

Instructions¹

You are now taking part in an economics experiment. If you read the following instructions carefully, you can, depending on your decisions and of those made by the others, earn a considerable amount of money. It is therefore important that you take your time to understand the instructions.

The instructions which we have distributed to you are for your private information. Please do not communicate with the other participants during the experiment. Should you have any questions, please raise your hand and one of the experimenters will come and assist you.

During the experiment we shall not speak of Dollars, but of Experimental Currency Units (ECU). Your entire earnings will be calculated in ECUs. At the end of the experiment, the total amount of ECUs you have earned will be converted to Australian Dollars at the rate of **1 ECU = 10 cents** and will be immediately paid to you in cash. Additionally, you will be given an endowment of **150 ECU** for showing up. This money will automatically be used to cover any losses you might occur throughout the experiment.

Overview of the experiment

There are three kinds of roles in the experiment: *Employers*, *Workers* and *Observers*. At the beginning of the experiment, roles will be randomly allocated to the 21 participants. At any given point in time, there will be 3 Employers, 6 Workers, and 12 Observers. Over the course of the experiment, you may end up playing all three roles, so it is important to understand the instructions for each role.

The experiment is divided into a number of rounds. At any given round, there will be 3 firms operating in a market. Firms remain active in the market for a random length of time. When these firms stop operating, there will be new firms coming into existence.

Each firm is run by an Employer. Each Employer needs to employ one Worker to operate the firm and earn money. To be able to employ a Worker, in every round, each Employer will offer an employment contract to the Workers. Each contract will specify (i) a wage that the Employer will pay and (ii) a level of effort that the Worker must exert in exchange. The effort that the Worker exerts generates benefits for the Employer, but carries a cost for the Worker as described below.

The employment contracts will be offered simultaneously to all 6 Workers. A Worker may accept any of the contracts on offer. Note that each Employer can employ only one Worker to

¹ These instructions are for the Rat-Race treatment. The instructions for the Efficient treatment were appropriately adjusted and are available from the authors upon request.

work for his or her Firm. This means that only 3 of the 6 Workers will be employed in every round.

If the firm continues to operate, the Workers which are employed in a given round will become the Employers in the subsequent round. This will give them a chance to run the firm for one round. The new Employers will offer employment contracts to a new set of 6 Workers, randomly drawn from the pool of Observers.

The way roles will be assigned throughout the experiment is explained in more detail in the following section.

How will the roles of Observers, Workers, and Employers be assigned?

Recall that at any given point in the experiment, there will be 3 firms in operation. The firms in the experiment do not continue to operate forever. These firms can be either new or old. After one round of operation, new firms become old firms.

Whether a new firm lives to become an old firm and whether an old firm will continue its operation for another round depends on a *random* event. In particular, at the end of each round, a virtual dice will be thrown.

- If the outcome of the throw is 1, 2, 3, 4, or 5, the firms will continue to operate. As mentioned above, in this case, the Workers employed by the firms in the previous round will become the firms' Employers. Next, 6 of the 12 Observers will be randomly assigned to the role of Workers. Finally, the former Employers of the firms and the *unemployed* Workers will become Observers.
- If the outcome of the throw is a 6, *all* firms will cease to exist. In the next round, 3 new firms will come into existence and they will have 3 new randomly-appointed Employers. The role of Employers, Workers, and Observers will be assigned randomly to the 21 participants when new firms come into existence. In particular, 3 participants will be randomly assigned the role of the Employer, 6 the role of the Worker, and 12 the role of the Observer.

Hence, the way roles are assigned will depend on whether firms are new or old.

Detailed description of tasks performed by each type of player

Employers' task

Employers must design a contract. The contract will specify (i) the wage that the Employer will pay to the Worker and (ii) the level of effort that the Worker will exert if he or she accepts the contract. Wages can range between 0 and 150. The level of effort is measured in Units and can be 0, 20, 40, 60, 80 or 100 Units. Each Unit of effort creates a surplus of 1.5 ECU for the Employer. Employers will be able to observe the contracts offered by the other

Employers and have the opportunity to change the details of their own contracts as long as their contract has not been accepted.

