GOVERNANCE AND THE EFFICIENCY
OF ECONOMIC SYSTEMS
GESY

Discussion Paper No. 528

Balance of power and the propensity of conflict

Luisa Herbst*
Kai A. Konrad**
Florian Morath***

* Max Planck Institute for Tax Law and Public Finance. E-mail: luisa.herbst@tax.mpg.de.
** Max Planck Institute for Tax Law and Public Finance. E-mail: kai.konrad@tax.mpg.de.
*** Max Planck Institute for Tax Law and Public Finance. E-mail: florian.morath@tax.mpg.de.

Financial support from the Deutsche Forschungsgemeinschaft through SFB/TR 15 is gratefully acknowledged.

Sonderforschungsbereich/Transregio 15 · www.sfbtr15.de
Universität Mannheim · Freie Universität Berlin · Humboldt-Universität zu Berlin · Ludwig-Maximilians-Universität München
Rheinische Friedrich-Wilhelms-Universität Bonn · Zentrum für Europäische Wirtschaftsforschung Mannheim

Speaker: Prof. Dr. Klaus M. Schmidt · Department of Economics · University of Munich · D-80539 Munich,
Phone: +49(89)2180 2250 · Fax: +49(89)2180 3510

Balance of power and the propensity of conflict

Luisa Herbst* Kai A. Konrad† Florian Morath‡

November 30, 2015

Abstract

We study the role of an imbalance in fighting strengths when players bargain in the shadow of conflict. Our experimental results suggest: In a simple bargaining game with an exogenous mediation proposal, the likelihood of conflict is independent of the balance of power. If bargaining involves endogenous demand choices, however, the likelihood of conflict is higher if power is more imbalanced. Even though endogenous bargaining outcomes reflect the players' unequal fighting strengths, strategic uncertainty causes outcomes to be most efficient when power is balanced. In turn, the importance of exogenous mediation proposals depends on the balance of power.

JEL codes: C78, C91, D72, D74

Keywords: Conflict, balance of power, contest, bargaining, Nash demand game, conflict resolution, asymmetries, experiment

*Max Planck Institute for Tax Law and Public Finance. E-mail: luisa.herbst@tax.mpg.de.
†Max Planck Institute for Tax Law and Public Finance. E-mail: kai.konrad@tax.mpg.de.
‡Max Planck Institute for Tax Law and Public Finance, E-mail: florian.morath@tax.mpg.de.

1 Introduction

The reasons for the emergence of resource-wasteful conflict and the question of how to prevent it have intrigued researchers from different social science disciplines. Peaceful settlement of distributional conflict usually yields a large peace dividend compared to the payoffs that players can expect when they disagree and enter into a resource-wasteful conflict. Nevertheless, mutual agreement on how to divide the peace dividend is not an automatism and the emergence of resource-wasteful conflict is often considered a puzzle. A prominent aspect in the discussion on the determinants of conflict is the role of the balance of power: Does war become more likely if the parties involved are rather equal or unequal in terms of their fighting strengths? Our paper addresses this question and provides experimental evidence on the willingness to reach an agreement at the negotiation stage when two players bargain in the shadow of conflict. We show how the likelihood of conflict and the nature of peaceful settlements is affected by an increased asymmetry of fighting power in the conflict that emerges when the players fail to reach a peaceful agreement.

Our experiment considers two alternative institutional arrangements in which bargaining takes place. In one arrangement the players are offered a division of the resources, which they can either accept or reject; conflict occurs if the players do not accept this peaceful solution. This two-sided take-it-or-leave-it offer is made by the laboratory which acts like a mediator who structures the negotiations according to clear and simple rules.[1] The exogenously proposed split conforms with the rules of cooperative Nash bargaining and thus accounts for the power imbalance by taking the players' expected conflict payoffs as threat points. The alternative arrangement is a Nash demand game, in which the two players simultaneously choose how much of the resources each of them demands; conflict occurs if the endogenous demands are incompatible.[2] Both types of negotiations are based on a symmetric bargaining protocol and a static framework. The Nash demand game, however, introduces elements of peaceful appropriation, strategic uncertainty, and coordination problems, which are absent by construction in the baseline arrangement with the exogenous mediation offer. For both types of negotiations, bargaining failure leads to a resource-wasteful conflict which yields an outcome that is Pareto inferior to what the players can achieve through peaceful agreement.

[1] This type of mediator is not a real player but acts more like an automated device, which is of course a simplification. The survey by Kydd (2010) highlights that a mediator may have several roles and may also be a player with own objectives. See, e.g., Bercovitch and Schneider (2000) and Bercovitch and Gartner (2009) on the selection of mediators, Beardsley (2011) on the limits of mediation, and Hörner et al. (2015) on the role of information collection and enforcement power for successful mediation.

[2] For a related theory framework see Wittman (2009) who analyzes a Nash demand game in which the players have private information on their fighting abilities (which directly translate into the win probabilities). In his model, the relation between similarity in fighting capabilities and the likelihood of conflict depends on whether the (exogenous) cost of war is high or low.

The conflict that players enter into if they fail to reach an agreement follows the rules of a Tullock (1980) lottery contest. The players invest resources and their conflict payoffs are determined by the two players' effort choices. The key feature of our experimental design is the variation of the players' relative fighting strengths in the contest, which are known when bargaining. This variation enables us to identify whether an increased imbalance of power affects the probability that players will fail to reach a peaceful outcome at the bargaining stage. The treatment with the exogenous mediation proposal removes many additional channels through which an asymmetry in fighting strengths may affect the likelihood of power. Compared to this benchmark, the treatment with the endogenous demand choices reveals how the effect of an increased imbalance of power may change when the complexity of the negotiations is increased and how the imbalance of power is reflected in peaceful allocations. Moreover, we conduct three types of control treatments: one in which we change the exogenously given division to an equal split; one in which the exogenous mediation proposal does not take into account changes in the relative fighting strengths; and one arrangement with a 'weaker' mediator who suggests a peaceful division (which corresponds to the exogenous mediation proposal) but in which the two players endogenously decide on the shares they demand.

In all treatments, we observe a significant probability of resource-wasteful conflict. In case of an exogenous mediation proposal, increases in the power imbalance do not have a significant impact on the likelihood of conflict. Here, conflict is more often triggered by the player who is disadvantaged in the conflict. In case of endogenous demands, however, the likelihood of conflict significantly increases with a larger imbalance of power. Here, if a peaceful agreement is reached, the player with the low fighting ability often receives almost the entire surplus from peaceful division. Overall, if fighting power is balanced, exogenous mediation proposals can lead to more conflict than endogenous demands, but if the power imbalance is large, mediation helps to avoid conflict more effectively.

These results can be interpreted in light of three broad lines of literature. First, the paper relates to the large (theoretical and experimental) literature on bargaining and the role of asymmetries in this context. In the bargaining experiment by Roth and Murnighan (1982), two players bargain by free communication and have complete or incomplete information on their valuations of winning. They find that even when both players know both valuations and this is common knowledge, players fail to reach an agreement in 17% of cases. Our framework has a different game structure. Failure to reach an agreement leads to fighting with an asymmetry in the balance of fighting power. Hence, the threat-point payoff is the outcome of a contest subgame and changes with variations in the relative fighting strengths. The idea that fighting power may impact the allocation of property rights is developed and illustrated by Umbeck (1981) in the context of property claims during the Californian gold rush. Several more recent models of anarchy incorporate similar considerations.[3]

The institutional design of bargaining becomes relevant in work by Schneider and Krämer (2004) who consider different fair-division procedures, documenting the importance of rules and their credibility. Eisenkopf and Bächtiger (2013) consider the role of an impartial or biased mediator who may facilitate communication and/or may be able to punish conflict parties. Similar to these experiments, which hint at the role of norms and rules, our results underline the importance of institutional rules for negotiation failure.

Two papers that consider asymmetries between players in a bargaining context are Anbarci and Feltovich (2013, 2015) who vary the exogenously given disagreement payoffs for players (in a Nash demand game and an unstructured bargaining game). They find that players are less sensitive to changes in their bargaining position than theory predicts, as the players stick closely to the 50-50 split. Sieberg et al. (2013) study the effect of power asymmetries in a two-stage alternating offer game with shrinking pie; if no agreement is reached, a lottery with exogenous win probabilities determines the allocation. They find no clear relationship between the probability of early agreement and power asymmetry.

Second, the paper contributes to a major controversy in international politics on the emergence of international conflict.[4] One important school of thought (power transition theory) argues that military conflict is most likely whenever exogenous changes in power lead adversaries to be of roughly similar strength.[5] Another school of thought (balance of power theory) predicts that military conflict is most likely to break out if the conflicting nations have very different military power. Balance of power theorists (Morgenthau 1948; Kaplan 1957; Claude 1962; Wright 1965; Ferris 1973) argue that parity dissuades nations from fighting because parity is associated with high uncertainty regarding the war outcome. Much in line with economic bargaining theory, Wittman (1979) suggests that the balance of power should not matter for the probability of military conflict; it should only matter for the equilibrium distribution of the resources.

Our setup addresses Wittman's (1979) argument and isolates the effect of an increased imbalance of power on peaceful sharing and conflict avoidance in different institutional bar-

[3]Related work on the relationship between conflict power and bargaining outcomes includes Anbarci et al. (2002), Jordan (2006), Piccione and Rubinstein (2007), and Sánchez-Pagés (2009).

[4]More generally, a considerable number of theories have been put forward to explain the occurrence of war, and the discussion is ongoing (see, e.g., Wagner 1994, Fearon 1995, Powell 1996 and 1999, Wagner 2000, Chadefaux 2011, and Benson et al. 2014; for surveys see Kydd 2010 and Jackson and Morelli 2011).

[5]Power transition theory, also called power shift theory (Gulick 1955; Organski 1958; Garnham 1976; Waltz 1979; Organski and Kugler 1980; Levy 1987; Blainey 1988; Kim and Morrow 1992; see the survey by Tammen 2008), takes a dynamic approach. War will be initiated either by a weaker but rising challenger or by a country with superior but declining power. During periods of power preponderance, the likelihood of war decreases.

gaining arrangements.[6] Previous experimental work in this literature addresses several aspects of bargaining in the shadow of conflict. McBride and Skaperdas (2014) deal with the likelihood of conflict when players are symmetric, concentrating on differences in the imposed discount factors of the future. Ke et al. (2015) focus on the acceptance of an exogenously imposed sharing rule within victorious alliances. Kimbrough et al. (2015) consider conflict avoidance through the choice of a lottery, focusing on the degree of commitment to the lottery outcome. Kimbrough and Sheremeta (2013, 2014) analyze the likelihood of conflict when one player can offer a side payment to his co-player. They find that side payments are used to avoid conflict and that larger side payments decrease the probability of conflict. Lacomba et al. (2014) focus on choices between production and investments in arms when conflict arises exogenously but post-conflict appropriation is endogenous. In Smith et al. (2014) symmetric players can invest in arms before deciding whether to cooperate. The emergence of conflict with heterogeneous players is also analyzed by Kimbrough et al. (2014). In their experiment, subjects choose between a peaceful symmetric lottery and a contest. As peaceful sharing rules themselves are always exogenously given, a mismatch of sharing rules and fighting strength may occur, and fighting may be induced because one of the key mechanisms to prevent fighting is blocked.[7]

Third, our findings relate to research in the context of evolutionary game theory. Parker (1974) and Grafen (1987) consider aspects of the role of asymmetry in fighting power and differences in the payoff consequences from conflict escalation for a resource holder and an attacker. In particular, Grafen (1987) alludes to a 'desperado effect': If fighting strength is a persistent characteristic of a player, weak players who always give in will always be on the losing side. We find that resource-wasteful conflict is more often triggered by the weaker players. They sacrifice own material payoff but gain a (small) chance to end up better-off than the stronger player. Related to this, spiteful behavior may emerge in finite populations where fitness is determined by material payoff *relative* to other players (Schaffer 1988).

The next sections describe the formal details of the framework (Section 2), derive the main hypotheses (Section 3), and present the results of the experiment (Section 4).

[6] Even though the laboratory experiment evidently sidesteps a number of highly relevant issues, it can address many problems such as idiosyncrasies, sample selection, and endogeneity issues which pose a major difficulty to empirical work on international conflict (see, e.g., Houweling and Siccama 1988, Powell 2002, Wohlforth et al. 2007, and Wallensteen and Svensson 2014).

[7] There is also a growing literature on contest experiments with asymmetric players, in particular asymmetric Tullock lottery contests; for a recent survey on contest experiments see Dechenaux et al. (2015). There is mixed evidence of the effect of asymmetry on rent dissipation in the contest (see, for instance, Davis and Reilly 1998, Anderson and Stafford 2003, and Hörtnagl et al. 2013). As a side result of our experiment, rent dissipation in the conflict is reduced if the imbalance of power increases, in line with the theory prediction.

2 Theoretical and experimental framework

2.1 Formal framework and equilibrium prediction

We consider two players A and B who compete in a two-stage game for a prize that has monetary value V. Nature endows them with different fighting abilities, denoted by $c_A \geq 0$ and $c_B \geq 0$. These abilities are common knowledge and become important in stage 2.

In stage 1, A and B bargain over the division of the prize. We consider two variants of this stage which characterize two different games. The first variant is called the SPLIT game and is described by shares s_A and s_B that are exogenously given. Players can accept or reject a division of V according to these shares. If both players accept, they divide the prize accordingly and the game ends. If one or both of them reject, they enter stage 2. The second variant is called the DEMAND game: The two players A and B simultaneously choose a share of the prize, which is then announced. If both shares sum up to no more than the value of the prize V, each player receives his share of the prize demanded and the game ends. If the shares sum up to more than V, agreement fails and A and B enter stage 2 of the game, which is the same for both variants of the bargaining stage.

In stage 2, the players have to fight for the prize in a Tullock (1980) lottery contest.[8] Players A and B simultaneously choose efforts $x_A \geq 0$ and $x_B \geq 0$. This is where players' fighting abilities matter: c_A and c_B represent the players' constant marginal effort cost. Hence, i's expected material payoff from conflict is equal to

$$\pi_i = p_i\left(x_A, x_B\right)V - c_i x_i, \;\; i = A, B.$$

Here, p_i denotes player i's probability of winning the prize and is equal to

$$p_i\left(x_A, x_B\right) = \frac{x_i}{x_A + x_B}, \;\; i = A, B$$

if $x_A + x_B > 0$ and equal to 1/2 otherwise.

The existence and uniqueness of equilibrium of the stage 2 subgame is well known (Szidarowszky and Okuguchi 1997; Cornes and Hartley 2007). Table 1 characterizes the equilibrium and shows that equilibrium effort x_i^* is decreasing in a player's effort cost c_i, but the equilibrium cost of effort $c_i x_i^*$ is the same for both players. Hence, the player with the lower cost of effort wins with higher probability and has a higher expected payoff. We now turn

[8] The Tullock (1980) contest is one of the most commonly used frameworks to describe a wasteful fight over the distribution of a prize. Several microfoundations (see, e.g., Hirshleifer and Riley 1992, Fullerton and McAfee 1999, and Baye and Hoppe 2003) and axiomatic foundations (see Skaperdas 1996 and Clark and Riis 1998) have been offered for this contest structure.

	Player A	Player B
Effort x_i^*	$\frac{c_B}{(c_A+c_B)^2}V$	$\frac{c_A}{(c_A+c_B)^2}V$
Win probability p_i^*	$\frac{c_B}{c_A+c_B}$	$\frac{c_A}{c_A+c_B}$
Expected payoff π_i^*	$(\frac{c_B}{c_A+c_B})^2V$	$(\frac{c_A}{c_A+c_B})^2V$

Table 1: Characterization of the equilibrium of the stage 2 contest subgame.

to the details of the two different setups for stage 1.

