen, you will have 90 seconds to reach an agreement between you (the entrepreneur) and the other participant (the investor). Specifically, you will make and receive offers regarding the percentage amount that the investor receives in exchange for her/his investment of 200 points. Both you and the other participant can make as many offers as you wish in the 90 seconds available for negotiations. If you wish, you can also accept the most recent offer made by the other participant (the investor). If time expires without an offer being accepted, then the round ends and no investment is made. In this case, the investor keeps her/his 200 units and you (the entrepreneur) receive zero.

Figure A1 Negotiation Interface With Sample Offers: SI-PoorEnt and SI-RichEnt Treatments

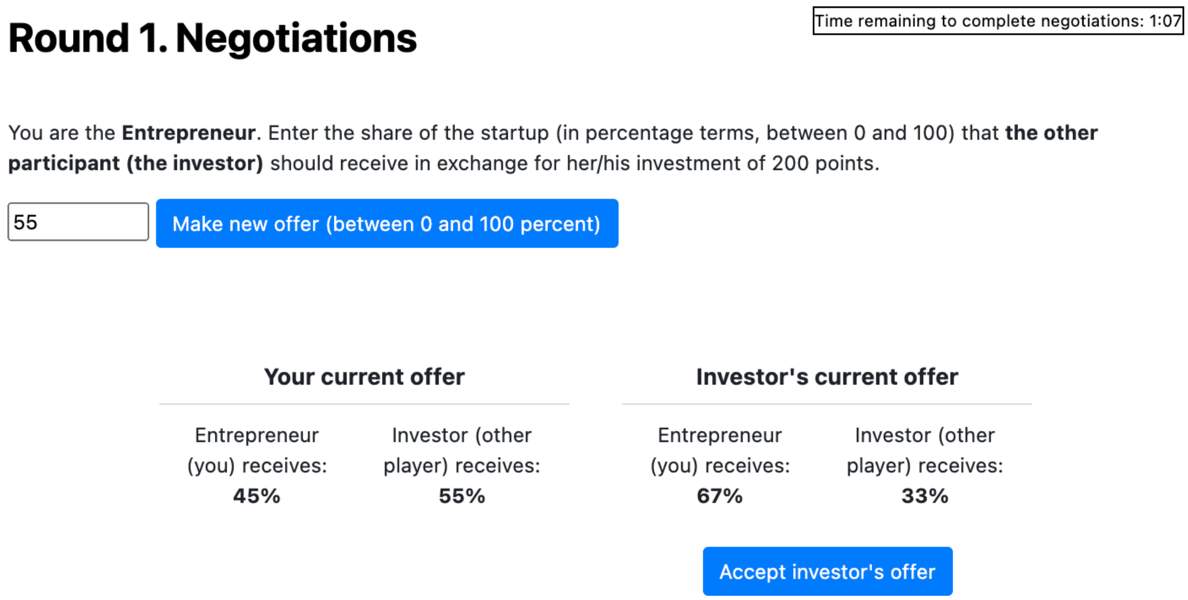


Figure A2 Offers Exchange: TI-PoorEnt and TI-RichEnt Treatments

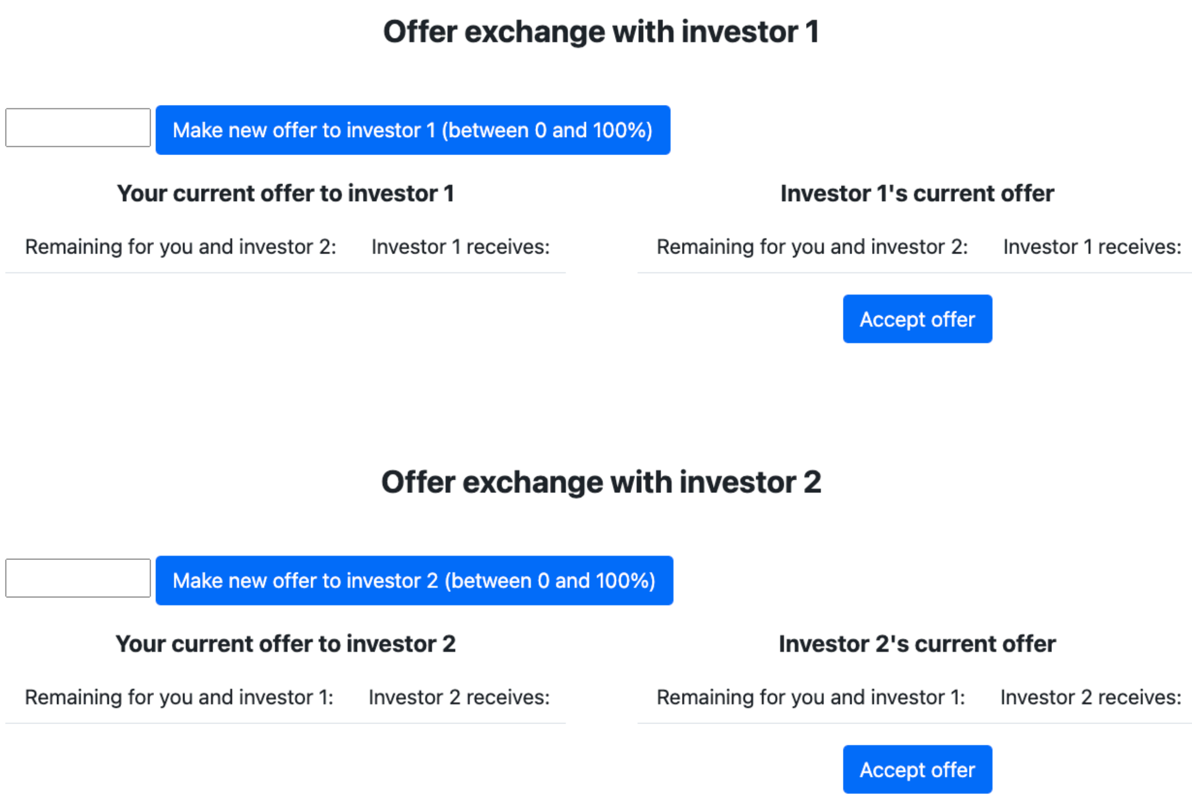
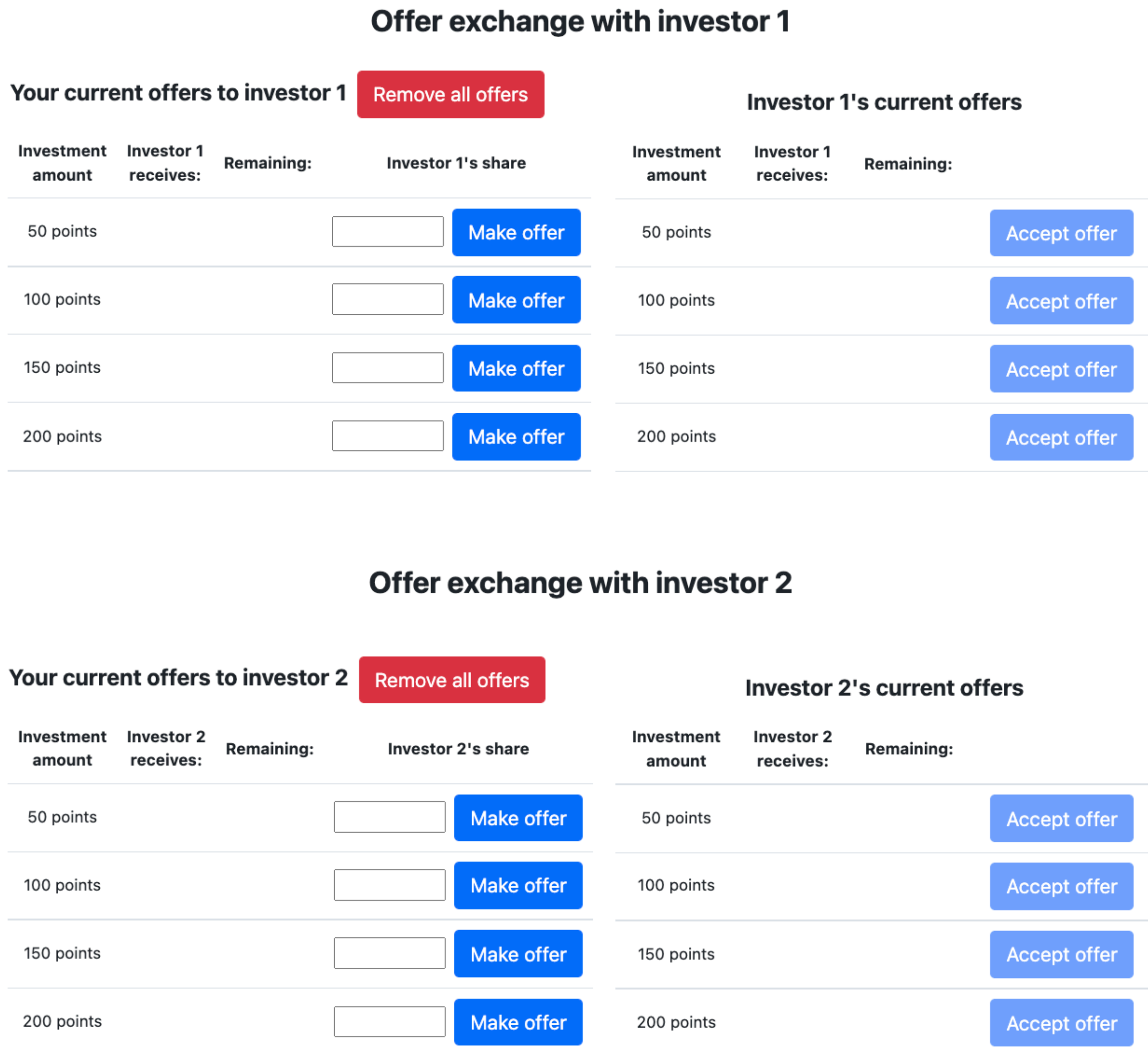


