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Bargaining Outside the Lab –

A Newspaper Experiment of a Three-Person Ultimatum Game[*]

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Abstract

In a large scale newspaper experiment 5,132 readers of the German weekly, *Die Zeit*, participated in a three-person bargaining game. In our data analysis we focus on (1) the influence of age, gender, profession and the medium chosen for participation on bargaining behavior and on (2) the external validity of student behavior (inside and outside the lab). We find that older participants and women care more about equal distributions and that Internet users are more self-regarding than those using mail or fax. Decisions made by students in the lab are rather similar to those made by students in the newspaper experiment. Furthermore, student behavior is not different from non-student behavior when the same age group is considered, indicating a high degree of external validity of student data.

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I. Introduction

Newspaper experiments have recently become popular, because they address a possibly large audience from the general public instead of the typical student subject pool. Due to the much broader audience, newspaper experiments provide a suitable tool to test the often disputed external validity of usual laboratory experiments with student participants. Furthermore, newspaper experiments offer the chance to study the influence of socio-economic or demographic factors – which have very limited variation with student participants – on economic decision making. Since readers of prestigious newspapers – such as the Financial Times in which a newspaper experiment on the guessing game has been run (Thaler, 1997) – are often important decision makers in society, one may even observe the economic decision making of a special, and important, segment of a society.

So far, newspaper experiments have been run almost exclusively on the guessing game (Nagel, 1995; Bosch-Domenech et al., 2002) for which fairness, distributional concerns or other social motives play no role. Since social motives are very important in many economic decisions – think of bargaining, charitable giving, political decisions on social welfare, etc. – it is rather surprising that newspaper experiments have only very recently been run on other games than the guessing game.[1]

In this paper, we present the results of a newspaper experiment on a bargaining game, which was run in the German weekly, *Die Zeit*, in November 2001. A total of 5,132 individuals, ranging in age from 8 years to 96 years, participated via mail, fax or Internet. We can control for several characteristics of experimental participants and concentrate in our analysis of the data on the following research questions: First, how do socio-demographic

[1] Cabrales and Nagel (2002) have used the platform of *Spektrum der Wissenschaft* (the German version of Scientific American) for a modified public goods game. Güth et al. (2003) have run a two-person ultimatum game with readers of the *Berliner Zeitung*, however without eliciting socio-economic or demographic data.

variables like gender, age or education influence bargaining behavior? Second, has the medium chosen for participation (mail, fax, Internet) an impact on bargaining behavior? Third, and most important, is student behavior (in the lab and in the newspaper experiment) different from the behavior of non-students in the newspaper experiment, and, if so, how? Answering these questions will contribute to the discussion on the external validity of student data in the laboratory by exploiting a rather large dataset and it will promote a better understanding of the determinants of bargaining behavior in a more diverse subject pool than typically used in laboratory experiments.

As the experimental task, we have chosen a three-person ultimatum game (studied previously in the laboratory by Güth and van Damme, 1998). In this game, the proposer (X) suggests how to distribute a pie of DM 1,200 (about € 600) among himself, the responder (Y), and the dummy player (Z). If the responder accepts the proposal, then all three players receive their corresponding share, otherwise, in case of rejection, all receive zero.

We have chosen this extension of the standard two-person ultimatum game for several reasons. Compared to the standard two-person ultimatum game, the three-person ultimatum game offers a much richer structure for studying social motives. The three-person game integrates aspects of the two-person ultimatum game as well as of the two-person dictator game. It includes the strategic interaction between the proposer and a responder with veto power and, in addition, forces the proposer and the responder to consider the powerless third party (person Z). Hence, we can analyze how the responder's decision to accept or reject a given proposal depends both on the own share *and* on the share allocated to the dummy. This very feature of the three-person game implies that the responder may have to weigh concerns regarding disadvantageous inequality (towards the proposer) against concerns with regards to advantageous inequality (towards the dummy). Such a tradeoff between both types of inequality and the associated consequences for the responder's own material payoff is absent

in the standard two-person games (like the ultimatum or the dictator game) meaning that in the latter games the relative importance of advantageous versus disadvantageous inequality can only be assessed by taking data from different subjects who act in different roles. In comparison, observing the responder's behavior in the three-person game allows a within-subject control of the relative impact of both types of inequality on the responder's decision. In our view the three-person game is a more appropriate tool to study behavioral motives when inequality and fairness considerations are involved. Findings for this richer game may have implications for the ongoing debate on how to model social preferences.

Of course, using the standard two-person ultimatum game might have entailed a much broader set of laboratory experiments to compare newspaper data to. Camerer (2003, p. 115) even asks for a "moratorium on creating ultimatum data". But we wanted to shift attention to a structurally richer game, and still compare our newspaper data to stylized facts from two-person ultimatum games and to the laboratory behavior in the three-person game. Our three-person experiment is not simply 'another ultimatum game', but differs from previous studies by its very large number of participants and the variance in the subject pool with respect to several (controlled) characteristics. This data set allows checking the external validity of student data both from our newspaper experiment and from the laboratory (Güth and van Damme, 1998).

Furthermore, the three-person ultimatum game is also interesting from a theoretical perspective as to how social preferences might shape bargaining behavior. Bolton and Ockenfels (1998) rely in their analysis of the three-person ultimatum game on their ERC-model of inequity aversion (Bolton and Ockenfels, 2000). They show that the proposer will offer around one third of the pie to the responder, and a much smaller amount (probably slightly above the minimum) to the dummy. The driving force for this prediction is that a subject cares for his relative payoff share (compared to *all* other interacting partners) in

addition to his own payoff. Thus, the proposer does not fear a rejection by the responder when he offers almost nothing to the dummy. One may question the assumption that – *given* the share y – the responder does not care at all about the distribution of the remaining pie between the proposer X and the dummy Z. This assumption is not necessary in the model of Fehr and Schmidt (1999) on self-centered inequity aversion, though. According to their model, one relates the own payoff to the payoffs of all others in pairwise comparisons. Depending on a subject's sensitivity to (dis)advantageous inequality (captured by parameters α and β) one can then derive predictions for the game.[2] Using, for instance, Fehr and Schmidt's (1999) estimations of the distribution of α and β in the two-person ultimatum game (see Table III on p. 844 of their paper) one arrives either at the same prediction as Bolton and Ockenfels (1998), namely that the proposer allocates one third to the responder and the minimum to the dummy, or at a prediction where the proposer and responder share the pie almost equally, leaving only the minimum amount to the dummy.[3]

A major shortcoming of such an analysis is that the distribution of inequality aversion (parameters) will probably depend on socio-demographic factors like age, gender or the medium chosen for participation. One of the appealing features of a newspaper experiment is that one can gather data on a very large and rather diverse subject pool and check the external

[2] The crucial assumption is, of course, that one party (X) must be aware of the distribution of inequality aversion (parameters).

[3] Both predictions from the Fehr and Schmidt (1999)-model are almost equally likely, and depend on the proposer's idiosyncratic parameters to α and β. The distribution of parameters α and β in the paper by Fehr and Schmidt is based on two-person ultimatum game data, though, and hence it need not capture the role of inequity aversion in the three-person game adequately. There is still a long way to go to identify the distribution of the α and β parameters across different games and across different subject pools. One recent attempt to estimate the distribution in a representative sample of the Dutch population in a two-person ultimatum game is Bellemare et al. (2005).

validity of student data and gain insights into the influence of socio-demographic factors. Gathering and systematically analyzing such data may ultimately advance our theoretical understanding of the factors determining human behavior.