2.1.1 The bargaining game (stage 1): exogenous division mechanism

In the Split game, a division (s_A, s_B) of the prize is proposed with s_A being the solution to

$$\max_{s_A} \left(s_A - \pi_A^*\right)\left(V - s_A - \pi_B^*\right), \tag{1}$$

where $\pi_i^* = \left(c_{-i}/\left(c_A + c_B\right)\right)^2 V$ is player i's expected equilibrium payoff of the stage 2 contest subgame (as given in Table 1). The solution to (1) yields

$$(s_A, s_B) = \left(\frac{c_B}{c_A + c_B}V,\ \frac{c_A}{c_A + c_B}V\right) \tag{2}$$

The shares s_A and s_B are the values that emerge from cooperative Nash bargaining. We account for players' asymmetry in fighting power by using the different equilibrium payoffs of the contest as threat points. The division in (2) splits the surplus from agreement evenly between the two players.[9] It maximizes the minimum of the two players' gains from cooperation at stage 1. This maximin property makes it an attractive choice for a mediator who would like to make a proposal that is likely to be accepted since both players need to agree to the proposal.[10] In the experiment, the proposed division (s_A, s_B) is exogenous from the perspective of the players; A and B learn this division and simultaneously decide whether to accept or to reject it. If both accept, A gets a payoff of s_A and B gets a payoff of s_B, and

[9] It is important to distinguish between asymmetries in reservation utilities ("fighting payoffs") and bargaining power. Both players are equally pivotal in whether a division is accepted, which should provide them with the same bargaining power when dividing the aggregate surplus.

[10] Also, this division rule emerges as the subgame perfect equilibrium of a non-cooperative bargaining game with alternating offers and an exogenous termination probability of the negotiations if this probability becomes so small that the advantage of making the first offer vanishes.

the game ends. If at least one player rejects the proposal, the game enters into the fighting subgame in stage 2.

In the subgame-perfect equilibrium, player $i \in \{A, B\}$ anticipates the own expected equilibrium payoff π_i^* in the stage 2 contest subgame and prefers acceptance of the division if and only if $s_i \geq \pi_i^*$. Since $s_i = p_i^* V > \pi_i^*$, both players will choose to accept the peaceful split in equilibrium when maximizing their expected material payoff.[11]

2.1.2 The bargaining game (stage 1): Nash demand game

In the DEMAND game, stage 1 closely follows the rules of a Nash (1953) demand game. Rather than being exogenously determined, $s_A \in [0, V]$ and $s_B \in [0, V]$ are simultaneously chosen by players A and B, respectively. If $s_A + s_B \leq V$ then A's payoff is s_A and B's payoff is s_B, and the game ends. If $s_A + s_B > V$ then the game enters the stage 2 contest subgame.

In the DEMAND game, there is a continuum of stage 1 choices (s_A, s_B) that belong to a subgame-perfect equilibrium. The set of pairs (s_A, s_B) that characterizes the set of efficient pure-strategy equilibrium choices is characterized by $s_A \geq \pi_A^*$, $s_B \geq \pi_B^*$, and $s_A + s_B = V$. There is also a continuum of inefficient equilibria, which are generally characterized by $V - s_A < \pi_B^*$ and $V - s_B < \pi_A^*$: Suppose that player A asks for an excessively high share which does not leave sufficient resources on the bargaining table to make B at least as well-off as in the fighting equilibrium. Then, B will prefer to fight. As B's choice of s_B is arbitrary and inconsequential, B may actually choose a very high demand as well. In this case, unilateral deviations to a lower demand s_i (with $s_i \geq \pi_i^*$) cannot avoid conflict.

2.2 Experimental treatments and procedures

2.2.1 Treatments

The experiment is based on a 2×2 between-subjects design. The first dimension varies the bargaining mechanism in stage 1 (exogenously proposed SPLIT versus Nash DEMAND); the second dimension focuses on the degree of asymmetry in fighting strengths (SMALL versus LARGE asymmetry).[12] In the treatments with small asymmetry, the players' effort costs in the stage 2 contest are set to $c_A = 4$ and $c_B = 5$, respectively; thus, players are "almost

[11] Strictly speaking, this is the payoff-dominant equlibrium. Another equilibrium exists in which both players reject because none of them is pivotal if the other player rejects. This other equilibrium does not survive trembling. In the experimental setup, we allow for minor trembling to eliminate this "trivial" equilibrium: If one player rejects the division and the other accepts, there is a 10% probability of the proposed division being implemented in order to ensure that a player's choice in the experiment reveals his preference even when he expects his co-player to reject the division.

[12] Importantly, both bargaining mechanisms keep the bargaining protocol symmetric; the only dimension of asymmetry relates to the conflict strengths.

	SPLIT	DEMAND
SMALL: $(c_A, c_B) = (4, 5)$	72 subjects 9 independent obs.	72 subjects 9 independent obs.
LARGE: $(c_A, c_B) = (2, 7)$	72 subjects 9 independent obs.	72 subjects 9 independent obs.

Note: SPLIT: exogenously proposed shares (Nash bargaining solution); DEMAND: Nash demand game.

Table 2: Experimental treatments: 2×2 between-subjects design.

symmetric" at the contest stage.[13] In the treatments with large asymmetry, we increase the cost spread to $c_A = 2$ and $c_B = 7$, keeping the average cost parameter and average effort constant. In all treatments, the prize value is equal to $V = 549$. Table 2 summarizes the treatments.

For the exogenous division mechanism (SPLIT), the choice of the cost parameters implies that the exogenous peaceful split option is $(5V/9, 4V/9) = (305, 244)$ in case of small asymmetry and $(7V/9, 2V/9) = (427, 122)$ in case of large asymmetry. Table A.1 in the appendix summarizes the parameters used in the experiment together with the theory prediction (in DEMAND, possible choices in efficient equilibria). Note that for a given cost asymmetry in SPLIT, the sacrifice in payoffs when choosing conflict is the same for players A and B (that is, $s_A - \pi_A^* = s_B - \pi_B^*$). Due to the higher effort cost with small asymmetry, however, this sacrifice in payoffs is higher in SMALL than in LARGE, following the standard theory result that rent dissipation is highest if the contestants are equally strong.

2.2.2 Procedures

The experiment was programmed using z-Tree (Fischbacher 2007) and run at the MELESSA laboratory in Munich, Germany. Subjects were recruited from the student body of Munich universities using ORSEE (Greiner 2004). We admitted 24 subjects to each session (288 participants in total). Each subject participated in exactly one of the treatments outlined above. The game described in Section 2.1 was played repeatedly (30 independent interactions/rounds in total), but the subjects were randomly rematched in each round. To obtain a larger number of independent observations, random matching took place in subgroups of

[13] Choosing a small degree of asymmetry, instead of perfect symmetry, makes the identification of the treatment effect of increased asymmetry much cleaner (compare also Kimbrough et al. 2014).

eight participants. The subjects were not given specific information about the precise nature of matching other than that they would be randomly rematched between rounds.

At the beginning of each session, written instructions were distributed and read out loud (see Appendix B for a sample of the instructions). Subjects had to complete a quiz to make sure they understood the experiment. In the main part of the experiment, the role as player A or B (the respective cost parameter) was randomly assigned to the players in each of the 30 rounds and announced at the beginning of a round.[14] In SPLIT, the division proposal (s_A, s_B) was shown to the participants. No specific information was provided on how this proposal was generated. Players decided whether to accept the division of the prize. In DEMAND, the participants had to enter their demand as an integer between 0 and 549.[15] The contest took place only if no agreement had been reached. At the contest stage, both players' choices in the bargaining stage were displayed on the screen and players chose their effort as a non-negative integer. The resulting win probabilities were illustrated in a circular area on the screen, with a pointer running clockwise determining the winner. At the end of each round, the subjects learned their payoff from this round.

Before subjects were paid, they had to undergo a questionnaire on individual characteristics and behavior in the main part of the experiment, including incentivized tests on distributional preferences (subjects had to repeatedly make two-person allocation decisions, following Bartling et al. 2009 and Balafoutas et al. 2012) and preferences for playing a lottery. The lottery was similar to the fighting subgame, but subjects had to decide whether to invest a fixed amount at a given win probability which increased from 0.1 to 0.9 in increments of 0.2. Moreover, the questionnaire contained several questions on the willingness to take risks (Dohmen et al. 2011) and one task to elicit ambiguity aversion.

At the end of the experiment subjects were paid separately and in private. In all treatments, the conversion rate was 50 points = 1 euro. Each participant received a show-up fee of 4 euros, 10 euros to cover effort cost expenses, the earnings (possibly negative) of three randomly selected rounds from the main experiment plus the payoff (also possibly negative) from one randomly selected post-experimental task. On average, subjects earned 26 euros (plus the show-up fee), and a session took about 100 minutes.

[14] Varying the players' roles (as A or B) during the experiment ensures that participants have the same expected payoff even at the interim stage (that is, after the first role assignment) and do not feel disadvantaged or unfairly treated by the design.

[15] In all treatments, in order to help subjects to compute winning probabilities, the lower part of the screen displayed a calculator. Subjects could repeatedly enter hypothetical effort levels and compute the cost of effort and the probability of winning as often as they wished.

3 Hypotheses

3.1 Small versus large asymmetry

The treatments with the exogenous division mechanism at the bargaining stage (Split) serve as a baseline for measuring the effect of an imbalance of fighting power. Strategic uncertainty and coordination problems are absent in stage 1: players either agree to the exogenous split or not. Hence, this treatment isolates the effect of an increased asymmetry in fighting ability. In line with Wittman's (1979) claim and with standard bargaining theory, for rational players who maximize material payoff, the balance or imbalance of power should not matter for the likelihood of conflict, but the imbalance in fighting power should translate into asymmetric bargaining shares that players obtain (reflected in the exogenously proposed division).[16] An alternative hypothesis suggests that larger power imbalances lead to more conflict. The balance of power theory in political science argues that a larger imbalance increases the advantaged player's win probability and his conflict payoff and thus makes it more attractive for the advantaged player to incite war. In comparison, fighting an equally strong competitor leads to an uncertain outcome and a low expected payoff; thus, avoiding conflict becomes more attractive if power is balanced. Although for different reasons, a higher likelihood of conflict under imbalanced compared to balanced power is also in line with evolutionary arguments in biology on the incentives of strongly disadvantaged players to reject asymmetric settlements which make them persistently worse off (compare Section 3.3). The different considerations lead to two competing hypotheses:

Hypothesis 1a (Wittman): *The likelihood of conflict is independent of whether players are almost symmetric* (Small) *or asymmetric* (Large) *in terms of fighting strengths.*
Hypothesis 1b (Balance of power): *The likelihood of conflict is lower when players are almost symmetric* (Small) *than when they are asymmetric* (Large) *in terms of fighting strengths.*

From a theory perspective with players who care about their monetary payoffs, there is no direct reason for why an increase in the imbalance of power may systematically affect the likelihood of conflict, neither in case of an exogenous mediation proposal (Split) nor when players endogenously choose their demands (Demand). But since agreement is likely to be

[16] There is a caveat to the Wittman hypothesis. Wittman (1979) notes that the probability of war will only stay constant if the advantaged player's increase in his subjective probability of winning is equal to the disadvantaged player's decrease in his subjective probability of winning. If subjective probabilities differ from objective probabilities in a differential way for the advantaged and the disadvantaged player in Small and Large, the hypothesis might no longer be fulfilled.

more difficult in Demand, there may be a differential effect of changes in the balance of power, as we discuss next.

3.2 Exogenous division versus Nash demand game

Compared to the option to split according to exogenous shares (Split), in the demand game (Demand) players can influence how much of the resource share they appropriate and they face strategic uncertainty, leading to the possibility of coordination failure. In the Nash demand game, the sum of the players' demands may exceed the prize, causing bargaining to break down and wasteful conflict to emerge. Similarly, there are inefficient equilibria that lead to conflict. Also, although the theory framework is one with complete information, it is reasonable to assume that subjects in the experiment exhibit heterogeneity in unobservable characteristics, for instance, because they are not only motivated by their own monetary payoffs or because they differ in their perceptions of winning the contest. Intuitively, such type heterogeneity and beliefs about the co-player's type become particularly important when players endogenously choose their demands, which could make peaceful settlement more difficult to achieve in Demand.[17] Overall, we expect players to more frequently arrive at the conflict stage in Demand compared to Split, both for small and for large asymmetry in the fighting strengths.

Hypothesis 2 (Bargaining mechanism): *The likelihood of conflict is lower for the exogenous division mechanism* (Split) *than when players endogenously choose their demands* (Demand).

In the Demand treatments, the larger the asymmetry, the more likely it is that coordination failure might occur. Table A.1 shows that the 50-50 split of the prize is not an equilibrium in case of large asymmetry (A should rationally demand at least $\pi_A^* = 333 > 549/2$). Therefore, within the Demand treatments, we expect coordination to be easier and, hence, conflict to be less likely under Small than under Large asymmetry, in line with Hypothesis 1b. Put differently, while the Split treatment provides the most favorable conditions for Wittman's (1979) claim to be confirmed, the Demand treatment incorporates one of the major reasons for why Hypothesis 1a may be rejected; thus, our design reveals whether increasing asymmetry has a differential effect when bargaining is crucially affected by strategic uncertainty and elements of appropriation, where the latter refers to the fact that in the

[17]Note that in such an incomplete information framework the stage 1 decisions obtain informational value about the players' non-monetary motives and may affect the stage 2 effort choices; even the theory prediction for the Split setup would become much less straightforward in this case.

DEMAND treatment both players can exert direct influence on their peaceful share and can try to improve their position even in the process of bargaining.

3.3 On the choice of whether to reject in the SPLIT treatments

Players may care not only about their monetary rewards, but also about status, that is, their material payoff relative to that of others.[18] Under the exogenous division, player B ends up with a lower material payoff than player A. If B chooses to fight then both players sacrifice some income, but B has a chance to end up with a higher payoff than A. The choice of fighting can be preferable for B if he is sufficiently strongly motivated by relative standing concerns.[19] This is most evident in the case of ordinal relative standing preferences: The disadvantaged player B can reverse the payoff ranking only by entering into the contest.[20] Accordingly, relative standing considerations suggest that the disadvantaged player B may have a stronger incentive to reject the proposed split than the advantaged player A. This argument is in line with the 'desperado effect' in evolutionary game theory (Grafen 1987). Relative payoff matters for survival in an evolutionary context in finite populations (Schaffer 1988). Thus, a player who is certain to receive a lower payoff in the bargaining outcome may prefer to take chances and trigger a resource-wasteful conflict.

3.4 On sharing in the DEMAND treatments

The payoff in the contest constitutes a player's outside option in the Nash demand game and is increasing in the player's relative fighting strength. In turn, a higher outside option suggests a higher demand. This relationship is not a sharp equilibrium prediction, as the demand game has multiple equilibria (recall Table A.1). The prediction becomes sharp if we assume, in addition, symmetry or restrict consideration to risk dominant equilibria (a frequent restriction in the analysis of Nash demand games; see also Anbarci and Feltovich 2013, 2015). We therefore expect that a player's demand is positively correlated with his relative fighting strength. In other words, we expect the advantaged player A to choose a higher demand than the disadvantaged player B and expect this difference to be higher with large than with small cost asymmetry.

[18] A considerable amount of theory and empirical evidence supports this hypothesis. Seminal work is by Hirsch (1976) and Frank (1984a, 1984b, 1985a, 1985b).

[19] Status concerns in the context of risky choices have been analyzed systematically by Konrad and Lommerud (1993). Generally, the decision outcome depends on the shape of the utility function under risk.

[20] The role of rank order in relative standing comparisons has been recognized both in economics (see, for instance, Kuziemko et al. 2014 for recent experimental evidence on such ordinal preferences in the context of redistribution decisions and Powdthavee 2009 for survey data) and in psychology (see, for instance, Boyce et al. 2010 on the role of income rank for life satisfaction).

3.5 On fighting efforts in the Tullock contest

In line with the theory prediction on the Tullock (1980) contest for players who are motivated by monetary rewards, we expect the following: Effort cost (rent dissipation) should be decreasing in the degree of asymmetry. Thus, effort cost should be lower in LARGE than in SMALL, independent of the bargaining mechanism. This may contribute to a higher likelihood of conflict in LARGE compared to SMALL since bargaining failure is predicted to be less costly in LARGE; the treatment comparisons along the two dimensions will shed light on the role of such efficiency considerations. Finally, on the individual level we expect effort to be higher for the advantaged than for the disadvantaged players.

4 Results

Our main research question is on the relationship between power imbalance and conflict probability. The analysis in Sections 4.1 to 4.4 is mainly based on non-parametric tests; Section A.2 presents a regression analysis of individual-level data.

