Homo Oeconomicus 22(2): 169–189 (2005)

www.accedoverlag.de

Employment Duration and Resistance to Wage Reductions: Experimental Evidence

Michael Burda
Faculty of Economics, Humboldt University, Berlin, Germany
(e-mail: burda@wiwi.hu-berlin.de)

Werner Güth
Max Planck Institute for Research into Economic Systems
(e-mail: gueth@mpiew-jena.mpg.de)

Georg Kirchsteiger
ECARES-Université Libre de Bruxelles
(e-mail: gkirchst@ulb.ac.be)

Harald Uhlig
Faculty of Economics, Humboldt University, Berlin, Germany
(e-mail: uhlig@wiwi.hu-berlin.de)

Abstract One of the long-standing questions in economics is whether or not wages will fall sufficiently in recessions so as to avoid increases in unemployment. Put differently, if the competitive market wage declines, will employers simply force their employees to accept lower wages as well? As an alternative to reviewing statistical data, we have performed an experiment with a lower competitive wage in the second phase of an employment relationship that is known and can thus be (rationally) anticipated by both parties. The experiment casts two subjects in the highly stylized roles of employer and employee. For the hypothesis that employers will not lower wages correspondingly and that employees will resist such wage cuts we find at most mild evidence. Instead, the experimental results can be more fruitfully interpreted in terms of an "ultimatum game", in which surplus between employers and employees is shared. In this view, wages and their lack of decline are simply the mechanical tool for accomplishing this split.

JEL codes C72, C78, C91, E24, J31, J41, J52
Key words wage flexibility, wage ratchet effect, wage bargaining, labor market, ultimatum game

ISBN 3-89265-058-6 ISSN 0943-0180

11/07/2005 18:48 04-22-2 Burda.doc

1. Introduction

One of the long-standing questions in (labor) economics is whether wages (do not) fall sufficiently in recessions so as to avoid the rises in unemployment.[1] Put differently, if the competitive market wage declines, will employers simply force their employees to accept a lower wage as well? As an alternative to reviewing statistical data, we have performed an experiment with a lower competitive wage in the second phase of an employment relationship.

Employment relationships as well as many other human relationships can either be opportunistically terminated or be turned into longer-term relationships in which opportunism is subordinated to other objectives. In the case of labor relations, an employer observing a decline in the "opportunity wage" available to workers might try to increase profits[2] by cutting wages. If the employee rejects the wage cut, however, he can impose a cost on the employer; although a replacement worker can be hired at the low competitive wage, match-specific human capital accumulated in the former employee will be lost. We want to test the hypothesis that employers will not lower wages correspondingly, i.e. that they do not adjust wages according to market pressure, and that employees would reject such wage cuts.[3]

Our experiment casts two subjects in highly stylized roles which can be readily interpreted as employer and employee. The experimental method allows us to confront decision makers with well-defined decision alternatives which are less clearly delineated in observable employment relationships. The tradeoff is clear: by concentrating on just a few features, we can analyze them in fine detail, but as a result we must be circumspect in our conclusions for actual labour markets. We have explicitly refrained from "framing" the experiment (see Tversky and Kahneman, 1986) as the labor market situation discussed above, as this could induce behavior which is determined by general political views rather than by the structural relationships captured by our

---

[1] The question was probably first posed by Keynes (1936) and has been investigated empirically by Bewley (1995, 1997). More recently, the evidence seems much more ambiguous: firms under stress can often convince employees, and even trade unions, that wage cuts will secure employment. The debate in the empirical literature has advanced considerably in recent decades, so that we know that individual wages are procyclical, even though the composition effect causes aggregate wage indexes to be acyclical (Bils (1985), Solon, et al. (1994)). The question remains whether wages for some individuals decline sufficiently to clear the labor market.

[2] What may mean to avoid or at least reduce losses.

[3] Collard and de la Croix (2000) use this "fair wage hypothesis" to explain business cycle fluctuations in the context of the real business cycle framework. One can view the present paper as examining the experimental micro-foundations for this hypothesis.

1111/07/2005 18:48 04-22-2 Burda.doc

experimental situation.

Our experiment concentrates on the "microeconomics" of the bargaining problem between employers and employees as it is likely to be one of the key issues in resolving the "macroeconomic" puzzle stated at the beginning. One might conceive of an experiment going all the way by actually embedding the microeconomic relationships into a full-blown macroeconomic environment, see e.g. Tietz, 1975. However, this would require many more and possibly contentious additional assumptions. Since our focus is purely on the bargaining relationship between employers and employees, we chose to abstract in our experimental setting from general equilibrium effects.

Labor market relationships have been analyzed experimentally elsewhere and most notably in Fehr, Kirchsteiger and Riedl (1993, 1996) and Fehr, Gächter and Kirchsteiger (1996, 1997).[4] While this paper has been influenced by this work, we deviate from these authors by treating the best outside alternative as the wage in an anonymous, competitive labor market: The employer can hire somebody else who is actually not present in the experiment, and the employee can turn to another firm at the competitive wage, even though that firm is not present either. One beneficial side effect is that we do not have to generate "market clearing" wages as part of the experimental design: as a result, far more independent data points are generated with a given number of subjects.