The rest of the paper is organized as follows: Section II discusses some methodological differences between laboratory and newspaper experiments and presents our experimental design and some general media data on readers of *Die Zeit*. Section III reports aggregate data on participation, and section IV analyzes the results, with an emphasis on the influence of socio-demographic factors and on the external validity of student data. Section V relates our results to the prevailing literature and concludes.

II. Experimental design

II.A. A general methodological note on newspaper versus laboratory experiments

Before presenting the experimental design used in *Die Zeit* let us address some methodological differences between laboratory and newspaper experiments. Newspaper experiments are run under different conditions than laboratory experiments. The advantage of addressing a much larger subject pool via a newspaper might, therefore, come at some cost.

First, there is the issue of selection bias. Choosing a certain newspaper already implies a selection bias due to the characteristics of its readership. Typically, newspapers willing to engage in an experiment have a rather large share of well-educated readers (see Bosch-Domenech et al., 2002, for a list of newspaper experiments). However, this selection bias is analogous to the bias in laboratory experiments when students participate, because students are not a random sample from the general population, but rather originate from the relatively better educated and possibly richer segments of society. Another kind of selection bias is present in newspaper experiments, because one usually has no control which readers self-

select into participation. Yet, the same is true in laboratory experiments with students. As far as we are aware of, there is no study examining whether those students volunteering for participation in experiments are systematically different from those that never participate in an experiment.

Second, there is the practical issue of how and when to present the experimental task. In the laboratory, students get to know the task only after they have registered for the experiment.[4] In newspaper experiments, it has so far always been the case that readers know the experiment when deciding to participate. Whether this creates a selection bias is open to further investigation. One possible control would be to run a newspaper experiment sequentially where readers are first asked whether they want to participate and only then receive the experimental instructions. This would enhance the experimental control, but could greatly discourage participation (as the journalist of *Die Zeit* argued forcefully).

Finally, newspaper and laboratory experiments differ in the way a task is presented. Since newspapers want to 'sell' content, they prefer to put an experiment into a social context which serves as a teaser to attract readers' interest. In our case, the editing journalist used words like "rational principles", "sensible decisions" or "emotions" to stress the importance of the experiment and used the frame of brothers (for X, Y and Z) in the experimental instructions. Although we would have preferred a more neutral frame and wording, we had to accept the newspaper's editing in order to sustain the cooperation for running the experiment.

[4] Of course, students (in particular those with experience in participation) have a fairly good idea about the possible types of tasks.

II.B. The experimental design used in *Die Zeit*

Die Zeit is a well-known German weekly magazine, which is widely read by academics, top-level executives and politicians. According to the independent media analyst *Arbeitsgemeinschaft Media-Analyse* (http://mediadaten.zeit.de/mediadaten/md/leserschaft), there are about 1.03 million readers per issue (with about 456,000 copies sold), of which 59% are male. 37% of *Die Zeit*-readers are below the age of 40, and 53% are between 20 years and 49 years old. About two thirds of readers are graduates of a secondary school or have a university degree (compared to 15.5% in the German population). 43% have a net household income of 3,000 Euro or more per month (compared to 16.4% of the German population), and 29% of readers are independents, upper-level managers or senior officers.

The instructions for the experiment were proposed by the authors, and the journalist, Christoph Drösser, did the final editing (see App. A for a translated version of the introduction motivating the experiment and the instructions published in *Die Zeit* on November 1, 2001). The instructions introduce (i) the pie of DM 1,200, (ii) the three players/brothers X, Y, and Z, and (iii) the rules, namely that X proposes a vector (x, y, z) with $x + y + z = 1{,}200$. To limit the number of possible vectors, we let $x \in \{0, 200, 400, 600, 800, 1000\}$ and $y, z \in \{100, 200, 300, 400, 500, 600\}$.

Participants have to decide in both roles X and Y. Of the 18 possible proposals (x, y, z) a subject in the role of X has to select one (see App. B for the decision form). In the role of Y, a subject has to determine for all 18 proposals (x, y, z) whether to accept or reject any of them (strategy method for Y[5]). Acceptance implies that a subject in the role of X earns the amount

[5] The strategy method allows for independent decision making of the interacting parties in a sequential game and it delivers a much richer data set than the 'play method' where subjects in the role of Y would only have to react to one particular proposal by X. Roth (1995, p. 322f.) discusses in more detail the possible

x, and Y and Z the amounts *y* and *z*, respectively. In case of a rejection all three parties earn nothing. In addition to choosing a strategy vector, subjects were requested to submit their expectations of the most frequent behavior in the role of X, respectively Y, by all participants. We thus can check whether a participant regards his own behavior as typical, what could be due to a false consensus.

The instructions informed participants that 18 of them would be randomly selected for actual payments by partitioning them into 6 groups of three players each and by randomly assigning the roles X, Y, and Z in each group. Furthermore, seven participants could win a prediction prize of DM 400 for correctly predicting (in their submission on expectations) the most frequent strategy vector.

III. General data on participation

Participation was possible either by cutting out the form from the newspaper, filling it out, and mailing or faxing it, or by using a computerized fill-out form that was available on the

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advantages and disadvantages of the strategy method. Note that from a rational choice-perspective such procedural aspects should not matter.

Internet site of *Die Zeit*. In total, 5,132 subjects participated in our experiment[6], of which 32.8% used mail and 9.5% fax, whereas 57.7% participated via the Internet (see Table 1).[7]

Table 1 about here

A submission was classified as valid when subjects had given their full address and indicated the chosen proposal (as well as the most frequently expected proposal) in the role of X, whether they accepted or rejected any of the 18 different proposals in the role of Y and the corresponding expectations. Even though we tried to stress in the instructions that only completely filled-out decision and prediction forms would be valid, we received some incomplete submissions. The few invalid mail submissions (3.4%) were mainly due to missing data on some decisions. The many invalid faxes (40.8%) were due to the partly

[6] Besides the 5,132 individual submissions, we had 426 submissions which were filled out in classroom situations (at universities or in secondary schools) on the initiative of the respective instructors, without former contact to the authors, and which were sent collectively, or with summary statistics only, to us by the instructors. In their accompanying letters, instructors indicated that they had used the experiment as an illustration of game theory or methods of social science research in general. We do not consider these classroom submissions in the following analysis, because participation was compulsory and data reveal clearly that students regarded the experiment rather as a practical exercise of game theory than a real bargaining experiment.

[7] In addition to the huge number of submissions, we received about 100 comments, some of them five pages long, from participants debating our design and its (dis)advantages and conjecturing about, or simply asking for our research interests and intentions. The frequency and diligence of the comments shows that many participants actually invested quite some time thinking about the experiment.

colored decision form[8], and the very few invalid Internet submissions (0.2%) were caused by nonsensical addresses.

Table 2 about here

In addition to making all necessary decisions and providing an address, participants were asked on a voluntary basis to state their age and their profession and/or education. Gender was inferred unambiguously from the first name of participants in 96.4% of valid submissions (see Table 2), and 68% of identified participants were male. We did not ask explicitly for gender, because that could have induced implicit demand effects.

In total, 3,844 participants with valid submissions (79%) indicated their age, which ranged from 8 years to 96 years. The overall average age was 40.6 years. Internet participants with an average age of 36.6 years were significantly younger than participants using either mail or fax, averaging 46.6 and 48.2 years, respectively ($p < 0.001$, *t*-test).

