Contract Negotiation between Principal and Agent.

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Experimental Economics

- Why laboratory experiments?
  - Test of economic theories
  - Real subjects in a controlled environment (information conditions)
  - Real incentives: monetary payment depends on subjects' choices
  - Repeatability
  - Costs and validity
- Current experimental topics at our department
  - Principal-Agent Conflict
  - Capital Market Simulation
  - Time Series (Eye Tracker Experiments)
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Agenda

- Motivation
- Agency Theory
- The Experiment
- Theoretical Solution
- Hypotheses
- Results

Motivation

Whitford, A. B. ,Miller, G. B. and Bottom, W. H.
Negotiated Compliance: Social Solution to the 'Principal's Problem' (2005)

- Principal Agent Problem and its Solution: Are strong incentives the only possibility to motivate high performance?
- How does outcome-based compensation (such as bonuses or commission) influence agents' effort?
- Incentives vs. social solution of the problem.

Agency Theory

An **Agency Relationship** represents a hierarchical relationship and it arises between two or more parties when one, designated as the **agent**, acts on behalf of the other, designated as the **principal**.

- Conflict of interests
- Information Asymmetry
- Moral Hazard

The Experiment

- Programmed with z-Tree (Zurich Toolbox for Ready-made Economic Experiments).
- Conducted in the Max Jung Laboratory in the 'Institute of Statistic and Operations Research.
- Participants: undergraduate, graduate and post-graduate students of the Karl-Franzens-University of Graz.

The general Procedure of the Experiment (1)

- The experiment is a finite game and it consists of 4 sessions.
- Each session represents a simple principal-agent relationship:
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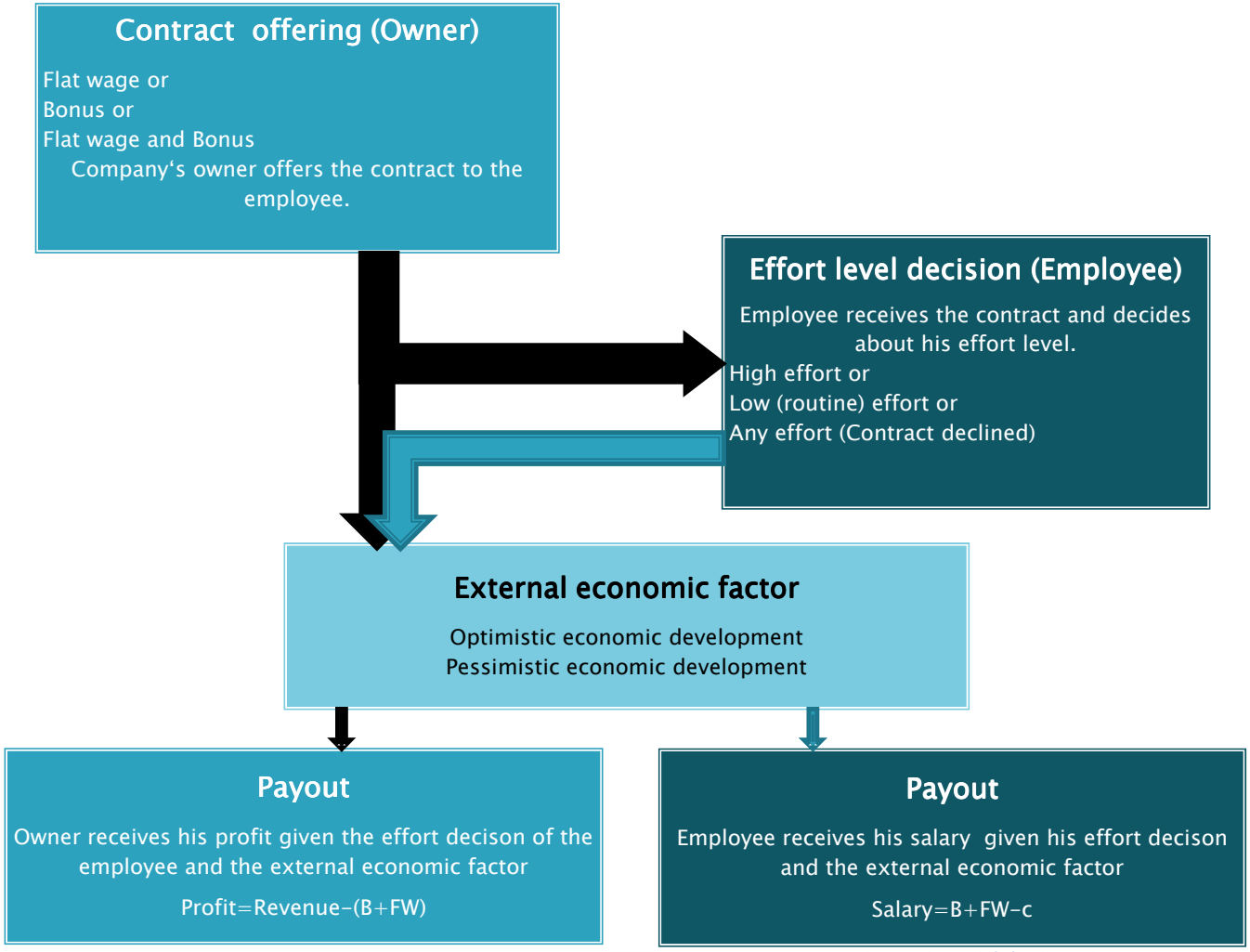
The general Procedure of the Experiment (2)

