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# Ultimatum Salary Bargaining with Real Effort

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## Abstract

We report experimental results on ultimatum salary bargaining with a real task performed by employee subjects. Compared to the baseline treatment with a hypothetical task, the introduction of a real task raises offers, accepted wages and rejection rates.

*JEL Classification:* J30, C91

*Keywords:* Ultimatum bargaining, salaries, experiments.

## I Introduction

A well-known theoretical and experimental framework in which fairness and bargaining have been analyzed by economists is that of ultimatum games. In an ultimatum game, two players bargain over a pie of size  $Y$  in the following way: The first player (leader) offers a share  $X \in [0, Y]$  to the second (follower) one, keeping  $Y - X$  for himself. The second player has to decide whether to accept or reject the offer. If

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the offer is accepted, the proposed shares are gained by the players. Otherwise, they both earn nothing. Since the seminal article by Güth et al. (1982), the game has inspired a vast literature. Bearden's (2001) exhaustive review indicates that results are sensitive to a number of factors. Typical findings include systematic deviations from the subgame perfect equilibrium prediction of minimum offers by leaders and global acceptance by followers. Instead, a fairer split of 60%-40% is the most frequently observed outcome.

An implicit assumption underlying ultimatum bargaining is that both parties' involvement is needed for the pie to be earned, first, and then divided. The most obvious real world example of such asymmetric negotiations can be found in salary formation resulting from employee-employer interaction. However, bargaining between employers and employees never occurs over "found money". If an employer had full control of the pie, why would he need a second agent with whom to share his own property? In the real world, firms can be seen as the result of combining complementary assets like, for example, labor and capital. Salaries offered by employers and accepted by employees should reflect each party's involvement in the common enterprise. Following standard economic theory, raising one's cost of participating in a partnership should increase his pursued and actual share of the resulting profit. In this paper, we test this hypothesis. First, we frame ultimatum bargaining as a situation of salary negotiation. Second, we introduce a real task which has to be performed by employee-subjects as a consequence of accepting a given salary. We show that real effort raises salaries. In fact, this result is due to both higher salary offers by employers and higher rejection rates by employees.

The paper is organized as follows. Section II presents the experimental design. In section III we discuss the results. Section IV concludes.

## II Experimental design

The experiments reported here were run as a part of a more general, ongoing project investigating several labor market-related phenomena like unemployment, contract security, cultural and gender differences, etc. All sessions were run in the *Laboratori d'Economia Experimental* (LEE) at Castellón, Spain. Forty subjects were recruited among Business Administration students. They were randomly assigned to one of the two treatments labelled hereafter as HT (Hypothetical Task) and RT (Real Task). At the beginning of each session, subjects were randomly assigned the role of an *employee* or an *employer*. Each subject's role was kept fixed along the whole session. To avoid end-game effects, sessions were randomly stopped between the 30th and the 35th period. In each period, subjects were randomly matched to form employer-employee pairs. In order to avoid undesirable session effects, subjects in each session were divided into two groups between which no matching took place.<sup>1</sup>

At the beginning of each session, written instructions<sup>2</sup> were given to the subjects followed by oral explanation and answers to any remaining doubts. The experiment was framed as a situation in which an employer offers his/her employee  $x \in [0, 10]$  Euro in steps of .10. Acceptance by an employee in HT implies that the 10€ profit is raised by the firm and divided as proposed by the employer. Apart from profit raising and sharing as defined in HT, acceptance by an employee-subject in RT implies accepting to perform a unit of a real task: *filling each one of 20 numbered envelopes with their corresponding single-page letters*. The envelop-filling sub-session was organized in a separate room next to the computer lab. Payment and, when applicable, task performing obligations, were determined as the sum of earnings and task units agreed over 5 periods which were randomly chosen by the computer. Apart from their earnings in the experiment, subjects received a 5€ show-up fee

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<sup>1</sup>Differences across groups were found not to be statistically significant and data reported here are the result of aggregation within each treatment.

<sup>2</sup>Available upon request.

which was used to mitigate the relative magnitude of the difference in earnings across player types. Average earnings were approximately 25€. The computerized<sup>3</sup> salary-negotiation sub-session (HT and RT) lasted an average of one hour. The duration of the task-performing sub-session (RT only) never exceeded 30 minutes, but significantly varied across subjects, depending critically on the number of task units performed.

### III Results

For the sake of comparability, we have analyzed the same number of observations per treatment. Thus, we focus on the analysis of data obtained from the first 33 periods of each session. This implies 330 observations for each type of player. We summarize here our main findings.

Tables 1 and 2 present descriptive statistics on offers, salaries and rejections. A first finding concerns the resemblance of our HT treatment to standard ultimatum game experiments. Both salary offers and accepted salaries are not significantly different from 4. This means that in the absence of a real task, our experiments reproduce the results usually obtained in the standard (abstract) ultimatum game. We summarize this in the following result.

**Result 1:** *The “labor-market” label of ultimatum bargaining yields the standard 60%-40% split of earnings.*

Both the median (4 vs. 4.5) and the average (3.96 vs. 4.09) of salary offers posted by employers are lower when employees are faced with a fictitious task than when they have to perform a real one. The difference is statistically significant as reflected by the result of a Mann-Whitney test ( $p=0.000$ ).

[Table 1 about here]

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<sup>3</sup>Programmed and conducted with the software z-Tree (Fischbacher, 1999).

