

# Startup Contracting and Entrepreneur-Investor Bargaining

(Authors' names blinded for peer review)

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**Abstract. Problem definition:** The increasingly complex landscape of startup financing demands that entrepreneurs seek the most advantageous funding strategies to support their growth. This paper focuses on three elements of entrepreneur-investor negotiations: the number of potential investors, their size, and the contractual complexity surrounding investor protection. **Methodology/Results:** Our approach involves a vignette-based survey of active entrepreneurs and investors in the field, followed by a theoretical model and by a series of laboratory experiments that systematically analyze different bargaining conditions and contractual terms. We show that the conventional wisdom that entrepreneurs should seek to negotiate with as many investors as possible, while consistent with the theoretical model, is not universally true in the data (field or lab). Instead, bargaining outcomes depend on factors such as investor size and the entrepreneur's outside options. A refinement of belief modeling in multi-party bargaining reconciles these results with theory predictions. Our findings also show that investor downside protections may disadvantage early-stage startups, but can be beneficial to later-stage startups. **Managerial Implications:** Our findings provide a decision framework for entrepreneurs to optimize their approach to investors and negotiate favorable contractual terms, based on startup stage and investor characteristics.

**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 trends not only highlight the complex reality of entrepreneurial financing but also underscore the need for entrepreneurs to adopt a more calculated and strategic approach to the fundraising process.

### 1.1. Background

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 dynamics and equity splits.

Methodologically, our approach builds on the behavioral operations literature that examines bargaining in supply chains (Leider and Lovejoy 2016, Davis et al. 2022, Davis and Hyndman 2024). A related stream of research investigates how contract complexity and the allocation of risk influences welfare and profit allocation (Kalkanç et al. 2011, 2014, Zhang et al. 2016). We extend the analysis of multi-party bargaining and contract design beyond supply chain contexts, focusing instead on the innovation and entrepreneurship setting. This area, despite its clear social and economic relevance, has received relatively little attention in the literature and has been identified as an important new frontier for behavioral research (Loch 2017, Donohue et al. 2020).

We examine the bargaining and contracting that occurs between an entrepreneur and one or more 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 this setting. 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 model (Horn and Wolinsky 1988) predicts that the investor should benefit from negotiating with a larger number of investors. The Nash-in-Nash logic is that, keeping the maximal investment amount constant, the entrepreneur is better off with two smaller investors because the entrepreneur can leverage the ability to walk away from one investor and still obtain (some) funding from the other investor. In contrast, with a single large investor, the entrepreneur does not have this leverage.<sup>1</sup> Further, the model posits that entrepreneurs can use the reduction in investor risk as a source of leverage for retaining a larger

<sup>1</sup> The Nash-in-Nash logic that “the more investors, the better” can be further extended to scenarios with more than two investors, but this is outside of the scope of this research.

share of the startup. Therefore, the entrepreneur should see an increase in their share under Preferred Stock contracts which limit investor risk, relative to Common Stock contracts that do not include such investor protections. In this paper, we experimentally examine these theoretical arguments by systematically varying the number of investors, and the type of equity agreement used (Common vs. Preferred Stock contract).

## 1.2. Field Study

As a first step, to validate the Nash-in-Nash logic we conducted a vignette-based survey of active entrepreneurs and investors. 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). We asked them to assess several negotiation scenarios with a single investor vs. 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. In particular, 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 ( $p \ll 0.01$ ).<sup>2</sup> 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.

<sup>2</sup> 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.

### 1.3. Summary of Experiments and Preview of Results

The survey results in §1.2 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 laboratory experiments, systematically examining the number of investors involved in the negotiation process, as well as the contract used to divide ownership.

In §4 we test the logic that “the more investors, the better” and examine how the number of investors affects the share of the startup retained by the entrepreneur. Our first experimental result is 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 size of investor. With two *small* 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 *large* 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 large 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 (§5), 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 survive 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 large and can each 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, in §6 we turn to the question of whether offering investors downside protection helps entrepreneurs retain larger ownership. The contractual provisions offering such protection vary (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); therefore, Preferred Stock contracts shift a large portion of risk from the investors to the entrepreneur. Examining the effects of Preferred vs. Common Stock in our experimental data, we find that Preferred Stock contracts disadvantage the entrepreneur when the entrepreneur has no other outside options. In this scenario, bargaining outcomes do not adjust sufficiently to compensate the entrepreneur for bearing the risk, 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.

In §7, we revisit the Nash-in-Nash theory and propose two refinements that help reconcile the model with our findings. First, we show that an appropriate adjustment of off-equilibrium belief modeling aligns model predictions more closely with observed data. Second, to explain the effects of different contract types, we introduce a framework that accounts for the effects of risk exposure on bargaining outcomes. Specifically, we posit that a non-zero outside option changes the bargaining dynamics, placing the entrepreneur on more equal footing with the investor(s) and providing a compelling argument for retaining a larger share with Preferred Stock, compared to scenarios where the entrepreneur has no outside options and no capital at risk.

#### **1.4. Contributions**

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 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 startups. In doing so we highlight the importance of investor size which has not been previously emphasized. Second, we show the potentially negative effect of excessive investor downside protection on startup success, particularly for early-stage startups, suggesting a causal pathway for related findings in the empirical finance literature (See, for example, [Ewens et al. 2022](#)).