	Optimistic Scenario	Pessimistic Scenario	Opportunity Costs
Revenue (x)	$x_H = 30$	$x_L = 10$	
	Probabilities		
High effort (e_H)	p	$1 - p$	c_H
Low effort (e_L)	q	$1 - q$	c_L

$$c_H > c_L$$
$$p > q$$

The Design of the Experiment



Two Phases of the Experiment

- The **negotiation phase** - face-to-face; it lasts around 20 minutes; participants have all necessarily data for all four sessions and they have to act out the four contracts
- The **decision phase** - on the computer; participants have to make a final decision for each session; the verbal agreement, made during the face-to-face negotiation phase, is not binding for the participants.

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Theoretical Solution

- The **Model**:

$$\max_{S,b} p \cdot x_H + (1-p) \cdot x_L - (S + p \cdot b) \Longleftrightarrow \min_{S,b} S + p \cdot b$$

$$S + p \cdot b - c_H \geq \underline{U} \qquad \text{(PC)}$$

$$S + p \cdot b - c_H \geq S + q \cdot b - c_L \qquad \text{(ICC)}$$

$$S, b \geq 0 \qquad \text{(NNC)}$$

$$\Rightarrow b = \frac{c_H - c_L}{p - q}$$

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Revenue (x)	30 MU	30 MU	
	Probabilities		
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Low effort (e_L)	0,5	0,5	5,0 MU

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Revenue (x)	30 MU	30 MU	
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Theoretical Solution - Four Sessions

		Marginal Cost of Effort of Agent	
		Low ($c_H - c_L = 3,5$)	High ($c_H - c_L = 5,0$)
Marginal efficiency of Agent	High ($p - q = 0,3$)	Session 1 $b = 11,(6);\ S = 0$	Session 2 $b = 16,(6);\ S = 0$
	Low ($p - q = 0,2$)	Session 3 $b = 17,5;\ S = 0$	Session 4 $b = 25,0;\ S = 0$

Hypotheses

1. High effort can be induced with a compensation package that is significantly different from the theoretical compensation, which means that the agent can also be motivated to supply high effort with a fixed salary and the bonus lower than the critical bonus suggested by the principal-agent theory.
2. No significant discrepancies can be detected in the compensation packages offered in the four sessions of the experiment.