More importantly, this paper focuses on a different question by modelling the employment relationship as one in which the surplus can be destroyed to the disadvantage of both parties by the single-handed refusal of the employee to cooperate. This unilateral refusal to cooperate – ranging from withholding of effort to work slowdowns to strikes and sabotage – is a well-known response in industrial relations to wage reductions, and forms the basis for the "fair wage" literature (see Akerlof and Yellen (1990a, b)). Our experimental situation can be interpreted as an "ultimatum game", in which some surplus between employers and employees is divided. In this view, wages and their flexibility are simply the mechanical tool for accomplishing this split. Of course, one could have imposed other, e.g. more symmetric rules of bargaining, for instance, the "split the difference" approach of Nash (1953) which is sometimes employed to model wage formation (see for example McDonald/Solow (1981), Oswald (1985), Layard et al. (1991), Pissarides (1991)) or the elaborate microfoundations proposed by Rubinstein (1982) and Binmore et al. (1986).

Although wages are flexible downward in our experimental results, our

[4] In contrast to these authors, we do not investigate variation of effort in the spirit of the efficiency wage literature.

empirical evidence indicates some resistance to wage declines. Although the ultimatum game has been studied extensively with the rather robust finding that approximately 40 percent of the allocable surplus is given to the second player,[5] we did not think of employment relationships as representing ultimatum games initially. Given our findings, it seems hard to avoid this perspective, and it is intriguing to speculate what this implies about actual labor markets.

The paper is organized as follows. Section 2 explains the experimental design. Section 3 contains some hypotheses. Section 4 provides a descriptive analysis of our results, whereas section 5 contains a statistical analysis. Section 6 concludes. The appendix includes all the documents used in conducting the experiment.

2. Experimental design

The experimental instructions were framed in non-suggestive, neutral terms (see Appendix A). In the following we apply the notation described there. Let $t = 1,2$ denote the period of interaction. In both periods $t = 1,2$ "employer" X first proposes a non-negative wage x_t with an upper bound equal to the commonly known surplus S_t in period t. "Employee" Y can reject this wage $(y_t = 0)$ or not $(y_t = 1)$. Only in case of $y_t = 1$ does the relationship continue with period 2. The decision $y_t = 0$ results in replacing the former employee by an anonymous substitute who works for the competitive wage w_t, but requires an additional investment C in human capital (to be paid by X). This investment cost is non-recoverable and has zero value at the end of the game.

The surplus S_t and the competitive wage w_t of periods $t = 1,2$ were chosen as

$$w_1 = 10, w_2 = 5$$
$$S_1 = 25, S_2 = 20$$

i.e. from period 1 to period 2 the competitive wage declines, while the difference $S_t - w_t$ remains constant. The sole treatment variable is the investment cost C; here two values were chosen, namely $\underline{C} = 2$ and $\overline{C} = 10$. C represents the only structural threat of employee Y.[6] In case of $\underline{C} = 2$ we

[5] see Camerer, 2003, Güth, 1995, and Roth, 1995, for surveys.

[6] Non-structural threats could be contempt (Y characterizes X as opportunistic) or feelings of guilt (X condemns himself as an exploiter) and the like.

speak of *no essential threat* whereas $\overline{C}=10$ is assumed to represent *considerable threat.*[7] To sum up, the earnings-functions for the participants were given as:

X's action	Y's action	X's payoff	Y's payoff
x_1	$y_1=0$	28	15
x_1, x_2	$y_1=1$, $y_2=0$	$38-x_1$	x_1+5
x_1, x_2	$y_1=1$, $y_2=1$	$45-x_1-x_2$	$x_1 + x_2$

In case of $\underline{C}=2$, whereas earnings in the $\overline{C}$-treatment where given by:

X's action	Y's action	X's payoff	Y's payoff
x_1	$y_1=0$	20	15
x_1, x_2	$y_1=1$, $y_2=0$	$30-x_1$	x_1+5
x_1, x_2	$y_1=1$, $y_2=1$	$45-x_1-x_2$	$x_1 + x_2$

These payments were made in German Marks or Dutch Guilders, respectively.

Our (student) participants received the instructions – identical for *X* and *Y* – after being seated. After reading the instructions, asking for private clarification and filling out the pre-experimental questionnaire (Appendix B), the subjects were subdivided equally into an *X*- and a *Y*-group. Then the groups received their decision forms (Appendix C) and proceeded as described by the sequential decision process. Without announcing this beforehand, participants then repeated the game with new partners (where 4 participants formed one matching group), but in the same position (*X* or *Y*). Necessary feedback information was provided according to the rules of the sequential decision process. In doing so, special care was taken to preserve anonymity. To save time, all payments were made one week later.

We conducted three experimental sessions with the same English instructions (see Appendix A), one with 24 student participants registered for a macroeconomic course at the University of Tilburg and two with 48 and 40 student participants of a macroeconomics undergraduate course at

[7] From the perspective of the "employer" in the absence of strategic interaction, this situation is identical to one in which the competitive wage is respectively lower or higher in the second period. In the presence of strategic interactions - as in this case - the role of C as a third party cost is of essential importance.

Humboldt-University of Berlin. An experimental session lasted on average 45 minutes. The Dutch subjects received on average 43.2 HFL, whereas the German subjects earned 44.6 DM on average.