Our experimental results help advance bargaining theory in two ways. First, we highlight the importance of carefully modeling off-equilibrium beliefs, demonstrating how this approach improves the predictive accuracy of the Nash-in-Nash model. Second, we introduce a simple framework that links each party's money-at-risk with the expected negotiation outcomes and suggest how the Nash-in-Nash model can be revised to accommodate such behaviors. Our experiments thus provide new behavioral micro-foundations (beyond just entrepreneur-investor bargaining) for future models of multi-party bargaining and contracting under uncertainty.

## **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 included 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). 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, ranging from smaller angle investments to large multi-industry investment funds (Akerlof and Holden 2019, Halac et al. 2020).

**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. While such contracts create stronger incentives for entrepreneurs to exert effort (Schmidt 2003, Hellmann 2006, De Bettignies 2008), their inherent complexity 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. Both papers assume leader-takes-all behaviors and do not consider bargaining dynamics. Ewens et al. (2022) find that investors generally receive greater ownership stakes relative to what would be optimal for maximum value creation. 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 in Economics and Operations Management

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 horizontal competition. This is an understudied problem in the literature, with the closest being Lovejoy (2010) and Leider and Lovejoy (2016) who study bargaining between supply chain tiers. Different from these studies, which assume single sourcing/contracting within a tier, entrepreneurs may contract with multiple investors. Further, we examine contracts that differ in their allocation of risk. A rich behavioral literature studies how risks (of excess inventory, poor product quality or unserved demand) are allocated between supply chain partners, in serial inventory ordering settings (e.g., Sterman 1989, Croson et al. 2014, Moritz et al. 2022) and in supplier-retailer contracting settings (e.g., Özer et al. 2011, 2014, Beer et al. 2018). The closest papers in this literature are Kalkancı et al. (2011, 2014) and Zhang et al. (2016). Different from this literature, we allow the parties to

endogenously determine contractual terms and do not consider how contracts affect subsequent behaviors; however, similar to this literature, we are also interested in the role of contract complexity in the allocation of risk and profits between the contracting parties.

### 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 theoretical predictions, as well as a brief preview of the 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 size, i.e., whether each investor alone can provide the full investment and can thus act as a substitute for the second investor, or alternatively, both investors are needed for the venture to launch at maximum scale. We examine both small and large investor scenarios, as each may occur, given the heterogeneity of investor types reported in the literature (See §2.1).

We study entrepreneur-investor bargaining in two distinct environments: one in which the entrepreneur has no outside options if the negotiations fail (“PoorEnt”), and a second one in which the entrepreneur can still launch the business, though at a lower scale if the negotiations fail (“RichEnt”). 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 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.<sup>3</sup> The six negotiation scenarios are further subdivided into two treatment arms varying whether or not the entrepreneur has a positive outside option if the negotiations break down (PoorEnt, RichEnt) and three treatment conditions within each arm, varying the number and type of investors (SI, TI-L, TI-S). In total, 386 subjects participated in our study across 32 independent sessions.

<sup>3</sup> The sequence of contracts (Common  $\rightarrow$  Preferred) or (Preferred  $\rightarrow$  Common) was randomized in the SI treatments; we found no order effects.



**Table 2 Overview of Research Questions and Sections**

Question	Treatment arm (varied between-subject)	Treatment conditions (varied between-subject)	Contracts (varied within-subject)	Section
How do the number and size of investors affect equity division?	PoorEnt	SI, TI-S, TI-L	Common Stock	§4
	RichEnt	SI, TI-S, TI-L	Common Stock	§5
How does contract type affect equity division?	PoorEnt, RichEnt	SI, TI-S	Common Stock, Preferred Stock	§6
What are the key bargaining dynamics driving the outcomes?	PoorEnt, RichEnt	SI, TI-S, TI-L	Common Stock, Preferred Stock	Appx. A.5

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 investors are small and are both needed to complete the investment round (TI-S), and a condition in which each investor is larger and if needed can provide the full investment alone (TI-L). 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-S and TI-L, with the treatment being randomly assigned to participants. In §6 we examine the effects of contracts within each environment.<sup>4</sup> Finally, in Appx. A.5 we provide the relevant details about the negotiation process 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-S condition relative to SI, with the TI-L 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-S relative to SI, and a weakly larger share in TI-L relative to the other two treatments.<sup>5</sup> In particular, while the treatment conditions are ranked  $SI \leq TI-L \leq TI-S$  (from the entrepreneur's perspective) in theory, they are ranked  $TI-S < SI \leq TI-L$  in our data. In other

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

<sup>5</sup> "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.

words, multiple investors only benefit the entrepreneur when the investors are large. This pattern of results continues to hold in the RichEnt treatment arm in §5; however, TI-L 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 Appx. A.5 shows that these outcomes arise from differences in investor aggressiveness in initial offers, as well as from more strategic entrepreneur behavior when investors are large. In §7, we revisit the Nash-in-Nash model and show how it can be refined to accommodate our findings.<sup>6</sup>

## 4. Early Stage Startups (PoorEnt)

In this section, we examine scenarios where the entrepreneur is “poor” and 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 small investors (TI-S) and Two large investors (TI-L). 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 one 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  $t \in \{\text{SI, TI-S, TI-L}\}$  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  $\alpha$  be the random variable representing startup success. With probability  $p$  the startup succeeds and  $\alpha = \alpha_H$ ; 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  $\alpha = \alpha_L$ , where

<sup>6</sup> 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.

$\alpha_L < \alpha_H$ ; 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  $\alpha$ .<sup>7</sup> The realized payoff to investor  $j$ , who reached an agreement with the entrepreneur is:

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

The realized payoff to the entrepreneur is then:

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

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

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  $d_e = 0$ .

