Performance Information, Production Uncertainty and Subjective Entitlements in Bargaining

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Abstract

We experimentally explore the effects and interactions of three variables considered important when bargaining over a jointly produced surplus: performance information, production uncertainties when translating performance into output, and subjective entitlements derived from the production process. We find that without performance information subjective entitlements are mostly mutually consistent and bargaining mainly ends with an equal-split. In stark contrast, negotiators derive strong, mutually inconsistent, subjective entitlements when there is performance information. These subjective entitlements affect opening proposals, concessions and bargaining duration, and lead to asymmetric agreements. Moreover, given performance information, endogenous variations in entitlements influence bargaining suggesting an independent role of subjective entitlements. Production uncertainties impact bargaining but do not substantially mitigate the effect of entitlements. Theoretical bargaining models allowing for reference points can partly account for the empirical results. Yet, important aspects are left unexplained and our results suggest ways for extending these models.

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1 Introduction

Economic surplus is efficiently created most of the time through a joint production process, which raises the question of how to share the joint proceeds. Since ex-ante contractual solutions are not always feasible or prone to renegotiation (Ledyard, 2008), parties often have to negotiate the distribution of the proceeds ex-post. In such bargaining a fair distribution may be difficult to determine as the exact relative contributions of different parties may not be fully disclosed. Exogenous shocks to the production process may additionally increase uncertainties regarding relative contributions. Examples of negotiation conflicts that have (at least partly) been induced by such uncertainties range from the U.S. National Basketball League, the computer gaming industry, to more general labor disputes.

Another important aspect of such conflicts is that negotiators often bring subjective entitlements to the bargaining table, which may be derived from their real or perceived contribution to the joint surplus. In most cases such entitlements are mutually inconsistent and self-servingly biased, which may hamper finding an agreement all involved parties find acceptable (for effects of mutual inconsistency, see, e.g., Hoffman and Spitzer, 1985, Burrows and Loomes, 1994, Hoffman et al., 1994, Gächter and Riedl, 2005 and for self-serving bias, e.g., Messick and Sentis, 1979, Thompson and Loewenstein, 1992, Babcock et al., 1995a, 1996, Buchan et al., 2004, Gächter and Riedl, 2005).

Although performance information, production uncertainties, and subjective entitlements are considered as important environmental variables which likely affect negotiations, there is yet no systematic investigation of how all three elements together influence bargaining over a jointly produced surplus. In this paper we take up this issue and use laboratory experiments to provide comprehensive evidence on the influence of relative performance information and production uncertainties on (i) the existence and strength of subjective entitlements and (ii) the bargaining process and outcome, which in turn may be influenced by entitlements.

In the experiment pairs of subjects produce a joint surplus by individually performing a real effort task. The size of the surplus depends on the total performance of both parties involved. Thereafter negotiations over how to share the pie take place in a completely symmetric free-

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1In the season of 1998–1999 NBA players were on strike for 191 days. In the conflict the main point at issue was the relative contributions of players and owners to the enormous growth of the NBA league at that time (Schiesel, 2008).

2In 2008 the conflict between a voice actor and the owning company of Grand Theft Auto IV – then the fastest selling computer game in history – caught media attention. The voice actor and the company haggled about the relative contributions of the “human performance” and the “conception of the art director” to the success of the game (Ortutay, 2008, Totilo, 2008)).

3See, e.g., Corfman and Schmeltzer (2002) and Lyons (2009) for public accounts of discussions and disputes about how to share the burden between white collar and blue collar workers or between management and workers during business and economic crises.
form bargaining environment. In case bargainers agree on a split of the surplus they earn their respective shares. In case of disagreement they earn nothing.\footnote{Hence, our research is also related to the literature exploring distribution behavior in environments with joint production. For instance, Gantner et al. (2001) show that fairness judgements influence the distribution of the surplus in simple ultimatum and demand games. In Cherry et al. (2002), Frohlich et al. (2004) and Cappelen et al. (2007) a single person (the ‘dictator’) dictates the distribution of the surplus. They find that the dictator’s decision is influenced by recipients’ relative contributions to the joint surplus. Camerer and Loewenstein (1993), Babcock et al. (1995b) and Loewenstein and Moore (2004) study the effect of information in bargaining and show that information disclosure does not necessarily facilitate bargaining. Finally, regarding production uncertainty Wittig et al. (1981) report that people allocate more to themselves when they are told that their own contribution to the joint surplus is not due to luck but due to their performance. See Karagözoğlu (2012) for a recent comprehensive survey.}

Subjective entitlements are defined as “subjectively perceived rights that go along with a motivational disposition to defend them” (Schlicht, 1998, p. 24). In our experiment subjects may derive such subjective rights for a fair share of the surplus from their performance in the real effort task. To elicit these subjective entitlements we privately and anonymously ask bargainers what they think a fair distribution of the jointly produced surplus would be from the vantage point of a neutral arbitrator. We ask this question after the size of the surplus is known but before bargaining begins.

Previous research has shown that entitlements can be important in bargaining (see references above). In this paper we are interested in how performance information and production uncertainties affect subjective entitlements and negotiations. For that we manipulate performance information and production in the following way. First, negotiators either learn whether they have been the better or worse performer in their pair or they do not receive this information. In the former case we deliberately do not give precise performance information as such information is also usually not known in the field. Second, in one condition negotiators know that the joint surplus is solely due to their joint performance while in another condition the actual size of the pie is also affected by an exogenous random event.

Crossing these conditions gives a $2 \times 2$ experimental design with which we can study important issues in bargaining. First, we can investigate which entitlements bargainers derive from their performance in the joint production task and whether these are self-servingly biased. Research on accountability (e.g., Konow, 1996, Cappelen et al., 2007) suggests that a person’s entitlement can only be related to variables an agent controls. Hence, one would expect that entitlements emerge only when there is performance information, that they are role specific (i.e., related to actual performance), and weaker when there are production uncertainties. Second, when subjective entitlements are mutually inconsistent an agreement can be reached only when at least one bargaining party concedes. Therefore, entitlements likely affect bargaining but the strength of the effect may depend on performance information and production uncertainties, as entitlements themselves are likely influenced by them. With our experimental design we
can track the influence of entitlements and their interaction with performance information and production uncertainties through the whole negotiation process, beginning with opening offers via concessions and bargaining duration to agreements.

It should be noted, that performance information in our experiment is relatively coarse which may make it difficult for negotiators to derive subjective entitlements at all. Moreover, in contrast to previous research (Gächter and Riedl, 2005), our performance information does also not provide claims that could be used as an anchor for subjective entitlements. Therefore, we consider our set-up as a rather conservative test bed for the existence of subjective entitlements as well as their potential impact on bargaining.

Our main results are the following. First, bargainers undoubtedly derive subjective entitlements from the performance task, but only when there is relative performance information. Second, entitlements are role specific as better performers derive stronger entitlements than worse performers. In addition, within bargaining pairs entitlements are mostly mutually inconsistent. Third, perhaps surprisingly, uncertainties in the production process only weakly affect subjective entitlements. Forth, the existence and strength of subjective entitlements are reflected in the whole bargaining process. They impact opening offers and agreements as those are skewed away from the equal split and correlated with subjective entitlements. Further bargaining takes longer and concessions are smaller and both are correlated with the tension in entitlements in a bargaining pair. Hence, we find that the (in)existence and strength of subjective entitlements strongly depends on the information negotiators have and that derived subjective entitlements systematically influence the whole bargaining process. Fifth, importantly, production uncertainties about the translation of performance into surplus does affect bargaining but does not systematically mitigate the effect of entitlements on bargaining. Moreover, even when performance information does not differ across bargaining pairs individual differences and differences at the pair level in entitlements correlate with all aspects of bargaining. This strongly suggests that entitlements per se are important factors shaping the bargaining process.

The rest of the paper is organized as follows. The next section presents the experimental design and procedures, in Section 3 we develop our research hypotheses, partly based on theoretical bargaining models assuming reference points, and Section 4 contains the results. In Section 5 we summarize our findings and put them into perspective, especially in relation to theoretical bargaining models assuming reference-dependence.

2 Experimental Design and Procedures

In our experiment, randomly and anonymously paired subjects take on the role of department heads of a company. Subjects are informed that their firm has a standard ‘salary budget’ of 2050 points available for them and that this budget can change depending on their performances or external factors. They are further told that the top management of the firm does not want to
impose a salary distribution and that they will have to bargain over the distribution of the salary budget.5

We implement a 2 × 2 experimental design where we vary (i) the information subjects receive about their own and their colleague’s performance in a real effort task and (ii) the way how these performances are translated into the salary budget. In the NOINFO treatments subjects receive neither information on their own nor on their partner’s performance. In the INFO treatments they receive relative performance information, that is, they are informed about who has performed better and who has performed worse in their pair. In the Det(erinistic) treatments the produced surplus is solely determined by department heads’ joint performance, whereas in the UNC(ertainty) treatments we introduce some uncertainty into the surplus production process. Specifically, in UNC the salary budget is determined by department heads’ joint performance with a chance of 25 percent and due a random devise with a chance of 75 percent. The four resulting treatments are labeled NOINFO-UNC, NOINFO-Det, INFO-Unc and, INFO-Det.

Table 1 summarizes the main elements of the experiment in the sequence they were presented to the subjects. In the following we explain these elements in detail.

| 1. Reading of instructions |
| 2. Performance task |
| 3. Outcome determination |
| 4. Elicitation of beliefs on performances |
| 5. Relative performance information* |
| 6. Elicitation of subjective entitlements |
| 7. Bargaining |
| 8. Post-experiment questionnaire** |

* This information is provided only in the INFO treatments. ** Before stage 8 there was another, not pre-announced, bargaining; the results of this stage are reported elsewhere.

Performance and Outcome Determination: After reading the instructions aloud, the performance of each department head is determined with a real effort task, for which we use a version of a general knowledge quiz that has successfully been applied in other studies (Hoffman et al., 1994, Clark, 1998, Gächter and Riedl, 2005). The quiz consists of 16 multiple choice questions with four incorrect and one correct answer to each question. The questions concern a variety of fields of knowledge, such as politics, music, religion, astronomy and, geography. Each participant receives the same set of questions in the same order. Subjects have at most 30 seconds to

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5The framing and some other details of the experimental design are borrowed from Gächter and Riedl (2005). The precise wording of our frame can be found in the experiment instructions provided in Appendix B.
answer each question and unanswered questions count as wrong answers. In each pair the head of department with the most correct answers has a better performance. All this information is made public knowledge.

Before taking the quiz, it is explained to subjects in the treatments with deterministic production (i.e., in INFO-DET and NOINFO-DET) that the salary budget will be 1390 points when both department heads in sum have 0 to 10 correct answers, 2050 points when the total number of correct answers is between 11 and 20, and 2710 points when both in sum answer 21 to 32 questions correctly. In the treatments with production uncertainty (i.e., INFO-UNC and NOINFO-UNC), subjects are informed that with a chance of 25 percent their salary budget is determined by their joint performances (as described above) and that with a chance of 75 percent each salary budget size is randomly chosen with equal probability. After the quiz, subjects get to know the actually produced salary budget.

Elicitation of Beliefs on Performances: Knowing the salary budget, each subject is asked to guess their own number of correct answers as well as the number of correct answers of the other department head.⁶

Relative Performance Information: In both NOINFO treatments, subjects do not receive any information about their absolute or relative performances in the quiz, while in both INFO treatments subjects get to know whether they are the better or worse performer in their pair.⁷ In case of a tie, subjects are also informed about that.

Elicitation of Subjective Entitlements: We elicit subjective entitlements by adopting the elicitation question successfully used by Gächter and Riedl (2005) (see also Babcock et al., 1995a). Specifically, all subjects answer the following question:

According to your opinion, what would be a ‘fair’ distribution of the salary budget from the vantage point of a non-involved neutral arbitrator? (Please use exact amounts; no intervals! The amounts have to sum up to the salary budget!)

Subjects are not informed about this question beforehand. In the NOINFO treatments they see and answer it after they have stated their beliefs about performances and in the INFO treatments

⁶Belief elicitation is incentivized: for each precise estimation, a subject earns 60 points, for each estimation with 1 (2) error(s), a subject earns 30 (15) points; estimates with larger errors do not earn any payoff. We ask beliefs about performances after subjects know the value of the salary budget as a self-serving bias may be reflected in these beliefs.

⁷We present this information after eliciting beliefs on performances because, (i) we do not want beliefs to be affected by performance information, and (ii) in this way we can keep symmetry in belief elicitation between the INFO and NOINFO treatments.
after they have received the relative performance information. Hence, subjects’ fairness judgments could depend on the role (they believe) they are in and elicited entitlements are therefore *subjective*.

**Bargaining:** Each pair of department heads bargains over the distribution of their salary budget. If an agreement is reached within 10 minutes both earn the agreed shares. If no agreement is reached they are told to be ‘fired’ by the management of the firm and do not earn anything. We implement free-form bargaining (as, e.g., Roth and Murnighan, 1982, Gächter and Riedl, 2005), because it is a natural bargaining protocol, avoids exogenous first-mover effects, and gives subjects much freedom in bargaining (e.g., in the timing, sequence and number of proposals). Subjects are seated in computer cubicles and bargain anonymously with their opponents over a computer network by sending proposals that consist of an amount for themselves and an amount for the other department head.8

**Post-Experiment Questionnaire and Payout:** After all parts of the experiment are finished, subjects are asked to answer a questionnaire where we asked them amongst others about their opinion on the general knowledge quiz. They are also presented the Machiavelli personality test (Christie, 1970), a risk attitude questionnaire (Dohmen et al., 2011), and questions about their personal background. Thereafter, subjects are paid out their earnings in cash individually and confidentially.

The experiment was computerized and programmed with the software z-tree (Fischbacher, 2007) and conducted in the BEElab (Behavioral and Experimental Economics Laboratory) of Maastricht University. In total 348 subjects participated in 16 randomized experimental sessions. Most subjects were undergraduates in economics, business and international business. A typical session lasted about 90 minutes. The points earned in the experiment were converted into cash with an exchange rate of 100 points equals 65 euro cents. The average earnings (including a lump-sum show-up fee of € 3,–) were approximately € 16,–.

## 3 Research Hypotheses

We are interested in the existence and strength of subjective entitlements over a jointly produced surplus and how such entitlements are affected by performance information and production uncertainties. Further, in case entitlements do emerge, we want to investigate how they influence the bargaining process under the described information and production conditions. In this section we develop some hypotheses regarding these issues.