3. Solution behavior and hypotheses

We first describe the game-theoretic solution under payoff-maximization as a subgame perfect equilibrium (Selten, 1965). If period $t = 2$ is actually reached, employee Y should accept any wage offer $x_2 \geq 5$, i.e. not below the competitive wage $w_2 = 5$. To avoid the cost of retraining a new worker C employer X should therefore offer $x_2^* = 5$.

In period 1, similarly, employee Y will accept all wage offers $x_1 \geq 10$; i.e. not below the competitive wage $w_1 = 10$ in period 1. Thus the employer X should offer $x_1^* = 10$ in order to avoid the positive cost C which results when Y has to be replaced. Thus the game-theoretic hypothesis for rational, payoff-maximizing players is:

Hypothesis 1 Employers offer competitive wages, i.e. $x_1 = 10$ and $x_2 = 5$, and employees accept all wages which do not fall below the competitive levels.

A milder version of Hypothesis 1, which embodies the crucial behavior of wages adjusting according to market pressure is

Hypothesis 2 The wage decline between the first and second period equals the decline in competitive wages, i.e. $x_1 - x_2 = 5$.

In the introduction, we speculated that this hypothesis fails to hold, and thus could explain why wages do not adjust during recessions. It is interesting that costs C do not matter at all except for the fact that they are positive. In game-theoretic terms, the threat of having to pay C does not influence X's behavior since X confronts Y with a take-it-or-leave-it offer. An alternative hypothesis is that agents behave differently, with Y rejecting offers near competitive wage levels, and X anticipating this in its initial offer. This can be summarized as follows:

Hypothesis 3 Employees will reject offers corresponding to the competitive wage levels and employers will offer higher than competitive wages. Wage offers x_1 and x_2 as well as the highest rejected wages will be higher for $\overline{C} = 10$ than for $\underline{C} = 2$.

Hypothesis 3 has been made plausible by recent work in abstract bargaining experiments (see Roth, 1995, for a survey) and more specific (labor market) experiments (see Fehr et al., 1993, 1996, 1997) which suggest that optimal take-it-or-leave-it offers $x_1^* = 10$ and $x_2^* = 5$ will not be accepted. If one wants someone's approval (here: the reactions $y_1 = 1$ and $y_2 = 1$), one had better offer a "fair share".

Our next hypothesis deals with the duration of an employment relationship: Let $P(y_1 = 1)$ denote the share of pairs X and Y of a matching group who cooperate in the first period, making it to the second, and $P(y_1 = 1, y_2 = 1)$ the share of pairs X and Y who also cooperate in period 2. We postulate

Hypothesis 4

1. $\dfrac{P(y_1 = 1, y_2 = 1)}{P(y_1 = 1)} > P(y_1 = 1) > 0$, and
2. $x_2 - w_2 > x_1 - w_1 > 0$

Part 1 of Hypothesis 4 means that a considerable share of pairs X and Y will choose a "commitment" and that they are more eager to maintain that commitment (continue the relationship) the longer it has lasted already. Part 2 asserts a higher *wage drift* in the sense of positive values $x_t - w_t$ when relationships last longer. In our view, this would indicate that relative (dis)advantages of one party, e.g. the sharp decrease of the competitive wage, play a subordinate role in wage determination.

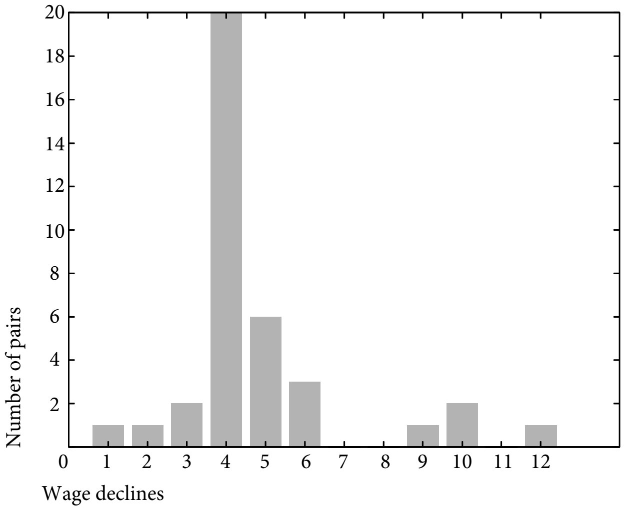
One might explain part 2 of Hypothesis 4 also by the effect of cost C. If Y is fired already in period $t = 1$, employer X is compensated for his cost C by low competitive wages in both periods, whereas firing Y in period 2 means that costs can be recovered in period 2 only. To distinguish between the two interpretations of part 2 of Hypothesis 4 one could impose the cost C for every period when a substitute worker is employed, i.e. that X would have to pay total training costs of $(1 - y_1)2C + y_1(1 - y_2)C$ instead of $(1 - y_1)C + y_1(1 - y_2)C$ only.

Our final hypothesis comes from redefining the experiment as an ultimatum game with a surplus of C to be split between the employer and the employee. In line with the experimental results from the ultimatum game literature, we formulate:

Hypothesis 5 In successful matches, the employee receives on average the competitive wage plus forty percent of the surplus C, whereas the employer keeps sixty percent of C on average.