The characterization of equilibria for these bargaining problems depends on  $(p, \alpha_H, \alpha_L)$  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 parametrizations that give rise to a unique equilibrium. Further, we will assume equal bargaining powers. A more complete characterization of the equilibria under general  $\mu_\alpha$  and general bargaining powers is relegated to Appx. A.2. Lastly, we assume risk neutrality (see Appx. 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  $V = \alpha I_0$ .

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  $s_e = 1 - s_0$ . Let  $d_e$  and  $d_0$  denote the disagreement point of the entrepreneur

<sup>7</sup> 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. That is,  $\alpha$  is determined by a random draw whose distribution, and realization, are common knowledge among the negotiators.

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  $d_e = 0$ .<sup>8</sup> Given our assumptions, the expected profit of the entrepreneur is  $\pi_e(I_0, s_0) = \mu_\alpha I_0(1 - s_0)$ , 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:

$$\max_{I_0 \in [0, e], s_0 \in [0, 1]} [\pi_0(I_0, s_0) - d_0] [\pi_e(I_0, s_0) - d_e] \quad (3)$$

$$\pi_0(I_0, s_0) \geq d_0, \pi_e(I_0, s_0) \geq d_e.$$

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 Small Investors (TI-S)** 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  $V = \alpha(I_1 + I_2)$ .<sup>9</sup>

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

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

<sup>8</sup> 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  $d_e$ .

<sup>9</sup> 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.

$i$ , 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).<sup>10</sup> Then  $d_e^{-1} = \pi_e(0, I_2, 0, s_2)$  is the profit of the entrepreneur when Investor 2 is the only investor. Similarly  $d_e^{-2} = \pi_e(I_1, 0, s_1, 0)$ . 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  $\mathbf{I}$  and the shares  $\mathbf{s}$  maximize the Nash products simultaneously for each  $i = 1, 2$ :

$$\max_{I_i \in [0, e/2], s_i \in [0, 1]} [\pi_i(\mathbf{I}, \mathbf{s}) - d_i] [\pi_e(\mathbf{I}, \mathbf{s}) - d_e^{-i}] \quad (4)$$

$$\pi_i(\mathbf{I}, \mathbf{s}) \geq d_i, \pi_e(\mathbf{I}, \mathbf{s}) \geq d_e^{-i}, i \in \{1, 2\}.$$

Solving (2), we obtain the following proposition:

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

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

**Bargaining with Two Large Investors (TI-L)** In this setting, we assume that there are two small 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-S 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  $\pi_e(\mathbf{I}, \mathbf{s}) = \mu_\alpha(I_1 + I_2)(1 - s_1 - s_2)$  and the expected profit of Investor  $i$  is  $\pi_i(\mathbf{I}, \mathbf{s}) = \mu_\alpha(I_1 + I_2)s_i + e - I_i$ .

Denote by  $d_e^{-i}$  the disagreement point of the entrepreneur when bargaining with Investor  $i$ . Then  $d_e^{-1} = \pi_e(0, I_2, 0, s_2)$  is the profit of the entrepreneur when Investor 2 is the only investor (with 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  $d_e^{-2} = \pi_e(I_1, 0, s_1, 0)$ . 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

<sup>10</sup> 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.

additional constraint that  $I_1 + I_2 \leq e$ . Then, the investments  $\mathbf{I}$  and the shares  $\mathbf{s}$  maximize the following Nash product simultaneously:

$$\begin{aligned} \max_{I_i \in [0, e], s_i \in [0, 1]} & [\pi_i(\mathbf{I}, \mathbf{s}) - d_i] [\pi_e(\mathbf{I}, \mathbf{s}) - d_e^{-i}] \\ & \pi_i(\mathbf{I}, \mathbf{s}) \geq d_i, \pi_e(\mathbf{I}, \mathbf{s}) \geq d_e^{-i}, i \in \{1, 2\}, \\ & I_1 + I_2 \leq e. \end{aligned} \quad (5)$$

Solving the problem, we have the following proposition.

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

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

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

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

**COROLLARY 1 (Comparison of entrepreneur's share).** The entrepreneur's equilibrium shares satisfy that  $s_e^{TI-S} \geq s_e^{TI-L} \geq s_e^{SI}$ , 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  $\alpha_H$  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-S and TI-L. The difference between TI-S and TI-L is whether each investor can alone provide 200 units, the maximum amount of funding. In TI-S each investor can only provide up to 100 units, i.e., half of the maximum funding, while in TI-L 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-S and 200 in TI-L.

**Negotiation Format** In each condition (SI, TI-S, TI-L), the entrepreneur engages in bilateral negotiations with each investor present. In particular, in the two investor treatments (TI-S and TI-L), 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-S 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-L 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-L 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 do not see each other and 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. See Fig. A1-A3 for screenshots of the negotiation interface.

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.<sup>11</sup> If no agreement is reached with any investor, 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-L treatment, each investor also retains any portion of their initial endowment that they chose not to invest. The complete set of experimental instructions is reproduced in the supplementary online companion on Researchbox ([https://researchbox.org/3335&PEER\\_REVIEW\\_passcode=XITWXN](https://researchbox.org/3335&PEER_REVIEW_passcode=XITWXN)).

<sup>11</sup> 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  $j$ .

