# Fairness Considerations in Joint Venture Formation*

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**Abstract**

Using a series of laboratory experiments in the context of bilateral bargaining over whether and how to engage in a joint venture, this paper shows that fairness concerns result in failures to undertake profitable joint production opportunities. We find that framing an opportunity as an employment relationship rather than as a partnership significantly reduces these inefficiencies and increases subjects' welfare. Consistent with the theoretical model developed in the paper, text analysis and a follow-up experiment demonstrate that the lower likelihood of an efficient outcome in the partnership frame is driven primarily by a concern for fairness generated by the perceived social relationship associated with partnerships, and not by differences in the economic structure, cognition, subject motivation, or changes in relative bargaining power.

**JEL Classification:** C92, D91, L14, D83

**Keywords:** Firm Formation, Fairness Concerns, Cooperative Bargaining, Organizational Structure

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# 1 Introduction

It is frequently assumed that in environments with full information and without contractual frictions or income effects, individuals who have a profitable opportunity to enter into a new venture will do so (Coase, 1960; Hellmann, 2007). In fact, there is evidence that people exit well-paying jobs to found new ventures even when expected profits are not positive (e.g. Artinger and Powell, 2016). Despite the well established notion that profitable opportunities are generally pursued when individuals are aware of them and capable of doing so (Shane, 2001), barriers to firm formation may restrict the capabilities of a potential entrepreneur to proceed with founding a venture. For instance, due to informational frictions, the formation of ventures may be dependent on whether a potential entrepreneur is connected to appropriate co-founders and early employees (Klepper and Sleeper, 2005). In this paper, we investigate an particular barrier to firm formation; contracting difficulties under full informatiom bargaining that arise when people are considering forming a new venture.

We study how bargaining between two people considering an opportunity to form a firm affect whether they form a firm and how they share the profits. We examine these questions by analyzing findings from laboratory experiments that allow us to observe difficulties that arise among people negotiating the terms of a new joint production agreement under full information depending on the profitability of the opportunity and their outside options. The contribution of the paper is threefold. First, we demonstrate that while subjects do not engage in unprofitable joint ventures, they frequently fail to engage in profitable ones. This failure is more likely when equal sharing of firm profits is not individually rational for one of the two participants. Second, we find that framing of the firm's organization affects how individuals exploit that opportunity even when there is no subsequent decision to be made after agreeing to produce jointly. Third, we show that organizational framing changes whether or not profitable joint ventures are formed by altering the likelihood that subjects incorporate outside options in defining fairness, and that this change is driven by the social contexts associated with different organizational frames.

In our experiments, subjects are randomly assigned into pairs and offered an opportunity to leave their current wage employment to enter into joint production with their pair mate. To pursue this joint production opportunity, a pair of subjects has to agree on which production specifications to choose, and how to divide the associated net profit. Pairs attempt to reach this agreement through free-form chat, creating a cooperative bargaining setting. If the pair mates agree on production

and the division of profits, their shares of the net profit determine their payoffs for that period. Otherwise, their payoffs default to their outside options. There is no uncertainty or information asymmetry in terms of the outside options, revenues, or production costs associated with joint production.[1] Moreover, choices, payoffs, and partners in one period have no bearing on the next period.

We first compare bargaining outcomes under two organizational forms: a partnership and an employment relationship. Under partnership, pair mates are labeled as partners. To engage in joint production, they have to agree on how to share firm revenues from which their individual production costs are deducted. Under employment, one randomly chosen member is labeled as the owner of the firm. The owner and the employee have to jointly agree on a salary for the employee in order for joint production to occur. The employer receives the amount remaining from the joint production revenue after costs and salary have been paid. All other particulars of the two organization forms are identical. Thus, the economic opportunities underlying the two organizational forms are identical, but they are framed differently.

Comparing bargaining outcomes for potential new ventures founded as partnerships versus those founded by a single founder who requires an employee to pursue the opportunity is directly relevant for potential firm founder decision making. In particular, a single firm founder rarely has all the resources required to pursue an opportunity and whether or not to bring on a co-founder partner or a first employee to fill those voids is a critical decision.[2] The extent to which there are bargaining advantages to an employee relative to a partner can help to inform this decision.

For each organizational form, we vary the parameters of the economic opportunity from joint production and outside options across periods in both frames to obtain three *cases*. Case 1: Net profit from joint production is less than the sum of the outside options. Case 2: Half of the net profit exceeds each outside option. Case 3: Net profit exceeds the sum of outside options, but one outside option is larger than half of the net profit.

Findings from our experiments demonstrate that inefficient choices under both organizational forms are made almost exclusively by choosing wage work over joint production when joint production is optimal. When choosing the outside options was optimal, subjects almost always chose

[1] Each agent knows the outside wage of their potential partner.

[2] Message boards and blog posts hosted by major start-up communities, including Y-Combinator, Medium, Inc.Com, and CoFoundersLab, demonstrate little consensus over whether to bring on a founding partner or to hire a first employee.

the outside option. Moreover, conditional on choosing joint production when it is optimal to do so, they chose the optimal production specification. There is a significant difference in the level of efficiency between the two frames. The probability that inefficient choices were made went down by more than a third, from 34.4% to 22%, and players' welfare increased by more than 18% under the employment frame relative to the partnership frame. Notably, more than 15% of the pairs that chose the optimal joint production mode in case 3 divided profits equally, violating one subject's individual rationality constraint, under the partnership frame. These individual rationality violations do not occur under the employment frame.

Consistent with the theoretical model we develop based on Fehr and Schmidt (1999)[3] to derive predictions about our empirical tests, chat logs and profit divisions demonstrate that subjects have different notions of fairness, and the proportion of subjects which hold these different notions changes under the different frames. In particular, we find that equal profit divisions are less likely to be offered in the employment frame than the partnership frame and that these equal profit offers are associated with a significantly higher likelihood of realized equal profit splits. We do not find compelling evidence that the differences across the two frames are caused by differences in cognition, differences in subject motivation, or differential bargaining power between owners and employees relative to partners.

To further hone in on why organizational framing can change perceptions about what is fair, we ran a third framing treatment, the "supplier" frame, in which the joint production profit functions offered to the chair and table maker are analogous to those in the partnership frame. However, under the supplier frame, subjects within a bargaining pair are referred to as independent suppliers instead of partners, invoking a purely business-like, or transactional, relationship. Inefficient outcomes in the supplier frame occur significantly less frequently than in the partnership frame, and are statistically as likely as in the employment frame. Moreover, equal profit sharing occurs significantly less in the supplier frame than in the partnership frame and as frequently as in the employment frame when equal sharing leads one pair member to be worse off than her outside option. These findings demonstrate that the social aspect of the partnership frame rather than its economic structure is the primary driving force behind subjects focusing on equality of joint production profits at the expense of outside option considerations under the partnership frame.

[3] A related paper is Charness and Rabin (2002), who investigate how social preference affects subjects' willingness to sacrifice own payoffs.

Combined, our findings suggest that potential co-founders of a firm are concerned about efficiency and fairness in distribution. Pareto efficiency is independent of framing, whereas fairness is not. Changing the frame may change how "fair" a deal is to potential participants. When such framing effects are quantitatively significant, organizational design (in this case, how roles are defined) affects the efficiency and equity of engaging in joint production. We show that framing the joint production opportunity as a business relationship rather than a social relationship results in more efficient outcomes. Concerns for fairness and equity are well known in the behavioral economics literature (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000; Hoffman and Spitzer, 1985; Kahneman et al., 1986). We build on this to show that fairness in firm formation depends on how the hierarchical structure of the organization is framed, even when there is no difference in the economic problem underlying the firm's formation. More generally, we provide suggestive evidence that fairness concerns may have negative macroeconomic impacts by reducing the likelihood of profitable firm formation. A similar result is found in a model of output sharing within teams in Gill and Stone (2015), where fairness concerns can lead to a significant level of inefficiency in team members' effort choices.

As far as we know, this is one of the first papers to allow for unstructured cooperative bargaining with a wide range of possible outcomes and potentially different outside options as modeled by Nash Jr (1950) by letting bargainers chat among themselves in a free-form format.[4] As our experiment includes only cooperative bargaining, we do not present a discussion of the large literature on experiments with ultimatum games and non-cooperative bargaining. The literature on experiments with unstructured bargaining process and free-form communication is relatively sparse. Roth and Murnighan (1982), Isoni et al. (2014), and Luhan et al. (2013) present experiments with unstructured bargaining. However, participants make their offers in an experiment-specific structured way and cannot chat via free-form texts, unlike in our setting. Gaechter and Riedl (2005) and Galeotti et al. (2018) do allow free-form communication, but the focus of the bargaining games are different from ours. Moreover, Galeotti et al. (2018) allow participants to choose from only two or three specific allocations where the total earnings vary across these options. On the other hand, subjects can reach a wide number of allocations in Camerer et al. (2017) where the total earning is fixed, but only one of the two participants knows the size of the total earning.

[4]Another recent example of free-form chat between players is provided by Huang and Low (2018), who analyze gender effect on negotiation strategies where subjects communicate using free-form chats prior to a battle of sexes game with a limited number of possible outcomes.

Our experimental design is somewhat similar to Exley et al. (2016) who analyze anonymous pair-wise bargaining over profit-wage splits in the lab but use a more structured bargaining protocol. They focus on the gender of the potential employee and find that women negotiate over their wage less frequently than men but perform better on average when they do negotiate. Perhaps more closely related to our study is Andreoni et al. (2002) who also find that concerns about equality can lead to non-equilibrium outcomes in two-people public goods games. However, participants in their experiments make decisions sequentially, rather than simultaneously, following an open chat negotiation. Moreover, they do not investigate whether organizational design alters this relationship. A number of related papers demonstrate concerns for fairness in ultimatum games (e.g. Gantner et al., 2001; Kagel et al., 1996) consistent with our finding that subjects have strong preferences for fairness which, in some cases, dominate their preferences for personal gain. One difference between most bargaining experiments and ours is that we systematically explore the effect of outside options, equal and unequal, on bilateral bargaining outcomes.[5] More generally, there is a large literature in experimental economics, both in the lab and in the field, that explore framing effects in different contexts such as contribution to public goods (Sonnemans et al., 1998; Rege and Telle, 2004), incentive effects (Hossain and List, 2012; Hong et al., 2015; de Quidt, 2017; Artinger and Powell, 2015), and intrinsic motivations to work (Hossain and Li, 2014). Our lab experiments show that framing affects efficiency levels of organizational design.

Our results are consistent with recent evidence in the organization economics literature that efficient joint production is difficult even in the absence of contractual frictions, impediments to bargaining, or income effects (Breza et al., 2017; Dessein and Santos, 2006; Hjort, 2014; Lyons, 2017). Moreover, we provide further evidence to a growing stream of literature demonstrating that preferences for pay equality have meaningful implications for productivity (Gartenberg and Wulf, 2017) and organizational design of firms (Feldman et al., 2018).