4.1 On the probability of conflict

Theory predicts that there should never be conflict, focusing on the efficient peaceful equilibrium outcomes in all four treatments. But the left panel in Figure 1 shows that there is a significant amount of conflict in all treatments. More importantly, consider the effect of increased asymmetry in Figure 1a. For the case of an exogenous division (column SPLIT), the probability of conflict does not significantly differ between the treatments with small asymmetry (33.6%) and with large asymmetry (35.9%). Thus, we cannot reject Wittman's (1979) hypothesis that the balance of power does not matter for the likelihood of conflict. Without strategic uncertainty and coordination problems, an imbalance of power alone does not lead to more conflict (Hypothesis 1a).

In the Nash demand treatments, however, we see a different result: In the DEMAND column of Figure 1a, the probability of conflict doubles in case of a large imbalance (53.2%) compared to the case of small asymmetry (26.9%), in line with Hypothesis 1b. This suggests that the effect of an increased imbalance of power depends on how difficult it is to reach an agreement at the bargaining stage.

Result 1 *(a) In case of exogenous divisions, peaceful agreement does not fail more often with large asymmetry than with small asymmetry in fighting strengths.*
(b) In case of endogenous demands, peaceful agreement fails more often with large asymmetry than with small asymmetry in fighting strengths.

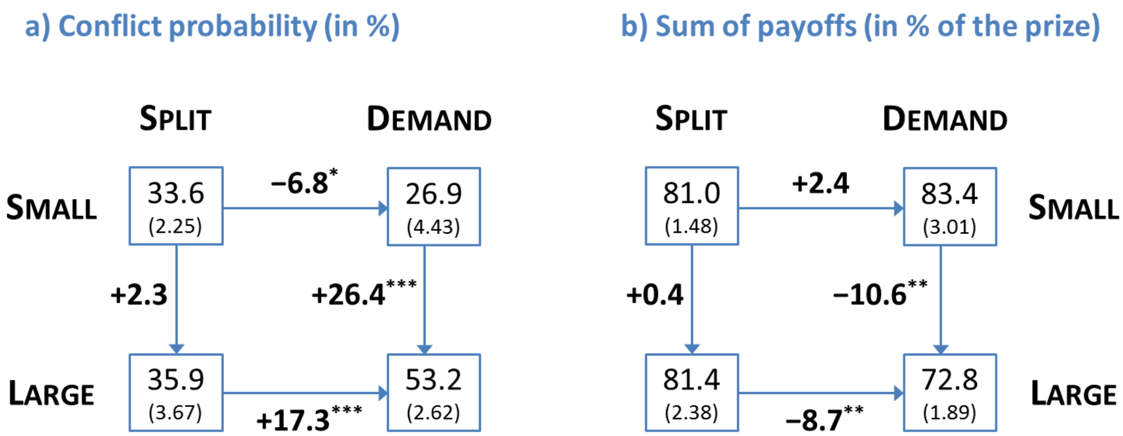

Figure 1: Probability of conflict and efficiency per treatment.

Note: Calculated are mean and standard error (in parentheses) of the probability that the game proceeds to the contest stage (panel a) and of the total payoffs of A and B (panel b). Values based on matching group averages (8 subjects over 30 rounds per matching group). Differences are tested using Mann Whitney U tests on the matching-group level (18 observations per test), ***(**,*) significant at the 1% (5%,10%) level.

Now turn to the effect of endogenizing demands for a given cost asymmetry in Figure 1a. With a large imbalance of power (row LARGE), the probability of conflict is significantly higher when players have to choose their demands endogenously (53.2%) instead of deciding on a given division (35.9%), in line with the bargaining mechanism hypothesis (Hypothesis 2). At the same time, for the case of small asymmetry (row SMALL), the probability of conflict is *lower* with endogenous demand choices (26.9%) than with an exogenously given split (33.6%). Despite the strategic uncertainty in the Nash demand treatment, we observe less conflict. This result for small asymmetry contradicts the bargaining mechanism hypothesis (the difference of −6.8% is significantly different from zero; p-value is 0.057). We will discuss this finding below when analyzing individual stage 1 decisions.

Result 2 *(a) With small asymmetry in fighting strengths, peaceful agreement on endogenous demands fails less often than peaceful agreement on exogenous divisions.*
(b) With large asymmetry in fighting strengths, peaceful agreement on endogenous demands fails more often than peaceful agreement on exogenous divisions.

Related experimental studies in which conflict is endogenous yield a large variety of observed conflict rates of conflict resolution, which is not surprising since the experiments differ in important aspects regarding the bargaining stage, possible allocations, and the conflict setup. Most comparable to our study are the experiments of Anbarci and Feltovich (2013) who find a conflict probability of 32% in a Nash demand game with exogenously given disagreement payoffs that fall in the range of the expected conflict payoffs in Small. When the peaceful allocation is determined by a coin flip and therefore leads to an equal split in expectation, Kimbrough et al. (2014) find a conflict probability of 40% with a slightly higher asymmetry of players' strengths than in our control treatment with an equal split (SPLIT-50-50; see Section 4.4.1). Ke et al. (2015) find that the likelihood of conflict increases from 24% to 55% if players with symmetric fighting strengths are offered an asymmetric (70%-30%) exogenous split instead of a symmetric one. The latter result is, however, obtained in a setup in which players have a joint history of having won as an alliance against an out-group player in a preceding conflict.

In line with the observed effect on the conflict probability, Figure 1b shows that total payoffs (and, hence, rent dissipation) are very similar in Split-Small, Split-Large, and Demand-Small. They are significantly lower (hence, rent dissipation is significantly higher) in the Nash demand game with large asymmetry. These lower payoffs are a consequence of the high conflict probability that is observed in this treatment. Note that in all treatments except Demand-Large, there is a slight downward trend in conflict probabilities of later rounds so that Results 1 and 2 are reinforced when focusing on experienced behavior only.[21]

In the remainder of this section, we consider in more detail the reasons for the observed relation between the balance of power and the likelihood of conflict. First we analyze the effort choices in the stage 2 conflict and the resulting cost of conflict. Then we turn to the individual choices in stage 1 which form the basis of the observed conflict probability.

4.2 Stage 2 decisions: on fighting

Consider the individual choices in the contest if the players do not peacefully split the prize in stage 1. Figure 2 summarizes the effort levels in the stage 2 contest.[22] The data reveal that, with small cost asymmetry, the efforts of A and B are very similar. When the asymmetry increases, however, the advantaged player increases his effort while the disadvantaged player reduces his effort.[23] The total units of effort expended are slightly lower under small than under large asymmetry.[24] Second, from Figure 2, we can directly compute the effort cost

[21] Appendix A.8 contains the time series of all relevant variables (conflict probabilities, effort levels, rejection probabilities, and demand choices).

[22] There is overdissipation in all treatments. This is a standard result in experimental contests, especially winner-take-all contests (see Cason et al. 2013).

[23] The decrease in effort for player B with large asymmetry is weaker for Split than for Demand. Since the contest stage is reached less often in Split, players gain less experience in this treatment. The bargaining procedure might also affect the non-monetary values of winning the contest or may cause different selection effects. Note, however, that player B's average conflict payoff does not significantly differ between the bargaining mechanisms.

[24] For the considered Tullock lottery contest the equilibrium prediction for the total number of units of effort depends only on the average marginal costs and is, thus, the same in Small and Large. The difference

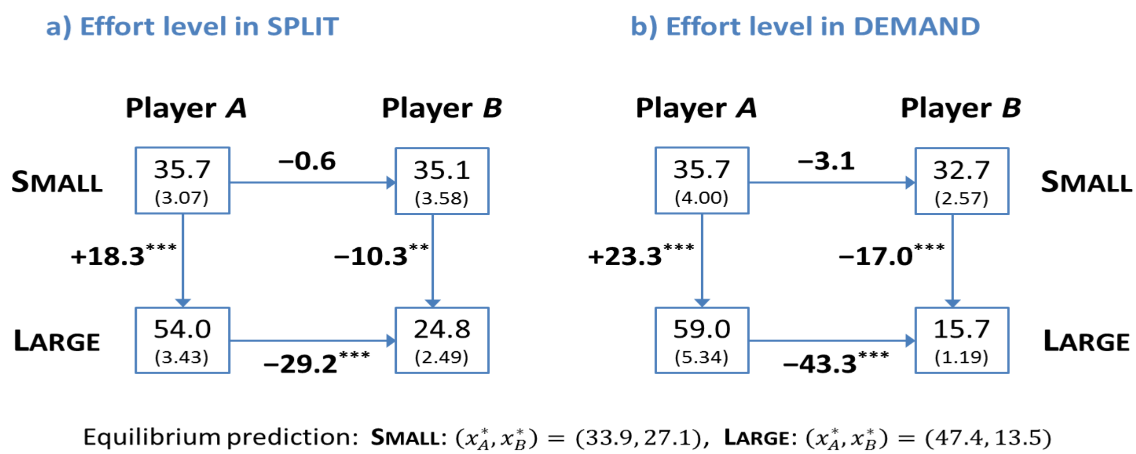

Figure 2: Effort choice x_i in the stage 2 contest.

Note: Calculated are mean and standard error (in parentheses) of the effort level conditional on reaching the contest in stage 2. Values are based on matching group averages (8 subjects over 30 rounds per matching group). Differences between SMALL and LARGE are tested using Mann Whitney U tests and differences between A and B are tested using Wilcoxon signed-rank tests; tests on the matching-group level (18 observations per test), ***(**) significant at the 1% (5%) level.

expended with small asymmetry (effort cost parameters $(c_A, c_B) = (4, 5)$) compared to a large asymmetry (effort cost parameters $(c_A, c_B) = (2, 7)$). With the exogenous division in Split, total effort cost (rent dissipation) is higher under small asymmetry (318.1) than under large asymmetry (281.5). Similarly, with endogenous demands in Demand, total effort cost is higher in Small (306.2) than in Large (227.8).[25] The difference in rent dissipated between Small and Large, although smaller than predicted, makes peaceful agreement relatively more attractive in case of a balance of power than in case of largely asymmetric fighting strengths.

Result 3 *Total rent dissipation in the conflict decreases in the degree of asymmetry, making bargaining failure more costly when players are similar in terms of their fighting strength.*

While Result 3 addresses the sum of effort costs, we also see that the individual cost of entering stage 2 is larger in Small than in Large for both players A and B (see the overview of the average realized payoffs from both stages in Appendix A.3).

With endogenous demands, a peaceful outcome is more likely if the asymmetry in the fighting strengths of the two players is small (Result 1(b)). This is in line with efficiency

observed is not statistically significant and might have to do with learning effects (it is reduced in later rounds).

[25] The effect of an increased asymmetry on total effort cost is, however, only statistically significant in Demand (p-value is 0.01). The weaker effect in Split is mainly due to the disadvantaged player who strongly overdissipates with large asymmetry; see also the remark on the effort levels above.

considerations. The predicted overall cost of conflict is higher if the players have more similar fighting strengths, making it more valuable to reach a peaceful agreement if players are very similar in terms of fighting strength (also compare Wittman 2009). Efficiency considerations would, however, also induce the conflict probability in Split to be lower for small asymmetry than for large asymmetry, in contrast to Result 1(a). The following analysis of stage 1 choices reveals that efficiency considerations alone cannot explain the observed treatment differences in the likelihood of conflict.

4.3 Stage 1 decisions

4.3.1 On the choice to reject in the SPLIT treatments

Anticipating the second stage conflict payoffs, players A and B are strictly better off when accepting the exogenously given division of the prize, independent of the co-player's decision. Nonetheless, there is a significant probability of rejections in all treatments, as summarized in the left panel of Figure 3. Moreover, the rejection probability is lowest for the strongly advantaged player in case of large asymmetry (8.6%) and highest for the strongly disadvantaged player in Large (32.9%), revealing a simple pattern: The less a player is offered (and the lower his relative fighting strength), the more likely it is that he rejects the offer. This effect is particularly strong when comparing the advantaged player A and the disadvantaged player B, both for small and for large asymmetry.[26]

Result 4 *The rejection probability is higher for the disadvantaged player than for the advantaged player.*

The significant difference in the rejection probabilities of players A and B suggests that efficiency considerations (the cost of conflict in stage 2; Result 3) cannot be the main reason for the observed conflict probabilities in Small and Large. Rather, disadvantaged players seem to consider the proposed division to be inappropriate.[27] The result on the higher rejec-

[26] Note, however, that the rejection probability of disadvantaged players is reduced to about 20% in later rounds of the experiment. In Split-Large, it is no longer significantly different from the rejection probability of advantaged players when using non-parametric tests at the matching group level but remains significantly different at the 1% level in regressions on individual-level data even in the last 10 of the 30 rounds.

[27] During the experiment an on-screen calculator was offered as a help to compute win probabilities for possible effort choices. If we use the values entered for the co-player's effort as a proxy for the individual beliefs of the actual effort of the co-player, we can deduce the individuals' expected win probabilities (although with the caveat that not all subjects made use of the calculator). In Small, the expected win probabilities of A and B are about 52 to 54%; thus, players may perceive themselves as basically symmetric. In Large, player A's perceived win probability increases to 60% while B's perceived win probability decreases to 42% (both for Split and for Demand).

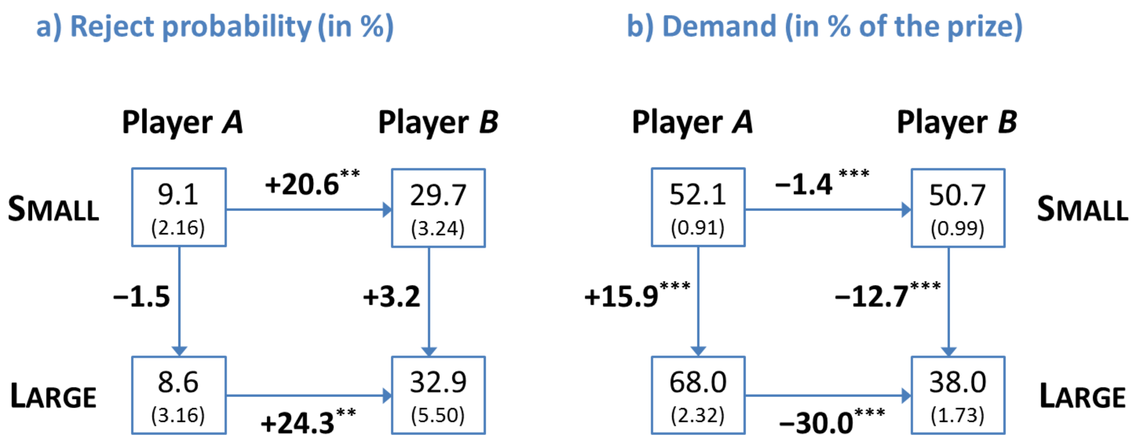

Figure 3: Probability of rejection of the exogenous split and endogenous demands in the Nash demand game.

Note: Calculated are mean and standard error (in parentheses) of the probability that a player rejects the exogenous division in SPLIT (panel a) and of the demand (as % of the prize) in DEMAND (panel b). Values are based on matching group averages (8 subjects over 30 rounds per matching group). Differences between SMALL and LARGE are tested using Mann Whitney U tests and differences between A and B are tested using Wilcoxon signed-rank tests; tests on the matching-group level (18 observations per test), ***(**) significant at the 1% (5%) level.

tion probability of disadvantaged players is in line with preferences on relative standing.[28] Such relative standing concerns also receive support from evolutionary biology.

Making use of the random re-assignment of roles (as A or B) in each round, Figure A.3 in Appendix A.4 addresses a potential subject heterogeneity and illustrates the distribution of the subjects' average rejection probability as player A and B, respectively. There is a substantial amount of subjects who never reject the proposed split (neither as an advantaged nor as a disadvantaged player); this behavior may be favored by the random re-assignment of roles which restores equity in expectations. The remaining subjects typically reject the proposal with a much higher probability when assigned the role as player B than when assigned the role as player A (both in Split-Small and in Split-Large), that is, we do not find evidence of strong aversion to both unfavorable and favorable inequity (which could have been a result of the fact that players experience both roles). When examining the correlation between a subject's choices in both roles we find that in Split-Large average rejection rates as player A and B are uncorrelated (the correlation coefficient is -0.01), as a vast majority of subjects never reject the proposed split when being in the role of the

[28] Comparing Small and Large, increasing the advantage of A (the disadvantage of B) further lowers (increases) the rejection probability, yet the estimated differences (-1.5% and 3.2%, respectively) are not statistically significant.

strongly advantaged player A. In SPLIT-SMALL, however, the observed subject heterogeneity is reflected in a significant correlation between a subject's average rejection rate as player A and B (the correlation coefficient is 0.35^{***}).[29] In Section 4.4 we further discuss the rejection behavior in SPLIT when presenting additional treatments which implement different exogenous divisions.

