



The Impact of Compulsory Arbitration on Bargaining Behavior – An Experimental Study

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A series of experiments compares bargaining behavior under three different settings: no arbitration, conventional and final offer arbitration. Under no arbitration disputes with zero payoffs were around 10%, while the pie was equally split in less than half of the cases. Under conventional arbitration - where the arbitrator is free in choosing his award - every third negotiation ended in dispute giving evidence for a modified chilling effect. Under final offer arbitration – where the arbitrator has to award to the bargainers either one of their final offers - there was only a small increase of disputes while equal splits have doubled to 80%. The experiment shows final offer arbitration, though having lower dispute rates, to interfere more with bargaining behavior than conventional arbitration where the bargaining behavior was similar to the no-arbitration treatment. Under final offer arbitration, negotiators adjust their bargaining strategy to the arbitrator’s expected award.

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1. Introduction

When considering the typical structure of bargaining behavior it seems that most negotiations are following the same ritual. Far from the efficient outcome as suggested by the Rubinstein Game [1982], each party usually tries to claim a large part of the pie for himself when two parties sequentially bargain about the split of a shrinking pie. Therefore, both parties often pose incompatible demands and offers. After expensive negotiations, in many cases bargaining parties tend to agree on compromises which are between the opening demands.²

The gap between theory and practice can be explained by incomplete information. The information required for the Rubinstein outcome is prohibitively high: the size of the pie, the discount rates of the bargaining parties, their 'outside options' and their subjective preferences must be common knowledge to secure agreements without any frictions. Negotiations become more complex if there is incomplete information about any of these parameters. Then, both parties – after receiving first offers - may form expectations about each others' preferences and consider these expectations in their own bargaining strategies (and vice versa).³ As Kennan and Wilson [1993, p. 46] put it “from an ex ante perspective the costly process of bargaining can be an efficient way of establishing a common information basis for an agreement“, even if it should lead ex post sometimes to a zero payoff for both parties.

Introducing the institution of an arbitrator is, therefore, suggested as a prevalent policy to reduce negotiation cost. Agreements may be settled in less amount of time so that the bargaining cost, measured by a decreasing size or a complete loss of the pie, are considerably reduced. On the other hand, an arbitrator - if vested with the power to settle compulsory awards – may complicate negotiations. The bargaining parties have to consider possible settlements of the arbitrators in their own decision, as well.

The two most diverging schemes, conventional and final offer arbitration, and their impact on bargaining behavior are in the focus of this paper.⁴ According to Conventional Compulsory Arbitration (CCA), the arbitrator is able to impose an award of his own choice if negotiations end in dispute, allowing him to choose freely among a continuum of potential outcomes. It was raised, however, that the awards might not be based on independent decisions of the arbitrators but may be affected by the bargaining process. Unyielding bargaining behavior will become predominant- the so called 'chilling effect', cf. Stevens [1966] - if arbitrators tend

² For some field evidence on costly delays, cf. Kennan and Wilson [1990a,b]. Moreover, Ashenfelter and Currie [1990] documented that delays in the field are not very different from those observed in experimental studies.

³ The central role of information in explaining bargaining behavior is discussed in the survey of Kennan and Wilson [1993]. See also Roth and Murnighan (1982) for the relevance of information in bargaining experiments.

⁴ See Charness [1996] for a more general conceptual framework on alternative dispute resolutions where arbitration approaches are also related to other dispute resolution procedures.

to split the difference between the final bargaining positions.⁵ In this case posing incompatible demands is the best strategy: Arbitrators can be called into action in due time, and dispute cost can be kept at a low level while the higher the last claim is before asking for arbitration the higher will be the share of the pie which the arbitrator will reward to the respective bargainer.

The most provocative hypothesis with respect to this incentive was formulated by Borchardt [1990] who analyzed the bargaining outcomes under CCA in the late twenties of the German Weimar Republic. He believes that only one bargaining party (the unions) was making use of the strategic advantages of CCA. According to his analysis he came to the conclusion that the unions were posing excessive demands while the employers were suggesting zero increases for the wages. Arbitrators then decided according to the split the difference notion which allowed the unions to realize half of the wage increases they were demanding. Borchardt concluded that the unions were partly responsible for the Hitler regime because their wage demands caused the strong depression in Germany inducing sharp increases in votes for the Nazi-party. With this provocative thesis the so-called Borchardt controversy was released. And his suggestions about the behavior of CCA arbitrators motivated the present experiment.

Hence, several studies observed that dispute rates increased under CCA, seemingly indicating that bargainers are discouraged to find an agreement on their own.⁶ CCA might sit on the fence between the advantage of cost savings and the disadvantage of higher dispute rates. To save the advantage and circumvent the disadvantage, Stevens [1966] proposed the other extreme among the arbitration schemes: The number of available awards is restricted to two, i.e. the arbitrator has to choose one of the final offers of the two bargaining parties as award, the *Final Offer Arbitration* (FOA).⁷ Dispute rates may decrease because, due to the limited number of available awards, parties are forced to make more conducive offers than under CCA so that agreements may be realized without any arbitration procedure. Some but not all empirical papers (e.g., Stern et al. [1975]) gave evidence for decreasing dispute rates.

⁵ For the chilling effect, see also Feuille [1975], Wheeler [1978]. Other arbitration effects which may cause unserious bargaining behavior are characterized as 'narcotic effect' (Wirtz [1963]) and as 'familiarity effect' (Farber and Katz [1979]). In contrast to the chilling effect these effects may arise only in repeated games even if the arbitrator has his own preferences about the awards, irrespective of the behavior of the bargaining parties.

⁶ Field studies (Borchardt [1990], Currie and McConnell [1991]) and some experimental studies (Ashenfelter et al. [1992], Bolton and Katok [1998], Dickinson [2004]) show that dispute rates increase under conventional arbitration. See also Roth [1995].

⁷ There exist some further specific forms of FOA and of other intermediate schemes, where arbitrators have more than two but less than a continuum of choices to settle an award, such as issue by issue, nighttime-baseball, tri-offer, combined or multiple-final offer arbitration. See Donn [1977], Crawford [1979], Brams and Merrill [1986], Ashenfelter et al. [1992] and Charness [1996] for description and analysis of the expected behavior under each of these arbitration schemes. However, in this paper the focus is restricted to the two extreme points of arbitration, final offer and conventional arbitration.

The incentives created by FOA were criticized for not being superior to those of CCA because the negotiating parties will be driven “to what the arbitrator desires. Rather than revealing their own preferences in the process, they reveal their perceptions of the arbitrator“ (Crawford [1979, p. 143]). Negotiators would not bargain in the same way with each other. Empirical evidence supports some of these assertions. Farber and Katz [1979] showed that the outcomes under CCA and FOA are different. Ashenfelter and Bloom [1984] found lower dispute rates and lower wage increases (in wage negotiations in the US) under FOA than under CCA indicating that bargaining behavior seems to be different under these two arbitration regimes.

This paper aims to shed more light on the mutual effects between bargaining parties and arbitrators and on the impact of these two arbitration schemes on bargaining behavior. We will not only compare dispute rates under CCA and under FOA but also investigate to what extent bargaining behavior is influenced by the incentives of each arbitration scheme. This will allow us, as well, to suggest what kind of settlements the bargaining parties might expect when they ask for arbitration. We further aim to find typical decision pattern of arbitrators: are they influenced by the bargaining parties (cf. e.g. Borchardt [1990] Feuille [1975]) or do they develop independent 'appropriate' (Farber and Bazerman [1986]) or 'fair' (Crawford [1979]) award criteria. Last but not least it is of central interest whether the awards are substantially different due to the restricted number of choices in FOA. Answers to these questions will allow to gather new insights which design saves most of the advantage of arbitration (the cost reductions) without increasing the dispute rates and without deviating too much from bargaining behavior in negotiations without arbitration.

The rest of the paper is organized as follows. Section 2 gives an overview of related experiments. Section 3 describes the three experimental treatments, the basic Rubinstein Game without arbitration as well as the conventional and the final offer arbitration treatments. In section 4 the main results of the experiments are reported giving an overview over the complete bargaining process in the three treatments. In section 5 the two arbitration schemes are compared with respect to their impact on bargaining behavior. Section 6 concludes.

2. Results of Related Experiments

Since the basic treatment of the experimental setting is a multi-period Rubinstein game, earlier experiments with a similar design, as conducted e.g. by Neelin et al. [1988], Ochs and Roth [1989], Weg et al. [1990] and Bolton [1991], are an important benchmark. All experiments were Rubinstein games with three to twenty bargaining periods. In addition, Ochs and Roth [1989] varied discount factors and subgame-perfect outcomes. These studies

report that only about half of the observed results could be captured either by the equal split⁸ or by the subgame-perfect outcome, while half of the results need further explanation. All studies also show a small but significant share of break downs of negotiations with zero payoffs. Ochs and Roth suppose that players make strategic considerations leading for some of them to a first mover advantage (which is not ‘justified’ by subgame-perfectness). Players further “try to estimate the utilities of the players they are bargaining with, and some [other] players incorporate distributional considerations in their utility functions“ (Ochs and Roth [1989]).⁹ They also report that the subgame-perfect equilibrium is a poor qualitative predictor.

Ashenfelter et al. [1992], Bolton and Katok [1998], Charness [2000], and Dickinson [2004] report first experimental work on bargaining under arbitration.¹⁰ These papers have one crucial point in common with respect to the experimental design: arbitration was not allocated to a person but was computerized, with stochastic awards drawn from a normal distribution with an expected value of an unequal split in cf. Ashenfelter et al. [1992], and (in two differing treatments) with an expected value of an equal as well as an unequal split of the pie in Bolton and Katok [1998]), and of an equal split in Charness [2000] and Dickinson [2004].¹¹ Except for Charness [2000], the three other approaches can be directly related to the present study. In comparison to bargaining behavior without arbitration, Ashenfelter et al. [1992] analyzed behavior under CCA and FOA, Bolton and Katok [1998] under CCA and Dickinson [2004] under CCA, FOA and a new approach designed by Brams and Merrill [1986].

All three experiments have in common that under CCA the frequency of disagreement was higher (presumably due to the lower cost of disagreement) than in the no-arbitration treatment. In addition, Ashenfelter et al. and Dickinson, observed that the dispute rates under FOA were not lower than under CCA. Bolton and Katok (who had no FOA treatment) found that in the equal split treatment under CCA usually the bargainer who was closer to the equal split asked for arbitration. Dickinson further revealed that dispute rates were highest under the combined arbitration approach, in contrast to the expectations of Brams and Merrill [1986].

⁸ In some experiments the share of equal splits was slightly higher than 50%.

⁹ A more general explanation for this outcome is given by Forsythe et al. [1991] who assert that the preferences of the participants are heterogenous.

¹⁰ It should be emphasized that there is one more experiment by Deck and Farmer [2003] where the same arbitration design is used as in Ashenfelter et al. [1992]. Since their model and their experiment had a different focus than the present paper (bargaining behavior when there is asymmetric information about the pie size), it will not be further related to the discussion presented here. Their experimental design, however, provides an important insight to why wage increases are lower under FOA than under CCA – as it was observed by Ashenfelter and Bloom [1984].

¹¹ There are further differences in the design of the experiments: Ashenfelter et al. [1992] introduce a time limit to the bargainers but no cost of decay and no restriction in bargaining periods. Bolton and Katok [1998] used a ‘deadline game’ (for more details see the previous version of Bolton [1995]). In comparison to Ashenfelter, Charness extended the time limit and introduced shrinking payoffs per 100 seconds of bargaining, while in Dickinson [2004] the time constraint was reduced and subjects were privately given suggested bargaining ranges.

The three papers showed that the institution of arbitration increases dispute rates, irrespective of its design. However, by randomizing the decision of the arbitrator and by not having given any information about the related final offers which were done by the bargainers previous to the settlement of the arbitrator, the information about the last 100 settlements of an arbitrator is meaningless for the bargaining parties. At the same time, it makes almost explicitly clear that it is impossible to influence the arbitrator by any bargaining strategy. Thus, bargainers had no reason to chill their offers in order to influence the arbitrator in their favor. The observation of increased dispute rates must have other reasons.

Bargainers might have been influenced by a computerized arbitrator in a different way than by a real person. A computerized arbitrator has the advantage that bargainers in experiments could be informed about ‘his’ (or better its) previous decisions.¹² Nevertheless, it has to be pointed out that a random arbitration design with any kind of expected value contains some serious disadvantages, as well. First of all, the idea that arbitrators are statistically exchangeable is empirically not supported: Farber and Bazerman [1986, p. 1513] note that “arbitrators differ substantially in their evaluation of any particular scenario in both types of arbitration. This is important evidence that there is real uncertainty in the arbitration process due to differences among arbitrators in the awards they made in identical situations“.

Second, the fact that there is a random draw needs to be discussed. Participants were explicitly (see e.g. Ashenfelter et al. [1992, p. 1412]) or implicitly informed (in the other two papers) that they are not able to influence the arbitrators’ decision by their bargaining behavior.¹³ Since they knew (in the experiment of Ashenfelter) or probably anticipated (in the other experiments) the random award mechanism¹⁴ it is a *dominant strategy* of those players who are favored in the treatment with unequal awards and of risk-seeking, risk-neutral and to a certain extent even of the risk-averse players¹⁵ in the equal-award-treatments to pose claims higher than the equal split. Doing so they increased the probability of a dispute because the equal split was on average guaranteed by the special design of the experimental arbitrator in these three papers. Therefore, it should not be a surprise that dispute rates increased.

The structure of the arbitration mechanism might also explain further findings of Ashenfelter et al. [1992] and Dickinson [2004]. They report that disputes were about the same under FOA and CCA. Since in their experiment both arbitration mechanisms relied on the same random

¹² There are only few countries – the US among them - where bargainers in the field are provided with the information of the earlier decisions of arbitrators. In most countries this is not given, mostly because arbitrators – usually elder politicians - have no award history and act as arbitrators only once or twice in their lifetime.

¹³ As one anonymous referee pointed out participants of Ashenfelter’s experiment were even explicitly reminded that the arbitrator’s decision is completely independent of any past bargaining behavior.

¹⁴ A list of the last 100 decisions of the arbitrator without telling the participants the impasse offers of the two bargaining parties may even insinuate such information.

¹⁵ Ashenfelter et al. [1992] argue that the data do ‘not indicate ... evidence of risk aversion’ of bargaining parties.

award mechanism and the distribution of the awards was "invariant to the arbitration scheme" [p. 1410], arbitration could not have a different impact on bargaining behavior, simply because the original chilling effect (which could only be unleashed when human beings act as arbitrators) was eliminated by the design of arbitration.

These approaches showed that the behavior of the bargainers is influenced in their specific arbitration design in a completely different way than under a real arbitrator. Therefore, the existence of another chilling effect is revealed, namely that players who anticipate the effects of a random award mechanism with a certain expectation value have the dominant strategy to chill their final offer thus increasing the probability of a dispute. However, these experiments cannot give any answer to the questions whether CCA (done by a human being) increases disputes because bargainers hope to be able to influence the arbitrator by their respective bargaining strategy and whether FOA (also done by a human being) eliminates this effect.

The focus of Charness [2000] is different and for other reasons important for the present study. The aim of Charness [2000, 285] is to find out whether "information about player types affects bargaining efficiency" where efficiency is measured as the number of agreements concluded without arbitration. The arbitration scheme plays a minor role. In this study, before they started bargaining, players had to make choices in a \$5 Dictator Game and were labeled as high types (if they transferred more than \$1.5) or low types (if they transferred less). In the basic treatment, players did not know the type they were matched with. What is most important for the later comparison to the present paper is that players who are labeled low types in his approach earned most in this treatment when they were matched with high types. In a second treatment players learned of the sorting process before the bargaining session but after the Dictator Game. In comparison to the first treatment, now high types had significantly lower dispute cost when they knew that they were matched with a high type. In contrast to this dispute cost were higher when low types were matched with high types (and they knew about the kind of matching) while average earnings now became the same for low and high types.

3. Experimental Design and Procedures

3.1 The Treatments

The experimental design of the present study encompassed three different treatments, one treatment where the participants played a *Basic Rubinstein* game (called BR treatment) without any arbitration, one with conventional, and one with final offer arbitration. All other conditions were kept identical. In all three treatments, two bargaining parties always had to sequentially negotiate to share a pie of 259 experimental currency units (ECU) (=13,25 Euro).

In the BR treatment without arbitration, the bargaining parties made alternating offers. Time was divided into periods. In period 1, bargainer 1 had to divide the pie of 259 ECU between the two parties. He was only allowed to make integer offers. Bargainer 2 could reject or accept. In case of rejection, bargainer 2 had the chance to make a counteroffer. Subsequently, player 1 (player 2) could continue to make alternating offers in odd-numbered (even-numbered) periods. Any further proposal beyond period two induced a shrinking pie of 10 ECU per period. (The pie had in the third period the size of 249 ECU, etc.). Thus, the two players had both the ability for one costless proposal. Any further proposals reduced the pie size by 10 ECU (see also Appendix A). In all but the first period, bargaining parties had the choice between four options: i) to accept the division of the other party, ii) to make an own offer, iii) to ask the other party for another proposal in the next period (which actually never happened) and iv) to break off the negotiations. The experiment was designed as an ‘optional break-down game’ where both parties received a zero payment when one party chose to end the negotiations. When both parties agreed on a division of the pie, they were paid according to this division. If no offer had been accepted until period 28, both parties received no payoff.

In the second treatment bargaining parties had the option to ask for arbitration at any time (CCA treatment). Arbitrators could fashion compulsory awards based on their own choice, e.g. on the bargaining history or on any external judgment (e.g. a fair division). The bargaining design was the same as in the BR treatment. It changed only with respect to choice iv): the parties had the option to ask for conventional arbitration if the negotiations ended in disagreement. The bargaining cost per period (from period 3) were fixed – as in the BR treatment - at 10 ECU per period. Going to the arbitrator also costed 10 ECU. The third treatment was designed as final-offer arbitration (FOA treatment), again with compulsory awards. When negotiations ended in dispute (choice iv) bargaining parties had again the option to ask for arbitration. However, arbitrators chose now one of both parties’ final offer as settlement. Bargaining cost per round and arbitration cost were fixed again at 10 ECU.

3.2 Procedures

ORGANIZATION: In the entire experiment 300 undergraduate students from all faculties of the University participated in the three treatments as bargainers and 20 graduate students as arbitrators. Bargaining participants were recruited by verbal and written announcements. Their participation required appearance at a prearranged place and time, and was restricted to one session. Upon arrival, participants were randomly assigned to their roles as bargainer 1 or 2. 100 students were assigned to each treatment where two participants had to bargain with each other. Throughout the sessions participants were placed in two separate classrooms. All experiments were conducted once, after the participants had received written and verbal instructions about the setting, their four possible choices in every period and about the

arbitration modus (see Appendix B). All participants were anonymously and randomly matched. Each participant had practiced one test-run where they played a complete game.¹⁶

PROCEDURE: The negotiations were played sequentially. Together with the instructions bargainer 1 received in period 1 the bargaining record shown in Appendix A. Having made a proposal, the sheet was transferred to the assigned bargainer 2. He was expected to make one of the four choices mentioned above. The sheet was taken back and forth until an agreement or a disagreement (and in the arbitration treatments a compulsory award if requested) was settled. Participants were immediately informed about their payoffs. Throughout the sessions nobody was informed about the identity of his partner. Participants received their payoffs from a third party not involved in the experiment. Participants were required to reveal their password to the third party in order to get paid. These features ensured the one-shot nature of the experiments. Sessions lasted between 45 minutes and one hour. The average payoff was more than 5 Euro which covered the opportunity cost of participation.

INFORMATION: Bargainers had complete information about the size of the pie, the bargaining cost and the arbitration mechanism, thus, the game was designed to be one of common knowledge about the "objective" payoffs.¹⁷ Moreover, they knew that the bargaining record (if their negotiations ended in dispute) would be anonymously passed to the appointed arbitrator. Participants were informed about the rules of conventional and final offer arbitration.

ARBITRATORS: For each arbitration treatment 10 arbitrators were independently recruited from the graduate programs of the same university. Before they received the first dispute protocol for arbitration, arbitrators were verbally instructed about their role in the negotiation process. They were informed about the procedures (as described above), and they were informed that they will receive anonymous bargaining records when negotiations end in dispute. Without being able to communicate with the bargaining parties they were then required to settle their own award in case of CCA or to choose one of the two final offers of the parties in case of FOA. Besides the bargaining protocol and the size of the pie no information was given to them. Arbitrators were paid about 2.5 Euro as a show-up fee regardless whether they had to make a decision and regardless of their decision. Seven arbitrators in the CCA treatment who had to stay longer for making a second award, received another 2.5 Euro to be compensated for their further effort.

¹⁶ The experiments were not repeated because this paper was not focused on learning curves. In order to make the participants sufficiently familiar with the experimental design, the test-run was introduced.

¹⁷ At the same time it should be emphasized that players had – of course – incomplete information about the preferences of their bargaining partners.

The aim of this fee structure was to cover the ‘expenses’ for the time the arbitrators had to spend for doing ‘their job’.¹⁸ Arbitrators were asked to make careful decisions. On purpose, arbitrators were given no incentives which would have induced connection between their decision and their payment. Accordingly, they were also informed that their decision does not affect the likelihood of their being chosen to do another arbitration. Ten arbitrators had to do one decision, three arbitrators had to make no decision and seven had to do two decisions. When a dispute occurred, arbitrators were randomly selected by a neutral third party. The seven arbitrators who were randomly selected for second decisions were chosen irrespective of their previous award.

An arbitration design like this resembles to the economic reality in many European countries (and in particular in the Weimar Republic where arbitrators were chosen by a third party not involved into the bargaining process). In addition, arbitrators in European Countries usually have no special training. Mostly they are receiving fixed payments irrespective of their award (either their salary when they are bureaucrats from a ministry or their pension when they are elder politicians beyond their active role in politics). In many cases, the pie of the bargaining parties is not reduced by the payment to the arbitrator. Bargainers¹⁹ perceive then arbitrators as a choice which only costs additional time but not additional money which is why we kept the reduction of the pie constantly at 10 ECU.²⁰

3.3 Hypotheses

Before we will present some hypotheses with respect to the three treatments, it has to be emphasized that with respect to the bargainers’ and experimenter’s expectations about the arbitrator’s judgement this study is indeed exploratory. Since Farber and Bazerman [1986] we know that there is “real uncertainty in the arbitration process” so that we may expect that the judgement of the arbitrator depends on the type of the person.

¹⁸ From the point of view of keeping the cost low, it would have made sense to have only one or two arbitrators for the complete experiment. Then it would have been sufficient to pay 10 ECU per award without any show-up fee. However, since we were interested into the variety of possible awards, we decided to have about one arbitrator per award.

¹⁹ Bargainers were only informed about the award cost of 10 ECU (see description about the design in sect. 3.1).

²⁰ In this context, another critical point needs to be discussed. In the beginning of experimental economics, it was a “*conditio sine qua non*” that all experimental payoffs of participants (i.e. in the present experiment also the payoff of the arbitrator) should depend on their choices. In the present experiment (as much as in reality) the payoff to the arbitrator was a fixed amount. Meanwhile, there are several further experiments without strategy dependent payments (see e.g. Charness and Rabin [2002] or Falk and Ichino [2003]) and some studies who analyzed the validity of experiments where some players received certain payoffs irrespective of their strategy (see e.g. Camerer and Hogarth [1999], or Leuven and Oosterbeek [2003]). It was concluded that the strategy dependent payoffs matter only if the experiment is rather ‘boring’ and if it is repeated several times. This kind of description of experimental settings had nothing in common with the present experiment. Rather to the contrary, we observed the arbitrators to feel intrigued by the experimental setting. Most arbitrators were making e.g. calculations to find appropriate awards.

For the BR treatment, although rejected in several experiments, the game theoretic outcome is used as hypothesis. The subgame-perfect equilibrium would be that bargainer 1 in his opening offer suggests an equal split and that bargainer 2 accepts that split.

Hypotheses for the two arbitration schemes are more difficult to be derived since there is no normative model and since the decisions of the arbitrators depend on their personal attitudes. Accordingly, in this paper we are only able to offer hypotheses for different types of arbitrators. Basically, we can distinguish between two extreme kind of attitudes. Arbitrators may either consider the bargaining behavior of the two parties and try to mediate between the individual bargaining situation of the two parties which might but must not lead to a split-the-difference award. If turned abside down, this means that negotiators are able to influence the arbitrator with their kind of bargaining. If, in contrast to this, arbitrators have their own fair or appropriate award criteria, whatever fair or appropriate means, they may decide according to their own considerations independently of the two parties' bargaining behavior.²¹

These two potential attitudes unfold very differing incentives for the bargaining behavior under the two arbitration schemes. Starting with CCA, if we use the chilling effect as benchmarking hypothesis, the effect on which the earlier critics of Stevens [1966] and Borchardt [1990] are based, arbitrators would make awards dependent on the impasse offers of the two bargaining parties. If bargaining parties expect such awards they will claim infinite amounts or at least the complete pie for themselves. Parties, further, would make no concessions and would ask for arbitration after one bargaining period. This would lead to a 100% dispute rate. The presumed award would be the equal split of the pie.

If we assume that the arbitrator decides only according to his own fairness standard and if we further assume that in the present experiment the fairness standard is the equal split, then again we should expect the equal split to be the outcome of the game. However, in contrast to the chilling effect, now also the bargaining parties – if they anticipate the arbitrator to decide according to his own fairness standard - will be expected to find an agreement without arbitration. If, nevertheless, their negotiations end in disagreement e.g. because further rounds of bargaining are too costly for them, they may expect the equal split to be awarded.

Assuming under FOA that the arbitrator decides according to his own fairness standard and that the award would be the final offer that is closer to the equal split if none of the final offers is the equal split, bargaining parties would then – given that they expect such awards - agree on the equal split without arbitration in order to avoid an award favoring the other player.

²¹ There exist, of course, more than these two attitudes. Arbitrators might have other unexpected fairness standards and they are also able to 'punish' bargainers for inappropriate bargaining behavior. However, for reasons of tractability we will restrict the suggested hypotheses to these 'most obvious' behavioral norms.

FOA does not allow any split the difference awards. The chilling effect is foreclosed by the design. The number of potential patterns is reduced by this award system.²²

The comparison of these hypotheses also makes clear under which conditions FOA and CCA may lead to similar outcomes, namely if the arbitrator determines his own fairness standard and feels committed to this standard before being asked for arbitration. In this case, he will choose always the same award irrespective of the arbitration mechanism chosen - or (under FOA) will choose the final offer being closer to his standard (for similar reasoning, cf. Crawford [1979]). The problem of committing to such a standard and to exclude the possibility of making split-the-difference or any other middle ground awards should not be discussed any further here.

Before we come to the results section, it is, however, important to note the sharp contrast between the two arbitration schemes. At first glimpse, it seems as if it makes no difference which arbitration scheme is chosen, since they all may lead to the equal split, at least if the expectations of the bargainers and their behavior coincides. However, the set of solution standards which the arbitrator is able to apply in his decision making is reduced under FOA in comparison to CCA. Under FOA, the arbitrator is only able to realize his own fair or appropriate standard as award. Under CCA, the arbitrator can do both, apply his own standard but also consider the individual bargaining history of the two parties which might differ from case to case. His additional discretion can be seen as opportunity (in the sense of adjusting the award to the individual claims) or as a source of misuse (in the sense of the chilling effect).²³ Thus, the two arbitration mechanisms have different incentives for the two bargaining parties to reveal their preferences and will therefore influence the kind and number of deliberate agreements between the bargaining parties.

It also becomes clear that the above derived hypotheses for the CCA treatment depend on consistent expectations of the bargaining parties about the arbitrator's behavior. Moreover, inconsistency in the expectations does not matter, as long as the expectations of both bargaining parties are such they expect the arbitrator to make an award according to his own fairness standard. Even in this case, the bargainers will (with high probability) deliberately agree on a split close to the expected award of the arbitrator, here the equal split. The

²² It is nevertheless important to make clear what would happen if an arbitrator is confronted under FOA with two diverging final offers of, say, party A demanding 70% and party B demanding 60% of the pie. The arbitrator has then the choice between two unequal outcomes (70% to 30%) or (40% to 60%) but is neither able to make an award which is adjusted to the final offers meaning in this case an award of about 54% to 46% nor to propose an equal split.

²³ It should be emphasized that the outcomes under the two arbitration schemes might be completely different if the assumption about a fair award does not hold. If for instance there is biased judgement about a fair outcome (because there is no equal split or because the equal split is seen for whatever reasons as an unfair outcome) the expected outcome is different (and difficult to be determined). For a discussion around the problems of finding a fair award when there is biased judgement between the two bargaining parties, see Babcock et al. [1995].

arbitrator will not be called into action, even if he would have announced an award different of the expectations of the bargainers. This reveals that the arbitrator's attitude matters only if at least one bargainer expects to be able to influence the arbitrator in his decision making by a certain bargaining behavior.

4. Results

This section starts with the presentation of dispute rates in the different treatments. Following, we will discuss typical patterns of bargaining behavior, explaining the dispute rates and other results of each treatment. As already noted, the BR treatment serves the purpose of being a baseline for comparison with the arbitration treatments and may provide insights into how different designs of arbitration may influence the bargaining behavior.

Ahead of the presentation of the results which is supported by several tables and figures, it has to be emphasized that in the second and fourth column of table 2 as well as in Figures 1a, b and 2 the final claims are displayed as if the pie has always the hypothetical size of 259 ECU, i.e. it is not shrinking.²⁴ This is done in order to enable a comparison of all final claims. Moreover, it should be clarified that we define an equal split as an agreement where the difference between the outcomes of the two parties is less than 4 ECU. A completely equal split was not possible due to the design of the experiment.

4.1 Dispute Rates

Table 1 displays the dispute rates for each treatment. In the BR treatment 8% of the negotiations ended in disagreement – players received no payment at all. As expected from previous studies the dispute rates were increased by the introduction of conventional arbitration from 8% in the BR treatment to 34% in the CCA treatment.²⁵ (Fisher's test show these differences to be significant, with $p=0.001$, see Siegel and Castellan [1988]).²⁶

- insert Table 1 about here -

In contrast to this the FOA treatment shows that the final offer arbitration - where 14% of the negotiations ended in disagreement - does not significantly increase the dispute rates if

²⁴ Thus, when e.g. the bargaining parties negotiated for four periods the pie as calculated in Table 2 had still the size of 259 ECU instead of 239 ECU. An offer of bargaining party 1 in period 4 of 200 ECU for itself and of 39 ECU for party 2 (thus, with a pie size of 239 ECU) was transferred into a claim of 210 ECU for bargaining party 1 and an offer of 49 ECU for party 2.

²⁵ This compares to 11.2% in the Ashenfelter et al. [1992] treatment with no arbitration and 33.8% under a similar CCA. Moreover, these results show a certain consistency with the field experience: Ashenfelter and Bloom [1984] found that about every third wage-negotiation is solved by arbitration.

²⁶ Besides, the cost of arbitration might also have an influence on the rate of disagreement, see Bloom [1981]. However, this factor was not varied in the present study.

compared to the BR treatment (Fisher's test shows $p=0.26$) while a comparison of the FOA with the CCA treatment shows a significant decrease in disputes ($p=0.017$).

Result 1: Under BR 8% of the negotiations end in dispute with a zero payoff. Under conventional arbitration, dispute rates are significantly increased. Under FOA dispute rates are nearly as low as under BR.

Thus, arbitration is apt to prevent losses of the pie. However, dispute rates between the two arbitration treatments differ which is in contrast to the results of Ashenfelter et al. [1992] and Dickinson [2004]. It seems, as if CCA indeed increases dispute rates and as if FOA eliminates this effect. In order to understand the reasons for the differing outcomes in the treatments we will analyse further details of the bargaining process.

4.2 Disagreements and Awards

The question which party asked for arbitration allows to gather first insights into the expectations of the bargaining parties. To differentiate the bargainers, the party whose first claim in periods 1 and 2 was above the median claim will be called 'the far bargainer', the party whose first claim was lower than the median claim will be called 'the close bargainer'. The cut-off values for median claims were 165 ECU in the BR treatment, 190 ECU in the CCA treatment and 170 ECU in the FOA treatment.

In the CCA treatment there were 18 matches of a far with a close bargainer and 16 matches of a far with a far and 16 matches of close with a close bargainer. Furthermore, under the CCA treatment 17 negotiations ended in dispute. In 12 of the dispute cases a far was matched with a close bargainer. Thus, $2/3$ of all far/close matches ended in dispute. More often, far (in 9 cases) than close bargainers (in 3 cases) called for arbitration ($p=0.073$, one-tailed binomial test).²⁷ In 11 cases the arbitrators suggested an unequal split (Figure 1a), similar to difference-splitting and, thus, in favor of the far bargainer. There was one award that allocated the equal split to both bargainers (where the far bargainer had asked for arbitration). Far bargainers when matched with close bargainers were mostly awarded with a 'split the difference' decision and, hence, with more than 50% of the pie.²⁸ Figure 1b shows that in the other 5 cases two far bargainers were matched, about $1/3$ of all far/far matches. Moreover, in the 5 cases the bargainers made offers which were similarly far away from the equal split.²⁹ The arbitrator awarded the equal split. If two close bargainers were matched, a solution was always found without arbitration.

²⁷ This is in contrast to Bolton and Katok [1998] where mostly the close bargainer induced arbitration.

²⁸ The average award allocated to the 11 far bargainers was 151 ECU (minus the negotiation cost per period).

²⁹ These 5 cases also differ from the mentioned 12 negotiations as they took more than four bargaining periods.

- insert Table 2 and Figures 1a, b and 2 about here -

In the FOA treatment 7 disputes were observed, all matchings of far with close bargainer (see Figure 2). Here, in 5 cases it was the close and in 2 cases it was the far bargainer who asked for an external award.³⁰ In two cases the arbitrator had the choice between an equal and an unequal split (the two final offers) and preferred the equal split. In five cases the arbitrator had to choose between two unequal splits. In all five cases the less unequal split (which was always the final offer of the close bargainer) was awarded, thus in favor of the close bargainer.

Result 2: (1) Under CCA, far bargainers more often than close bargainers ask for arbitration. Awards correspond to the split the difference notion and are in favor of the far bargainer, if he is matched with a close bargainer. When two far bargainers are matched the award resembles to the equal split. (2) Under FOA, close bargainers ask more often for an award. Arbitrators always prefer the less unequal split, i.e. they decide in favor of the close bargainer.

At this stage it is also interesting to compare the dispute rates in this experiment with those of Charness [2000]. Since there is no information about first claims and about the dynamics of negotiations in the experiment of Charness [2000] we do not know whether bargainers who are labeled here as far (close) bargainers are similar to the low (high) bargainers in Charness [2000]. Nevertheless, it is apparent that similar to the present results in the treatments of Charness dispute rates were also always highest when cross types were matched.

4.3 Opening Offers

In order to reveal the path leading to the diverging dispute rates, it is necessary to analyze opening and final offers. Starting with the opening offer, Table 1 compares the average first claims in all treatments. The average first claim in the BR treatment was around 180 ECU. As Table 3 further shows, in about 80% of the cases it was far from the subgame-perfect opening offer.³¹ Bargaining parties were testing their partner's willingness of rejecting unequal splits. This strategy was successful not only in the sense that in this treatment 6 bargainers realized a kind of first mover advantage where their bargaining partner did agree to the unequal split, but also in the sense that bargainers, when confronted with a counter-offer, tried to find out the type they were matched with. This kind of bargaining strategy corresponds to the

³⁰ A Fisher test reveals that the differences between FOA and CCA is significant with respect to the question of who called for arbitration ($p < 0.05$).

³¹ Similar results are found in many other experiments, see e.g. Ochs and Roth [1989], Bolton [1991] and in the overview of Roth [1995] where it is also emphasized that the subgame-perfect outcome is a poor point predictor. The reason for the particularly low share of subgame-perfect offers in the present experiment might be that the negotiation cost per period were (with 10 ECU) relatively low.

approach of Kennan and Wilson [1993] where the level of the opening demand is one way of exchanging signals between the bargaining parties.

- insert Table 3 about here -

As Table 1 further shows, the average opening offer significantly increased to 192 ECU in the CCA treatment compared to the BR treatment. (The Kolmogorov-Smirnov test reveals $D=0.268$ leading to $\chi^2 = 7.18$, for $df=2$ is $p=0.03$). In contrast to this, the average first claim in the FOA treatment was almost the same as in the BR treatment.

By comparing the average first claim ending in dispute with the average first claim leading to an agreement (without having sorted into far or close bargainer) it is possible to further reveal the influence of the arbitration design on bargaining behavior (Table 2). The average first claim in the CCA treatment leading in later periods to disagreement – the ‘disagreement claim’ - was with 224 ECU as high as in the BR treatment (220 ECU). The same holds for observations leading to an agreement: the average first claim – the ‘agreement claim’ - was 176 ECU in the CCA and in the BR treatment. Differences between first claims leading to an agreement and those leading to a dispute are highly significant under CCA. (The Mann Whitney U test shows for CCA $U=304$, $p<0.0003$).

There is another striking observation. The chilling effect - as also hypothesized in section 3.3. - expects negotiators under CCA that they may demand infinitely high claims or at least the complete pie (and that they would not make any further concessions) in order to influence the arbitrator in their direction. In the CCA treatment there was only one participant who demanded the whole pie of 259 ECU for himself.³²

We observed that more persons were posing the ‘disagreement claim’ under CCA but that the disagreement claim was not higher under CCA than under BR.³³ Thus, this experiment indicates an absence of the chilling effect, as it was originally defined. The observed *higher number* of disagreement claims could be labelled as “modified chilling effect”.

Considering the FOA treatment, Table 3 reveals differences in the distributional structure of first claims between the FOA and the BR treatment. While in the BR treatment the first claims are divided into two segments - about 50% of the participants claimed for themselves amounts between 130 and 165 ECU and about 40% amounts between 200 and 250 ECU, in the FOA treatment almost 80% of the participants posed first claims less than 200 ECU.³⁴

³² Having asked for arbitration, this bargainer was awarded with slightly less than half the pie (see Figure 1a).

³³ Concession during the subsequent bargaining periods were - as we will show in the next subsection - also the same under BR and CCA.

³⁴ The first demands were clustered into three groups (group 1 contained claims between 100 and 140 ECU, group 2 between 140 and 200 ECU and group 3 between 200 and 250 ECU). A χ^2 -test comparing the subgroups of the BR treatment with the FOA treatment reveals that the hypothesis that the share of first claims was for the

Thus, first claims in the FOA treatment were (with almost 180 ECU) on average the same regardless whether negotiations were concluded by arbitration or by agreement. A considerable number of players were perhaps afraid of provoking an early break-off of the negotiations so that only about 20% of the first claims were higher than 200 ECU.

Result 3: (1) The first claims in the CCA treatment and in the BR treatment show the same spread where participants in negotiations ending in disagreement systematically pose higher claims than in negotiations ending in agreement. There are more participants in the first period of the CCA treatment than in the BR treatment demanding the ‘disagreement claim’. (2) The first claims in the FOA treatment are on average not higher than in the BR treatment but are different in their distribution structure. In negotiations ending in disagreement, the first claims were not higher than in negotiations ending in agreement.

The present experiment, thus, reveals that the chilling effect in negotiations is not necessarily caused by the arbitration system. It is rather that there are different types of bargainers who decide to chill the negotiations by increasing first claims even if they do not have the safety net of arbitration. CCA then increases the number of chilled first offers, but these first offers are not higher than under BR while FOA rather decreases the number of chilled first offers.

4.4 Final Offers and Concessions

Table 2 displays the average final claims (the claim is displayed as if the pie does not shrink). Again, results are disaggregated with respect to the fact whether negotiations ended in agreement or disagreement. In case of an agreement, Table 2 shows the average amount which the far bargainer received in case of an unequal split. In case of a dispute it shows the average impasse offer of the far bargainer and his average payoff in case of an unequal award.

The first result is that in the BR treatment only 38% of all negotiations resulted in an equal split. Thus, more than half of all negotiations were concluded with an unequal split. The average payoff of the 27 far bargainers was 152 ECU (using the full size of the pie), or 58.9%.³⁵ No far bargainer received less than 50%. It has to be emphasized that making a far offer mostly did not pay off. Due to the shrinking pie there were only few far bargainers who were able to realize a higher amount of money (in absolute terms) than if they had proposed the equal split at the first round of bargaining and if the other bargainer had agreed on it.

BR and the FOA treatment the same in the three subgroups can be rejected at $p < 0.05$; $\chi^2 = 6.9$, $df=2$.

³⁵ Similar low shares of equal splits were found in a five period Rubinstein game by Neelin et al. [1988] and in the unstructured time limited bargaining game by Ashenfelter et al. [1992]. Interestingly, there are also similar shares of equal splits in the Ultimatum Game, cf. inter alia Forsythe et al. [1994] and Güth [1995]. This might indicate that bargainer types who bargain according to their subjective preferences might have a stronger impact on the outcome than the incentive structure of a certain bargaining game.

In contrast to this, in the arbitration treatments most negotiations resulted in an equal split if the parties succeeded to find an agreement. This result is supported by column 4 which shows the number of equal splits, namely 27 of 33 (82%) in the CCA and 39 of 43 (90%) in the FOA treatment (shares are related to the negotiations ending in an agreement). The payoff of the far bargainer was significantly lower in both arbitration treatments than in BR ($p < 0.001$).

The differing impact of the two arbitration methods, however, becomes particularly clear when we relate the shares of equal splits to the total observations in each treatment. In the conventional arbitration treatment, more participants (54%) accepted an equal split (which is already significantly higher than in the BR treatment, $p = 0.04$). Further, the share of equal splits climbs to 78% in the FOA treatment, significantly more than in any other treatment (the Fisher test reveals $p = 0.01$ when comparing the FOA with the CCA treatment).

Another striking difference appears when we analyze the willingness to make concessions during the bargaining process. By comparing the average first and final offers (see columns 1, 2, and 4 in Table 2) and by taking into account the average number of bargaining periods, it appears that in the BR and CCA treatment participants were ready to make similar concessions of about 10 ECU per bargaining period to their bargaining partners as the number of periods increased. This observation holds for both treatments irrespective whether the bargainers opened negotiations with an ‘agreement’ or a ‘disagreement claim’. The same behavior was observed in the FOA treatment when the negotiators made an agreement. In those cases ending in dispute under FOA, far bargainers made almost no concessions.

Result 4: (1) Compared to the BR treatment, in the FOA treatment more than in the CCA treatment the *existence* of an arbitrator induces far bargainers to voluntarily agree on an equal split when they are matched with a close bargainer. (2) In the BR and in the CCA treatment bargainers make similar concessions. In contrast to this in the FOA treatment, if negotiations end in dispute, far bargainers tend to make fewer concessions during the negotiations.

4.5 Bargaining Periods and Payoffs

Finally, we analyzed whether the arbitration design has an impact on the number of bargaining periods. The chilling effect under CCA in its extreme form would suggest that bargainers would ask for arbitration immediately after the first proposal. Table 2 shows for all treatments the average number of bargaining periods in case of a settlement and in case of a dispute.

- insert Table 4 about here -

First of all, it becomes apparent that in *all* treatments the average number of bargaining periods was shorter when the parties came to an agreement. Thus, even in the arbitration

treatments the participants did some additional efforts to come to an agreement without arbitration. The comparison of the FOA with the CCA treatment (Table 4) shows that participants were even more patient or cautious under the FOA treatment and preferred another period of bargaining before they submitted to the arbitrator.³⁶

Result 5: Negotiations ending in dispute were proceeded over a higher number of bargaining periods, irrespective whether arbitration was available.

With respect to cost savings, arbitration may reduce the cost of bargaining in two ways: by reducing the number of bargaining periods and by excluding zero payoffs to both bargainers after a disagreement.³⁷ In the present experiment, bargainers did not realize any cost savings due to a smaller number of bargaining periods. Cost savings were only incurred by asking for arbitration in case of a dispute (see result 1).

5. The Impact of Compulsory Arbitration

Based on the regularities of bargaining behavior which can be found in the three treatments, this section will discuss the impact of the different arbitration schemes on the bargaining process. We also aim to compare bargaining patterns under both arbitration schemes with the typical bargaining behavior in the BR treatment.

Similar to previous studies, we could reject the first hypothesis (provided in section 3.3.) that bargaining parties always agree on the equal split (the subgame perfect outcome) after one round of bargaining. Moreover, as was found already in several earlier studies, the observations in the BR treatment make it reasonable to assert that bargainers have heterogenous preferences being not only related to the subgame perfect outcome.³⁸ In the present study, we roughly categorized the parties into two types according to the distribution of opening offers in the BR treatment: close and far bargainers with a cut-off value such that they are equally distributed. Due to the random matching we may further assume that same type and cross type matchings appeared both in about 50% of all cases.

The outcomes in the last section showed (see also Table 5) that it is possible to capture the regularities in the BR treatment as follows: All matches of close with close bargainer and most of the matches of far with far bargainer lead to an equal split. Three cases of a far-far

³⁶ A statistical comparison showed that in the BR and the CCA treatment parties negotiated over a similar number of bargaining periods (see Table 4). In contrast to this result, comparison of the CCA and the FOA treatment showed a lower number of bargaining periods in CCA ($p=0.067$).

³⁷ See Currie and McConnell [1991] who showed similar results for field data.

³⁸ Earlier research found that there is not only an equilibrium-dependent but also a type-dependent bargaining behavior. See Malouf and Roth [1981], Ochs and Roth [1989] and, more recently, Charness [2000] who distinguished between bargainer types in a similar way as in the present paper.

matching ended in a break down. When far bargainers were matched with close bargainers, all but one close bargainer were willing to accept an unequal split of the pie.

	Far-Far matching	Far-Close Matching	Close-Close Matching
BR	Equal splits if no dispute 3 Disputes	Unequal split in favor of far bargainer if no dispute 1 Dispute	Equal splits No Disputes
CCA	Equal splits if no dispute 5 Disputes. Award: Equal Split	Equal splits if no dispute 12 Disputes: Awards: 11 Splits in favor of far bargainer (split the difference), 1 equal split	Equal splits No Disputes
FOA	Equal Splits No disputes	Equal splits if no dispute Awards: 5 Splits in favor of close bargainer, (no equal split available), 2 equal splits	Equal Splits No disputes

Table 5: Overview over the results of the three treatments

In the CCA-treatment, the chilling effect as hypothesized in section 3.3. was not observed. There was only one bargainer asking for the complete pie in the first round and all bargainers were negotiating for about the same number of periods, were making similar opening offers and similar concessions per round as in the BR treatment. The only difference to be observed was that a higher number of bargainers made a ‘disagreement claim’ (see Table 3) instead of an ‘agreement claim’. We, thus, reject the existence of a chilling effect (as hypothesized in 3.3.) and we may call this differing behavior a ‘modified chilling effect’.

With respect to the matchings (Figure 5) we found that negotiations of the same types resulted again in an equal split. The CCA treatment changed the outcomes of far-far matchings insofar, as negotiations which might have ended in dispute without arbitration are settled now by an equal split award. The most obvious and significant differences between the CCA treatment and the BR treatment are in cross-type matchings. In the BR treatment, all these negotiations ended in an unequal split. Under CCA an unequal split was only observed when arbitrators were asked for an award. Those half of the far-close matchings where the negotiations resulted in an agreement, the pie was splitted almost equally between the two parties.

This behavior may allow to make first assertions about the expectations of the bargainers. It seems as if some far bargainers were not sufficiently sure whether they can expect a split-the-

difference solution as award. These far bargainers preferred an equal or a less unequal settlement with a close bargainer to the dispute resolution by the third party.

It also seems as if close bargainers now were not willing to deliberately agree on the kind of unequal splits in the CCA treatment, as close bargainers did in the BR treatment when they were matched with a far bargainer. Those far bargainers who asked then for arbitration in the CCA treatment (most negotiations in the CCA treatment were called off by the far bargainer) may have expected that arbitrators will decide in their favor. Indeed, they were awarded with the kind of solution they might have been expecting.³⁹

Turning to the final offer arbitration, all hypotheses posed in section 3.3. with respect to FOA were met to a much higher extent than in the other two treatments: i) Bargainers mostly found solutions without a dispute. ii) They agreed on an equal splitting of the pie during the negotiations. iii) Arbitrators, if called into action, chose the impasse offer as award which was closer to the equal split, irrespective whether this impasse offer was made by the close or the far bargainer.

Again, when the same types were matched, the equal split resulted. Differences to the CCA treatment exist insofar as in far-far matchings no award had to be made by the arbitrator - even these bargaining parties were always able to find an agreement without dispute resolution. With respect to the cross-matchings, it is remarkable that more bargaining parties were agreeing to an equal split than in any other treatment. The incentives set by this arbitration mechanism seem to be so strong that heterogenous preferences are not expressed anymore (see also Footnote 35). As Table 3 revealed all bargainers were more cautious from the first round of the negotiations and posed much lower opening claims and made almost always concessions leading to the equal split. We will label this as 'destiny effect'.

Finally, with respect to the 7 cases of arbitration which all appeared in cross-matchings, under FOA (in contrast to CCA) it was mostly the close bargainer who was asking for an external award indicating that under FOA the close bargainer expected to be favored by the arbitrator. This expectation received support as the arbitrator always chose the final offer which was closer to equal split and which was always posed by the close bargainer.

6. Conclusion and Discussion

The present experiment gives incidence that the bargaining outcome in a Rubinstein Game depends on the design of the arbitration mechanism. Asking the hypothetical question of

³⁹ Of course it is not yet clear, whether arbitrators would have announced the same kind of split-the-difference solution if the far bargainers had behaved as suggested by the chilling effect, i.e. asking for the full amount of the pie and making no concessions.

which arbitration design should be installed, the choice depends on the purpose of the institution to decide. If the aim is to guarantee completely non-intervened negotiations, no arbitration should be introduced. Free negotiations implicate that parties have to make signals in order to give credible information about their preferences even if that costly process is charged as inefficient from an ex post perspective, even if there are many bargaining outcomes far from the equal split and even if bargainers may choose to break off negotiations with zero payoffs.⁴⁰ This means to accept the existence of types of bargainers who have heterogenous preferences leading to seemingly unfair outcomes in a bargaining environment.

If the purpose is to keep the impact on bargaining behavior at a minimum and to achieve results similar to the no-arbitration treatment in the sense that bargaining types reveal their differing preferences, conventional arbitration may be favored. This kind of safety net can be knit only at the cost of a modified chilling effect. To ensure an even tighter safety net, not only excluding disputes but also inducing agreements according to an accepted convention, the number of available awards should be restricted to the two final offers. The consequence is that there will be a destiny effect: Splits beyond the convention will almost be excluded.

The crucial difference between the three treatments can always be observed in the cross-matchings. While matchings of the same types usually lead to the equal split (arbitration is only sometimes needed to realize the equal split if two far bargainers were matched), matching between different types lead to strongly differing outcomes in the three treatments. In the BR treatment most far bargainers realized an unequal splitting of the pie in their favor. In the CCA treatment, they were able to realize an unequal split in their favor if they asked for arbitration. In the FOA treatment, there were almost no unequal splits and if there was one, it was in favor of the close bargainer. (This is an implication which was also found to a certain extent by Deck and Farmer [2003] although their approach completely differed from the present one since they had a different information setting).

It should be emphasized that this clear result was deduced from a simple bargaining situation where negotiations had welfare consequences for the bargainers but not for third parties. For future research it might be interesting to analyze the impact of the two arbitration designs in more complex situations. Variations are that the bargaining outcome might directly affect third parties (in terms of efficiency), and that the arbitrators in order to be able to decide about the award, will need information that can be influenced by the negotiating parties.

Moreover, the present experiment was designed as one-shot experiment where bargaining parties had no chance to learn about the attitudes and awards of the arbitrators. This outcome

⁴⁰ Chatterjee and Samuelson [1983] showed that bargaining under incomplete information will not happen in a pareto-efficient manner. The approach of Charness [2000] made clear that there are other ways of exchanging information about bargainer types in a less costly manner.

is an important result insofar, as many bargaining situations in reality are happening as one-shot, as well, where the bargaining parties have no chance to adjust their behavior in the future to their learning experience. Nevertheless, there are also numerous situations where bargainers play repeated games. Given that arbitrators tended to favor split-the-difference awards in the CCA treatment and the final offers which were closest to the equal split in the FOA treatment, it is also worth to conduct experiments with repeated bargaining. With respect to the two arbitration treatment it would then be interesting to see whether there would be a tendency towards extreme demands under CCA and to a 100% equal split rate under FOA. With respect to the CCA design it is also important to better understand under what conditions arbitrators will make independent awards and under what conditions they let themselves be influenced by the bargaining behavior of the two parties.

Since bargaining outside of the laboratory takes place in more complex environments, we may ask to what extent our results help understand real-live phenomena. The present approach analyzes an environment where information about pie sizes, individual claims etc. are common knowledge. In this context it is possible to reveal the fundamental interdependencies between subjective preferences and arbitration schemes on the bargaining process. As soon as further variables (as the above suggested variations) are considered, their influence may surface the phenomena observed in the present experiment. Then it would be almost impossible to trace back to the causalities of a certain behavior. Insofar, the present insights are an important benchmark for future research in more realistic environments.⁴¹

⁴¹ Theoretical results showing into this direction were already derived by Armstrong and Hurley [2002] who ‘calculated’ the optimal impasse offers for both types of arbitration.

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treatment	observations	$\bar{\Delta}$ first claim	disputes
BR	50	180 (69%)	4 (8%)
CCA	50	192 (74%)	17 (34%)
FOA	50	178 (69%)	7 (14%)

Table 1: Summary of first claims in ECU and frequencies of disputes.
(For significance of differences see section 4)

treatment	$\bar{\Delta}$ first claim	$\bar{\Delta}$ impasse offer of far bargainer	Number of equal/unequal splits	$\bar{\Delta}$ final payoff of far bargainer if award/split is unequal	bargain periods
BR dispute	220 (85%)	165 (64%)	-----	00	5.67
BR agree	176 (68%)		19/27	152 (59%)	3.44
CCA dispute	224 (86%)	173 (67%)	6/11	151* (58%)	4.29
CCA agree	176 (68%)		27/6	136 (53%)	3.54
FOA dispute	178 (69%)	168 (65%)	(2/5)	118* (46%)	5.00
FOA agree	178 (69%)		39/4	140 (54%)	4.09

Table 2: Average offers and payoffs in ECU, bargaining periods, and divisions of the pie.

*Average payoff of far bargainer if award was according to difference splitting (11 cases)

*Average payoff of far bargainer if award was in favor of close bargainer (5 cases)

Final claims and payoffs are displayed as if the pie was of full size.

First claim	BR	CCA	FOA
-120	1 (2%)	1 (2%)	1 (2%)
121-140	11 (22%)	10 (20%)	7 (14%)
141-165	14 (28%)	4 (8%)	15 (30%)
166-180	2 (4%)	5 (10%)	6 (12%)
181-200	3 (6%)	12 (24%)	11 (22%)
201-220	4 (8%)	3 (6%)	5 (10%)
221-240	11 (22%)	10 (20%)	4 (8%)
241-259	4 (8%)	5 (10%)	1 (2%)

Table 3: Opening claims of bargainer 1 clustered in 8 groups

<u>bargain.</u> <u>periods</u> treatment	1/2	3	4	5	6 and more
BR	13 (26%)	12 (24%)	10 (20%)	8 (16%)	7 (14%)
CCA	4 (8%)	22 (44%)	11 (22%)	7 (14%)	6 (12%)
FOA	8 (16%)	11 (22%)	9 (18%)	11 (22%)	11 (22%)

Table 4: Number of bargaining periods in the BR, CCA and FOA treatment

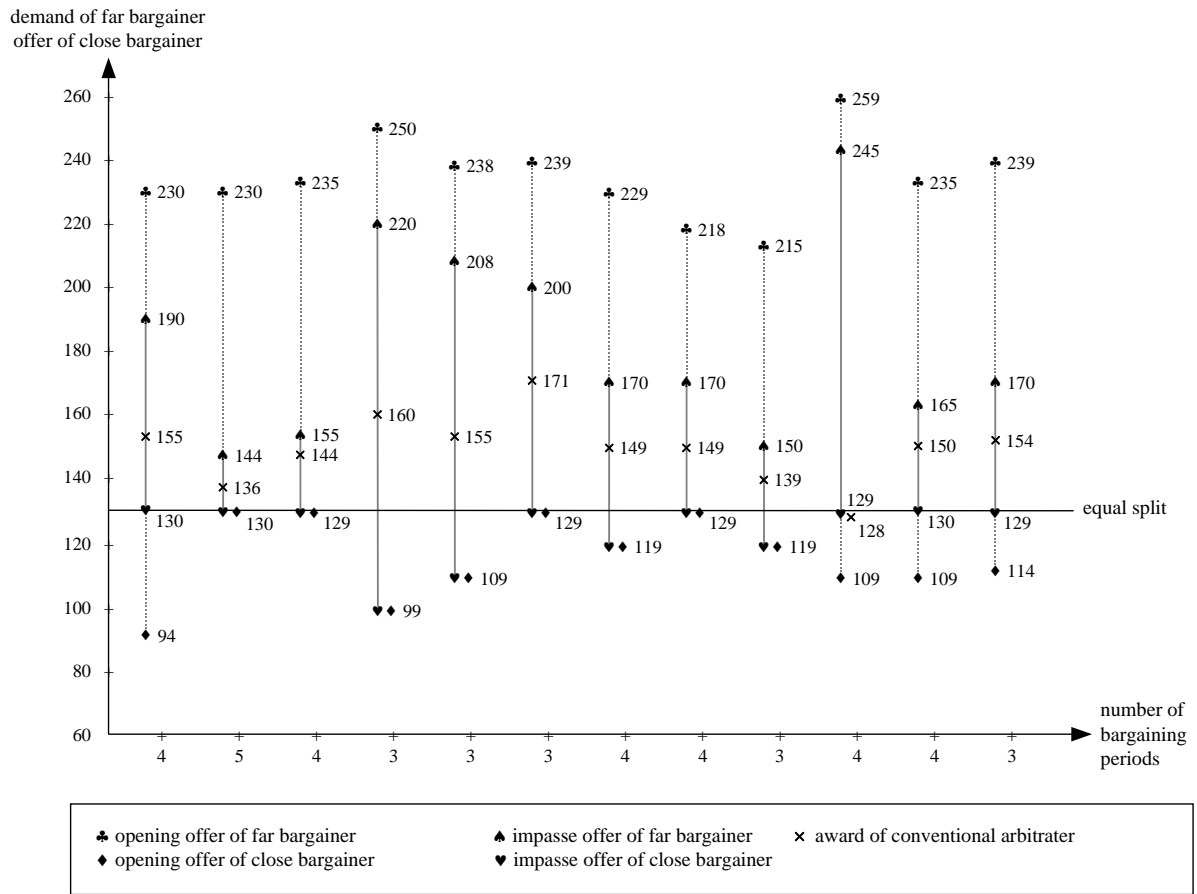


Figure 1a: Opening and impasse offers of the 12 matchings of far with close bargainer in the CCA treatment and awards of the conventional arbitrators.

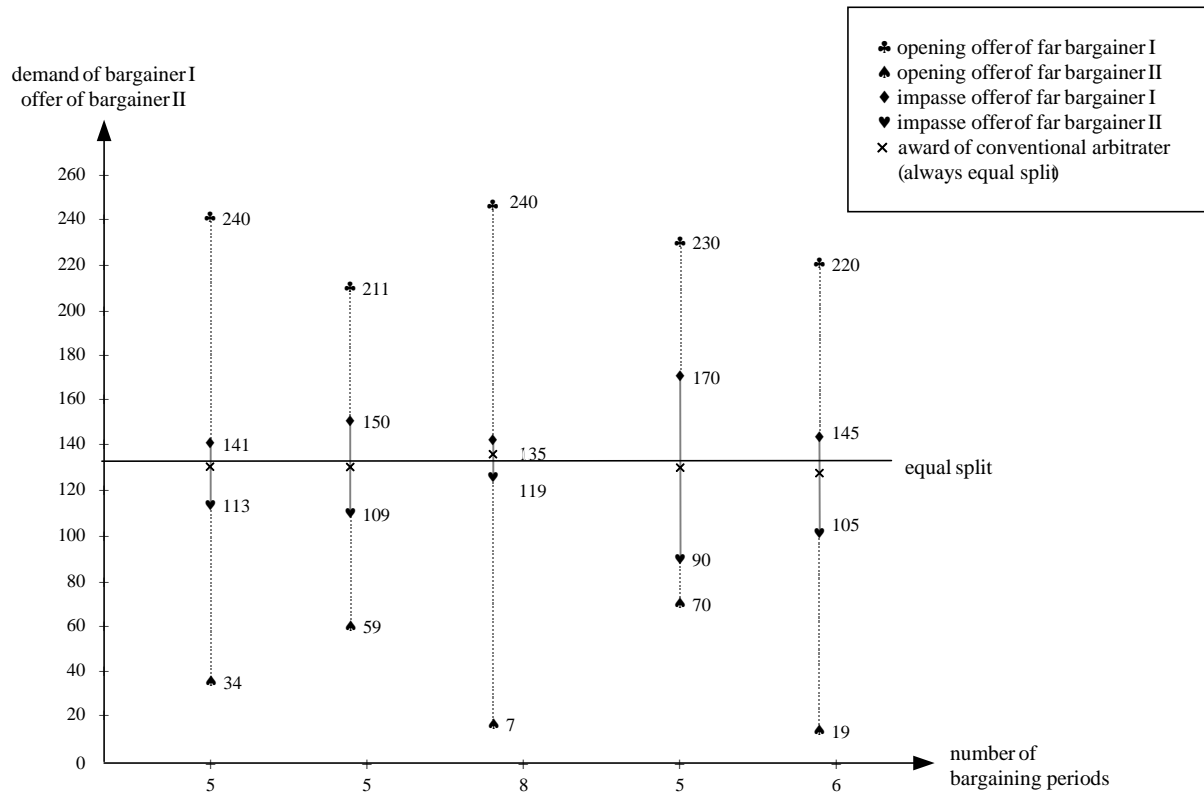


Figure 1b: Opening and impasse offers of the five matchings of far with far bargainer in the CCA treatment and awards of the conventional arbitrators.

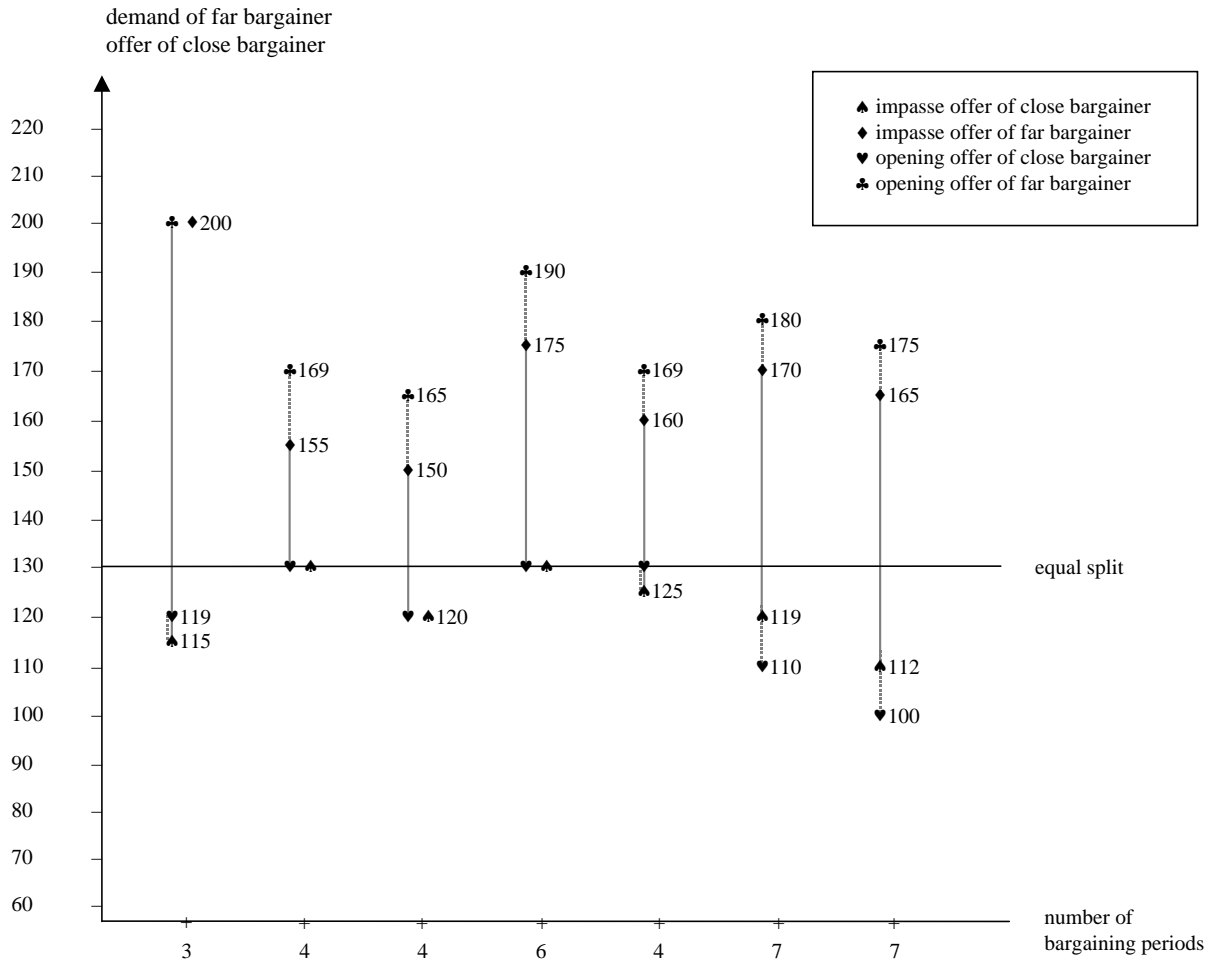


Figure 2: Opening and impasse offers in the FOA treatment. (The award was always the impasse offer of the close bargainer)

Appendix A: Bargaining Record

date: Bargaining record		Game Nr:			Group Nr:
		started at:			
		Finished at:			
I demand for myself:					
offer Nr.	by	Party I	Party II	arbitrator	Actual size of pie
1	I				259
2	II				259
3	I				249
4	II				239
5	I				229
6	II				219
7	I				209
8	II				199
9	I				189
10	II				179
11	I				169
12	II				159
13	I				149

Appendix B: Instructions for Party I:

You take part in a bargaining experiment between two parties, you are party I, the other person is party II. There is a pie with a size of 259 Experimental Currency Units (ECU) and you have to bargain with the other party about the splitting of the pie. Party II will be selected at random from the group of participants in the other room. All pairings are anonymous.

In the first bargaining period you are entitled to make the opening offer where you may suggest how to divide the 259 ECU. Party II can either reject or accept your offer. In case of rejection party II may make a counteroffer. From the third period on you may in odd-numbered and the other party may in even-numbered periods continue to make alternating offers. Any further proposal beyond period two induces a shrinking pie of 10 ECU per period. After period 1, you are free to make a decision according to one of the following four choices:

- 1) You make an offer to the other party where you suggest how to split the pie.
- 2) You ask the other party for another offer without making an offer by yourself.
- 3) You accept the last offer of the other party.
- 4) You break down the negotiations [and (in treatment 2 and 3) ask for arbitration].

Make a decision according to one of the four choices. Write down your decision into the bargaining record. After making your decision the sheet will be transferred to the other party.

The negotiations will end either if one of the two parties agrees to the splitting of the pie suggested by the other party or if one party decides to break down negotiations. If you succeed to make an agreement, both parties will get paid according to that agreement. If you decide to break down negotiations, then

[in treatment 1] both parties will receive no payment at all.

[in treatment 2] you may ask for conventional arbitration. The arbitrator will receive your bargaining record and will make a decision of his own choice. You have to accept the decision of the arbitrator. Then you will receive payments according to the award of the arbitrator.

[in treatment 3] you may ask for final offer arbitration. The arbitrator will receive your bargaining record. The arbitrator has to choose one of the two final offers as award. You have to accept the decision of the arbitrator. Then you will receive payments according to the award of the arbitrator.

Earnings are confidential. Only you and a third person not involved in the experiment will know the amount you earned. Each ECU is worth 0.10 DM (0,051 Euro).

If you like you may comment your decisions on the back side of this instruction. If at any time you have questions or problems, raise your hand and you will be assisted.