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8Detailed bargaining instructions and example computer screens can be found in Appendix B.
3.1 Subjective Entitlements

In our experiment, subjective entitlements are expressed as subjectively perceived fair shares of the jointly produced surplus. Therefore, we will say that a subjective entitlement exists when the perceived fair share is larger than the equal split and will call an entitlement stronger the more it deviates from the equal split.

The literature on accountability (e.g., Konow, 1996) suggests that subjective entitlements can emerge only when an agent has control over the variables affecting outcomes. In our experiment it is performance in the quiz subjects have control over and this performance also affects the salary budget.

**Hypothesis 1 Existence and strength of subjective entitlements.**

Subjects exhibit subjective entitlements and ascribe stronger entitlements to those who performed better in the quiz.

Research on self-serving biases in performance evaluation (e.g., Babcock et al., 1995a) suggests a role specific interpretation of subjective entitlements. That is, high performers have a tendency to attribute stronger entitlements to themselves than low performers do and vice versa. Clearly, role specific entitlements are only possible if one knows one’s role. In our experiment subjects either know (INFO) or not (NOINFO) that they are the better or worse performer in their pair. Therefore, we expect that role specific subjective entitlements are present with performance information but are not observed without performance information. Further, the produced surplus is either solely due to joint performance (DET) or prone to production uncertainties (UNC). Since role specific entitlements may also be moderated by uncertainties in the translation of performance into outcomes (Zuckerman, 1979, Konow, 1996), they are likely weaker with than without such uncertainties.

**Hypothesis 2 Subjective entitlements, performance information, and production uncertainties.**

Subjects exhibit role specific subjective entitlements only when performance information is available (INFO). In this case, better performers attribute stronger entitlements to themselves than worse performers attribute to better performers.

Given performance information, subjective entitlements are stronger when the production process is deterministic (INFO-DET) than when there is production uncertainty (INFO-UNC).

3.2 Subjective Entitlements and Bargaining

In our free-form bargaining subjects’ strategy sets are extremely rich and to our knowledge there is no theoretical model that could predict behavior in the bargaining process (e.g., first proposals, concessions, bargaining duration) and agreements as well as the influence of subjective entitlements. However, there is some theoretical bargaining literature that analyzes bargaining
situations which may be viewed as similar to ours and, hence, could be informative for what to expect in our bargaining game.

For predicting agreements in unstructured bargaining often classical cooperative bargaining solutions are employed (see, e.g., Nash, 1950, Kalai and Smorodinsky, 1975, for theoretical solutions, and, e.g., Roth, 1995, for early experimental evidence). Importantly, these solutions are completely determined by the utility set and disagreement point and ignore any form of entitlements. In our experiment the bargaining parties are symmetric from a strategic point of view. Therefore, all such solutions predict an equal split of the produced surplus, irrespective of the treatment.

The bankruptcy and bargaining with claims literature has introduced objective entitlements in the form of claims into bargaining theory (see Thomson, 2003, for an overview, and Gächter and Riedl, 2006, for an experiment). More closely related to our bargaining with subjective entitlements is the model of Gupta and Livne (1988) (see, also Balakrishnan et al., 2011) who introduce a reference and ideal point into the bargaining problem. In these models the ideal point is exogenously defined via the disagreement point. In our bargaining environment we can define the ideal point endogenously via subjective entitlements. Specifically, in each bargaining pair, \((s_1, s_2)\), a subject’s declared entitlement \(e_i\) implies an entitlement \(B - e_i\) ascribed to the bargaining partner, where \(B\) denotes the produced surplus. Clearly, one can say that in an agreement negotiator \(s_1\) \((s_2)\) would approve giving \(B - e_1\) \((B - e_2)\) to the opponent. Using the idea of Gupta and Livne (1988) the subjective entitlements \((e_1, e_2)\) can be thought of as the ideal point and \((B - e_1, B - e_2)\) as the reference point. Note, that, due to role specific interpretations of entitlements they are likely mutually incompatible (i.e., \(e_1 + e_2 > B\)). The bargaining solution to this problem is then given by \(\left(\frac{e_1 + e_2}{2}, \frac{2B - e_1 - e_2}{2}\right)\), which is the mid-point between \((e_1, e_2)\) and \((B - e_2, B - e_1)\). Figure 1 sketches the solution graphically.

![Figure 1: A bargaining solution with subjective entitlements](image)

It is easily seen that ceteris paribus strong entitlements, \(e_i\), of a bargainer \(i\) as well as stronger ascribed entitlements, \(B - e_j\), by the opponent \(j\) move the bargaining solution in favor of the
former. Hence, when there are strong asymmetric (ascribed) subjective entitlements, agreements should be skewed away from the equal split towards agreements closer to the subjective entitlements. In case there are no entitlements the solution predicts the equal split. The equal split is also predicted when subjective entitlements of bargaining partners are symmetric around it. This prediction is consistent with the long strand of literature on the prevalence of the equal-split in (almost) symmetric bargaining environments (e.g., Schelling, 1960, Siegel and Fouraker, 1960, Nydegger and Owen, 1975, Roth and Malouf, 1979, Anbarci and Feltovich, 2012, 2013).

Obviously in real bargaining a set of additional factors, like risk preferences and other personal characteristics, may play a role in determining the bargaining process and outcome. Further, it is by no means obvious that in real bargaining subjective entitlements are of comparable importance as the described ideal point is in theory. Consequently, we do not expect that bargaining partners agree exactly on the described solution. However, together with our hypotheses on the emergence and strength of subjective entitlements, the discussed theoretical solution provides us with a useful framework for qualitative and comparative statics predictions.

We can distinguish two effects of subjective entitlements on bargaining agreements that may differ across treatments. First, there could be a level effect, meaning that the existence of entitlements leads to bargaining agreements different from the equal split. Specifically, since we expect subjective entitlements in favor of the bargainer who performs better in the real effort task (Hypothesis 1) and that these entitlements differ in strength across treatments (Hypothesis 2), we predict similar effects for bargaining agreements. Second, there may also be a marginal effect of entitlements implying that bargaining agreements within each treatment may be correlated with the entitlements subjects in a bargaining pair hold. In principle, such a marginal effect could be similar in the different treatments. However, in the Unc treatments entitlements may be psychologically weaker than in the Det treatments because when production cannot be unambiguously attributed to performance the role of desert is more controversial (Bazerman and Neale, 1992) and the “moral wiggle room” (Dana et al., 2007) is larger. In this case, or if there are no entitlements at all (as we expect to be the case in the Noinfo treatments), the marginal effect of entitlements may be weakened or inexistent. The following hypothesis, which is conditional on the observation of entitlements as described in Hypotheses 1 and 2, captures these considerations.

**Hypothesis 3 Subjective entitlements and bargaining agreements.**

(1) When there is no performance information (Noinfo) agreements do not differ from the equal split. With performance information (Info), agreements do differ from the equal split in favor of the better performer and deviate more when production is deterministic (Info-Det) than when it is noisy (Info-Unc).
(2) Moreover, with performance information (INFO) agreements are positively correlated with each bargaining partner’s subjective entitlement and the correlation is stronger without production uncertainty (INFO-Det) than with it (INFO-Unc). Without performance information no such correlation exists (NOINFO).

Recent theoretical bargaining models (Compte and Jehiel, n.d., Li, 2007, Hyndman, 2011) can account for the fact that bargaining agreement is almost never immediate but rather follows a gradual process of offers and counter offers, concessions and eventual agreement. However, to our knowledge there is no theoretical model available that could be used to predict the effect of entitlements on important elements of the bargaining process, as opening proposals, concession behavior, bargaining duration, and disagreements. Intuitively, however, it seems reasonable that entitlements have similar effects on these bargaining elements as on agreements. Opening proposals set the stage for the rest of the bargaining process and are certainly strongly influenced by strategic considerations. Nevertheless, if role specific entitlements are strongly present they may also be reflected in these first proposals. Specifically, when negotiators anticipate that they have to make some compromises during bargaining and if their target outcome is related to derived and ascribed entitlements these may influence their opening proposals in a similar way as agreements.

**Hypothesis 4 Subjective entitlements and opening proposals.**

(1) Without performance information (NOINFO) opening proposals of high and low performers are similar and centered around the equal split. With performance information (INFO) opening proposals of both low and high performers are skewed in favor of the high performer and the skewness is stronger without (INFO-Det) than with (INFO-Unc) production uncertainty.

(2) With performance information (INFO) opening proposals of both, high and low performers, are positively correlated with their subjective entitlements and the correlation is stronger without (INFO-Det) than with (INFO-Unc) production uncertainty. No such correlation exists in case of no performance information (NOINFO).

If entitlements are weak and bargaining partners view the equal split as the natural focal point to agree upon there is little reason for much haggling, long negotiations or even disagreement. However, when entitlements are strong and incompatible negotiators should be ready to defend them and not give in easily when the other side has a different view on matters. In that case, concessions may build in only slowly and late and bargaining will take long. Hence, when subjective entitlements exist, we expect that concessions and bargaining duration will be influenced by them. This effect may be enhanced the further apart individual entitlements within a pair are, that is the larger the tension in entitlements is. In the extreme, when bargaining partners are ready to strongly defend their entitlements and refrain from making compromises, it may even lead to disagreement. Our last hypothesis specifies this reasoning.
**Hypothesis 5** Subjective entitlements and concessions, bargaining duration, and disagreements.

1. Without performance information (Noinfo) concessions are larger and bargaining duration shorter than with performance information (Info). Further, concessions are weaker and bargaining duration longer when the production process is deterministic (Info-Det) than when it is noisy (Info-Unc).

2. With performance information (Info) concession behavior is negatively and bargaining duration positively correlated with the tension in subjective entitlements within a bargaining pair. This correlations are stronger without (Info-Det) than with (Info-Unc) production uncertainty. No such correlation exists in case of no performance information (Noinfo).

3. Disagreements are more frequent in (Info-Det) than in (Info-Unc) and do not occur when there is no performance information (Noinfo).

4 Results

In the following we refer to the subject with the better performance (i.e., more correct answers in the performance quiz) in a pair as the “winner” and to the other subject as the “loser”. Further, we express entitlements, proposals and agreements in shares to the winner (“winner share”).

On average subjects answered 7 of the 16 questions correctly indicating that the questions were neither too easy nor too difficult. In addition, subjects’ answers to post-experiment questions show that they perceived the performance quiz as a legitimate measure of general knowledge. Subjects’ estimate of their own and their partner’s number of correct answers was with 7.26 and 7.54, respectively, pretty accurate. This is in concordance with other studies also reporting no or little overconfidence at success levels around 50 percent (Moore and Healy, 2008, Blavatskyy, 2009).

In total we have data of 174 bargaining pairs. The salary budget of 1390, 2050, and 2710 points occurred in 55, 81, and 38 pairs, respectively. Across salary budgets we do not find statistical significant differences in the variables of interest. Therefore, in the subsequent statistical analysis we pool the data of the different salary budget sizes.\(^\text{12}\)

\(^{10}\)On a 7-point Likert-scale (1 = “do not agree at all”, 7 = “agree very much”) the average (median) answer to the statement “In my view the knowledge questions have been difficult.” was 5.10 (5), and to “The one with the better general knowledge is able to answer more questions correctly.” it was 5.42 (6).

\(^{11}\)Two-sided Kruskal-Wallis rank sum tests do not reject the hypotheses of equality across salary budget sizes for subjective entitlements of both winners and losers, separately and pooled, (\(p > 0.4755\)), bargaining durations (\(p = 0.5961\)) and, agreements (\(p = 0.5374\)).

\(^{12}\)We classify and exclude three subjects as outliers on the basis of their subjective entitlements (see Appendix A.1 for the statistical rationale).
4.1 Subjective entitlements

Hypothesis 1 stated that overall subjects will exhibit and ascribe entitlements which are skewed away from the equal-split in favor of the winner in the performance quiz. Figure 2 depicts the distribution of subjective entitlements as stated by winners and losers pooled across treatments. Entitlements are shown as shares to the winner (winner shares) and losers’ entitlements should be read as the entitlement losers ascribe to winners. It shows that for winners as well as losers, subjective entitlements are indeed skewed in the hypothesized way. In the pooled data the average subjective entitlement stated by winners and losers is 0.571 and 0.541, respectively. For both roles Wilcoxon signed-ranks (WSR) tests indicate that entitlements are significantly larger than the equal-split (\( p < 0.0001, 1\)-sided).\(^{13}\) The difference in stated entitlements between winners and losers is significant (\( p < 0.0001, 2\)-sided, WSR test) indicating role specific entitlements.\(^{14}\)

To test our Hypotheses 2 we analyze winners’ and losers’ entitlements separately for the four treatments. The descriptive statistics reported in Table 2 show that role specific subjective entitlements of both, winners and losers, differ across treatments. Subjective entitlements of winners are higher with performance information than without it, while the opposite holds for losers. For winners a Kruskal-Wallis (KW) test indicates significant differences in subjective entitlements across treatments (\( p = 0.0001, 1\)-sided). Subsequent pair-wise comparisons with

\(^{13}\)Whenever we have a clear 1-sided hypothesis we employ 1-sided tests. Otherwise, 2-sided tests are used.

\(^{14}\)By definition, there are no losers and winners in pairs where subjects performed equally well in the performance task (22 pairs). Not surprisingly, there is no difference in entitlements within such pairs (absolute difference is smaller than 0.001). Therefore, here and in the following analyses we do not take into account the data of these pairs.
Table 2: Subjective entitlements stated by winners and losers in each treatment

<table>
<thead>
<tr>
<th></th>
<th>NOINFO-UNC</th>
<th>NOINFO-Det</th>
<th>INFO-Unc</th>
<th>INFO-Det</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winner</td>
<td>0.539</td>
<td>0.535</td>
<td>0.594</td>
<td>0.619</td>
</tr>
<tr>
<td></td>
<td>(0.053)</td>
<td>(0.048)</td>
<td>(0.060)</td>
<td>(0.079)</td>
</tr>
<tr>
<td>Loser</td>
<td>0.561</td>
<td>0.540</td>
<td>0.523</td>
<td>0.533</td>
</tr>
<tr>
<td></td>
<td>(0.081)</td>
<td>(0.054)</td>
<td>(0.039)</td>
<td>(0.056)</td>
</tr>
<tr>
<td>Difference</td>
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<td>-0.005</td>
<td>0.071</td>
<td>0.086</td>
</tr>
<tr>
<td></td>
<td>(0.098)</td>
<td>(0.081)</td>
<td>(0.059)</td>
<td>(0.107)</td>
</tr>
<tr>
<td># of obs.</td>
<td>41</td>
<td>34</td>
<td>37</td>
<td>37</td>
</tr>
</tbody>
</table>

Note: Table reports averages and average differences, respectively. Standard deviations in parentheses.

