Designing Incentives in Startup Teams: Form and Timing of Equity Contracting

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Entrepreneurial teams assign equity positions in their startups using a term sheet that details equity splits and conditions for being granted those splits. It is conventional wisdom in the entrepreneurial press that equal splits are poor choices. The conventional logic is that by not connecting rewards to contribution level equal split contracts can encourage free-riding behaviors. We experimentally test this conventional wisdom, among other entrepreneurial contracting hypotheses. Our results confirm the relationship between equal splits and depressed effort and contribution, but suggest a different causal sequence relative to conventional wisdom. Rather than the contract form being the primitive and the behavior the derived consequence, our results suggest the reverse. The differences in contract performance are driven primarily by the sorting of high contributors into non-equal contracts and of low contributors into equal contracts. However, delaying the contracting mitigates these sorting effects, reducing the effort gap between contracts. Taken together, our results suggest that both investors and founders should pay as much (or more) attention to personality type as they do to contract form, but if one is stuck with a given set of personalities delayed contracting (more so than contract form) can improve performance.

Key words: Entrepreneurial operations, Contracting, Startups, Behavioral operations, Innovation

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1. Introduction

In the presence of tightly constrained cash flows startup founders are frequently compensated through equity shares—the rights to participate in the proceeds from going public or from being acquired by another company. The division of equity among the founders is manifest in their first "term sheet" that specifies how and when equity vests (becomes earned) and under what conditions it can be withheld. The design of these provisions has attracted considerable attention in the entrepreneurial press with the conventional wisdom suggesting that equal splits are poor choices (Wasserman 2012, Moyer 2012). The conventional logic is that by not connecting rewards to either effort or contribution level equal split contracts can encourage free-riding behaviors. In this paper we experimentally test this conventional wisdom, among other entrepreneurial contracting hypotheses. In particular, we explore two research questions: what is the effect of (1) contract form and (2) contracting time on founder effort and on the value generated by the startup team?

Equity division in startups can take many forms from equal division to contribution-proportional splits. The latter are based on the value assigned to various inputs provided by the founders including labor, capital and other assets, as well as contacts and business leads they bring to the team (Moyer 2012). Incentive theory suggests that such arrangements can align individual self-interest with the firm‘s objectives better than equal division rules, predicting that they will result in higher effort levels and value generation.

While the incentive strength arguments favor non-equal contracts, some of their theoretical benefits may not be realized in practice, or at least not to the fullest extent. Indeed, it is often unclear what team members generate value, and how much. Many technology startups log working hours and track the number of lines of code written, however both measures are crude gauges of effort and poor predictors of value generation (Graham 2004). Also, the significance of some key events may be apparent ex post but may not be easily recognizable at the time those events occur. Examples are industry contacts that open up new markets or product features whose functional appeal is not apparent until a complementary technology emerges. The delays in realization of an input‘s true value, and the interactions between various inputs make it difficult to evaluate each contribution separately reducing the appeal of contribution-based contracting.

Indeed, in practice most startups avoid including detailed effort or value tracking into their term sheets. Instead, many prefer simpler contracts that include minimal performance-oriented contribution thresholds, frequently referred to as “vesting” contracts (Metrick and Yasuda 2010). In these the initial equity allocation is tentative and the final splits are granted only after the team members satisfy some pre-specified contribution requirements. When a vesting requirement is not met, the unvested shares are withheld and redistributed to the remaining shareholders. By ignoring minor differences in contribution amounts vesting contracts therefore serve as a compromise solution between equal and proportional contracts.[1]

Simpler, more egalitarian contracts are supported not only by practical considerations (of not being able to track contributions), but also by the evidence of their motivational benefits. Specifically, the human resources and the behavioral economics literatures both suggest that large differences in earnings within the team may lead to undesirable behaviors. Sharing the risks and the

[1] A common form of vesting provisions is time-based vesting, in which team members earn shares by simply remaining part of the team for a specified length of time. An alternative approach to time-based vesting is milestone-based vesting, in which the split is confirmed only after some milestone tied to individual contribution has been reached. A milestone is typically an event that correlates with value creation, such as the completion of a prototype or the first customer shipment. For sample vesting contracts used in practice see Metrick and Yasuda (2010).

rewards equally may emphasize solidarity with collective interests and promote cooperative behavior (Morgan and Sawyer 1979, Deutsch 1975, Kroll et al. 2007), while large differences in pay may lead to adverse reactions depressing effort and contributions (Pfeffer and Langton 1993, Fehr et al. 2009). If these arguments apply in the startup contracting context, contribution-proportional equity division should be avoided and vesting contracts may be preferred, to allow some redistribution of equity while guarding against excessive free-riding.

While there are few empirical studies on startup contracting, some survey data suggest that equal division is associated with lower outside investments and with lower valuations, relative to non-equal splits (Hellmann and Wasserman 2016). However, there are some important differences in the characteristics of teams choosing different contracts. Equal contracts are preferred by family firms whose ventures are frequently funded by their informal networks and not by outside investors (Sahbaz 2013, Hellmann and Wasserman 2016). Contractual choices are also affected by founder experience with more seasoned teams including more contribution-dependent components into their contracts. These selection effects dominate the relationship between contract form and startup performance, leaving open whether the effect of contract form on value creation is causal.

The timing of the contractual agreement is another important consideration for incentive design in practice. Frequently the equity terms are not negotiated until part way downstream in the innovation process. In particular, equity agreements are often made at certain milestones, such as the conceptualization of the business idea, internal or external funding events, or the start of business operation (Jared 2016). When founders contract in the very early stages (i.e. before finalizing the product concept), the direction of the venture and the roles of the founders are often uncertain. In contrast, when founders contract after some work is completed, at least some of the uncertainties will be resolved prior to contracting. This may lead to better informed contracting decisions and to greater satisfaction with the contract, increasing effort and value generation (Wasserman 2012).

However, delayed contracting also has its drawbacks. The human resource literature suggests that pay ambiguity may reduce worker motivation (Belt and Paolillo 1982, Barber and Roehling 1993, Yuce and Highhouse 1998). Not knowing how their efforts will be rewarded the team may be reluctant to commit to the startup needs prior to contracting. In particular, early-stage developers may feel discouraged from participating in value creation if they anticipate that their efforts will not be fully reflected in the contract.

To understand the effects of contract form and contracting time on founder effort and on startup performance we develop a new experimental game that captures several key elements of the entrepreneurial innovation process. The value creation begins with the founders jointly determining the initial startup value by deciding how much effort to exert. Then, after observing the value generated in stage 1, the effort allocation decisions are repeated in stage 2. The individual contributions and the final value of the startup are correlated with founders' effort investments but are also affected by random noise. Once the final value is known, it is divided between the founders according to an allocation rule (as will be explained below).

Our experimental investigation allows endogenous contract selection among several contract alternatives that parallel the contract forms used in practice. These include equal, vesting and proportional division rules. To isolate the incentive effects from the effects of the negotiation process and of selection we conduct control treatments in which we impose the contract form exogenously. After studying the effects of contract form on contribution behavior we examine whether delaying the contracting until after stage 1 affects founder efforts and startup value.

This is the first study to our knowledge to investigate the effects of equity contracting on effort and value creation in an experimental setting.[2] More broadly, this is one of the first experimental studies of incentive design for (and by) collaborative teams in the innovation and technology management literature, which often treats incentive design in technology projects as a "principal-agent" problem bypassing any within-team interactions (Loch 2016).

Our results confirm the relationship between equal splits contracting and depressed effort and contribution, but suggest a different causal sequence relative to conventional wisdom. Rather than the contract form being the primitive and the behavior the derived consequence, our results suggest the reverse. Personal characteristics are the primitive and the contract form the derived consequence. In particular, our data reveal the presence of three behavioral types (low, conditional and high contributors) that differ in their preferences and behaviors. When contracting happens upfront low contributors select into equal contracts and the remaining types select into non-equal contracts. This results in the free-riding behaviors occurring more frequently in equal contracts relative to non-equal contracts. That is, equal contracts are bad for team performance, not because of their incentive strength but because of the founder types that self-select into them.

However, when contracting is delayed, teams operate with richer information when deciding on the contract. Free-riding intent of low contributors is revealed early on, and others do not want to sign equal contracts with them. Further, robust contributors are also revealed early on, which reduces others‘ reluctance to sign equal contracts with them. Together, these behaviors result in low contributors no longer being over-represented in equal contracts. More generally, since it is founder type rather than the contract type (strength of incentives) that primarily impacts behaviors, with a

[2] The only existing experimental studies on equity contracting known to the authors are Jared (2016) and Bao and Wu (2017). Jared (2016) explores the effects of contracting time on norm formation (cooperative vs. competitive norm) and focuses on equal splits. Bao and Wu (2017) examine inequality attitudes of employees to differences in equity and in salary. Our study is different because it focuses on startup teams, explores the effects of both contract form and contracting time, and because it examines effort as the main dependent variable.

stronger signal of type the contract form becomes less important leading to a more even distribution of types over contracts and to smaller effort and value differences between contracts.

Our findings have implications for startup investors and founders. Our results add texture to the conventional wisdom that investors should avoid startups with equal split contracts, clarifying that this result is driven primarily by the personal characteristics of the teams selecting different contracts. Both investors and founders should pay as much (or more) attention to personality type as they do to contract form. But, if one is stuck with a given set of personalities delayed contracting (more so than contract form) can improve performance.

2. Literature

There are several streams of literature that are relevant to our investigation. We will first discuss the empirical research on the effects of equity splits on firm performance and then move to the broader behavioral and experimental economics literature on incentive design in collective production settings.

2.1. Entrepreneurship literature

Given the theoretical arguments in support of input or contribution-based contracts as effective incentive instruments one may expect to find many startups using such contracts. However, the contrary is the case in practice: equal division rules are used frequently by startups and by partner-owned firms, more generally. Encinosa et al. (2007) find that 54% of small medial-group practices divide all profits equally. Farrell and Scotchmer (1988) present similar data for law partnerships. Jared (2016) reports that 64% of South-East Asian startups have an equal ownership split between founders. Hellmann and Wasserman (2016) survey North American technology startups and find that 35% divide equity equally.

To our knowledge, the only study to examine empirically the relationship between equity splits and startup performance is Hellmann and Wasserman (2016). The survey-based evidence therein suggests that equal contracts are associated with reduced outside investment and with reduced VC involvement. However, the authors do not find a causal link between the contract form and those metrics. Rather, they argue that equal contracts are chosen by teams with close social ties who tolerate reduced team effort and value generation in favor of greater income equality. Our data confirm that a large proportion of teams reject contribution-proportional splits and that profit-seeking is not the sole motive for many teams, but suggest a different mechanism. While some individuals are indeed driven to equal splits by inequality aversion, a preference for equal contracts is most strongly associated with the desire to free-ride on partner effort.