The Employer’s earnings are given by the following equation.

(i) Employer’s earnings in a given round if contract is accepted =
 $1.5 \times \text{Level of Effort} - \text{Wage paid to Worker}$

(ii) Employer’s earnings in a given round if contract is NOT accepted = 0

Example 1: Assume you are an Employer and offer a contract with a wage of 20 in exchange for 20 units of effort. If the contract is accepted by a Worker, the Employer’s earnings will equal $1.5 \times 20 - 20 = 10$ ECU. If the contract is not accepted by a Worker, the Employer will earn 0 ECU in this round.

Figure 1 shows a sample screen shot of the interface given to Employers. The top half of the interface is divided into three parts and is used to offer contracts in the current round. On the left hand side, employers can submit contracts by entering a wage and effort level and pressing the “Make offer” button. Offers made will appear in the middle box and can be accepted by workers in the market.

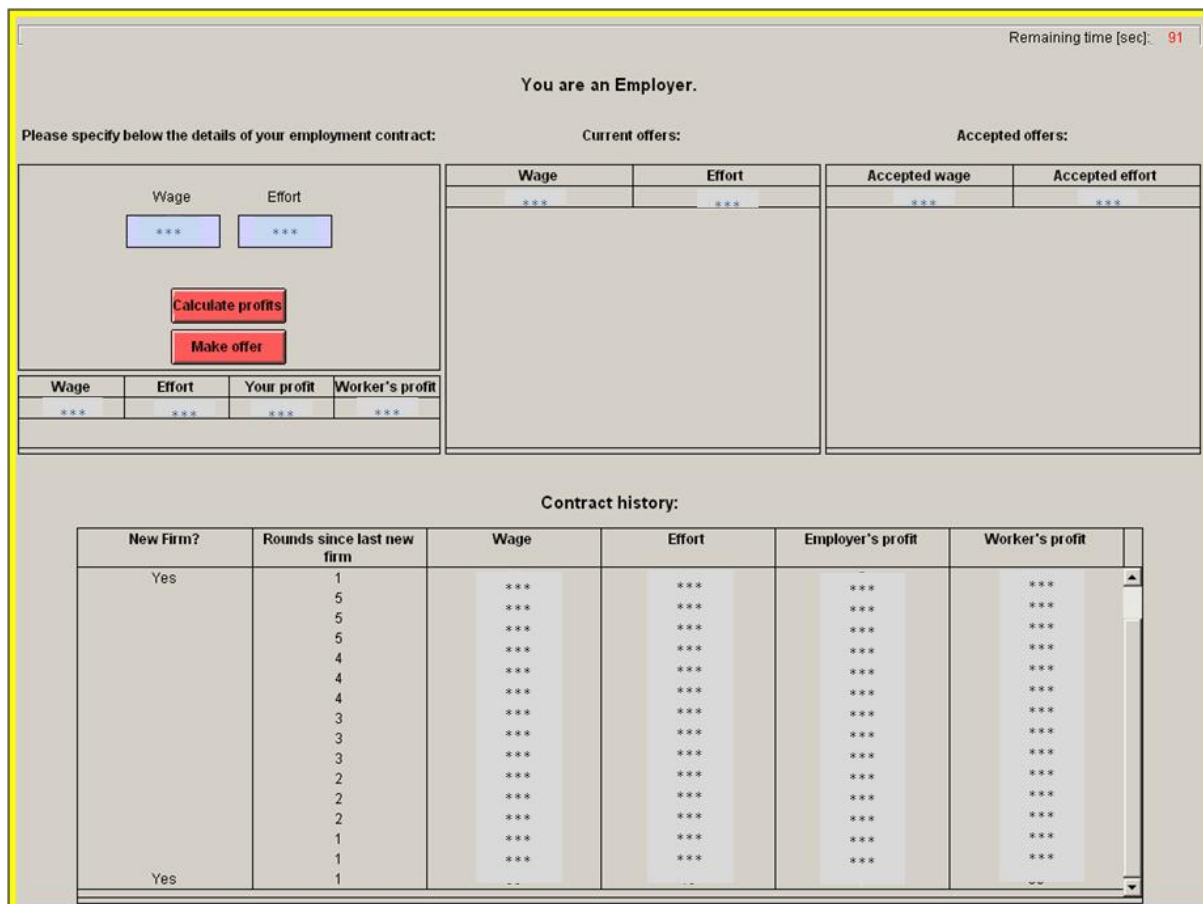


Figure 1

Once an employer has made an offer, a “withdraw offer” button will replace the “make offer” button in the employer interface. As long as an employer’s offer has not been accepted by a worker, employers can make a new offer by withdrawing their current offer and submitting a new contract. Employers also have the ability to calculate their profits under different choices of wage and effort. To do so, employers can enter the wage and effort levels desired and press the “calculate profit” button located below the make and withdraw offer buttons.

The upper right hand side of the interface shows all contracts that were traded in the current round. Once a worker accepts a contract, the contract is removed from the centre display and moved to the accepted offers box on the right side of the screen. Both the employer who made the offer and the worker who accepted the offer are bound to this contract and cannot participate further in the round.

In the bottom half of the interface, a history of all trades from previous rounds is shown. For each previous round all contracts accepted by the Workers are shown. Thus, if in a round all three contracts are accepted, there will be three contracts shown in the history. On the other hand, if only one contract is accepted, only one contract will be shown in the history.