Mann-Whitney (MW) tests show that the differences between NOINFO-UNC and NOINFO-Det as well as INFO-Unc and INFO-Det are not significant ($p = 0.7133$, 2-sided, and 0.1199, 1-sided). At the same time, comparing the NOINFO with the INFO treatments indicates significant differences ($p < 0.0001$, 1-sided). Hence, for winners role specific entitlements are strengthened by performance information but unaffected by noise in the production process. For losers a KW test detects differences across treatments at the marginal significance level ($p = 0.0503$, 1-sided). Pair-wise comparisons using MW tests show that only the difference between NOINFO-UNC and INFO-Unc is significant ($p = 0.0104$, 1-sided), while the other differences are at best marginally significant.

Analyses of the differences between winner and loser entitlements across and within treatments further supports the idea that it is mainly performance information that strengthens role specific entitlements (see lower part of Table 2). Comparisons across treatments show that there are no significant differences between both NOINFO as well as both INFO treatments ($p \geq 0.3768$, 1-sided MW tests), while all other pair-wise differences are significant ($p < 0.0001$, 1-sided MW tests). Within treatments, WSR tests indicate that differences between winner and loser entitlements are highly significant when performance information is available (INFO-Unc: $p < 0.0001$, INFO-Det: $p < 0.0001$; 1-sided) but fail to detect such significant differences in treatments without performance information (NOINFO-UNC: $p = 0.1834$, NOINFO-Det: $p = 0.2277$; 1-sided).\textsuperscript{15,16}

\textsuperscript{15}To see whether in the NOINFO treatments the belief of being a better/worse performer induces entitlements we look at 'belief-winner'/'belief-loser' (who believes to have more/less answers correct than the paired subject). In NOINFO-Det average subjective entitlements of belief-winners (0.568; $n = 17$) and belief-losers (0.529; $n = 29$) significantly differ ($p = 0.0254$, 1-sided MW test) while in NOINFO-Unc they are virtually the same (0.554, $n = 32$ and 0.551, $n = 45$, respectively; $p = 0.3459$, 1-sided MW test). Hence, only when production is deterministic there is evidence in favor of belief-based role specific entitlements.

\textsuperscript{16}One may hypothesize that better performance in the knowledge quiz is related to stronger entitlements, if better performers are generally ‘smarter’ and anticipate that stronger entitlements may help them in securing a
In sum, the data support the hypothesis that role specific entitlements are established when there is performance information but are inexistent in the absence of it. Notably, in contrast to our hypothesis, given performance information, noise in the production process does not significantly affect role specific subjective entitlements.

4.2 Bargaining and Subjective Entitlements

In the previous subsection we have shown that role specific subjective entitlements exist and that they differ across treatments. Yet, such entitlements will have economically relevant consequences in bargaining only when negotiators are ready to defend them. In the following subsections we look into this issue and explore the effect of entitlements on opening proposals, concessions and bargaining duration (including disagreements), and agreements.

4.2.1 Opening Proposals

Depending on who makes the first move, in each pair the very first proposal comes either from a winner or a loser. Table 3 shows summary statistics of these opening proposals (in winner shares). The figures in the table clearly indicate that opening proposals comprise a role-specific strategic element as in each treatment winners demand significantly higher shares for themselves than losers are offering to them (in all treatments $p < 0.0001$, 1-sided MW tests).

As hypothesized, across treatments opening proposals are influenced by performance information and the nature of the production process (Hypotheses 4). The lower part of Table 3 shows larger share in bargaining. We correlate the number of correct answers in the quiz with stated entitlements and find statistically significant but economically weak support for this hypothesis (Spearman’s $\rho = 0.1686, p = 0.0261$ in NoInfo, $\rho = 0.1384, p = 0.0736$; 2-sided)

<table>
<thead>
<tr>
<th></th>
<th>NoINFO-Unc</th>
<th>NoINFO-Det</th>
<th>Info-Unc</th>
<th>Info-Det</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winner</td>
<td>0.588</td>
<td>0.598</td>
<td>0.642</td>
<td>0.692</td>
</tr>
<tr>
<td># of obs.</td>
<td>19</td>
<td>18</td>
<td>18</td>
<td>23</td>
</tr>
<tr>
<td>Winner</td>
<td>0.091</td>
<td>0.035</td>
<td>0.124</td>
<td>0.081</td>
</tr>
<tr>
<td># of obs.</td>
<td>22</td>
<td>16</td>
<td>19</td>
<td>14</td>
</tr>
<tr>
<td>Distances from equal split:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winner</td>
<td>0.088</td>
<td>0.098</td>
<td>0.142</td>
<td>0.192</td>
</tr>
<tr>
<td>Loser</td>
<td>-0.090</td>
<td>-0.020</td>
<td>-0.050</td>
<td>-0.021</td>
</tr>
</tbody>
</table>

Note: Table reports averages. Standard deviations in parentheses.
the average distances of the opening proposals from the equal split. In NOINFO-UNC these distances are almost perfectly symmetrical for winners and losers and a MW test does not reject the hypothesis of equal absolute distance from the equal split ($p = 0.7030$, 2-sided). In no other treatment winner and loser opening proposals are symmetric around the equal split ($p < 0.0050$, 2-sided). Instead they are skewed toward the winner. Hence, performance information and deterministic production influence opening proposals in favor of the winner. Further, a KW test indicates that opening proposals of winners significantly differ across treatments ($p = 0.0006$, 1-sided). Pair-wise comparisons between treatments fail to detect significant differences between the two NOINFO and the two INFO treatments ($p = 0.3396$ and $p = 0.1154$, respectively; 1-sided) but indicate significant differences for all other comparisons ($p < 0.0296$, 1-sided). Also for losers a KW test indicates significant differences in opening proposals across treatments ($p = 0.0012$, 1-sided). MW tests reveal a marginally significant difference between INFO-Det and INFO-UNC ($p = 0.0572$, 1-sided) and significant differences for all other pair-wise comparisons ($p < 0.0477$, 1-sided), except NOINFO-Det vs. INFO-UNC ($p = 0.3959$, 1-sided).

Overall, these results are largely – albeit not fully – in line with the first part of Hypothesis 4 claiming a level effect of entitlements on opening proposals that differs across treatments. Specifically, winners ask for more when there is performance information than when this information is not available. Further, given performance information, opening offers appear to be more strongly (but statistically at best weakly significantly) skewed towards winners when the production process is deterministic than when it is noisy.

In order to investigate a potential marginal effect of entitlements we run Tobit regressions relating opening proposals to subjective entitlements of winners and losers in each treatment. Table 4 reports the results, where the independent variables W_Entitle and L_Entitle stand for the entitlement claimed by and ascribed to the winner in the quiz by the winner and the loser, respectively. In line with Hypothesis 4, in both treatments with performance information winners’ opening proposals are indeed significantly and positively affected by their subjective entitlements. Those who claim a higher entitlement also demand a higher proportion of the salary budget. In contrast to our hypothesis the estimated coefficient of W_Entitle is larger in

---

17 When comparing opening proposals between the NOINFO treatments we find that belief-winners ask significantly more in NOINFO-Det than in NOINFO-UNC (0.621 and 0.491, $p = 0.0020$, 1-sided MW test). Similarly, belief-losers offer significantly more in NOINFO-Det than in NOINFO-UNC (0.568 and 0.459, $p = 0.0015$, 1-sided MW test). This is consistent with the stronger role specific entitlements of belief-winners and belief-losers when the production process is deterministic.

18 In order to keep the paper focussed on the main research questions and to save on space we do not report results of regressions when adding individual characteristics as control variables, here and in the other subsequently reported regressions. Appendix A.3 reports regression estimates where we add control variables which can reasonably be assumed to affect bargaining behavior: risk preferences, Machiavellianism, and, respectively, gender of the bargainer and gender composition of the bargaining pair. The regression results reported in the main text are robust to adding these control variables.
Table 4: Opening proposals as a function of subjective entitlements for winners and losers in each treatment

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>NOINFO-UNC</th>
<th>NOINFO-DET</th>
<th>INFO-UNC</th>
<th>INFO-DET</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Loser</td>
<td>Winner</td>
<td>Loser</td>
<td>Winner</td>
</tr>
<tr>
<td>Const</td>
<td>0.811***</td>
<td>0.427**</td>
<td>0.481***</td>
<td>0.301</td>
</tr>
<tr>
<td></td>
<td>(0.108)</td>
<td>(0.220)</td>
<td>(0.067)</td>
<td>(0.268)</td>
</tr>
<tr>
<td>W_Entitle</td>
<td>0.294</td>
<td>0.556</td>
<td>0.886***</td>
<td>0.570**</td>
</tr>
<tr>
<td></td>
<td>(0.351)</td>
<td>(0.495)</td>
<td>(0.205)</td>
<td>(0.310)</td>
</tr>
<tr>
<td>L_Entitle</td>
<td>-0.718***</td>
<td>-0.002</td>
<td>0.225</td>
<td>0.337*</td>
</tr>
<tr>
<td></td>
<td>(0.183)</td>
<td>(0.122)</td>
<td>(0.502)</td>
<td>(0.211)</td>
</tr>
<tr>
<td>F</td>
<td>15.37</td>
<td>0.70</td>
<td>0.00</td>
<td>1.26</td>
</tr>
<tr>
<td>N</td>
<td>22</td>
<td>19</td>
<td>16</td>
<td>18</td>
</tr>
</tbody>
</table>

Note: ***,**, * indicates statistical significance at the 1-sided 1, 5, 10 percent level, respectively. Robust standard errors in parentheses.

INFO-UNC than in INFO-DET. The difference is, however, not significant (p = 0.1985, 1-sided).

With performance information, the opening proposals of losers are also positively influenced by entitlements, but the effect is weaker than for winners. It is marginally statistically significant when the production process is deterministic and insignificant when production is noisy. The coefficient estimates of L\_Entitle do not differ between the INFO treatments (p = 0.4125, 1-sided).

Without performance information, we expected that entitlements do not play any significant role in bargaining for both, winners and losers. The reported estimates support this, except for losers’ opening proposals in treatment NOINFO-UNC where we observe a significant negative effect. At first sight this is surprising but a closer look at the data reveals that it is purely due to one outlying observation, where a loser subject ascribes a relatively high entitlement to the winner (0.863) but offers a very small share in the first proposal (0.137). This observation also points out that opening proposals are likely comprising an important strategic element. In light of that it may be viewed as surprising that entitlements exhibit the hypothesized effects at all.

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19 Here and elsewhere, in order to test equality of coefficient estimates between treatments we pooled the data of the respective treatments and added a dummy and an interaction variable to control for treatment effects.

20 When eliminating this observation the coefficient of L\_Entitle is increased to −0.258 and not significantly different from zero (p = 0.232, 1-sided).

21 We have seen above (Footnote 16) that entitlements are weakly related to performance in the knowledge quiz. If this indicates strategic use of entitlements by better performers then performance may correlate with opening offers and not entitlements per se. To test this we ran the same set of regressions while controlling for the number of correct answers. All results reported in Table 4 stay qualitatively the same and the added variable is never positively significant.
We conclude that for winners and to a smaller extent also for losers there is a positive marginal effect of entitlements on opening proposals when performance information is available and that these effects are similar with and without noise in the production process.

4.2.2 Concessions and Bargaining Duration

In order to analyze concessions in bargaining we employ concession measures introduced by Gächter and Riedl (2005), which incorporate both the size of a concession relative to the remaining surplus, taking into account the concessions already made, and the time at which a concession is made. These measures are (i) the sum of average relative concessions, (ii) the sum of average concession times, and (iii) the sum of average time-weighted relative concessions, where the sum is taken over the individual statistics of the two bargainers in a pair.\(^{22}\) These concession measures summarize concession behavior on the pair level by combining individual-level data in each pair. In order to save on space we report here only results for the most encompassing concession statistic, the sum of average time-weighted relative concessions (concessions, for short), and relegate results regarding the other two concession measures to Appendix A.2.

The upper part of Table 5 reports descriptive statistics of concessions for all four treatments, where smaller values indicate weaker concessions (that is, concessions that are made later and/or are smaller). As stated in Hypothesis 5 concessions in bargaining differ across treatments. Specifically, concessions are weaker with than without performance information and are weakest when performance information is combined with a deterministic production process. A KW test indicates that concessions are significantly different across treatments (\(p < 0.0001\), 1-sided). Pair-wise comparisons with MW tests further show that the difference between the NOINFO

\(^{22}\) The exact definitions are as follows (slightly adapted from Gächter and Riedl, 2005, p.256, to fit our bargaining environment): A relative concession of a winner is defined as the difference between a winner’s standing offer (in winner share) and his new offer (in winner share) divided by the current bargaining area. The current bargaining area is given by the difference between the standing offer of the winner (as winner share) and the standing offer of the loser (as winner share). A relative concession of a loser is defined analogously. For example, if the standing offers of a winner and a loser are 0.7 and 0.5, respectively (i.e., the current bargaining area is 0.2), and the winner now demands only 0.6 for himself, then the absolute concession is 0.1 and the relative concession is 0.5 (= 0.1/0.2). The magnitude of 0.5 can be interpreted as going halfway toward an agreement. The initial bargaining area is assumed to be equal to the salary budget (i.e., 1). A concession leading to a new offer that precisely matches the opponent’s standing offer gives a relative concession of 1. Therefore, an acceptance is calculated as a relative concession of 1. The summary statistics average relative concession of a bargainer is just the average of all his relative concessions made during bargaining.

The average concession time of a bargainer is defined as the sum of the points in time concessions are made divided by the number of concessions.

A time-weighted relative concession is a relative concession (as defined above) multiplied by (601-time of concession) if the concession is positive and multiplied by time of concession if the concession is negative, respectively. This measure has the property that a given positive (negative) relative concession gets the less (more) weight the later the concession is made. The statistic we use is the average of all time-weighted relative concessions of a bargainer.
treatments is insignificant ($p = 0.9958$, 2-sided) while all other differences are significant at least at the 5 percent level (1-sided).