Other empirical and experimental research also questions the incentive strength argument. Kroll et al. (2007) show that a more egalitarian division of shares between the founders improves startup's post IPO performance. Their argument is based on increased team cohesion in groups with an even ownership structure. The team cohesion argument is broadly related to the literature on horizontal pay differences showing that productivity may suffer as a result of unequal pay (Pfeffer and Langton 1993, Fehr et al. 2009).

Finally, some entrepreneurship research indicates that the focus on incentive strength of the contract may hide some interactive aspects that are relevant for startup performance in practice. Breugst et al. (2015) explore the collaborative dynamics in a case study of 8 entrepreneurial teams some of which have equal and some non-equal contracts. They find that it is not the equity split per se, but its perceived justice that affects team interactions and team effectiveness. In a similar vein, Jared (2016) shows that equal splits may lead to a conflicted or to a cooperative environment depending on the contextual circumstances of the equity negotiations.

These findings give some insights into the sociological and psychological antecedents of a team adopting (or not) equal contracts, but provide little advice for startup teams. In our investigation we are able to study both the incentive effects of contracts and the selection effects, by examining scenarios with endogenously selected and exogenously imposed contracts. Further we focus on the direct effects of contracts on effort and contribution dynamics bypassing the contextual details of founder-investor negotiations that may interact with the effects of contracts on cooperative behavior.

2.2. Behavioral economics literature

The micro-foundations of contribution behavior in team settings have been studied in the behavioral economics literature, particularly in the context of public goods provision. One robust finding is the reduction of free-riding in regimes allowing punishment of low contributors (Ostrom et al. 1992, Rapoport and Au 2001, Gürerk et al. 2006, 2009, Gürerk 2013, Putterman et al. 2011). Engel (2014) examines mild and harsh punishments and finds that the positive effect of punishment on contributions increases in the severity of the punishment. If these results carry over to the startup setting, we should see proportional contracts perform best and equal contracts perform worst. However, one caveat to extrapolating these findings to our setting is the reward allocation system used in the public goods studies. These typically assume voluntary punishment by group members, whereas startup teams use contractual sanctions.

Several studies suggest that when effort decisions are private or when effort cannot be observed perfectly, the advantage of high-powered incentives may collapse (Cappelen et al. 2007, 2010, Fischbacher 2007, Grechenig et al. 2010, Bornstein and Weisel 2010, Sousa 2010, Ambrus and Greiner 2012). These papers show that teams are willing to punish low contributors only when the differences in contribution amounts are caused by free-riding and not when caused by luck. Indeed, Bao and Wu (2017) show that workers are more sensitive to arbitrary differences in equity compensation, than in salary compensation. Further, while both profit maximization and equitability are important concerns, a significant share of individuals split equally in order to signal unity to their partners (Corgnet et al. 2011, Luhan et al. 2013). If both profit seeking and fairness concerns are important determinants of behavior in our setting, vesting contracts may outperform both equal and contribution-proportional division rules.

A related set of studies examines whether individuals who exhibit socially desirable behaviors select into less egalitarian reward allocation regimes. Balafoutas et al. (2013) find that low contributors select into regimes with redistribution, but the selection effect is dominated by incentive effects. Tyran and Feld (2006), Gürerk et al. (2009) and Sutter et al. (2010) show that selection effects can be stronger than incentive effects in the public goods game setting. In a prisoner's dilemma game with and without punishment Dal Bó et al. (2010) show that both incentives and selection affect the frequency of defections. Consistent with these results we find that the preference for equal splits is associated with free-riding behaviors, and that the sorting of low contributors into equal contracts is the primary driver of contract performance differences. However, we also find that the extent to which free-riders are able to select into egalitarian regimes depends on the availability (or lack) of effort information prior to contracting.

The existing empirical and experimental literature is relatively silent on the effects of contracting time on startup performance. Sahbaz (2013) and Hellmann and Wasserman (2016) report that a non-trivial share of startups delay contracting until further downstream in the innovation process. However, they do not find a significant relationship between contracting time and performance. Wasserman (2012) argues that early contracting may create clarity around the incentive structure, increasing effort levels. Early negotiations may lead to fewer conflicts among the founders, particularly if the stakes increase over time. However, Wasserman (2012) also notes that delaying the contracting may reduce the uncertainty around the firm value and the individual contributions to it. This may help craft a more informed and thus a more effective contractual agreement. Jared (2016) finds that delayed equal splits lead to more cooperative norms relative to upfront equal splits. Though Jared (2016) does not examine the effects of contracts on effort, his findings anticipate one of our results, that contract performance depends on the availability of mutual effort signals prior to contracting.

In sum, the extant empirical research presents mainly correlational evidence and mixed results. The experimental literature suggests that allowing teams to penalize free-riders will lead to higher contributions and value creation. This supports contribution-based contracting. However, by focusing on one-shot contribution decisions, observable efforts and (predominantly) ex post division of the surplus these experimental studies are only partially reflective of the entrepreneurial context.

None of the existing experimental studies provide clear recommendations for entrepreneurs, partly because the division rules examined there do not resemble the contractual agreements used by startups in practice. Our model and experiment are designed to address this gap by following more closely the contracting and collaborative dynamics in startups.

3. A stylized model of entrepreneurial contracting and value creation

The contracting and collaboration environment in our experiment reflects several features shared by many entrepreneurial ventures. The following scenario is the stylized context of our model that maintains the relevant features and is used in the experiment. After introducing the model setup we will discuss equilibrium effort levels implied by each contract form.

3.1. Setup

A startup team consisting of two partners has identified a problem that they want to develop a product to solve, creating a new business that they will own. They do not yet know what the actual value of the business will be, or how much effort each partner will allocate to the venture. There are two phases to the business development effort. In each phase, each partner can choose to invest effort in the venture (with a risky return as described below) or an outside option (with a certain return). This is to model the outside employment or other options that each individual has, which is also the opportunity cost for the effort invested in the venture. In practice, phase I may feature market research, product concept selection and product development activities, while phase II may involve more downstream processes, such as setting up the supply chain or marketing and sales activities.

Each partner $i \in \{1, 2\}$ begins stage $s \in \{1, 2\}$ with a finite effort endowment E that she can allocate between the venture and the outside option. There are two dimensions to the real value increase of the venture as a result of the cooperative efforts of the founders. First, each founder chooses to contribute effort $e_{is} \in [0, E]$ to the venture. Second, the venture value is increased based on the joint investment of both partners. This latter mapping is uncertain. For example, effort can be expended at a high cost to the contributor, but with a low value for the venture. However, the real venture value increment is positively correlated with the joint effort investment of both partners. Formally, i's contribution in stage s, $c_{is} = m_{is} \times e_{is}$, where m_{is} are i.i.d. discrete random variables that can take a low, medium or high value with some known probabilities (We choose a simple three-point mapping of effort to contribution to make the game more accessible to the experimental subjects). In contrast, the return to each individual for effort invested in their outside option is certain. That is, in each stage founder i earns an additional private payoff of $(E - e_{is}) \times K$, where K is a constant.[3]

[3] Our model and experiment abstract away from any ex ante skill asymmetries within the team. That is, m_{is} has the same probability distribution for each partner i and in each stage s.

Effort is private information, but the value contribution is public. After each phase each team member observes the value increment resulting from their own and from their partner's effort allocation decision, but not the partner's effort level. That is, the amount of effort actually invested by the partner is shared in form of a noisy signal. The quality of the product concept V_1 (determined at the end of stage I) depends on how much effort (and the returns to that effort) is invested in understanding customers and designing for their needs. At the end of stage I the team members see a business valuation number V_1 that is positively correlated with their joint contributions, and also has a positive signal value about what the final business value will be. In particular, $V_1 = c_{i1} + c_{j1}$. This is to model the end of the market research phase, where the potential market valuation of the business is known if the team can deliver a product or service that responds to the needs discovered in stage I.

The partners then (privately) choose their individual level of effort in phase II and the process repeats yielding stage II value $V_2 = c_{i2} + c_{j2}$. This is to model the incremental increase of the firm value resulting from the actual product launch and sales activities. At the end of stage II the team gets a final business valuation V that is positively correlated with the value at the end of stage I, and with the joint contributions realized in stage II. In particular, the final valuation of the startup, $V = V_1 \times V_2$. This is to model the actual business value, after the product design and launch. The final earnings of each founder include her share of the firm value V and her private payoffs. That is, founder i's profit $\pi_i = \sigma_i^X V + K(2E - e_{i1} - e_{i2})$, where σ_i^X denotes the share of the startup value allocated to founder i under contract X (contracts will be discussed below).[4]

In sum, we model the entrepreneurial innovation process as a two-stage game. Value creation begins with the founder contributions jointly determining the initial startup value. These contributions are correlated with founders' effort investments but are also affected by random noise. Higher initial startup value increases the attractiveness of contributing to the startup in the second stage. Once the final value of the startup is known, it is divided between the founders according to an allocation rule. The allocation can be made contingent on the individual contributions (effort is not observable so cannot be contracted on) with four contract forms to choose from: Equal split, Threshold vesting, Difference vesting and Proportional contracts. The specifics of these contracts are described next.

[4] Our two-stage model draws on the idea that the value of the venture is often much lower and much more uncertain before the startup has found its product-market fit.The value crystallizes once a working business model has been found. The two-stage model can also be interpreted as an abstraction to the milestone-driven growth typical for many startups. Indeed, a startup's valuation is often shown to increase at isolated and well-defined events, a proof of concept of the core technology, a successful demonstration of prototype performance, or a key customer acquisition (Nachum 2015).

3.2. Contracts

Our investigation focuses on contractual division rules in which the differences in future (and not past) contributions can be contracted on. Such symmetric, forward-looking contracts are typical for early stage ventures formed by teams of peers (rather than entrepreneur-adviser or inventor-employee teams) in which founder roles are comparable in importance. The contract menu used in our model and experiments draws on the equity contracts used by startups in practice (Wasserman 2012, Moyer 2012). The contracts are further validated in pilot experiments, in which we allow teams to design their own contracts from scratch (The pilot is described in section 4.2, the contract transcripts are reproduced in the supplementary documents).

The contract alternatives in our model and in our experiments are Equal split (henceforth EQUAL), threshold vesting (THRESH VESTING), difference vesting (DIFF VESTING) and contribution-proportional split (PROPORTION). With THRESH VESTING a player loses 10 percentage points of equity each time she contributes less than a fixed contribution threshold c^{THRESH} and the partner contributes at least the threshold amount. The lost portion of the equity is reallocated to the partner. With DIFF VESTING a player loses 10 percentage points each time she contributes less than her partner and the difference is at least c^{DIFF}. The lost portion of the equity is, again, reallocated to the other player. With a PROPORTION contract a player's share is computed as the ratio of the sum of her contributions to the sum of all individual contributions.