Our results also contribute to the entrepreneurship literature by demonstrating that how a co-founder agreement is framed may impact the likelihood of it being successful and how equity is divided. This latter point may be of particular practical relevance given recent evidence that equal equity divisions may reduce performance and co-founder effort. For instance, Hellmann and Wasserman (2016) observe a negative relationship between equal equity splits and valuations. Fur-

[5] A notable exception is Binmore et al. (1989) who present experimental results from alternating-offer bargaining with outside options and time discounting.

ther evidence that equal profit sharing presents real-world barriers for potential new firm founders, in a 2017 *Wall Street Journal* article, a venture capitalist identified the absence of a clear founding team leader as a primary reason she would avoid investing in a venture (Kornelis, 2017). Also consistent with inequity aversion affecting partner negotiations, a recent analysis performed by the McKinsey Consulting Company (Rinaudo and Rosqig, 2016)[6] reports that joint ventures take six to ten times longer to negotiate than acquisitions. Further consistent with a preference for equality in firm ownership, Bao and Wu (2017) present evidence that many technology start-ups offer employees with different levels of responsibilities equity compensation despite paying them unequal salaries, and they provide experimental evidence that preferences for equality are stronger for equity than salaries because it is perceived as scarce relative to cash. Our results suggest this preference and the problems that it presents potential firm founders may be alleviated by changing how a start-up employee's position is framed. Moreover, we add to Kagan et al. (2017), who find a negative relationship between equal equity divisions and subjects' performance in the lab, by demonstrating that self-selection into an equal split agreement can be impacted by the proposed organizational design as well as by participants' perception of fairness.

Our study also has important implications for potential firm founders and early stage start-up investors. In particular, our findings confirm prior evidence that equality concerns can erode efficiency in the early stages of firms; however, our findings also provide actionable recommendations for how to reduce these efficiency losses. Most notably, our results suggest find that clarifying co-founder roles, for instance by specifying who will play the role of CEO and reducing emphasis on the firm as a social partnership, can reduce co-founders' desire for equal equity splits.

The remainder of our paper proceeds as follows. We begin with a detailed description of our experiment design. We then present a theoretical model of bargaining where the players exhibit concerns for fairness. Based on this theoretical framework, we present the empirical results in Section 4. Section 5 describes and reports the results of the supplier treatment, and Section 6 concludes the paper by summarizing and discussing the implications of our study.

[6] https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/negotiating-a-better-joint-venture

## 2 Experimental Design

In our experimental setting, two subjects decide whether to create a firm to produce jointly instead of staying with their outside wage options. The experiments were conducted between December 2016 and March 2019 at the University of Toronto and were programmed and conducted with the software *z-Tree* (Fischbacher, 2007). Each laboratory session included an even number of subjects (ranging from 6 to 14) and was 20 periods long. The first five periods were considered practice periods, and the remaining 15 periods were used to determine the earnings of the subjects. The instruction text provided to subjects in all the treatments of this experiment are provided in an online appendix.[7]

In every period, each subject was randomly assigned the role of a chair maker or a table maker, and randomly and anonymously paired with another subject who was assigned the opposite role. At the beginning of a period, each subject was assigned as employed at a specific wage, which was reported to both subjects. The two subjects had the option of leaving their current jobs to jointly produce chairs and tables for a client. If they chose to produce jointly, they were required to choose one of four production specifications. The amount the client was willing to pay (revenue) and the costs of producing chairs and tables under each specification were reported to both subjects. The revenue and cost functions, and the outside options were exogenously determined. We presented only revenues from joint production and did not break the revenues down in terms of the contributions of the chair and table makers separately. As a result, the subjects could not identify their individual contribution to joint revenue from a particular production specification.

After observing the production possibilities and outside options, the subjects were asked to find the most profitable specification using the revenue and cost information. A firm's net profit for a given specification is defined as revenue minus the production costs of chair and table for that specification. Revenue and costs from all production specifications were deterministic, with no uncertainty in the production function.

Note that our experimental setting also constitutes a test of the idea that in a one-shot full information environment without contractual frictions, impediments to bargaining, or income effects, individuals who have a profitable opportunity to engage in joint production will do so (Coase, 1960). We created a setting where profits depend on both revenue and costs with four different

[7]The online appendix is available at http://www-2.rotman.utoronto.ca/tanjim.hossain/HLSOnlineAppendix.pdf.

production specifications for two reasons: first, to allow for the possibility that participants' abilities to solve the optimal production problem conditional on forming a firm varied depending on the frame and parameters; second, to present a richer bargaining problem in which both how to produce and how to divide gains from production are made. *Ex post*, we found that these issues did not have a meaningful impact on the creation of a firm in our experiments.

After subjects individually reported the production specification that they believe maximizes firm profit, a chat box within *z-Tree* opened up. The pair could then conduct free-form chat for two and a half minutes to discuss their plans for joint production.[8] Figure 1 displays how the chat program appeared to subjects. During the chat, subjects decided whether to produce jointly, the production specification for the firm (if formed), and the earnings of each subject from the firm (if formed). The exact structure of a subject's earnings depended on the framing of the roles of the two players within the firm as discussed in detail below. Once paired subjects made a decision regarding joint production, they could voluntarily end the chat. If they did not end the chat before the stipulated time limit, the chat ended automatically and the chat window closed. Once the chat ended, subjects individually indicated whether they had decided to produce jointly, or stay at their current jobs and not produce jointly, or were unable to reach an agreement. If paired subjects could not reach an agreement or decided to stay at their current jobs, the period ended and subjects earned their outside options. If both indicated that they had decided to produce jointly, they were first asked which production specification they had chosen, and, if both subjects' entries matched, they were asked about how they decided to allocate firm earnings. If paired subjects disagreed on either of these decisions, the period ended and they earned their outside options. If they agreed on all decisions, they earned their share of the new firm's profits.

**Framing:** Depending on the session, subjects were asked about how they decided to allocate firm earnings in different ways. Our main analysis revolves around two frames to describe the organization of jointly producing chairs and tables — *partnership* and *employment*. In the sessions under the partnership frame, each pair of subjects was referred to as partners. Each subject bore the cost of the product she produced (either chair or table) and received a share of the revenue. Thus, under joint production, each subject's earning was equal to the share of revenue that she received minus the cost of the product she produced. During the chat, pairs discussed whether to

[8] We allowed three minutes of chatting in the five practice periods. The time limit for chat was typically not binding.

produce jointly, which production specification to choose under joint production, and negotiated over their respective share of firm revenue. They entered this amount after entering their agreed-upon production specification. Under the employment frame, on the other hand, the chair maker was labeled as the firm owner and the table maker as the employee. Under joint production in this frame, the employee earned a salary determined by the two subjects during the chat. The owner bore the salary and production costs of both chairs and tables, and earned the full revenue. The owner's (chair maker) net earning equaled revenue minus the employee's salary and the two production costs. The structure of the chat remained unchanged relative to the partnership frame. The two subjects chatted to reach an agreement on whether they wanted to produce jointly, which production specification to choose under joint production, and the table maker's salary. During the reporting of the chat decisions at the end of the chat, both entered the salary of the employee (table maker) instead of revenue shares. Given the rules of determining each player's earning, the economic contents of the cooperative game under the two frames are the same. However, the nature of the firm is framed differently. Within a session, the framing remained unchanged across periods.

In a given period within a session, all subject pairs faced the same parameters. Parameters across periods were different. Moreover, the set of parameters in the five practice periods were the same in every session and their sequence was also unchanged. For the 15 paid periods, we used the same set of parameters in all sessions under both framings. However, we randomize the sequence of the parameters over the periods for each session to control for any order effects.

To represent different economic opportunities, we varied the maximum possible profit from joint production and the two players' outside options. The parameters for a given period were chosen to represent three different economic opportunities, which we refer to as *cases*. They are as follows: i) case 1: net profit from the profit maximizing joint production specification is lower than the sum of the outside options, making staying with current jobs preferable to producing jointly; ii) case 2: net profit from the profit maximizing joint production specification is higher than the sum of the outside options and splitting the net profit equally makes each subject better off relative to her outside option; and iii) case 3: while net profit from the profit maximizing joint production specification is higher than the sum of the outside options, splitting the net profit equally makes one subject strictly worse off relative to her outside option. Thus, joint production is sub-optimal under case 1 and optimal under cases 2 and 3. Pareto improvements due to joint production can be achieved by splitting the net profit equally or unequally between the subjects under case 2, but

it can only be achieved through unequal sharing of the net profit under case 3. We provide the full set of parameters subjects faced in Table 1.

As there is no uncertainty in this game, subjects were aware of their earnings, denoted in points, from a period at the end of that period. Nonetheless, we reported the final outcome in terms of firm formation, chosen production specification, revenue share/table maker's salary, and earning of each player within a pair for subjects' review. After participating in 20 periods, two periods between the 6th and 20th were randomly chosen to determine payments. The subjects were paid in cash according to their point earnings from those periods using the pre-specified exchange rate of $1 for 10 points. Subjects spent around an hour and 45 minutes in the lab from the beginning of the experiment to payment and on average received slightly more than $25. Subjects received written instructions about the session and a written guideline for appropriate chatting protocol. They also participated in a short survey about their degree majors and past experience with economic and psychology experiments before they were paid.

# 3 A Model of Bargaining with Preference for Fairness

In our experiments, subjects engage in a cooperative bargaining game with clearly defined outside options. To analyze what outcomes we can expect from this bargaining process, we present a theoretical model which incorporates individual notions of fairness. In this model, a player's utility equals her payoff when she receives her exogenously given outside option. However, when the players determine their earnings themselves through bargaining in a cooperative setting, fairness concerns arise.[9] We model player's utility from the bargaining outcome based on the model by Fehr and Schmidt (1999) where players receive disutility from unfair income distributions. As there is no outside option in their model, fair division would imply equality of income. On the other hand, when players have potentially unequal outside options, fairness may incorporate outside options, as is done for calculating Shapley values. Below, we describe the particulars of a simple game that is consistent with our experimental setting where two players bargain over dividing a pie of size $\pi$.[10] If they do not agree on a division of the pie, they receive their outside options which may be

[9]The first assumption simplifies the proofs and makes the results slightly more general. Nonetheless, similar results can be shown if we assume that players have fairness concerns when they receive outside options.

[10]Assuming that participants choose the optimal production specification if they produce jointly (which is supported by our empirical findings in the next section) we restrict attention to a fixed-sized pie and focus on whether players can reach an agreement on how to share it and how they divide the pie in case of agreement.

different for the two players.

Suppose that there are two players, denoted by 1 and 2, who are bargaining to share a pie of size $\pi$. If they fail to agree on how to share the pie, player $i \in \{1, 2\}$ receives her outside option, which gives her utility of $w_i > 0$. If they agree to share the pie and player $i$ accepts $x_i \geq 0$ with $x_1 + x_2 = \pi$, then player $i$'s utility from the bargaining outcome equals

$$u_i(x_1, x_2, w_1, w_2) = x_i - \alpha |x_1 - x_2 - \mathbf{1}_{O_i}(w_1 - w_2)|.$$

Here, $\alpha > 0$ and $\mathbf{1}_{O_i}$ is an indicator which equals 0 if for player $i$ a fair outcome means equal division of $\pi$ and equals 1 if for player $i$ a fair outcome is equal division of the surplus $(\pi - w_1 - w_2)$.[11] That is, some players define fairness in terms of absolute payoffs and others define it in terms of surplus relative to outside options. When both players have the same outside option (i.e., $w_1 = w_2$), player $i$'s utility does not depend on $\mathbf{1}_{O_i}$.

The two players agree to share the pie, giving up their outside options, if and only if there is some $x$ such that $u_i(x, \pi - x, w_1, w_2) \geq w_i$ for both. If no such $x$ exists then bargaining fails and they stay with their outside options, receiving utility of $w_i$.

Given our utility functions, a player's utility from receiving $x$ from the bargaining process is at most $x$. Under case 1, where the sum of outside options is smaller than $\pi$, any division of the $\pi$ will provide at least one of the players with utility strictly lower than her outside option. As a result, players will stay with their outside options under case 1.