The history contains information regarding the wage and effort of the firm, the Employer’s and Worker’s profits, and the longevity of past firms. The first column reports whether the firm is a new firm or an existing firm. The second column shows the number of rounds since the last group of new firms was created. Note that the history shows newest contracts at the top. Thus, in the example shown here, the previous group of firms operated for a total of five rounds before a “6” was rolled and a new group of firms started operating.

At the end of each round, a virtual dice is thrown, as shown in Figure 2. If the virtual dice outcome is 1-5 and the current firm continues to operate, all Employers will become Observers in the following round.

If, on the other hand, the virtual dice outcome is 6, the existing firms will stop operating. In this case, Employers have the same chance to become an Employer, a Worker and an Observer.

Example 2: *Suppose that you are an Employer and that you offer a contract that requires an effort of 60 Units for a wage of 40 ECU. One of the Workers accepts your contract. In this case, your earnings are $1.5 \times 60 - 40 = 50$ ECU. At the end of the round, the virtual dice outcome is 4 and thus the firm continues to operate. In this case, you will be assigned the role of the Observer in the following round.*



Figure 2

Workers' task

Workers must decide whether or not to accept one of the employment contracts offered in a given round. The Worker's earnings in a given round depend on whether the Worker accepts a contract and is therefore employed, or the Worker remains unemployed. The Worker's earnings in a given round are calculated using the following equation.

(i) Worker's earnings in a given round if employed = $Wage - Cost\ of\ Effort$

(i) Worker's earnings in a given round if unemployed = 0

The cost of effort depends on the level of effort. Table 1 shows the cost of effort.

Units of Effort	0	20	40	60	80	100
Cost of Effort	0	0	20	60	100	140

Example 3: Assume the contract offers a wage of 20 in exchange for 20 units of effort. If the Worker accepts this contract and is thus employed, his/her earnings will equal $20 - 0 = 20$ ECU. If the Worker is unemployed, his/her earnings from the round will be 0 ECU.

Figure 3 shows a sample screen shot for the Workers. To accept a contract as a Worker, highlight the contract from the current offers you wish to accept and press the “Accept contract” button at the bottom of the screen. As with the Employers, once a Worker accepts a contract he or she is bound to this contract and cannot participate further in the round. The accept contract button will disappear indicating that the worker has successfully completed the contract.