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Results: Hypothesis 1

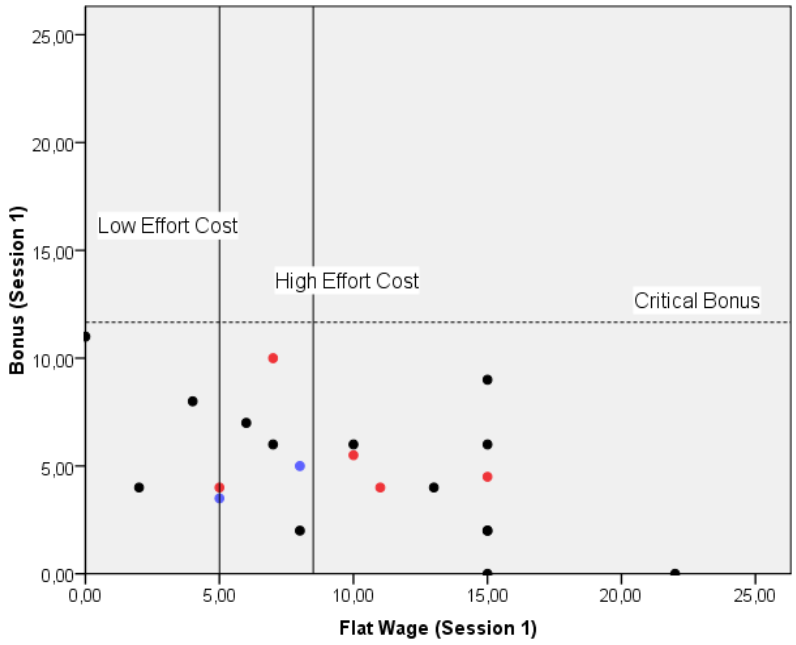
Extended Version		Bonus Observed	Bonus Theoretical	Bonus Sig.	Flat Wage Observed	Flat Wage Theoretical	Flat Wage Sig.
Session 1	Mean	4,93	11,67	0,000	9,91	0,00	0,000
	Median	4,50			10,00		
Session 2	Mean	6.07	16,67	0,000	8,74	0,00	0,000
	Median	6,00			9,00		
Session 3	Mean	4,48	17,50	0,000	8,83	0,00	0,000
	Median	4,00			10,00		
Session 4	Mean	5,33	25,00	0,000	8,29	0,00	0,000
	Median	5,00			8,00		

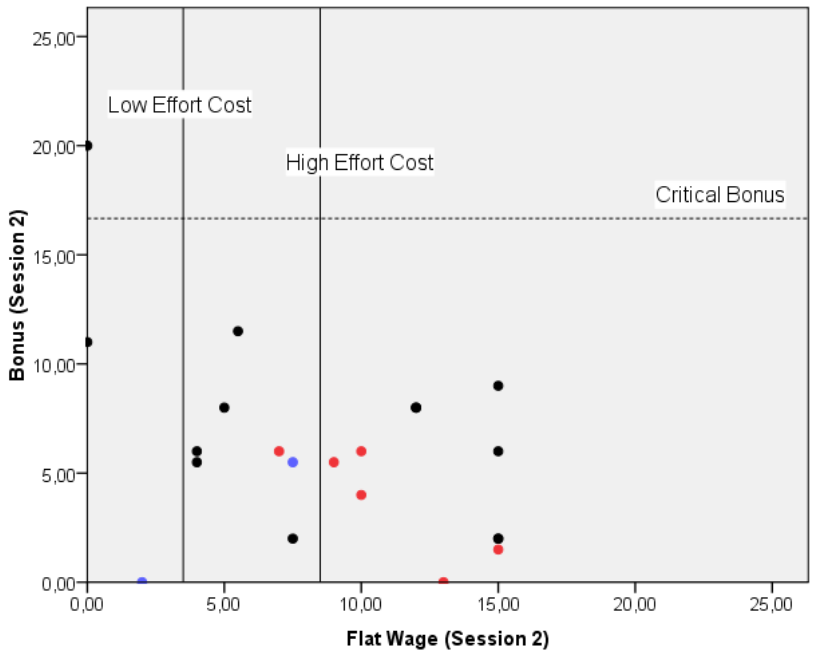
- The bonus and the flat wage offered in the experiment are significantly different to the bonus and the fixed salary predicted by the theory (T-test).

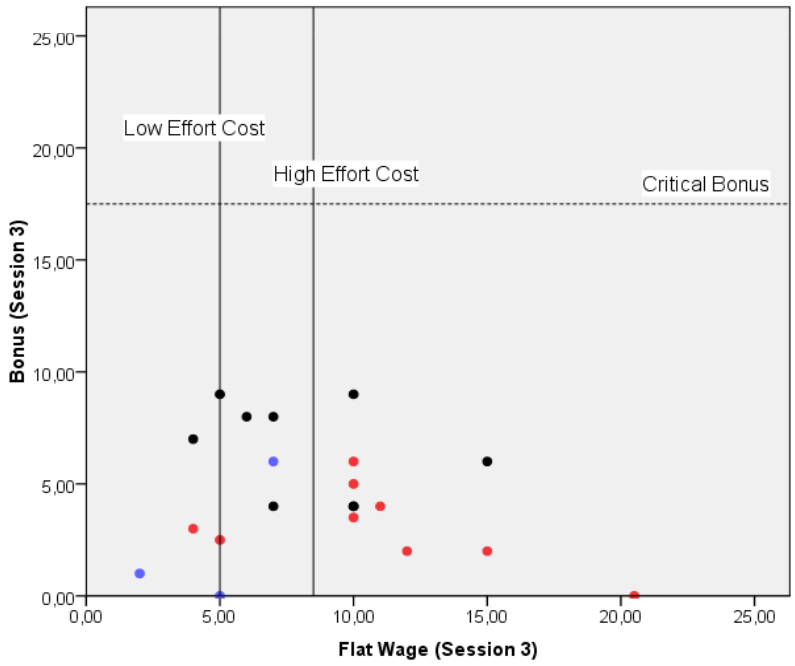
Results: Hypothesis 1

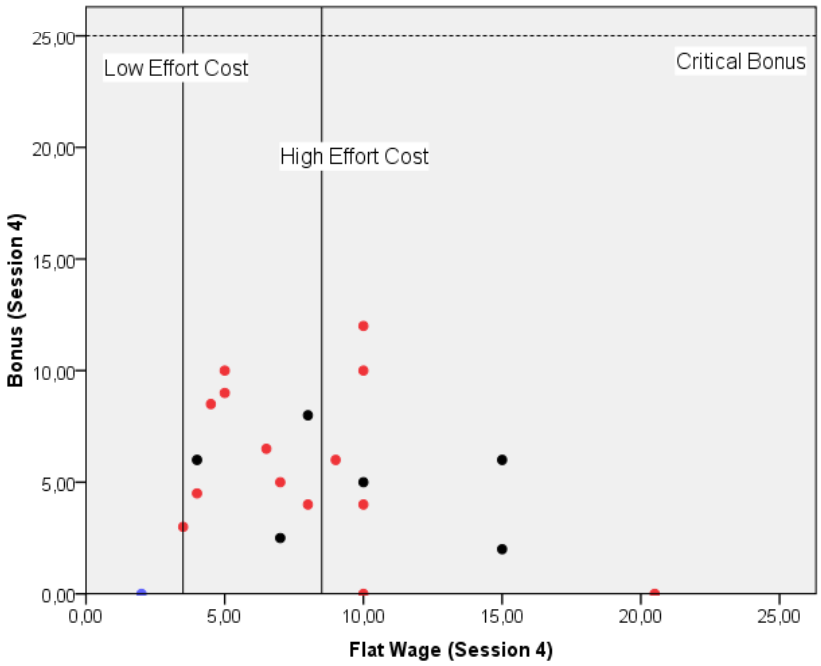
		Bonus		
		$<$ Critical Bonus	$\geq$ Critical Bonus	
Effort	High	41	1	42
		97,60%	2,4%	
	Low	34	0	34
		100,00%	0,00%	
	Exit	8	0	8
		100,00%	0,00%	
		83	1	84
		98,80%	1,20%	

- The majority of principals offered a bonus less than the bonus necessary for inducing high effort (the bonus predicted by the model).









High Effort Low Effort Exit

Results: Hypothesis 1

- In our experiment we could observe that principals offered lower bonuses than the critical bonus and additionally they used risk-free compensation in the form of a flat wage.
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Results: Hypothesis 2

	Mean Rank
Bonus & Flat Wage (Session 1)	2,62
Bonus & Flat Wage (Session 2)	2,69
Bonus & Flat Wage (Session 3)	2,45
Bonus & Flat Wage (Session 4)	2,24

	Test Statistics[a]
N	21
Chi-Square	1,957
df	3
Asymp. Sig.	**0,581**

a. Friedman Test

- Compensation packages offered in four sessions do not differ significantly from each other.
- The second hypothesis can be thus corroborated.

Results: Hypothesis 3

Principal's Deviations

	Bonus	Flat Wage	Bonus and Flat Wage
No Deviation	66	75	67
	78,58%	89,29%	79,76%
Positive Deviation	9	9	12
	10,71%	10,71%	14,29%
Negative Deviation	9	0	5
	10,71%	0,00%	5,95%
	84	84	84
	100,00%	100,00%	100,00%

Agent's Deviations

	Effort
No Deviation	65
	77,38%
Negative Deviation	19
	22,62%
	84
	100,00%

Conclusions

- The outcomes in our experiment are not consistent with the theoretical solution.
  - Bonuses equal to or higher than the theoretical bonus are very rare.
  - Nevertheless, we observe high effort in many cases.
  - There are no significant differences between the compensation packages offered in 4 sessions.
- Both principals and agents mostly abide by the agreements made in the negotiation phase.

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