Figure A3 Offers Exchange: TI-Alt Treatment



A.5. Additional Experimental Results

A.5.1. Anchoring in TI-S

As with the SI and TI-C institutions, we observe very strong and similar anchoring effects. The "Agreement Reached" column shows that more aggressive share offers reduce the likelihood of agreements. More interesting, we see that there is a tension about the size of the investment. Investors who propose a larger investment are less likely to reach an agreement with that investor, while an investor proposing a larger investment are more likely to come to an agreement. This suggests that entrepreneurs want large investments from investors, while investors prefer smaller investments. This is further corroborated by the coefficients on offered investment amount in the other two regressions. When an entrepreneur asks for a large investment, the final share received by the investor is lower,[24] and when an investor is willing to invest a large amount from the start, they are more likely to end up with a larger investment.

Table A3 The Influence of First Offers on Agreements, Investor Shares and Investment Amounts

	Agreement Reached		Investor's Share		Investment Amount	
Offered Share To Inv	0.005***	(0.001)	0.466***	(0.096)	0.410***	(0.142)
Offered Share By Inv	−0.003***	(0.001)	0.018	(0.057)	−0.330	(0.281)
Offered Inv. Amount To Inv	−0.002***	(0.000)	−0.076***	(0.018)	−0.000	(0.060)
Offered Inv. Amount By Inv	0.001*	(0.001)	0.026	(0.023)	0.277***	(0.084)
RichEnt	−0.067	(0.053)	1.613	(2.041)	−7.768	(9.605)
Constant	0.899***	(0.062)	17.275***	(3.840)	63.696***	(17.813)
Treatment Controls	Yes		Yes		Yes	
R^2	0.079		0.148		0.059	
N	690		690		690	

Note: Results are based on a random effects regressions. All regressions include controls for treatment variables and standard errors are corrected for clustering at the session level. *, ** and *** denotes significance at the 10%, 5% and 1% level, respectively. If no agreement is reached between an investor and the entrepreneur, both the share and the investment amount are set to zero.