With respect to profession, 3,364 participants revealed their profession and/or their education. This allowed us to distinguish five different groups with respect to profession: Academic professionals (subjects below 66 years stating an academic title or indicating a job that regularly requires an academic education; 1,548 submissions), nonacademic professionals (735), retired persons (258), students (626), and pupils (195).[9]

[8] The layout staff of *Die Zeit* thought that a partly colored form would help in filling out the form, which was probably true for mail submissions. Unfortunately, many faxes became illegible due to the coloring.

[9] Unemployment was mentioned in two cases.

IV. Results

Our large data set is, first, analyzed on the aggregate level, including only the 4,869 valid submissions. Second, we examine the determinants of behavior by controlling for participants' characteristics with respect to chosen medium, age, gender and profession. Third, we address the issue of external validity by comparing student and non-student behavior.

IV.A. Aggregate data analysis

IV.A.1. Proposer behavior

Figure 1 shows the actual and expected decisions in the role of proposer. Below the horizontal axis you see the shares allocated to members X, Y and Z in a given proposal (column). Only a few proposals have a relative frequency such that it is visible on the vertical axis.[10] Most notably, 56.8% of participants choose the *equal split* (400,400,400). The second most frequent proposal made by 15.9% of participants is (600,500,100). We refer to this proposal as the *power coalition* since the players with strategic power (X and Y) share (more or less equally) the pie by exploiting the dummy. The *game theoretic benchmark* (1000,100,100) is the third most frequent choice by 8.3% of participants. In total, the three most frequent proposals account for 81% of all proposals.

Averaging over all decisions in the role of X, we can calculate average shares allocated to X, Y and Z, respectively. The average proposer keeps 42.5% of the pie for himself, allocates 33% to the responder and 24.5% to the dummy.

[10] Proposals with a relative frequency of 0.1% or less are indistinguishable from the horizontal axis. Further details on absolute and relative frequencies can be found in the working paper version of this paper (see Güth et al., 2002).

Figure 1 about here

With regards to expectations, most participants (61.3%) expect their own proposal to be the most frequent one. In particular, the majority of participants (64.2%) expect the equal split to be most frequent, whereas the power coalition is expected as most frequent by 13.3% of the participants. Only 5% expect the game theoretic benchmark as the most frequent choice.

Our expectation data reveal a rather strong false consensus effect (Mullen et al., 1985; Engelmann and Strobel, 2000) in that subjects expect their own behavior to be more common in the larger population than it is estimated by subjects who engage in alternative behavior. For instance, 82% of participants choosing the equal split expect the equal split to be the most frequent proposal. However, only 41% of participants *not* choosing the equal split expect it to be most frequent. A similar degree of false consensus prevails also among participants choosing the power coalition or the game theoretic benchmark.

IV.A.2. Responder behavior

Figure 2 shows actual and expected acceptance decisions. Note that the proposals on the horizontal axis are sorted such that the share y is increasing from left to right. For a given share y the proposals are ordered ascending in the share z. The equal split is the most often and almost always accepted proposal. All other proposals are accepted significantly less often. The second most frequent proposal, the power coalition (600,500,100), is accepted by about two thirds of participants only. The three offers assigning to Y only DM 100, including the game theoretic benchmark, have the lowest acceptance rates of roughly 22% each. A general

pattern of behavior in the role of Y is that all proposals with $y \geq 400$ are accepted by a majority of subjects, whereas proposals with $y < 400$ are rejected by a majority (see the proposals to the left and to the right of the dashed line in Figure 2).

Figure 2 about here

IV.A.3. Interdependence of proposer and responder behavior

Considering the actual response behavior, the proposal maximizing the expected payoff for the proposer is, indeed, the equal split, with an expected payoff of DM 387.8. The power coalition (600,500,100) yields the second highest expected payoff of DM 384.3. However, this proposal involves a considerably higher probability of rejection. The game theoretic benchmark (1000,100,100) yields an expected payoff of only DM 219.6.

Since subjects had to make decisions both in the role of X and Y, we can address two further aspects of the interdependence of both types of decisions. First, 97.6% of subjects accept as Y their own proposal as X, showing a high consistency of decisions. Second, the number of accepted proposals in the role of Y seems to be related to the chosen proposal in the role of X. Subjects who accept only a single proposal ($N = 524$) are predominantly those who choose the equal split as proposers (476 out of the 524). Subjects who accept all 18 different proposals most frequently propose the game-theoretic benchmark (383 out of 1030 subjects who accept all proposals).

IV.B. Decisions and socio-demographic variables

IV.B.1. The determinants of proposer behavior

In Figures 3 and 4 we illustrate the influence of age, gender and medium of participation on the relative frequency of proposing the two most prominent allocations, i.e. the equal split (Figure 3) and the power coalition (Figure 4).[11] On the left hand side of Figures 3 and 4 we show the data for Internet submissions, separately for female and male participants. On the right hand side we present data for mail and fax submissions. We pool fax and mail submissions since age or gender of participants using these two media are not significantly different (refer to Table 2).

Figure 3 and Figure 4 about here

We present the influence of age by considering four age categories. The first one ("under 26") includes all pupils and most students. The second category ("26-45") captures the first half of professional life, and the third category ("46-65") its second half. The fourth age category ("over 65") represents the retirement phase.

According to Figure 3 the relative frequency of proposing the equal split increases almost always with higher age, irrespective of gender and the medium of participation. Almost

[11] Note that the relative frequencies in Figures 3 and 4 are based on different absolute frequencies (which can be found in the working paper version, Güth et al., 2002). In addition to data on age, gender, and medium of participation we have data on academic/non-academic profession. With respect to the analysis of proposer behavior, we have not found any significant differences between academic and non-academic professionals. Therefore, we do not account for profession in Figures 3 and 4.

exactly the reverse pattern is found in Figure 4 on the relative frequency of proposing the power coalition. Hence, our first observation is that proposing an equitable distribution gets more important and frequent with increasing age.

Female participants always choose the equal split significantly more often than male participants ($p < 0.05$; χ^2-tests), as is indicated by the downward trends of all lines in Figure 3. The reverse pattern can again be found in Figure 4, because male participants choose the power coalition always more often than female participants. Our second observation is, thus, that women care more for equity in their proposals than men. Male participants, on the contrary, are more likely to propose higher stakes for themselves than for the other players (most often by choosing the power coalition or the game theoretic benchmark).

Internet users typically propose the equal split less often than participants using mail or fax, even though the difference is only significant for men under 26 years. The power coalition is in most cases more frequently proposed in the Internet than by mail or fax. Thus, our third observation is that Internet users act more opportunistically than participants using mail or fax.

IV.B.2. The determinants of responder behavior

We have run probit regressions with the responder's decision to accept (=1) or reject (=0) any of the 18 different proposals as dependent variable (see Table 3 for the regression results).[12] Since individual acceptance decisions for all 18 proposals are likely to be correlated, a generalized estimation equation model for clustered ordinal data has been used (Heagerty and Zeger, 1996; Yan, 2002). We include structural and demographic variables as predictors.

[12] We would like to thank Dennis Dittrich for his invaluable help with the econometric estimations.