4.3.2 On sharing in the DEMAND treatments

The right panel of Figure 3 summarizes the player's choices in stage 1 of the Nash demand game. We find that as a player's relative fighting strength is reduced, his demand decreases. This effect is statistically significant both for the difference between small and large asymmetry for a given type of player (A or B) and the difference between an advantaged and a disadvantaged player for a given asymmetry (SMALL or LARGE).

Result 5 *A player's demand is increasing in his relative fighting strength.*

Both in SMALL and in LARGE, the two players' average demands sum up to more than 100%, but are very close to 100% of the prize value, in particular in case of small asymmetry. Moreover, with large asymmetry, both players' average demands clearly differ from the 50-50 split. In LARGE, players demand half of the prize (274 or 275 points) in only 13% of the cases (compared to 67% in SMALL) and successfully achieve a 50-50 split in less than 1% of the observed pairs (compared to 46% in SMALL).[30] If power is almost balanced, players may either perceive the setup of cost parameters with $c_A = 4$ and $c_B = 5$ as basically symmetric, or they may choose the 50-50 split as a coordination device. We will pick up on this question in Section 4.4. In the case of a large asymmetry, the 50-50 split loses its property as a focal point and coordination becomes seemingly more difficult.[31]

Figure 4 depicts the distributions of bargaining outcomes with small and large asymmetry. The dark (green) combinations show mutual demands that sum up to less than the prize V and lead to peaceful divisions, the light (orange) combinations show demand combinations that sum up to more than V and lead to conflict. First, consider the players' actual payoff

[29] The same holds for the additional treatment "SPLIT-50-50" included in Figure A.3 (the correlation coefficient is 0.34^{***} in this case), in which the exogenous proposal is an equal split and which we analyze in Section 4.4.1 below.

[30] For the distribution of individual demand choices see the figures in Appendix A.5. Even in the successful 50-50 splits with small asymmetry we observe that the advantaged player A demands slightly more than the disadvantaged player B, although this can come at a high cost in case bargaining fails. With SMALL asymmetry, about 27% of the successful 50-50 splits allocate 275 points to A and 274 points to B, while the reverse with B earning 275 points and A earning 274 points only occurs in 7.6% of cases. (In the remaining 65.5% of successful 50-50 splits A and B each earn 274, forgoing one point of the prize.)

[31] Also compare Anbarci and Feltovich (2015) who observe that outcomes crucially depend on whether the 50-50 split is a viable split.

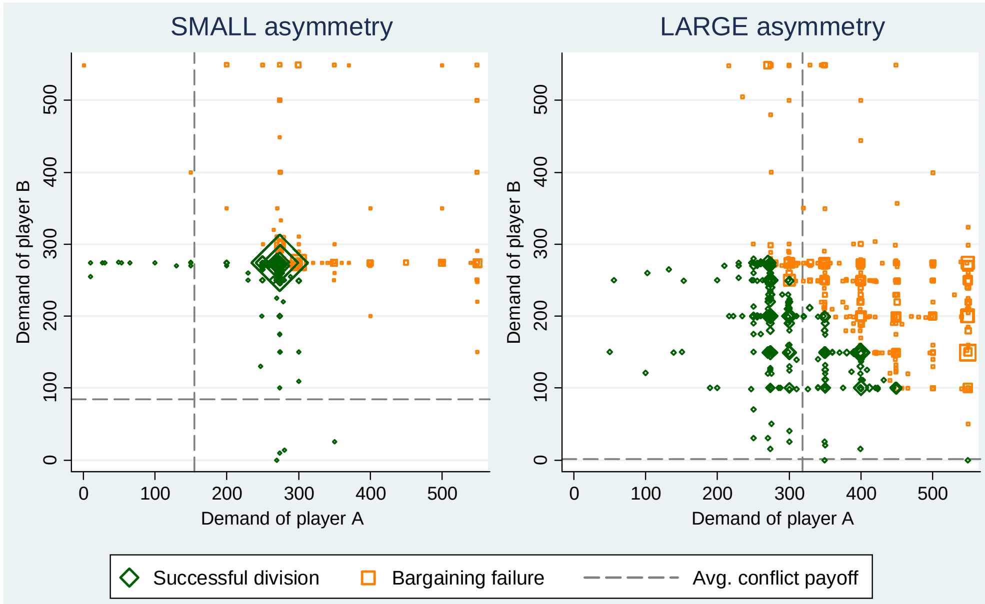

Figure 4: Stage 1 demands (s_A, s_B) with SMALL and LARGE asymmetry; the dashed lines are the average observed conflict payoffs.

if they can reach a peaceful division in stage 1. In SMALL, conditional on bargaining being successful, A receives 268.9 points and B receives 267.9 points and, hence, almost the same payoff (see also Figure A.2a in the appendix).

With an imbalance of power in LARGE, successful peaceful agreements in DEMAND allocate 311.9 points to the advantaged player and 178.4 points to the disadvantaged player (compare again Figure A.2a in the appendix).[32] The advantaged player A ends up with an average share upon peaceful division that is even slightly lower than his empirically observed average conflict payoff (which is 318.5; see Figure A.2b in the appendix). The disadvantaged player B, however, earns significantly more when a peaceful agreement is reached than what he would get in conflict (his observed conflict payoff is only 2.7 and, hence, even much less than predicted by theory). Thus, in the Nash demand game with large asymmetry, on average, successful bargaining allocates the entire material surplus of peaceful sharing to the disadvantaged player B, while the advantaged player A only gets his outside option (a resource share close to his conflict payoff). Even when players reach an agreement, some inefficiency emerges in that players are not successful in dividing the full prize between them but leave a share of the peace dividend on the negotiation table.

[32] These shares in successful agreements are considerably below the players' average demands in LARGE (Figure 3b). Further indication that settlement is more difficult with a large imbalance of power stems from the difference in the sum of realized peaceful shares: With small asymmetry, successful peaceful agreements allocate 98% of the prize while with large asymmetry, this number is reduced to 89%. Hence, more rent is left on the table when the imbalance of power becomes stronger.

Result 6 *(a) When asymmetry in fighting strengths is small, the distribution of demand choices by players A and B is concentrated at (and just below)* 50% *of the prize. Players successfully achieve a* 50-50 *split in about half of the cases.*
(b) When asymmetry in fighting strengths is large, coordination on the 50-50 *split is no longer predominant.*
(c) If bargaining is successful, the division of the peace dividend (bargaining surplus) is biased in favor of the disadvantaged player.

To conclude this section we compare the distribution of individual demands to the players' choices in SPLIT. Among the disadvantaged players B, a vast majority of the demand choices (98.0% of the demand choices in SMALL and 88.8% of the demand choices in LARGE) are higher than what players B are proposed in the respective SPLIT treatment (where rejection rates are only 29.7% and 32.9%, respectively). Among the advantaged players A, about 7.7% of the demand choices in SMALL are higher than the exogenously allocated share in SPLIT-SMALL (where the rejection rate is 9.1%), but in LARGE this number increases to 26.4% (compared to a rejection rate of 8.6% in SPLIT-LARGE). Thus, the possibility to appropriate a larger part of the resources (as in DEMAND) tends to make the individuals less willing to compromise.

4.4 Discussion and further treatments

The conflict probability in the DEMAND treatments is (weakly) lower than in SPLIT if the asymmetry is small but significantly higher than in SPLIT if the asymmetry is large. We address three possible channels that may explain this finding. First, do many individuals consider the proposed Nash bargaining solution as "unfair" if power is almost balanced? Is the conflict probability reduced if the exogenous mediation proposal is replaced by the proposal of an equal split (which the participants can implement in DEMAND)? Second, how does the likelihood of conflict change if the exogenous mediation proposal does not take into account changes in the players' fighting strengths? More precisely, what happens in the SPLIT treatments if we change the asymmetry in fighting strengths from SMALL to LARGE (and vice-versa) but leave the exogenously proposed division unchanged?[33] And third, is the high conflict probability in the Nash demand game with large asymmetry mainly due to coordination failure? That is, does large asymmetry simply make it more difficult to coordinate on one of the equilibria? To answer these questions and to further investigate

[33]From an experimental design perspective the variation from SPLIT-SMALL to SPLIT-LARGE changes both the relative fighting strengths and the proposed division, which is the main idea behind Wittman's (1979) argument. In this sense, the second set of control treatments constitutes intermediate treatments which restore one-step deviations between the different variants of the SPLIT treatment.

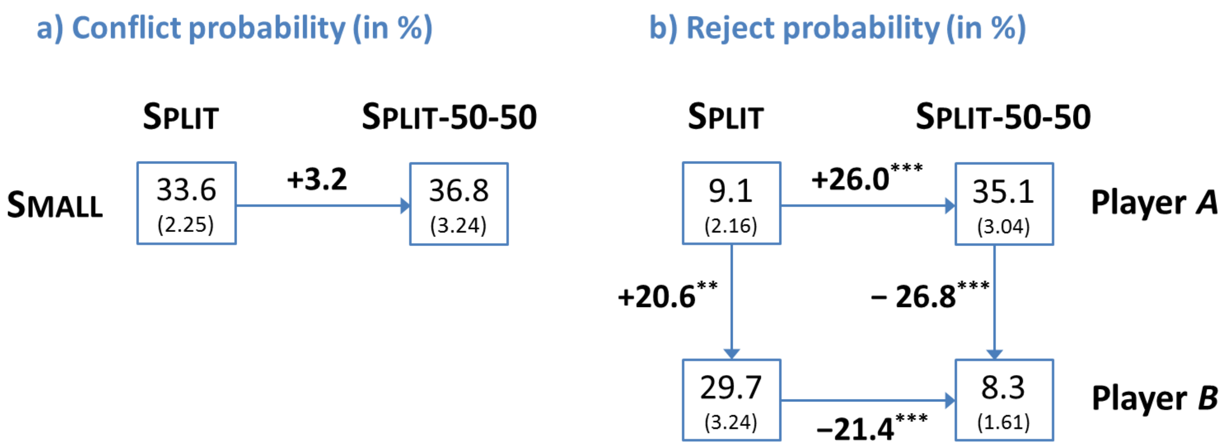

Figure 5: Conflict probability and rejection probability in the SPLIT-50-50 treatment.

Note: Calculated are mean and standard error (in parentheses) of the probability that the game proceeds to the contest stage (panel a) and of the probability that a player rejects the exogenous division (panel b) for the SPLIT-50-50 treatment (compared to SPLIT). Values are based on matching group averages (8 subjects over 30 rounds per matching group). Differences between SPLIT and SPLIT-50-50 are tested using Mann Whitney U tests and differences between players A and B are tested using Wilcoxon signed-rank tests; tests on the matching-group level (18 observations per test), ***(**) significant at the 1% (5%) level.

the observed relation of the balance of power and the likelihood of conflict, we conduct three sets of control treatments.

4.4.1 SPLIT-50-50 treatment

First we conduct a variant of the SPLIT-SMALL treatment in which the exogenous mediation proposal is not the Nash bargaining solution but an equal division of the prize $V = 549$.[34] To be precise, the proposed split is $(275, 274)$ and in each matched pair of players it is randomly decided who gets the additional point.[35] If the bargaining solution in SPLIT with small asymmetry is perceived as unfair by weak players but a majority of strong players are willing to accept an equal split, the conflict probability in SPLIT-50-50 could be lower than in SPLIT-SMALL and also lower than in DEMAND-SMALL (where coordination failure may still occur).

The results on conflict probabilities and rejection probabilities are summarized in Figure 5. We find that the likelihood of conflict in SPLIT-50-50 is even slightly higher than

[34] Apart from the change in the proposed division, the setup is exactly as in SPLIT-SMALL outlined in Section 2.2. We have nine independent observations from 72 subjects who took part in this treatment.

[35] This allocation rule makes the SPLIT-50-50 treatment most comparable to the SPLIT-SMALL treatment, keeping the exact same total value of the prize as well as complete information on the proposed split. Moreover, players in the DEMAND treatment can implement the exact same allocation endogenously.

in Split-Small (36.8% compared to 33.6%; the difference is statistically insignificant). Consequently, there is significantly more conflict in Split-50-50 than in Demand-Small (p-value is 0.069). Thus, an equal split is not the "fair" division that every individual prefers. Quite the contrary, the rejection probability of the stronger player (player A with the effort cost $c_A = 4$) significantly increases to 35.1%. In turn, the rejection probability of the weaker player (player B with the effort cost $c_B = 5$) who is favored by the equal division significantly decreases to 8.3%. For both players A and B, the difference of the rejection probability in Split-50-50 compared to Split-Small is highly significant (p-value<0.001); compare Figure 5b. These results can again be explained by relative standing comparisons, causing a larger share of players A to prefer conflict where their expected payoff is higher than B's expected payoff. Note also that player i's rejection probability in Split-50-50 is higher in case of an allocation $(s_i, s_{-i}) = (274, 275)$ than in case of $(s_i, s_{-i}) = (275, 274)$ (see Appendix A.6). Some subjects seem to not like being worse off even by a single point, but we do not want to stress this finding which may be an artifact of the design with the uneven size of the prize.[36] Overall, a change in the proposed division to an equal split does not reduce the conflict probability. Rather, endogenous demand choices seem to adjust better to potential heterogeneity across individuals if power is almost balanced.

To illustrate this latter point, suppose there are two types of individuals across players A and B: on the one hand, individuals who find the Nash bargaining solution appropriate (but would also accept a higher share if offered) and, on the other hand, individuals who find the equal split appropriate (but would also accept a higher share if offered). Then, in Split-50-50 the probability of conflict is equal to the probability that A is a 'Nash-bargaining-type.' In Split-Small, the probability of conflict is equal to the probability that B is an 'equal-split-type.'[37] In Demand-Small, however, if players demand the share which they find appropriate, the probability of conflict is strictly lower: Conflict occurs only if A is a 'Nash-bargaining-type' and at the same time B is an 'equal-split-type.'

4.4.2 SPLIT treatments with unadjusted mediation proposal

A second set of control treatments is also based on the Split treatment. In these treatments, the exogenous mediation proposals are not adjusted to changes in the relative fighting strengths. In one variant, although the asymmetry in fighting strengths is small, the exogenous division proposed is derived as in the case with large asymmetries (Split-Small-

[36] Note, however, that this finding is also in line with the observation that a substantial amount of subjects in Demand-Small (in particular, advantaged players A) choose a share $s_i = 275$, even though this more than doubles the likelihood of conflict compared to a choice of $s_i = 274$.

[37] Compare the rejection probabilities in Figure 5b: Conflict is mainly triggered by player A in Split-50-50 and by player B in Split-Small.

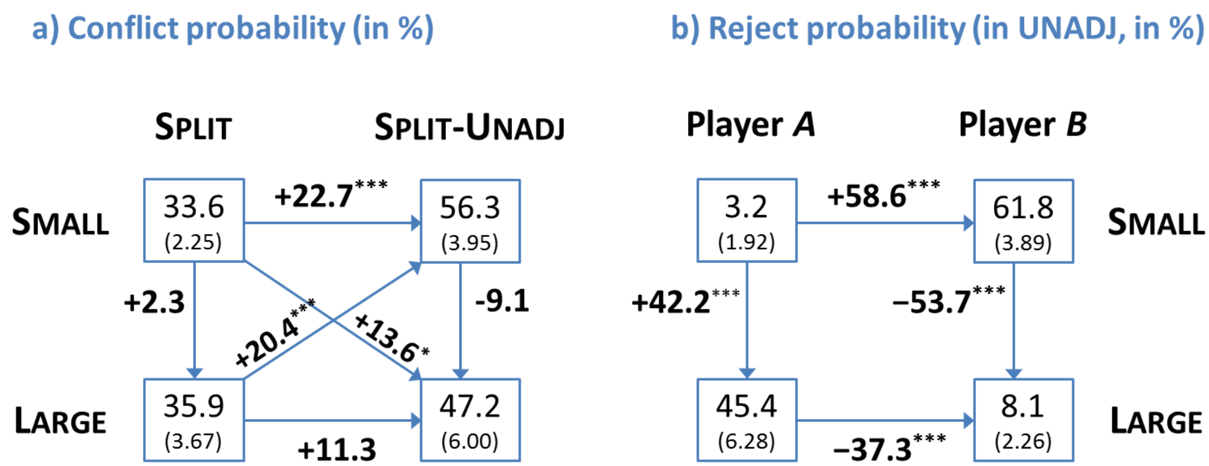

Figure 6: Conflict probability and rejection probability in the SPLIT-UNADJUSTED treatments with small and large asymmetry.