Result 4 *As with the other bargaining institutions, there are strong anchoring effects of first offers and the effects are similar across institutions. Beyond that, the amount an investor ultimately invests is positively associated with the investment amount in their first offer.*

A.5.2. Spillovers Across Negotiations in the TI-C and TI-S Institutions

In the TI-C and TI-S institutions, the entrepreneur simultaneously negotiates two separate bilateral agreements with the two entrepreneurs. According to the Nash-in-Nash theory, when negotiating with investor i, the entrepreneur is able to use the presence of the investor j to "argue" that they have a high outside option and, consequently, deserve a larger share. If this is true, then we might

[24] Indeed, given that a higher proposed investment amount decreases the likelihood of agreement, the share could be zero.

expect there to be spillover effects between the two negotiations. That is, the offers made by the entrepreneur and investor i could conceivably affect the outcome between the entrepreneur and investor j. We investigate this in Table A4 for the TI-C institution and in Table A5 for the TI-S institution.

As can be seen, there is virtually no evidence that the two simultaneous negotiations exert an influence on each other. The only spillover variable that is significant is the offer made by investor 1 and the likelihood that investor 2 reaches an agreement with the entrepreneur. Specifically, the larger the share demanded by investor 1, the more likely is the entrepreneur to reach an agreement with investor 2. This is intuitive and consistent with the Nash-in-Nash logic. If investor 1 is being excessively demanding, it could make sense to focus on reaching an agreement with investor 2.

Table A4 Spillovers Across Simultaneous Negotiations in the TI-C Institution (First Offers)

	Inv 1 (Agree)		Inv 2 (Agree)		Inv 1 (Share)		Inv 2 (Share)	
Offer To Inv 1	0.019^{***}	(0.007)	0.000	(0.005)	0.493^{**}	(0.192)	0.022	(0.072)
Offer By Inv 1	0.001	(0.001)	0.002^{***}	(0.001)	0.155^{***}	(0.050)	0.041	(0.033)
Offer To Inv 2	−0.010	(0.006)	0.003	(0.004)	−0.120	(0.149)	0.404^{***}	(0.081)
Offer By Inv 2	−0.000	(0.002)	-0.005^{**}	(0.002)	−0.011	(0.033)	0.072	(0.068)
RichEnt	−0.009	(0.078)	0.046	(0.075)	-1.734^{***}	(0.620)	−0.384	(1.296)
Preferred	0.050	(0.060)	0.105	(0.087)	-3.036^{**}	(1.366)	1.742	(1.367)
RichEnt×Preferred	−0.027	(0.093)	−0.079	(0.112)	1.250	(1.602)	-3.866^{***}	(1.486)
Constant	0.621^{***}	(0.107)	0.856^{***}	(0.075)	19.102^{***}	(4.979)	17.762^{***}	(3.248)
Treatment Controls	Yes		Yes		Yes		Yes	
R^2	0.137		0.062		0.357		0.412	
N	378		378		320		330	

Note: Results are based on a random effects regressions. All regressions include controls for treatment variables and standard errors are corrected for clustering at the session level. *, ** and *** denotes significance at the 10%, 5% and 1% level, respectively. The grey-shaded cell indicates that there is a statistically significant spillover effect from negotiation with one investor to the other.

In contrast, for the TI-S institution, we see much more evidence of spillovers, particular the opening offers made by investor 2 influence the likelihood of agreement, the share and the amount invested for investor 1. The coefficients are consistent with the tendency for entrepreneurs to seek larger investments from a single investor. Consequently, the higher the investment amount proposed by investor 2, the less likely is there to be any agreement for investor 1, the lower is their share and the lower is the investment amount. Similar to the TI institution, higher demanded shares by investor 2 appear to push the entrepreneur to negotiate more with investor 1, leading to a higher likelihood of agreement, a higher share and a larger investment amount.