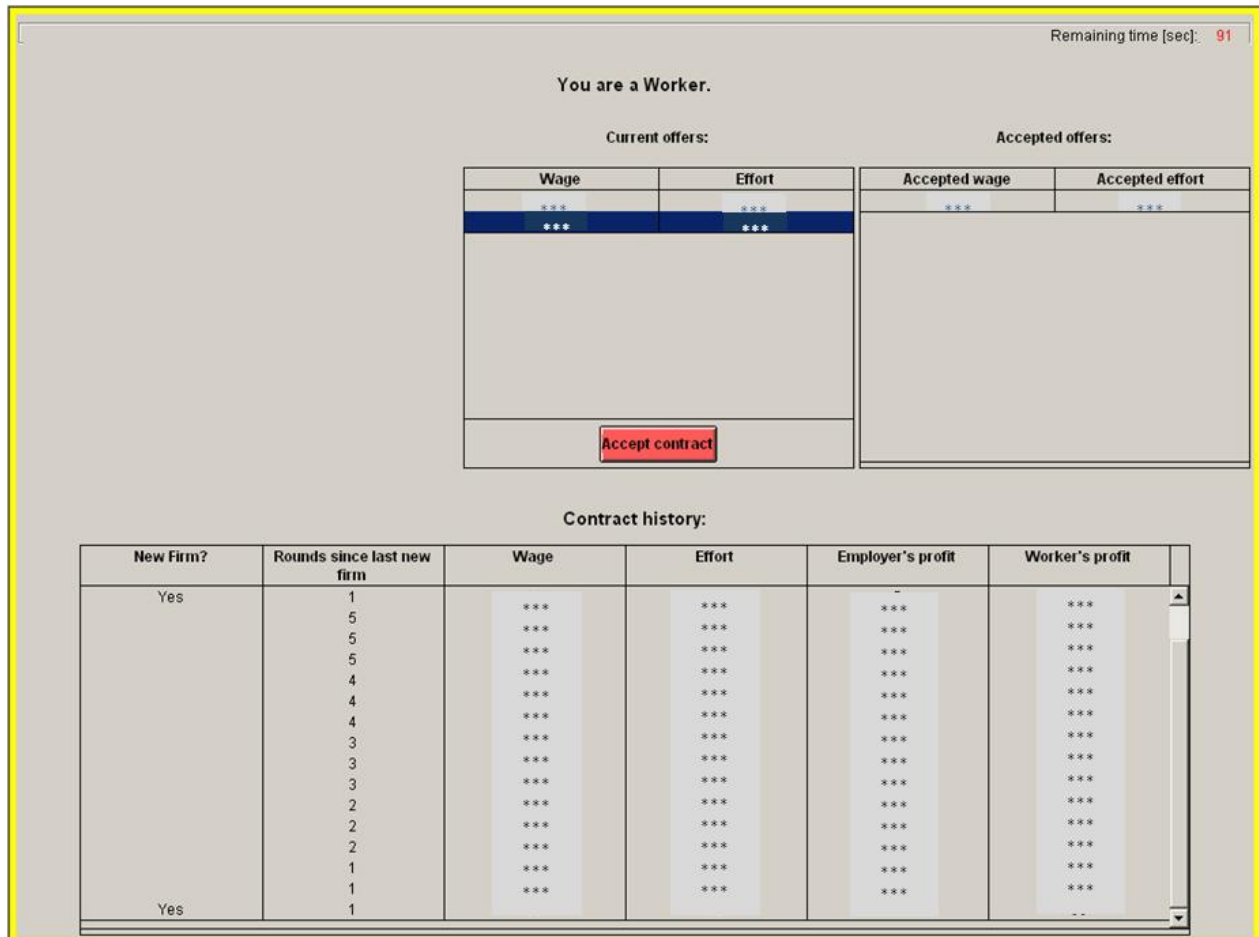


Figure 3

At the end of the round, if the virtual dice outcome is 1-5, the existing firm continues to operate for at least another round. In this case, Workers who are unemployed will become Observers in the following round, while employed Workers will be promoted to Employers.

In case a 6 comes up, the existing firms will stop operating. Employed and unemployed workers are equally likely to be assigned the role of an Employer, a Worker, and an Observer in the following round.

Example 4: Suppose that you are a Worker in the current round and accept a contract which requires an effort of 60 Units for a wage of 40 ECU. In this case, your earnings in the round are $40 - 60 = -20$. At the end of the round, the virtual dice roll is a 3. In this case, the existing

firms continue to operate. Since you are working in the firm, you will be promoted to Employer in the next round.