Figure 1

Wage declines in “successful” matches, $C = 2$



Wage declines in “successful” matches, $C = 10$

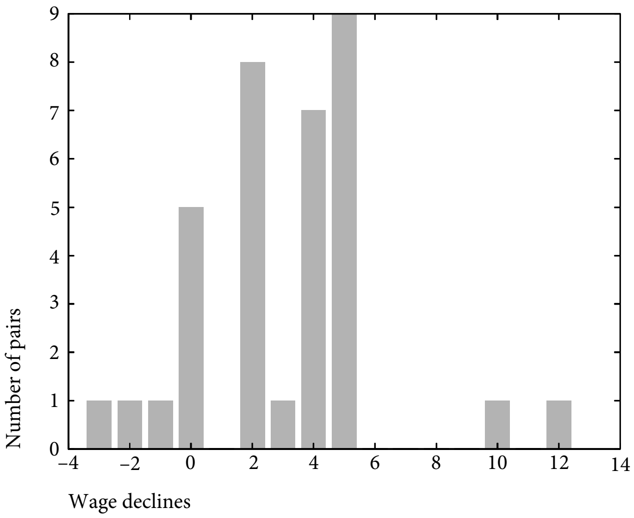
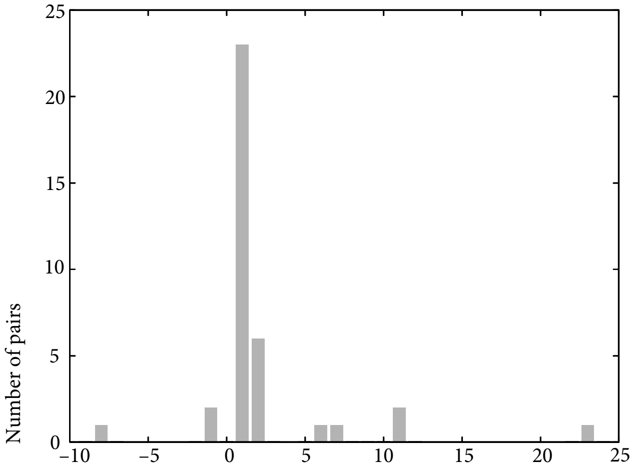


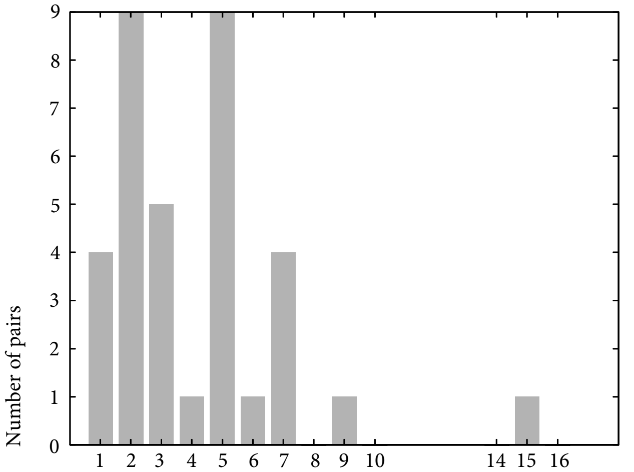
Figure 2

Surplus offered in “successful” matches, $C = 2$



Surplus offered

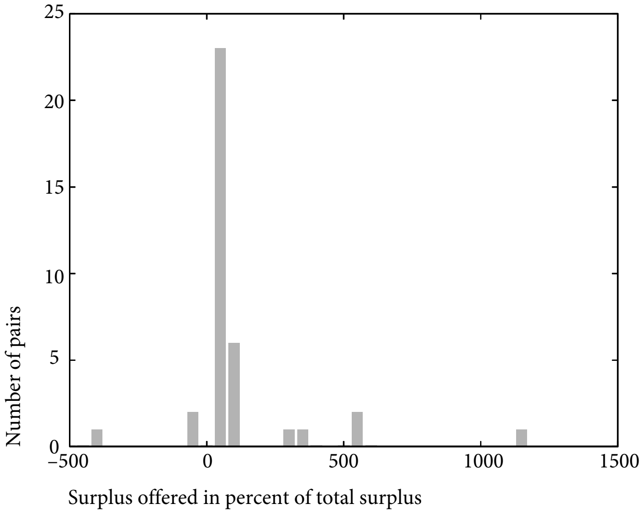
Surplus offered in “successful” matches, $C = 10$



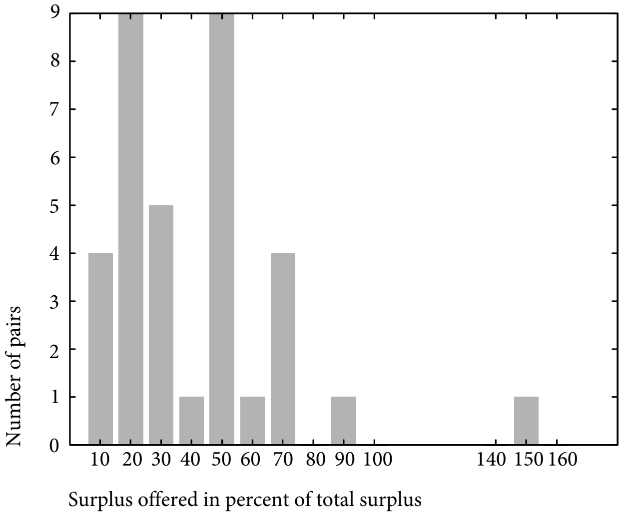
Surplus offered

Figure 3

Percent surplus offered in "successful" matches, $C = 2$



Percent surplus offered in "successful" matches, $C = 10$



4. Descriptive data analysis

What follows is a graphical summary of the results of the experiments. We conducted a total of three experiments, the details of which can be found in the appendix. Here, we treat the entire data as one sample.