Table 3 about here

The structural variables are constructed from the allocation of shares in a given proposal. In particular, they measure the deviation of the share *y* for the responder from the share *x* of the proposer and from the share *z* of the dummy. By considering deviations in both directions, we arrive at four structural variables. If all of them were significantly negative, this would mean that acceptance rates were non-monotonic with a peak at the equal split (where all four structural variables would have the value zero). However, if acceptance rates depended monotonically on the responder's share y, then the signs of $max\{0,x-y\}$ and $max\{0,z-y\}$ should be negative and that of $max\{0,y-x\}$ and $max\{0,y-z\}$ positive.

In addition to the structural variables, we include a dummy for the chosen medium (1 for Internet, zero otherwise). In our model I, we add also age (in years) and gender (1 for male). Profession, respectively education, is controlled for in model II, where we include only working subjects, thereby excluding students, pupils and retired persons. We, then, split the working subjects into those with an academic degree (1) and those without (0) in order to test for the effects of an academic education on responder behavior. To determine the influence of the demographic variables on the structural variables, the respective first order interactions are also included in both models.

As can be seen from Table 3, age has a significantly negative impact on the probability to accept any of the 18 different proposals. Hence, older subjects accept fewer proposals. Male participants are more likely to accept proposals for any given set of structural variables (as can be seen by the significantly positive interaction terms). Participants using the Internet have higher acceptance probabilities, both in the main effect and the interaction effects. In general, academic professionals accept more proposals.

The signs of the structural variables show that the acceptance probability is increasing with the share *y* if this share is compared to the proposer's share *x* (see the negative effect of $max\{0,x-y\}$, and the positive one of $max\{0,y-x\}$). However, the acceptance probability is non-monotonic when we compare the share *y* with the share *z*, as can be judged from the negative marginal effects of both, $max\{0,z-y\}$ and $max\{0,y-z\}$. Hence, the probability to accept a proposal is higher the closer the share *z* is to the responder's share *y*, indicating a concern of the responder for the dummy's payoff.

Figure 5 about here

Given the non-linear model to analyze responder behavior, we note that evaluating the marginal effects at a specific value for the responder share *y*, for instance, requires further assumptions about the values of the other relevant variables. In order to provide a concise graphical display of the changes in the acceptance probability when the responder's share *y* increases, Figure 5 shows the mean predicted acceptance probabilities resulting from model 1 (in Table 3) for a given set of values. In particular, we have calculated the acceptance probabilities separately for female and male responders who are either 25 years or 65 years old – thus comparing the behavior of subjects who are basically at the beginning or the end of their working career – and who have either participated via the Internet or via mail and fax. Given that hardly any proposals with $z \geq 500$ have been made, we restrict the parameter space for *z* to $z \in \{100, 200, 300, 400\}$. For these combinations of gender (bold lines for men), age (broken lines for 25 year olds), medium of participation (upper row for mail and fax), and dummy's share *z* (columns in Figure 5), we have calculated the acceptance probability for the

actually possible shares *y*.[13] The difference in the acceptance probability for two different values of the share *y*, holding all other variables constant, then indicates the marginal effect of an increase in *y* (where the increase is always 200 units of money).

From Figure 5 it becomes clear that the increase in the acceptance probability is not linear. In the rightmost column (with $z = 400$) it is even the case for the 65 years old subjects that the acceptance probability *de*creases if the responder's share increases from $y = 400$ to $y = 600$, which indicates that older subjects are more likely to accept the equal split than the – in monetary terms – more advantageous proposal (200, 600, 400).

In general, though, Figure 5 reveals the following regularities: First, the acceptance probabilities of men are *ceteris paribus* always higher than those of women, in some cases up to 10 percentage points when we control for age and the medium of participation. Second, younger subjects are always more likely to accept an offer than older ones. This latter difference can amount up to 20 percentage points. Third, acceptance probabilities are typically, but not in any case, higher for Internet users than for those using mail and fax.

IV.C. External validity of student data

To examine the issue of parallelism, i.e. the external validity of decisions made by students, we proceed in three steps: First, we compare the laboratory data (Güth and van Damme, 1998) with our newspaper data, considering only the data from students in our pool. This step allows us to compare student behavior inside and outside of the laboratory. Second,

[13] Note that the proposer's share *x* results from $1200 - y - z$. By considering all possible payoff vectors (*x, y, z*) we could also calculate the average change in the acceptance probability of a subject (with given gender, age and medium of participation) due to a ceteris paribus increase in any of the four structural variables. Detailed figures for males and females, 25 years or 65 years old and participating via Internet or fax and mail, are available upon request.

we take our newspaper data and check whether we find differences between students and non-students from the same age group. This step provides evidence whether students behave similar as non-students when we control for the age of non-students. Third, we compare our student data to the overall data from our newspaper experiment, which constitutes the most general test of the external validity of student data.

Table 4 about here

To compare student data inside and outside the laboratory, we take the first round-data of Güth and van Damme (1998) where responders get full information about the shares *x*, *y*, and *z*, as in our newspaper experiment.[14] We concentrate on the first round laboratory data only, since our newspaper experiment was one-shot. Columns [1] and [GvD] in Table 4 present the student data from the newspaper and the laboratory experiment. Both data sets provide rather similar results. Whereas students in the laboratory allocate 531 out of 1,200 units to themselves in the role of proposer, student proposers in the newspaper demand 551 units. Responders get more in the lab (443) than in the newspaper (385), whereas the dummies are given 226 in the lab versus 264 in the newspaper.[15]

Concerning responders' behaviour, it is much more difficult to compare both data sets, because Güth and van Damme (1998) did not elicit a complete response strategy, but rather

[14] Güth and van Damme (1998) explore several treatments with varying information conditions for the responder when making his decision: either the responder knows all shares *x, y* and *z*, or only either share *y* or share *z*.

[15] The slightly higher share for the dummy in the newspaper data seems to be at least partly due to the different minimum shares in both studies (100 in the newspaper versus 50 in the laboratory).

asked responders to react to the actually chosen proposal. Only one out of 36 first round proposals was actually rejected in their study (which matches the frequency of rejecting the equal split in the newspaper data). Overall, the comparison of the newspaper data with those of Güth and van Damme (1998) suggests parallelism of student behaviour inside and outside the laboratory.

Our next step in addressing the issue of parallelism is to compare student data with non-student data from the newspaper experiment. We restrict the non-student data to the subgroup of participants aged 19 to 30 years. This subset of non-student participants matches the age structure of our student subjects very closely (see section c. of columns [1] and [2] in Table 4). In total, we have 626 submissions from students, and 363 submissions from non-students with age 19 to 30 years. Section a. of Table 4 reports the relative frequency of proposing the equal split, the power coalition or the game theoretic benchmark. There is no significant difference in the distribution between students (column [1]) and non-students (column [2]) ($\chi^2 = 1.6$; $df = 2$; $p > 0.2$). Moreover, average amounts allocated to X, Y, and Z are remarkably close to each other in both groups. The frequencies of accepting a given proposal (section b. in Table 4) are also not significantly different between students and non-students. In sum, our group of students is rather representative for the behavioral patterns of non-students in the same age group.[16]

As the final step in evaluating the external validity of student data we compare students in the newspaper experiment with the full set of 2673 non-students (i.e. participants who stated another profession than 'student'). Decisions of the full set of non-students are accounted for in column [3] of Table 4 and include the data from column [2]. For the non-students considered in column [3] the equal split is much more likely than for the student population in

[16] Even if a considerable part of these non-students were, in fact, former students, then our results would at least provide evidence that former students behave more or less in the same way as actual students.

column [1]. In total, there is a significantly different distribution of the three proposals considered ($\chi^2 = 23.3$; $df = 2$; $p < 0.01$). Acceptance rates of students are significantly higher for the power coalition and the game theoretic benchmark ($p < 0.05$; χ^2-test with $df = 1$ for any pairwise comparison). However, both students and non-students are equally likely to accept the equal split.