**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). 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).<sup>12</sup> 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 large investors (TI-S), 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-S (Based on Propositions 1-2). The theoretical prediction for the two-investor scenario with large investors (TI-L) depends on the specific investment amounts from each investor; however, regardless of the investment amounts, in equilibrium TI-L is always weakly preferred to SI, and weakly dominated by TI-S (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:  $SI \leq TI-L \leq TI-S$ , 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 achieved between 72% and 83% of the time. Not surprisingly, full agreement is less common in TI treatments, and especially in TI-L 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-L 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 small investor case (TI-S) leads to the worst possible

<sup>12</sup> 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-S	TI-L	SI	TI-S	TI-L	SI vs TI-S	SI vs TI-L	TI-S vs TI-L
<b>Agreement</b>	<b>Investment</b>									
Efficient	All	<b>82.92</b>	<b>77.08</b>	<b>72.22</b>	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	<b>17.08</b>	<b>22.92</b>	<b>27.78</b>						
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.

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-L) 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-L 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-L than under TI-S, 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-L treatment. In sum, negotiating with two investors may hurt or benefit the entrepreneur, depending on the types of investors (small or large) 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-S) is worse for the entrepreneur than negotiating with a single large investor (SI). However, entrepreneurs benefit from negotiating with two large investors (TI-L), due to the prevalence of exclusionary contracts in which one investor provides the full investment amount.*

To better understand Result 1, in Appx. A.5.1.-A.5.4. we examine the bargaining dynamics and show that the differences in bargaining outcomes are largely driven by the initial offers of the parties (rather than being caused by differences in concessionary behavior during the negotiations). Further, the advantage of TI-L is driven 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.

## 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-S case, with the TI-L case being in between.<sup>13</sup>

### 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.<sup>14</sup> 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:  $SI \leq TI-L \leq TI-S$ , with at least one strict inequality.*

### 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

<sup>13</sup> With two investors, there is a possibility that the entrepreneur receives 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.,  $d_e/2$ .

<sup>14</sup> To account for the possibility of partial investments, the outside options of both parties are pro-rated. For example, in the TI-L case, if the entrepreneur only secures 100 out of 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**

Agreement	Investment	Frequency of (dis-)agreements (%)			Entrepreneur share (%)			Entrepreneur share comparisons ( <i>p</i> -value)		
		SI	TI-S	TI-L	SI	TI-S	TI-L	SI vs TI-S	SI vs TI-L	TI-S vs TI-L
Efficient	All	<b>77.60</b>	<b>72.53</b>	<b>53.77</b>	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	<b>22.40</b>	<b>27.47</b>	<b>27.47</b>						
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.

common in RichEnt than in PoorEnt ( $p = 0.007$  and  $p = 0.756$ ).<sup>15</sup> 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-S scenario relative to SI ( $p = 0.000$ ) and relative to TI-L ( $p = 0.051$ ). However, different from the PoorEnt treatment arm, the entrepreneur earns a somewhat lower share in TI-L 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 in the TI-L 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-L 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.

<sup>15</sup> The tests comparing agreements between PoorEnt and RichEnt are *t*-tests using subject averages (focusing on entrepreneurs only to avoid double counting).

**Result 2** *Similar to the PoorEnt setting, negotiating with two investors does not generally benefit the entrepreneur. When the entrepreneur can negotiate with two large investors (TI-L) 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.*

In Appx. A.5.3. we examine the bargaining behaviors driving Result 2. We show that both parties have a strong preference for smaller investments and that investors bargain more aggressively when the entrepreneur is rich than when the entrepreneur is poor.

## 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.<sup>16</sup>

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  $i \in \{e, 0, 1, 2\}$  and  $j \in \{SI, TI - S\}$ .<sup>17</sup> Much of the analysis is analogous to the Common Stock contracts. Therefore, we only present the main results below. Detailed analysis and proofs are available at [https://researchbox.org/3335&PEER\\_REVIEW\\_passcode=XITWXN](https://researchbox.org/3335&PEER_REVIEW_passcode=XITWXN).

<sup>16</sup> 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.

<sup>17</sup> We do not examine the combination of Preferred Stock contracts and TI-L. This is to limit the complexity of negotiations for experimental participants, given that Preferred Stock contracts and TI-L would introduce a very large number of contingencies for possible splits.

**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 Small Investors (TI-S)** Under Preferred Stock contracts both investors, if they choose to invest, receive at least their endowments back in both states of the world. 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.,  $\tilde{I}_i^{TI-S} = e/2$  for  $i \in \{1, 2\}$ . The equilibrium shares are as follows:*

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

Note that 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 Appx. A.2.

## 6.2. Experimental Design and Hypotheses

The Preferred Stock contract was examined as part of the SI and TI-S treatments. In particular, in these treatments the contract type – Common or Preferred – was a within-subject manipulation, used in half of the experimental rounds. Given our theoretical analysis above and the parameterization used in our experiments, the theoretical prediction for entrepreneur's share under Common (resp., Preferred Stock) is 33.3% (resp., 45.5%) under SI PoorEnt, 46.7% (resp., 56.4%) under TI-S PoorEnt, 46.7% (resp., 63.6%) under SI RichEnt, 57.3% (resp., 70.9%) under TI-S 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 contracts.*

## 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-S scenarios under Preferred Stock contracts (SI:  $p < 0.001$ ; TI-S:  $p = 0.762$ ).

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-S:  $p = 0.918$ ; Preferred Stock: SI:  $p < 0.001$ , TI-S:  $p = 0.568$ ). 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. Instead, we find that the contract effect depends on whether the entrepreneur is poor or rich. 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.