<table>
<thead>
<tr>
<th></th>
<th>NOINFO-UNC</th>
<th>NOINFO-Det</th>
<th>INFO-UNC</th>
<th>INFO-Det</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concessions</strong></td>
<td>539.7</td>
<td>504.6</td>
<td>304.2</td>
<td>213.2</td>
</tr>
<tr>
<td></td>
<td>(398.4)</td>
<td>(370.8)</td>
<td>(470.3)</td>
<td>(244.8)</td>
</tr>
<tr>
<td><strong># of obs.</strong></td>
<td>41</td>
<td>34</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td><strong>Bargaining duration</strong></td>
<td>256.6</td>
<td>261.1</td>
<td>395.1</td>
<td>493.6</td>
</tr>
<tr>
<td></td>
<td>(222.1)</td>
<td>(233.3)</td>
<td>(209.6)</td>
<td>(186.1)</td>
</tr>
<tr>
<td><strong># of obs.</strong></td>
<td>41</td>
<td>33</td>
<td>36</td>
<td>35</td>
</tr>
</tbody>
</table>

Note: Table reports averages. Concessions (duration) statistics include (exclude) pairs that disagreed. Standard deviations in parentheses.

The lower part of Table 5 reports descriptive statistics for bargaining duration (that is, the time spent until an agreement is reached). It differs across treatments in a similar way as concessions do. Bargaining duration is shortest and almost equal in both treatments without performance information and it takes longest until an agreement is reached when performance information is combined with deterministic production (INFO-Det). The differences are significant across treatments ($p < 0.0001$, KW test, 1-sided) and pair-wise comparisons show that equality of bargaining duration cannot be rejected for the NOINFO treatments ($p = 0.6125$, 2-sided MW test) but is rejected for all other comparisons ($p < 0.0139$, 1-sided MW test).

In keeping with other free-form bargaining experiments (e.g., Roth et al., 1988) many agreements are reached in the last minute. More importantly though, across treatments the frequencies of last minute agreements differ and show a similar pattern as the timing of agreements. In both NOINFO treatments 27 percent of agreements are reached in the last minute. This percentage increases to 44 percent in INFO-UNC and peaks at 71 percent in INFO-Det. Pair-wise comparisons with $\chi^2$-tests indicate no difference in the frequency of last minute agreements between the two NOINFO treatments ($p = 0.966$). For all other treatment comparisons the differences are at least marginally significant ($p \leq 0.069$, 1-sided). In particular, the comparison between INFO-UNC and INFO-Det is significant ($p = 0.011$, 1-sided).

Hence, overall, the data clearly support the hypothesized level effect of entitlements on concessions and bargaining duration as formulated in the first part of Hypothesis 5.

When testing for a potential marginal effect of entitlements on concessions and bargaining duration we need a measure of entitlements at the bargaining pair level. Such a measure is given by the tensions in entitlements between losers and winners. Formally, this tension is defined as the difference in subjective entitlements between winners and losers in each bargaining pair: $\Delta_{\text{Entitle}} := W_{\text{Entitle}} - L_{\text{Entitle}}$ (see also Gächter and Riedl, 2005).
The second part of Hypothesis 5 claims that with performance information tensions in entitlements between losers and winners may weaken concessions and increase the time until an agreement is reached. We will test the hypothesis by regressing concessions and bargaining duration on tensions in entitlements. Concessions and bargaining duration may also be influenced by the difference in first proposals of winners and losers, as a larger initial difference needs larger concessions in order to strike an agreement and may also elongate the bargaining process. Our concession measure incorporates this potential influence of opening proposals by defining concessions relative to bargaining areas, which are given by standing proposals. Therefore, we do not need to control for opening offers in the concessions regressions. When analyzing bargaining duration we explicitly control for the influence of initial proposals with the variable $\Delta_{\text{First}}$, which stands for the difference in the first proposal and first counter proposal in a bargaining pair.

Tables 6 and 7 show the results of OLS and Tobit regressions for concessions and bargaining duration, respectively. 23 As expected, in the NoInfo treatments entitlements affect neither concessions nor bargaining duration. 24 Also as hypothesized, when performance information is available a larger tension in entitlements significantly weakens the concessions made in a bargaining pair. Surprisingly, the effect is stronger when there is noise in the production process than when production is deterministic. The difference in coefficients is only weakly significant, though ($p = 0.0940$, 1-sided).

The results for bargaining duration depict a similar picture. With performance information and noise in the production process tension in entitlements significantly increases the time until an agreement is reached, while this is only insignificantly the case for deterministic production. Here the difference in coefficient estimates of $\Delta_{\text{Entitle}}$ is significant ($p < 0.001$, 1-sided). 25

23 We use OLS estimates for concessions as our concession measure has no natural boundary points and Tobit estimates for bargaining duration as it is bounded below by 0 and above by 600 seconds. The differences in the number of observations between the two regression tables are due to pairs who did not reach an agreement and are not taken into account in the bargaining duration regressions. In addition, for some bargaining pairs the difference in first (counter)proposals could not be calculated because not both sides in the pair made a first (counter)proposal. When running the bargaining duration regressions with all pairs that reached an agreement but without $\Delta_{\text{First}}$, qualitatively the coefficient estimates for $\Delta_{\text{Entitle}}$ do not change.

24 The role of beliefs of being a better or worse performer is difficult to assess on the pair-level as their are many possible combinations, including where neither in a pair beliefs to be the winner or the loser in the performance task. Nevertheless, to see whether there is a potential role for beliefs affecting concessions or bargaining duration we compare pairs where at least one bargainer thought to be the better performer and no bargainer thought to be the worse performer with the rest of bargaining pairs. MW tests do not reject the null hypothesis of no difference between these two groups for concessions and bargaining duration ($p > 0.4290$ and $p > 0.3280$, respectively; 2-sided).

25 Probit regressions relating the likelihood of a last minute agreement to the difference in first proposals and tension in entitlements corroborate the findings for bargaining duration. In the different treatments the same explanatory variables as in the bargaining duration regressions are statistically (in)significant.
Table 6: Concessions as a function of subjective entitlements in each treatment (OLS regressions)

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>NOINFO-UNC</th>
<th>NOINFO-Det</th>
<th>INFO-UNC</th>
<th>INFO-Det</th>
</tr>
</thead>
<tbody>
<tr>
<td>Const</td>
<td>541.6***</td>
<td>501.8**</td>
<td>434.3***</td>
<td>279.1***</td>
</tr>
<tr>
<td></td>
<td>(64.5)</td>
<td>(65.1)</td>
<td>(100.6)</td>
<td>(49.1)</td>
</tr>
<tr>
<td>Δ_Entitle</td>
<td>86.0</td>
<td>-619.8</td>
<td>-1839.2**</td>
<td>-763.5***</td>
</tr>
<tr>
<td></td>
<td>(633.3)</td>
<td>(720.4)</td>
<td>(768.0)</td>
<td>(256.4)</td>
</tr>
</tbody>
</table>

R²                     | 0.0004     | 0.0182     | 0.0526    | 0.1123    |
F                      | 0.02       | 0.74       | 5.73      | 8.87      |
N                      | 41         | 34         | 37        | 37        |

Note: ***,**,* indicates statistical significance at the 1-sided 1, 5, 10 percent level, respectively. Robust standard errors in parentheses.

Table 7: Bargaining duration as a function of subjective entitlements in each treatment (Tobit regressions)

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>NOINFO-UNC</th>
<th>NOINFO-Det</th>
<th>INFO-UNC</th>
<th>INFO-Det</th>
</tr>
</thead>
<tbody>
<tr>
<td>Const</td>
<td>175.9***</td>
<td>278.7***</td>
<td>257.5***</td>
<td>472.0***</td>
</tr>
<tr>
<td></td>
<td>(49.5)</td>
<td>(60.1)</td>
<td>(57.9)</td>
<td>(46.0)</td>
</tr>
<tr>
<td>Δ_First</td>
<td>680.0***</td>
<td>386.1***</td>
<td>120.0</td>
<td>188.5**</td>
</tr>
<tr>
<td></td>
<td>(258.0)</td>
<td>(119.6)</td>
<td>(250.1)</td>
<td>(90.7)</td>
</tr>
<tr>
<td>Δ_Entitle</td>
<td>-197.4</td>
<td>267.8</td>
<td>1765.9***</td>
<td>194.8</td>
</tr>
<tr>
<td></td>
<td>(375.3)</td>
<td>(600.3)</td>
<td>(384.3)</td>
<td>(266.9)</td>
</tr>
</tbody>
</table>

Log-L                  | -235.27    | -154.5     | -229.5    | -195.6    |
F                      | 4.49       | 5.88       | 12.76     | 2.19      |
N                      | 36         | 23         | 35        | 33        |

Note: ***,**,* indicates statistical significance at the 1-sided 1, 5, 10 percent level, respectively. Robust standard errors in parentheses.

Before dismissing any marginal entitlement effect in INFO-Det, it is important to note that the coefficient estimate of Δ_First is significantly positive in this treatment but insignificant in INFO-Unc. Together with the already established result of significant effects of entitlements on opening proposals of both winners and losers in INFO-Det (see Table 4) this points towards an indirect effect of entitlements on bargaining duration in this treatment.
In sum, without performance information a stronger tension in entitlements affects neither concessions nor bargaining duration, but does affect both (directly or indirectly) when performance information is available. This supports the second part of Hypothesis 5. In contrast to the hypothesis we do not find a stronger effect with deterministic than with noisy production.

Finally, before discussing agreements, a note on disagreements. Similar to other comparable free-form bargaining experiments (e.g., Gächter and Riedl, 2005) we observe only very few disagreements. In total there are five pairs who do not strike an agreement, three in Info-Det and one each in Info-Unc and NoINFO-Det. Hence, in line with the third part of Hypothesis 5, there are indeed more disagreements in the Info than the NoINFO treatments and more in Info-Det than in Info-Unc. However, overall there are too few disagreements to make these differences statistically significant ($p = 0.111$, Fisher exact test, 1-sided). When using the pooled data and bargaining pairs with a winner (loser), a robust probit regression estimating the likelihood of a disagreement in dependence of $\Delta_{\text{Entitle}}$ and $\Delta_{\text{First}}$ indicates a significantly positive effect of both variables ($p < 0.001$ and $0.040$, respectively; 1-sided). This suggests that entitlements also have an effect on disagreements.

### 4.2.3 Agreements

Here we explore whether entitlements not only influence the bargaining process but also the ultimate bargaining outcome. Figure 3 shows the distribution of agreements and Table 8 reports summary statistics for all four treatments. Both indicate clear differences across treatments that are confirmed by a KW test ($p = 0.0001$, 1-sided). Further, applying MW tests we find that there are no significant differences in agreements between both NoINFO and both Info treatments ($p = 0.5028$, 2-sided, and $p = 0.2035$, 1-sided, respectively), while all other pair-wise differences are highly significant ($p < 0.0001$, 1-sided).

<table>
<thead>
<tr>
<th></th>
<th>NoINFO-Unc</th>
<th>NoINFO-Det</th>
<th>Info-Unc</th>
<th>Info-Det</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreements</td>
<td>0.502</td>
<td>0.501</td>
<td>0.548</td>
<td>0.550</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.008)</td>
<td>(0.050)</td>
<td>(0.055)</td>
</tr>
<tr>
<td># of obs.</td>
<td>41</td>
<td>33</td>
<td>36</td>
<td>35</td>
</tr>
</tbody>
</table>

*Note: Table reports averages in winner shares. Standard deviations in parentheses.*

Figure 3 shows specifically that without performance information almost all bargaining pairs agree on splitting the salary budget equally. In NoINFO-Unc and NoINFO-Det, respectively, 73.2 and 69.7 percent of all agreements are exactly on the equal split and all other agreements are very close. WSR tests confirm that the distribution of agreements in these treatments is not significantly different from the equal-split ($p = 0.6583$ and $p = 0.7155$, respectively; 2-sided). In the treatments with performance information the frequency of equal-splits is strongly reduced and amounts to only 13.9 percent in Info-Unc and 8.6 percent in Info-Det. Consequently,
WSR tests indicate that bargaining pairs split their salary budget in favor of the better performer rather than equally (p < 0.0001 in both INFO treatments; 1-sided).

In sum, in line with our results on subjective entitlements and in accordance with the first part of Hypothesis 3, agreements are on the equal-split when there is no performance information and with performance information winners receive a significantly higher share than losers. Interestingly, agreements do not differ between noisy and deterministic production processes. The latter result contrasts partly with Hypothesis 3 but is in concordance with our earlier finding that subjective entitlements do not differ with respect to the production process.

Next we analyze whether subjective entitlements exhibit a marginal effect on agreements as hypothesized in the second part of Hypothesis 3. We look at two outcome measures and relate winner and loser entitlements (W.Entitle and L.Entitle) in each pair, first, to the actually agreed share and, second, to the likelihood that the agreement deviated from the equal split. Table 9 reports the Tobit regression results for agreed shares. As expected, for the treatments without performance information, the coefficient estimates for W.Entitle and L.Entitle are not significantly different from zero. In the treatments with performance information the entitlement losers ascribe to winners is marginally significant with the expected sign in INFO-DET, while it is insignificant in all other cases.

To check whether the opening proposals affect agreements we ran the same set of regressions as in Table 9 but added the first proposals (in winner share) as explanatory variable. We do not find any significant effect of these proposals on the agreed share. The effect of entitlements get a
Table 9: Agreements as a function of subjective entitlements in each treatment (Tobit regressions)

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>NOINFO-UNC</th>
<th>NOINFO-Det</th>
<th>INFO-UNC</th>
<th>INFO-Det</th>
</tr>
</thead>
<tbody>
<tr>
<td>Const</td>
<td>0.505***</td>
<td>0.483***</td>
<td>0.584***</td>
<td>0.418***</td>
</tr>
<tr>
<td></td>
<td>(0.024)</td>
<td>(0.019)</td>
<td>(0.124)</td>
<td>(0.114)</td>
</tr>
<tr>
<td>W.Entitle</td>
<td>-0.029</td>
<td>0.032</td>
<td>0.062</td>
<td>0.015</td>
</tr>
<tr>
<td></td>
<td>(0.039)</td>
<td>(0.025)</td>
<td>(0.168)</td>
<td>(0.120)</td>
</tr>
<tr>
<td>L.Entitle</td>
<td>0.022</td>
<td>0.004</td>
<td>-0.139</td>
<td>0.230*</td>
</tr>
<tr>
<td></td>
<td>(0.023)</td>
<td>(0.020)</td>
<td>(0.183)</td>
<td>(0.134)</td>
</tr>
<tr>
<td>Log-L</td>
<td>135.9</td>
<td>112.7</td>
<td>57.7</td>
<td>53.7</td>
</tr>
<tr>
<td>F</td>
<td>0.69</td>
<td>0.82</td>
<td>0.31</td>
<td>1.50</td>
</tr>
<tr>
<td>N</td>
<td>41</td>
<td>33</td>
<td>36</td>
<td>35</td>
</tr>
</tbody>
</table>

Note: ***,**,* indicates statistical significance at the 1-sided 1, 5, 10 percent level, respectively. Robust standard errors in parentheses.

little stronger in the predicted direction. Specifically, in INFO-Det L.Entitle becomes significant at the 5 percent level and in INFO-UNC and NONFO-Det W.Entitle becomes significant at the 10 percent level. This suggests the observed entitlements on opening proposals carry over to agreements but that the opening proposals per se have no effect on agreements.