Summing up our evidence on the external validity of student data we conclude that student behavior inside and outside the laboratory seems to be very similar. Even more reassuring for the debate on the external validity of student data is the fact that our students do not behave differently from the group of non-student participants, provided that we control for the age of non-students. Finally, we have found differences in proposer and responder behavior between our group of students and the unrestricted set of non-students (of any age).

V. Discussion and conclusion

Our large-scale newspaper experiment on bargaining can be summarized by two major findings: First, age, gender, education, and the medium of participation have an important influence on bargaining behavior, what should have both practical and theoretical implications. Second, there is a rather high degree of parallelism between student data and non-student data, which is an important contribution to the methodological discussion of the external validity of student data and indeed very comforting news for experimenters not only in economics, but more generally in the social sciences.

Let us discuss the two major findings in more detail. The first one can be succinctly captured as follows: The equal split is the most often proposed and most often accepted proposal. Moreover, equitable distributions are more likely proposed by women and older participants and by those submitting their decision by mail or fax. The frequency of accepting

proposals decreases with age, is higher for men than for women, and higher for Internet participants than for those using mail or fax.

The prominence of the equal split in the three-person game nicely ties in with results from standard two-person ultimatum experiments where the equal split is clearly the modal offer (see Camerer, 2003, for a recent overview). Introducing a third player, however, reveals that responders do not only care for their own (relative) well-being (by rejecting relatively low offers in the two-person ultimatum experiment), but that they condition acceptance or rejection also on the share offered to the dummy player.

The latter result can be regarded as confirming the theory of inequality aversion in bargaining games, although the theory does not predict the equal split (see Bolton and Ockenfels, 1998). Hence, it might be the case that the models of inequality aversion discussed above underestimate the importance of inequality aversion. A large dataset like ours might therefore be useful when further calibrating such models.

Our results on the influence of socio-demographic variables also challenge the flourishing models on fairness, reciprocity and inequality aversion[17] which do not (yet) account for the influence of socio-demographic or other factors on bargaining. These models have been developed mostly on the basis of and inspired by stylized facts from (bargaining) experiments with students in the laboratory, and thus with little variation in such background variables. The stylized facts of our study might provide a promising basis for modeling the influence of factors like age or gender on behavior involving strategic interaction. That behavior will probably depend on more than own and other payoffs has been nicely captured in a statement of Bolton and Ockenfels: “The weights individuals give these objectives may well change

[17] See, e.g., Bolton (1991), Rabin (1993), Fehr and Schmidt (1999), Bolton and Ockenfels (2000), Charness and Rabin (2002), Dufwenberg and Kirchsteiger (2004), Falk and Fischbacher (2005).

over the long term, with changes in age, education, political and religious beliefs, and other characteristics" (Bolton and Ockenfels, 2000, p. 171). We deem newspaper experiments and other types of field experiments (see Harrison and List, 2004) as appropriate and promising approaches to gain more insights into the factors shaping human (bargaining) behavior. Such research should ultimately lead to richer models by accounting for socio-demographic and other factors and they should also have practical value by telling us how to condition one's behavior in strategic interaction on others' (personal and socio-demographic) characteristics.

How are our findings on age and gender related to the literature? The rather strong age effect could be due to the fact that age correlates with wealth so that, on average, the stakes are relatively minor for older than younger subjects (like students). Seen in this light, the lower rejection rates of younger participants are compatible with findings from high stakes experiments in which rejection rates in ultimatum games decline, slightly though, with higher stakes (Slonim and Roth, 1998).

Another explanation could be the fact that older participants had their childhood and adolescence in the war or post-war period, what might have induced stronger moral obligations to share equally. Although retired persons give less as trustors in trust experiments than students (Holm and Nystedt, 2005; Sutter and Kocher, 2004) or persons in their 40ies (Fehr et al., 2003), in the role of trustees the retired persons return more, what actually leads to a more equitable final distribution of payoffs. This confirms that the older generation cares more for sharing equally.

The influence of gender on economic decision making has long been examined, not the least because it might provide a better understanding for the causes of some unpleasant social phenomena, like a gender gap in wages. Though Eckel and Grossman (1998, 2001) have found women to be more generous in dictator and two-person ultimatum games (which would imply more equitable proposals of women in our case), there is also conflicting evidence (see

Solnick, 2001, or the brief survey in Camerer, 2003). Thus, it seems that gender does not have a simple main effect. Andreoni and Vesterlund (2001) examine gender effects more thoroughly and can organize the partly mixed results: By varying incomes and costs of generosity in a dictator experiment they conclude that it is not gender *per se* that determines fairness, but rather how gender interacts with the costs of altruism, i.e., what it costs to give. When altruism is expensive, women are kinder, but when it is cheap, men are more altruistic.

Along this line of reasoning, one might explain our findings of women proposing more often the equal split as follows: If participants in our experiment perceived the pie at stake as a considerable reward in spite of the low probability to be selected for payment, it would be rather expensive to be altruistic, meaning that women should show more altruism (in our case proposing the equal split instead of exploiting the dummy, for instance, by proposing the power coalition). Therefore, on a much broader scale and with a much more diverse subject pool, our data seem to support the conclusions of Andreoni and Vesterlund (2001). Analyses of gender effects in bargaining should therefore pay attention to the relative importance of the stakes involved, e.g. by assuming that with higher stakes women place more weight on the payoffs of the interaction partners. In the frame of the Fehr and Schmidt (1999)-model this would, for instance, imply that the parameters α and β are sensitive to stake size and gender.

The influence of the chosen medium on economic decision making promises to become a more important topic in the future, given the steady increase in electronic business transactions (see Lucking-Reiley and Spulber, 2001; Lucking-Reiley, 2000; Roth and Ockenfels, 2002). Güth et al. (2003) already examined the effect of the medium on bargaining behavior in a two-person ultimatum game, run with readers of the *Berliner Zeitung*. They found that Internet users are more opportunistic than participants relying on letter or fax. However, without data on age or education level they could not control whether the effect of the medium is, actually, driven by an age or education discrepancy. Our experiment has shown that the medium is important, even when controlling for other socio-demographic data.

Internet users propose less often an equal split and accept more proposals, meaning that they are more opportunistic than subjects using mail or fax. It might be for this reason that reputation systems are so important in the Internet (Bolton et al., 2004).

Finally, we turn to our second major finding, which is of particular methodological interest. We have found a considerable degree of parallelism between student behavior and non-student behavior. Experimental researchers often face the objection that the typical subject pool of students is not representative of the population as a whole. Our experiment, however, has shown that aggregate behavior of students in our newspaper experiment is similar to the behavior of students in the laboratory. Furthermore, when we control for the age group (19 to 30 years), students in the newspaper experiment do not differ significantly from newspaper participants with another profession.