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

Treatment arm	Condition	Frequency of agreements (%)		Entrepreneur share (%)		Entrepreneur share comparisons ( $p$ -value) Common vs. Preferred
		Common	Preferred	Common	Preferred	
PoorEnt	SI	82.92	87.84	44.30	42.97	0.837
	TI-S	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-S	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.

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

In Appx. A.5.5. we examine the bargaining behaviors driving Result 3 and show that it emerges from more aggressive investor opening offers with Preferred (relative to Common) Stock contracts.

## 7. Theory Refinements

Our results so far offer mixed support for the Nash-in-Nash model predictions. In this section, we revisit the model and propose several refinements that help reconcile the model with our experimental results. First, in §7.1 we propose an alternative approach for modeling off-equilibrium beliefs and show that this approach more closely aligns model predictions with data (Results 1 and 2). Second, in §7.2 we propose a risk exposure framework that provides a plausible explanation for the underreaction to contract type when the entrepreneur is “poor” (Result 3).

## 7.1. Off-Equilibrium Belief Modeling

Contrary to model predictions (H1, H2), access to multiple investors does not necessarily translate into a negotiation advantage for the entrepreneur. Consistent with theory, larger investors who can each provide full funding can help improve the entrepreneur's position, relative to the single investor scenario. But, contrary to theory, negotiating with multiple small investors who cannot provide the full funding alone may disadvantage the entrepreneur.

To arrive at predictions (H1, H2), 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  $j$ . 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 (Horn and Wolinsky 1988, Yürükoğlu 2022), they may oversimplify the bargaining dynamics. Relaxing these assumptions and (i) estimating  $\theta_i$  from the data and (ii) examining alternative off-the-equilibrium-path beliefs may help improve model fit. Moreover, finding that the best-fitting  $\theta_i$  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-S, model (ii) assumes that disagreement with one investor implies disagreement with the other investor in TI-S. Analogously, to reconcile the finding that entrepreneurs outperform their theoretical benchmarks in TI-L, we give entrepreneurs more leverage and assume that disagreement with one investor still allows for full investment with the other investor in TI-L. (Model details and proofs are available at [https://researchbox.org/3335&PEER\\_REVIEW\\_passcode=XITWXN](https://researchbox.org/3335&PEER_REVIEW_passcode=XITWXN)).

Our estimation results are in Table 6. 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-S treatments the corner case  $\hat{\theta}_i = 1$  achieves the best fit, indicating full bargaining power for the investors. Similarly, for TI-L,  $\hat{\theta}_i = 0.192$ , 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 6, 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.<sup>18</sup>

**Table 6 Model Fit (Common Stock Contracts and PoorEnt Treatments Only)**

Model	Description	SI		TI-S		TI-L	
		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.

The takeaway from these comparisons is that the standard modeling approach of assuming a common belief model for different negotiation environments is not a good representation of real-life bargaining behavior. Changes in the bargaining environment (resulting, for example, from investor competition) can strengthen or weaken the negotiators' ability to leverage their outside options, and this should be reflected in how we model their beliefs.

## 7.2. Risk Exposure and Contracts

Our third result was that the downside protection for investors (afforded by "Preferred Stock" contracts) was only reflected in the equity split when the entrepreneur was "rich". In contrast, we did not see a fair reflection of contracts in the negotiated terms when the entrepreneur was "poor".

Why do poor entrepreneurs struggle 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 7.

<sup>18</sup> While we do not report estimates for Preferred Stock contracts, the same general patterns emerge, but the estimates of  $\theta_i$  are higher, indicating more investor bargaining power, consistent with our previous results.



**Table 7 Risk Exposure of Entrepreneur and Investor(s)**

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

As can be seen, on the off-diagonal the entrepreneur and the investor(s) have similar downside risk exposures, while along the main diagonal, their risk exposures are asymmetric. This difference in exposure levels is consistent with our data: poor entrepreneurs ( $d_e = 0$ ) are unable to increase their share with a Preferred (relative to Common) Stock contract; conversely, rich entrepreneurs ( $d_e > 0$ ) are able to do so. While outside of the scope of this paper, future refinements to bargaining models could potentially account for these results by explicitly incorporating loss aversion and other reference-dependent behaviors into the Nash-in-Nash framework (also see [Shalev 2002](#), [Karagözoğlu and Keskin 2018](#), for such refinements in simpler, bilateral bargaining models).

## 8. Conclusions

Equity negotiations are an essential part of entrepreneurial growth. This is the first study that we are aware of to explicitly model the key features of entrepreneur-investor bargaining, which includes the intrinsic value of the startup, uncertain valuation, multiple investors and the contracts common in the industry. We used the Nash-in-Nash framework to uncover the theoretical sources of leverage and to develop hypotheses regarding the split of shares between the entrepreneur and the investors. We then conducted lab experiments to test whether the leverage that is available in theory is exploitable in practice.

### 8.1. Summary of Results and Contributions

Our investigation offers several novel insights into equity bargaining. Consistent with theory, entrepreneurs benefit from having a stronger outside option. Although this result is not surprising, it is still worth emphasizing. Going beyond this simple insight, our theory also predicts that entrepreneurs should be able to benefit from negotiating with multiple investors and that they should receive a higher share when offering investors downside protection via Preferred Stock contracts. Neither of these predictions was fully supported by our data. Instead, we saw that multiple large investors can be beneficial, while multiple small investors strongly dilute the entrepreneur's stake in the company. We also saw that Preferred Stock contracts can be harmful when the entrepreneur has no outside options in negotiations.

To reconcile our experimental findings with theory, we proposed several refinements to the classic Nash-in-Nash model. Methodologically, the full-circle approach of analyzing a standard model, testing it in the

lab, and then revising its key assumptions, as we have done in this paper, can serve as a template for future research in this area.

In addition to contributing to the bargaining literature, our results add to 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.

## 8.2. Practical Implications

Our findings inform entrepreneurs seeking investment opportunities. The conventional wisdom that “the more investors, the better”, while consistent with classical bargaining models, is not uniformly true according to our data. The effects of having access to multiple investors are complex and depend on various factors, including the size and number of investors, and the entrepreneur's outside options. Therefore, entrepreneurs should carefully consider their individual circumstances when developing negotiation strategies and proposing 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.

## 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 others. 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.<sup>19</sup>

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 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.

<sup>19</sup> Note also that we randomized the order. The example here assumes that the “PoorEnt” case was seen first followed by the “RichEnt”.

- **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: 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. Numbers in the “Years Exp.” column do not sum to 100% due to rounding.

## A.2. Theory

This section focuses on Common Stock contracts. The analysis of Preferred Stock contracts is available at ([https://researchbox.org/3335&PEER\\_REVIEW\\_passcode=XITWXN](https://researchbox.org/3335&PEER_REVIEW_passcode=XITWXN)).

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  $\alpha$  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.



### 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:

$$\begin{aligned} \max_{I_0 \in [0, e], s_0 \in [0, 1]} & [\pi_0(I_0, s_0) - d_0]^{\theta_0} [\pi_e(I_0, s_0) - d_e]^{1-\theta_0} \\ & \pi_0(I_0, s_0) \geq d_0, \pi_e(I_0, s_0) \geq d_e. \end{aligned} \quad (\text{A-1})$$

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

$$\pi_e(I_0, s_0) = \mu_\alpha I_0(1 - s_0);$$

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,

$$\begin{aligned} \pi_0(I_0, s_0) - d_0 &= \theta_0 (\pi_e(I_0, s_0) + \pi_0(I_0, s_0) - d_e - d_0); \\ \pi_e(I_0, s_0) - d_e &= (1 - \theta_0) (\pi_e(I_0, s_0) + \pi_0(I_0, s_0) - d_e - d_0). \end{aligned} \quad (\text{A-2})$$

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

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

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

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

■

**A.2.1.2. The Two Small Investors Model** The investments  $I_i$  and the share  $s_i$  maximize the following Nash product simultaneously:

$$\max_{I_i \in [0, e/2], s_i \in [0, 1]} [\pi_i(\mathbf{I}, \mathbf{s}) - d_i]^{\theta_i} [\pi_e(\mathbf{I}, \mathbf{s}) - d_e^{-i}]^{1-\theta_i} \quad (\text{A-3})$$

$$\pi_i(\mathbf{I}, \mathbf{s}) \geq d_i, \pi_e(\mathbf{I}, \mathbf{s}) \geq d_e^{-i}.$$

The following proposition is Proposition 2 under general bargaining powers.

**PROPOSITION A2 (Two small 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.,  $I_i^{TI-S} = e/2$  for  $i \in \{1, 2\}$ . The equilibrium share of investor  $i$  is*

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

- *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  $I_i^{TI-S} = e/2$  and  $I_j^{TI-S} = 0$  for  $i, j \in \{1, 2\}$  and  $i \neq j$ , and the equilibrium share of Investor  $i$  is*

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

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

$$\pi_e(\mathbf{I}, \mathbf{s}) = \mu_\alpha(I_1 + I_2)(1 - s_1 - s_2), \quad (\text{A-5})$$

and the expected profit of Investor  $i$  is

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

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

$$d_e^{-1} = \pi_e(0, I_2, 0, s_2) = \frac{d_e(e - I_2)}{e} + \mu_\alpha I_2(1 - s_2),$$

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

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

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

$$\begin{aligned} \pi_1(\mathbf{I}, \mathbf{s}) - d_1 &= \theta_1 (\pi_1(\mathbf{I}, \mathbf{s}) + \pi_e(\mathbf{I}, \mathbf{s}) - d_1 - d_e^{-1}); \\ \pi_e(\mathbf{I}, \mathbf{s}) - d_e^{-1} &= (1 - \theta_1) (\pi_1(\mathbf{I}, \mathbf{s}) + \pi_e(\mathbf{I}, \mathbf{s}) - d_1 - d_e^{-1}). \end{aligned} \quad (\text{A-7})$$

Note that the best-response investment level

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

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

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

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

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

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

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

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

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

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

■

**A.2.1.3. The Two Large Investors 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  $\mathbf{I}$  and the shares  $\mathbf{s}$  maximize the following Nash product simultaneously:

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

Solving the problem, we have the following proposition.

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

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

$$s_2^{TI-L} = \frac{I_2^{TI-L} \left( I_2^{TI-L} e \theta_2 (1 - \theta_1 + \mu_\alpha \theta_1) - e^2 \left( \theta_2 (2 - \mu_\alpha (1 - \theta_1) - \theta_1) - 1 \right) - d_e \left( \theta_2 (1 - \theta_1) e + I_2^{TI-L} \theta_1 \theta_2 \right) \right)}{\mu_\alpha e (e^2 - I_1^{TI-L} I_2^{TI-L} \theta_1 \theta_2)}; \quad (\text{A-13})$$

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

- 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:  $I_1^{TI-L} = e$  and  $I_2^{TI-L} = 0$ , and the share of investor  $i$ :  $s_1^{TI-L} = \frac{e + e(\mu_\alpha - 1)\theta_1 - d_e \theta_1}{e\mu_\alpha}$  and  $s_2^{TI-L} = 0$ .
- 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:  $I_1^{TI-L} = 0$  and  $I_2^{TI-L} = e$ , and the share of investor  $i$ :  $s_1^{TI-L} = 0$  and  $s_2^{TI-L} = \frac{e + e(\mu_\alpha - 1)\theta_2 - d_e \theta_2}{e\mu_\alpha}$ .

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

$$\pi_e(\mathbf{I}, \mathbf{s}) = \mu_\alpha (I_1 + I_2) (1 - s_1 - s_2),$$

and the expected profit of Investor  $i$  is

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

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

$$d_e^{-1} = \pi_e(0, I_2, 0, s_2) = \frac{d_e(e - I_2)}{e} + \mu_\alpha I_2 (1 - s_2),$$

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

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

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

$$\begin{aligned} \pi_1(\mathbf{I}, \mathbf{s}) - d_1 &= \theta_1 (\pi_1(\mathbf{I}, \mathbf{s}) + \pi_e(\mathbf{I}, \mathbf{s}) - d_1 - d_e^{-1}); \\ \pi_e(\mathbf{I}, \mathbf{s}) - d_e^{-1} &= (1 - \theta_1) (\pi_1(\mathbf{I}, \mathbf{s}) + \pi_e(\mathbf{I}, \mathbf{s}) - d_1 - d_e^{-1}). \end{aligned} \quad (\text{A-14})$$

Note that the best-response investment level

$$I_1(I_2, s_2) = \arg \max_{I_1 \in [0, e], I_1 + I_2 \leq e} \{ \pi_1(\mathbf{I}, \mathbf{s}) + \pi_e(\mathbf{I}, \mathbf{s}) - d_1 - d_e^{-1} \} = \begin{cases} e - I_2 & \text{if } \mu_\alpha(1 - s_2) \geq 1; \\ 0 & \text{otherwise.} \end{cases} \quad (\text{A-15})$$

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

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

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

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

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

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

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

$$s_2^{TTI-L} = \frac{I_2^{TTI-L} \left( I_2^{TTI-L} e \theta_2 (1 - \theta_1 + \mu_\alpha \theta_1) - e^2 (\theta_2 (2 - \mu_\alpha (1 - \theta_1) - \theta_1) - 1) - d_e (\theta_2 (1 - \theta_1) e + I_2^{TTI-L} \theta_1 \theta_2) \right)}{\mu_\alpha e (e^2 - I_1^{TTI-L} I_2^{TTI-L} \theta_1 \theta_2)}; \quad (\text{A-19})$$

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

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:  $I_1^{TTI-L} = e$  and  $I_2^{TTI-L} = 0$ , and the share of investor  $i$ :  $s_1^{TTI-L} = \frac{e + e(\mu_\alpha - 1)\theta_1 - d_e \theta_1}{e\mu_\alpha}$  and  $s_2^{TTI-L} = 0$ .

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:  $I_1^{TTI-L} = 0$  and  $I_2^{TTI-L} = e$ , and the share of investor  $i$ :  $s_1^{TTI-L} = 0$  and  $s_2^{TTI-L} = \frac{e + e(\mu_\alpha - 1)\theta_2 - d_e \theta_2}{e\mu_\alpha}$ . ■

## A.2.2. Preferred Stock Contracts

Preferred Stock setting analysis is analogous to Common Stock. The analysis and proofs are available on Researchbox, under [https://researchbox.org/3335&PEER\\_REVIEW\\_passcode=XITWXN](https://researchbox.org/3335&PEER_REVIEW_passcode=XITWXN).

## 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-S 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.

**Table A2 The Entrepreneur's Share Under Risk Aversion**

(a) Common Stock contracts		
Risk Parameters	SI-PoorEnt (%)	TI-S-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-S-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

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 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  $\alpha_H$ . 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

In §7.1 we discuss the alternative belief model. The analysis and proofs for the alternative belief model are available under [https://researchbox.org/3335&PEER\\_REVIEW\\_passcode=XITWXN](https://researchbox.org/3335&PEER_REVIEW_passcode=XITWXN).

### A.4. Experimental Protocol and Instructions

The full protocol and instructions are available under [https://researchbox.org/3335&PEER\\_REVIEW\\_passcode=XITWXN](https://researchbox.org/3335&PEER_REVIEW_passcode=XITWXN). Here we reproduce the screenshots of the oTree interface.

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

**Round 1. Negotiations** Time remaining to complete negotiations: 1:07

You are the **Entrepreneur**. Enter the share of the startup (in percentage terms, between 0 and 100) that the **other participant (the investor)** should receive in exchange for her/his investment of 200 points.

Make new offer (between 0 and 100 percent)

Your current offer		Investor's current offer	
Entrepreneur (you) receives:	Investor (other player) receives:	Entrepreneur (you) receives:	Investor (other player) receives:
<b>45%</b>	<b>55%</b>	<b>67%</b>	<b>33%</b>

Accept investor's offer

**Figure A2** Offers Exchange: TI-S Treatments

**Offer exchange with investor 1**

Make new offer to investor 1 (between 0 and 100%)

Your current offer to investor 1		Investor 1's current offer	
Remaining for you and investor 2:	Investor 1 receives:	Remaining for you and investor 2:	Investor 1 receives:

Accept offer

**Offer exchange with investor 2**

Make new offer to investor 2 (between 0 and 100%)

Your current offer to investor 2		Investor 2's current offer	
Remaining for you and investor 1:	Investor 2 receives:	Remaining for you and investor 1:	Investor 2 receives:

Accept offer

**Figure A3** Offers Exchange: TI-L Treatment

**Offer exchange with investor 1**

Your current offers to investor 1				Remove all offers	Investor 1's current offers			
Investment amount	Investor 1 receives:	Remaining:	Investor 1's share		Investment amount	Investor 1 receives:	Remaining:	
50 points			<input type="text"/>	Make offer	50 points			Accept offer
100 points			<input type="text"/>	Make offer	100 points			Accept offer
150 points			<input type="text"/>	Make offer	150 points			Accept offer
200 points			<input type="text"/>	Make offer	200 points			Accept offer

  

**Offer exchange with investor 2**

Your current offers to investor 2				Remove all offers	Investor 2's current offers			
Investment amount	Investor 2 receives:	Remaining:	Investor 2's share		Investment amount	Investor 2 receives:	Remaining:	
50 points			<input type="text"/>	Make offer	50 points			Accept offer
100 points			<input type="text"/>	Make offer	100 points			Accept offer
150 points			<input type="text"/>	Make offer	150 points			Accept offer
200 points			<input type="text"/>	Make offer	200 points			Accept offer

## A.5. 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.

### A.5.1. Anchoring

Table A3 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-S treatment conditions, in which bargaining is one-dimensional (negotiators only negotiate equity percentage, and not the investment size). Anchoring results in the TI-L 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.5.2 for the



analysis of anchoring in the TI-L 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 A3 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 A3 Anchoring Effects of Initial Offers on Agreements and Investor Shares**

Dep. Var.:	SI		TI-S	
	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.

### A.5.2. Anchoring in TI-L

As with the SI and TI-S 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,<sup>20</sup> 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.

<sup>20</sup> Indeed, given that a higher proposed investment amount decreases the likelihood of agreement, the share could be zero.

**Table A4 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 A.5.1** *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.*

### A.5.3. 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-S). In contrast, bargaining in TI-L 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 A5 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-S 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-S; thus, while the funding amount is halved, the share offered to each investor drops by less than half as we go from SI to TI-S. 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-S PoorEnt (51.65% in SI RichEnt and 32.82% in TI-S RichEnt, see Tables 3-4), which is close to the midpoint between the

**Table A5 Opening Offers**  
(a) Frequency of Proposed Investment Amount

Treatment condition	Proposed investment	Entrepreneur's Proposal			Investor <i>i</i> 's Proposal		
		PoorEnt	RichEnt	PoorEnt vs. RichEnt <i>p</i> -value	PoorEnt	RichEnt	PoorEnt vs. RichEnt <i>p</i> -value
SI	200	100.00%	100.00%	-	100.00%	100.00%	-
TI-S	100	100.00%	100.00%	-	100.00%	100.00%	-
TI-L	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>i</i> 's Proposal		
		PoorEnt	RichEnt	PoorEnt vs. RichEnt <i>p</i> -value	PoorEnt	RichEnt	PoorEnt vs. RichEnt <i>p</i> -value
SI	200	36.97	40.30	0.348	70.77	65.13	0.313
TI-S	100	23.78	23.31	0.807	44.29	44.54	0.989
TI-L	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.

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-L 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-S 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-L with their opening offers in the SI and TI-S conditions, we see that investors are less demanding in TI-L PoorEnt (for an investment of 100 units they demand 40% in TI-L, while they demand 44% in TI-S; for an investment of 200 units they demand 59% in TI-L, while they demand nearly 71% in SI). On the other hand, in RichEnt their offers are roughly similar between TI-S 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-L 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 A.5.2** *Opening offers of both parties largely explain the differences in final outcomes in SI and TI-S. Poor entrepreneurs prefer larger investments, while rich entrepreneurs prefer smaller investments. Investors prefer smaller investments. Investors bargain more aggressively when the entrepreneur is rich.*

#### **A.5.4. Bargaining Strategies in TI-L**

We next unpack the bargaining strategies in TI-L. 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 A6 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 A6 shows that, consistent with Table A5, 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.<sup>21</sup>

**Result A.5.3** *The advantage of TI-L 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.*

#### **A.5.5. Differences Across Contracts**

We conclude this section by examining the bargaining dynamics that cause the differences between Common vs. Preferred Stock contracts. Table A7 shows summary statistics on first offers for each role and for each of our treatment conditions in the SI/TI-S 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

<sup>21</sup> 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 A6 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.

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-S) for Preferred relative to Common Stock contracts. In particular, in TI-S, 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-S) 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.

**Result A.5.4** *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.*

**Table A7 First Offers (Share to Investor) by Bargaining Environment and Player Role**

(a) SI

	Entrepreneur's First Offer			Investor <i>i</i> 's First Offer		
	Common	Preferred	<i>p</i> -value	Common	Preferred	<i>p</i> -value
PoorEnt	36.97	39.70	0.303	70.77	71.60	0.858
RichEnt	40.30	34.25	≪ 0.01	65.13	66.71	0.500

(b) TI-S

	Entrepreneur's First Offer			Investor <i>i</i> 's First Offer		
	Common	Preferred	<i>p</i> -value	Common	Preferred	<i>p</i> -value
PoorEnt	23.78	20.48	≪ 0.01	44.29	49.59	0.004
RichEnt	23.31	20.30	0.031	44.54	49.38	≪ 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.