Reference Points, Reputation and Strategies in a Dynamic Bargaining Environment with a Residual Claimant *

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Abstract

We conduct an experiment of a two-period bilateral bargaining environment, where the payoff to one player is subject to ex-post risk, while the other player receives a fixed payment, effectively making the player exposed to risk a residual claimant. The ex-post risk not only provides substantive issues for bargaining parties to resolve in the experiment – i.e. what is a fair compensation for the exposure to risk – it also results in the endogenous formation of reference points for the second period. We find support for "pay-back". That is, not only are bargaining outcomes in the second period affected by the realization of the first-period pie, but it is also the case that agents not exposed to the risk are able to extract a great surplus following a high realization of the first-period pie.

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Very preliminary version and incomplete version.

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1 Introduction

Many bargaining situations between players involve two features: asymmetric exposure to risk and repeated interactions. A leading example of this is the interactions between a union and firm. Typically, the union negotiates a fixed wage schedule for its members which the firm must pay to the workers for the duration of the contract. Therefore, the workers' earnings are typically not subject to risk. In contrast, the firm's profits are likely subject to risk resulting from uncertainty about demand for its product(s) or the cost of procuring other inputs such as raw materials or capital investments. At the same time, the relationship between the union and firm is not a one-shot interaction. Instead, at periodic intervals, they must negotiate a new contract that will govern their relationship going forward. The question that we are interested in is the following: how does the resolution of uncertainty in one period affect negotiations in subsequent periods?

We feel that this is interesting because the resolution of uncertainty – even if it provided equal payoffs ex ante –will almost surely lead to ex post inequality between the union and the firm. If, for example, demand was unusually low, then in relative terms, the union fared better than the firm; on the other hand, if demand was unexpectedly high, then the firm is in an advantageous position. Of course, from a strictly rational point of view, past outcomes should not have any impact on current negotiations because they are "sunk".

A large body of literature has shown that people have concerns for fairness (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000). Yet again, what is the correct notion of fairness? One might argue that what constitutes a fair division in period 2 should not be influenced by the realized payoff distribution in period 1. However, it is equally plausible that one argues that the fair thing to do is to try to equalize the total payoffs over the first two periods. That is, the person who was relatively advantaged in period 1 should *pay back* the disadvantaged party in the period 2 negotiation by accepting less. Thus, there is a potential for conflict in what constitutes a fair way to divide the surplus in period 2. It is also possible that the parties involved will appeal, in a self-serving manner, to the notion of fairness that is most advantageous to them.

One recent example where these issues are particularly relevant concerns the United States automobile industry. During the financial crisis of 2008-2009, the American automakers either entered into bankruptcy (General Motors and Chrysler) or came close to it (Ford). Because of this, they were able to extract large cuts to both pay and benefits for their workers. However, in recent years, the carmakers have been much more profitable than most anticipated. As several newspaper articles indicate, this has had a substantial effect on how the recent union contracts have been negotiated. For example, in Canada, "The auto makers' declarations offer a glimpse of their key goal in bargaining – holding down their hourly labour costs, one of the key fixed costs they can control ... That sets the stage for difficult bargaining, because the union is intent on raising wages and recovering some benefits they surrendered during the 2008-2009 auto crisis" (Keenan, 2012). This example highlights that the firms are trying to maintain the wages that were agreed to in crisis times as a kind of "new normal", while the union is seeking payback now that times have improved.

A similar story has played out more recently in the United States between the carmakers and the union. In even more stark terms, speaking about the decision to reject the initial agreement reached between the United Auto Workers (U.A.W.) union and Fiat-Chrysler, one worker said, "I feel like the company has been extremely profitable, and because we made concessions when things were tight, we deserve fairness when things are good" (Chapman, 2015a).[1] Beyond this, there is also a sense that payback should be larger, the better that the advantaged party did in the initial interaction. In an article comparing the differences between General Motors' and Fiat-Chrysler's respective contract negotiations with the U.A.W.,

> [General Motors] also reported this week that it had made a pretax profit of $8.3 billion in North America in the first nine months of the year.
>
> That solid footing could prove to be G.M.'s biggest bargaining challenge, experts said.
>
> 'This is a company that just posted a very strong profitability,' Ms. Dziczek said. 'The company's just not in as precarious a position.' She added that could lead workers to expect G.M.'s contract to exceed Fiat Chrysler's (Chapman, 2015b).

In order to gain insights into how asymmetric risk exposure and repeated interactions influence bargaining, we run a controlled human-subjects experiment. In the experiment, two players are paired together — one of whose payoffs is subject to ex post risk, while the other is not. In each of two bargaining rounds, the pair must negotiate an fixed payment to be paid to the player whose payoff is not risky. At the end of the first period, the uncertainty over the size of the pie is resolved and players learn the payoffs of both players. With this information, they must then negotiate for a second time a fixed payoff to the party not subject to ex post risk.

We document the following results. First, both the party whose payoff is risky and the party whose payoff is not risky believe that payback – i.e., a dynamic notion of fairness – is the fair way to divide the second round surplus. However, or second result is that subjects stake out second period bargaining positions in a self-serving manner. For example, when the first round pie was low, fixed payoff players demand the same payment as they agreed to in the first round, while the residual claimants propose significantly less. Moreover, when the situation is reversed and the first round pie realization was high, now fixed payoff players demand significantly more than their agreed first round payoff, while residual claimants offer approximately the same as was agreed to in the first round.