For investor 2, there is less evidence that the negotiation between investor 1 and the entrepreneur influence the negotiation. However, those effects that are significant are consistent with intuition. The higher the investment amount offered to investor 1, the less likely is investor 2 to reach an agreement. Moreover, the higher the share offered to investor 1, the lower is any investment amount for investor 2. This likely follows because in such cases the entrepreneur is focused on agreeing with investor 1, to investor 2's detriment.

Table A5 Spillovers Across Simultaneous Negotiations in the TI-S Institution (First Offers)

(a) Investor 1 Outcome Variables

	Agreement Reached		Investor's Share		Investment Amount	
Share By Inv 1	−0.003**	(0.001)	−0.029	(0.066)	−0.345	(0.367)
Inv. Am. By Inv 1	0.000	(0.001)	−0.017	(0.034)	0.063	(0.109)
Share To Inv 1	0.004	(0.004)	0.388**	(0.170)	0.538	(0.482)
Inv. Am. To Inv 1	−0.001	(0.001)	−0.077	(0.051)	0.026	(0.205)
Share By Inv 2	0.004**	(0.002)	0.170**	(0.068)	0.789***	(0.196)
Inv. Am. By Inv 2	−0.002***	(0.001)	−0.103***	(0.025)	−0.353***	(0.094)
Share To Inv 2	0.001	(0.004)	−0.099	(0.148)	−0.670	(0.487)
Inv. Am. To Inv 2	0.000	(0.001)	0.046	(0.040)	0.216	(0.190)
RichEnt	−0.149*	(0.085)	−0.080	(3.803)	−19.513	(16.424)
Constant	0.990***	(0.109)	26.938***	(7.991)	75.007***	(23.536)
Treatment Controls	Yes		Yes		Yes	
R^2	0.147		0.207		0.129	
N	552		552		552	

(b) Investor 2 Outcome Variables

	Agreement Reached		Investor's Share		Investment Amount	
Share By Inv 1	−0.001	(0.003)	0.052	(0.072)	−0.031	(0.361)
Inv. Am. By Inv 1	0.001	(0.001)	0.010	(0.018)	0.037	(0.092)
Share To Inv 1	−0.003	(0.003)	−0.034	(0.078)	−0.855***	(0.287)
Inv. Am. To Inv 1	−0.002*	(0.001)	−0.033	(0.046)	−0.014	(0.184)
Share By Inv 2	−0.005**	(0.002)	−0.113	(0.071)	−0.522	(0.337)
Inv. Am. By Inv 2	0.002**	(0.001)	0.072**	(0.033)	0.441***	(0.120)
Share To Inv 2	0.010***	(0.004)	0.595***	(0.101)	0.943**	(0.407)
Inv. Am. To Inv 2	−0.001	(0.001)	−0.063	(0.042)	−0.022	(0.155)
RichEnt	−0.056	(0.095)	3.161	(1.986)	1.881	(16.029)
Constant	0.921***	(0.158)	12.196***	(4.101)	53.670**	(25.442)
Treatment Controls	Yes		Yes		Yes	
R^2	0.119		0.231		0.135	
N	552		552		552	

Note: Results are based on a random effects regressions. All regressions include controls for treatment variables and standard errors are corrected for clustering at the session level. *, ** and *** denotes significance at the 10%, 5% and 1% level, respectively. If no agreement is reached between an investor and the entrepreneur, both the share and the investment amount are set to zero. The grey-shaded cells indicates that there is a statistically significant spillover effect from negotiation with one investor to the other.

The fact that negotiations in the TI-C institution are largely independent, while there are strong spillovers between negotiations in the TI-S institution could explain why entrepreneurs fare the worst in the TI-C institution. They are unable to credibly express their enhanced bargaining power when, as in the TI-C institution, the investors are complementary. On the other hand, in the TI-S institution, where investors are more substitutable, they are able to successfully pit the investors against each other and, consequently, earn a larger share.

Result 5 *The two bilateral negotiations that entrepreneurs conduct with investors are larger independent in the TI-C institution, but there are strong spillover effects between negotiations in the TI-S institution.*