If sharing the pie is optimal, players are more likely to bargain successfully to share the pie when equal splitting of the pie makes both better off (case 2) than when equal splitting of the pie makes one player worse off relative to her outside option (case 3). There are two reasons for this. First, when both players' fair division is an equal share of $\pi$, agreement will always occur under case 2, but may not occur under case 3 if $\alpha$ is high enough. Moreover, when only one player incorporates outside options in the fairness consideration, the cutoff level of $\alpha$ for which disagreement occurs is lower under case 3 than under case 2. We can generalize this intuition and show that, fixing the sum of the two players' outside options and the pie size, bargaining failure is less likely when both players' outside options are smaller than half of the pie (case 2) than when one player's outside

[11] We assume that the effect of inequality for a given player is independent of which player receives higher payoff or surplus, unlike in Fehr and Schmidt (1999). Nonetheless, this assumption is made only for expositional simplicity and does not affect the results qualitatively.

option is more than half of the pie (case 3).[12]

**Proposition 1.** *Bargaining failure is more likely in case 3 than in case 2.*

This proposition provides rationalization for our main result. Suppose that the proportions of players who consider equal division of surplus is the fair allocation under frame $j$ is $p_j$. Suppose also that the proportions $p_j$ is not too small for any framing considered in this paper. Specifically, $p_A + p_B > 1$ for any two frames $A$ and $B$. Then, for both cases 2 and 3, successful bargaining will occur more frequently under the frame under which a greater proportion of people consider equal division of surplus to be the fair allocation.

**Proposition 2.** *If more players believe that fair allocation is equal division of surplus under frame $A$ than under frame $B$, the probability of bargaining success is higher under frame $A$ for both cases 2 and 3.*

The above result also suggests that if we observe greater success in bargaining outcomes for both cases 2 and 3 under frame $A$ over some other frame $B$, it is likely that more people consider equal division of surplus to be the fair bargaining outcome under frame $A$.

# 4 Empirical Analysis

We begin by discussing our data set and plan for empirical analysis. Then we present bargaining outcomes across the three cases and across the partnership and employment frames. We then analyze the chat logs to explore evidence for our theoretical interpretation of the two frames' impacting perceptions of fairness, and perform further tests to rule out alternative explanations.

## 4.1 Data and Analysis Plan

Sixty-four subjects participated in 7 partnership frame sessions, and 60 subjects participated in 6 employment frame sessions. With 15 paid periods in each session, we have a total of 930 pair-level (1860 individual-level) observations under the two frames equally divided between the three cases.[13]

[12]The proofs are provided in Appendix A

[13]The number of distinct individuals per session is between 6 and 14. This structure allows us to use subject fixed effects to determine whether efficiency differences across cases are driven by individual-specific differences. However, one may argue that each session might be considered as an independent observation. To address this concern, we performed Wilcoxon Rank tests on the mean optimal production and mean equal division per session by cases. We

In addition to the bargaining outcome variables, we investigate how subjects made decisions during the bilateral bargaining process. Using chat logs, a research assistant coded the chat characteristics for all periods. The research assistant's output was randomly audited by one of the authors who agreed with the coding in all cases. Our main outcome variables of interest and our treatment indicators are summarized in Table 2. Table 3 presents sample means and standard deviations for the outcome variables presented in Table 2. To ensure that the subjects across frames are comparable, we compared subject characteristics collected in the post-session survey. Driven by the timing of recruitment of subjects under different frames, there are differences in some personal characteristics, in particular, age and prior experience with experiments. There is no difference in subjects' perceived level of experiment difficulty or in whether or not they felt the allotted time per period was appropriate across frames.[14] Moreover, controlling for subject characteristics does not change our findings.

Our theoretical model suggests that bargaining outcomes will be affected by the economic opportunities (represented by different cases) the participants face. If framing of the process affects people's concept of fairness, framing will also affect bargaining outcomes. Our primary strategy for estimating the effects of the economic opportunity (represented by different cases) and framing of the economic opportunity on organizational choice is to compare mean of bargaining outcomes across these conditions. To verify that our mean comparisons are not driven by differences in populations across the frames, we also run regression analyses to test the effects of our treatment variables on outcomes conditional on subject characteristics and subject fixed effects. Motivated by our theoretical framework, the primary outcomes of interest are whether or not joint production occurs and, conditional on that occurrence, whether the efficient production specification is chosen and how the profits from joint production are shared. Specifically, we look at whether both participants are better off from joint production and whether partners split profits and surpluses equally. We also analyze other outcomes to support our interpretation of the main analysis.

find that even with 7 observations in the partnership frame and 6 in the employment frame, there are significant differences across frames. For instance, the p-values for Wilcoxon tests of the differences in mean optimal production and in mean equal profit sharing for case 3 are 0.022 and 0.087 respectively.

[14] Summary statistics are available in the online appendix.

### 4.2 Bargaining Outcomes by Framing and Economic Opportunity

Figure 2 presents mean outcomes by framing and economic opportunity. These comparisons allow us to investigate how often subjects reach optimal outcomes and whether that proportion is affected by the cases. Moreover, we can investigate the presence of any framing effect. Specifically, we can explore the prediction from Section 3 that the framing effect is likely to be stronger under case 3, where equal earnings sharing leaves one individual worse off. The results presented in Figure 2 demonstrate that, under both frames, joint production rarely happens when there is no benefit from joint production (case 1), as the theoretical model predicts. Under cases 2 and 3, however, subjects do not always produce jointly even though joint production provides a higher profit than the sum of outside options. As Proposition 1 suggests, we find that joint production occurs more often under case 2, for both frames. Interestingly, conditional on choosing joint production, subjects usually choose the optimal production choice under both cases 2 and 3 and both frames.

Despite these similarities across the two frames, there are important differences. The employment frame increases the frequency of optimal outcomes by similar amounts in both case 2 and case 3 relative to the partnership frame. In particular, relative to the partnership frame, optimal outcomes in case 2 and case 3 periods are about 11 and 14 percentage points higher, respectively, in the employment frame. Consistent with the employment frame improving bargaining outcomes, equal splits of the firm's profits falls from 15% in the partnership frame to less than 1% in the employment frame for case 3 periods, where equally sharing the profit would leave one participant worse off relative to her outside option. The employment frame also significantly reduces the frequency of equal profit sharing in case 2 periods where this is individually rational for both partners, suggesting that the frame may be altering subjects' views about how earnings should be divided. Further evidence of a shift in attitudes about how earnings should be divided under the employment frame is provided by the higher frequency of equal surplus sharing in both cases 2 and 3 under the employment frame. Moreover, there is no statistically significant difference between cases 2 and 3 in the frequency of equal sharing of the surplus under either frame. This is consistent with our theoretical model.

We verify that the significance of these mean comparison differences are robust to individual subject controls (odd-numbered columns) and subject fixed effects (even-numbered columns), and present these estimates in Table 4.[15] Columns 1 and 2 present the estimated effects of framing and

[15]This table reports linear probability regressions for simplicity. However, all our results stay qualitatively un-

economic opportunities on whether or not joint production occurs across all three cases. Columns 3-8 present estimated effects of framing and economic opportunities on whether optimal production, equal profit sharing, and equal surplus sharing occur, respectively, conditional on joint production being chosen for cases 2 and 3.

Additionally, we test whether the efficiency differences between the employment and partnership frames dissipate over time, perhaps because subjects are slower to learn how to optimally navigate through the bargaining process under the partnership frame. Specifically, Table 5 presents the effects of interactions between the employment frame indicator and indicators for each quartile of paid periods in a session on optimal production outcomes. Column 1 uses data from both cases 2 and 3 and columns 2 and 3 present data from cases 2 and 3 separately. Column 1 of the table demonstrates that the likelihood of optimal outcomes is greater under the employment frame in most quartiles. There is no clear time trend in the size of framing effect. In fact, the point estimate of net effect is increasing for case 2 across the first three quartiles. However, the net effect is the smallest in the last three periods in all three columns. The table also suggests that this reduction in framing effect is concentrated in case 3. Although these patterns provide suggestive evidence that the employment frame outperforms the partnership frame over time, dividing the paid periods in quartiles lead to very small sample sizes and does not allow us to reject the possibility that the probability of optimal outcomes are equal across the two frames in the later quartiles. This may indicate that the difficulties associated with negotiating in the partnership frame could become less severe for more experienced co-founders, though the number of entrepreneurs who have founded more than 2 ventures is very low in reality (Shaw and Sørensen, 2017).[16] That co-founders may improve their ability to successfully negotiate over equity divisions with experience is consistent with evidence that less experienced founder teams are more likely to divide equity shares equally (Hellmann and Wasserman, 2016).

The results we have presented so far demonstrate that, even in a transparent and frictionless environment, agreeing to produce jointly when it is efficient to do so is not trivial when equal profit sharing leaves one subject worse off. Forming profitable firms is easier when subjects in a pair are told that one of them is an owner and the other is an employee than when they are

changed if we use probit or logit regressions with individual fixed effects.

[16]Participants in the partnership frame who receive a lower payoff than their outside option by agreeing to an equal profit split in case 3 do not subsequently reduce their willingness to split profits equally in a future case 3 periods suggesting that that learning to incorporate outside options in the partnership frame is limited.

both told that they are partners. Furthermore, we find strong preferences for equal profit sharing when joint production is framed as a partnership, but this preference is reduced when an employer is coordinating with an employee. This suggests that, unlike efficiency, fairness concerns are not independent of framing (Knez and Camerer, 1994; Starmans et al., 2017).

We further explore fairness concerns as driving the large efficiency differences between the employment and partnership frames in the next subsection.

## 4.3 Evidence of Differential Perceptions of Fairness Across Frames

### 4.3.1 Chat Analysis

To provide more direct evidence of differences in fairness perceptions and bargaining efficiency across frames, we study the logs of chat between the subjects to investigate what concerns affected their decisions and investigate how behavior in chat sessions affected bargaining outcome. Comparisons of chat characteristics are presented in Table 7.

First, in favor of increased efficiency in the employment frame, the mean comparisons demonstrate that, despite chatting for a shorter duration of time on average, more proposals and counter-proposals are made in the employment frame than in the partnership frame.[17] Similarly, first proposals are made faster in the employment frame. There is some evidence that subjects are less likely to run out of time during chat under the employment frame in case 1. However, in cases 2 and 3, framing does not significantly affect whether or not pairs run out of time.

Second, consistent with differences in how subjects are defining fairness across the two frames, equality of profit sharing is mentioned significantly less frequently in the employment frame than the partnership frame, particularly in case 3 periods. Moreover, outside options are mentioned less frequently under both cases 2 and 3 in the employment frame, suggesting that it was a more obvious default under that framing.

Our analysis of chat logs also demonstrates differences in how proposals were made across the two frames. The first proposal made in a chat is much more likely to offer equal profit sharing in the partnership frame across cases than in the employment frame. To demonstrate the consequences

[17] In analyses not reported here, we find that more time spent in negotiation is associated with slightly worse outcomes (e.g., 1 more second spent negotiating is associated with a 0.2 percentage point decreased likelihood of optimal production), but also a slightly lower likelihood of equal profit sharing (which is somewhat mitigated in the employment frame). Moreover, we do not find evidence that the relationship between chat length and optimal production differs by frame type.

of this opening offer, Figure 3 demonstrates that when pair negotiations start with an equal profit division offer, the likelihood of equally splitting profits in joint production is significantly higher than when the first offer does not involve equal profit sharing.[18] Consistent with this, the first proposal is significantly more likely to be individually rational for the subject receiving the offer in the employment frame across all three cases.[19]

#### 4.3.2 Alternative Explanations

While the evidence we have presented up to this point is consistent with differences in how fairness is interpreted depending on frame, alternative explanations for differences in outcomes between frames are also possible. We explore and test for these explanations below.