In Table 2, the first column under each treatment’s heading presents the number of salary offers per 1/2€ interval. Approximately 86% of all salary offers (284/330) collected under treatment HT concentrate on a single peak between 3.7 and 4.2€. The distribution of salary offers collected under the RT treatment exhibit two peaks. One of them is observed on the 3.7-4.2 interval, corresponding to 30% (100/330) of all salary offers. Another 40% (127/330) of the observed salary offers correspond to the interval between 4.7 and 5.2€. Finally, 50 observations correspond to salary offers between these two modes. These differences in the distribution of salaries across treatments give further support to the finding that salary offers are higher in RT than in HT.

[Table 2 about here]

Apart from the distribution of salary offers, table 2 can be used to study differences in employees’ behavior expressed in terms of rejection rates. Under each treatment’s heading, the second and third columns present, respectively, rejections in absolute numbers and as a percentage of offers. Salary offers below 3.2€ are rejected in almost all cases under both treatments (except for 4/38 offers in RT). We focus on offers above 3.2€. In both treatments, rejection rates decrease as salary offers increase. However, the percentage of rejections in each salary offer interval is higher under the RT treatment. This result receives significant support if we compare across treatments rejection rates for salary offers in the 3.7-4.2 interval (13% in HT vs. 42% in RT).

Below, we summarize these findings.

**Result 2:** *Employers make higher salary offers when employees have to perform the real task.*

**Result 3:** *A given salary offer is more frequently rejected by employees in the real task treatment.*

Going back to table 1, we observe that salaries are higher in RT than in HT.

This is true for both the median (4 vs. 4.70) and the mean (4 vs. 4.55), and the difference is significant as indicated by a Mann-Whitney test ( $p=0.000$ ). This result is stated below.

**Result 4:** *Higher salaries (accepted offers) are observed when employees have to perform the real task.*

Figure 1 presents histograms which help us visualize the results discussed so far. It can also be observed that both salary offers and actual salaries (accepted offers) present a higher dispersion in RT than in HT, as can be also confirmed by the standard deviations reported in table 1. This secondary finding may suggest that the existence of a real task increases the heterogeneity in employers' perception of their employees' participation costs.

[Figure 1 about here]

The percentage of successful contracts over the number of employee-employer matchings is used as an indicator of efficiency in ultimatum bargaining. However, in our experiment, the costs and benefits of the real task should also be taken into account. Unfortunately, the realism-enhancing device of the real task makes it impossible to rigorously compare the two treatments in terms of efficiency, since the costs of performing the task are unknown. Instead, we concentrate on employment rates, measured as the percentage of accepted salary offers. From simple inspection of total rejection percentages (17% in HT vs. 33% in RT) provided under the third heading of table 1, we reach the following result.

**Result 5:** *Overall employment is lower when employees have to perform a real task.*

## IV Conclusions

We study salary formation as the result of ultimatum bargaining. Our main result can be stated in two steps. First, in comparison with standard ultimatum bargaining

experiments, our baseline treatment, framed as a labor market with a hypothetical task, reproduces the usual 60%-40% “split of the pie”. Second, when employee-subjects are asked to perform a real task, the resulting salaries are significantly higher than in the standard no-real-effort setting. Following the resemblance between our baseline treatment and previous abstract (non-labor framed) ultimatum games, the reported salary differences are unambiguously associated with employees’ real effort. Furthermore, we show that the effect of real effort on observed salaries is due to differences in both employer- and employee-subjects’ behavior. Specifically, in the real-effort treatment, employers post higher salary offers and employees are more likely to reject.

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	<b>Offers</b>	<b>Salaries</b>	<b>Rejections</b>
<b>Treatment HT</b>			
<i>N</i>	330	275	55
<i>Median</i>	4.00	4.00	
<i>Mean</i>	3.96	4.00	17%
<i>Std. Dev.</i>	0.21	0.16	
<b>Treatment RT</b>			
<i>N</i>	330	222	108
<i>Median</i>	4.50	4.70	
<i>Mean</i>	4.09	4.55	33%
<i>Std. Dev.</i>	1.30	0.80	

Table 1: Descriptive statistics by treatment.

<b>Offer (<math>x</math>)</b>	<b>Treatment HT</b>			<b>Treatment RT</b>		
	<i>N</i>	<i>% Rej.</i>	<i>C.D.</i>	<i>N</i>	<i>% Rej.</i>	<i>C.D.</i>
$0.7 > x$	0	0	0	17	88	15
$0.7 \leq x < 1.2$	0	0	0	15	87	28
$1.2 \leq x < 1.7$	0	0	0	0	0	28
$1.7 \leq x < 2.2$	0	0	0	1	100	29
$2.2 \leq x < 2.7$	0	0	0	3	100	32
$2.7 \leq x < 3.2$	3	100	3	2	100	34
$3.2 \leq x < 3.7$	25	64	19	9	90	42
$3.7 \leq x < 4.2$	284	13	55	100	42	84
$4.2 \leq x < 4.7$	17	0	55	50	24	96
$4.7 \leq x < 5.2$	1	0	55	127	9	107
$5.2 \leq x < 5.7$	0	0	55	2	50	108
$5.7 \leq x$	0	0	55	4	0	108

Table 2: Number ( $N$ ) of offers and percentage of rejections within each offer interval. *C.D.* refers to the Cumulative Distribution of the number of rejections.