The Probit regression results reported in Table 10 show that subjective entitlements have a stronger influence on the occurrence of deviations from the equal-split than on the exact agreed share. In treatments without performance information, entitlements have still no significant effect. This is also the case with performance information and noisy production. In INFO-Det, however, stronger entitlements of winners have a highly significantly positive effect on deviations from the equal split.

In relation to Hypothesis 3 the discussed evidence shows that with performance information entitlements have a strong level effect but only a weak marginal effect on agreements. Given performance information agreements are not affected by stronger entitlements when the production process is noisy. When the production process is deterministic entitlements have a weak effect on the actual agreed share but strongly affect the likelihood of agreeing on an outcome different from the equal split.
Table 10: Likelihood of deviation from equal-split as a function of subjective entitlements in each treatment (Probit regressions)

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>NOINFO-UNC</th>
<th>NOINFO-Det</th>
<th>INFO-UNC</th>
<th>INFO-Det</th>
</tr>
</thead>
<tbody>
<tr>
<td>Const</td>
<td>-5.32**</td>
<td>-3.42</td>
<td>-3.13</td>
<td>-21.28***</td>
</tr>
<tr>
<td></td>
<td>(2.65)</td>
<td>(4.04)</td>
<td>(3.22)</td>
<td>(7.05)</td>
</tr>
<tr>
<td>W_Entitle</td>
<td>5.29</td>
<td>3.49</td>
<td>4.09</td>
<td>25.24***</td>
</tr>
<tr>
<td></td>
<td>(3.88)</td>
<td>(4.87)</td>
<td>(6.17)</td>
<td>(8.96)</td>
</tr>
<tr>
<td>L_Entitle</td>
<td>3.25</td>
<td>1.90</td>
<td>3.53</td>
<td>15.59</td>
</tr>
<tr>
<td></td>
<td>(2.52)</td>
<td>(4.40)</td>
<td>(8.43)</td>
<td>(11.30)</td>
</tr>
<tr>
<td>Log-L</td>
<td>-22.2</td>
<td>-20.0</td>
<td>-13.9</td>
<td>-6.1</td>
</tr>
<tr>
<td>Wald $\chi^2$</td>
<td>3.32</td>
<td>0.57</td>
<td>1.96</td>
<td>11.86</td>
</tr>
<tr>
<td>N</td>
<td>41</td>
<td>33</td>
<td>36</td>
<td>35</td>
</tr>
</tbody>
</table>

Note: ***,**, * indicates statistical significance at the 2-sided 1, 5, 10 percent level, respectively. Robust standard errors in parentheses.

5 Concluding Remarks

In this paper we explore simultaneously the effects and interactions of three variables that are considered important in bargaining over a jointly produced surplus: subjective entitlements derived from performance contributing to the joint surplus, information on this performance, and production uncertainties when translating performance into output.

There is no doubt that in our experiment participants derive subjective entitlements from the performance task. These entitlements are significantly affected by the (in)existence of performance information while the (in)existence of production uncertainties has little effect. The derived entitlements impact all stages of bargaining and observed differences in entitlements are reflected by differences in the bargaining process. Irrespective of production uncertainties, without performance information entitlements center around the equal split and are mostly mutually consistent. This is also reflected in bargaining as in the absence of performance information all agreements are on or close to the equal-split. Further, negotiators make relatively large and early concessions and reach agreements relatively quickly. Given the little variation in entitlements it is unsurprising that there is no correlation between entitlements and bargaining behavior.

In stark contrast, with performance information subjective entitlements are skewed toward the better performer and mostly mutually inconsistent. These entitlements are economically relevant as they significantly influence opening proposals, concessions, bargaining duration, and final agreements. We find this strong effect of performance information although negotiators only learn whether they are better or worse performing. In comparison to when entitlements are
made specific and quantifiable (as, e.g., in Gächter and Riedl, 2005), such coarse performance information should make it harder for bargainers to derive entitlements and use them as an anchor for bargaining behavior. Moreover, our subjects correctly predicted that even the better performers did not do very well in absolute terms, which also should work against the emergence of subjective entitlements. The fact that we nevertheless observe them and also find that they impact bargaining behavior shows that subjective entitlements can be important even under unfavorable circumstances for them to emerge.

The economic importance of subjective entitlements in bargaining is also corroborated by the fact that entitlements affect bargaining even when there are relatively large uncertainties regarding the translation of performance into surplus. Specifically, we see that production uncertainties affect some parts of the bargaining process, but we do not find that they strongly mitigate the effect of entitlements. Overall, our findings show that negotiators derive subjective entitlements from performance information which affect bargaining because they are ready to defend them. This observation is also consistent with the casual evidence of our motivating examples presented in the Introduction.

In the investigated bargaining environment the existence of entitlements is closely related to performance information. Yet, the significant marginal effect of entitlements for given performance information strongly suggests that entitlements as such are the force behind bargaining behavior. If this indeed holds then entitlements may be manipulated in order to influence the bargaining process and outcome, independent of the actual performance of the involved negotiators. Such strategic use and manipulation of entitlements via, e.g., private or public information channels, could be important in many bargaining-like situations, from client-customer relations to union-firm wage bargaining and even political negotiations, and may be an interesting area of future research.

Our experimental results also speak to and inform theoretical bargaining models that assume reference points or reference-dependent preferences (Kahneman and Tversky, 1979). As discussed in Section 3 the cooperative bargaining model of Gupta and Livne (1988) predicts agreements that deviate from the equal split in the direction of an 'ideal point'. This prediction is consistent with the skewed distribution of agreements observed in our experiment. Yet, while the theoretical model is silent about the origin of the ideal point, we show that it can be attributed to subjective entitlements bargaining parties derive from their relative performance in a joint production process. Hence, ideal points and their effect on bargaining agreements should be viewed as endogenous to the economic environment. In addition, salient factors of that environment (e.g., performance information, production uncertainties) can modulate bargaining outcomes and may be taken into account when modelling negotiations.

Compte and Jehiel (n.d.) and Li (2007) model bargaining as a process where negotiators use reference points derived from past proposals when evaluating offers (see also, Hyndman, 2011). Their models can capture the fact that bargaining agreements are seldom immediate
but that bargaining is gradual and formalize the idea that it may be risky to start bargaining with too generous offers. We indeed observe gradual bargaining and strategically low opening offers. However, we also see that opening proposals, concessions, and bargaining duration are related to subjective entitlements. On top of that, gradual concessions, delays in agreement, and last-minute agreements are not equally distributed in all our treatments. Specifically, with no performance information most negotiators quickly agreed on the equal-split as asymmetric entitlements are hard to defend in that case. This suggests that bargaining behavior should not only be modelled as reference-dependent in the sense that preferences are influenced by the bargaining history but also as dependent on subjective entitlements and factors influencing them, which may be independent of the bargaining history.

Theoretical bargaining models and bargaining experiments have greatly improved our understanding of how negotiations work. However, many aspects of bargaining are still not well understood. Our study provides insight into the role of performance information, production uncertainty and subjective entitlements in bargaining. Perhaps more importantly though, the sketched theoretical approaches to bargaining using reference-dependence together with our experimental evidence on the emergence and influence of subjective entitlements may provide a fertile ground for more theoretical and experimental research furthering our knowledge of bargaining behavior.
References


Appendix

A Additional Statistics

A.1 Outlier Diagnostics

As mentioned in the main text we have classified three subjects as outliers and excluded from the main statistical analyses. Here we report the outliers diagnostics. The decision was based on subjects’ answers to the entitlement question which emphasized that they should put themselves into the role of neutral arbitrator and that they should state a fair distribution.

Table A.1 reports averages, standard deviations and extremes of entitlements (in winner share) for subjects who performed better (‘winner’) than, worse (‘loser’) than or equally (‘neither’) good as their paired subject in the performance quiz. Figure A.1 depicts box plots of these entitlements. It is obvious

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>St.dev.</th>
<th>Lower extreme</th>
<th>Upper extreme</th>
<th>No. of obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winner</td>
<td>0.572</td>
<td>0.081</td>
<td>0.293</td>
<td>0.996</td>
<td>152</td>
</tr>
<tr>
<td>Loser</td>
<td>0.544</td>
<td>0.072</td>
<td>0.432</td>
<td>1</td>
<td>152</td>
</tr>
<tr>
<td>Neither</td>
<td>0.533</td>
<td>0.070</td>
<td>0.432</td>
<td>0.829</td>
<td>44</td>
</tr>
</tbody>
</table>

that for winners entitlements 0.293 and 0.996 and for losers entitlement 1 are outliers. These are then also the observations we have excluded from the analyses in the main text.

Figure A.1: Outliers diagnostics - boxplot of entitlements for winner, loser, and neither
A.2 Concessions and entitlements: two alternative concession measures

In the main text we report level effects of entitlements on the time-weighted relative concessions (see Table 5). Here we do the same for the other two concession measures, the sum of average relative concessions, i.e., the size of concessions, and the sum of average concession times, i.e., the time when concessions were made. Table A.2 shows that, in line with Hypothesis 5, concessions are smaller and later in the INFO treatments than in the NOINFO treatments, given performance information they are smaller and later when production is deterministic. KW tests show that differences across treatments are highly significant for both concessions measures ($p < 0.0003$, 1-sided). Further pair-wise comparisons using MW tests detect for both concession measures no significant differences between the two NOINFO treatments ($p \leq 0.9195$, 2-sided) while the differences between INFO-UNC and INFO-DET are significant ($p < 0.0231$, 1-sided).

Table A.2: Relative concessions and concession times in each treatment

<table>
<thead>
<tr>
<th></th>
<th>NOINFO-UNC</th>
<th>NOINFO-DET</th>
<th>INFO-UNC</th>
<th>INFO-DET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative</td>
<td>1.111</td>
<td>1.036</td>
<td>0.794</td>
<td>0.661</td>
</tr>
<tr>
<td>concessions</td>
<td>(0.636)</td>
<td>(0.543)</td>
<td>(0.742)</td>
<td>(0.416)</td>
</tr>
<tr>
<td>Concession</td>
<td>257.5</td>
<td>273.5</td>
<td>387.8</td>
<td>498.7</td>
</tr>
<tr>
<td>times</td>
<td>(194.2)</td>
<td>(234.6)</td>
<td>(211.1)</td>
<td>(200.9)</td>
</tr>
<tr>
<td># of obs.</td>
<td>41</td>
<td>34</td>
<td>37</td>
<td>37</td>
</tr>
</tbody>
</table>

Note: Table reports averages. Concessions (duration) statistics include (exclude) pairs that disagreed. Standard deviations in parentheses.

In the main text we report regression analyses for the most encompassing concessions statistics, the time-weighted relative concessions (see Table 6). Here we report the equivalent regression analyses for the sum of average relative concessions and the sum of average concession times in Tables A.3 and A.4, respectively. For relative concessions the effect of entitlements is qualitatively equivalent to the results reported in the main text. The same holds for concession times with the exception that entitlements have not significant effect in INFO-DET. The latter indicates that in INFO-DET the effect of entitlements on time-weighted relative concessions comes mainly through smaller and not through later concessions in pairs with higher tension in entitlements.

Hence, the results for the two alternative concession measures corroborate the level and marginal effects of entitlements on concessions reported in Section 4.2.2 of the main text.

A.3 Robustness checks regarding regression analyses of entitlements

In this section we explore the robustness of the marginal effect of entitlements on opening offers, concessions, bargaining duration and reached agreements reported in Section 4.2. To this end we add control variables which can reasonably be assumed to affect bargaining behavior: risk preferences, Machiavellianism, and, respectively, gender of the bargainer and gender composition of the bargaining pair. The control variable for risk preferences, RiskScore, is constructed from answers to a set of risk questions taken from the German Socio-Economic Panel (GSOEP) survey which have been shown to correlate well with behavior measures of risk preferences (Dohmen et al., 2011, Holt and Laury, 2002). Specifically, subjects had to answer seven 11-Likert scale questions on the perception of risk, where higher a higher
Table A.3: Size of concessions as a function of subjective entitlements in each treatment (OLS regressions)

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>NINFO-UNC</th>
<th>NINFO-Det</th>
<th>INFO-UNC</th>
<th>INFO-Det</th>
</tr>
</thead>
<tbody>
<tr>
<td>Const</td>
<td>1.117***</td>
<td>1.032***</td>
<td>1.015***</td>
<td>0.776***</td>
</tr>
<tr>
<td></td>
<td>(0.104)</td>
<td>(0.095)</td>
<td>(0.151)</td>
<td>(0.074)</td>
</tr>
<tr>
<td>Δ_Entitle</td>
<td>0.263</td>
<td>-0.775</td>
<td>-3.127***</td>
<td>-1.335***</td>
</tr>
<tr>
<td></td>
<td>(0.991)</td>
<td>(1.124)</td>
<td>(1.206)</td>
<td>(0.410)</td>
</tr>
</tbody>
</table>

Note: ***,**, indicates statistical significance at the 1-sided 1, 5, 10 percent level, respectively. Robust standard errors in parentheses.

Table A.4: Concessions times as a function of subjective entitlements in each treatment (Tobit regressions)

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>NINFO-UNC</th>
<th>NINFO-Det</th>
<th>INFO-UNC</th>
<th>INFO-Det</th>
</tr>
</thead>
<tbody>
<tr>
<td>Const</td>
<td>258.7***</td>
<td>267.7***</td>
<td>314.4***</td>
<td>469.2***</td>
</tr>
<tr>
<td></td>
<td>(31.3)</td>
<td>(40.5)</td>
<td>(48.0)</td>
<td>(40.3)</td>
</tr>
<tr>
<td>Δ_Entitle</td>
<td>56.0</td>
<td>262.3</td>
<td>1037.6**</td>
<td>341.8</td>
</tr>
<tr>
<td></td>
<td>(269.9)</td>
<td>(459.4)</td>
<td>(497.7)</td>
<td>(271.1)</td>
</tr>
</tbody>
</table>

Note: ***,**, indicates statistical significance at the 1-sided 1, 5, 10 percent level, respectively. Robust standard errors in parentheses.

score indicates a higher willingness to take risks. (The individual questions can be found in Appendix B as Questionnaire D.) The variable Risk_Score is the sum of the seven individual scores. The Machiavelli score, Mac_Score, is constructed from the standard Machiavelli Questionnaire MACH-IV, which consists of a set of 20 questions measuring a manipulative personality trait which is considered to correlate with selfish behavior. (For a discussion of the MACH-IV, see, e.g., Paulhus and Williams (2002).)