Figure 1 contains the results for wage declines in both treatments, $C = 2$ and $C = 10$, with $\underline{C}$ shown at the top and $\overline{C}$ shown at the bottom. Hypothesis 1 would imply, that the wage decline should always be 5: the decline is usually lower than that, although some wage declines are dramatically larger. Hypothesis 2 does not seem to be strongly violated by this evidence: apparently, employers do by and large adjust wages according to market pressure.

Figure 2 shows, how much of the surplus the employee receives in successful matches. Note in particular, that more surplus is paid to the employee in treatment $\overline{C}$ as compared to treatment $\underline{C}$.

Figure 3 shows the same data as figure 2, but in percent of the total surplus to be distributed. What is remarkable is that the surplus distributed in treatment $\underline{C}$ is reasonably often below zero percent or above 100 percent. In treatment $\overline{C}$, the surplus distribution is tighter. In fact, the distribution for treatment $\overline{C}$ looks close to the distributions typically found in experimental ultimatum games, see our hypothesis 5.

Since the game was repeated once, one can also control for experience effects. In both treatments there is a slight rise in the wage level x_1 from the first to the second round (from 10.14 to 10.80 in treatment $\underline{C}$ and from 9.57 to 10.3 in treatment $\overline{C}$) which, in view of the large standard deviations, do not qualify as reliable experience effects. The average level of x_2 decreases in treatment $\underline{C}$ (from 6.23 to 5.68) and increases in treatment $\overline{C}$ (from 6.81 to 7.87). Both acceptance rates, i.e. shares of $y_t = 1$ for $t = 1,2$, increase with experience where the acceptance increase of x_2 is with 50% to 65.22% (46.15% to 59.26%) for treatment $\underline{C}$ ($\overline{C}$) much clearer than of x_1 (from 39.29 to 41.07 and from 43.33 to 45.00 % for treatment $\underline{C}$, respectively $\overline{C}$).

5. Statistical analysis

In this section, we provide some simple statistics related to our hypotheses. Given the graphical analysis above, we concentrate on the analysis of hypothesis 3 to 5. The results can be found in table 1. We find that:

1. The first claim of hypothesis 3, that employers offer wages above the competitive levels, is supported by the data for treatment $\overline{C}$: the average surplus offered to the employee is 4.13 with a standard deviation of 2.84: this allows to reject the null hypothesis of an average offered surplus of zero at a five

Table 1

		Treatment $\underline{C}$	Treatment $\overline{C}$
Total matches		56	60
of which unsuccessful		19	25
$(y_1 = 0 \text{ or } y_2 = 0)$ of which $y_1 = 0$:		11	7
Hypothesis 3			
Offers rejected at stage 1	max	10	11
	mean	5.22	5.43
	std. dev.	4.32	5.00
Offers rejected at stage 2	max	6	10
	mean	4.92	6.06
	std. dev.	0.74	2.80
Hypothesis 4			
Part 1:			
$\frac{P(y_1 = 1, y_2 = 1)}{P(y_1 = 1)}$		0.822	0.66
$P(y_1 = 1)$		0.80	0.88
Part 2: (succ. matches)			
$x_2 - w_2$	mean	1.21	3.01
	std. dev	1.52	1.94
$x_1 - w_1$	mean	1.05	1.11
	std. dev	3.28	2.15
Hypothesis 5			
(successful matches)			
Aver. surplus offered	mean	2.26	4.13
	std. dev.	4.65	2.84
in percent of *C*	mean	113	41
	std. dev.	232	28

This table shows some summary statistics as well as statistics relevant for testing some of the postulated hypotheses. In calculating standard deviations, we have not corrected for the dependence of the observations within each group.

percent significance level with a one-sided test, assuming normality.

For treatment $\underline{C}$, however, the null of no surplus offered in successful matches cannot be rejected. Furthermore, there is no support for the part of hypothesis 3, which postulates that the offered first period wages x_1 as well as

Table 2

	Accepted	Rejected	Total
Treatment $\underline{C}$:			
Offers above equil.	34	3	37
Offers at equil.	0	7	7
Offers below equil.	3	9	12
Treatment $\overline{C}$:			
Offers above equil.	35	14	49
Offers at equil.	0	5	5
Offers below equil.	0	6	6

This table shows the distribution of accepted and rejected offers vis-a-vis the quality of the offer. For first period rejections, we used a first period offer of $x_1 = 10$ as equilibrium, whereas we used $x_1 + x_2 = 15$ as equilibrium for games which reached the second period.

the rejected first period wages will be higher, if the costs C are higher: Conducting a robust rank-order test[8] a no-change hypothesis cannot be rejected at any conventional significance levels. This holds for the individual observations of the first round as well as for the average of a matching group of the second round. A different picture arises if we look at the second period wages x_2. A robust rank-order test reveals that the offered wages as well as the rejected wages are significantly higher in the high cost than in the low cost treatment at a 5% level. Again, this holds for the individual observations of the first round as well as for the average of a matching group of the second round. Hence, employment offers above the competitive wage mainly occurred in the second period of the high cost treatment.