Example 5: Suppose that you are a Worker in the current round and accept a contract which requires an effort of 80 for a wage of 110. In this case, your earnings in the round are $110 - 100 = 10$. At the end of the round, the virtual dice roll is a 6. In this case, the Firm stops operating and you will be an Employer, a Worker or an Observer in the next round.

Observers' task

Observers, as their name suggests, observe decisions in the employment market. Observers do not participate in the employment market and therefore cannot make a profit in any given round.

Figure 4 shows a sample screen shot for the Observers. The Observers' screen is identical to the Workers' screen except that they will not be able to accept offers.

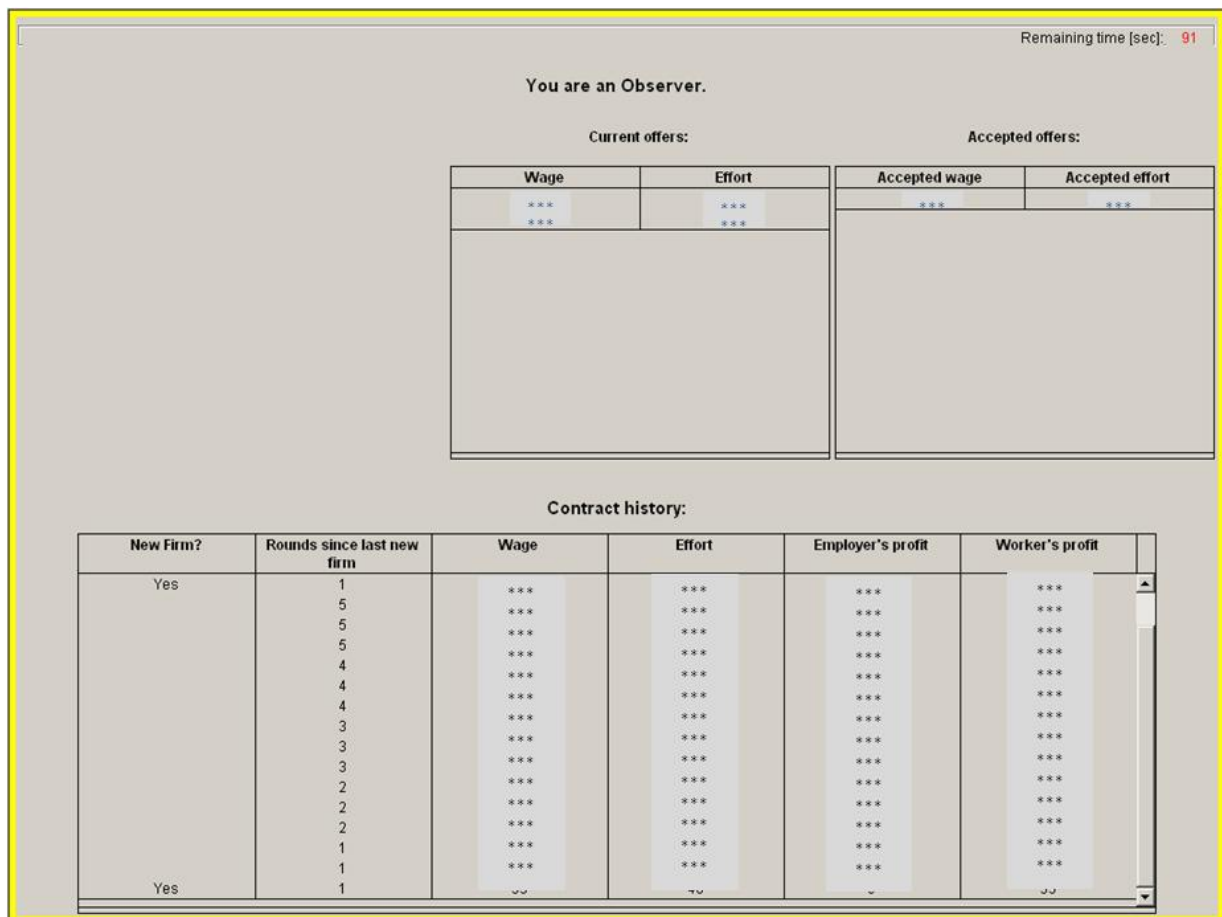


Figure 4

When the virtual dice lands on 1-5, existing firms continue their operation. In this case, half of the Observers will randomly be selected to be workers in the next round. Note that since the pool of Observers is always 12, you have a 50/50 chance of being selected to be a Worker in every round.