As can be seen from the results reported below the effect of entitlements on opening offers, concessions, bargaining duration and agreements is robust to adding these control variables. In all but one regression entitlement effects reported as significant in the main text remain significant after adding the control variables. In all but one regression entitlement effects reported as significant in the main text remain significant after adding the control variables.
variables. The only exception is L\textsubscript{Entitle} in the agreed share regression in INFO\_DET which is marginally significant without controls and becomes insignificant when adding controls. On the other hand, in the same treatment, in the regression estimating the likelihood of deviation from the equal-split, L\textsubscript{Entitle} is insignificant without controls and becomes significant with controls. Overall, we are confident to conclude that the marginal effects of entitlements reported in the main text are robust to adding control variables.

Opening proposals. Table A.5 reproduces the regression table reported in the main text (Table 4) now with the Machiavelli score, a risk score and gender (male) added as control variables. Adding these variables does not substantially change the estimates for W\textsubscript{Entitle} and L\textsubscript{Entitle}. All statistically significant estimates remain significant at least at the same level. In fact, in INFO\_DET the significance levels of L\textsubscript{Entitle} and W\textsubscript{Entitle} decrease from 10 to 5 percent and from 5 to 1 percent, respectively. If anything, adding the control variables reinforces the marginal entitlement effects reported in the main text.

Table A.5: Opening proposals as a function of subjective entitlements

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>NOINFO-UNC</th>
<th>NOINFO-DET</th>
<th>INFO-UNC</th>
<th>INFO-DET</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Loser</td>
<td>Winner</td>
<td>Loser</td>
<td>Winner</td>
</tr>
<tr>
<td>Const</td>
<td>1.013***</td>
<td>0.602*</td>
<td>0.495***</td>
<td>0.926***</td>
</tr>
<tr>
<td></td>
<td>(0.083)</td>
<td>(0.434)</td>
<td>(0.100)</td>
<td>(0.272)</td>
</tr>
<tr>
<td>W\textsubscript{Entitle}</td>
<td>-0.001</td>
<td>0.349</td>
<td>0.889***</td>
<td>0.508***</td>
</tr>
<tr>
<td>L\textsubscript{Entitle}</td>
<td>-0.835***</td>
<td>0.017</td>
<td>-0.357</td>
<td>0.569**</td>
</tr>
<tr>
<td>Mac\textsubscript{Score}</td>
<td>0.001</td>
<td>-0.002</td>
<td>0.000</td>
<td>-0.009***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.003)</td>
<td>(0.001)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Risk\textsubscript{Score}</td>
<td>-0.005***</td>
<td>0.001</td>
<td>-0.001***</td>
<td>-0.000</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.001)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Male</td>
<td>-0.066***</td>
<td>0.066</td>
<td>0.021</td>
<td>-0.142*</td>
</tr>
<tr>
<td></td>
<td>(0.027)</td>
<td>(0.092)</td>
<td>(0.016)</td>
<td>(0.044)</td>
</tr>
</tbody>
</table>

Log-L: 34.31 12.34 32.98 18.68 13.11 28.90 18.72 17.66
F: 29.37 1.78 1.63 4.88 3.96 5.46 2.34 5.33
N: 22 19 16 18 19 18 14 23

Note: ***,**,* indicates statistical significance at the 1-sided 1, 5, 10 percent level, respectively. Robust standard errors in parentheses.

Regarding the control variables the Risk\textsubscript{Score} coefficient is insignificant for winners in all specifications. For losers it is marginally significantly positive in INFO-UNC but significantly negative in the other three treatments. Hence, in most treatments more risk seeking losers tend to ask more for themselves in the opening proposal. Similarly, male subjects tend to make smaller opening proposals to the winner but the
coefficient is significant only in two regressions. Finally, the coefficient estimates of the Machiavelli score show no clear pattern.

**Concessions and bargaining duration.** To test the robustness of the marginal entitlement effect on concessions and bargaining duration we add pair-level measures of risk and Machiavellism to the regression equations reported in the main text (see Tables 6 and 7) and also control for gender composition. Specifically, the variable $\Sigma_{\text{Mac\_Score}}$ is the pair-wise sum of individual Machiavelli scores and $\Sigma_{\text{Risk\_Score}}$ is the pair-wise sum of individual risk scores. The variable Fem\_Male is 1 if the bargaining pair consists of a male and a female subject (0 otherwise) while the variable Fem\_Fem is 1 if the bargaining pair consists of two female subject (0 otherwise); bargaining pairs consisting of two male subjects are the omitted category.

We expect that pairs exhibiting higher Machiavelli scores make smaller and later concessions (i.e., the coefficient estimate should be negative). Pairs scoring higher on the risk measure consist of subjects willing to take risks which may also translate into smaller and later concessions. Hence, we expect the coefficient estimate of $\Sigma_{\text{Risk\_Score}}$ to be negative, too. We do not have any strong *a priori* expectations of the gender composition of bargaining pairs. Table A.6 reports the results.

**Table A.6: Concessions as a function of subjective entitlements in each treatment (OLS regressions): robustness check**

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>NOINFO-UNC</th>
<th>NOINFO-DET</th>
<th>INFO-UNC</th>
<th>INFO-DET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Const</td>
<td>1241.0</td>
<td>2167.9**</td>
<td>-1735.7*</td>
<td>985.1**</td>
</tr>
<tr>
<td></td>
<td>(1338.0)</td>
<td>(722.0)</td>
<td>(1201.6)</td>
<td>(482.8)</td>
</tr>
<tr>
<td>$\Delta_{\text{Entitle}}$</td>
<td>-59.6</td>
<td>-850.6</td>
<td>-1514.9**</td>
<td>-809.2***</td>
</tr>
<tr>
<td></td>
<td>(669.1)</td>
<td>(691.2)</td>
<td>(669.4)</td>
<td>(269.2)</td>
</tr>
<tr>
<td>$\Sigma_{\text{Mac_Score}}$</td>
<td>-0.9</td>
<td>-11.1**</td>
<td>13.2*</td>
<td>-4.1</td>
</tr>
<tr>
<td></td>
<td>(6.1)</td>
<td>(6.1)</td>
<td>(9.6)</td>
<td>(3.3)</td>
</tr>
<tr>
<td>$\Sigma_{\text{Risk_Score}}$</td>
<td>-9.7</td>
<td>-3.4</td>
<td>-0.8</td>
<td>-4.8**</td>
</tr>
<tr>
<td></td>
<td>(8.9)</td>
<td>(4.9)</td>
<td>(5.7)</td>
<td>(2.6)</td>
</tr>
<tr>
<td>Fem_Male</td>
<td>122.6</td>
<td>-278.5**</td>
<td>808.2**</td>
<td>176.0***</td>
</tr>
<tr>
<td></td>
<td>(172.5)</td>
<td>(134.7)</td>
<td>(415.6)</td>
<td>(71.4)</td>
</tr>
<tr>
<td>Fem_Fem</td>
<td>230.5*</td>
<td>58.2</td>
<td>746.4**</td>
<td>142.8</td>
</tr>
<tr>
<td></td>
<td>(157.1)</td>
<td>(128.7)</td>
<td>(339.1)</td>
<td>(114.9)</td>
</tr>
</tbody>
</table>

| R²                     | 0.0965     | 0.3178     | 0.3856   | 0.3242   |
| F                      | 1.14       | 3.17       | 3.24     | 4.86     |
| N                      | 41         | 34         | 37       | 37       |

Note: ***,*** indicates statistical significance at the 1-sided 1, 5, 10 percent level, respectively. Robust standard errors in parentheses.
Comparing the coefficient estimates for $\Delta_{\text{Entitle}}$ clearly corroborate the findings reported in the main text (Table 6): with performance information larger tensions in entitlements decrease the willingness to concede. The Machiavelli scores show no clear pattern as the coefficient estimates are significantly negative in NOINFO-DET but significantly positive in INFO-UNC while insignificant in the other two treatments. The risk measure has the hypothesized negative sign in all regressions but is significantly negative only in INFO-DET. Regarding gender composition there is some evidence that bargaining-pairs consisting of at least one female subject tend to be more willing to concede more or earlier. Most coefficient estimates are positive and three of them are also significantly positive. However, in one case (mixed gender pair in NOINFO-DET) the estimate is significantly negative, which makes it difficult to draw a straight conclusion.

Table A.7 reports the results for bargaining duration. As for concessions the coefficient estimates of $\Delta_{\text{Entitle}}$ reported in the main text turn out to be robust to adding the control variables. The same holds for the explanatory variable measuring the difference in first offers ($\Delta_{\text{First}}$). Regarding the control variables themselves the table shows that pair-wise Machiavelli scores do not affect bargaining duration. Interestingly, bargaining pairs with a higher risk score tend to strike agreements earlier, but only

Table A.7: Bargaining duration as a function of subjective entitlements in each treatment (Tobit regressions): robustness check

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>NOINFO-UNC</th>
<th>NOINFO-DET</th>
<th>INFO-UNC</th>
<th>INFO-DET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Const</td>
<td>548.0</td>
<td>-179.8</td>
<td>658.6*</td>
<td>569.0*</td>
</tr>
<tr>
<td></td>
<td>(526.9)</td>
<td>(435.3)</td>
<td>(403.2)</td>
<td>(395.7)</td>
</tr>
<tr>
<td>$\Delta_{\text{First}}$</td>
<td>636.2***</td>
<td>280.2**</td>
<td>35.5</td>
<td>150.1*</td>
</tr>
<tr>
<td></td>
<td>(215.4)</td>
<td>(132.1)</td>
<td>(216.2)</td>
<td>(90.7)</td>
</tr>
<tr>
<td>$\Delta_{\text{Entitle}}$</td>
<td>-181.6</td>
<td>428.5</td>
<td>1713.6***</td>
<td>157.4</td>
</tr>
<tr>
<td></td>
<td>(432.0)</td>
<td>(549.5)</td>
<td>(362.0)</td>
<td>(266.2)</td>
</tr>
<tr>
<td>$\Sigma_{\text{Mac_Score}}$</td>
<td>-3.2</td>
<td>3.9</td>
<td>-0.8</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>(3.3)</td>
<td>(3.0)</td>
<td>(2.6)</td>
<td>(2.7)</td>
</tr>
<tr>
<td>$\Sigma_{\text{Risk_Score}}$</td>
<td>0.4</td>
<td>1.5</td>
<td>-2.2*</td>
<td>-3.3**</td>
</tr>
<tr>
<td></td>
<td>(3.5)</td>
<td>(3.3)</td>
<td>(1.6)</td>
<td>(1.9)</td>
</tr>
<tr>
<td>Fem Male</td>
<td>25.9</td>
<td>-57.6</td>
<td>-139.4*</td>
<td>-44.0</td>
</tr>
<tr>
<td></td>
<td>(82.5)</td>
<td>(90.4)</td>
<td>(84.2)</td>
<td>(53.8)</td>
</tr>
<tr>
<td>Fem Fem</td>
<td>-94.0</td>
<td>-241.2***</td>
<td>-182.8**</td>
<td>9.5</td>
</tr>
<tr>
<td></td>
<td>(83.0)</td>
<td>(94.3)</td>
<td>(82.0)</td>
<td>(68.5)</td>
</tr>
<tr>
<td>Log-L</td>
<td>-233.7</td>
<td>-150.9</td>
<td>-227.0</td>
<td>-193.8</td>
</tr>
<tr>
<td>F</td>
<td>5.93</td>
<td>9.67</td>
<td>5.48</td>
<td>1.82</td>
</tr>
<tr>
<td>N</td>
<td>36</td>
<td>23</td>
<td>35</td>
<td>33</td>
</tr>
</tbody>
</table>

Note: ***,**,* indicates statistical significance at the 1-sided 1, 5, 10 percent level, respectively. Robust standard errors in parentheses.
when performance information is available. Further, largely consistent with the results on concessions, bargaining pairs with at least one female negotiator tend to bargain shorter. The respective coefficients are significantly negative in only three of eight possible cases, however.

**Agreements.** Tables A.8 and A.9 report Tobit and Probit regression results for the agreed share to the winner and the likelihood of a deviation from the equal-split, respectively. The set of control variables includes for Machiavelli scores and risk scores separately for the winner and the loser in a pair. In addition, as a above, the gender compositions in a pair are added as control variables with male-male pairs as omitted reference category. A comparison with the respective regression results in the main text (Tables 9 and 10) indicates that the coefficient estimates of the entitlement variables here are similar to those reported in the main text. In the regressions on agreed shares the insignificant coefficients stay insignificant. In addition, the marginally significant coefficient of $L_{\text{Entitle}}$ in INFO-DET becomes insignificant. In the same treatment, however, in the regressions estimating the likelihood of deviations from the equal-split adding the control variables makes the formerly insignificant coefficient of $L_{\text{Entitle}}$ significant while the formerly significant coefficient of $W_{\text{Entitle}}$ remains significant. In all other treatments (in)significances remain the same.