Table 2 sheds further light on hypothesis 3 by tabulating the accept-reject decisions vis-a-vis the quality of the offer.

2. For hypothesis 4, notice first that in all matching groups at least one first period offer was accepted. In the high cost treatment 88% of the first period offers were accepted and 84% in the low cost treatment. Hence, as stipulated by Hypothesis 4, most pairs X and Y chose a "commitment" in the first period. However, the claim that $P(y_1 = 1, y_2 = 1)/P(y_1 = 1) > P(y_1 = 1)$ is not supported by the data: on the basis of a Wilcoxon signed rank test[9] equality cannot be rejected. This holds for the low cost as well as for the high cost treatment. The claim that $x_2 - w_2 > x_1 - w_1$ is not supported in case of the

[8] For a description of this test see Siegel and Castellan 1988, p. 137.
[9] For a description of this test see Siegel and Castellan 1988, p. 87.

Table 3

	less than 25 %	25 % – 35 %	35 % – 45 %	at least 45 %
Treatment $\underline{C}$:	8	0	0	92
Treatment $\overline{C}$:	37	14	3	46

This table shows the percentage of the total surplus *C*, which is received by the worker in successful matches.

low cost treatment. A Wilcoxon signed rank test, reveals no difference. In the high cost treatment, however, the difference between the first- and the second period wage drift is highly significant. Hence, we can conclude that there is a positive correlation between employment duration and wage drift, but only if there is enough "surplus" to divide.

3. Concerning hypothesis 5, one indeed cannot reject that the offered surplus is 33 percent for both treatment $\underline{C}$ and treatment $\overline{C}$. The standard error in treatment $\underline{C}$ is huge, though, whereas it is much smaller for treatment $\overline{C}$: a symmetric one-standard (deviation) error interval would be [13;69] for the surplus offered to the employee in percent. The evidence thus provides support to hypothesis 5. Table 3 sheds further light on this hypothesis by examining the distribution of the total available surplus.

The number of rejections – failure to reach an outcome in spite of the positive surplus to share – was significant. In both treatments the fraction of rejections were of similar proportions, with 41.7 (for $\underline{C}$) and 33.9 (for $\overline{C}$). Interestingly, the fraction of total failures occurring in the first stage was significantly higher in the low surplus case (57.9) – a result which merits further attention.[10]

6. Conclusions

We wanted to explore experimentally whether wages decline in recessions to mitigate rises in unemployment. Put differently, if the competitive market wage declines, will employers (not) simply force their employees to accept lower wages as well? In our experiments the competitive wage in the second phase of an employment relationship could already be anticipated by both

[10] What this suggests is that human partnerships are more easily terminated when they are less profitable: Instead of trying to hold up such a relationship one prefers a more anonymous kind of exchange.

parties, so uncertainty over the best-available alternatives is nonexistent.[11]

For the hypothesis that employers would not lower wages correspondingly and that employees would reject such wage cuts, we found at most mild evidence for resistance to wage declines. Wages appeared downward flexible in treatments involving large costs of noncooperation as well as in which these costs are relatively low.

The experimental results can be interpreted as analogous to an "ultimatum game", in which some surplus between employers and employees is split and wages (and their lack of decline) are simply the mechanical tool for accomplishing this split. A possible reason for this result could be that we provided the conditions for perfect foresight as far as the structural relationship is concerned: Both partners knew that they will interact for at most two periods and how the structural variables (C_t, w_t) develop over time. Thus a partnership for the long race cannot be viewed as a risk sharing venture in which a lucky partner (the employer in the present case) is supposed to help the unlucky one (the employee).[12] By ruling out this insurance interpretation (Rosen 1985, Boldrin and Horvath 1995), our study can be regarded as a worst case scenario for testing the conjecture that wages (will not) decline in recessions in contrast to the theory of competitive labor markets.

Appendix A: Instructions

A.1 Instruction sheet for treatment C: costs $C = 2$

In the experiment two parties, each represented by one person called *X* and *Y*, are going to interact. Both, *X* and *Y*, receive the same instructions. Only before deciding you will learn whether you are going to be *X* or *Y*. You will not learn from us with whom you will be interacting. We kindly ask you to refrain from any public remarks, etc.

How will *X* and *Y* interact? The decision process is as follows:

- First *X* chooses x_1 with $25 \geq x_1 \geq 0$, i.e. x_1 cannot exceed 25 and must be nonnegative.
- Knowing the range $25 \geq x_1 \geq 0$ for x_1 and the actual decision x_1 then *Y* can either accept x_1 (we denote this by $y_1 = 1$) or not ($y_1 = 0$).

---

[11] Notice, however, that we could have easily avoided this by revealing in period 1 only the parameters S_1, w_1 and C and the total number of periods of interaction.

[12] As indicated above, we could have easily tested this experimentally by not informing the participants already in the first period what economic situation will prevail in period 2.

- In case of $y_1 = 0$ this is the end. In case of $y_1 = 1$:
- *X* again must choose, namely x_2 with $20 \geq x_2 \geq 0$.
- Knowing the range $20 \geq x_2 \geq 0$ for x_2 and the actual decision x_2 then *Y* again can accept x_2 (denoted by $y_2 = 1$) or not (denoted by $y_2 = 0$). After that the interaction ends.

How do decisions affect what the two parties *X* and *Y* earn? This is described by the following table:

What		What	
X has done	*Y* has done	*X* earns	*Y* earns
x_1	$y_1 = 0$	28	15
x_1, x_2	$y_1 = 1, y_2 = 0$	$38 - x_1$	$x_1 + 5$
x_1, x_2	$y_1 = 1, y_2 = 1$	$45 - x_1 - x_2$	$x_1 + x_2$

As you can see, the maximum amount that *X* and *Y* together can earn is 45. That maximum amount is reduced to 43 if $y_1 = 0$ or $y_2 = 0$.

Here the earnings are expressed in Dutch guilders (Hfl.). Since we need time to check your earnings you can collect the money only a week later. A code card will be attached to your decision form. You will have to show this when collecting your earnings. So you should keep it.

These are the simple rules please raise your hand if you did not understand something. We will try to answer your questions privately. Do not ask loud questions and, please, refrain from any communication. Thank you for your cooperation!

How will we proceed? After answering questions privately you will have to fill out a short questionaire concerning the experiment. We then proceed with the experiment exactly as described in these instructions. Enjoy the experiment!

A.2 Instruction sheet for treatment C: costs $C = 10$

In the experiment two parties, each represented by one person called *X* and *Y*, are going to interact. Both, *X* and *Y*, receive the same instructions. Only before deciding you will learn whether you are going to be *X* or *Y*. You will not learn from us with whom you will be interacting. We kindly ask you to refrain from any public remarks, etc.

How will *X* and *Y* interact? The decision process is as follows:

- First *X* chooses x_1 with $25 \geq x_1 \geq 0$, i.e. x_1 cannot exceed 25 and must be nonnegative.

- Knowing the range $25 \geq x_1 \geq 0$ for x_1 and the actual decision x_1 then Y can either accept x_1 (we denote this by $y_1 = 1$) or not (denoted by $y_1 = 0$).
- In case of $y_1 = 0$ this is the end. In case of $y_1 = 1$:
- X again must choose, namely x_2 with $20 \geq x_2 \geq 0$.
- Knowing the range $20 \geq x_2 \geq 0$ for x_2 and the actual decision x_2 then Y again can accept x_2 (denoted by $y_2 = 1$) or not (denoted by $y_2 = 0$). After that the interaction ends.

How do decisions affect what the two parties X and Y earn ? This is described by the following table:

What		What	
X has done	Y has done	X earns	Y earns
x_1	$y_1 = 0$	20	15
x_1, x_2	$y_1 = 1, y_2 = 0$	$30 - x_1$	$x_1 + 5$
x_1, x_2	$y_1 = 1, y_2 = 1$	$45 - x_1 - x_2$	$x_1 + x_2$

As you can see, the maximum amount that X and Y together can earn is 45. That maximum amount is reduced to 35 if $y_1 = 0$ or $y_2 = 0$.

Here the earnings are expressed in Dutch guilders (Hfl.). Since we need time to check your earnings you can collect the money only a week later. A code card will be attached to your decision form. You will have to show this when collecting your earnings. So you should keep it.

These are the simple rules please raise your hand if you did not understand something. We will try to answer your questions privately. Do not ask loud questions and, please, refrain from any communication. Thank you for your cooperation!

How will we proceed? After answering questions privately you will have to fill out a short questionnaire concerning the experiment. We then proceed with the experiment exactly as described in these instructions. Enjoy the experiment!

Appendix B: Questionnaire

Remember the range for x_1 is $25 \geq x_1 \geq 0$ whereas for x_2 it is $20 \geq x_2 \geq 0$. If X would choose $x_1 = 13$ and $x_2 = 19$ what will X and Y earn under following assumptions for Y´s behavior?

(a) x_1 and x_2 are accepted, i.e. $y_1 = 1$ and $y_2 = 1$:

X earns ☐ *Y* earns ☐

(b) x_1 is accepted, x_2 not, i.e. $y_1 = 1$ and $y_2 = 0$:

X earns ☐ *Y* earns ☐

(c) x_1 and x_2 are rejected, i.e. $y_1 = 0$:

X earns ☐ *Y* earns ☐

Which of the two positions *X* or *Y* do you prefer?

I prefer position ☐ (*X* or *Y*)

What would you do in case you were party X?

As *X* I would choose ☐ ($25 \geq x_1 \geq 0$)

If x_1 would be accepted, i.e. $y_1 = 1$, I would choose x_2= ☐
($20 \geq x_2 \geq 0$)

How would you react in case you were party *Y*?

As *Y* I would never reject any x_1 ☐

As *Y* I would some values of x_1 ☐

In case of the latter, please describe which values x_1 you would reject:

....

As *Y* I would never reject any x_2 ☐

As *Y* I would never reject some values of x_2 ☐

In case of the latter, please describe which values x_1 you would reject:

....

Appendix C: Decision forms

X Decision form

I offer $x_1 =$ ☐ only offers of $25 \geq x_1 \geq 0$ are possible

To be filled out by experimenter

Your offer x_1 is accepted [ ] $(y_1 = 1)$

Your offer x_1 is rejected [ ] $(y_1 = 0)$

Only if x_1 is is accepted, please continue:

I offer $x_2 =$ [ ] only offers of $20 \geq x_1 \geq 0$ are possible

To be filled out by experimenter:

Your offer x_2 is accepted [ ] $(y_2 = 1)$

Your offer x_2 is rejected [ ] $(y_2 = 0)$

Please compute when ready. I have earned: [ ]

Y Decision form

To be filled out by experimenter:

X has offered $x_1 =$ [ ]

I do not accept the offer [ ] $(y_1 = 0)$

I accept the offer [ ] $(y_1 = 1)$

To be filled out by experimenter:

X has offered $x_2 =$ [ ]

I do not accept the offer [ ] $(y_2 = 0)$

I accept the offer [ ] $(y_2 = 1)$

Please compute when ready. I have earned: [ ]

References

Akerlof, G. and J. Yellen (1990a), The Fair-Wage Effort Hypothesis andUnemployment, *Quarterly Journal of Economics*, 195, 255–284.

Akerlof, G. and J. Yellen (1990b), Fairness and Unemployment, *American Economic Review*, 78, 44–49.

Bewley, T. (1995), A Depressed Labor Market as Explained by Participants, *American Economic Review*, 85, 250–259.

Bewley, T. (1997), There's no Harm in Looking: A Close Look at Wage Rigidity, Alfred Marshall Lecture, 12th Congress of the European Economic Association, Toulouse, September.

Bils, M. J. (1985), Real Wages over the Business Cycle: Evidence from Panel Data, *Journal of Political Economy*, 93 (4), 666–689.

Binmore K., A. Rubinstein, and A. Wolinsky (1986), The Nash Bargaining Solution in Economic Modelling, *Rand Journal of Economics*, 17, 176–188.

Boldrin, M. and M. Horvath (1995), Labor Contracts and Business Cycles, *Journal of Political Economy*, 103, 972–1004.

Camerer, C. F. (2003) *Behavioral Game Theory: Experiments in Strategic Interaction*, Russel Sage Foundation, Princeton, NJ: Princeton University Press.

Collard, F. and D. de la Croix (2000), Gift exchange and the business cycle: the fair wage strikes back, *Review of Economic Dynamics*, 3/1, 166–193.

Fehr, E., G. Kirchsteiger and A. Riedl (1993), Does Fairness Prevent Market Clearing? An Experimental Investigation, *Quarterly Journal of Economics*, 108, 437–459.

Fehr, E., G. Kirchsteiger, and A. Riedl (1996), Involuntary Unemployment and Non-compensating Wage Differentials in an Experimental Labour Market, *Economic Journal*, 106, 106–121.

Fehr, E., S. Gächter and G. Kirchsteiger (1996), Reciprocal Fairness and Noncompensating Wage Differentials, *Journal of Institutional and Theoretical Economics*, 152(4), 608–40.

Fehr, E., S. Gächter and G. Kirchsteiger (1997), Reciprocity as a Contract Enforcement Device: Experimental Evidence, *Econometrica*, 65(4), 833–860.

Güth, W. (1995), On Ultimatum Bargaining Experiments: A Personal Review, *Journal of Economic Behavior and Organization*, 27(3), 329–44.

Keynes, J. (1936), The General Theory of Employment, Interest, and Money, London: Macmillan.

Layard, R., S. Nickell, and R. Jackman (1991), Unemployment, Oxford: Oxford University Press.

McDonald, I. and R.Solow (1981), Wage Bargaining and Employment, *American Economic Review*, 71, 896–908.

Oswald, A. (1985), The Theory of Trade Unions: A Survey, *Scandinavian Journal of Economics*, 87, 160–193.

Nash, J. (1953), Two-Person Cooperative Games, Econometrica, 21, 128–140.

Pissarides, C. (1991), *Equilibrium Unemployment*, Oxford: Basil Blackwell Press.

Rosen, S. (1985), Implicit Contracts: A Survey, *Journal of Economic Literature*, 23, 1144–1175.

1111/07/2005 18:48 04-22-2 Burda.doc

Roth, A. E. (1995), Bargaining Experiments, in: *The Handbook of Experimental Economics*, J. Kagel and A. E. Roth (eds.), Princeton, N. J.: Princeton University Press, 253–348.

Rubinstein, A. (1982), Perfect Equilibrium in a Bargaining Model, *Econometrica*, 50, 97–109.

Selten, R. (1965), Spieltheoretische Behandlung eines Oligopolmodells mit Nachfrageträgheit, *Zeitschrift für die gesamte Staatswissenschaft* (JITE), 121, 301–324, 667–689.

Siegel, S. and Castellan, J. (1988), *Nonparametric Statistics for the Behavioral Sciences*, Singapore: McGraw-Hill Book Co.

Solon, G., R. Barsky, and J. A. Parker (1994), Measuring the Cyclicality of Real Wages: How Important Is Composition Bias? *Quarterly Journal of Economics*, 109 (1), 1–25.

Tietz, R. (1975), An Experimental Analysis of Wage Bargaining Behavior, *Zeitschrift für die gesamte Staatswissenschaft* (JITE), 131(1), 44–91.

Tversky, A. and D. Kahnemann (1986), Rational Choice and the Framing of Decisions, *Journal of Business*, 59(4), Part 2, 251–78.