It may happen that during a round, an Employer does not employ a Worker. When this occurs, an Observer will be randomly assigned to the role of Employer of that firm.

When the virtual dice lands on a 6, existing firms stop their operations. In this case, each Observer has the same chance of being assigned to the role of Employers, Workers, or Observers.

***Example 6:** Suppose that you are an Observer. During the round, all three Employers employed Workers. At the end of the current round, the outcome of the throw of the virtual dice is 4. In this case, the existing firms will continue their operation. You have a 50/50 chance of being selected to be a Worker in the following round.*

***Example 7:** Suppose that you are an Observer. During the round, only 2 Employers employed Workers. At the end of the current round, the virtual dice outcome is 2. In this case, the existing firms will continue their operation. You have a 50/50 chance of being selected to be a Worker in the following round and a 1 in 12 chance of being promoted to an Employer.*

***Example 8:** Suppose that you are an Observer. During the round, only 1 Employer employed a Worker. At the end of the current round, the virtual dice outcome is 6. In this case, the existing firms will stop operating. You have the same chance of being assigned the role of Employers, Workers, or Observers*

Duration of each round

The employment market will operate for 4 minutes in the first 3 rounds of the experiment. From the 4th round onwards, employment markets will operate for 2 minutes. If all Employers employ their Workers before this deadline expires then the market will close.

How long does the experiment last?

The experiment will last at least 75 minutes (excluding instruction time). This means that if the outcome of the dice is 6 and 75 minutes have not yet passed, the existing firms will be replaced by new firms. The experiment will end when, after 75 minutes, the dice outcome is a 6. We will notify you when 75 minutes have passed.

Practice Questions

If you do not have any questions, please answer the following practice questions. When you finish, please raise your hand to attract the attention of the experimenter. The purpose of these questions is to help you understand the instructions.

1. Please state whether the following statements are true or false.

i. If the outcome of the dice is 1, some of the Observers will become Workers in the following round.

True False

ii. If the outcome of the dice is 2, employed Workers will become Employers in the following round.

True False

iii. If the outcome of the dice is 3, Employers will become Observers in the following round.

True False

iv. If the outcome of the dice is 6, all Employers will become Observers in the following round.

True False

2. Assume an Employer offers a contract with a wage of 40 and an effort level of 60. Assume also that Worker A accepts the contract, but Worker B cannot secure a contract and is unemployed. What will be the earnings of:

i. The Employer: _____

ii. Worker A: _____

iii. Worker B: _____

3. Assume an Employer offers a contract with a wage of 20 and an effort level of 80. Assume also that Worker A accepts the contract, but Worker B cannot secure a contract and is unemployed. What will be the earnings of:

i. The Employer: _____

ii. Worker A: _____

iii. Worker B: _____

4. In the example given in (3), what is the probability that the firm continues to operate?

5. In the example given in (3), suppose that the firm continues its operation. What is the probability that in the following round

i. The Employer will become an Observer? _____

ii. Worker A will become an Employer? _____

iii. Worker B will become an Observer? _____

6. In the example given in (3), suppose that the firm stops operating. What is the probability that in the following round

i. The Employer will become an Observer? _____

ii. Worker A will become an Employer? _____

iii. Worker B will become an Observer? _____

PAYOFF SUMMARY

(i) Employer's earnings in a given round if contract is accepted =

$$1.5 \times \text{Level of Effort} - \text{Wage paid to Worker}$$

(ii) Employer's earnings in a given round if contract is NOT accepted = 0

(i) Worker's earnings in a given round if employed = Wage – Cost of Effort

(i) Worker's earnings in a given round if unemployed = 0

Units of Effort	0	20	40	60	80	100
Cost of Effort	0	0	20	60	100	140