Note: Calculated are mean and standard error (in parentheses) of the probability that the game proceeds to the contest stage (panel a) and of the probability that a player rejects the exogenous division (panel b) for the SPLIT-UNADJ treatment. Values based on matching group averages (8 subjects over 30 rounds per matching group). Differences between SPLIT and SPLIT-UNADJ and between SMALL and LARGE are tested using Mann Whitney U tests and differences between players A and B are tested using Wilcoxon signed-rank tests; tests on the matching-group level (18 observations per test), ***(*) significant at the 1% (10%) level.

UNADJUSTED); in the other variant, the asymmetry in fighting strengths is large but the exogenous division is as in the case with small cost asymmetry (SPLIT-LARGE-UNADJUSTED).[38]

Figure 6 illustrates the main results of these control treatments and shows that the conflict probability is substantially increased if the exogenous mediation proposal does not take into account the changes in the relative fighting strengths.[39] With small cost asymmetry but a highly asymmetric split, the disadvantaged player's rejection probability increases further (to 61.8%) while the advantaged player's rejection probability becomes even lower (3.2%). With large cost asymmetry but a weakly asymmetric split, the exogenous mediation proposal becomes unfavorable from the point of view of the player with the low fighting cost who rejects the exogenous mediation proposal with high probability (45.4%); the player with the high fighting cost, however, strongly reduces his rejection probability (to 8.1%). As

[38] That is, one variant has $(c_A, c_B) = (4, 5)$ and $(s_A, s_B) = (427, 122)$ and the other variant has $(c_A, c_B) = (2, 7)$ and $(s_A, s_B) = (305, 244)$. Apart from the change in the proposed division, the setup is exactly as in SPLIT outlined in Section 2.2. For each variant we have nine independent observations from 72 subjects.

[39] With large asymmetries, the difference in conflict probabilities in SPLIT and SPLIT-UNADJUSTED is not significant using non-parametric tests on matching group averages; it becomes significant at the 5% level when using observations from late rounds only (rounds 16-30 or 21-30, for instance). For a time series of average choices in SPLIT-UNADJUSTED see Appendix A.8.

in Split-50-50, a substantial share of the players with the advantage in terms of fighting strengths are not willing to accept divisions that do not appropriately reflect their fighting advantage. Altogether, the results of these control treatments together with the original Split treatments and with Split-50-50 show a clear monotonicity of the players' rejection probability in the share offered to them. Moreover, they demonstrate the importance of making the mediation proposal a function of the relative fighting strengths.

4.4.3 DEMAND treatments with focal point

Third, to investigate the reasons for the increase in the conflict probability in the Nash demand game with large asymmetry we conduct a variant of the Demand treatment in which a possible division of the prize is suggested to the players in stage 1 when choosing the share of the prize they want to receive. This suggested division is fully non-binding but may serve as a focal point and solve the problem of multiple equilibria. The suggested division corresponds to the Nash bargaining solution; thus, the resulting Demand-Focal treatments can be considered intermediate treatments between the original Split and Demand.[40] If conflict is mainly driven by a failure to coordinate on one of the multiple equilibria and if the Nash bargaining solution is among the acceptable allocations (at least for many subjects), the likelihood of conflict should be lower in the Demand-Focal treatments than in the Demand treatments without a focal point, especially in the case of large asymmetry.

We find that even when a possible division is suggested to facilitate coordination (as implemented in Demand-Focal), conflict becomes more likely if power asymmetry is increased (compare rows Small and Large in Figure 7). When suggesting a division, the conflict probability slightly increases in case of small asymmetry (from 26.9% to 32.0%) and slightly decreases in case of large asymmetry (from 53.2% to 51.2%); in both cases, however, the difference is statistically insignificant. Similarly, the effect on individual demands is only weak, even though average individual demands are slightly closer to the focal point (see Appendix A.7).[41] As in the Demand treatment without focal point (Result 5), individual demand is increasing in a player's relative fighting strength, with the differences being significant at the 1% level.

The results of the control treatments suggest that the increased conflict probability in case of an imbalance of power and endogenous demands can only partially be explained by

[40] We ran this treatment for the case of small asymmetry and for the case of large asymmetry between players, each case with 72 subjects in total (nine independent observations each). Except for mentioning the possible division in the instructions and on the screen, the setup remains exactly as outlined in Section 2.2.

[41] This change in average individual demands is mainly driven by more individuals choosing a demand in the neighborhood of the focal point. This also implies that less individuals choose demands of 274 or 275 when the focal point is introduced; this effect is strongest in case of small asymmetry.

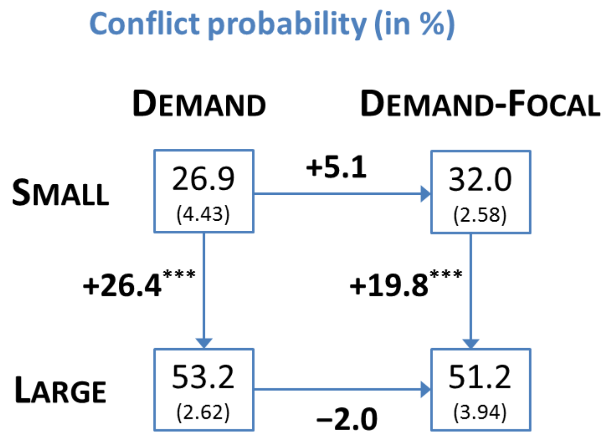

Figure 7: Conflict probability in the DEMAND-FOCAL treatments with small and large asymmetry.

Note: Calculated are mean and standard error (in parentheses) of the probability that the game proceeds to the contest stage for the DEMAND-FOCAL treatment (compared to DEMAND without focal point). Values based on matching group averages (8 subjects over 30 rounds per matching group). Differences between DEMAND and DEMAND-FOCAL and between SMALL and LARGE are tested using Mann Whitney U tests; tests on the matching-group level (18 observations per test), *** significant at the 1% level.

coordination failure and the fact that an equal split as coordination device is less appealing. Rather, the increased conflict probability in DEMAND-LARGE may be linked to the individual heterogeneity observed. If players differ in some relevant characteristics, such as their subjective value of winning the contest, their perception of win probabilities in the conflict or their views on which split would be 'socially appropriate,'[42] this turns the Nash demand game into a game under incomplete information. In line with the much higher variance of individual choices under large asymmetry, the individual perceptions of winning the conflict or the normative views on which splits would be appropriate may be more dispersed if the asymmetry between players is increased.[43] A higher variance of the distribution of types is generally considered to lead to a higher likelihood of conflict when bargaining in the shadow of conflict (Reed 2003; Wittman 2009).[44]

[42] Heterogeneity in the views on the socially appropriate allocation may be less of an issue under the exogenous mediation proposal in SPLIT. But it might make agreement most difficult in DEMAND-LARGE when increasing asymmetry makes it more likely that the two players' views are misaligned. See also Krupka and Weber (2013) for an elicitation of (context-specific) views on socially appropriate allocations in dictator games.

[43] The histograms of individual demands in the DEMAND treatment in Appendix A.5 illustrate the higher variance of choices under large asymmetry compared to small asymmetry.

[44] Also compare Morrow (1989) on the role of misperceptions and incomplete information for the probability of war.

5 Conclusion

We have studied whether a balance of power or an imbalance of power leads to a higher likelihood of conflict. As Wittman (1979) hypothesized, the distribution of power should not matter for the emergence of conflict if players can bargain over the peace dividend, taking into account their respective conflict strengths. Our experimental results provide a richer picture. The results support Wittman's hypothesis for the case of a simple bargaining mechanism that makes it easy for players to coordinate. If, however, the bargaining mechanism involves elements of peaceful appropriation, strategic uncertainty, and coordination problems, the balance of power matters: Higher asymmetries in fighting strengths make the problem of strategic uncertainty more severe. Consequently, higher asymmetry leads to a higher probability of bargaining failure and conflict.

In our baseline treatments, players decide whether or not to accept an exogenous division of the prize (implemented by the laboratory as a shortcut for the Nash bargaining solution). Disadvantaged players are more likely to reject the resulting division, leading to a positive overall conflict probability. Moreover, in control treatments we establish that advantaged players are more likely to reject divisions that do not correspond to their relative fighting advantage. But a higher asymmetry between players does not significantly affect the overall conflict probability if the exogenous mediation proposal reflects the relative fighting strengths. If, instead, bargaining follows the rule of the Nash demand game, players have to coordinate their peaceful demands. In case of a small asymmetry between players, there is a tendency to split the prize evenly, which may serve as a focal point and facilitate coordination even if stronger players do not consider it appropriate. With larger asymmetry, however, the strategic uncertainty in the Nash demand game becomes more important and individual demands become more dispersed. Although average demand choices adjust to the relative fighting strengths, bargaining fails to reach a peaceful agreement in more than half of the cases; this holds even when the Nash bargaining solution is suggested to the players as a possible allocation. Empirically, bargaining power is biased toward the player who is disadvantaged in the contest; with large asymmetry in fighting strengths, successful bargaining outcomes basically allocate the entire peace dividend to the player with the higher fighting cost.

What does our experimental study tell us on how to avoid conflict between individuals? Our results underline the importance of the institutional structure of bargaining. These institutional bargaining rules matter, even in a context of perfect information. Coordination or a possible failure to coordinate constitute a major efficiency problem. We expect this finding to be relevant in situations of distributional conflict that may turn into a fight or, more generally, into a scenario in which players choose resource-wasteful investments to influence an allocation decision. Such efficiency problems may be even more severe in a context of incomplete information. Here, bargaining behavior may, in addition, have informational value because it serves as a signal of players' strengths. This implies strategic considerations and reputation concerns which may make players less willing to compromise. If the institutional bargaining environment involves strategic uncertainty, it may be difficult to agree even in a context of perfect information.

As discussed in the theory of international politics, the process of negotiations and conflict between states is likely to have multiple actors, committee decision-making, multiple audiences of actors, elements of repetition, reputational aspects, and many other dimensions. Many of these dimensions are removed by construction from our experiment (as they are in Wittman's main analysis). Our experimental results draw attention to aspects that may also potentially be relevant when country leaders negotiate and international conflict emerges from the leaders' failure to reach a peaceful outcome. For instance, country leaders may have relative standing considerations which may originate from reelection concerns or, more generally, from political competition in the home country.

Also, our results may illustrate the ambivalent role of mediation and its interplay with the complexity of the negotiation problem. Our results speak in favor of a mediator as an effective way to prevent resource-wasteful conflict in the presence of coordination problems. The treatments with the exogenous division mechanism effectively propose an "equitable" settlement. Such binding third-party suggestions for settlement make the outbreak of a contest seemingly less dependent on whether parties to the conflict are rather symmetric or asymmetric. This outcome depends, of course, on whether the conflicting parties perceive the proposed division as being in line with their relative fighting strengths. Information regarding the perceived fighting strengths as well as the feasibility of the corresponding peaceful division become crucial for successful mediation. Our results have shown that exogenous mediation becomes more effective for conflict resolution in situations where fighting power is imbalanced and coordination is difficult to achieve.

Acknowledgments

We thank Tom Cusack, Wolfgang Leininger, Jeremy Lucchetti, Jan-Peter Siedlarek, Raphael Soubeyran, Elmar Wolfstetter, participants of seminars and workshops in Bonn (SFB-TR-15), Brisbane (QUT), Caputh (SFB-TR-15), Frankfurt, Innsbruck, Jena (MPI), Munich (MPI) and Tutzing (SFB-TR-15) and of the APET Conference in Seattle 2014, the ESA Meeting in Prague 2014, the 8th Maastricht Behavioral and Experimental Economics Symposium 2015, the 14th Journées Louis-André Gérard-Varet, the IIPF congress in Dublin 2015 and the Annual Congress of the Verein für Socialpolitik in Münster 2015. Moreover, we thank MELESSA of the University of Munich for providing laboratory resources and Ludwig Grill for programming the experiment. Financial support from the German Research Foundation (DFG, grant no. SFB-TR-15) is gratefully acknowledged.

References

[1] Anbarci, Nejat and Nick Feltovich, 2013, How sensitive are bargaining outcomes to changes in disagreement payoffs?, Experimental Economics 16(4), 560-596.

[2] Anbarci, Nejat and Nick Feltovich, 2015, How fully do people exploit their bargaining position? The effects of bargaining institution and the 50–50 norm, Working paper, http://www.deakin.edu.au/~nejata/ndgreal.pdf.

[3] Anbarci, Nejat, Stergios Skaperdas and Constantinos Syropoulos, 2002, Comparing bargaining solutions in the shadow of conflict: How norms against threats can have real effects, Journal of Economic Theory 106(1), 1-16.

[4] Anderson, Lisa R. and Sarah L. Stafford, 2003, An experimental analysis of rent seeking under varying competitive conditions, Public Choice 115, 199-216.

[5] Balafoutas, Loukas, Rudolf Kerschbamer and Matthias Sutter, 2012, Distributional preferences and competitive behavior, Journal of Economic Behavior & Organization 83(1), 125-135.

[6] Bartling, Björn, Ernst Fehr, Michel André Maréchal and Daniel Schunk, 2009, Egalitarianism and competitiveness, American Economic Review Papers and Proceedings 99(2), 93-98.

[7] Baye, Michael R., and Heidrun C. Hoppe, 2003, The strategic equivalence of rent-seeking, innovation, and patent-race games, Games and Economic Behavior 44(2), 217-226.

[8] Beardsley, Kyle, 2011, The mediation dilemma, Cornell University Press.

[9] Benson, Brett V., Adam Meirowitz and Kristopher W. Ramsay, 2014, The distribution of power and the risk of war in crisis bargaining, http://www.princeton.edu/~ameirowi/working/neutrality_070614.pdf.

[10] Bercovitch, Jacob, and Scott S. Gartner, 2009, New approaches, methods, and findings in the study of mediation. In: Jacob Bercovitch and Scott S. Gartner (eds.): International Conflict Mediation: New Approaches and Findings, New York: Routledge, 1-15.

[11] Bercovitch, Jacob and Gerald Schneider, 2000, Who Mediates? The Political Economy of International Conflict Management, Journal of Peace Research 37(2), 145-165.

[12] Blainey, Geoffrey, 1988, The Causes of War, 3rd ed. New York: The Free Press.

[13] Boyce, Christopher J., Gordon D.A. Brown and Simon C. Moore, 2010, Money and happiness: rank of income, not income, affects life satisfaction, Psychological Science 21(4), 471-475.

[14] Cason, Timothy N., William A. Masters and Roman M. Sheremeta, 2013, Winner-Take-All and Proportional-Prize Contests: Theory and Experimental Results, Working Paper, http://ssrn.com/abstract=2014994.

[15] Chadefaux, Thomas, 2011, Bargaining over power: When do shifts in power lead to war?, International Theory 3(2), 228-253.

[16] Cornes, Richard and Roger Hartley, 2007, Aggregative public good games, Journal of Public Economic Theory 9(2), 201-219.

[17] Clark, Derek J. and Christian Riis, 1998, Contest success functions: An extension, Economic Theory 11(1), 201-204.

[18] Claude, Inis L., 1962, Power and International Relations, New York: Random House.

[19] Davis, Douglas D. and Robert J. Reilly, 1998, Do many cooks always spoil the stew? An experimental analysis of rent seeking and the role of a strategic buyer, Public Choice 95(1/2), 89-115.

[20] Dechenaux, Emmanuel, Dan Kovenock, and Roman M. Sheremeta, 2015, A survey of experimental research on contests, all-pay auctions and tournaments, Experimental Economics 18(4), 609-669.

[21] Dohmen, Thomas, Armin Falk, David Huffman, Uwe Sunde, Jürgen Schupp and Gert G. Wagner, 2011, Individual risk attitudes: Measurement, determinants, and behavioral consequences, Journal of the European Economic Association 9(3), 522-550.

[22] Eisenkopf, Gerald, and André Bächtiger, 2012, Mediation and conflict prevention, Journal of Conflict Resolution 57(4), 570-597.

[23] Fearon, James D., 1995, Rationalist explanations for war, International Organization 49(3), 379-414.

[24] Ferris, W.M., 1973, The Power Capabilities of Nation-States: International Conflict and War, Lexington, Mass: Lexington Books.

[25] Fischbacher, Urs, 2007, Z-tree: Zurich tool box for ready-made economic experiments, Experimental Economics 10(2), 171-178.

[26] Frank, Robert H., 1984a, Are workers paid their marginal products?, American Economic Review 74(4), 549-571.

[27] Frank, Robert H., 1984b, Interdependent preferences and the competitive wage structure, Rand Journal of Economics 15(4), 510-520.

[28] Frank, Robert H., 1985a, The demand for unobservable and other nonpositional goods, American Economic Review 75(1), 101-116.

[29] Frank, Robert H., 1985b, Choosing the Right Pond: Human Behavior and the Quest for Status, Oxford University Press, New York.

[30] Fullerton, Richard L. and R. Preston McAfee, 1999, Auctioning entry into tournaments, Journal of Political Economy 107(3), 573-605.

[31] Garnham, David, 1976, Power parity and lethal international violence, 1969-1973, Journal of Conflict Resolution 20(3), 379-394.

[32] Grafen, Alan, 1987, The logic of divisively asymmetric contests: Respect for ownership and the desperado effect, Annimal Behavior 35, 462-467.

[33] Greiner, Ben, 2004. An Online Recruitment System for Economic Experiments. In: Kurt Kremer, Volker Macho (eds.): Forschung und wissenschaftliches Rechnen 2003. GWDG Bericht 63, Göttingen: Ges. für Wiss. Datenverarbeitung, 79-93.

[34] Gulick, Edward V., 1955, Europe's Classical Balance of Power: A Case History of the Theory and Practice of One of the Great Concepts of European Statecraft, Ithaca, NY: Cornell University Press.

[35] Hirshleifer, Jack and John G. Riley, 1992, The Analytics of Uncertainty and Information, Cambridge University Press, Cambridge UK.

[36] Hirsch, Fred, 1976, Social Limits to Growth, Harvard University Press, Cambridge, MA.

[37] Hörner, Johannes, Massimo Morelli and Francesco Squintani, 2015, Mediation and peace, Review of Economic Studies 82(4), 1483-1501.

[38] Hörtnagl, Tanja, Rudolf Kerschbamer, Rudi Stracke and Uwe Sunde, 2013, Heterogeneity in rent-seeking contests with multiple stages: Theory and experimental evidence, Working Papers in Economics and Statistics 2013-29, University of Innsbruck.

[39] Houweling, Henk and Jan G. Siccama, 1988, Power transitions as a cause of war, Journal of Conflict Resolution 32, 87-102.

[40] Jackson, Matthew O. and Massimo Morelli, 2011, The reasons for wars: an updated survey. In: Christopher J. Coyne, Rachel L. Mathers (eds.): The Handbook on the Political Economy of War, Cheltenham, UK: Edward Elgar, 34-57.

[41] Jordan, James S., 2006, Pillage and property, Journal of Economic Theory 131(1), 26-44.

[42] Lacomba, Juan A., Francisco Lagos, Ernesto Reuben and Frans van Winden, 2014, On the escalation and de-escalation of conflict, Games and Economic Behavior 86, 40-57.

[43] Kaplan, Morton A., 1957, System and Process in International Politics, New York: John Wiley & Sons.

[44] Ke, Changxia, Kai A. Konrad and Florian Morath, 2015, Alliances in the shadow of conflict, Economic Inquiry 53(2), 854-871.

[45] Kim, Woosang and James D. Morrow, 1992, When do power shifts lead to war?, American Journal of Political Science 36(4), 896-922.

[46] Kimbrough, Erik O., Jared Rubin, Roman M. Sheremeta and Timothy Shields, 2015, Commitment problems in conflict resolution, Journal of Economic Behavior and Organization 112, 33-45.

[47] Kimbrough, Erik O. and Roman M. Sheremeta, 2013, Side-payments and the costs of conflict, International Journal of Industrial Organization 31(3), 278-286.

[48] Kimbrough, Erik O. and Roman M. Sheremeta, 2014, Why can't we be friends? Entitlements and the costs of conflict, Journal of Peace Research 51(4), 487-500.

[49] Kimbrough, Erik O., Roman M. Sheremeta and Timothy Shields, 2014, When parity promotes peace: Resolving conflict between asymmetric agents, Journal of Economic Behavior and Organization 99, 96-108.

[50] Konrad, Kai A. and Kjell Erik Lommerud, 1993, Relative standing comparisons, risk taking, and safety regulations, Journal of Public Economics 51(3), 345-358.

[51] Krupka, Erin L. and Roberto A. Weber, 2013, Identifying social norms using coordination games: Why does dictator game sharing vary?, Journal of the European Economic Association 11(3), 495-524.

[52] Kuziemko, Ilyana, Ryan W. Buell, Tally Reich and Michael I. Norton, 2014, "Last-place aversion": Evidence and redistributive implications, Quarterly Journal of Economics 129(1), 105-149.

[53] Kydd, Andrew H., 2010, Rationalist approaches to conflict prevention and resolution, Annual Review of Political Science 13, 101-121.

[54] Levy, Jack S., 1987, Declining power and the preventive motivation for war, World Politics 40(1), 82-107.

[55] McBride, Michael and Stergios Skaperdas, 2014, Conflict, settlement, and the shadow of the future, Journal of Economic Behavior and Organization 105, 75-89.

[56] Morgenthau, Hans, 1948, Politics Among Nations: The Struggle for Power and Peace, New York: Alfred A Knopf.

[57] Morrow, James D., 1989, Capabilities, Uncertainty, and Resolve: A Limited Information Model of Crisis Bargaining, American Journal of Political Science 33(4), 941-972.

[58] Nash, John F., 1953, Two-person cooperative games, Econometrica 21(1), 128-140.

[59] Organski, Abramo F.K., 1958, World Politics, New York: Alfred A. Knopf.

[60] Organski, Abramo F.K. and Jacek Kugler, 1980, The War Ledger, Chicago: The University of Chicago Press.

[61] Parker, Geoffrey A., 1974, Assessment strategy and the evolution of fighting behavior, Journal of Theoretical Biology 47, 223-243.

[62] Piccione, Michele and Ariel Rubinstein, 2007, Equilibrium in the jungle, Economic Journal 117(522), 883-896.

[63] Powdthavee, Nattavudh, 2009, How important is rank to individual perception of economic standing? A within-community analysis, Journal of Economic Inequality 7, 225-248.

[64] Powell, Robert, 1996, Bargaining in the shadow of power, Games and Economic Behavior 15(2), 255-289.

[65] Powell, Robert, 1999, In the Shadow of Power: States and Strategies in International Politics, Princeton: Princeton University Press.

[66] Powell, Robert, 2002, Bargaining theory and international conflict, Annual Review of Political Science 5, 1-30.

[67] Reed, William, 2003, Information, power, and war, American Political Science Review 97(4), 633-641.

[68] Roth, Alvin E., and J. Keith Murnighan, 1982, The role of information in bargaining: An experimental study, Econometrica 50(5), 1123-1142.

[69] Sánchez-Pagés, Santiago, 2009, Conflict as a part of the bargaining process, Economic Journal 119(539), 1189-1207.

[70] Schaffer, Mark E., 1988, Evolutionary stable strategies for a finite population and a variable contest size, Journal of Theoretical Biology 132(4), 469-478.

[71] Schneider, Gerald and Ulrike Sabrina Krämer, 2004, The limitations of fair division: An experimental evaluation of three procedures, Journal of Conflict Resolution 48(4), 506-524.

[72] Sieberg, Katri, David Clark, Charles Holt, Timothy Nordstrom and William Reed, 2013, An experimental analysis of asymmetric power in conflict bargaining, Games 4(3), 375-397.

[73] Skaperdas, Stergios, 1996, Contest success functions, Economic Theory 7(2), 283-290.

[74] Szidarovszky, Ferenc and Koji Okuguchi, 1997, On the existence and uniqueness of pure Nash equilibrium in rent-seeking, Games and Economic Behavior 18(1), 135-140.

[75] Smith, Adam C., Daniel Houser, Peter T. Leeson and Ramin Ostad, 2014, The costs of conflict, Journal of Economic Behavior and Organization 97, 61-71.

[76] Tammen, Ronald L., 2008, The Organski legacy: A fifty-year research program, International Interactions 34, 314-332.

[77] Tullock, Gordon, 1980, Efficient rent-seeking. In: J.Buchanan et al. (eds.), Toward a Theory of the Rent-Seeking Society, College Station, TX: Texas A&M Press.

[78] Umbeck, John, 1981, Might makes rights: A theory of the formation of initial distribution of property-rights, Economic Inquiry 19(1), 38-59.

[79] Wagner, R. Harrison, 1994, Peace, war, and the balance of power, American Political Science Review 88(3), 593-607.

[80] Wagner, R. Harrison, 2000, Bargaining and war, American Journal of Political Science 44(3), 469-484.

[81] Wallensteen, Peter, and Isak Svensson, 2014, Talking peace: international mediation in armed conflicts, Journal of Peace Research 51(2), 315-327.

[82] Waltz, Kenneth N., 1979, Theory of International Politics. Reading, MA: Addison Wesley.

[83] Wittman, Donald, 1979, How a war ends: A rational model approach, Journal of Conflict Resolution 23(4), 741-761.

[84] Wittman, Donald, 2009, Bargaining in the shadow of war: When is a peaceful resolution most likely?, American Journal of Political Science 53(3), 588-602.

[85] Wohlforth, William C., Richard Little, Stuart J. Kaufman, David Jang, Charles A. Jones, Victoria Tin-Bor Hui, Arthur Eckstein, Daniel Deudney and William L. Brenner, 2007, Testing balance-of-power theory in world history, European Journal of International Relations 13(2), 155-185.

[86] Wright, Quincy, 1965, A Study of War, Chicago: University of Chicago Press.

A Appendix

A.1 Theory prediction

Stage 1: Bargaining shares			
		Player A	Player B
Split	Small	$s_A = 305$	$s_B = 244$
	Large	$s_A = 427$	$s_B = 122$
Demand	Small	$s_A \in [169.4, 440.5]$	$s_B \in [108.4, 379.6]$
	Large	$s_A \in [332.1, 521.9]$	$s_B \in [27.1, 216.9]$
Stage 2: Conflict behavior			
		Player A	Player B
Contest effort x_i^*	Small	33.9	27.1
	Large	47.4	13.5
Effort cost $c_i x_i^*$	Small	135.6	135.6
	Large	94.9	94.9
Expected conflict payoff π_i^*	Small	169.4	108.4
	Large	332.1	27.1

Note: Small: effort cost $(c_A, c_B) = (4, 5)$; Large: effort cost $(c_A, c_B) = (2, 7)$. For Split, stage 1 bargaining shares are outcomes of a Nash bargaining game with equal bargaining power. For Demand, stage 1 bargaining shares are choices in efficient equilibria of Nash demand game only. In the experiment, choice of shares in Demand and effort levels are restricted to integers.

Table A.1: Theory prediction for bargaining shares and conflict behavior.

A.2 Regression analysis

A panel regression analysis confirms the findings of the non-parametric tests on the summary statistics. Table A.2 presents results from two sets of random-effects logistic regressions of the individual choice as to whether to reject the exogenous division in Split and in Split-50-50, respectively. Table A.3 presents results from two sets of random-effects regressions: Tobit regressions of the individual demand chosen in Demand and in Demand-Focal; and Tobit regressions of the individual effort choice in the stage 2 contest. All estimations include an individual's effort cost parameter as the main independent variable (assuming for simplicity a linear effect of the stage 2 effort cost). Moreover, we include socioeconomic information from the post-experimental questionnaire and a number of individual-specific control variables generated in post-experimental tests. All regressions include "risk_general," which is a self-reported measure for the willingness to take risk on an increasing scale from 0 to 10, "risk_lottery," which measures the number of investments in lotteries with different win probabilities (on a scale from 0 to 5), dummy variables indicating "prosocial" or "envious" behavior in individual two-person allocation decisions and a dummy variable "ambiguity averse." As socioeconomic variables we include age, gender, field of study, semester, and number of siblings.

In line with the non-parametric tests, we find that being the disadvantaged player B (having a higher cost of effort) leads to a significantly higher probability of rejecting the Nash bargaining solution in Split but to a significantly lower probability of rejecting the equal split in Split-50-50 (compare the coefficient of "cost" in estimations 1-3 and 4-6 of Table A.2). Including the lagged choice of "reject" in estimations 2 and 5 shows that subjects who rejected in previous rounds are also more likely to reject the proposed split in the current round (see also the average individual rejection probabilities in Appendix A.4 which shows that a substantial share of subjects never reject the proposed split). Estimations 3 and 6 control for the player's role in the previous round: "low_cost$_{t-1}$" is equal to 1 if the player was assigned the role as the advantaged player A in round $t-1$. Further we include a player's payoff in the previous round expressed in percentage of the prize ("payoff$_{t-1}$/prize in %"). Neither the previous role nor the previous payoff significantly influence current rejection decisions. In terms of individual characteristics we find that a higher willingness to take risks is positively correlated with the reject probability and that the variable for prosocial behavior is negatively correlated with the reject probability in Split-50-50.

Table A.3 shows that demand choices in the Nash demand game are significantly decreasing in the stage 2 effort cost (see the coefficient of "cost" in estimations 1-3).[45] Including

[45] While the demand estimations pool the data from Demand and Demand-Focal, running separate regressions on the two subsamples yields qualitatively very similar results.

	(1)	(2)	(3)	(4)	(5)	(6)
Sample		SPLIT			SPLIT-50-50	
Dep. variable	Choice of "reject" in stage 1			Choice of "reject" in stage 1		
constant	-5.73***	-6.06***	-5.88***	7.56***	8.56***	8.19***
	(1.09)	(1.03)	(1.15)	(2.41)	(2.27)	(2.52)
cost	0.54***	0.55***	0.53***	-2.65***	-2.82***	-2.72***
	(0.03)	(0.03)	(0.03)	(0.17)	(0.19)	(0.18)
reject_{t-1}		0.86***			0.98***	
		(0.11)			(0.18)	
low_cost_{t-1}			-0.14			-0.24
			(0.11)			(0.15)
payoff_{t-1}/prize in %			-.0001			.0008
			(0.001)			(0.002)
risk_general	0.32***	0.29***	0.33***	0.37**	0.33**	0.36**
	(0.09)	(0.08)	(0.09)	(0.15)	(0.14)	(0.15)
risk_lottery	0.57***	0.56***	0.63***	0.77**	0.69**	0.77**
	(0.20)	(0.19)	(0.21)	(0.32)	(0.30)	(0.34)
prosocial	-0.15	-0.12	-0.13	-1.37*	-1.32*	-1.44*
	(0.48)	(0.45)	(0.51)	(0.76)	(0.71)	(0.80)
envious	0.49	0.45	0.51	0.46	0.37	0.42
	(0.42)	(0.40)	(0.45)	(0.65)	(0.61)	(0.69)
ambiguity averse	0.33	0.30	0.33	0.15	0.11	0.08
	(0.33)	(0.31)	(0.35)	(0.58)	(0.54)	(0.60)
Socioeconomics	yes	yes	yes	yes	yes	yes
Obs	4320	4176	4176	2160	2088	2088

Note: Estimations 1 to 3 are random-effects logistic regressions of the rejection probability in SPLIT (144 individuals); Estimations 4 to 6 are random-effects logistic regressions of the rejection probability in SPLIT-50-50 (72 individuals); the dependent variable is equal to 1 if a subject chose rejection and 0 otherwise. "cost" is a player's effort cost in round t, "reject_{t-1}" is equal to 1 if i chose "reject" in round $t-1$ and 0 otherwise; "low_cost_{t-1}" is equal to 1 if i was in the role of the advantaged player A in round $t-1$; "payoff_{t-1}/prize in %" is i's realized payoff in round $t-1$ in % of the prize; the remaining variables are control variables on risk and distributional preferences from the exit questionnaire. ***(**,*) significant at the 1% (5%,10%) level.