First, we consider whether the employment frame leads to more efficient bargaining and final outcome because labeling someone as owner is associated with improved bargaining position. As a result, she assumes a greater control of the bargaining process and the employee accepts it. If this is the case, one would expect the owner to pocket most of the surplus, unlike under the partnership frame. However, Figure 4 demonstrates that the chair producer, who is the owner in the employment frame, earns the same share of joint production profits and surplus under both frames. Moreover, the likelihood of the chair maker making the first offer does not change across the two frames. Similarly, we find that initial offers made by chair and table makers are equally likely to involve equal profit sharing in both the partnership and the employment frames. Combined, these patterns do not support the hypothesis that the employment frame does not change the relative bargaining power between the chair and table maker demonstrating that bargaining power changes caused by the labeling of one producer as owner are not driving our findings.

Another possible explanation is that the subjects are better able to calculate the optimal solution under the employment frame. There is a small difference in the percentage of individuals accurately choosing the optimal production specification prior to chatting across the two frames for cases 2 and 3 (90% in partnership frame, 94% in employment frame). However, our results do not change if we only consider periods where both subjects in a pair correctly identified the optimal production specification before bargaining began.[20] Framing has no impact on the likelihood of

[18] However, we find that if the subsequent proposal involves a new profit division, this relationship disappears.

[19] In case 1, it is quite rare that offers are made at all, as partners generally agree quite quickly not to produce jointly. However, even in those instances in which profit division offers are made, they are more likely to make the subject receiving the offer at least as well off as she would be in wage work under the employment frame.

[20] For instance, among these pairs, those under the employment frame are 10 and 11 percentage points more likely

reaching the optimal outcome when joint production is not optimal, suggesting that subjects know whether joint production is optimal or not. Lastly, it is unclear why the division of profits would differ so significantly across frames if the cause of inefficiency was subjects being unable to solve the optimization problem.

A third potential explanation for inefficient outcomes is that the gains from choosing optimal outcomes are low and subjects' motivation for doing so is even lower in the partnership frame. To test whether low potential gains from efficiency are driving our results, we include the surplus from the optimal joint production specification (highest potential gain from joint production relative to the sum of outside options of the pair mates) as a control in a regression that tests the effects of case 3 and the employment frame on optimal outcomes. These estimates, presented in Table 6, demonstrate that subjects do respond to larger potential gains from optimal production. However, this response is not higher for the employment frame and accounting for this response does not eliminate efficiency effect of employment framing.

A fourth possible explanation for our findings is that, despite knowing that joint production is optimal and having an incentive to reach that outcome, subjects cannot reach an agreement within the stipulated time and default to inefficient production as a result. This is unlikely to be the primary cause of our findings for several reasons. First, subjects rarely indicated that the chat ended without an agreement being reached; disagreements are indicated in 6% of the periods compared to a 20% occurrence of inefficient outcomes. Second, the employment frame does not offer the owner any bargaining advantage, suggesting that improvements in outcomes are not caused by one pair member making all the decisions and bargaining no longer being necessary. Consistent with this, results presented in Section 4.3.1 demonstrate that more bargaining, measured as the number of proposals made by either pair member in a chat, occurs under the employment frame.

# 5 Unpacking the Mechanism Driving Fairness Perceptions

Our analysis supports the hypothesis that the employment frame increases joint production efficiency by changing how subjects interpret fair allocation of profits from joint production. Specifically, they are more likely to incorporate outside options in defining a fair allocation. However, why this change in fairness perception occurs remains an open question. While the underlying problem

to form a firm in cases 2 and 3, respectively ($p$ value = 0.04 for both differences).

and decision-making are the identical between the two frames, they differ in both the interpersonal relationship and economic relationship presented to pairs. By referring to the participants as "partners,"the partnership frame creates a more social interpersonal relation between the two participants, and subjects may associate the setting with profit equality even in the absence of equal contributions (e.g. Farrell and Scotchmer, 1988). On the other hand, the employment frame may create a more transactional interpersonal relationship between the two participants. Another difference between the two frames is that, while the underlying economic problems are identical, the economic relationship between the pair-mates in terms of how the revenue is shared and the production costs are borne differs. Under the partnership frame, the economic relationship is horizontal: the participants share the revenue and each bears her own production cost. Under employment, the economic relation is vertical: the employee receives a salary and bears no cost. The employer is the residual claimant — she receives the entire revenue, bears the production costs of the table and the chair, and pays the employee's salary. This vertical economic relationship, especially the fact that the employee just receives a salary or wage, may make the outside options (which are also wages) more salient to the participants.

To disentangle these two mechanisms, we ran a third framing treatment, the "supplier"frame, in which the joint production profit functions offered to the chair and table maker are analogous to those in the partnership frame, creating a horizontal economic relationship. In particular, the chair maker was presented as the coordinator of production, and both the chair and table makers pay their own production costs and share the revenue from joint production. However, the subjects in a pair were referred to as independent suppliers instead of partners, invoking a more transactional interpersonal relationship than in the partnership frame. All other aspects of the supplier treatment mirrored those of the employment and partnership frames. If the economic relationship drives the difference between the employment and partnership frames, then pairs in the supplier frame should perform similarly to those in the partnership frame. Alternatively, if the interpersonal relationship drives the difference, then pairs in the supplier frame will perform similarly to those in the employment frame.

In total 66 new participants took part in 9 sessions under the supplier frame. This treatment was run more than a year after the partnership and employment frames were run. As a result, the composition of subjects was somewhat different. Mean subject characteristic comparisons between the supplier frame and the other two frames indicate the subjects in the supplier frame differ from

the employment frame in gender and age, and differ from both frames in experience with economics experiments. The differences, though, are not large in terms of magnitude.

Figure 5 compares the means of the main bargaining outcomes across the three frames and three cases. This figure demonstrates that, as in the other two frames, pairs in the supplier frame almost never choose joint production when it is not optimal to do so and do not always choose joint production when it is optimal to do so. As under the other frames, pairs almost always choose the optimal production mode conditional on choosing joint production. More interestingly, it also demonstrates that pairs in the supplier frame are as likely to enter into joint production in cases 2 and 3 as those in the employment frame and significantly more likely to do so as those in the partnership frame.

Figure 6 compares the frequencies of equal splitting of profits and surplus, conditional on joint production, across the three frames for cases 2 and 3. This figure demonstrates that pairs in the supplier frame are significantly less likely to split profits equally and significantly more likely to split surplus equally than those in the partnership frame. Moreover, as is the case in the employment frame, subjects under the supplier frame are very unlikely to split profits equally when it makes one pair member worse off. Similarly, under case 3, pairs in the supplier frame are as likely to split surpluses equally as those in the employment frame. We verify that the significance of these mean comparison differences are robust to individual subject controls, and present these estimates in Table 8.

Combined, these findings demonstrate that removing the social aspect of jointly supplying a client associated with partnership without changing the economic framework under which this is achieved eliminates the efficiency differences between an employment relationship and a horizontal economic relationship. Moreover, these findings demonstrate that the social aspect of the partnership frame is the more likely driving force behind subjects focusing on equality of joint production profits at the expense of outside option considerations.

It is important to note that there are some differences in how profits and surpluses are shared between the pair mates under the supplier and employment frames. Specifically, for almost all the dependent variables we explore, the mean for the supplier frame resides in between the means for the partnership and employment frames. This suggests that the economic structure of the opportunity also impact how returns from joint production are divided. However, most of these differences are not statistically significant. For example, relative to the employment frame, the supplier frame

does not lead to statistically significantly worse outcomes in terms of efficiency. The difference in the frequency of equal profit sharing between these two frames is statistically significant for case 2, but not case 3. Overall, while the horizontal economic structure of the supplier frame leads to some difference in outcomes relative to the employment frame, these differences are not large, and the supplier frame outcomes are closely aligned to those of the employment frame rather than the partnership frame.

# 6 Conclusion

This study provides novel evidence on the role of organizational design in bargaining outcomes in a cooperative setting. In particular, using evidence from a laboratory setting in which subjects are randomly and anonymously assigned into pairs, we demonstrate that framing a joint production opportunity as an employment relationship rather than a partnership significantly increases the incidence of profitable joint production. Moreover, using text analysis and a follow-up treatment with a new framing, we demonstrate that the lower likelihood of an efficient outcome in the partnership frame is driven primarily by a concern for fairness generated by the social aspects of the perceived interpersonal relationship associated with partnerships, and not by differences in the perceived economic relationship, cognition, subject motivation, or changes in relative bargaining power. Under the partnership frame, a concern for fairness leads to an equal division of profits being focal for the subjects, demonstrated by a much higher likelihood of equal profit sharing and of equal division mentions in chats than in the employment frame. Under the employment frame, a concern for fairness is primarily tied to outside options, which ensures that both subjects in a pair earns more than their outside options in joint production, and increases the likelihood that pairs optimally decide to enter into joint production.

A simple extension of the model presented in Fehr and Schmidt (1999) is able to explain our findings by allowing the definition of fair outcome to vary between players. This model also explains why, under any framing, we see at least 15% of pairs missing out on profitable joint production opportunities.

One may wonder whether fairness concerns may be as important in real-world entrepreneurial opportunities. Existing evidence from firm and entrepreneur-level data suggests that fairness concerns do play an important role in real-world situations (e.g. Bao and Wu, 2017; Hellmann and

Wasserman, 2016). Unlike observational studies, our experiment allows us to observe opportunities not taken. As a result, we are able to provide further evidence that inequality aversion may lead to equal equity divisions that make at least one partner worse off, and novel evidence that this aversion causes potentially profitable opportunities to be abandoned. Moreover, by isolating the specific impact of the social implications of partnerships for equality, we are able to demonstrate an important mechanism underlying preferences for equality in early stage firm equity.

While equal sharing of a pie may act as a focal point for bargaining, our work shows that, when outside options are very different, equal sharing of surplus may also arise as a common bargaining outcome. Moreover, the focal point for bargaining depends heavily on the how the organizational design of a new firm opportunity is framed. The finding that framing an entrepreneurial opportunity as an employment relationship over partnership moves the focal outcome to equal surplus sharing from equal profit sharing has important implications in practice.

In particular, our findings provide novel insights for improving the likelihood that firms with profit potential survive past the initial launch phase. Specifically, they suggest that if an opportunity is presented to a single founder who requires resources controlled by others to pursue it, offering these potential colleagues employment opportunities rather than pursuing them as co-founders can reduce the likelihood that these early-stage contract negotiations hinder the formation of efficient ventures. Though many factors should likely enter into a founder's decision about whether initial start-up team members should be brought on as employees or co-founders[21], our study demonstrates that ignoring how this decision will impact potential team member compensation expectations can damage productive relationships before they are established.

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[21] A simple Google search of this question yields hundreds of expert opinion pieces and question and answer discussions on the pros and cons of co-founders versus employees. See, for instance, https://medium.com/village-global/who-should-get-the-title-co-founder-at-your-startup-d3af016c924, and https://firstround.com/review/Looking-for-Love-in-All-The-Wrong-Places-How-to-Find-a-Co-Founder/.