The contractual share allocated to player i under contract X is denoted by σ_i^X, where $X \in$ {EQUAL, THRESH VESTING, DIFF VESTING, PROPORTION}. The contractual share allocated to player j, $\sigma_j^X = 1 - \sigma_i^X$. In the UPFRONT contracting scenario equity shares are calculated as follows:

$$\sigma_i^{EQUAL} = 0.5$$

$$\sigma_i^{THRESH\ VESTING} = \begin{cases} 0.3 \ \text{ if } \{c_{is} < c^{THRESH} \wedge c_{js} \geq c^{THRESH}\} & \text{in both stages } (s = 1, 2) \\ 0.7 \ \text{ if } \{c_{is} \geq c^{THRESH} \wedge c_{js} < c^{THRESH}\} & \text{in both stages } (s = 1, 2) \\ 0.4 \ \text{ if } \{c_{is} < c^{THRESH} \wedge c_{js} \geq c^{THRESH}\} & \text{in exactly one stage} \\ 0.6 \ \text{ if } \{c_{is} \geq c^{THRESH} \wedge c_{js} < c^{THRESH}\} & \text{in exactly one stage} \\ 0.5 \ \text{otherwise} \end{cases}$$

$$\sigma_i^{DIFF\ VESTING} = \begin{cases} 0.3 \ \text{ if } \{c_{js} - c_{is} \geq c^{DIFF}\} & \text{in both stages } (s = 1, 2) \\ 0.7 \ \text{ if } \{c_{is} - c_{js} \geq c^{DIFF}\} & \text{in both stages } (s = 1, 2) \\ 0.4 \ \text{ if } \{c_{js} - c_{is} \geq c^{DIFF}\} & \text{in exactly one stage} \\ 0.6 \ \text{ if } \{c_{is} - c_{js} \geq c^{DIFF}\} & \text{in exactly one stage} \\ 0.5 \ \text{otherwise} \end{cases}$$

$$\sigma_i^{PROPORTION} = \frac{c_{i1} + c_{i2}}{c_{i1} + c_{i2} + c_{j1} + c_{j2}}$$

3.3. Model parameters

The parameters in our model and experiments are chosen such that (1) there is a prospect of a substantial (but risky) gain for both value generation and expected founder profits if the partners both invest full effort into the startup, and (2) different contract types exhibit different incentive and allocation properties, rendering the contracting and effort decisions consequential. These considerations led to the following parameter choices. Subjects are endowed with an effort budget $E = 10$ in each stage. The returns for effort, m_{is} can take values 0.5, 1, and 2. The realization probabilities of these values are 0.25, 0.5 and 0.25, respectively (m_{is} has the same probability distribution for each partner i and in each stage s). The constant multiplier on the private investment, $K = 5$. The vesting thresholds c^{THRESH} and c^{DIFF} are both equal to 5. These parameter choices were validated in a pilot with 50 subjects (The pilot is described in sections 4.1-4.2).

3.4. Equilibrium strategies

We next outline the equilibrium strategies in the UPFRONT and IMPOSED scenarios (The predictions for the DELAYED scenario are postponed until section 5). A more detailed description of the equilibrium structure is relegated to the supplementary materials.

With EQUAL contracts stage II best response strategies depend only on the value of V_1. If $V_1 > \overline{v}_1$ investing full effort into the startup is the best response to any partner action. If $V_1 < \overline{v}_1$ investing no effort is the best response to any partner action. Following the backward induction logic and plugging in the continuation payoffs into the stage I profit function, "Invest full effort endowment" is the unique stage I best response to any partner action. The reason is that each player can unilaterally achieve that $V_1 > \overline{v}_1$ with a sufficiently high probability, making the expected returns for effort invested in the startup greater than the returns for the outside option. Further, because in equilibrium both partners will invest full effort in stage I, the "high" state with $V_1 > \overline{v}_1$ will always be reached in stage II resulting in full stage II effort. That is, any less-than-maximal effort investment in either stage implies off-equilibrium behavior.

With NON-EQUAL contracts the best response in stage II generally depends not only on the sum of stage I contributions (as was the case for EQUAL), but also on the individual stage I contributions c_{i1} and c_{j1}. However, it can be shown that simple strategies still exist for a range of V_1 values. Intuitively, because NON-EQUAL contracts tie the allocation of equity to individual effort and contribution, they lead to more socially desirable behaviors (i.e. equal or higher effort levels conditional on V_1), relative to EQUAL contracts. Indeed, plugging in the continuation payoffs and solving for the best response it can be shown that "Invest full endowment" is the unique best response in stage I in each NON-EQUAL contract. That is, given our parameter choices, effort differences among the contracts are predicted only in stage II and only on the off-equilibrium path.

In equilibrium each contract is predicted to lead to full effort investment in both stages (The off-equilibrium strategies in stage II are characterized more explicitly in the supplementary materials, see table S1.2).

4. Experimental setup and results

4.1. Experimental strategy

To investigate the effects of equity contract form and of the contracting time on effort and on startup performance we conducted a pilot treatment and 4 between-subject treatments labelled IMPOSED EQUAL, IMPOSED PROPORTION, UPFRONT and DELAYED. In the IMPOSED treatments contracts were imposed exogenously by the experimenters. In the UPFRONT and DELAYED treatments contracts were selected endogenously by the team.

In the pilot treatment (conducted ahead of the remaining treatments) we asked subjects to design their own contracts. The purpose of the pilot treatment was to explore inductively the contractual arrangements emerging from free-form negotiations, to validate the model parameters and to examine the frequencies of different contracts in a face-to-face setting. In the remaining treatments subjects interacted via the z-Tree interface (Fischbacher 2007). In the Endogenous negotiations treatments subjects chose jointly one of four contract types (EQUAL, THRESH VESTING, DIFF VESTING, PROPORTION). Our contract menu draws on the contractual agreements used by startups in practice and also aligns with the contract types emerging from the free-form pilot, as will be described below.

4.2. Pilot: Free-form negotiations

50 subjects were recruited at the University of Michigan to participate in the pilot treatment. Two-person teams were formed at random, and each team was given two empty sheets of paper to be used for writing down the contracts. Each team held private negotiations in a separate room with no time restriction. Once a team completed their negotiations, the experimenters verified that each partner had signed a copy of the contract and that the copies were identical, and brought the team to the laboratory where they continued with the contribution phase of the experiment. Each subject participated in three rounds of the startup game, with random re-matching in each round. The average duration of one negotiation round was 3 minutes and 40 seconds. On average, subjects spent one hour in the laboratory earning \$14 including the show-up fee of \$5.

Our pilot data show that equal splitting is a particularly appealing contract form with 73% of the teams choosing equal split contracts. The appeal of equal contracts is consistent with the behavioral economics literature on face-to-face interactions in joint production and bargaining settings (Roth 1995, Bochet et al. 2006, Corgnet et al. 2011, Konow et al. 2009) and is also consistent with the empirical entrepreneurship literature (Hellmann and Wasserman 2016, Breugst et al. 2015, Jared 2016)

In addition to the popularity of equal contracts, we were able to identify several categories among the non-equal contracts emerging from the negotiations. In particular, the non-equal contracts fell into 3 categories: "threshold-based" (a contribution below X points is penalized, where X is a constant), "difference-based" (a contribution below Y points, where Y depends on partner's contribution), and "proportion-based" (each partner is allocated a share of the profit proportional to the share of points contributed). These allocation rules are consistent with the endogenously designed redistribution schemes in the public goods literature (Rockenbach and Wolff 2016) and can also be mapped to the contracts used by startups in practice (Metrick and Yasuda 2010).[5] The contract types were further refined and calibrated by the authors and then used to design the contract menu for the remaining treatments. The transcripts of all contracts written by the subjects in the free-form treatment are reproduced in the supplementary documents.[6]

4.3. UPFRONT and IMPOSED treatments

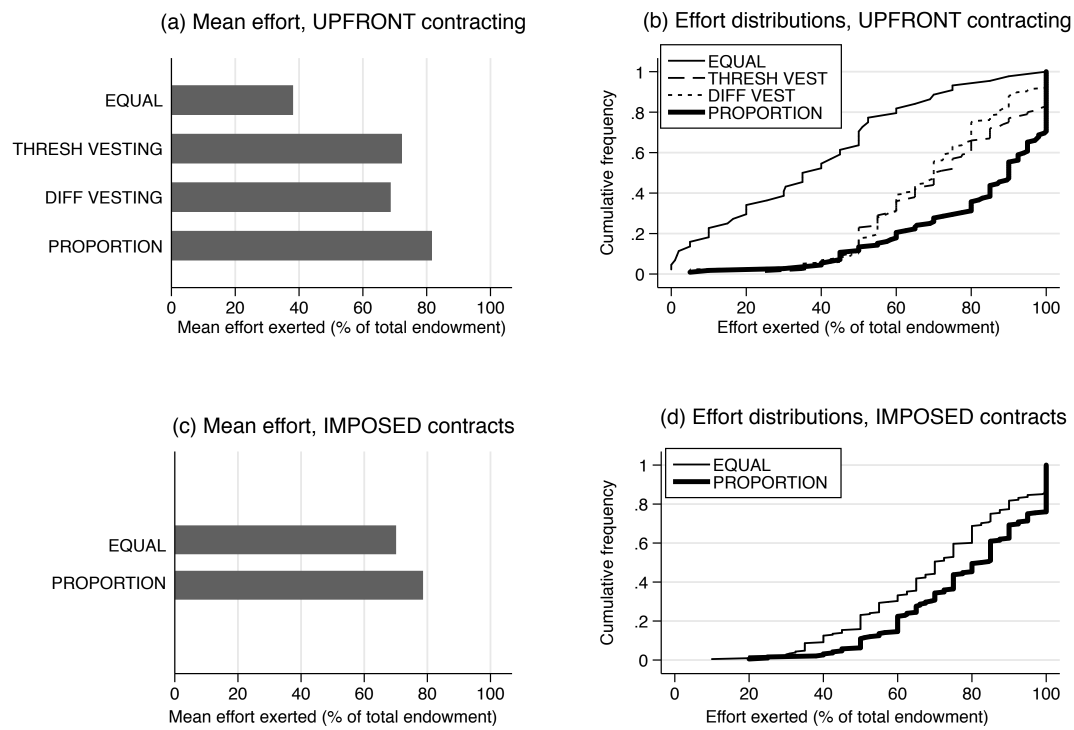
104 subjects were recruited at the University of Michigan to participate in the UPFRONT and IMPOSED treatments of the experiment. After going through the instructions all subjects were required to complete a mandatory quiz. Subjects then played eight rounds of the startup game, with random re-matching in each round. During the negotiations the interaction between the partners was limited to making, rejecting and accepting contract offers (subjects could not exchange chat messages). In the first two rounds subjects were given 4 minutes to agree on a contract. In the subsequent rounds subjects were given 2 minutes to agree on a contract. If a team was unable to agree on a contract, their endowments were allocated automatically to their private accounts. On average subjects spent 50 minutes in the laboratory and earned \$14 including the \$5 show-up fee. The exact transcript of the instruction text, and the screen shots of the negotiation screens are reproduced in the supplementary materials.[7]

[5] Rockenbach and Wolff (2016) report that endogenously designed allocation rules in public goods games are typically based either on either absolute or relative thresholds: "Mechanisms were [designed] in the form of pre-specified rules of deduction and/or redistribution contingent on complying with provision targets. These provision targets were either fixed levels (e.g. full provision) or contingent on the other group members (e.g. not being the lowest contributing player)."(Rockenbach and Wolff 2016, p. 332).