Table A.2: Regression of rejection probabilities.

the lagged dependent variable ("demand$_{t-1}$") in estimation 2 shows a positive correlation of individual demands over time, in line with the observed heterogeneity among subjects. Estimation 3 of Table A.3 includes a subject's role ("low cost$_{t-1}$") and payoff ("payoff$_{t-1}$") in the previous round; both variables do not significantly explain the current demand. On the other hand, the coefficient of the dummy variable "conflict$_{t-1}$" which indicates that bargaining was not successful in the previous round is positive and significantly different from zero. Note, however, that this finding is related to the positive coefficient of "demand$_{t-1}$" (since higher demands make conflict more likely) and cannot directly be interpreted in the sense that the experience of conflict drives demands up. Finally, the willingness to take risks is positively correlated with the share demanded.

Estimations 4 and 5 of Table A.3 reveal that effort is significantly lower the higher a player's effort cost. Due to space constraints, the estimations of stage 2 effort choices pool the data from the treatments Split, Split-50-50, Demand, and Demand-Focal. Estimation 5 includes a subject's role and payoff in the previous round and the indicator variable for the bargaining outcome ("conflict$_{t-1}$"). We find a negative but economically small effect of a subject's payoff in the previous round. This effect is, however, not robust to different subsample specifications so we do not want to over-interpret it. The explanatory power of the individual-specific characteristics is mixed: Positively correlated with the effort choice are a higher willingness to take risks and the indicator variable for envious behavior.

	(1)	(2)	(3)	(4)	(5)
Sample	DEMAND and DEMAND-FOCAL			DEMAND, DEMAND-FOCAL, SPLIT and SPLIT-50-50	
Dep. variable	Demand (in %) in stage 1			Units of effort in stage 2	
constant	75.4***	73.9***	76.1***	59.4***	62.3***
	(3.38)	(3.21)	(3.29)	(6.37)	(6.41)
cost	-6.48***	-6.60***	-6.58***	-8.80***	-8.89***
	(0.07)	(0.07)	(0.07)	(0.21)	(0.20)
demand_{t-1} in %		0.06***			
		(0.01)			
low_cost_{t-1}			-0.17		0.08
			(0.28)		(0.74)
payoff_{t-1}/prize in %			-0.001		-.0.02**
			(0.004)		(0.01)
conflict_{t-1}			1.33***		0.65
			(0.31)		(0.75)
risk_general	0.70***	0.62**	0.64**	1.69***	1.62***
	(0.26)	(0.25)	(0.26)	(0.50)	(0.51)
risk_lottery	1.30**	1.25**	1.24**	1.25	0.87
	(0.62)	(0.58)	(0.60)	(1.15)	(1.16)
prosocial	-1.20	-1.14	-1.18	-1.08	-1.54
	(1.37)	(1.29)	(1.33)	(2.57)	(2.59)
envious	-1.47	-1.44	-1.50	3.95*	3.95*
	(1.19)	(1.12)	(1.15)	(2.27)	(2.28)
ambiguity averse	-0.46	0.27	0.32	-0.33	-0.60
	(0.98)	(0.93)	(0.95)	(1.88)	(1.89)
Socioeconomics	yes	yes	yes	yes	yes
Obs	8640	8352	8352	5824	5594

Note: Estimations 1 to 3 are random-effects Tobit regressions of the demand choice in DEMAND and DEMAND-FOCAL (288 individuals); the dependent variable is the demand in percentage points (truncated at 0 and 100). Estimations 4 and 5 are random-effects Tobit regressions of stage 2 effort (truncated at 0; 503/502 individuals); the dependent variable is the units of effort invested if players entered the conflict stage. "cost" is a player's effort cost in round t, "demand_{t-1}" is i's demand in round $t-1$; "low_cost_{t-1}" is equal to 1 if i was in the role of the advantaged player A in round $t-1$; "payoff_{t-1}/prize in %" is i's realized payoff in round $t-1$ in % of the prize; "fight_{t-1}" is equal to 1 if i entered stage 2 in round $t-1$; the remaining variables are control variables on risk and distributional preferences from the exit questionnaire. Standard errors in parentheses. ***(**,*) significant at the 1% (5%,10%) level.

Table A.3: Regression of demand choices and conflict efforts.

A.3 Payoffs conditional on whether bargaining was successful

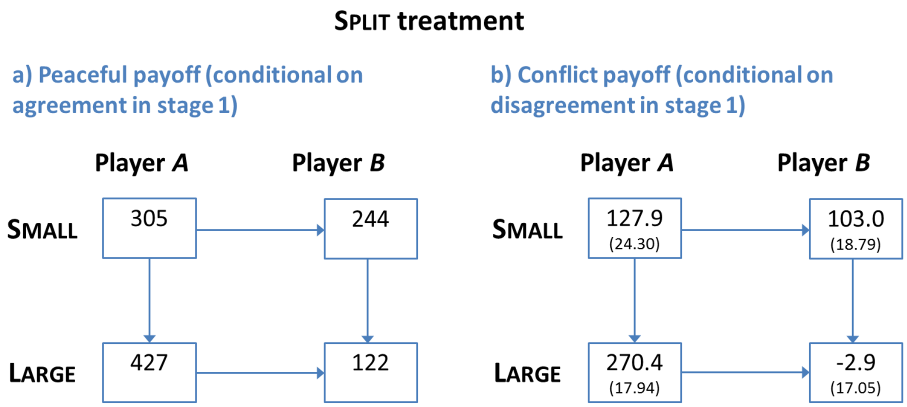

Figure A.1: Average payoffs in the SPLIT treatment.

Note: Calculated are mean and standard error (in parentheses) of payoffs in SPLIT if agreement has been reached in stage 1 (panel a) and if conflict takes place (panel b). Values based on matching group averages (8 subjects over 30 rounds per matching group).

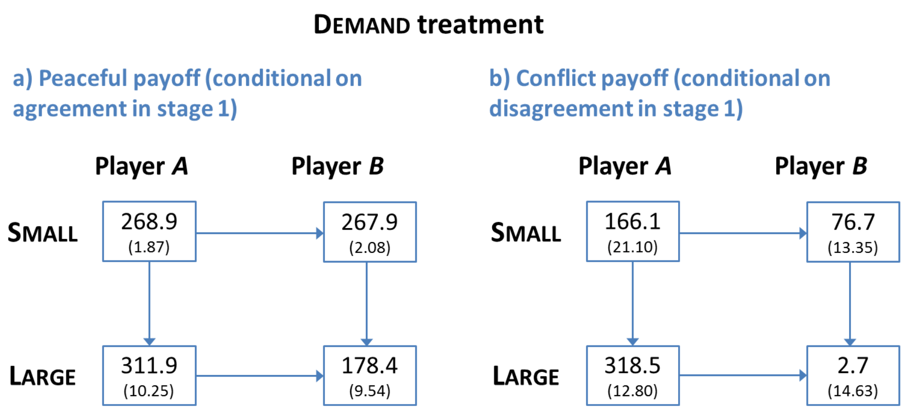

Figure A.2: Average payoffs in the DEMAND treatment.

Note: Calculated are mean and standard error (in parentheses) of payoffs in DEMAND if agreement has been reached in stage 1 (panel a) and if conflict takes place (panel b). Values based on matching group averages (8 subjects over 30 rounds per matching group).

A.4 Distribution of individual rejection rates (stage 1)

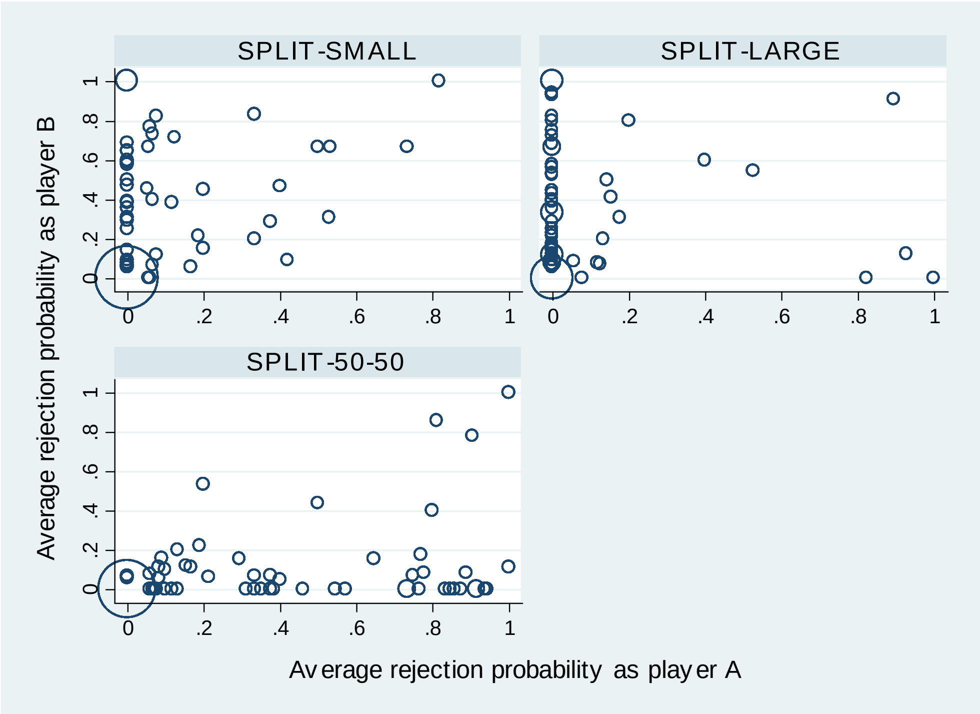

Figure A.3: Distribution of average rejection probabilities by subject in role of player A and player B, respectively, to identify subject heterogeneity in rejection behavior (markers weighted by frequency).

A.5 Distribution of individual demands (stage 1)

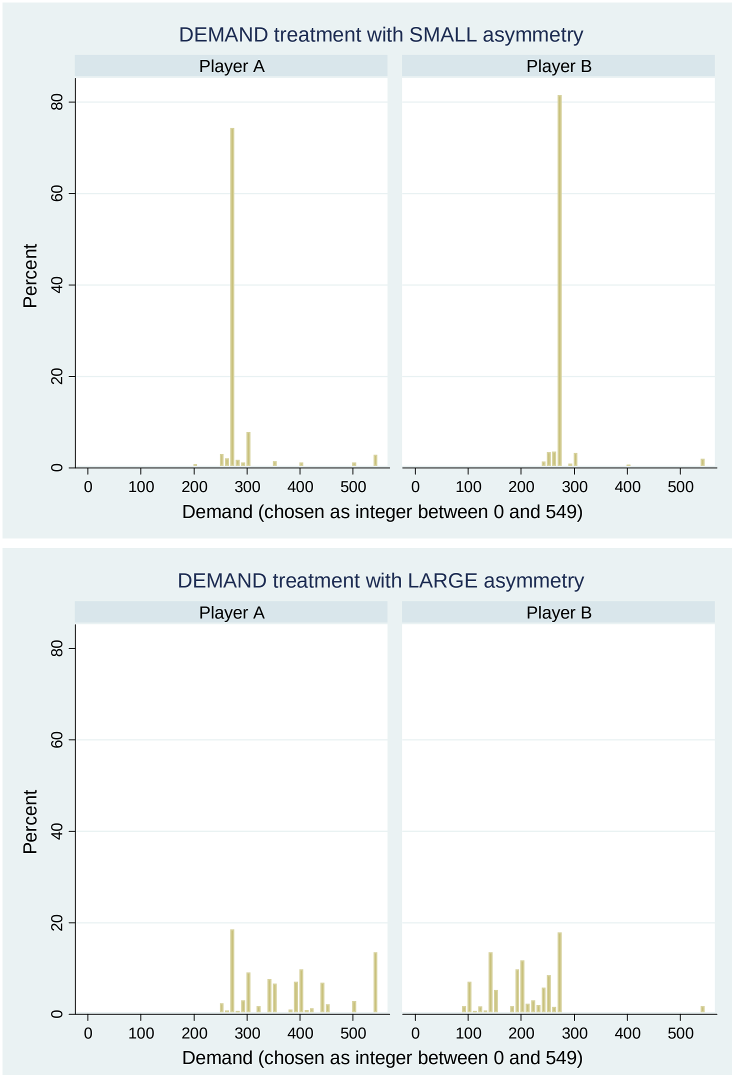

Figure A.4: Histograms of individual demands with SMALL and LARGE asymmetry (by player A and B).

A.6 Rejection probabilities in SPLIT-50-50 (stage 1)

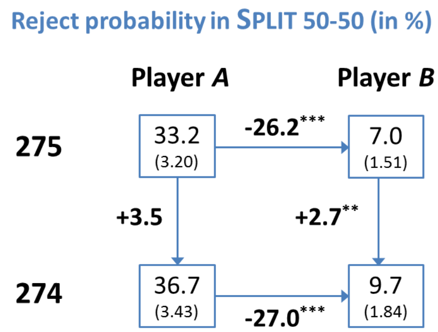

Figure A.5: Rejection probabilities in the SPLIT-50-50 treatment.

Note: Calculated are mean and standard error (in parentheses) of the probability that a player rejects the exogenous division in SPLIT-50-50, depending on whether the player is allocated 274 or 275 points in the exogenous division. Values based on matching group averages (8 subjects over 30 rounds per matching group). Differences are tested using Wilcoxon signed-rank tests on the matching-group level (18 observations per test), ***(**) significant at the 1% (5%) level.

A.7 Demands in DEMAND and DEMAND-FOCAL (stage 1)

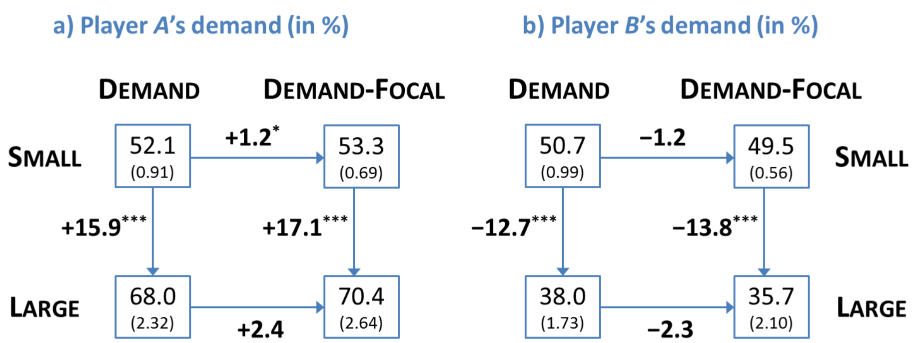

Figure A.6: Endogenous demands in the Nash demand game with and without focal point.

Note: Calculated are mean and standard error (in parentheses) of the demand (in % of the prize) for player A (panel a) and for player B (panel b) in DEMAND-FOCAL (compared to DEMAND). Values based on matching group averages (8 subjects over 30 rounds per matching group). Differences between SMALL and LARGE and between DEMAND and DEMAND-FOCAL are tested using Mann Whitney U tests; tests on the matching-group level (18 observations per test), ***(*) significant at the 1% (10%) level.