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# Tables & Figures

**Figure 1: Screenshot of Z-Tree Chat Box**

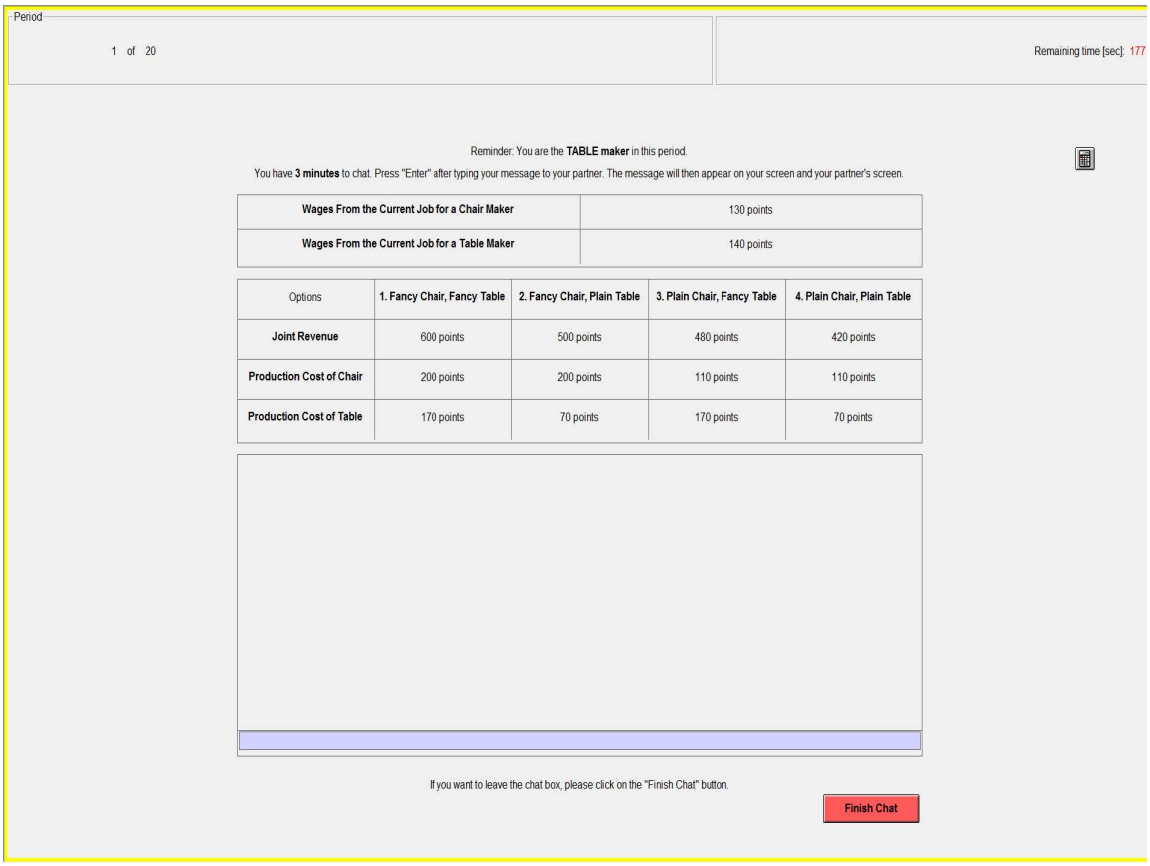
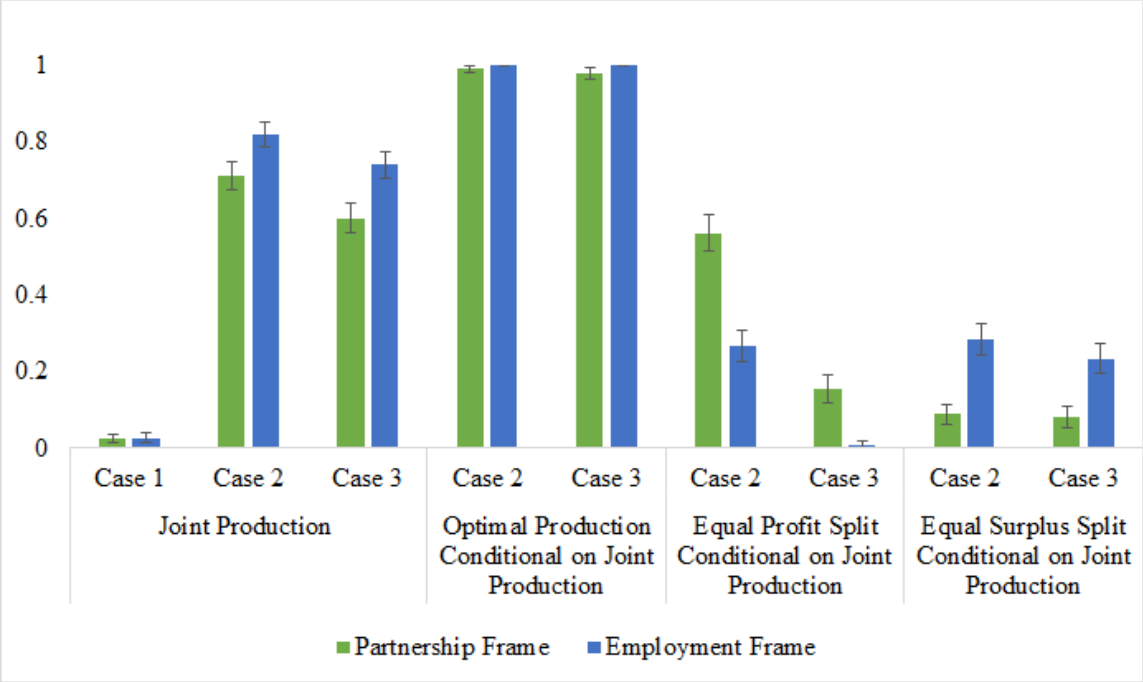
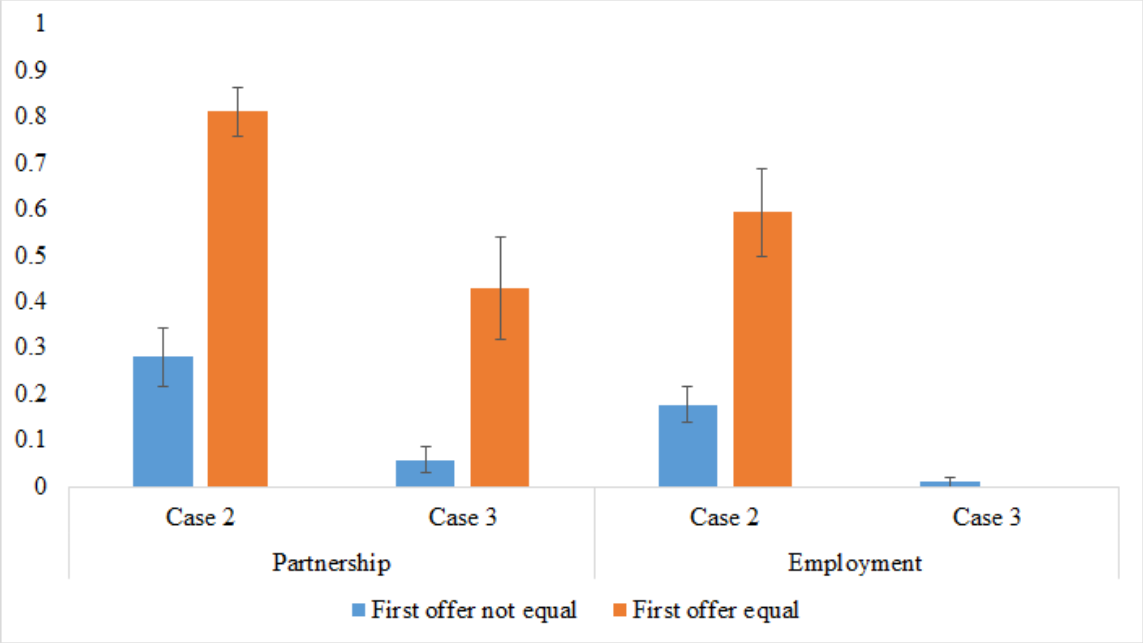


**Figure 2: Average Outcomes by Frame and Case**



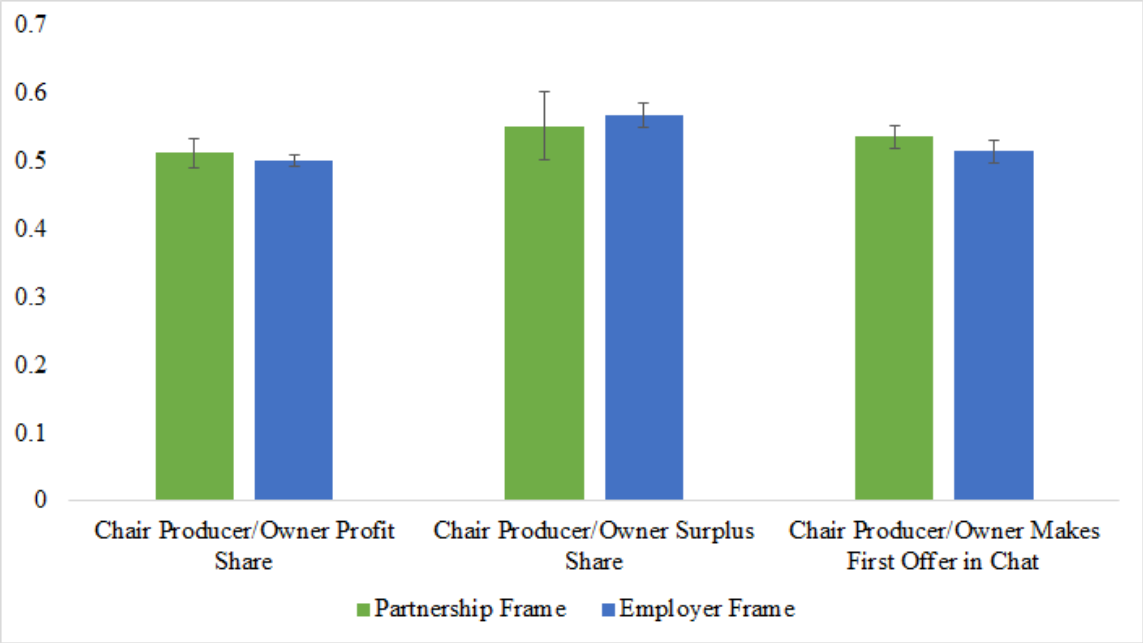

Notes: The figure compares average pair outcomes across the partnership and employment frames and by cases. Case 1 periods are those in which joint production is not optimal. Case 2 periods are those in which joint production is optimal and equal profit sharing makes both subjects better off than their outside option. Case 3 periods are those in which joint production is optimal and equal profit sharing makes one subject worse off than their outside option. Black lines represent 95% confidence intervals.