Only if the full sample of non-students (see column [3] in Table 4) is compared to student behavior, we find significant differences like non-students proposing more often the equal split and rejecting more often inequitable proposals. Though significant, these differences should be put into perspective once more (refer to Table 4 for the absolute figures): Students in our newspaper experiment demand 46% of the pie for themselves, whereas 'non-students' (of any age) demand 42%. Responders get on average 32% from students, and 33% from non-students. The dummies receive 22% from students, but 25% from non-students. So, the differences in proposer behavior are not substantial in economic terms. Likewise, the acceptance rates for the power coalition and the equal split are different between students and non-students, but they reveal the same comparative static effects concerning the influence of the shares y, respectively z, on acceptance rates.

In sum, it seems that student behavior is a reasonable and fairly close benchmark for non-student data even when non-students cover the full age range. If we restrict non-students to the same age group as students, though, there are no longer differences that are significant and

student data practically match non-student data. Overall, our findings support the claim that the results of laboratory experiments with university students are representative enough.

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Table 1: Participation by medium

Medium	Submissions	Valid	Share of valid cases
Internet	2,961	2,954	0.998
Mail	1,681	1,625	0.967
Fax	490	290	0.592
All	5,132	4,869	0.949

Table 2. Age, profession, gender, and medium (valid submissions only)

Medium	Internet	Mail	Fax	All
	(n=2954)	(n=1625)	(n=290)	(n=4869)
Age				
Share of subjects				
under 26	0.217	0.110	0.063	0.172
26 to 45	0.525	0.376	0.422	0.469
46 to 65	0.237	0.368	0.395	0.290
over 65	0.021	0.146	0.121	0.069
Average age	36.6	46.6	48.2	40.6
(Std. dev.)	(13.2)	(16.6)	(14.6)	(15.3)
	(n=2329)	(n=1292)	(n=223)	(n=3844)
Gender				
Share of male	0.711	0.632	0.688	0.684
participants	(n=2912)	(n=1519)	(n=263)	(n=4694)
Profession[a]				
Share of				
Academic	0.460	0.456	0.500	0.460
Nonacademic	0.208	0.228	0.280	0.242
Retired	0.032	0.148	0.140	0.076
Students	0.238	0.112	0.054	0.185
Pupils	0.062	0.056	0.027	0.058
	(n=2064)	(n=1114)	(n=186)	(n=3364)

a. In two cases, unemployment was mentioned.

Table 3: Determinants of acceptance rate of proposals (probit regression)

Dependent variable: Acceptance (1) / rejection (0)	Marginal effects	
of 18 different proposals	Model I[+]	Model II[++]
max(0,*x*-*y*)	-0.228 ***	-0.212 ***
max(0,*y*-*x*)	0.059 ***	0.021
max(0,*z*-*y*)	-0.240 ***	-0.190 ***
max(0,*y*-*z*)	-0.035 **	-0.083 ***
Age	-0.009 ***	-0.009 ***
Internet (= 1, Mail and Fax = 0)	0.059 **	0.066 **
Male (= 1, Female = 0)	0.026	0.051
Academic		0.093 ***
max(0,*x*-*y*)*Age	-0.001 ***	-0.002 ***
max(0,*x*-*y*)*Internet	0.041 ***	0.032 ***
max(0,*x*-*y*)*Male	0.036 ***	0.050 ***
max(0,*x*-*y*)*Academic		0.024 **
max(0,*y*-*x*)*Age	-0.002 ***	-0.002 ***
max(0,*y*-*x*)*Internet	0.034 ***	0.037 ***
max(0,*y*-*x*)*Male	0.034 ***	0.035 ***
max(0,*y*-*x*)*Academic		0.022 **
max(0,*z*-*y*)*Age	-0.001 ***	-0.003 ***
max(0,*z*-*y*)*Internet	0.040 ***	0.045 ***
max(0,*z*-*y*)*Male	0.040 ***	0.040 ***
max(0,*z*-*y*)*Academic		0.029 ***
max(0,*y*-*z*)*Age	-0.001 **	0.000
max(0,*y*-*z*)*Internet	0.016 *	0.015
max(0,*y*-*z*)*Male	0.024 ***	0.025 **
max(0,*y*-*z*)*Academic		0.009

* (**) [***] significant at the 10% (5%) [1%]-level.

[+] Including all subjects with known age and gender. 3765 subjects.

[++] Including all *working* subjects (excluding students, pupils and retired persons) with known age, gender and education (academic/non-academic). 2161 subjects.

Table 4: External validity – Students versus non-students

	[1] Student as profession (N=626)	[GvD]*	[2] Profession other than student and age 19 – 30 (N=363)	[3] Profession other than student (N=2673)
a. X-proposals (frequency in %)				
Proposal				
400-400-400	47.0		50.4	58.4
600-500-100	18.2		16.5	15.6
1000-100-100	11.2		13.8	7.3
Average amount allocated to				
X	550.63	530.60	548.21	502.21
Y	384.97	443.10	380.44	400.00
Z	264.40	226.40	271.35	297.79
b. Y-acceptance rate (frequency in %)				
Proposal		96.7*		
400-400-400	96.4		98.3	96.6
600-500-100	73.9		70.5	61.0
1000-100-100	28.0		31.7	20.1
c. Data on age				
Average age	24.88		26.65	43.83
standard deviation	4.16		3.60	14.89
5^{th} percentile	20.00		19.00	19.00
95^{th} percentile	31.00		30.00	68.00

* Data from Güth and van Damme (1998), Table 2, Round 1 (figures have been multiplied by 10, since subjects could distribute a pie of 120 points, whereas the pie was 1,200 DM in our case). The overall acceptance rate was 96.7%. However, responders reacted to a single proposal and not to all possible proposals as in our case. The subject pool consisted of undergraduate students, which were probably a bit younger than the students of our newspaper experiment.

Figure 1: Actual and expected proposals (N = 4869)

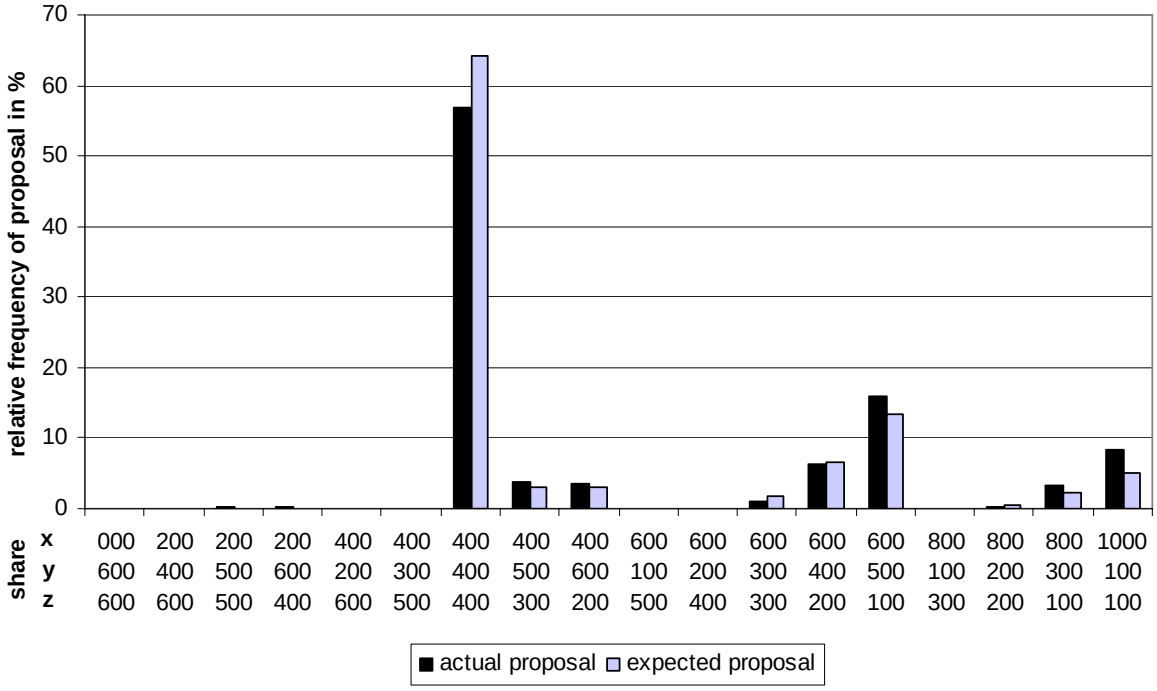


Figure 2: Actual and expected acceptance rates of proposals (N = 4869)