Our third result is to demonstrate that, because of the concession process in the second round of bargaining, we find limited support for the payback hypothesis. While there is some payback, it does not come close to equalizing the payoffs of the two players over the two rounds they interact. We also find some evidence for bargaining skill. Specifically, the greater the payoff to the fixed payoff player in the first round of bargaining, the greater will be her payoff in the second round of bargaining. That is, there is a positive correlation between earnings in the two bargaining rounds,

[1] Another example comes from the subsequent negotiations with General Motors: "G.M. is more profitable than it's ever been ... We've been killing ourselves on the floor, while G.M.'s raking in billions. We need something better" (Chapman, 2015b).

where as the payback hypothesis would suggest a negative relationship. One other interesting result that we document is that there is a strongly negative relationship between the round two claim of the fixed payoff players and their level of risk aversion, which is consistent with risk aversion being disadvantageous in bargaining. However, we also document that such risk averse players are less likely to concede. That is, they make a relatively weak offer but then "stick to their guns". Despite this, the overall result is that the total payoff to the fixed payoff player over the two bargaining rounds is significantly negatively related to her level of risk aversion.

2 Related Literature

White (2008) theoretically analyzes the role of asymmetric exposure to ex post risk in a one-shot bargaining environment. She provides relatively mild conditions under which the expected receipts of the party exposed to risk increase with a small increase in risk. Even more interestingly, she also provides conditions under which the residual claimant would actually *prefer* to bargain over a risky pie, rather than a riskless pie. The condition is essentially decreasing absolute risk aversion. Because of this, the marginal utility of the residual claimant is convex. Therefore, when a small risk is introduced, the expected marginal utility of an additional dollar is higher than the marginal utility of the expected value. In a bargaining environment, this effectively makes the residual claimant more patient, which increases her bargaining power and leads to higher welfare for the residual claimant.

Embrey et al. (2015) experimentally studied the role of asymmetric exposure to risk in a one-shot setting, testing the theory of White (2008). Their experiments verified that the payment to the fixed payoff player decreases (i.e., the expected receipts of the residual claimant increase) as the riskiness of the distribution increases. They also showed that in notable instances, some residual claimants did better in an expected utility sense when bargaining over a risky pie than when bargaining over a riskless pie. However, in contrast to the prediction of White (2008), the residual claimants who benefited were the relatively less risk averse. One of the main driving factors for this result appears to be that the fixed payoff players – especially those who are more risk averse – adopt weak initial bargaining positions, make larger concessions and are more likely to accept the residual claimant's proposal. Finally, they show that the presence of risk increases bargaining frictions – it takes longer to reach an agreement when the pie is risky and the chance of disagreement is increasing in the riskiness of the distribution. A key driver for this result is that the two players have different notions of fairness – fixed payoff players generally think that the fair division is the 50-50 split of the expected pie size, while residual claimants think that being compensated for their risk exposure is fair.

3 Experimental Design

In the experiment, subjects entered the lab and were assigned the role of either the residual claimant (RC) or the Fixed Payoff (FP) player. They kept their role for the duration of the experiment, which

consisted of five periods. Each period was further divided into two "rounds". At the beginning of each period, subjects would be matched into pairs consisting of one FP player and one RC player, and the pairs would interact with each other for the two rounds of the period. In each of the rounds, the pairs had to negotiate an amount of money to be paid to the FP player, with the residual claimant receiving the realized value of the pie less the agreed payment to the FP player. In each of the bargaining rounds, the pie was equally likely to be ECU14 or ECU26.

The protocol for bargaining was different for the two rounds. Specifically, in the first bargaining round, each pair of subjects had 4 minutes to try to reach an agreement and could send and receive offers in a completely unstructured manner. Bargaining would end when one of the players accepted the other's current proposal, in which case the agreement would be implemented and the value of the pie would be realized, or with the elapse of 4 minutes, in which case both players would receive zero for the round. At the end of the round, subjects would learn about their payoff as well as the realized value of the pie.

Because we are interested in identifying bargaining positions, in Round 2 – and specifically, how the realized value of the round 1 pie affects subsequent negotiations, in Round 2 we implemented a structured bargaining environment. Specifically, at the beginning of the round, subjects would simultaneously make a proposal – which was framed as a payment for the FP player. If these claims were compatible, in the sense that the proposed amount by the RC player was greater or equal to the proposed amount by the FP player, then bargaining would end immediately and the FP player would receive the average of the claims. However, if the claims were incompatible, the round would continue to a concession stage. Specifically, time would start counting and at every instant, either play could choose to accept their partner's proposal, which would end the round.

In order to induce a cost of delay, subjects were told that each second that elapsed, the round would terminate with a chance of 0.55%, which corresponds to an expected duration of three minutes. From a design perspective, one issue is that this creates a censoring problem. For example, if bargaining terminates after 200 seconds, then all we know is that players were willing to wait *at least* 200 seconds. In order to alleviate this, we implemented a blocking design. Specifically, the experimental software would only check evert 60 seconds to see if bargaining expired. Therefore, in the above example, the concession stage would continue until the early of 240 seconds or a player concedes to his/her opponent. Of course, if a player conceded after 200 seconds but before 240 seconds, then the players would be told that bargaining had expired and would receive no payment, but now we, as experimenters, know the true concession time of the player who conceded. This blocking design has been used in indefinitely repeated games with random termination to mitigate a similar censoring issue (see, e.g., Wilson and Wu, 2014; Fréchette and Yüksel, 2013).

At the beginning of each new period, subjects would be matched with another subject in the opposite role with whom they have never previously interacted. Each session consisted of 10 subjects – five FP and five RC players – and the first part of the experiment consisted of five periods. Therefore, every FP player was paired with every other RC player in the experiment exactly once. At the end of the five bargaining periods, subjects completed an incentivized risk elicitation task where we employed multiple price lists to elicit certainty equivalents for six binary

lotteries. Subjects' final earnings were determined as follows: one bargaining round was randomly selected for payment. The exchange rate was ECU2 = €1. For the risk elicitation task, there was a 50% chance that subjects would receive a fixed payment of €4 and a 50% chance that one decision for one of the lotteries would be implemented for payment. Earnings for parts 1 and 2 would then be summed and, an additional €2 show-up fee was given. On average, subjects earned €17.80 (min. €6.95, max. €33.90).

In total, six sessions were conducted in the BEElab at Maastricht University in June 2015. Each session lasted approximately 90 minutes. The experimental software was programmed in zTree (Fischbacher, 2007) and subjects were recruited using the online recruitment software ORSEE (Greiner, 2015).

4 Results

4.1 Fairness Perceptions & Summary Outcomes

In Table 1 we provide summary statistics for the fairness perceptions that we elicited, broken down by subject-role. We also show the average agreed payoffs to the FP player in round 1 and in round 2, conditional on each pie realization in round 1 of bargaining.

Table 1: Perceived Fair Amount For FP Player and Average Agreed FP Payoffs

Player Type	Round 1	Round 2	
		Round 1 Pie: Low	Round 1 Pie: High
FP Player	9.85	8.32	10.95
RC Player	9.00	7.75	11.07
Average Agreed FP Payoff	9.55	8.90	10.32

Discussion (Fairness). Comparing Round 1 with Round 2 (Low) and Round 1 with Round 2 (High), we see that for both types the difference in means are highly statistically significant (two-sided $t-$test, $p \ll 0.001$ in all cases). Comparing FP and RC players, we see that only the Round 1 fairness perception is significantly different ($p = 0.011$). Neither of the Round 2 fairness perceptions are different ($p > 0.1$). At least in terms of fairness perceptions, the payback hypothesis for both types of players appears to be valid. Note, however, that the fairness preferences do not generally equalize expected total payoffs over the two bargaining rounds. Except for residual claimants when the first round pie was low, implementing the average fair agreements for each type of player would leave the party with the higher first round payoff with a significantly higher total expected payoff.[2]

[2]For example, suppose that the round 1 agreement was at 9.00 (the average RC fairness preference) and the realized pie was 26. Then, if the round 2 agreement allocated the FP player 11.07, her total payoff would be 20.07, while the expected total payoff to the RC player would be 25.93.

Discussion (Agreements). First, observe that the agreed FP payment in Round 1 lies in between the perceived fair allocation of the FP and RC players. This is quite common in many bargaining situations (see, e.g., Gächter and Riedl, 2005; Bolton and Karagözoğlu, 2013; Karagözoğlu and Riedl, 2015). The average agreed FP payoff, at 9.55, is significantly different from 10 (two-sided $t-$test, $p = 0.032$), which indicates that a residual claimants do extract a risk premium.[3] Moreover, we also find evidence of payback at the aggregate level. In particular, $8.90 < 9.55$ ($p = 0.013$) and $9.55 < 10.32$ ($p = 0.003$); that is, the agreed FP payoff in Round 1 is strictly in between the agreed FP payoffs in Round 2 when the pie in Round 1 was low and high. However, the effect is smaller than one might have expected. For example, conditional on the pie in Round 1 being low, on average, the FP player earns 18.45 overall, while the RC player can expect to earn 15.55 overall. Thus, the FP player still earns nearly ECU3 more than the RC player when the pie in Round 1 was low. The situation is flipped, and even more extreme, when the pie in round 1 was high. In this case, the FP player earns approximately 19.87, while the RC player can expect to earn 26.13 – over ECU6 more! Thus, the party that earned more in Round 1, because of the realization of the pie, earns more in expectation overall.

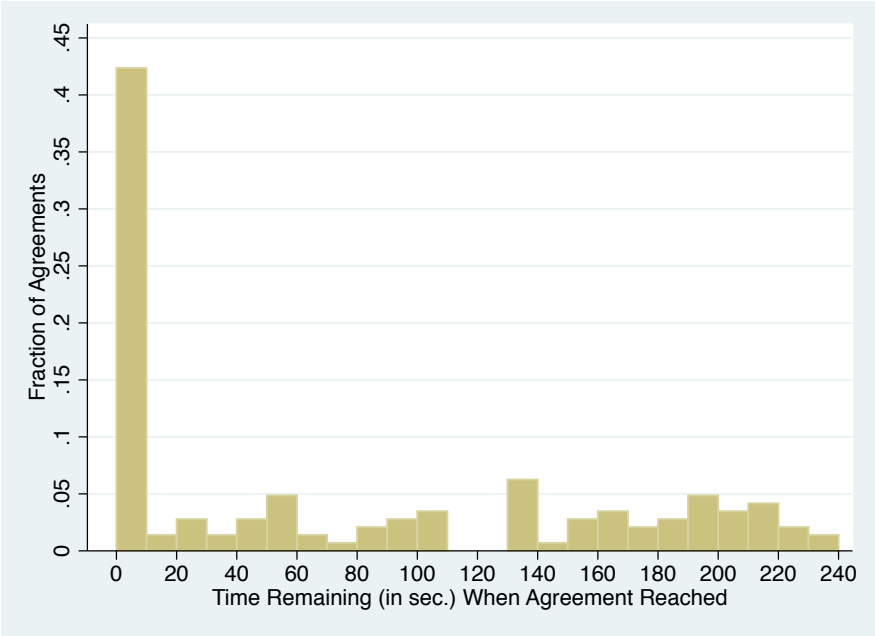
Discussion (Timing of Agreements). In Figure 1 we plot a histogram of the time at which agreements were reached in the first round of bargaining. While many studies on unstructured bargaining report strong deadline effects, it is even more pronounced here than usual. Over 40% of agreements take place in the last 10 second of bargaining; more strikingly, 35% of agreements are reached in the last **two** seconds. Of course, subjects knew that they would bargain with the same opponent in a second round. Therefore, it seems is plausible that they wanted to show strength by holding out as long as possible – though this is cheap talk because there was no explicit cost of delay. Note also that the agreements do not appear to be strongly influenced by whether an agreement was reached at the deadline or not. Specifically, we cannot reject that the average agreed payoff to the FP player or the standard deviation of agreed payoffs are different depending on whether an agreement was reached in the last 10 seconds or an agreement was reached earlier (in both cases, $p \gg 0.1$). Thus, reputation-building seems to be the primary motivation for the strong deadline effect.

4.2 Do Risk Preferences Affect The Round 1 Outcome?

Discussion (Agreed Payoffs). Table 2 looks at the determinants of Round 1 agreed payoffs. The first three columns individually include opening offers (to test for anchoring), risk preferences, and fairness considerations, while column (4) includes all variables. As can be seen, the only variable that is significant is the opening offer of the fixed payoff player, which suggests that opening offers

[3] We cannot compare this result with Embrey et al. (2015) because they did not implement the distibution used in our experiment. However, the average agreed payment to the FP player for their $(16, 24)$ distribution was 9.61, which is very similar to our experiment with the $(14, 26)$ distribution. Note that the repeated interaction in our experiment make even a direct comparison problematic because players may try to build a reputation. Moreover, the riskiness of total payoffs is not the same because the pie sizes were drawn independently across bargaining rounds within the same period.

Figure 1: Time of Agreement in Round 1



do have, at least partially, an anchoring effect (Galinsky and Mussweiler, 2001). In contrast to Embrey et al. (2015), risk preferences do not appear to have any influence on agreements, nor do fairness preferences.

Table 2: Determinants of Round 1 Agreements

	(1)		(2)		(3)		(4)	
FP First Off.	0.347***	(0.109)					0.341***	(0.131)
RC First Off.	0.106	(0.088)					0.099	(0.078)
FP Risk Param.			−0.876	(0.939)			−0.593	(0.980)
RC Risk Param.			−0.305	(0.782)			−0.120	(0.513)
FP Fairness					0.016	(0.142)	0.123	(0.086)
RC Fairness					0.182	(0.150)	0.103	(0.143)
Constant	4.607**	(1.797)	9.839***	(0.354)	7.674***	(2.271)	2.790**	(1.181)
Observations	260		268		268		260	
R^2	0.15		0.03		0.02		0.18	

Notes: Data includes only observations for which $|\rho_i| < 1$ for both RC and FP players. ***1%, **5%, *10% significance using standard errors clustered at the matching group level.

Discussion (Disagreements). Table 3 looks at the determinants of Round 1 disagreements. As above, we add the same explanatory variables. When variables are included individually, as in columns (1)–(3), only the fairness perception of the FP players is significantly positively associated with disagreement. When all variables are included simultaneously in (4), we also see that opening offers for the FP player are (marginally) significantly positively associated with disagreement. We

also see, somewhat surprisingly, that the opening offer of the RC player is positively associated with disagreement. This might be picking up something else. For example, RC players who make high opening offers might be unwilling to subsequently make concessions, which might increase the risk of disagreement. Although significant, the effect is quantitatively very small.

Table 3: Determinants of Round 1 Disagreement

	(1)		(2)		(3)		(4)	
FP First Off.	0.018	(0.011)					0.022*	(0.012)
RC First Off.	0.006	(0.004)					0.006**	(0.003)
FP Risk Param.			0.012	(0.022)			0.003	(0.025)
RC Risk Param			0.028	(0.080)			0.002	(0.080)
FP Fairness					0.023***	(0.006)	0.026***	(0.005)
RC Fairness					−0.019	(0.016)	−0.020	(0.019)
Constant	−0.211	(0.142)	0.031	(0.027)	−0.015	(0.132)	−0.333**	(0.158)
Observations	272		280		280		272	
R^2	0.02		0.00		0.04		0.06	

Notes: Data includes only observations for which $|\rho_i| < 1$ for both RC and FP players. ***1%, **5%, *10% significance using standard errors clustered at the matching group level.

4.3 Round 2 Bargaining Positions

Recall that in the second bargaining round, we implemented a structured bargaining protocol. In particular, subjects would simultaneously make a proposal – an amount to be paid to the fixed payoff player. The software would then check whether the proposals were compatible (i.e., the residual claimant offered more to the fixed payoff player than the fixed payoff player demanded for herself) or not. If the offers were compatible, then the fixed payoff player would receive the average of the proposals and bargaining would end immediately. If the offers were not compatible, then the players would enter into a concession stage. In this stage, at every instant, subjects could either wait or accept the proposal of their opponent. Waiting was costly – there was a 0.55% chance that bargaining would end every second. Unlike the unstructured bargaining environment that was implemented in the first round, opening offers are highly payoff relevant because they cannot be subsequently modified. Therefore, this allows us to better identify credible bargaining positions.

Table 4 reports the frequency of agreements and disagreements in Round 2. As can be seen, 21.33% of bargaining pairs made compatible claims in the initial stage of Round 2. In these cases, bargaining ended immediately. In the remaining 78.67% of the cases, the players proceeded to a concession stage, where a player could only accept their match's proposal or wait, hoping for their match to accept their own proposal. Most of the time a valid agreement was reached within the time available for bargaining. The blocking procedure that we used to mitigate censoring due to random termination gave us 10% more uncensored data about concession times.

Table 5 reports the average second round claims by each type of player and conditioning on each of the two possible pie realizations in the first round. Looking at the claims, we can see why

Table 4: Round 2 Bargaining Outcomes

Outcome	Fraction of Observations
Compatible Claims	21.33%
Incompatible Claims	
Valid Agreement	62.00%
Invalid Agreement	10.00%
No Agreement	6.67%

Note: To limit censoring of the data, we employed a blocking design in which the software would only check whether the bargaining time had expired every 60 seconds. For example, if the total time for bargaining was 70 seconds, then any agreement made at 70 seconds or before is "valid", while agreements made from 71 – 120 seconds would be considered "invalid" due to the lapse of bargaining time. If an agreement was still not reached after 120 seconds, then we classify these as "No Agreement".

payback is rather low. While the FP player believes that it would be fair to accept 8.32 if the pie in Round 1 was low, the average Round 2 claim is for 9.48, which corresponds almost exactly to the agreed Round 1 payoff. Indeed, for the FP player, when the pie in Round 1 was low, we are able to reject that the average claim in Round 2 is equal to the average fairness perception ($p = 0.020$), while when the pie in Round 1 was high, we are unable to reject the same hypothesis ($p = 0.898$). A similar picture emerges for the residual claimant. When the pie in Round 1 was low, the average proposed Round 2 amount for the FP player is not significantly different from the average fairness perception ($p = 0.569$), while when the pie was high, the average proposed Round 2 amount for the FP player is significantly different from the average fairness perception ($p = 0.003$). Thus it appears that players adopt self-serving, status-quo based bargaining positions when it is to their advantage. On the other hand, when the Round 1 outcome was to their disadvantage both player types' Round 2 bargaining positions are almost identical to their perceived fair allocation – that is, they demand payback.

Table 5: Average Claims in Round 2 Given Round 1 Pie

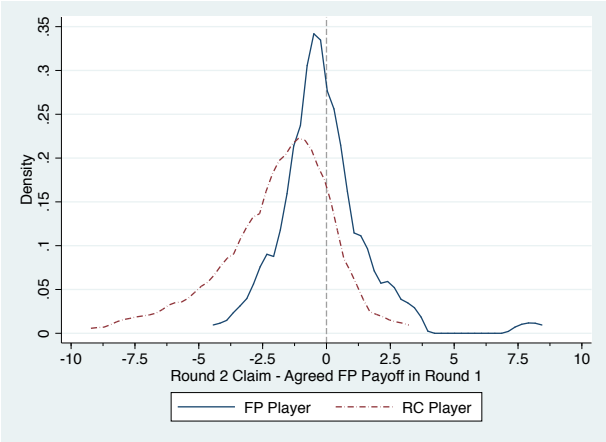
Player Type	Round 1 Pie: Low	Round 1 Pie: High
FP Player	9.48	10.96
RC Player	7.61	8.85

Remark 1 *Perhaps a more powerful test is to compute the difference between an individual's fairness perception and her subsequent claim in Round 2 for each realization of the pie in Round 1 and then to compute the matching group average to conduct the tests. If we do this, the results are qualitatively identical. When subjects were in a disadvantageous position due to the Round 1 pie realization, then their subsequent claims are statistically indistinguishable from their fairness perception ($p > 0.7$). In contrast, when subjects were in an advantageous position due to the Round 1 pie realization, their subsequent claim differs significantly – and in the direction of the status quo – from their fairness perception ($p < 0.01$).*

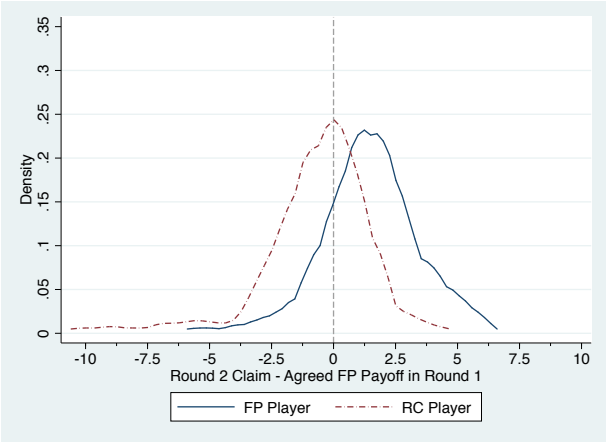
To give a sense of the dispersion of second round claims, Figure 2 reports kernel density estimates

Figure 2: Round 2 Claims

(a) Round 1 Pie: 14



(b) Round 1 Pie: 26



Note: The dashed vertical line is at 0; which corresponds to the second round claim being identical to the first round payoff to the FP player.

of the difference between second round claim and first round agreed payoff to the FP player, broken apart by player type and the realization of the pie in Round 1. Unsurprisingly, the mode of the distribution for FP players is always to the right of the mode for RC players. Also consistent with what appear to be self-serving norms, when the Round 1 pie was 14, the mode for FP players only slightly to the left of 0; when the Round 1 pie was 26, the mode for RC players is almost exactly at 0. That is, when the round 1 outcome was advantageous, it is common to adopt a "status quo" bargaining position. On the other hand, when the outcome was disadvantageous to the player, the mode of the distribution demands payback; that is, for RC players, the distribution is left-shifted when the pie was 14 and for FP players, the distribution is right-shifted when the pie was 26.

In Table 6we do a regression analysis of Round 2 claims on fairness perceptions and the realization of the pie in Round 1. Here, in contrast to our analysis based on matching group averages, the regression analysis shows that claims, for both players, are significantly correlated with fairness perceptions when the realized pie in Round 1 was low. When the pie in round 1 was high, again for both players, there is no relationship between fairness perceptions and claims. Instead, when the pie was high in Round 1, their is a shift upwards in claims.

Two other interesting results are apparent from column (3) of Table 6(a). First, there is a (weakly) significant positive relationship between the first round payoff and the second round claim. This is our first indication that bargaining skill is at play. Having secured a relatively favorable agreement in round 1, they proceed to demand more in round 2. Second, the claims of FP players are highly significantly negatively correlated with their risk preferences. That is, more risk averse FP players demand less. This is also interesting because risk preferences did not seem to play a role in the first period, which suggests that even risk averse FP players were trying to build a reputation. However, in the second period, when there is no future with the same opponent, their choices are governed by their risk preferences.

Table 6: Round 2 Claims, Round 1 Pie Realization and Fairness

(a) FP Players

	(1)		(2)		(3)	
R1 Pie: 26	3.890***	(1.281)	4.075***	(1.387)	4.551***	(1.188)
Fairness Perception						
R1 Pie: 14	0.190*	(0.107)	0.193*	(0.108)	0.268***	(0.075)
R1 Pie: 26	−0.076	(0.145)	−0.090	(0.153)	−0.075	(0.134)
FP Round 1 P.O.			0.144	(0.088)	0.143*	(0.078)
FP Risk Param.					−2.759***	(0.351)
Constant	7.926***	(0.940)	6.523***	(1.249)	6.751***	(0.942)
Observations	144		144		144	
R^2	0.22		0.26		0.41	

(b) RC Players

	(1)		(2)		(3)	
R1 Pie: 26	4.272**	(2.065)	4.235**	(2.077)	2.301	(2.016)
Fairness Perception						
R1 Pie: 14	0.337**	(0.159)	0.333**	(0.165)	0.308*	(0.168)
R1 Pie: 26	−0.028	(0.155)	−0.025	(0.160)	0.138	(0.099)
FP Round 1 P.O.			0.179	(0.231)	0.305	(0.217)
RC Risk Param.					−0.069	(0.657)
Constant	4.953***	(1.263)	3.258	(2.970)	2.424	(2.684)
Observations	144		144		134	
R^2	0.14		0.16		0.28	

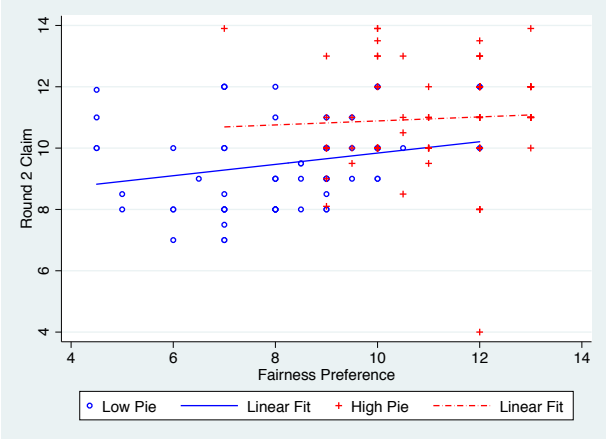
Notes: We condition only on those cases for which an agreement was reached in Round 1. For regressions including risk preferences, we include only those subjects for which $|\rho| < 1$. ***1%, **5%, *10% significance using standard errors clustered at the matching group level.

Figure 3 provides a visual representation of how second round claims are associated with fairness preferences for both FP and RC players and for both possible realizations of the pie in round 1. The results are consistent with Table 6 in that the relationship is positive (and significant) only when the pie was low in the first round.

We now dig a little deeper into claims in the second round. We first seek to determine the characteristics which determine whether the round 2 claims are compatible. For example, if both players are risk averse, the may prefer to make a generous claim in order to reduce the risk of disagreement. The results are displayed in Table 7. As can be seen, the more risk averse the FP player, the more likely are the offers to be compatible (because, as the previous table shows, they demand less). Offers are less likely to be compatible when the Round 1 pie was high, which suggests that there is more conflict about what an acceptable agreement is in this situation. Finally, compatible offers are more likely when there was an agreement in the first round.

Figure 3: Round 2 Claims

(a) FP Players



(b) RC Players

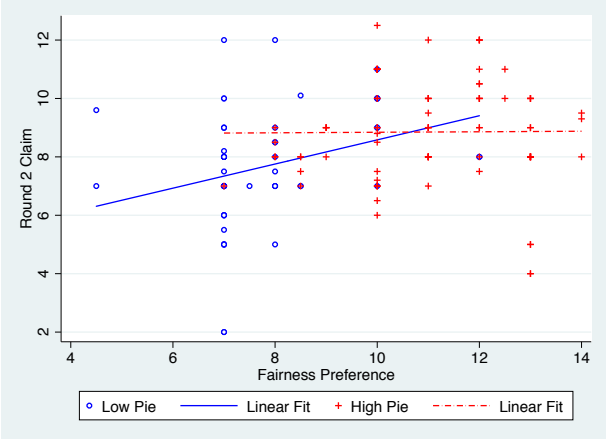


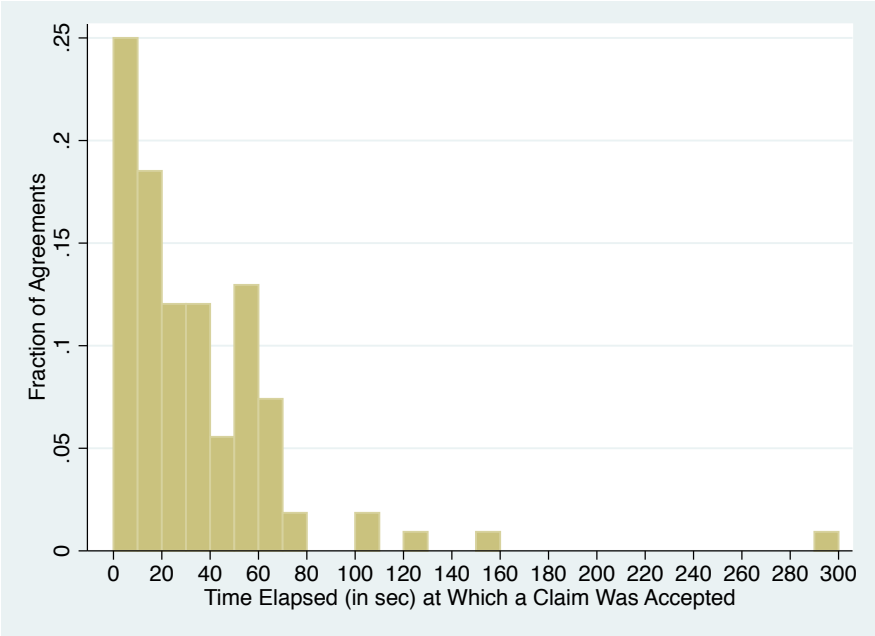
Table 7: The Determinants of Compatible Round 2 Claims

	(1)	
FP Risk Param.	0.596***	(0.078)
RC Risk Param.	−0.066	(0.091)
Round 1 Pie: 26	−0.139**	(0.059)
Round 1 Agreement	0.223***	(0.065)
Constant	−0.076	(0.078)
Observations	280	
R^2	0.15	

Note 1: We include only those subjects for which $|\rho| < 1$ for both players.

Note 2: ***1%, **5%, *10% significance using standard errors clustered at the matching group level.

Figure 4: Distribution of Acceptance Times (Round 2)



4.4 Round 2 Duration Analysis

In Figure 4 we plot a histogram of acceptance times for the groups whose initial claims were incompatible but who successfully reached an agreement (possible invalid, due to the blocking procedure). Interestingly, 26.85% of agreements were concluded within the first 10 seconds of the concession stage, and 56.48% were concluded within the first 30 seconds. From this we can conclude that the cost of delay – in the form of random termination – was particularly salient to subjects.

In Table 8, we report the results of a duration analysis. Specifically, we report the results of a Weibull regression where a subject's decision to accept the offer is coded as a "failure". We focus only on player's whose offers were incompatible in Round 2, so that they entered into the

Table 8: Duration Analysis of Round 2 Bargaining

	(1)		(2)		(3)	
FP−RC Claim	−0.31***	(0.097)				
FP×(FP−RC Claim)			−0.44***	(0.105)	−0.46***	(0.119)
RC×(FP−RC Claim)			−0.24**	(0.094)	−0.25**	(0.115)
FP Risk Param.					−0.99**	(0.497)
RC Risk Param.					−0.23	(0.927)
Log Likelihood	−226.95		−223.10		−220.89	
Observations	216		216		216	

Notes: We condition only on those cases for which incompatible claims were made. For regressions including risk preferences, we include only those subjects for which $|\rho| < 1$. ***1%, **5%, *10% significance using standard errors clustered at the matching group level.

concession stage. As explanatory variables we include the difference in claims between the FP and RP, as well as the risk coefficients. We also experimented with including other variables such as fairness preferences or the outcome in Round 1 of bargaining, but none of these variables were found to have more than a negligible effect. To interpret the coefficients, note that negative coefficients are associated with longer durations.

As can be seen, the greater the difference between the claims of the FP and RC players, the longer do subjects hold out before accepting. Looking at column (2), we actually see that FP players are significantly more willing to hold out longer. Column (3) shows that more risk averse FP players also hold out longer. This is a bit unusual, but recall From Table 6(a) that more risk averse FP players make significantly smaller claims. The two effects combined suggest that these subjects make smaller claims but then "stick to their guns" until the other player accepts.

4.5 Bargaining Skill

Table 9 looks at the relationship between the agreed Round 1 FP payment and the agreed Round 2 FP payment. Note that if payback is sufficiently strong, then we might expect a negative correlation between agreed FP payoff in round 1 and agreed FP payoff in round 2: if the pie in round 1 was low, then a higher round 1 FP payoff means that there is more to be paid back, while if the pie was high, then a higher FP payoff means that the RC needs to payback less to equalize total payoffs over the bargaining rounds. In contrast, a positive correlation may be indicative of skill at bargaining. As can be seen, the correlation is indeed significantly positive. Therefore, FP players who successfully negotiate a higher payment in Round 1 are also likely to receive a higher payment in Round 2. As Column (2) shows, this correlation holds true even after controlling for factors risk preferences.

Table 9: Bargaining Skill

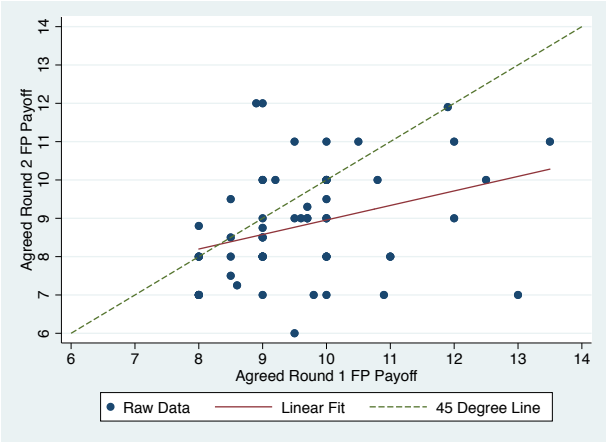
	(1)	(2)
FP Agreed Round 1 Payoff	0.277*** (0.096)	0.278*** (0.077)
Round 1 Pie: 26	1.516*** (0.188)	1.455*** (0.098)
FP Risk Param.		−1.247*** (0.449)
RC Risk Param.		0.505 (0.394)
Constant	6.198*** (0.919)	6.456*** (0.835)
R^2	0.26	0.29
Observations	268	250

Notes: For regressions including risk preferences, we include only those subjects for which $|\rho| < 1$. ***1%, **5%, *10% significance using standard errors clustered at the matching group level.

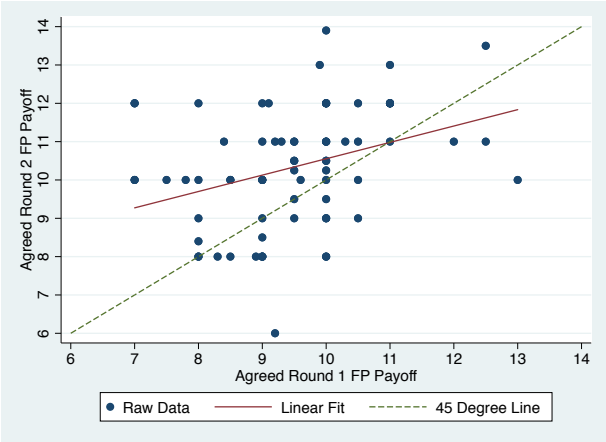
Figure 5 plots the relationship between the agreed FP payments in rounds 1 and 2 of bargaining. Consistent with Table 9, the relationship is positive for both pie realizations. When the round 1 pie was low, the best fitting line lies below the 45 degree line, which shows that FP players do provide some payback, while when the round 1 pie was 26, the best fitting line is mostly above the 45 degree line, indicating that FP players are able to extract payback.

Figure 5: The Relationship Between Round 1 and Round 2 Agreements

(a) Round 1 Pie: 14



(b) Round 2 Pie: 26



Note: We drop one outlier observation from the figure in panel (a) which had an agreed FP payment of 2 in round 1 and an agreed FP payment of 10 in round 2.

In Figure 6, we plot histograms of the subject-average agreed payments to FP players over the five bargaining periods for both Rounds 1 and 2. As can be seen, there is a great deal of heterogeneity. It is difficult to say whether a particular cell represents a high-skilled or low-skilled player. For example, the left-most bin in panel (a) could represent a particularly *bad* FP player or a particularly *good* RC player. What is true is that the extremes represent bargainers of either high or low skill, depending on the player type and whether the average FP payment is high or low. One thing that we can say is that the risk averse FP players who made weak second round claims but then, largely, refused to concede, did significantly worse than their less risk averse counterparts who made stronger claims but were more open to conceding.

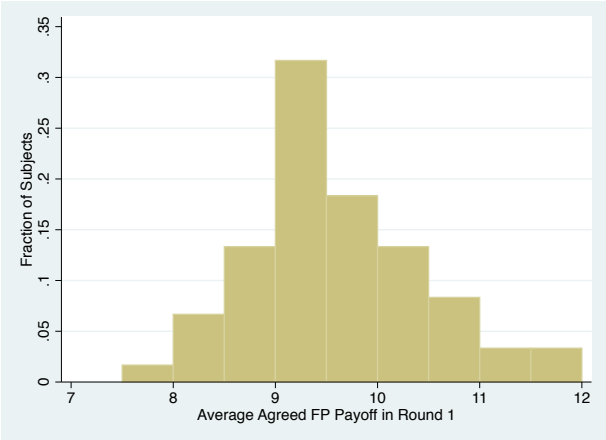
5 Conclusion

In this paper we studied the influence that asymmetric exposure to risk affects bargaining in a setting where players must negotiate with the same opponent over two bargaining rounds. Because of asymmetric exposure to risk, an agreement that was ex ante fair will necessarily lead to ex post inequality when the players must negotiate an agreement in a second round of bargaining.

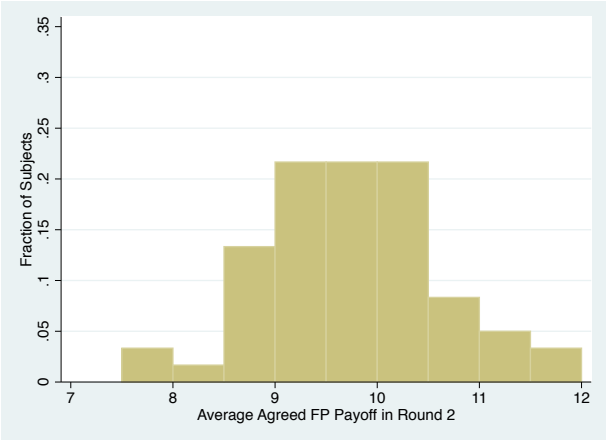
Our results suggest that a limited form of payback is considered fair by both the fixed payoff players and residual claimants. That is, the fairness norm extends over the duration of a pair's interaction. However, when it comes to actual bargaining, players who were in an advantageous position after the first period outcome made offers which were consistent with the status quo, while players who were in a disadvantageous position made offers which were consistent with their fairness perceptions for payback. Because of these competing bargaining positions, while the average agreements are consistent with payback, the amount is qualitatively very small and there is still substantial inequality in expected total payoffs over the two bargaining rounds in favor of the

Figure 6: Subject Average Negotiated Payments to FP Players

(a) Round 1 Agreements



(b) Round 2 Agreements



advantaged party based on the round 1 pie realization.

While we do find evidence for the payback hypothesis, our results also highlight the role of skill. Players who secured more favorable agreements in the first round, also secured more favorable agreements in the second round. Our results also indicate that, while players may have tried to build a reputation for tough bargaining in the first round, at least for FP players, their second round actions were influenced by risk preferences. Similar to Embrey et al. (2015), risk averse FP players adopt weak bargaining positions, which is to the advantage of residual claimants. In addition to risk aversion of the FP players, the one other robust finding appears to be that Economics majors earn significantly less than non-economics majors.

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6 Sample Instructions