**Figure 3: Propensity of Equal Profit Splitting**



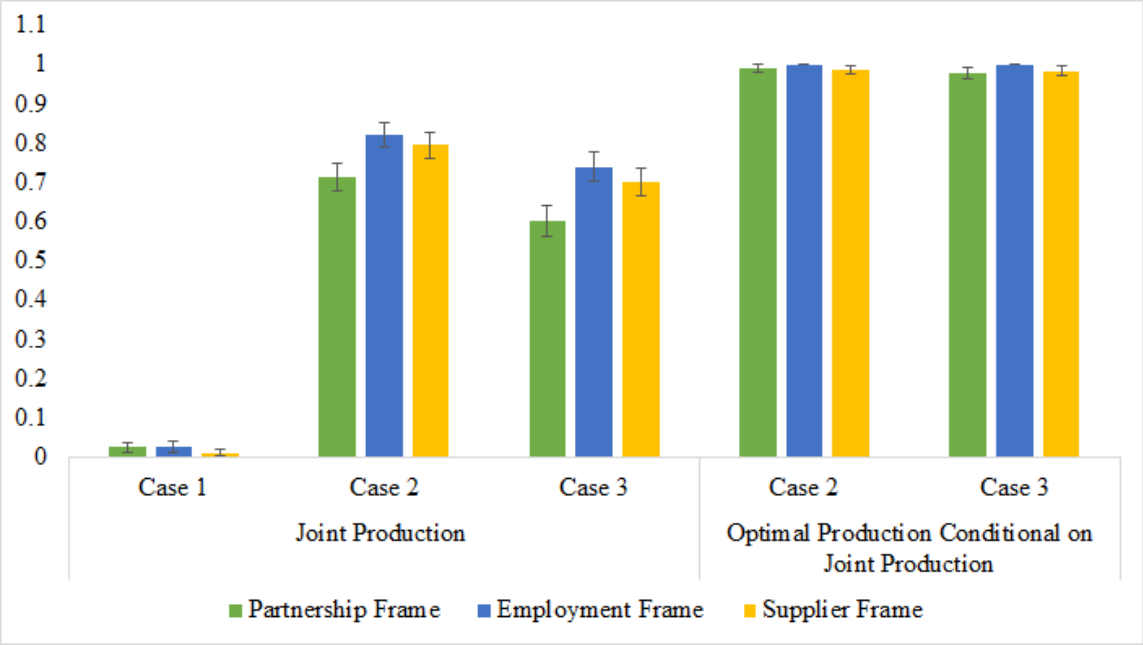

Notes: The figure compares the frequency of sharing profits equally by whether or not the first offer made during chat was an equal profit split. Case 2 periods are those in which joint production is optimal and equal profit sharing makes both subjects better off than their outside option. Case 3 periods are those in which joint production is optimal and equal profit sharing makes one subject worse off than their outside option.

**Figure 4: Outcome and Activity of the Chair Maker by Frame**



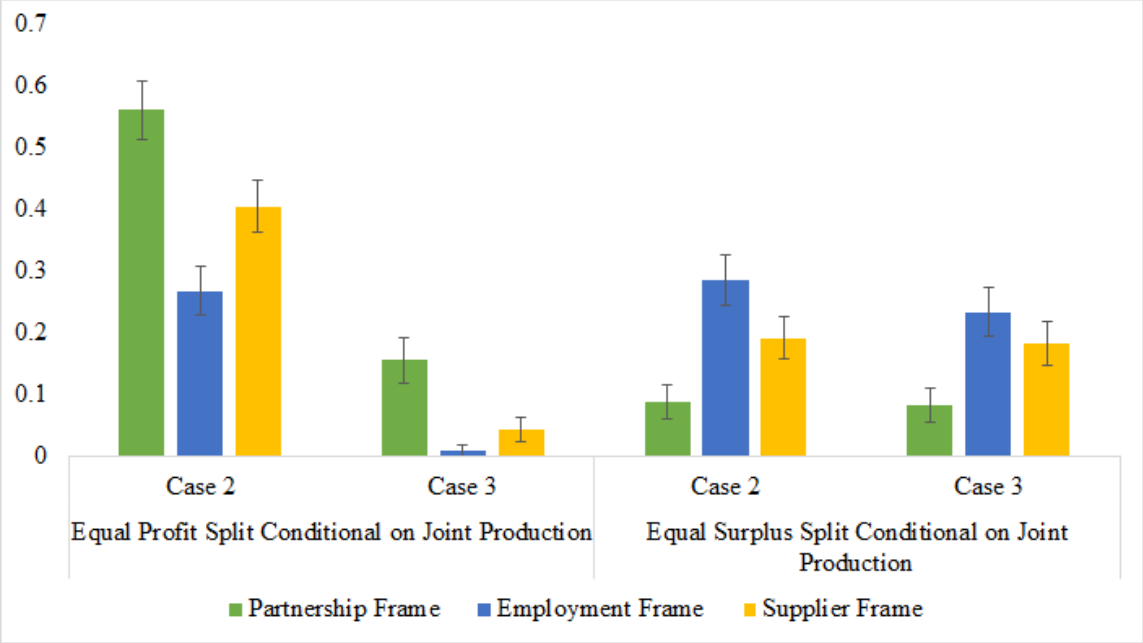

Notes: The figure compares chair maker's share of net profit and net surplus and whether the chair maker made the first offer in pair negotiations across the partnership and employment frames. Black lines represent 95% confidence intervals.

**Figure 5: Joint Production Propensity and Optimal Production Specification Choice for all Three Frames**




Notes: The figure compares average pair outcomes across the supplier, partnership and employment frames and by cases. It presents the probability of joint production for all three cases and probability of optimal production specification conditional on joint production for cases 2 and 3. Case 1 periods are those in which joint production is not optimal. Case 2 periods are those in which joint production is optimal and equal profit sharing makes both subjects better off than their outside option. Case 3 periods are those in which joint production is optimal and equal profit sharing makes one subject worse off than their outside option. Black lines represent 95% confidence intervals.

**Figure 6: Division of Returns from Joint Production for all Three Frames**




Notes: The figure compares the likelihood of equal profit and surplus splits, conditional on joint production, across the three frames for cases 2 and 3. Case 2 periods are those in which joint production is optimal and equal profit sharing makes both subjects better off than their outside option. Case 3 periods are those in which joint production is optimal and equal profit sharing makes one subject worse off than their outside option. Black lines represent 95% confidence intervals.

**Table 1: Experimental Parameters**

| | Joint Revenue | | | | Cost | | | | Wages | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Period | F, F | F, P | P, F | P, P | Fancy C | Plain C | Fancy T | Plain T | $W_c$ | $W_T$ | Case |
| Practice | 450 | 150 | 225 | 50 | 130 | 65 | 160 | 75 | 55 | 65 | 2 |
| Practice | 350 | 150 | 150 | 50 | 125 | 75 | 175 | 75 | 30 | 45 | 1 |
| Practice | 500 | 455 | 300 | 50 | 150 | 140 | 150 | 75 | 75 | 125 | 3 |
| Practice | 450 | 150 | 225 | 50 | 130 | 65 | 160 | 75 | 95 | 25 | 3 |
| Practice | 400 | 300 | 300 | 300 | 150 | 70 | 150 | 50 | 75 | 75 | 2 |
| Paid | 600 | 500 | 480 | 420 | 200 | 110 | 200 | 70 | 130 | 130 | 1 |
| Paid | 500 | 150 | 225 | 50 | 100 | 75 | 100 | 75 | 95 | 115 | 2 |
| Paid | 400 | 300 | 300 | 220 | 200 | 70 | 200 | 110 | 30 | 30 | 1 |
| Paid | 700 | 700 | 700 | 500 | 200 | 80 | 200 | 110 | 135 | 225 | 3 |
| Paid | 700 | 700 | 700 | 500 | 200 | 80 | 200 | 110 | 240 | 240 | 1 |
| Paid | 400 | 350 | 300 | 300 | 190 | 70 | 190 | 70 | 25 | 85 | 3 |
| Paid | 500 | 455 | 300 | 50 | 150 | 140 | 150 | 75 | 100 | 95 | 2 |
| Paid | 700 | 700 | 700 | 500 | 200 | 80 | 200 | 110 | 200 | 160 | 2 |
| Paid | 500 | 380 | 480 | 320 | 190 | 90 | 190 | 90 | 30 | 115 | 3 |
| Paid | 600 | 500 | 500 | 400 | 170 | 100 | 130 | 80 | 165 | 45 | 3 |
| Paid | 500 | 250 | 450 | 250 | 200 | 80 | 170 | 90 | 60 | 85 | 2 |
| Paid | 400 | 250 | 350 | 150 | 175 | 70 | 220 | 90 | 25 | 45 | 1 |
| Paid | 470 | 465 | 370 | 170 | 160 | 75 | 200 | 75 | 130 | 65 | 3 |
| Paid | 390 | 225 | 150 | 50 | 100 | 75 | 210 | 75 | 50 | 50 | 1 |
| Paid | 500 | 320 | 320 | 320 | 200 | 80 | 200 | 80 | 45 | 65 | 2 |

Notes: This Table presents the full set of parameters subjects faced in the partnership and employment frames. Each set of parameters introduced during paid periods were randomized across periods by session. Case 1 periods are those in which joint production is not optimal. Case 2 periods are those in which joint production is optimal and equal profit sharing makes both subjects better off than their outside option. Case 3 periods are those in which joint production is optimal and equal profit sharing makes one subject worse off than their outside option.

## Table 2: Variable Definitions

| Variable | Description |
|---|---|
| *Outcome Variables: Pair Level of Observation*: | |
| Joint Production | Equal to one if the pair enters into joint production, zero otherwise |
| Optimal Outcome | Equal to one if the pair chooses to produce jointly if optimal and also chooses the optimal joint production mode, or equal to one if the pair chooses to continue in wage work if joint production is not optimal, zero otherwise |
| | than they would have earned in wages had they decided not to produce jointly, zero otherwise; conditional on joint production |
| Equal Profit Split | Equal to one if pair members agree to divide net profit equally between each other, zero otherwise; conditional on joint production |
| Equal Surplus Split | Equal to one if member earns their own wage plus half of (profit − outside wages), zero otherwise; conditional on joint production |
| Chair Producer/Owner Profit Share | Equal to the share of firm profit allocated to chair producer (owner in employment frame); conditional on joint production |
| Chair Producer/Owner Surplus Share | Equal to the share of total firm surplus allocated to chair producer (owner in employment frame); conditional on joint production |
| *Outcome Variables: Individual Level of Observation*: | |
| Accurate Optimal Production Calculation | Equal to one if the individual accurately chooses the optimal production mode under joint production before the chat window begins, zero otherwise |
| Indicated Disagreement | Equal to one if individual indicates that they could not reach an agreement during the chat, zero otherwise |
| *Outcome Variables: Chat Text Characteristics*: | |
| Number of Proposals Made | Equal to the number of distinct proposals made during the chat |
| Seconds Spent Chatting | Equals the number of seconds the pair spent chatting in a period |
| Mention of Equality of Division | Equal to one if equal earnings sharing is mentioned during the chat, zero otherwise |
| Chair Producer/Employer Makes First Offer | Equal to one if chair producer (owner in employment frame) makes opening offer during the chat, zero otherwise |
| Mention of Outside Option | Equal to one if either pair member mentions the outside option wage during the chat, zero otherwise |
| Time to First Proposal | Equal to the number of seconds before the first proposal is made by either pair member during the chat |
| First Offer Equal Profit Sharing | Equal to one if the first proposal made during chat proposes equal profit sharing zero otherwise |
| Ran Out of Time Before Agreement Reached | Equal to one if negotiation is on-going when chat times out, zero otherwise |
| First Offer Individually Rational | Equal to one if the first offer made is greater than or equal to the outside option for the subject receiving the offer & zero otherwise |
| *Independent Variables*: | |
| Case 1 | Equal to one if joint production is not optimal, zero otherwise |
| Case 2 | Equal to one if joint production is optimal and equal sharing of firm profits is individually rational for both pair members, zero otherwise |
| Case 3 | Equal to one if joint production is optimal but equal sharing of firm profits makes one pair member worse off than her outside option, zero otherwise |
| Employer Framing | Equal to one if pair members are in an employer framing session, zero if pair members are in a partnership framing session |

**Table 3: Summary Statistics**

| | **Mean** | **(Std. Dev.)** | **Observations** |
|---|---|---|---|
| *Outcome Variables: Pair Level of Observation*: | | | |
| Joint Production | 0.486 | (0.5) | 930 |
| Optimal Outcome | 0.799 | (0.401) | 930 |
| Equal Split of Profits | 0.254 | (0.436) | 452 |
| Equal Split of Surplus | 0.179 | (0.384) | 452 |
| Share of Profit to Chair Producer | 0.506 | (0.506) | 452 |
| Share of Surplus to Chair Producer | 0.561 | (0.554) | 452 |
| *Outcome Variables: Individual Level of Observation*: | | | |
| Accurate Optimal Production Calculation | 0.903 | (0.296) | 1860 |
| Indicate Disagreement | 0.06 | (0.238) | 1860 |
| *Outcome Variables: Chat Text Characteristics*: | | | |
| Number of Proposals Made | 1.873 | (1.188) | 871 |
| Seconds Used in Chat | 87.626 | (47.613) | 927 |
| Mention of Equality of Division | 0.246 | (0.431) | 871 |
| Chair Producer/Employer Makes First Offer | 0.527 | (0.500) | 871 |
| Mention of Outside Option | 0.540 | (0.499) | 870 |
| Time to First Proposal | 64.310 | (24.813) | 635 |
| Ran Out of Time Before Agreement Reached | 0.071 | (0.257) | 871 |
| First Offer Equal Profit Sharing | 0.203 | (0.403) | 881 |
| First Offer Individually Rational | 0.881 | (0.324) | 871 |

**Table 4: Effect of Framing and Economic Opportunity on Outcomes**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Joint Production | | Optimal Production | | Equal Profit | | Equal Surplus | |
| Employment Framing | -0.005 | | 0.009 | | -0.306*** | | 0.164*** | |
| | (0.016) | | (0.019) | | (0.044) | | (0.034) | |
| Case 2 | 0.680*** | 0.684*** | | | | | | |
| | (0.027) | (0.027) | | | | | | |
| Case 3 | 0.568*** | 0.571*** | 0.018 | 0.011 | -0.404*** | -0.379*** | -0.012 | -0.021 |
| | (0.029) | (0.029) | (0.016) | (0.015) | (0.042) | (0.040) | (0.029) | (0.029) |
| Employment Framing × Case 2 | 0.109*** | 0.107*** | | | | | | |
| | (0.036) | (0.036) | | | | | | |
| Employment Framing × Case 3 | 0.146*** | 0.142*** | 0.016 | 0.021 | 0.154*** | 0.137*** | -0.035 | -0.005 |
| | (0.039) | (0.039) | (0.020) | (0.019) | (0.051) | (0.049) | (0.048) | (0.039) |
| Accurate Optimal Production | 0.113*** | 0.057 | 0.086** | 0.056 | 0.032 | 0.060 | 0.002 | -0.001 |
| Calculation | (0.032) | (0.035) | (0.041) | (0.042) | (0.063) | (0.063) | (0.046) | (0.038) |
| Economics or Accounting Major | 0.020 | | 0.012 | | -0.018 | | 0.125*** | |
| | (0.022) | | (0.010) | | (0.031) | | (0.035) | |
| Male | -0.007 | | 0.007 | | -0.039 | | 0.024 | |
| | (0.018) | | (0.010) | | (0.026) | | (0.025) | |
| Age | 0.000 | | 0.001 | | -0.010 | | -0.007 | |
| | (0.004) | | (0.001) | | (0.007) | | (0.006) | |
| Year of Study | 0.010 | | -0.000 | | 0.017 | | -0.033*** | |
| | (0.009) | | (0.005) | | (0.013) | | (0.012) | |
| Prior Economics | -0.006 | | 0.011 | | -0.015 | | 0.019 | |
| Experiment Experience | (0.019) | | (0.011) | | (0.030) | | (0.026) | |
| Prior Psych | -0.014 | | -0.011 | | -0.032 | | -0.073*** | |
| Experiment Experience | (0.018) | | (0.010) | | (0.027) | | (0.025) | |
| Constant | -0.092 | -0.024 | 0.854*** | 0.913*** | 0.745*** | 0.338*** | 0.308*** | 0.191*** |
| | (0.085) | (0.032) | (0.056) | (0.041) | (0.139) | (0.062) | (0.118) | (0.039) |
| Observations | 1,860 | 1,860 | 904 | 904 | 904 | 904 | 904 | 904 |
| R-squared | 0.446 | 0.498 | 0.034 | 0.194 | 0.222 | 0.443 | 0.094 | 0.504 |
| Mean dep var | 0.486 | 0.486 | 0.799 | 0.799 | 0.254 | 0.254 | 0.179 | 0.179 |

All estimates are from linear probability model regressions. Case 2 is an indicator for periods in which joint production is optimal and equal profit sharing makes both subjects better off than their outside option. Case 3 is an indicator for periods in which joint production is optimal and equal profit sharing makes one subject worse off than their outside option. Data from partnership and employment frames are included. Robust standard errors are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

**Table 5: Effect of Economic Opportunity, Framing, and Experience on Optimal Production**

| | (1) Both Cases | (2) Case 2 | (3) Case 3 |
|---|---|---|---|
| Employment Framing | 0.158** | 0.029 | 0.288*** |
| | (0.079) | (0.116) | (0.104) |
| Periods 5-8 | -0.010 | -0.149 | 0.113 |
| | (0.075) | (0.103) | (0.103) |
| Periods 9-12 | 0.105 | -0.118 | 0.311*** |
| | (0.075) | (0.100) | (0.105) |
| Periods 13-15 | 0.177** | 0.067 | 0.228* |
| | (0.082) | (0.098) | (0.130) |
| Employment Framing* | 0.043 | 0.154 | -0.173 |
| Periods 5-8 | (0.102) | (0.144) | (0.174) |
| Employment Framing* | -0.055 | 0.207 | -0.276* |
| Periods 9-12 | (0.106) | (0.154) | (0.142) |
| Employment Framing* | -0.142 | -0.034 | -0.200 |
| Periods 13-15 | (0.109) | (0.150) | (0.160) |
| Constant | 0.592*** | 0.771*** | 0.439*** |
| | (0.057) | (0.072) | (0.079) |
| Observations | 620 | 310 | 310 |
| R-squared | 0.035 | 0.040 | 0.059 |
| Mean dep var | 0.711 | 0.761 | 0.661 |

The dependent variable is equal to one if pairs produce jointly and choose the optimal joint production mode in case 2 and 3. The sample is restricted to cases 2 and 3 in column 1. Case 2 periods are those in which joint production is optimal and equal profit sharing makes both subjects better off than their outside option. Case 3 periods are those in which joint production is optimal and equal profit sharing makes one subject worse off than their outside option. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

**Table 6: Effect of Economic Opportunity, Framing, and Potential Gains from Optimal Joint Production on Optimal Production Decision**

| **Dependent Variable** | **Joint Production** | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Case 3 | -0.103*** | -0.103*** | 0.017 | -0.104*** |
| | (0.036) | (0.036) | (0.116) | (0.036) |
| Employment Framing | | 0.133*** | 0.132*** | 0.308*** |
| | | (0.036) | (0.036) | (0.116) |
| Absolute Profit Gain in Optimal Production | 0.002** | 0.002** | 0.003*** | 0.004*** |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| Case 3 × | | | -0.002 | |
| Absolute Profit Gain in Optimal Production | | | (0.002) | |
| Employment Framing × | | | | -0.003 |
| Absolute Profit Gain in Optimal Production | | | | (0.002) |
| Constant | 0.629*** | 0.565*** | 0.503*** | 0.481*** |
| | (0.062) | (0.065) | (0.078) | (0.087) |
| Observations | 620 | 620 | 620 | 620 |
| R-squared | 0.021 | 0.042 | 0.044 | 0.046 |
| Mean dep var | 0.711 | 0.711 | 0.711 | 0.711 |

Sample restricted to periods in which joint production is optimal. Joint production is equal to one if a pair enters into joint production, and zero otherwise. Data from cases 2 and 3 in partnership and employment frames are included. Case 3 is an indicator for periods in which joint production is optimal and equal profit sharing makes one subject worse off than their outside option. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

**Table 7: Chat Characteristics by Session & Cases**

| | Case 1 | | Case 2 | | Case 3 | |
|---|---|---|---|---|---|---|
| | **Partner** | **Employ** | **Partner** | **Employ** | **Partner** | **Employ** |
| **Pair Outcomes, Full Sample** | | | | | | |
| Seconds Spent Chatting | 61.925 | 42.373 | 103.969 | 95.727 | 120.796 | 100.040 |
| | (3.753) | (2.812) | (3.304) | (3.150) | (2.827) | (3.048) |
| Number of Proposals Made | 1.444 | 1.250 | 1.574 | 2.527 | 1.821 | 2.567 |
| | (0.057) | (0.052) | (0.070) | (0.122) | (0.083) | (0.117) |
| Seconds Before First Offer | 87.317 | 58.633 | 62.473 | 52.520 | 78.321 | 59.573 |
| | (4.717) | (3.039) | (2.016) | (1.373) | (2.350) | (1.646) |
| Ran Out of Time Before | 0.056 | 0.013 | 0.071 | 0.067 | 0.157 | 0.093 |
| Agreement Reached | (0.019) | (0.009) | (0.022) | (0.020) | (0.027) | (0.024) |
| Mention of Equality of Division | 0.133 | 0.081 | 0.500 | 0.393 | 0.242 | 0.127 |
| | (0.029) | (0.022) | (0.042) | (0.040) | (0.036) | (0.027) |
| Mention of Outside Option | 0.894 | 0.980 | 0.369 | 0.227 | 0.496 | 0.287 |
| | (0.025) | (0.012) | (0.041) | (0.034) | (0.042) | (0.037) |
| First Offer Equal Profit Sharing | 0.500 | 0.323 | 0.531 | 0.208 | 0.282 | 0.040 |
| | (0.075) | (0.085) | (0.044) | (0.033) | (0.038) | (0.016) |
| First Offer Individually | 0.824 | 0.953 | 0.766 | 0.987 | 0.771 | 0.967 |
| Rational | (0.032) | (0.018) | (0.036) | (0.009) | (0.036) | (0.015) |
| N | 142 | 148 | 141 | 150 | 140 | 150 |

Notes: Standard errors are in parentheses. Case 1 periods are those in which joint production is not optimal. Case 2 periods are those in which joint production is optimal and equal profit sharing makes both subjects better off than their outside option. Case 3 periods are those in which joint production is optimal and equal profit sharing makes one subject worse off than their outside option. * significant at 10%; ** significant at 5%; *** significant at 1%