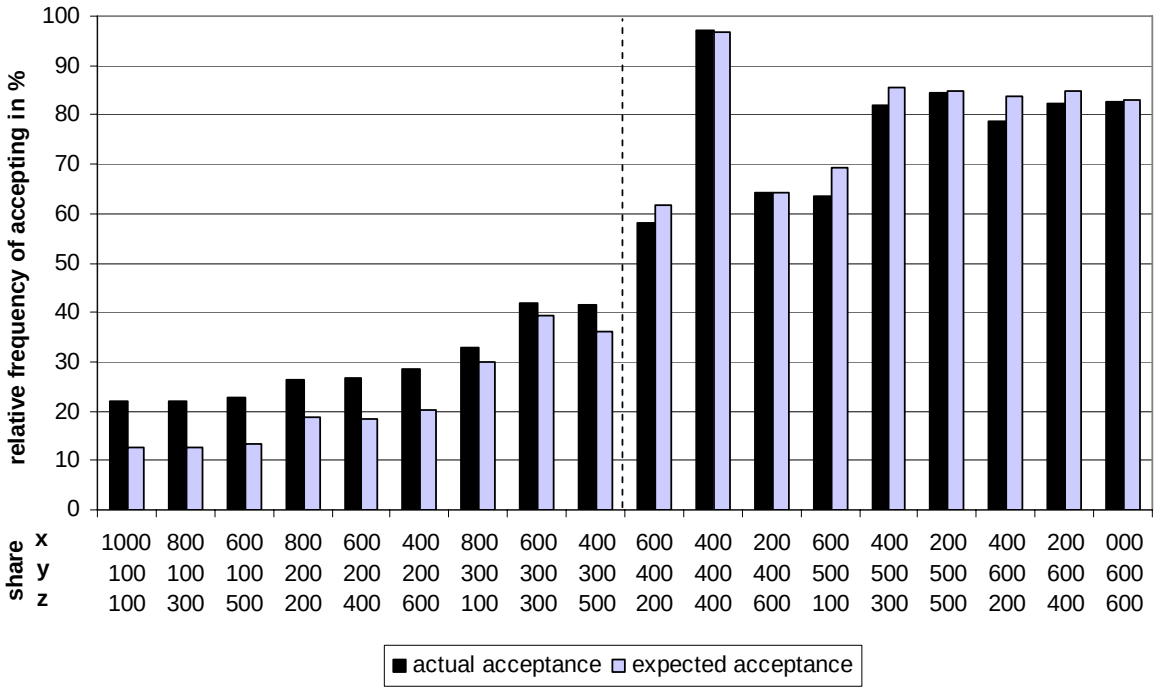


Figure 3: Influence of age, gender and medium on the relative frequency of proposing the equal split (400,400,400)

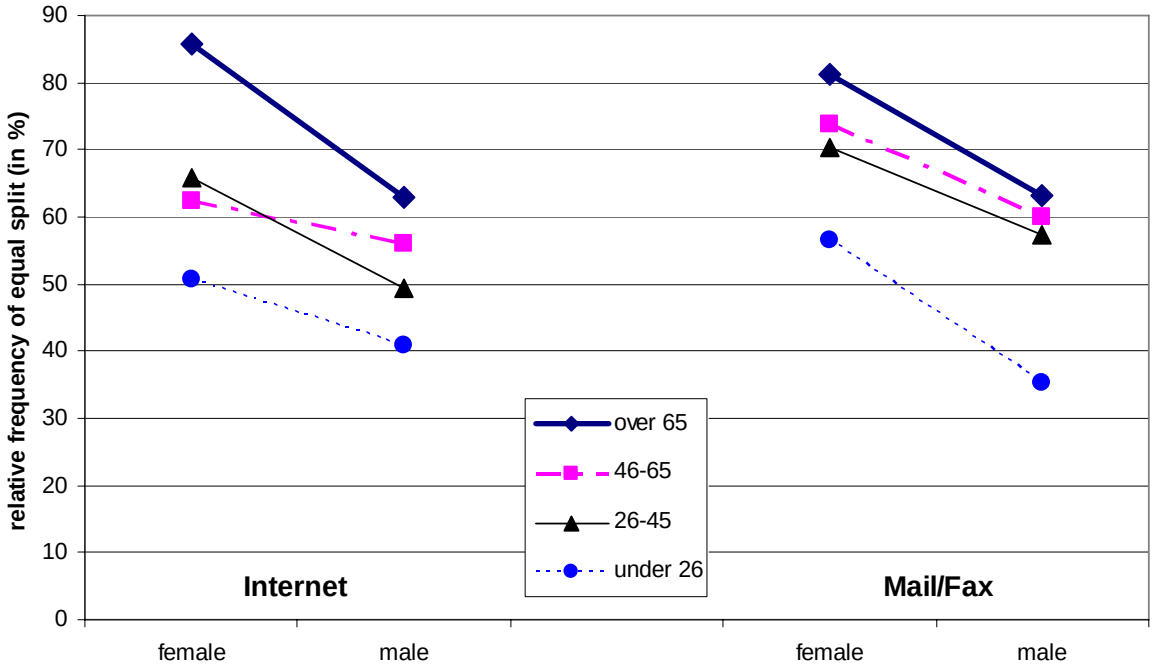


Figure 4: Influence of age, gender and medium on the relative frequency of proposing the power coalition (600,500,100)