A.8 Dynamics and time patterns

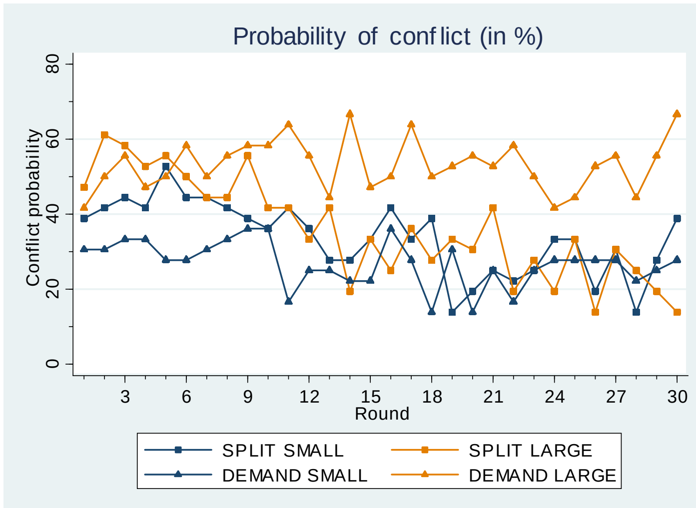

Figure A.7: Time series of conflict probabilities in the Split and in the Demand treatment, for Small and Large asymmetry.

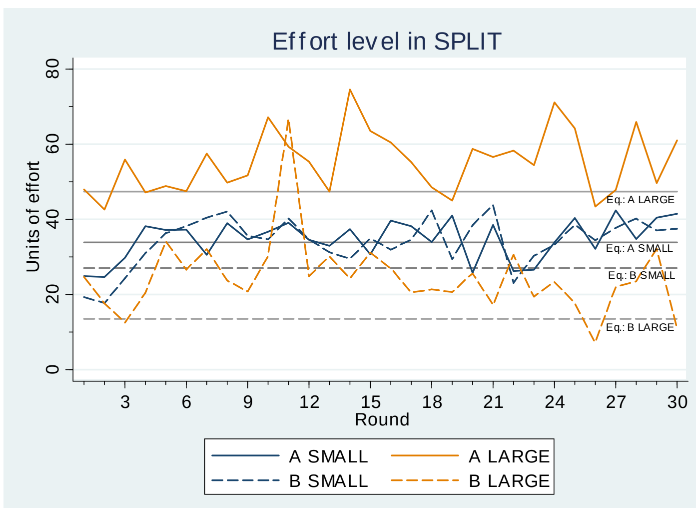

Figure A.8: Time series of units of effort in contests of the Split treatment, for Small and Large asymmetry (by A and B); the horizontal lines refer to the equilibrium predictions.

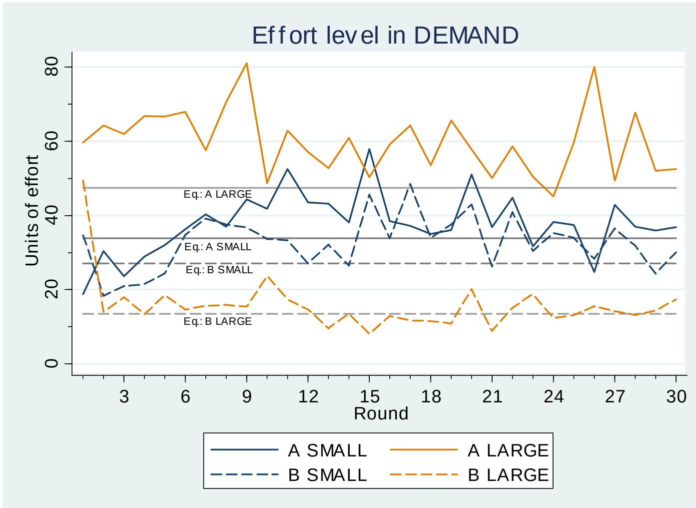

Figure A.9: Time series of units of effort in contests of the DEMAND treatment, for SMALL and LARGE asymmetry (by A and B); the horizontal lines refer to the equilibrium predictions.

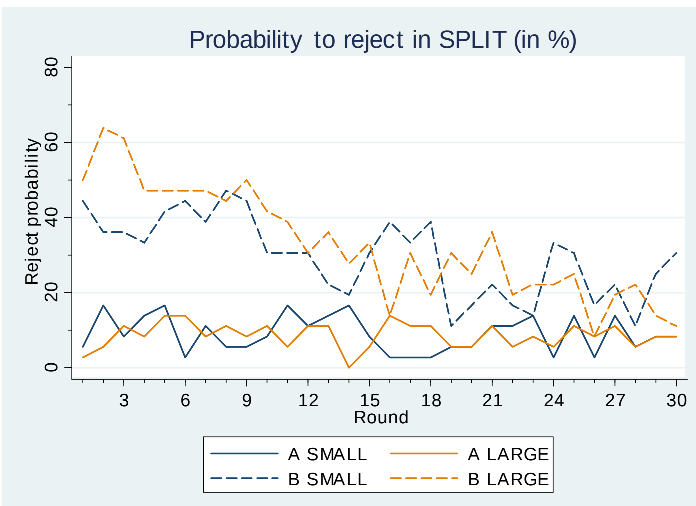

Figure A.10: Time series of rejection probabilities in the SPLIT treatment, for SMALL and LARGE asymmetry (by A and B).

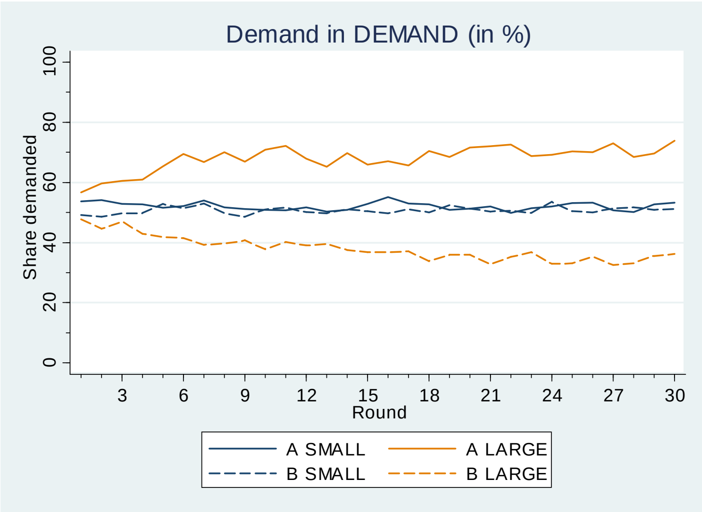

Figure A.11: Time series of demand choices (in % of the prize) in the DEMAND treatment, for SMALL and LARGE asymmetry (by A and B).

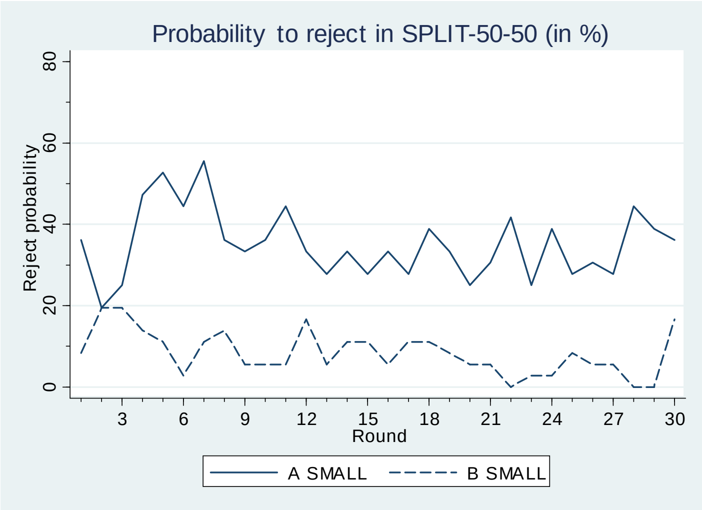

Figure A.12: Time series of rejection probabilities in the SPLIT-50-50 treatment, by A and B.

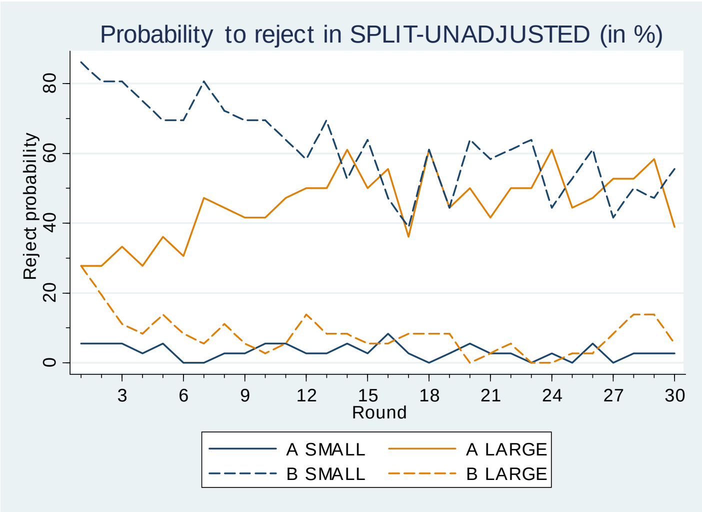

Figure A.13: Time series of rejection probabilities in the SPLIT-UNADJUSTED treatment, for SMALL and LARGE asymmetry (by A and B).

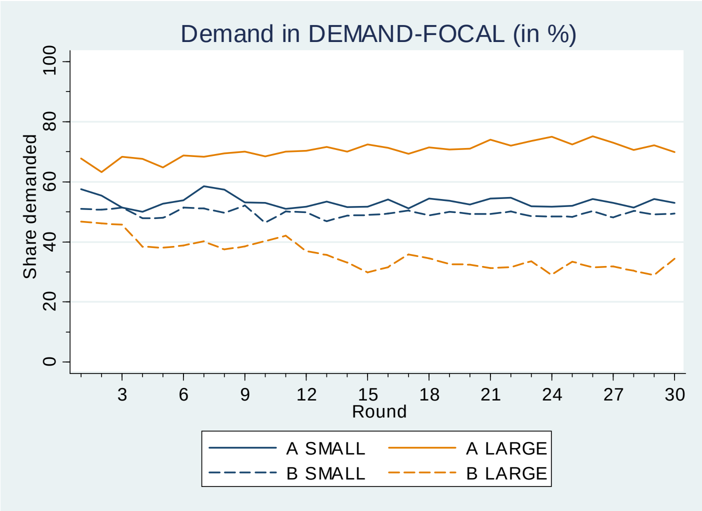

Figure A.14: Time series of demand choices (in % of the prize) in the DEMAND-FOCAL treatment, for SMALL and LARGE asymmetry (by A and B).

B Experimental instructions*

Welcome! Please read the following instructions carefully and completely. A full understanding of them might help you to earn more money.

Your earnings in this experiment will be measured in Talers. At the end of the experiment we will convert the Talers you have earned to cash and pay you in private. For every 50 Talers you earn you will be paid 1 Euro in cash. In addition, each participant will receive a show-up-fee of 4 Euros.

Please keep in mind that you are not allowed to communicate with other participants during the entire course of the experiment. If you do not obey this rule, you will be asked to leave the laboratory and you will not be paid. Whenever you have a question, please raise your hand and we will help you.

Your task In the main part of today's experiment, two participants will each make a decision on how to split 549 Talers. The two participants in such a pair are called "participant A" and "participant B." The division of the 549 Talers between participant A and participant B takes place in several stages.

Stage 1 **<<version of the SPLIT treatment>>** Both participants choose simultaneously and independently of each other whether they want to split the 549 Talers in the following way: A receives 305 Talers and B receives 244 Talers.

Subsequently, the choices of A and B are displayed on the screen.

- If both participants A and B decide in favor of the proposed split, then the 549 Talers are split as proposed and the division is completed.
- If both decide against the proposed split, then the division of the 549 Talers is decided in "stage 2."
- If one of the two participants decides in favor of the proposed split and the other decides against it, then there will be a random draw: In 9 out of 10 cases, the division of the 549 Talers is decided in "stage 2," and in 1 out of 10 cases, the 549 Talers will be split as proposed.

Stage 1 **<<version of the DEMAND treatment>>** Each participant decides how much of the 549 Talers he/she wants to receive. To do so, both participants choose simultaneously and independently of each other an integer between 0 and 549, that is, 0, 1, 2, ..., 549.

*This section contains a translation of the set of instructions for the SPLIT and for the DEMAND treatment, both for the case of SMALL asymmetry. Note that the instructions in these two treatments only differ in subsection "Stage 1" and in subsection "Summary," as indicated below.

Subsequently, the choices of A and B are displayed on the screen.

- If the sum of the amounts chosen by A and B is smaller than or equal to 549, then both get exactly the amount (in Talers) they have chosen for themselves and the division is completed.

- If the sum of the amounts chosen by A and B is greater than 549, then the division of the 549 Talers is decided in "stage 2."

Stage 2 Stage 2 of the experiment will be reached only if the 549 Talers were not divided in stage 1. In stage 2, the two participants A and B can buy "tokens." Both participants A and B simultaneously and independently choose an integer as their respective number of tokens, that is, 0, 1, 2, 3, etc. These tokens decide who will get the 549 Talers. The more tokens a participant buys, the more likely it is that he will get the 549 Talers.

Buying tokens is costly. Participant A has to pay 4 Talers per token, and participant B has to pay 5 Talers per token. Hence, participant A pays less per token than does participant B.

After both participants have chosen the number of tokens to buy, the screen will show a display of how many tokens A and B have bought. The computer assigns the 549 Talers to one of the participants. The probability that A will get the 549 Talers is exactly equal to the share of his tokens in the tokens bought by A and B together:

$$\text{Success probability of A} = \frac{\text{Tokens of A}}{\text{Tokens of A + tokens of B}}.$$

Participant B receives the 549 Talers with the corresponding probability:

$$\text{Success probability of B} = \frac{\text{Tokens of B}}{\text{Tokens of A + tokens of B}}.$$

If one of the two participants did not buy any tokens, the other participant receives the 549 Talers. If none of the players bought any tokens, then each participant's success probability is 50%.

Note that the more tokens a player buys, the more likely it is that he will get the 549 Talers in stage 2, but the more Talers have to be paid as a cost of the tokens. On the computer screen it will be possible to compute the Talers to be paid for arbitrary choices of tokens. Moreover, you can compute success probabilities for any number of tokens potentially chosen by you and your co-player.

In the experiment the success probabilities are illustrated by a circular area on the screen. The area is divided into two colors: the red segment represents the success probability of A and the blue segment represents the success probability of A. An arrow on the circular area will first rotate before stopping randomly. Depending on where the arrow stops (in the red or the blue segment), A or B will get the 549 Talers.

Summary **<<version of the SPLIT treatment>>** The division of the 549 Talers between two participants A and B takes place in up to two stages.

- In stage 1, both A and B choose whether they want to split the 549 Talers as proposed by the laboratory.
- Stage 2 is reached only if the division was not completed in stage 1. If stage 2 is reached, both A and B can buy tokens. The number of tokens bought determines whether A or B will get the 549 Talers.

Summary **<<version of the DEMAND treatment>>** The division of the 549 Talers between two participants A and B takes place in up to two stages.

- In stage 1, both A and B choose how many Talers to receive for themselves.
- Stage 2 is reached only if the division was not completed in stage 1. If stage 2 is reached, both A and B can buy tokens. The number of tokens bought determines whether A or B gets the 549 Talers.

Procedure The main part of the experiment consists of 30 identical and independent rounds. In each of these rounds, 549 Talers will be divided between two participants each, according to the rules described above. In each round, the co-player will be randomly and newly assigned to you; hence, your co-player will typically vary across rounds. You will not know the identity of your respective co-player. Any attempt to reveal your identity is prohibited.

Furthermore, it will be randomly decided in each round whether you are participant A or participant B in this round. Hence, in each round, it will be randomly decided who (you or your co-player) will be assigned the low (and the high, respectively) cost per token.

At the end of today's experiment, your Talers earned in three out of the 30 rounds will be added up and the cost for tokens possibly bought in these rounds will be deducted. The resulting amount will be converted to Euros (50 Talers = 1 Euro). The earnings of the other rounds will not be paid to you. For these other rounds, however, you do not have to pay the cost of tokens bought either. Which three out of the 30 rounds are relevant for your payoff will be determined only at the end of this experiment.

In addition, you will receive 10 Euros that will be added to your earnings (gain or loss) in the three randomly selected rounds. In addition, you will receive a show-up-fee of 4 Euros. The resulting amount will be paid to you in cash.

Before the experiment starts, you will be asked some questions about the experiment on the screen. These questions should illustrate the rules of the experiment by means of different examples. After the experiment, you will be asked for some additional information. All the information you provide will be kept anonymous and strictly confidential.

We would like to thank you in advance for participating and wish you good luck!