[6] Due to a small number of observations and due to a large number of different contractual arrangements we do not explore in detail the effects of contracts on effort in the pilot data. On average (pooled) non-equal contracts were associated with an increase in contribution levels of 8.60 percentage points relative to equal contracts, but the effect was not statistically significant.

[7] All but one team in our data were able to agree on a contract. Among the four contracts no single one attracted more than 40% of the teams in any given round, and each contract was chosen by a non-trivial share of teams in each round. Further, neither the negotiation time, nor the number of exchanged offers were predictive of effort and value generation.

Figure 1 Mean effort levels and effort distributions (UPFRONT and IMPOSED treatments)



In the remainder of section 4 we examine effort and value generated in each contract when the contract is determined upfront. Section 5 examines the delayed contracting scenario. Section 6 investigates the motives and behaviors of different personality types present in our data.

4.3.1. Results: aggregate effort and value comparisons Figure 1(a) shows a substantial gap in effort levels between EQUAL and each NON-EQUAL contract and a smaller gap between PROPORTION and each VESTING contract. Average (stage I + stage II) effort levels are lower in EQUAL relative to PROPORTION (mean difference: 43.49 percentage points), and also lower in pooled VESTING relative to PROPORTION (mean difference: 11.62 percentage points). Effort levels do not differ substantially between the two VESTING contracts. These results suggest that effort levels rise monotonically in the extent to which the share allocation is tied to contribution differences.

Not only the means, but also the distributions of effort levels in the UPFRONT negotiation scenario differ between contracts, as shown in figure 1(b). In particular, each NON-EQUAL contract dominates EQUAL contracts in terms of effort and total value generated (V) in the sense of first order stochastic dominance (all $p < 0.01$).[8] This suggests that an investor would prefer to fund a team with a non-equal contract regardless of risk sensitivity. Further, figure 1(b) suggests that the

[8] This result is obtained using tests based on quantile regressions discussed in Ng et al. (2011).

advantage of PROPORTION contracts relative to VESTING contracts is driven by frequent near-maximum effort levels in the former. Indeed, over two thirds of the observations in PROPORTION contracts feature effort levels above 80% of the subject's endowment, compared to only one third of the observations in VESTING contracts.

Compared to the robust differences in contract performance with endogenously selected contracts, the differences between exogenously imposed contracts are small. In particular, figure 1(c) shows that the effort gap between PROPORTION and EQUAL contracts is approximately 9 percentage points. These results suggest that it is not the incentive structure of the contract that matters most for contract performance, but the personal characteristics of those who select these contracts.

4.3.2. Non-parametric tests of effort level differences We have so far examined average effort and value generated in each contract without specifying whether multiple observations of behavior in a contract came from one subject or from multiple subjects. To isolate between-subject differences in behavior we next examine effort levels observed in a single round of the experiment.

In the *first* experimental round of the IMPOSED treatment, the effort gap between EQUAL and PROPORTION contracts is 0.20 percentage points (Rank Sum test, $p = 0.868$). In the *last* experimental round EQUAL falls behind PROPORTION by 7.34 percentage points, with the difference not being statistically significant ($p = 0.183$). In contrast, the *first* round comparison in the UPFRONT negotiation treatment reveals a 27.56 percentage point gap between EQUAL and PROPORTION ($p = 0.018$). Further, that effort gap widens over time reaching 59.95 percentage points in the *last* experimental round ($p < 0.01$). These results suggest that the endogenous contracting environment generates a persistent effort gap between the contracts. Further, the increase of the gap over time suggests that the differences are driven in part by observed partner behaviors, and not by the incentive strength of the contract.

4.3.3. Regression analysis We next examine the effects of contracts on effort using random effects regressions. Columns 1-4 of table 1 report the effects of PROPORTION contracts on effort when contracts are imposed exogenously by the experimenter (baseline is IMPOSED EQUAL). The coefficients describe the changes in effort levels caused solely by the change in the incentive structure and are free of any selection effects. Column 1 shows that stage I effort levels differ by approximately 8 percentage points between EQUAL and PROPORTION contracts, with the difference being marginally significant ($p = 0.067$). Column 2 shows that this effort gap expands to approximately 10 percentage points and becomes statistically significant as we move from stage I to stage II ($p = 0.027$).

Column 3 shows that some of the effort level differences in stage II are explained by the differences in V_1. This is consistent with our equilibrium predictions. However, column 4 shows that most of this effect is driven by the responses to stage I partner contribution, c_{j1}. Column 4 breaks V_1 into some of its components and shows that one point increase in stage I partner effort is associated with 0.64 percentage point increase in own stage II effort ($p < 0.01$). In contrast, people are not sensitive to exogenous changes in the returns for investing effort measured by their stage I multiplier, m_{i1} ($p = 0.872$). These results suggest that subjects respond to incentive strength differently than suggested by standard theory, which would predict similar effects on effort of partner contribution and of the randomly assigned multiplier. In our data only the former affects effort levels.

The right half of table 1 repeats the analysis for the UPFRONT scenario. Columns 5 and 6 show a substantial effort gap between EQUAL and each NON-EQUAL contracts, and an increase in the gap as we go from stage I to stage II. In particular, PROPORTION contracts are associated with an effort increase of 28 (37) percentage points in stage I (stage II) relative to EQUAL. Given that the stage I (stage II) effort gap was 8 (10) percentage points in the IMPOSED scenario, over 70% of the differences in contract performance appear to be driven by factors other than the incentive strength of the contracts. Further, each VESTING contract is associated with lower effort relative to PROPORTION contract. However, these differences are at most 9.6 percentage points (Wald tests, $p = 0.017$ and $p = 0.000$). There are no significant differences between the two VESTING contracts ($p = 0.255$). Columns 7 and 8 suggest that some of the changes in effort are, again, a result of the subjects reacting to observed partner behavior, and not to differences in incentive strength. Column 8 shows that the effect of own stage I multiplier on stage II effort is not statistically significant ($p = 0.529$) whereas the effect of partner contribution is statistically significant ($p = 0.000$).

Summing up our results so far, EQUAL contracts are associated with uniformly lower effort levels compared to each NON-EQUAL contract. However, over 70% of the effort gap is driven by factors other than the incentive strength of the contract. Even with exogenously imposed contracts effort differences are driven in part by reactions to partner behavior, and not by the strength of incentives alone.

4.4. Discussion

While our results are consistent with the conventional wisdom that equal splits are associated with low value generation, our data suggest that this is not driven by the differences in incentive strength. If incentive strength drives the differences in effort, we should observe robust differences in contract performance even when contracts are imposed exogenously rather than being selected endogenously by the team. However, we see the opposite, that 75% of the effort gap between

Table 1 Effects of contract form on effort

	Treatment: IMPOSED	Treatment: IMPOSED	Treatment: IMPOSED	Treatment: IMPOSED	Treatment: UPFRONT	Treatment: UPFRONT	Treatment: UPFRONT	Treatment: UPFRONT
Dep. Var:	stage I effort	stage II effort	stage II effort	stage II effort	stage I effort	stage II effort	stage II effort	stage II effort
EQUAL	baseline	baseline	baseline	baseline	baseline	baseline	baseline	baseline
THRESH VEST					21.655*** (4.855)	29.391*** (5.156)	25.566*** (4.649)	27.052*** (5.010)
DIFF VEST					20.139*** (4.398)	27.286*** (5.337)	25.258*** (4.903)	25.687*** (5.132)
PROPORTION	8.004* (4.375)	9.514** (4.295)	7.391* (4.031)	8.598** (4.266)	27.803*** (5.018)	36.871*** (6.270)	31.850*** (5.743)	33.634*** (6.021)
V_1			0.695*** (0.164)				0.821*** (0.117)	
Own stage I multiplier				0.358 (2.221)				0.855 (1.357)
Partner stage I contribution				0.639*** (0.209)				0.742*** (0.130)
Constant	43.827*** (8.706)	38.930*** (9.004)	31.271*** (9.168)	36.048*** (9.487)	28.384 *** (9.407)	14.675 (9.757)	8.357 (9.179)	11.821 (9.657)
Observations	400	400	400	400	432	432	432	432
Subjects	50	50	50	50	54	54	54	54
					Tests of linear combinations of coefficients			
THRESH VEST– DIFF VEST					1.516 (2.303)	2.106 (1.850)	0.309 (1.960)	1.365 (1.918)
THRESH VEST– PROPORTION					-6.147** (3.050)	-7.480** (3.122)	-6.284** (2.677)	-6.582** (2.626)
DIFF VEST– PROPORTION					-7.664*** (2.560)	-9.585*** (2.598)	-6.593** (3.129)	-7.947*** (3.115)

Note. Dependent variable is stage I effort (columns 1 and 5) and stage II effort (columns 2-4 and 6-8). Regression coefficients are obtained using random effects regression, standard errors clustered at subject level. Controls: age, gender, experimental period.
$^{*}\ p < 0.1, ^{**}\ p < 0.05, ^{***}\ p < 0.01$.

contracts disappears when contracts are imposed externally. In the latter scenario selection is not possible, suggesting that the effort gap between contracts is driven by the individuals with socially desirable behaviors selecting into non-equal contracts and vice versa.

Further, if subjects respond to incentive strength alone (as standard theory would predict), we should observe similar reactions to partner-driven and exogenous changes to the marginal return for investing effort into the startup. However, we again see substantial deviations from theory predictions. Effort levels do not change in response to exogenous changes in productivity but do change in response to partner effort, suggesting that initial effort can be a salient signal that drives (or reduces) cooperative behaviors in the team. In the next section we show that not only effort levels, but also contract choices can be affected by initial effort signals when effort information is available to the team prior to contract selection.

In addition to the effort gap between equal and non-equal contracts our data reveal some differences between the non-equal contracts. However, these differences are substantially smaller, relative to the equal/non-equal gap. This, again, is consistent with the incentive strength being a secondary factor in our data. If incentive strength was the main driving force, we should observe robust performance differences between proportional contracts and vesting contracts because vesting contracts impose only a mild penalty for free-riding. However, effort and value differences between vesting and proportional contracts are small. In section 6 we show that this is primarily because vesting contracts attract fewer undesirable founder types, relative to equal contracts.