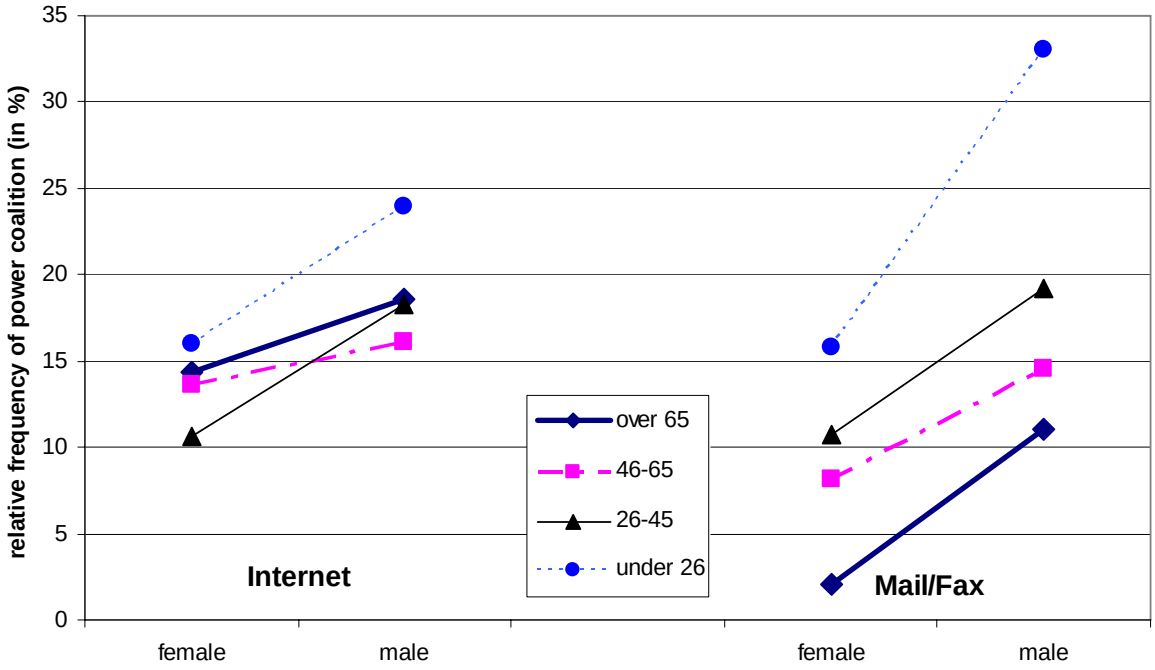
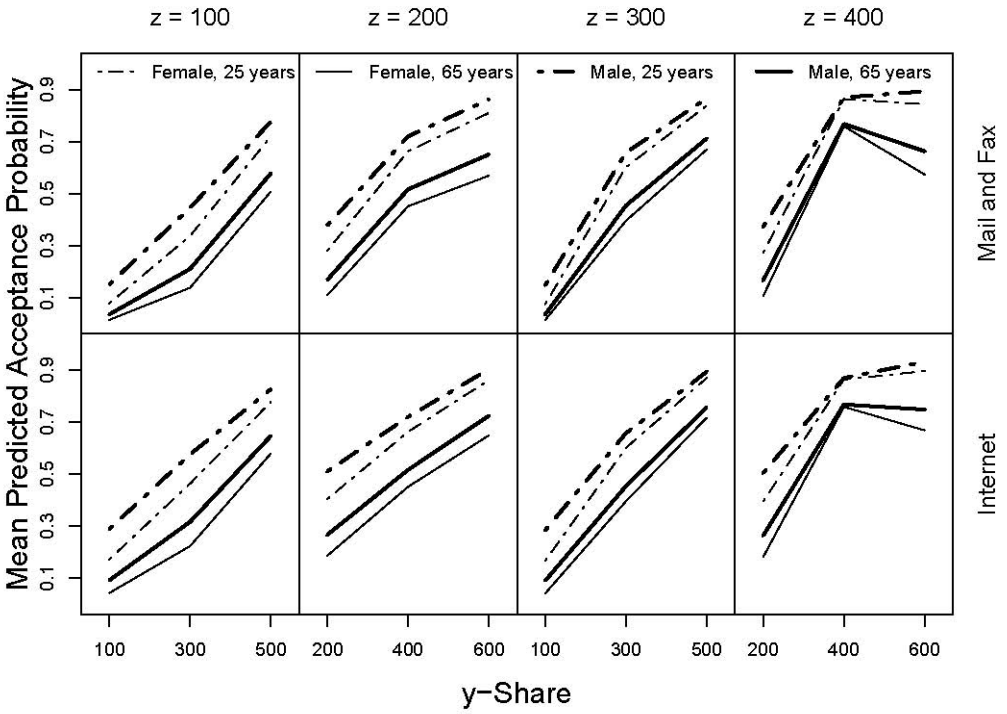


Figure 5: Mean predicted acceptance probability of responder for given proposals and controlling for age, gender and medium



Appendix A. Translated Instructions (originally in German) –

not necessarily for publication (could be made available on a webpage)

The 1200 DM Prize Game for "Die ZEIT" - Readers

By Christoph Drösser

Does the economy rely on rational principles or do the emotions of market players have a major influence on it? The classical game theory was mainly concerned with examinations on how to find the most sensible decision possible in a tricky situation.

In recent years, scientists have increasingly contemplated the extent to which people's decisions actually agree with those that would appear most sensible in a given economic situation.

This game is not just an ordinary prize competition, but rather also a scientific experiment. It is jointly staged by "Die ZEIT" and the Max-Planck-Institute for Research into Economic Systems. Accordingly, our readers do not only have a chance of winning a prize, but will simultaneously help us obtain scientific findings.

The rules of the game

Three brothers (designated X, Y, and Z hereafter) have received 1200 DM from their aunt in America. This sum is to be distributed among them. The following rules have been established by their aunt: X proposes how to distribute the total amount. Y must decide whether (or not) he accepts this proposal. If he agrees, each of the three brothers receives his share as proposed by X. If Y rejects the proposal, their aunt will retain her money. The third brother Z has no say in the distribution of the money at all.

In a first step, it is your task to imagine yourself in the situation of brother X. On our response sheet, you will find eighteen prepared distribution options. Choose one of these!

In the next step, you should slip into the role of brother Y. You are required to state – for each of all eighteen distribution options – if you would accept or reject it.

In other words: you are required to make one cross-mark in column X and eighteen cross-marks in column Y of the fill-out form 1.

The winners are established as follows in this game: From all fill-out forms sent in, six groups of three participants each – one in the role of X, one in that of Y, and one in that of Z – will be chosen in a random procedure. The form sheets of X and Y are then compared with each other. When Y has accepted the distribution proposed by X, the three participants will receive the 1200 DM as suggested by X. All other participants will not be paid.

Additional award for the best forecast

On form sheet 1 you have cross-marked your personal decision. In addition, on form sheet 2 you are requested to predict how the majority of participants will decide. This means: cross-mark the X column for that distribution which you believe has been selected in most cases, then cross-mark all those proposal lines in column Y which you believe have been accepted by the majority of participants. From all responses who predicted the most frequent mode of behavior, we will draw seven winners of the prediction prize of 400 DM each.

Decision from (form 1)						**Prediction form (form 2)**					
Proposal in the role of X Please cross-mark only one proposal		Distribution of the DM 1200 pie to X, Y, and Z		**Response in the role of Y** Please cross-mark for **every** proposal 'yes' or 'no'! In those columns exactly 18 crosses!		**Modal pro-posal in the role of X** Please cross-mark only one proposal		Distribution of the DM 1200 pie to X, Y, and Z		**Modal response in the role of Y** Please cross-mark for **every** proposal 'yes' or 'no'! In those columns exactly 18 crosses!	
	X	Y	Z	Yes (accept)	No (reject)		X	Y	Z	Yes (accept)	No (reject)
	0	600	600				0	600	600		
	200	400	600				200	400	600		
	200	500	500				200	500	500		
	200	600	400				200	600	400		
	400	200	600				400	200	600		
	400	300	500				400	300	500		
	400	400	400				400	400	400		
	400	500	300				400	500	300		
	400	600	200				400	600	200		
	600	100	500				600	100	500		
	600	200	400				600	200	400		
	600	300	300				600	300	300		
	600	400	200				600	400	200		
	600	500	100				600	500	100		
	800	100	300				800	100	300		
	800	200	200				800	200	200		
	800	300	100				800	300	100		
	1000	100	100				1000	100	100		
Name:			Address:			Age (optional):			Profession (optional):		