Most of the control variables are either insignificant or show no clear pattern. Perhaps, the only exception is the Machiavelli score for losers in the regressions regarding agreed shares. There in three of the four treatments the coefficient estimates are significantly negative (i.e., in pairs with losers scoring high on the Machiavelli score winners tend to receive lower shares) which is consistent with the intuitive idea that more Machiavellian types demand and receive larger shares.
Table A.8: Agreements as a function of subjective entitlements in each treatment (Tobit regressions): robustness check

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>NOINFO-UNC</th>
<th>NOINFO-DET</th>
<th>INFO-UNC</th>
<th>INFO-DET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Const</td>
<td>0.515***</td>
<td>0.511***</td>
<td>0.671***</td>
<td>0.530***</td>
</tr>
<tr>
<td></td>
<td>(0.030)</td>
<td>(0.029)</td>
<td>(0.151)</td>
<td>(0.135)</td>
</tr>
<tr>
<td>W_Entitle</td>
<td>-0.047</td>
<td>0.028*</td>
<td>0.088</td>
<td>-0.071</td>
</tr>
<tr>
<td></td>
<td>(0.037)</td>
<td>(0.021)</td>
<td>(0.152)</td>
<td>(0.116)</td>
</tr>
<tr>
<td>L_Entitle</td>
<td>0.025</td>
<td>0.008</td>
<td>-0.064</td>
<td>0.157</td>
</tr>
<tr>
<td></td>
<td>(0.024)</td>
<td>(0.020)</td>
<td>(0.179)</td>
<td>(0.161)</td>
</tr>
<tr>
<td>W_Mac_Score</td>
<td>-0.00007</td>
<td>-0.00019</td>
<td>-0.00032</td>
<td>0.00029</td>
</tr>
<tr>
<td></td>
<td>(0.00014)</td>
<td>(0.00013)</td>
<td>(0.00089)</td>
<td>(0.00079)</td>
</tr>
<tr>
<td>L_Mac_Score</td>
<td>0.00006</td>
<td>-0.00019*</td>
<td>-0.00149*</td>
<td>-0.00244**</td>
</tr>
<tr>
<td></td>
<td>(0.00017)</td>
<td>(0.00014)</td>
<td>(0.00088)</td>
<td>(0.001230)</td>
</tr>
<tr>
<td>W_Risk_Score</td>
<td>0.00018</td>
<td>-0.00024**</td>
<td>-0.00066</td>
<td>0.00308***</td>
</tr>
<tr>
<td></td>
<td>(0.00017)</td>
<td>(0.00014)</td>
<td>(0.00090)</td>
<td>(0.00110)</td>
</tr>
<tr>
<td>L_Risk_Score</td>
<td>-0.00027</td>
<td>-0.00012</td>
<td>-0.00044</td>
<td>-0.00064</td>
</tr>
<tr>
<td></td>
<td>(0.00032)</td>
<td>(0.00012)</td>
<td>(0.00054)</td>
<td>(0.00058)</td>
</tr>
<tr>
<td>Fem_Male</td>
<td>0.0047**</td>
<td>0.0015</td>
<td>0.01478</td>
<td>0.0179</td>
</tr>
<tr>
<td></td>
<td>(0.0022)</td>
<td>(0.0021)</td>
<td>(0.0172)</td>
<td>(0.0189)</td>
</tr>
<tr>
<td>Fem_Fem</td>
<td>0.0048</td>
<td>-0.0004</td>
<td>-0.0113</td>
<td>0.0280</td>
</tr>
<tr>
<td></td>
<td>(0.0037)</td>
<td>(0.0033)</td>
<td>(0.0192)</td>
<td>(0.0324)</td>
</tr>
<tr>
<td>Log-L</td>
<td>138.6</td>
<td>114.2</td>
<td>60.1</td>
<td>59.7</td>
</tr>
<tr>
<td>F</td>
<td>0.85</td>
<td>0.68</td>
<td>2.06</td>
<td>1.41</td>
</tr>
<tr>
<td>N</td>
<td>41</td>
<td>33</td>
<td>36</td>
<td>35</td>
</tr>
</tbody>
</table>

Note: ***,**,* indicates statistical significance at the 1-sided 1, 5, 10 percent level, respectively. Robust standard errors in parentheses.
Table A.9: Likelihood of deviation from equal-split as a function of subjective entitlements in each treatment (Probit regressions)

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>NOINFO-UNC</th>
<th>NOINFO-DET</th>
<th>INFO-UNC¹</th>
<th>INFO-DET¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Const</td>
<td>-6.02</td>
<td>-4.59</td>
<td>-10.58*</td>
<td>-30.46***</td>
</tr>
<tr>
<td></td>
<td>(5.13)</td>
<td>(5.36)</td>
<td>(6.31)</td>
<td>(10.17)</td>
</tr>
<tr>
<td>W_Entitle</td>
<td>8.35*</td>
<td>5.69</td>
<td>5.96</td>
<td>38.88**</td>
</tr>
<tr>
<td></td>
<td>(4.89)</td>
<td>(4.74)</td>
<td>(5.64)</td>
<td>(16.96)</td>
</tr>
<tr>
<td>L_Entitle</td>
<td>2.73</td>
<td>-0.22</td>
<td>14.15</td>
<td>18.47**</td>
</tr>
<tr>
<td></td>
<td>(3.16)</td>
<td>(4.98)</td>
<td>(11.53)</td>
<td>(9.17)</td>
</tr>
<tr>
<td>W_Mac_Score</td>
<td>0.0027</td>
<td>0.0274</td>
<td>0.0812</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0239)</td>
<td>(0.0371)</td>
<td>(0.0528)</td>
<td></td>
</tr>
<tr>
<td>L_Mac_Score</td>
<td>0.0046</td>
<td>-0.0102</td>
<td>-0.0233</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0344)</td>
<td>(0.0325)</td>
<td>(0.0436)</td>
<td></td>
</tr>
<tr>
<td>W_Risk_Score</td>
<td>-0.0517</td>
<td>-0.0327</td>
<td>-0.0343</td>
<td>-0.0467</td>
</tr>
<tr>
<td></td>
<td>(0.0344)</td>
<td>(0.0352)</td>
<td>(0.2545)</td>
<td>(0.0462)</td>
</tr>
<tr>
<td>L_Risk_Score</td>
<td>0.0087</td>
<td>0.0309</td>
<td>-0.0327</td>
<td>0.0151</td>
</tr>
<tr>
<td></td>
<td>(0.0288)</td>
<td>(0.0221)</td>
<td>(0.0297)</td>
<td>(0.0299)</td>
</tr>
<tr>
<td>Fem_Male</td>
<td>0.513</td>
<td>0.320</td>
<td>1.632</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.520)</td>
<td>(0.686)</td>
<td>(1.253)</td>
<td></td>
</tr>
<tr>
<td>Fem_Fem</td>
<td>0.082</td>
<td>0.287</td>
<td>1.069</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.866)</td>
<td>(0.739)</td>
<td>(1.255)</td>
<td></td>
</tr>
<tr>
<td>Log-L</td>
<td>-20.1</td>
<td>-17.9</td>
<td>-10.6</td>
<td>-5.3</td>
</tr>
<tr>
<td>Wald $\chi^2$</td>
<td>6.56</td>
<td>5.38</td>
<td>7.83</td>
<td>15.34</td>
</tr>
<tr>
<td>N</td>
<td>41</td>
<td>33</td>
<td>36</td>
<td>35</td>
</tr>
</tbody>
</table>

Note: ***,**,* indicates statistical significance at the 2-sided 1, 5, 10 percent level, respectively. Robust standard errors in parentheses.¹ Due to (hidden) collinearities between some of the added explanatory variables in INFO-UNC and INFO-DET had to be dropped.
B Experimental Instructions & Debriefing Questionnaire

As mentioned in the main body of the paper, there are some differences in the sequence of events across the four treatments. Below we present the instructions for all treatments and the differences between treatments are mentioned indicated with remarks. After this, the debriefing questionnaire used in the experiment is presented.

General Explanations for Participants

You are now participating in an economics experiment that is financed by several scientific institutions. In the experiment you can – next to the fixed show-up fee of 3 Euro - earn money with the decisions you make. Your earnings may also depend on the decisions of other participants and random events. How exactly is explained in this instructions document. It is, therefore, very important that you carefully read the following explanations. At the end of the experiment, you will be instantly and confidentially paid in cash all the money you have earned. During the experiment, we will speak of points instead of euro. Thus, all your income will be counted in points. The total number of points you have earned during the experiment will be exchanged into euro at the end of the experiment, where the exchange rate is

\[
100 \text{ points} = 65 \text{ euro cents.}
\]

**During the experiment you are not allowed to communicate.** If you have questions then please raise your hand. One of us will come to you to answer your question.

On the following pages we will describe the exact procedure of the experiment.

Information about the exact procedure of the experiment

This experiment will consist of multiple parts. You will receive information about each part after the preceding part has ended. Be assured that your earnings in a particular part are unaffected by what happens in later parts.

This is the instructions of the first part of the experiment.

In this part of the experiment you are randomly paired with another participant. Neither during nor after the experiment will anybody be informed about who has been paired with whom.

In the experiment, you and the person you are paired with ('other' for short) will act in the role of a head of department in a firm. Imagine that in this firm there is initially a total budget of 2050 points for your (you and the other) salaries. However, depending on the performances of both of you and some external factors (both of which will be explained below), the firm might have a larger (2710 points), the same (2050 points) or a smaller (1390 points) salary budget.

In any case, the top management of the firm does not want to dictate a salary distribution between the heads of department. Therefore, you are asked by the top management to bargain a salary distribution with the other head of department. If you can agree on a salary distribution within a pre-specified time,
the firm **pays** your **corresponding salaries** (that is, you earn the points you agreed on). However, if you are not able to settle an agreement within the pre-specified time you are both 'fired', that is, you are **not paid any salary** (that is, you do not earn any points).

This part of the experiment consists of two stages. The first part consists of the **determination of the salary budget and some questions**. In the second part, **bargaining** over the salary budget takes place.

**Determination of performance and the salary budget:**

**Determination of performance.**  
Your performance will be measured with a **general knowledge quiz**. Your performances potentially affect the salary budget you will later bargain on. The determination of performance is done as follows. Each participant has to answer questions. For each question there is exactly one correct answer and several wrong answers. The questions concern several fields of knowledge. In total there are 16 questions. Each participant receives the **same questions** in the **same order**. The head of department with the **most correct answers** has the **better performance**. You will answer the questions on the computer. You will have at most **30 seconds** to answer each question. Unanswered questions count as wrong answers. A question will look like this:

```
Remaining Time 30 seconds

Which color is contained in the flags of all Islamic countries?

  ◦ Red
  ◦ Blue
  ◦ Green
  ◦ Yellow
  ◦ Orange

OK
```

You answer a question by **choosing the option you think is correct** and subsequently striking the **OK** button within 30 seconds. The next question then shows up automatically. After you and the other head of department have answered all questions (or the time is over) you will see on the screen the salary budget you will have to bargain over with the other head of department. In the following, the determination of the salary budget is explained.

**Remark 1** *The following “Determination of salary budget” was used in the UNC treatments.*

**Determination of salary budget.**  
First, it is randomly decided whether the salary budget is determined by **external factors** (e.g., demand conditions in the market for the firm’s product) or the **joint performance** of you and the **other head**
of department in the general knowledge quiz. More concretely, with 75% chance, the salary budget is determined by external factors and 25% chance it is determined by your joint performance, that is, the total number of correct answers in the general knowledge quiz. Below, it is explained in detail how external factors and performances affect the salary budget.

With a chance of 75% the salary budget will be determined by external factors in the following way:

- With a chance of $1/3$ (i.e. 33.3%), the salary budget will be **1390 points**
- With a chance of $1/3$ (i.e. 33.3%), the salary budget will be **2050 points**
- With a chance of $1/3$ (i.e. 33.3%), the salary budget will be **2710 points**

With a chance of 25% the salary budget will be determined by the joint performance of you and the other head of department in the following way:

- If the total number of correct answers by you and the other is from 0 to 10, then the salary budget will be **1390 points**.
- If the total number of correct answers by you and the other is from 11 to 20, then the salary budget will be **2050 points**.
- If the total number of correct answers by you and the other is from 21 to 32, then the salary budget will be **2710 points**.

**Summary of the determination of salary budget**

![Diagram showing the determination of salary budget]

**Remark 2** The following “Determination of salary budget” was used in the DET treatments.

**Determination of salary budget.**
The salary budget is completely determined by the joint performance of you and the other head of department in the general knowledge quiz. More concretely, it is determined by the total number of
correct answers in the general knowledge quiz. Below, it is explained in detail how performances affect
the salary budget.

The salary budget will be determined by the joint performance of you and the other head of de-
partment in the following way:

- If the total number of correct answers by you and the other is from 0 to 10, then the
salary budget will be 1390 points.
- If the total number of correct answers by you and the other is from 11 to 20, then the
salary budget will be 2050 points.
- If the total number of correct answers by you and the other is from 21 to 32, then the
salary budget will be 2710 points.

After you have finished the knowledge quiz you will learn the outcome of the described procedure and,
ence, learn what the salary budget you have to bargain about is.

Beliefs on the number of correct answers.
Next you will be asked your beliefs about your and the other’s performance in the general knowledge quiz.
You can earn extra money depending on the accuracy of your estimation:

- If your estimation is exactly equal to the true number of correct answers, you earn 60 points.
- If your estimation is the true number of correct answers –1 or + 1, you earn 30 points.
- If your estimation is the true number of correct answers –2 or + 2, you earn 15 points.
- Otherwise, you earn 0 points.

You will be asked for an estimation of your own performance as well as for the performance of the other
department head. Nobody except you will get to know these estimations.

Remark 3 The following part was used only in the Info treatments.

Information about relative performance in the general knowledge quiz.
Next you will receive information on your screen about your actual performance in the general knowledge
quiz in comparison to the other department head.

If you have more correct answers in the general knowledge quiz than the other department head, then
you are the better performing department head and the other is the worse performing department head.

If you have less correct answers in the general knowledge quiz than the other department head, then
you are the worse performing department head and the other is the better performing department head.

If you and the other have the same number of correct answers in the general knowledge quiz, then
you and the other department head are equally performing.
This finishes the first stage of the experiment. The next stage is the bargaining over the salary budget. The instructions for this stage will be given shortly. Do you have any questions at this point? If you have a question please raise your hand. If there are no (more) questions we shall continue with the instructions.
The Bargaining

You will have a maximum of **10 minutes** to reach an agreement on the distribution of the salary budget, which is at your joint disposal. You do not have to use up all the bargaining time but must not exceed it. If you do not agree on a distribution within 10 minutes, then you will earn nothing from this bargaining stage! If you do agree on a distribution then you will earn your share.

The bargaining is done via the computer. During bargaining you will **work with a screen** that consists of four parts, which we will explain in what follows. (See screen-shot at the end of these instructions.)

1. In the upper-right part the salary budget you are bargaining over is shown. The clock right on the top shows how much bargaining time (in seconds) is still remaining.
2. In the lower-right part you see “Make and Send New Proposal” screen. There is a “SEND” button to confirm and send proposals.
3. In the upper-left part, the table shows all previous proposals, the identity of proposers (you or other), the number of the proposal, your and the other’s proposed share of the salary budget, and the remainder share. For instance, if you have made the first proposal by proposing $x$ to yourself and $y$ to the other, then the first row of the table shows “You” as the proposer, “1” as the number of the proposal, “$x$” as the proposer’s salary claim and, “$y$” as the remainder. Note, that the entries in the column “Proposer’s Salary Claim” refer to the claim of the proposer and, hence, can be your claim or the claim of the other department head. The entries in the column “Remainder” therefore also refer to you or the other, depending on who made the proposal.
4. In the lower-left part, you see the other’s and your currently valid proposals. There is also “Accept the Proposal” button to accept the other’s currently valid proposal. If the other department head has not made any proposal to you yet, a “No proposals have been made to you yet” message is shown. Similarly, if you have not made any proposal, a “You have not made a proposal yet” message is shown.