**Table 8: Effect of Supplier Framing and Economic Opportunity on Outcomes**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Joint Production | | Optimal Production | | Equal Profit | | Equal Surplus | |
| Frame Comparison | Partner | Employ | Partner | Employ | Partner | Employ | Partner | Employ |
| Supplier Frame | -0.006 | -0.005 | 0.010 | 0.013 | -0.155*** | 0.149*** | 0.082** | -0.072* |
| | (0.014) | (0.020) | (0.017) | (0.017) | (0.046) | (0.046) | (0.032) | (0.041) |
| Case 2 | 0.682*** | 0.790*** | | | | | | |
| | (0.027) | (0.024) | | | | | | |
| Case 3 | 0.569*** | 0.714*** | 0.017 | 0.034*** | -0.407*** | -0.251*** | -0.012 | -0.047 |
| | (0.029) | (0.027) | (0.016) | (0.011) | (0.042) | (0.028) | (0.028) | (0.039) |
| Supplier Frame × Case 2 | 0.092*** | -0.016 | | | | | | |
| | (0.035) | (0.033) | | | | | | |
| Supplier Frame × Case 3 | 0.109*** | -0.036 | -0.002 | -0.020 | 0.045 | -0.112** | 0.009 | 0.046 |
| | (0.039) | (0.038) | (0.021) | (0.017) | (0.053) | (0.044) | (0.044) | (0.052) |
| Accurate Optimal Production | 0.088*** | 0.093*** | 0.095** | 0.055 | 0.074 | 0.021 | 0.055 | 0.018 |
| Calculation | (0.027) | (0.031) | (0.040) | (0.035) | (0.054) | (0.047) | (0.037) | (0.053) |
| Economics or Accounting Major | 0.025 | 0.015 | 0.004 | 0.023*** | -0.051 | -0.030 | 0.019 | 0.157*** |
| | (0.026) | (0.023) | (0.013) | (0.006) | (0.040) | (0.031) | (0.035) | (0.042) |
| Male | 0.026 | -0.029* | 0.009 | 0.000 | -0.047 | 0.027 | -0.010 | 0.017 |
| | (0.018) | (0.017) | (0.011) | (0.010) | (0.029) | (0.024) | (0.023) | (0.028) |
| Age | 0.005 | 0.004 | 0.003*** | 0.000 | -0.009 | 0.000 | -0.004 | -0.020** |
| | (0.004) | (0.005) | (0.001) | (0.002) | (0.006) | (0.009) | (0.005) | (0.009) |
| Year of Study | 0.004 | 0.004 | -0.006 | -0.006 | 0.007 | 0.010 | -0.010 | -0.022 |
| | (0.008) | (0.009) | (0.005) | (0.005) | (0.014) | (0.013) | (0.011) | (0.014) |
| Prior Economics | -0.001 | -0.011 | 0.004 | -0.008 | -0.015 | -0.007 | 0.024 | 0.037 |
| Experiment Experience | (0.020) | (0.022) | (0.012) | (0.011) | (0.032) | (0.030) | (0.024) | (0.034) |
| Prior Psych | 0.002 | -0.015 | -0.016 | -0.006 | -0.053* | -0.004 | -0.014 | -0.057* |
| Experiment Experience | (0.018) | (0.018) | (0.011) | (0.010) | (0.031) | (0.025) | (0.024) | (0.029) |
| Constant | -0.172** | -0.131 | 0.815*** | 0.917*** | 0.717*** | 0.207 | 0.147 | 0.672*** |
| | (0.076) | (0.103) | (0.056) | (0.050) | (0.131) | (0.172) | (0.102) | (0.175) |
| Observations | 1,950 | 1,890 | 924 | 972 | 924 | 972 | 924 | 972 |
| R-squared | 0.434 | 0.502 | 0.034 | 0.023 | 0.203 | 0.175 | 0.025 | 0.054 |
| Mean dep var | 0.491 | 0.491 | 0.806 | 0.806 | 0.249 | 0.249 | 0.181 | 0.181 |

Case 2 is an indicator for periods in which joint production is optimal and equal profit sharing makes both subjects better off than their outside option. Case 3 is an indicator for periods in which joint production is optimal and equal profit sharing makes one subject worse off than their outside option. Data from all three frames are included. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

# Appendix A Proofs

Below we present the proofs for the propositions presented in Section 3 and two related lemmas. Without loss of any generality, we assume that $w_1 \geq w_2$.

**Lemma 1.** *We can characterize the outcomes under three different cases as following: i) When the size of pie is smaller than the sum of outside options then the players will always choose the outside options.*
*ii) When $\pi > w_1 + w_2$ and $\frac{\pi}{2} > w_i$ for both $i \in \{1, 2\}$, then there is a Pareto improving division of $\pi$ for any $\alpha$, if either both players or neither player incorporate outside options in fairness consideration. However, if one player incorporates outside options in fairness consideration and the other player does not, then there is a Pareto improving division of $\pi$ only if $\alpha$ is low enough.*
*iii) When $\pi > w_1 + w_2$ and $\frac{\pi}{2} < w_i$ for some $i \in \{1, 2\}$, then there is a Pareto improving division of $\pi$ for any $\alpha$, if both players incorporate outside options in fairness consideration. However, if at least one player does not incorporate outside options in fairness consideration, then there may not be a Pareto improving division of $\pi$ if $\alpha$ is high enough.*

*Proof.* First we consider case 1, where $\pi < w_1 + w_2$. Note that, for joint production, $u_i(x_1, x_2, w_1, w_2) \leq x_i$ independent of whether player $i$ incorporates outside options to define fairness. As $x_1 + x_2 < w_1 + w_2$ for any allocation of the pie, both cannot be (weakly) better-off by sharing the pie. Hence, the players should choose the outside options in the bargaining game.

For case 2, where $\pi > w_1 + w_2$ and $\frac{\pi}{2} > w_i$ for both $i \in \{1, 2\}$, $u_i\left(\frac{\pi}{2}, \frac{\pi}{2}, w_1, w_2\right) = \frac{\pi}{2} > w_i$ if neither player incorporates outside options in fairness and $u_i\left(w_1 + \frac{\pi - w_1 - w_2}{2}, w_2 + \frac{\pi - w_1 - w_2}{2}, w_1, w_2\right) = w_i + \frac{\pi - w_1 - w_2}{2} > w_i$ if both players do. Thus, there is some allocation of the pie that makes both players better off when they both define fair allocation the same way. However, if the two players differ in how they define fair allocation, then it is possible that there is no division of $\pi$ that makes both better off if $\alpha$ is large enough and $w_1 \neq w_2$.

Now consider case 3, where $\pi > w_1 + w_2$ and $w_1 > \frac{\pi}{2} > w_2$. If both players incorporate outside options in fairness, $u_i\left(\frac{\pi + w_1 - w_2}{2}, \frac{\pi - w_1 + w_2}{2}, w_1, w_2\right) = \frac{\pi + w_i - w_j}{2} > w_i$. Thus, there will be a Pareto improving division of the pie in that case. When at least one player does not incorporate the outside

options in fairness, then if $\alpha$ or $w_1 - w_2$ is large enough, there might not be any division of $\pi$ that is Pareto improving, leading to bargaining failure. Note that even when both players believe that equal division is the fair allocation, when the outside options are very different, giving player 1 just $w_1$ would already make player 2 worse off than her outside options. □

**Lemma 2.** *Suppose the two players differ in how they define fair allocation. If $\alpha$ is such that successful bargaining outcome is feasible for some outside option combination $(w_1, w_2)$ where $w_1 > \frac{\pi}{2} > w_2$, for a given $\pi$, then successful bargaining outcome will be feasible for any outside option combination $(w_1 - \epsilon, w_2 + \epsilon)$ such that $\frac{w_1 - w_2}{2} \geq \epsilon > 0$.*

*Proof.* The restriction on $\epsilon$ implies that $w_1 - \epsilon \geq w_2 + \epsilon$. First, we consider the case where $\mathbf{1}_{O_1} = 0$ and $\mathbf{1}_{O_2} = 1$ and joint production is feasible. Hence, there are $x_1, x_2$ such that $x_1 + x_2 = \pi$ and

$$u_1(x_1, x_2, w_1, w_2) = x_1 - \alpha |x_1 - x_2| \geq w_1 \text{ and } u_2(x_1, x_2, w_1, w_2) = x_2 - \alpha |x_1 - w_1 - (x_2 - w_2)| \geq w_2.$$

If we offer the two players $x_1 - \epsilon$ and $x_2 + \epsilon$ when the outside options are $(w_1 - \epsilon, w_2 + \epsilon)$, then player 1's utility from agreeing to accept $x_1 - \epsilon$ is

$$u_1(x_1 - \epsilon, x_2 + \epsilon, w_1, w_2) = x_1 - \epsilon - \alpha |x_1 - \epsilon - (x_2 + \epsilon)| = x_1 - \alpha |x_1 - x_2 - 2\epsilon| - \epsilon \geq w_1 - \epsilon.$$

Moreover, player 2's utility from bargaining agreement is

$$\begin{aligned} u_2(x_1 - \epsilon, x_2 + \epsilon, w_1, w_2) &= x_2 + \epsilon - \alpha |x_1 - \epsilon - w_1 + \epsilon - (x_2 + \epsilon - w_2 - \epsilon)| \\ &= x_2 - \alpha |x_1 - w_1 - (x_2 - w_2)| + \epsilon \geq w_2 + \epsilon. \end{aligned}$$

Hence, bargaining agreement will be feasible.

Similarly, when $\mathbf{1}_{O_1} = 1$ and $\mathbf{1}_{O_2} = 0$, bargaining success under case 3 implies,

$$u_1(x_1, x_2, w_1, w_2) = x_1 - \alpha |x_1 - w_1 - (x_2 - w_2)| \geq w_1 \text{ and } u_2(x_1, x_2, w_1, w_2) = x_2 - \alpha (x_1 - x_2) \geq w_2.$$

Using arguments similar to the ones above, we can show that for a different set of outside options $(w_1 - \epsilon, w_2 + \epsilon)$ such that $\frac{w_1 - w_2}{2} \geq \epsilon > 0$, there will be a share of pie which makes both players better off. Note that the restriction on $\epsilon$ covers all possible case 2 situations as well as case 3

situations with less lop-sided outside options. Thus, the existence of feasible bargaining solution in a case 3 scenario involving two players whose fairness definitions differ, would suggest that there will be feasible bargaining solution in any case 2 scenario involving those two players. □

**Proposition 1.** *Bargaining failure is more likely in case 3 than in case 2.*

*Proof.* Lemma 1 characterizes scenarios where bargaining failure may occur under cases 2 and 3. It suggests that it will suffice to focus on the case where the players differ in their definition of a fair outcome. Lemma 2 shows that, in that scenario, fixing $\pi$ and the sum of outside options, if the parameters $(\alpha, w_1, w_2)$ are such that there is a Pareto-improving allocation of $\pi$ when $w_1 > \frac{\pi}{2} > w_2$, then there must be a Pareto-improving allocation of $\pi$ when $w_1$ is decreased and $w_2$ is increased by the same amount in a way that $\frac{\pi}{2} \geq w_i$ for $i \in \{1, 2\}$. Hence, while bargaining failure can happen in both cases 2 and 3, it would happen more frequently under case 3. □

**Proposition 2.** *Suppose more players believe that fair allocation is equal division of surplus under frame A than under frame B. Then, the probability of bargaining success is higher under frame A for both cases 2 and 3.*

*Proof.* We will prove this result by considering different scenarios. First, consider case 2. When both players define fairness the same way, they will successfully bargain to share the pie. If the two players define fairness differently, if $\alpha$ is small enough given $(\pi, w_1, w_2)$ then the players will bargain successfully. Therefore, we need to compare bargaining success probability under the two frames when bargaining failure occurs if the two players define fairness differently. In that case, the probability of bargaining success under frame $j \in A, B$ is $p_j^2 + (1 - p_j)^2$ for $j$. The difference in the success rate between frames $A$ and $B$ is $2p_A^2 - 2p_A - 2p_B^2 + 2p_B = 2(p_A + p_B - 1)(p_A - p_B)$. This difference is strictly positive if $p_A + p_B > 1$. Therefore, the probability of bargaining success in case 2 will be higher for employment frame. For case 3, first consider $(\pi, w_1, w_2)$ combinations for which bargaining failure occurs only when the players differ in their definition of fairness. The above argument shows that the employment frame will increase probability of bargaining success when $p_A > p_B$ and $p_B + p_A > 1$. If $(\pi, w_1, w_2)$ is such that bargaining success occurs only when both players define fairness with respect to outside options, then the employment frame will increase bargaining success as $p_A > p_B$. Therefore, frame $A$ will lead to a higher likelihood of bargaining success for both cases 2 and 3. □