Selection patterns similar to ours have been observed in the experimental economics literature (Gürerk et al. 2006, Sutter et al. 2010, Dal Bó et al. 2010). This literature shows that individuals with undesirable behaviors are frequently opposed to high-powered incentive regimes. However, much of the literature focuses on examining behavior in one-shot interactions characterized by a conflict between what is socially efficient and individually optimal. Our study is different in that it presents teams with a more contextualized environment (involving risky and partner-dependent returns to effort investment) that is more reflective of collaborative work in startups. Further, the contracting process itself is designed to reproduce the contracting dynamics in startups with a range of available contracting options from equal to fully contribution-proportional. Such contractual division rules have not been examined in the literature, which has mainly focused on voting-based reward allocation and voluntary punishment of free-riders (Gürerk et al. 2006, Cappelen et al. 2007, Sutter et al. 2010, Dal Bó et al. 2010).

Our results so far suggest that contractual offers may signal something about the personality type of the individual when contracting happens upfront. Many entrepreneurial teams, however, delay contracting until at least some work is done (Wasserman 2012, Hellmann and Wasserman 2016). In that case founders can observe each other's collaborative behaviors, which can provide another signal into the personality of the partner, prior to contracting. In section 5 we investigate the consequences of this additional signal.

5. Delayed contracting

In this section we examine a scenario in which equity contracting is delayed until after stage I. The sequence of events is similar to the UPFRONT contracting treatment, however the order of the stage I contribution phase and the negotiation phase is reversed.

5.1. Model parameters and equilibrium predictions

As in the UPFRONT treatment, each subject is endowed with 10 units of effort to be allocated between the risky startup account and the safe private account in each of the two contribution stages. As previously, the effort allocated to the startup account is multiplied by 0.5, 1 or 2 with probabilities 0.25, 0.5 and 0.25. The contract parameters are as follows:

$$\sigma_i^{EQUAL} = 0.5$$

$$\sigma_i^{THRESH\ VESTING} = \begin{cases} 0.3 & \text{if } \{c_{i2} < c^{THRESH} \wedge c_{j2} \geq c^{THRESH}\} \\ 0.7 & \text{if } \{c_{i2} \geq c^{THRESH} \wedge c_{j2} < c^{THRESH}\} \\ 0.5 & \text{otherwise} \end{cases}$$

$$\sigma_i^{DIFF\ VESTING} = \begin{cases} 0.3 & \text{if } \{c_{j2} - c_{i2} \geq c^{DIFF}\} \\ 0.7 & \text{if } \{c_{i2} - c_{j2} \geq c^{DIFF}\} \\ 0.5 & \text{otherwise} \end{cases}$$

$$\sigma_i^{PROPORTION} = \frac{c_{i2}}{c_{i2} + c_{j2}}$$

Notice that because our investigation focuses on forward-looking, ex ante symmetric contracting, the allocation of shares in DELAYED NON-EQUAL contracts is based on stage II contributions and is independent of stage I contributions. The equilibrium structure is similar to the UPFRONT scenario. Different contracts feature different off-equilibrium path predictions for stage II, but identical (full effort) predictions for stage I. Complete characterization of the equilibrium is relegated to the supplementary materials.

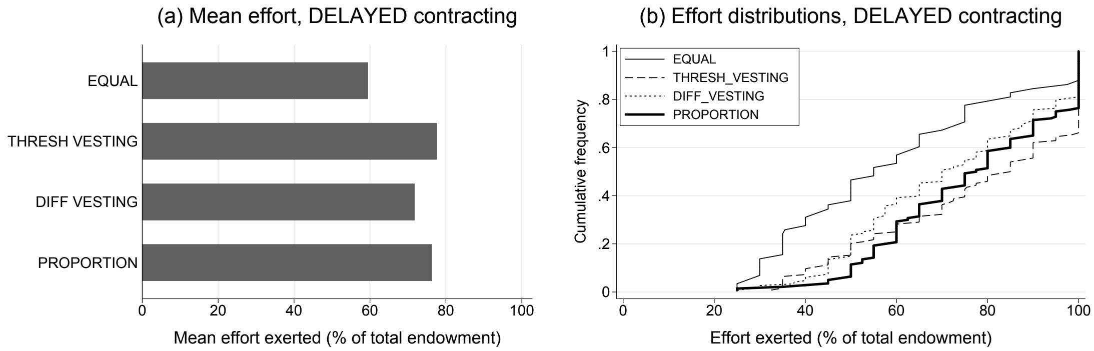
5.2. Experimental results

Aggregate effort and value levels (averaged over all contracts) are similar in the UPFRONT and the DELAYED treatments. On average, subjects invest 67 (70) percent of their effort endowment and their team value V is 278 (273) points in the UPFRONT (DELAYED) treatments.[9]

However, there appears to be an interactive effect of contract form and contracting time on effort (see fig. 2). In particular, the effort gap between EQUAL and NON-EQUAL contracts, as well as the gap among the NON-EQUAL contracts both shrink substantially in the DELAYED treatment relative to the UPFRONT scenario. When contracting is delayed, the gap between EQUAL and THRESH VESTING (DIFF VESTING) is 17.8 (12.3) percentage points. Further, THRESH VESTING exhibit effort levels on par with PROPORTION, while both THRESH VESTING and PROPORTION perform better than DIFF VESTING with the difference of 4.53 and 5.90 percentage points, respectively.

[9] Random effects regressions confirm that there are no significant effort or value differences between pooled UPFRONT and pooled DELAYED treatments ($p > 0.1$). However, teams split their effort endowments somewhat differently between stage I and stage II in UPFRONT and in DELAYED. Given the multiplicative structure of the startup value function ($V = V_1 \times V_2$) the efficient allocation of a fixed amount of effort (from the team perspective) would be to split effort evenly between the stages. Such even allocations of effort are observed in all UPFRONT contracting scenarios. In contrast, in all DELAYED NON-EQUAL scenarios subjects increase effort by 15 to 20% as they go from stage I to stage II.

Figure 2 Mean effort and effort distributions in the DELAYED treatment



5.2.1. Regression analysis Table 2 examines the effects of contracts on effort levels more formally, using random effects regressions. Column 1 shows that none of the stage I effort differences between contracts are statistically significant. This result is strikingly different from the UPFRONT scenario, in which we saw substantial stage I effort differences between contracts. Column 2 shows that both VESTING and PROPORTION contracts are associated with increased stage II effort relative to EQUAL contracts (all $p < 0.01$). However, these effort differences shrink by about 60 to 70 percent, relative to the UPFRONT scenario suggesting that contract form and contracting time have an interactive effect on effort. Column 3 of table 2 shows that the effect of V_1 on effort is significant ($p < 0.01$), but the strength of the effect is, again, reduced relative to the UPFRONT scenario (UPFRONT: $\beta = 0.821(0.117)$, DELAYED: $\beta = 0.369(0.088)$). Column 4 suggests that this is driven primarily by a drop in the effect of stage I partner contribution on subsequent effort, both in terms of magnitude and statistical significance (UPFRONT: $\beta = 0.742(0.130)$, DELAYED: $\beta = 0.197(0.129)$).

In sum, in the DELAYED scenario more egalitarian regimes perform better while the contribution-proportional regime performs slightly worse relative to the UPFRONT scenario. Further, partners' stage II effort is less sensitive to mutual stage I effort levels. Both these effects may be driven by the availability of effort information prior to contracting, allowing founders to identify free-riders early on and to reduce the appeal of free riding by choosing NON-EQUAL contracts. This behavior will be examined next.

5.2.2. Negotiation dynamics and contract choices in DELAYED Similarly to the UPFRONT scenario, each contract is chosen by a non-trivial share of the teams in each experimental round, and no contract dominates the contracting decisions in the DELAYED treatment. However, an examination of the negotiation dynamics reveals some important differences between the UPFRONT and DELAYED treatments. In particular, in the DELAYED scenario teams negotiate longer (UPFRONT: 23.47 seconds, DELAYED: 34.99 seconds, random effects regression:

Table 2 Effects of contract form on effort in the DELAYED treatment

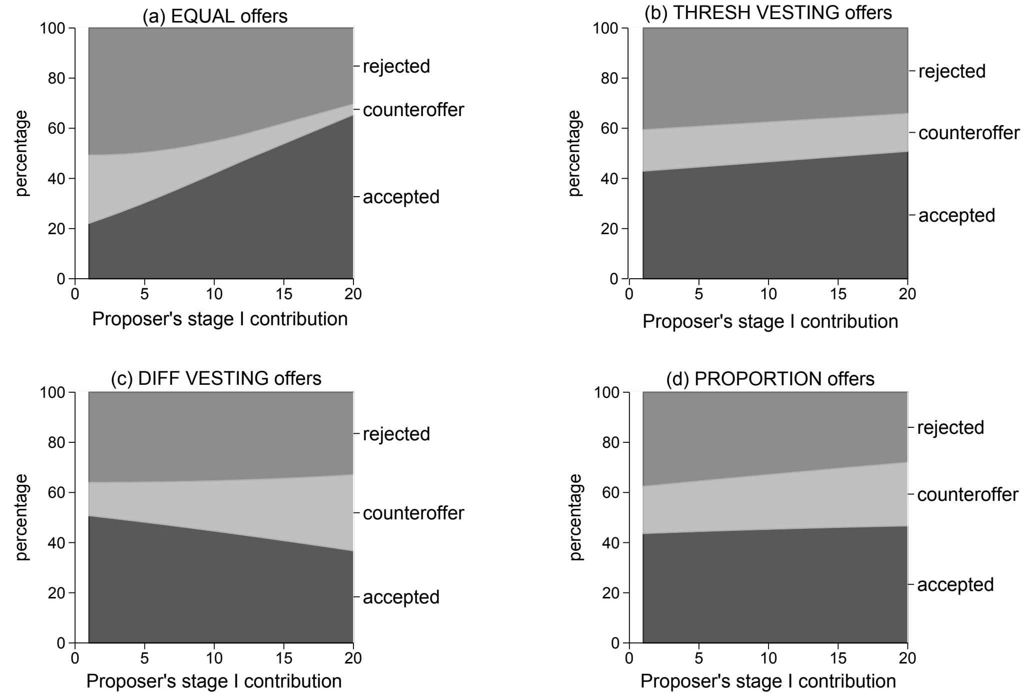
	Treatment: DELAYED	Treatment: DELAYED	Treatment: DELAYED	Treatment: DELAYED
Dep. Var:	stage I effort	stage II effort	stage II effort	stage II effort
EQUAL	baseline	baseline	baseline	baseline
THRESH VESTING	2.508	12.501***	13.128***	12.479***
	(3.348)	(4.123)	(4.116)	(4.163)
DIFF VESTING	0.272	11.154***	11.664***	11.175***
	(2.867)	(3.536)	(3.523)	(3.549)
PROPORTION	0.804	16.611***	17.318***	16.680***
	(3.266)	(3.965)	(4.002)	(3.999)
V_1			0.369***	
			(0.088)	
Own stage I multiplier				0.356
				(1.022)
Partner stage I contribution				0.197
				(0.129)
Constant	36.624***	40.602***	37.131***	39.497***
	(12.248)	(12.032)	(11.565)	(12.144)
Observations	470	470	470	470
Subjects	56	56	56	56
	Tests of linear combinations of coefficients			
THRESH VESTING− DIFF VESTING	2.235	1.347	1.465	1.304
	(2.041)	(2.245)	(2.262)	(2.245)
THRESH VESTING − PROPORTION	1.704	-4.110*	-4.189*	-4.201*
	(2.166)	(2.273)	(2.287)	(2.377)
DIFF VESTING − PROPORTION	-0.531	-5.457**	-5.654**	-5.505**
	(1.977)	(2.367)	(2.303)	(2.296)

Note. Dependent variable is stage I effort (columns 1) and stage II effort (columns 2-4). Regression coefficients are obtained using random effects regression, standard errors clustered at subject level. Two observations were removed because the team was not able to agree on a contract. Five of the six experiment sessions involved 8 experimental periods, one session involved 10 experimental periods (programming error). Qualitative results are not sensitive to omitting that session. Controls: age, gender, experimental period.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

$p < 0.001$) and exchange significantly more offers before agreeing on a contract (UPFRONT: 2.09 offers, DELAYED: 3.04 offers, $p < 0.001$). These results suggest that individuals are more persistent in pursuing their contract preferences when contracting is delayed.

Further, our data suggest that the increased intensity of the negotiations in the DELAYED scenario is driven primarily by the teams arguing about choosing (or not) EQUAL division contracts.

Figure 3 **Response to contract proposals, as a function of proposer's stage I contribution (DELAYED)**



Note. Predictive margins of response to contract offers are displayed. Predictions are obtained using Multinomial Logit regressions of response (0: reject, 1: counteroffer, 2: accept) on the proposer's contribution level. Standard errors are clustered at subject level. For the regression specification and detailed estimation results see Appendix A.

On average, when EQUAL contracts are mentioned during the negotiations teams spend more time negotiating (49.15 seconds vs. 27.87 seconds, random effects regression: $p < 0.001$) and exchange more offers (4.73 offers vs. 2.18 offers, $p < 0.001$), relative to the teams that do not consider EQUAL contracts.

In addition to increased negotiation intensity in the DELAYED scenario, the probability of the partner accepting an EQUAL offer is positively correlated with the proposer's stage I contribution level ($\rho = 0.20,\ p = 0.056$). Indeed, EQUAL contract proposers can convince their partners to agree to an equal split only if they show evidence of high effort, as shown in figure 3 (see Appendix A for estimation details). Specifically, if the proposer contributes nothing to the startup in stage I, her EQUAL offer will be accepted with 20% probability. However, if the proposer contributes the maximum possible value, 20 points, then her offer will be accepted with 60% probability. On average, the odds of an EQUAL contract being accepted increase by 11% with each contribution point ($p = 0.042$). In contrast, the probability of acceptance is near-constant at 40 to 50 percent for each NON-EQUAL contract, as illustrated in figures 3(b)-(d). In fact, the relationship between the proposer's contribution level in stage I and her partner's response is not statistically significant for any NON-EQUAL split offer ($p > 0.268$).[10]

In sum, the analysis of the negotiation dynamics suggests that with delayed contracting initial effort is an important signal used by teams to decide on the contracts. The availability of effort information affects equal contract proposers who are scrutinized more closely by their partners prior to agreeing to an equal split offer.

5.3. Discussion

When contracting happens prior to the start of collaboration equal division contracts are associated with poor performance, mainly due to self-selection of free-riders into equal contracts. But, when contracting is delayed the effort and value gap between equal and non-equal contracts narrows by more than 60% relative to the upfront scenario. Further, the performance gap among the non-equal contracts, too shrinks to a minimum; in fact effort and value levels in the different non-equal contracts become statistically indistinguishable.

Our investigation of the negotiation dynamics suggests that the narrowing of the contract performance gap is the result of the change in the information available to the team when they select contracts. With upfront contracting, the contract offers are the only signal available to the teams and there are few barriers for free-riders to select into equal division contracts. Further, free-riding (and cooperative) behaviors are reinforced as team partners reciprocate to each other's initial contributions levels. Together, these effects lead to a robust performance gap between equal and non-equal contracts. However, with delayed contracting initial effort is another signal into the personal characteristics of the proposer. Free-riders are revealed early on by their partners, who can refuse equal contracts if they observe low initial effort signals. Further, robust contributors are also revealed early on and others are willing to sign equal contracts with them.

The positive effect of delayed contracting on equal contract performance, while being conjectured in the entrepreneurial contracting literature, has not been validated by data (Hellmann and Wasserman 2016, Jared 2016). More generally, the entrepreneurship literature is hesitant to recommend delayed contracting listing two undesirable features of postponing the negotiations. First, not knowing how their efforts will be rewarded, founders may be reluctant to invest effort in the pre-contracting stages. Second, the value of the business (often) increases over time raising the stakes for the founders, which may lead to increased conflict potential and extend the negotiations (Wasserman 2012). Our data confirm both these features of delayed contracting. However, our results show that these effects are dominated by the additional effort information exchanged prior

[10] Figure 3 uses Multinomial Logit predictions with the response to contract offer as dependent variable (0: accept, 1: counteroffer, 2: reject). For robustness we repeat the analysis using random effects Logit regressions with a binary dependent variable (0: accept, 1: not accept) and find similar results.

to the negotiations, allowing founders to match contracts to personality type. For founders who are concerned with free-riding in their teams but skeptical about performance-based contracts, these results suggest that delaying the contracting can improve performance.

In sum, in the delayed contracting scenario teams' contracting decisions are driven at least partly by the initial effort signals, with the consequence that undesirable founder types are no longer able to self-select into equal contracts. However, the new information available to teams prior to contracting may have other, more indirect effects on behavior of both undesirable and desirable founder types. The next section examines these effects more closely.

6. Characterization of types' preferences and behaviors

Our results so far indicate that the effort gap between contracts is driven primarily by the differences in personal characteristics of individuals who select these contracts. Further, the information available to the team prior to contracting matters for contract performance. In the UPFRONT scenario revealed negotiation preferences is the only information available to negotiators, but in the DELAYED scenario teammates have additional information to incorporate into their expectations for future performance. In this section we examine these selection dynamics from a new angle, introducing a taxonomy of personality types who signal their type by the contract form they favor in negotiations. Specifically, our data suggest three types—low contributors, conditional contributors and high contributors—and these behave differently in negotiations and perform differently even under identical contracting regimes and when faced with different partner behaviors.

The examination of type behaviors addresses three open questions in our investigation. First, we have seen that behaviors in our data are driven not solely by self-interest, or at least not in ways predicted by standard incentive theory, so it is useful to characterize the relevant drivers of behavior more explicitly. Second, we have shown that EQUAL contracts attract free-riders. However, it is also useful to examine the differences between those who favor VESTING and those who favor PROPORTION contracts. Third, effort information available to the team prior to contracting has been shown to affect contract performance. Given that each personality type may put different weights on different outcomes, it may be worthwhile to examine how this additional effort information interacts with the types' preference structures.

We next discuss type assignment, the preference structure of each type and type behaviors in each treatment. The description of our estimation methodology, the robustness analyses and a more detailed discussion of the estimation results are left to the supplementary materials.

6.1. Type assignment and types' preferences

While there are many procedures to divide the subject population into types, we use the contract offers subjects accept and reject in negotiations. These negotiation data give a more nuanced

Table 3 **Types' preference structure.**

	Relevance for type		
Factor	*Low contributor*	*Conditional contributor*	*High contributor*
Own profit	Yes (marginally sign.)	Yes	Yes
Profit differences within team	No	Yes	No
Effort differences within team	No	Yes	No
Exerting less effort than partner	Yes	No	No

Note. Each factor is computed in terms of expected values. Profit differences within team are computed in relative terms, based on the expected deviation of the share allocated to player i and the 50% norm (Bolton and Ockenfels 2000). Effort differences are computed as expected absolute difference between own effort and partner effort. "Yes" indicates that the corresponding factor is associated with a statistically significant utility coefficient in the type's utility function ($p < 0.01$). "No" indicates that the factor is not associated with a statistically significant utility coefficient in the type's utility function ($p > 0.1$). For detailed results see the supplementary documents.

window into personality types than the final contracts, because they reflect individual preferences for different division rules (and not team consensus). In our case, the availability of three contractual alternatives lends itself to a three-type taxonomy (low contributors, conditional contributors and high contributors) with each type preferring one of the three contract forms (EQUAL, VESTING, PROPORTION). The label choices for the types will become clear below.[11]

To allow insight into the drivers of type behaviors we use Conditional Logit analysis (McFadden 1973). The range of Conditional Logit uses is extensive, but the closest application to ours is the analysis of distributional preferences in the experimental economics literature (see Frey and Meier 2004, Bardsley and Moffatt 2007, Cappelen et al. 2007, Moffatt 2016). In these studies, and in ours, Conditional Logit is used to characterize the preferences of a population by estimating the coefficients in utility models that account for self-interest (profit maximization) and a range of nonself-interest factors. The functional forms of these models are chosen based on their ability to explain the data, both in terms of adding intuition and their econometric fit.

6.1.1. Results Our estimation results indicate that all types are at least partly concerned with own profit maximization. However, the extent to which other factors (not related to narrow self-interest) affect their decisions differs by type. In particular, low contributors are primarily driven by the desire to work less yet share equally in any profits generated. Further, they put the lowest weight on their own profits relative to the remaining types; in fact the utility coefficient on their own profit is only marginally significant. Indeed, our models show that low contributors are the only type who will tolerate lower earnings if they can invest less effort than their partners. Conditional

[11] We identify low (conditional, high) contributors as subjects who prefer EQUAL (VESTING, PROPORTION) contracts to other contract forms in the initial three experimental rounds. We pool THRESH VESTING and DIFF VESTING into one category because we do not find substantial differences in behaviors between subjects who prefer one of these contracts.

contributors care more about own profits than low contributors, but are also concerned with effort and payoff of their partners. They will tolerate lower earnings if they can avoid discrepancies in both effort and profits in the team. High contributors are not concerned with anything other than their own payoffs. None of the coefficients on other, nonself-interest factors are statistically significant for them. Table 5 summarizes these results.[12]

6.2. Type behaviors

We next contrast type behaviors in the UPFRONT and DELAYED treatments. We use effort and contracting data from experimental periods 4-8 for these comparisons (Periods 1-3 are excluded because they were used to assign subjects to types).

6.2.1. UPFRONT treatment Figure 4(a) shows the contracts preferred by each type.[13] The data reveal that low contributors prefer EQUAL and PROPORTION contracts to VESTING contracts. Conditional contributors are not entirely opposed to EQUAL contracts and PROPORTION contracts, but typically lead with VESTING offers. High contributors express a preference for PROPORTION contracts most of the time. They never lead with EQUAL contracts, but sometimes accept and offer VESTING contracts.

The differences in revealed contract preferences of the types were confirmed in Probit regression analysis. Conditional contributors exhibit a stronger preference for VESTING and a weaker preference for EQUAL contracts relative to low contributors, whereas high contributors exhibit a stronger preference for PROPORTION contracts relative to conditional contributors (all $p < 0.05$, see Table B.1 in Appendix B for the estimation results). These preferences align with intuition. Further, the types differ not only in the contracts they favor, but also in the contracts they end up selecting (See column 2 in Table B.1), confirming that the personality mix differs significantly between contracts.[14]

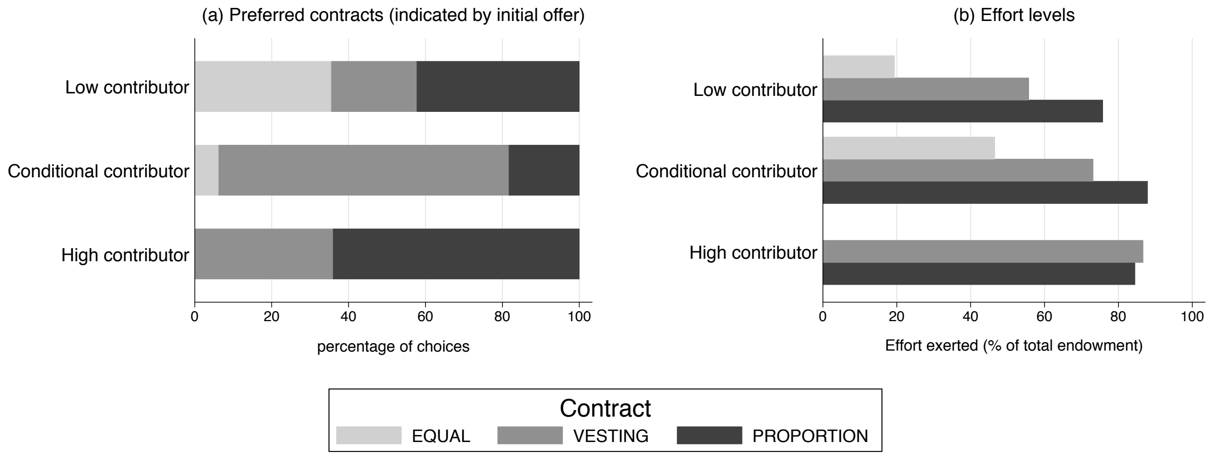
We now turn to the differences in effort levels between the types. Figure 4(b) reveals that both low and conditional contributors' effort levels are sensitive to the chosen contract form, whereas high contributors are indifferent to the contract form. Further, low contributors exhibit lower

[12] In this analysis, the utility coefficients are estimated using the UPFRONT data. The reason for omitting the DELAYED data in the utility analysis is the interaction of effort signals and revealed contract preferences in the DELAYED scenario. Detailed description of type assignment for both UPFRONT and DELAYED treatments and the characterization of the utility functions is relegated to the supplementary documents.

[13] We measure contract preferences of the types by tracking the initial contract offers they make in the negotiations. If a subject makes no offers in a given round we use the contract he/she accepts in the negotiations. For robustness we replicate the analysis using rejection and acceptance rates of contracts, for each type. These robustness checks yield similar results.

[14] The result that low contributors prefer PROPORTION to VESTING contracts may appear surprising. However, recall that low contributors care mainly about working less than their partners. This can be done most easily in PROPORTION contracts, in which partner effort is highest among all contracts.

Figure 4 Contract preferences and effort levels by personality type (UPFRONT treatment)



Note. Contract preferences show the shares of first contract proposals for each type in the UPFRONT treatment (If a subject did not propose any contracts in a given round, he/she is assigned the first contract he/she accepts). Effort comparisons show total (stage I + stage II) effort as a percentage of endowment. The bar for high contributors in EQUAL is omitted in panel (b) because high contributors never select EQUAL contracts.

effort levels in each contract form relative to the remaining groups. To examine these differences more formally we regress effort levels on the personality type dummy variable and the chosen contract (for estimation results see table B.2 in Appendix B). Indeed, our regression results confirm that low contributors exhibit lower effort relative to both conditional and high types, even after controlling for the contract. Further, comparisons of within-type effort levels suggest that both low and conditional contributors are more sensitive to the contract form than high contributors and that conditional types are the only ones who adjust their stage II effort levels based on observed stage I partner effort (for estimation results see table B.3 in Appendix B).[15]

6.2.2. DELAYED treatment In the UPFRONT treatment individuals signal their type by the contract offers they make and accept in the negotiations. However, in the DELAYED scenario initial effort is another signal that may affect how types behave in the negotiations. Therefore, rather than identifying types based on their initial contract offers (as we did in the UPFRONT scenario), we assign types based on type similarity scores that are computed for each subject based on their contracting and stage II effort decisions.[16]

[15] We also examine whether types differ in the extent to which they act according to the equilibrium predictions. We examine differences in type behavior when equilibrium analysis predicts full effort provision and when it predicts zero effort provision in stage II and find that both low and conditional contributors deviate from the equilibrium predictions more often than not, and by large amounts, whereas high contributors act in accordance with equilibrium predictions in 73% of the cases.

[16] To account for the differences in the initial partner efforts subjects see prior to contracting, we use these data to compute the utility that each subject would enjoy conditional on being low, conditional or high type, given the

Comparisons of type behaviors reveal that the availability of additional effort information changes the contract forms each type prefers in the negotiations and also affects the effort levels they exhibit in contracts. In particular, we have seen that low contributors want to maximize their own payoffs, subject to low effort expenditure. In the UPFRONT treatment, these preferences led to low contributors self-selecting into EQUAL contracts. However, in the DELAYED treatment free-riding intent is revealed early on, with the consequence that low contributors are forced to either increase initial effort (so that others sign equal contracts with them) or choose NON-EQUAL contracts. Our results show that both these behaviors indeed occur in the DELAYED scenario (Detailed results are relegated to the supplementary documents).

When contracting happens prior to collaborating, conditional contributors are not entirely opposed to EQUAL contracts, but prefer VESTING contracts in which they can avoid excessive free-riding and also reduce profit discrepancies in the team. However, because they are facing more desirable behaviors in DELAYED EQUAL contracts, they become more receptive to EQUAL offers, particularly when they see high initial effort.

High contributors are strongly opposed to EQUAL contracts in the UPFRONT treatment. They exert maximum effort and prefer the strongest incentive scheme to induce their partners to do the same. However, if they observe high initial efforts they may be less inclined to insist on PROPORTION contracts, particularly if they believe that initial effort is predictive of future behavior. This should lead to the high contributors becoming more receptive to both EQUAL and VESTING contracts, relative to the UPFRONT scenario. Indeed, our data show that high contributors sometimes (though still less frequently than other types) choose EQUAL contracts, and also continue contributing near-maximum effort in DELAYED EQUAL.

In the aggregate, in the DELAYED scenario low contributors select into EQUAL contracts at a lower rate, while conditional and high contributors select into EQUAL contracts at a higher rate, relative to the UPFRONT scenario. This results in a more even personality mix in each contract, reducing effort and value differences between contracts.

6.3. Discussion

Our data reveal the presence of three behavioral types (low, conditional and high contributors) that differ in their motives and behaviors. While all three types prefer more profit to less, the preference structure for two of the three types is more complex and features tradeoffs of profit for other considerations. Specifically, low contributors do not want to work more than their partners,

contracting and stage II effort decisions they make. Using subjects' decisions in periods 1 through 8 we then compute the posterior probabilities for each subject of being the low, conditional or high contributor type and assign each subject to the type with the highest posterior probability. Our estimation procedure and estimation results are described in detail in the supplementary materials.

and will tolerate lower payoffs if they can work less than their partner. Conditional contributors dislike discrepancies in both effort and payoffs within the team. High contributors are driven by self-interest alone, in line with the preferences frequently assumed in standard economic analyses.

In the upfront scenario contractual offers and responses to these offers are the only signals that founders have to work with. Low contributors signal their type by offering and accepting equal contracts, because these allow them to work less yet share equally in any profits generated. If low types end up in non-equal contracts they are not indifferent to incentive strength, but still exert lower effort relative to any other group in that contract. Conditional contributors prefer vesting contracts because these reduce pay inequalities, relative to proportional splits, and at the same time limit free-riding behaviors, relative to equal splits. Conditional contributors' effort levels differ with the contract, however a significant part of the within-type effort difference is driven by their attempts to match partner effort and not by the incentive strength of the contract. High contributors are not concerned with anything other than their own payoffs. They exert near-maximum effort and prefer proportional contracts to vesting, because the former hold their partners fully accountable for their actions. Further, high contributors strictly avoid equal contracts.

When contracting happens upfront, these behaviors lead to the low contributors being overrepresented in equal contracts, and the other types being overrepresented in non-equal contracts. That is, equal contracts are bad for team performance, not primarily because of their incentive strength but because of the founder types that self-select into them. But, in the delayed contracting scenario, founders have additional information to work with: the initial contribution of their partner. Low contributors are revealed and others do not want to sign equal contracts with them. Further, robust contributors are also revealed which reduces others' reluctance to sign equal contracts with them. Together, these behaviors result in low contributors no longer being over-represented in equal contracts. More generally, since it is founder type rather than the contract type (strength of incentives) that primarily impacts behaviors, with a stronger signal of type the contract form becomes less important leading to a more even distribution of types over contracts and to smaller effort and value differences between contracts, relative to the upfront scenario.

Taken together, these results add texture to the signaling and selection dynamics described in the previous sections. Different personality types have different desires, and they pursue these desires consistently, in each contracting regime. However, the availability of effort information that is not tied to contract means that in the delayed scenario different contracts can attract their attention. For startup contracting in practice these results suggest that the presence of undesirable personality types in the team can be best handled by delaying the negotiations until further downstream in the entrepreneurial innovation process.

7. Concluding remarks

This is the first experimental test to our knowledge of the relationship between contract form and contracting time and effort and value generation in startups. Our results confirm the conventional finding that equal splits are poor choices, but suggest that this is driven not by the incentive differences between contracts, but mainly by the differences in personality types. Equal splits are proposed and embraced by the least desirable personality types who prefer working less than their partners even when this harms their profits. Contribution-dependent contracts attract high contributors who invest high effort and prefer the strongest incentive for the partner to do the same.

We also find a smaller contribution gap, between partially performance-dependent (vesting) contracts and fully performance-dependent contracts. This is, again, driven by the differences in personality type. Vesting contracts are preferred by individuals who care not only about their own payoffs, but also dislike disparities in both, effort levels exerted by the team and payoff levels. In contrast, individuals who choose fully performance-dependent contracts are guided entirely by self-interest.

When contracting happens upfront, individuals can often select contracts that align with their preferences. This generates a substantial effort gap between equal contracts (dominated by undesirable personality types) and non-equal contracts (dominated by desirable types). As a result, teams choosing equal contracts generate only half of the value relative to the teams choosing non-equal contracts. However, when contracting is delayed the effort and value gap between equal and non-equal contracts shrinks by about 60 percent and the differences between the non-equal contracts disappear completely.

The narrowing of the performance gap between contracts is the result of the change in the signaling and selection dynamics. When contracting happens upfront revealed contract preferences are the only signal available to the team, but in the delayed scenario there is an additional (costly) effort signal that parties use to indicate who they are and how they will behave in the future. In the presence of this additional signal, equal contracts are accepted only when equal contract proposers demonstrate that they are worthy of an equal split, by exerting high initial effort.

Our findings have several implications for startup investors. Our results confirm the conventional wisdom that investors should avoid startups with equal equity splits between founders. However, equal contracts chosen further downstream in the entrepreneurial process are markers of a more desirable personality mix, relative to equal contracts selected early on. Hence, information about when and how the contract was chosen is as important as the contract form and should be included into the investors' due diligence process.

Our findings also have implications for startup founders. Because personality characteristics are the primary driver of behavior founders should pay as much (or more) attention to personality type as they do to contract form. For a given mix of personality types, however coalesced, the contract form can make a difference. However, especially in the early stages founders may have neither the flexibility to change the composition of their teams, nor the ability to include stringent terms into their equity contracts. In such situations, delaying the contracting can improve performance.

Our investigation focuses on founder teams formed by peers with few differences in prior founder experience, who can (at least initially) be expected to add similar value if they decide to participate in the venture. Such teams are a common, but not the only form of early-stage startups. An important next step is to examine the effects of different contracting regimes in teams that are more asymmetric and differ in seniority (founder/advisor or inventor/first-employee teams) and expertise (technical-developer/marketer teams).

References

Ambrus A, Greiner B (2012) Imperfect Public Monitoring with Costly Punishment: An Experimental Study. *The American Economic Review* 102(7):3317–3332.

Balafoutas L, Kocher MG, Putterman L, Sutter M (2013) Equality, equity and incentives: An experiment. *European Economic Review* 60:32–51, ISSN 00142921.

Bao J, Wu A (2017) Equality and Equity in Compensation.

Barber AE, Roehling MV (1993) Job postings and the decision to interview: A verbal protocol analysis. *Journal of Applied Psychology* 78(5):845–856, ISSN 0021-9010.

Bardsley N, Moffatt PG (2007) The experimetrics of public goods: Inferring motivations from contributions. *Theory and Decision* 62(2):161–193, ISSN 00405833, URL `http://dx.doi.org/10.1007/s11238-006-9013-3`.

Belt JA, Paolillo JG (1982) The Influence of Corporate Image and Specificity of Candidate Qualifications on Response to Recruitment Advertisement. *Journal of Management* 8(1):105–112.

Bochet O, Page T, Putterman L (2006) Communication and punishment in voluntary contribution experiments. *Journal of Economic Behavior and Organization* 60(1):11–26, ISSN 01672681.

Bolton GE, Ockenfels A (2000) ERC: A Theory of Equity, Reciprocity, and Competition. *The American Economic Review* 90(1):166–193.

Bornstein G, Weisel O (2010) Punishment, Cooperation, and Cheater Detection in Noisy Social Exchange. *Games* 1(1):18–33, ISSN 20734336.

Breugst N, Patzelt H, Rathgeber P (2015) How should we divide the pie? Equity distribution and its impact on entrepreneurial teams. *Journal of Business Venturing* 30(1):66–94, ISSN 08839026.

Cappelen AW, Hole AD, Sorensen E (2007) The Pluralism of Fairness Ideals: An Experimental Approach. *The American Economic Review* 97(3):818–827.

Cappelen AW, Sørensen E, Tungodden B (2010) Responsibility for what? Fairness and individual responsibility. *European Economic Review* 54(3):429–441, ISSN 00142921.

Corgnet B, Sutan A, Veszteg RF (2011) My teammate, myself and I: Experimental evidence on equity and equality norms. *Journal of Socio-Economics* 40(4):347–355, ISSN 10535357.

Dal Bó P, Foster A, Putterman L (2010) Institutions and Behavior: Experimental Evidence on the Effects of Democracy. *The American Economic Review* 100(December):2205–2229, ISSN 0002-8282.

Deutsch M (1975) Equity, equality and need: What determines which value will be used as the basis of distributive justice? *Journal of Social Issues* 31:137–149.

Encinosa WE, Gaynor M, Rebitzer JB (2007) The sociology of groups and the economics of incentives: Theory and evidence on compensation systems. *Journal of Economic Behavior and Organization* 62(2):187–214, ISSN 01672681.

Engel C (2014) Social preferences can make imperfect sanctions work: Evidence from a public good experiment. *Journal of Economic Behavior and Organization* 108:343–353, ISSN 01672681.

Farrell J, Scotchmer S (1988) Partnerships. *The Quarterly Journal of Economics* (May):279–297.

Fehr E, Goette L, Zehnder C (2009) A Behavioral Account of the Labor Market: The Role of Fairness Concerns. *Annual Review of Economics* (1):355–384, ISSN 1941-1383.

Fischbacher U (2007) Z-Tree: Zurich toolbox for ready-made economic experiments. *Experimental Economics* 10(2):171–178, ISSN 13864157.

Frey BS, Meier S (2004) American Economic Association Social Comparisons and Pro-Social Behavior : Testing " Conditional Cooperation " in a Field Experiment Published by : American Economic Association Stable 94(5):1717–1722.

Graham P (2004) *Hackers and Painters* (O'Reilly Media, Inc.).

Grechenig C, Nicklisch A, Thoni C (2010) Punishment despite Reasonable Doubt A Public Goods Experiment with Uncertainty over Contributions. *Journal of Empirical Legal Studies* 7(4):1–32, ISSN 17401453.

Gürerk Ö (2013) Social learning increases the acceptance and the efficiency of punishment institutions in social dilemmas. *Journal of Economic Psychology* 34(October):229–239, ISSN 01674870.

Gürerk Ö, Irlenbusch B, Rockenbach B (2006) The Competitive Advantage of Sanctioning Insitutions. *Science* 312(August 2016):108–11, ISSN 0036-8075.

Gürerk Ö, Irlenbusch B, Rockenbach B (2009) Voting with feet: community choice in social dilemmas. *Uni Erfurt Working Paper* (4643):1–46, URL `http://papers.ssrn.com/sol3/papers.cfm?abstract{_}id=1526073`.

Hellmann TF, Wasserman N (2016) The First Deal: The Division of Founder Equity in New Ventures. *Management Science* 1–23, ISSN <null>.

Jared NWD (2016) *Timing of reward allocations.* Doctoral dissertation, Natinal University of Singapore.

Konow J, Saijo T, Akai K (2009) Morals and mores? Experimental evidence on equity and equality. *Working Paper* (June).

Kroll M, Walters B, Le SA (2007) the Impact of Board Composition and Top Management Team Ownership Structure on Post-Ipo Performance in Young Entrepreneurial Firms. *Academy of Management Journal* 50(5):1198–1216, ISSN 00014273, URL `http://dx.doi.org/10.2307/20159920`.

Loch CH (2016) Creativity and Risk Taking Aren't Rational: Behavioral Operations in MOT. *Production and Operations Management* 26(4):591–604, ISSN 10591478.

Luhan WJ, Poulsen O, Roose MWM (2013) Unstructured bargaining over an endogenously produced surplus and fairness ideals: an experiment.

McFadden D (1973) Conditional logit analysis of qualitative choice behavior.

Metrick A, Yasuda A (2010) *Venture capital and the finance of innovation* (John Wiley & Sons), ISBN 9780470074282.

Moffatt PG (2016) *Experimetrics: Econometrics for Experimental Economics* (London: Palgrave Macmillan).

Morgan WR, Sawyer J (1979) Equality , Equity , and Procedural Justice in Social Exchange. *Social Psychology* 42(1):71–75.

Moyer M (2012) *Funding Your Business Without Funds* (CreateSpace).

Nachum G (2015) Milestone-Based Vesting For Startup Founders. *Tech Crunch* URL `https://techcrunch.com/2015/12/09/milestone-based-vesting-for-startup-founders/`.

Ng P, Wong WK, Xiao Z (2011) Stochastic Dominance via Quantile Regression (working paper).

Ostrom E, Walker J, Gardner ROY (1992) Covenants With and Without a Sword : Self-Governance is Possible. *The American Political Science Review* 86(2):404–417.

Pfeffer J, Langton N (1993) The Effect of Wage Dispersion on Satisfaction , Productivity , and Working Collaboratively : Evidence from College and University Faculty. *Administrative Science Quarterly* 38(3):382–407.

Putterman L, Tyran JR, Kamei K (2011) Public goods and voting on formal sanction schemes. *Journal of Public Economics* 95(9-10):1213–1222, ISSN 00472727, URL `http://dx.doi.org/10.1016/j.jpubeco.2011.05.001`.

Rapoport A, Au WT (2001) Bonus and Penalty in Common Pool Resource Dilemmas under Uncertainty. *Organizational behavior and human decision processes* 85(1):135–165, ISSN 0749-5978.

Rockenbach B, Wolff I (2016) Learning and Peer Effects Designing Institutions for Social Dilemmas Designing Institutions for Social Dilemmas. *German Economic Review* 17(104):316–336, ISSN 14680475.

Roth AE (1995) Bargaining Experiments. John Kagel and Alvin E Roth, ed., *Handbook of Experimental Economics*, 253–348 (Princeton University Press.).

Sahbaz FM (2013) *Study of the Principles of Distributive Justice in Entrepreneurial Teams*. Ph.D. thesis.

Sousa S (2010) Cooperation and Punishment under Uncertain Enforcement.

Sutter M, Haigner S, Kocher MG (2010) Choosing the carrot or the stick? Endogenous institutional choice in social dilemma situations. *Review of Economic Studies* 77(4):1540–1566, ISSN 00346527.

Tyran JR, Feld LP (2006) Achieving compliance when legal sanctions are non-deterrent. *Scandinavian Journal of Economics* 108(1):135–156, ISSN 03470520.

Wasserman N (2012) *The founder's dilemmas* (Princeton University Press.).

Yuce P, Highhouse S (1998) Effects of Attribute Set Size and Pay Ambiguity on Reactions to 'Help Wanted' Advertisements. *Journal of Organizational Behavior* 19(4):337–352.