If you want to make a first (or new) proposal you have to fill in two boxes in the lower-right quarter with corresponding shares for yourself and the other department head. The amounts you fill in should add up to the salary budget. Thereafter, you need to press the “SEND” button to send your proposal. The following rules apply:

1. A proposal consists of an **amount of points for you** and an **amount of points for the other department head**. To switch a field forward you can either press the “TAB” key on your keyboard or you can click on the next field you want to fill in.
2. The sum of points **cannot** exceed the budget. Smaller sums are also **not** allowed. In case you make an invalid proposal in this sense, a “**The numbers have to sum to the salary budget**” message appears.
3. Only **integer** offers are allowed.
4. A sent offer is **binding**, that is, if the other department head accepts your proposal, bargaining is finished and both of you earn the points on which you have agreed upon. The same holds if you
accept a proposal of the other department head. You can only accept the current proposal; earlier proposals are not valid any more.

Hence, as long as you have not pressed the “SEND” button you can still change the offer. A sent proposal is binding and shows up on the screen of the other department head as well as on your own screen. You can always make a new proposal, provided that neither you nor the other department head have accepted a proposal and provided that there is still some bargaining time left.

If you want to accept a currently valid proposal, you have to press the “Accept Proposal” button. If you have agreed upon a distribution you have to enter it in the corresponding space in your information & documentation sheet.

This is the end of the instructions of this part of the experiment. Do you have any questions? If you have questions please raise your hand. If there are no (more) questions the experiment will start shortly.
Information and Documentation Sheet 1

Cubical #: ....................

1- The size of the salary budget can be 1390 points, or 2050 points, or 2710 points.

Remark 4  The following part was used in the Det treatments.

The actual salary budget is determined completely by
the joint performance of myself and the other head of department.
The actually realized size of the salary budget is:.........................

Remark 5  The following part was used in the UNC treatments.

The actual salary budget is determined by
the joint performance of myself and the other head of department with a chance of 25% and
due to external factors with a chance of 75%.
The actually realized size of the salary budget is: .........................

2- My estimation about the number of correct answers in the general knowledge quiz is:

My own number of correct answers: ............................
The other department head’s number of correct answers: ............................

Remark 6  The following part (part 3) was used in the Info treatments.

3- Actually I am the better/worse/equally performing department head (please strike through the in-applicable) and the other is the better/worse/equally performing department head (please strike through the inapplicable).

4- The bargaining outcome:

There was an agreement: ..... yes ..... no
In case of “yes”:
The agreed share of the salary budget that goes to me: .......................
The agreed share of the salary budget that goes to the other department head:..............
Figure B.1: Screenshot of Bargaining Stage

You are bargaining over a salary budget of 2050 points

Your Partner's Currently Valid Proposal
Your partner's salary claim: 1200
This leaves for you a salary of: 854

Your Currently Valid Proposal
Your salary claim: 500
This leaves for your partner: 1050
Remark 7  The following question was asked after bargaining had finished.

Mood Question

Cubicle #: ............

How do you feel at this moment? Please choose with the help of the figure the number that best describes how you feel.
Remark 8  After the experiment reported in this paper another unannounced bargaining stage was conducted. The results of this stage are reported elsewhere. For completeness, the instructions of this stage are provided below.

A New Experiment

Now a new experiment takes place, which is very similar to the experiment you have just completed. In this experiment you have again to bargain with the other head of department, who is the same person as in the experiment you just finished.

Consider that one year has passed by and that the top management of the firm asks you again to bargain about the salary budget. There is one important difference with last years’ procedure, however. Now there is no performance measurement. Suppose further that you and the other department head had an equal intermediate performance that was neither good nor bad for the firm.

Therefore, the salary budget that you will bargain about is determined purely by external factors (e.g., demand conditions in the market for the firm’s product).

That is, the economic conditions and, hence, your salary budget are determined completely randomly. If the economic conditions turn out to be favorable, you bargain over 2710 points of salary budget. If the economic conditions are unchanged you bargain over 2050 points of salary budget. If the economic conditions turn out to be bad you bargain over 1390 points of salary budget. The salary budget is randomly determined in the following way:

- With a chance of 1/3 (i.e. 33.3%), the salary budget will be 1390 points
- With a chance of 1/3 (i.e. 33.3%), the salary budget will be 2050 points
- With a chance of 1/3 (i.e. 33.3%), the salary budget will be 2710 points

As last year the top management does not want to dictate the new salaries. Therefore, it has decided to let you and the other department head bargain over the distribution of the new salary budget as you did in the past.

Otherwise the experiment proceeds precisely as the earlier one. You will bargain with the other department head about the distribution of the new salary budget. Again, these points will be exchanged to euros at the same rate (100 points = 65 euro cents). In case of no agreement within 10 minutes, both of you receive nothing. As before, you will not be informed about the identity of the other department head. Otherwise the same rules as before apply. Please, enter the bargaining result in the new documentation sheet that comes along with these new instructions. After you have finished this part of the experiment you get paid your bargaining result from the earlier part of the experiment (including eventual earnings from your estimations of the numbers of correct answers in the general knowledge quiz) and the bargaining result from this part of the experiment The points you have earned in the earlier experiment will not be touched by this experiment, whatever the outcome is.

Do you have any further questions? If you have questions please raise your hand. If there are no (more) questions this part of the experiment will start shortly.
**Randomization Procedure**

A random number generator independently draws two random numbers from a uniform distribution over $[0,1]$ interval, one for you and one for the other department head.

- If the sum of those two numbers is less than 0.8165, the salary budget will be **1390 points**,
- If the sum of those two numbers is between 0.8165 and 1.1835, the salary budget will be **2050 points**,
- If the sum of those two numbers is more than 1.1835, the salary budget will be **2710 points**.
5- The second bargaining outcome:

The size of the salary budget can be 1390 points, or 2050 points, or 2710 points.
The actual salary budget is determined completely by external factors.
The actually realized size of the salary budget: .........................
There was an agreement: ..... yes ..... no
In case of “yes”:
The agreed share of the salary budget that goes to me: ........................
The agreed share of the salary budget that goes to the other department head: ........................
Debriefing Questionnaire

Questionnaire -A-

The following questions concern the determination of performance in the knowledge quiz. Please, indicate for all questions, by crossing the appropriate field, how strongly you agree with the statement. “1 = not at all”, “7 = very”.

1- In a knowledge quiz like this, pure luck decides who is able to answer more questions correctly.
   1  2  3  4  5  6  7

2- The one with the better general knowledge is able to answer more questions correctly.
   1  2  3  4  5  6  7

3- In my view the knowledge questions have been difficult.
   1  2  3  4  5  6  7
Questionnaire -B-

We would now like to know how you assess your own general knowledge. Not all people have an equally good general knowledge. We ask you, therefore, to compare your own knowledge with that of the other participants in this experiment. By definition, of course, there is somebody who has the least general knowledge and somebody who has the best general knowledge. We ask you to indicate on the scale below where you position yourself with respect to your general knowledge, within the group of the participants of this experiment. Of course, since you do not know all participants of this experiment this is a difficult task. Nevertheless we ask you to make your self-assessment as accurate as possible. Please, position yourself by crossing the percentage interval - on the scale below - where you think your own position relative to the other participants in this experiment is with respect to general knowledge. If you think, for example, that you are with your general knowledge at the top ten percent, then cross the percentage interval 91-100. If you think, for example, that you are with your general knowledge at the lowest ten percent, then cross the percentage interval 0-10.

Your estimation of your position within the group of the participants of this experiment with respect to your general knowledge:

- 0 – 10
- 11 – 20
- 21 – 30
- 31 – 40
- 41 – 50
- 51 – 60
- 61 – 70
- 71 – 80
- 81 – 90
- 91 – 100
Questionnaire -B- continued

The following questions concern your behavior in the bargaining experiment.

1- Which factors influenced your bargaining behavior in the first bargaining stage?

Remark 9 Questions 2, 3, 4, 5, 6 and, 7 below are not relevant for the current paper. They are provided here only to keep the debriefing questionnaire in its original form.

2- Which factors influenced your bargaining behavior in the second bargaining stage?

3- Did you take the first bargaining stage outcome into account in the second bargaining stage?

4- If your answer to the previous question was YES, then please explain how the first bargaining stage outcome affected your behavior in the second bargaining stage. If your answer to the previous question was NO, then you can continue with the next question.

5- Did you use the first bargaining stage outcome as a reference point for negotiations in the second bargaining stage?

6- Which factors influenced your decision to use or not to use the first bargaining stage outcome as a reference point for the second bargaining stage?

7- Did your level of satisfaction play a role in your decision to use or not to use the first bargaining stage outcome as a reference point in the second bargaining stage?
Questionnaire -C-

To what extent do each of the following statements accurately describe you? Please indicate the degree to which you personally agree or disagree with each of the following statements by choosing a number from the scale below that reflects your opinion.

1- Never tell anyone the real reason you did something unless it is useful to do so.
   - strongly disagree
   - disagree
   - neutral
   - agree
   - strongly agree

2- The best way to handle people is to tell them what they want to hear.
   - strongly disagree
   - disagree
   - neutral
   - agree
   - strongly agree

3- One should take action only when sure it is morally right.
   - strongly disagree
   - disagree
   - neutral
   - agree
   - strongly agree

4- Most people are basically good and kind.
   - strongly disagree
   - disagree
   - neutral
   - agree
   - strongly agree

5- It is safest to assume that all people have a vicious streak and it will come out when they are given a chance.
   - strongly disagree
   - disagree
   - neutral
   - agree
   - strongly agree

6- Honesty is the best policy in all cases.
   - strongly disagree
   - disagree
   - neutral
   - agree
   - strongly agree
7- There is no excuse for lying to someone else.
   ◦ strongly disagree
   ◦ disagree
   ◦ neutral
   ◦ agree
   ◦ strongly agree

8- Generally speaking, people won’t work hard unless they’re forced to do so.
   ◦ strongly disagree
   ◦ disagree
   ◦ neutral
   ◦ agree
   ◦ strongly agree

9- All in all, it is better to be humble and honest than to be important and dishonest.
   ◦ strongly disagree
   ◦ disagree
   ◦ neutral
   ◦ agree
   ◦ strongly agree

10- When you ask someone to do something for you, it is best to give the real reasons for wanting it rather than giving reasons which carry more weight.
    ◦ strongly disagree
    ◦ disagree
    ◦ neutral
    ◦ agree
    ◦ strongly agree

11- Most people who get ahead in the world lead clean, moral lives.
    ◦ strongly disagree
    ◦ disagree
    ◦ neutral
    ◦ agree
    ◦ strongly agree

12- Anyone who completely trusts anyone else is asking for trouble.
    ◦ strongly disagree
    ◦ disagree
    ◦ neutral
    ◦ agree
    ◦ strongly agree

13- The biggest difference between most criminals and other people is that the criminals are stupid enough to get caught.
    ◦ strongly disagree
    ◦ disagree
    ◦ neutral
14- Most people are brave.
   - strongly disagree
   - disagree
   - neutral
   - agree
   - strongly agree

15- It is wise to flatter important people.
   - strongly disagree
   - disagree
   - neutral
   - agree
   - strongly agree

16- It is possible to be good in all respects.
   - strongly disagree
   - disagree
   - neutral
   - agree
   - strongly agree

17- P.T. Barnum was wrong when he said that there’s a sucker born every minute.
   - strongly disagree
   - disagree
   - neutral
   - agree
   - strongly agree

18- It is hard to get ahead without cutting corners here and there.
   - strongly disagree
   - disagree
   - neutral
   - agree
   - strongly agree

19- People suffering from incurable diseases should have the choice of being put painlessly to death.
   - strongly disagree
   - disagree
   - neutral
   - agree
   - strongly agree

20- Most people forget more easily the death of their parents than the loss of their property.
   - strongly disagree
   - disagree
   - neutral
○ agree
○ strongly agree
Questionnaire -D-

Please click the option you find most appropriate! “0=not at all willing to take risks”, “10=very willing to take risks”

How do you personally assess yourself: Generally speaking, are you a person who is ready to take risks or are you trying to avoid risks?

0 1 2 3 4 5 6 7 8 9 10

One can behave differently in different circumstances. In the following circumstances, how would you assess your readiness to take risks?

Driving a car?

0 1 2 3 4 5 6 7 8 9 10

Making a financial investment?

0 1 2 3 4 5 6 7 8 9 10

In leisure time and when doing sports?

0 1 2 3 4 5 6 7 8 9 10

Regarding your professional career?

0 1 2 3 4 5 6 7 8 9 10

Regarding your health?

0 1 2 3 4 5 6 7 8 9 10

Regarding confidence in strangers?

0 1 2 3 4 5 6 7 8 9 10

Please, consider what you would do if you face the following situation: Imagine that you win 100,000 Euro in a lottery. Right after receiving the prize, you receive a new offer from a reputable lottery company, which includes the following: there is a chance to double the amount of money you bet. In case you win, the prize will be immediately paid out. However, there is also an equally high risk of losing half of the money you bet. You can invest the 100,000 Euro into the lottery in whole or in part in the following ways or reject the offer entirely.

What part of the lottery winnings would you put in this new lottery, which is, on the one hand, risky and promises gains, on the other hand?

- The whole amount of 100.000 Euro
- An amount of 80.000 Euro
- An amount of 60.000 Euro
- An amount of 40.000 Euro
- An amount of 20.000 Euro
- Nothing at all
Questionnaire -D- continued

Another question about risk-taking. Please consider what you would do if you face the following situation: Imagine that you win 100,000 Euro in a lottery. Right after receiving the prize, you receive an investment offer from a reputable bank, which includes the following: within two years, there is a chance to double the amount of money you invest. However, there is also an equally high risk of losing half of the money you invest. You can invest the 100,000 Euro in whole or in part in the following ways or reject the offer entirely.

What part of the lottery winnings would you put in this investment opportunity, which is, on the one hand, risky and promises gains on the other hand?

- The whole amount of 100,000 Euro
- An amount of 80,000 Euro
- An amount of 60,000 Euro
- An amount of 40,000 Euro
- An amount of 20,000 Euro
- Nothing at all
Questionnaire -E-

At the end some statistical questions:

  - Age:
  - Gender:
  - Study:
  - How much money per month do you have at your disposal (net of accommodation costs)?:
