A Network Experiment in Continuous Time: The Influence of Link Costs
– Translation of Experimental Instructions –

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In the following, we present the experimental instructions for Treatment I. Note, that the instructions for the remaining treatments only differ with respect to link costs c, the conversion rate, and a show-up fee.

Instructions

You are participating in an experiment on interactive decision making. In this experiment, you can earn cash. How much you earn, depends on your own decisions and the decisions of the other participants. In the experiment, payoffs earned are measured in so-called **experimental currency units [ExCU]**. The sum of currency units you earn in total will be transformed into Euro at the end of the experiment and paid out in cash. Each participant makes his decisions separate from the remaining participants sitting at his computer-terminal. Communication between participants is not allowed.

At the beginning of the experiment, you will be randomly matched with five other participants to form a **group of six**. The participants of a group are not necessarily sitting side by side. The composition of a group persists during the course of the experiment. There is no interaction with other groups. The six members of your group will be randomly assigned internal labels from one to six. **However, each participant is denoted on his screen as player $T1$**. In the following, the term participant will be used only to denote participants of your group. Any other participant in your group obtains exactly the same instructions as you do.

The experiment runs for **30 minutes**. During this time you can open or sever links with the other participants of your group. You obtain a continuous payoff stream whose size depends on the connections built by all participants in the group.

Connections

There are three ways to be connected to other participants in your group.

You can decide to open connections to other participants by yourself. These connections will be called your **active connections**. Your active connections will be displayed as arrows pointing from you to other participants.
You can build active connections to as many participants as you want. However, to each

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participant you can only open one active connection. You can change your connections at any point in time.

The participants to whom you have opened an active connection will be called your **actively reached participants**.

In addition to your actively reached connections, your so-called **passive connections** and your **indirect connections** are also relevant for you.

A passive connection for you is a connection, that another participant opened to you. That is, it is a participant's active connection to you.

Your indirect connections are the **passive and active connections of your actively reached participants**. In other words, these are the passive and active connections of those participants, to whom you have an active connection. Through your passive connections you do not have access to indirect connections.
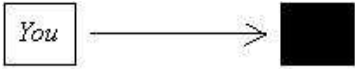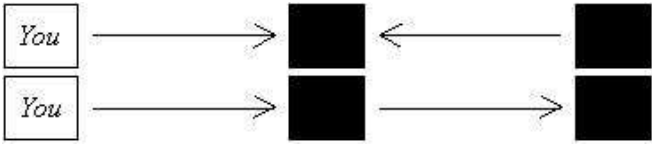
A participant cannot open connections with himself.

Type of connection	Meaning
1. active	Your connection to another participant. Graphical illustration:
2. passive	Other participant's connection to you. Graphical illustration:
3. indirect	Active and passive connections of a participant, who is actively reached by you. Graphical illustration (two possibilities of indirect connection):

Table 1: Types of connection

If you have an active and a passive connection to a participant at the same time, it will be displayed as a double arrow.

The following Figure 1 illustrates the meaning of the denotations **active, passive** and **indirect** connection. This figure only helps the illustration. In the experiment, the arrows will neither be labeled nor broken.
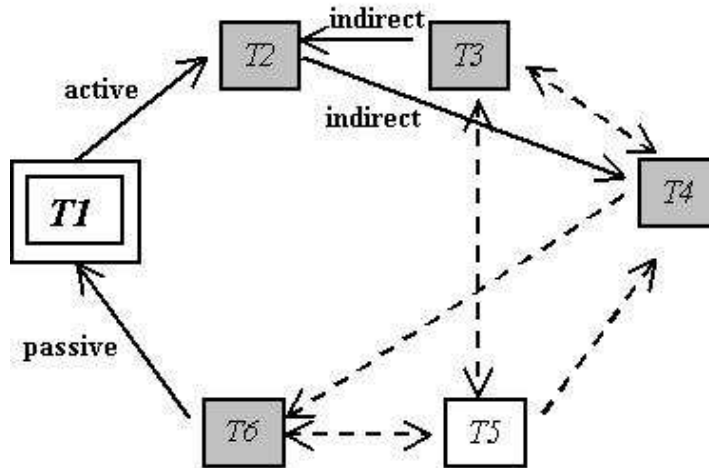
Figure 1: Types of connection from *T1*'s point of view

The arrowheads in Figure 1 point away from the participant, who has opened the connection. The dashed arrows have no consequences for *T1*. *T1* is connected with the participants *T2*, *T3*, *T4* and *T6* marked in gray (in the experiment: blue marking). *T2* is actively reached by *T1*, since *T1* has an active connection to *T2*. *T1* is indirectly connected to *T3* and *T4*, because *T2*, who is actively reached by him, is passively and actively connected with *T3* and *T4*, respectively. *T1* is passively connected to *T6*. *T1* is not connected with *T5*.

Establishing connections: As participant *T1* you are marked in red on the screen. You can choose active connections to other participants by writing the participant's number (2, 3, 4, 5, or 6) into the upper line labeled with "participant's number" in the green input window at the lower right corner of the screen. Then switch to the lower line of the window labeled with "activation of the connection" by clicking on the enter button. In this line you write "1" and confirm by clicking on the enter button again. You can dissolve an existing connection by writing the number of the respective participant on the upper line of the input window and entering a "0" on the lower line.

As soon as you have chosen an active connection all participants in your group see this link on their screen. Likewise you can see all active connections which currently exist in your group. When you are connected with another participant (actively or a passively or an indirectly) this participant will be **marked blue** on your screen.

At the beginning of the experiment you have to decide for each possible connection (connection with *T2*, *T3*, *T4*, *T5*, *T6*) whether you want to open it (enter "1") or not (enter "0"). All inputs have to be confirmed by pushing the enter button. The clock is activated only after all participants made their decisions on their possible connections.

Costs and earnings

Now you are informed about all three types of connection. In this section you learn how your earnings are determined.

You obtain a continuous profit stream which is calculated in currency units per minute. The size of your profit stream depends on the active connections currently chosen by you and the other five participants. It is calculated as follows.

<u>Costs</u>: Each **active connection** that you have chosen at a point in time **costs you 2 ExCU per minute**. So if you keep a connection for a whole minute you pay 2 ExCU. If you dissolve this connection for example after 15 seconds you have to pay 0.5 ExCU. Your costs are subtracted continuously depending on the number of your current active connections. You can see your cost flow per minute on the lower right corner of your screen. The costs are directly included in the payoff flow.
Your passive and indirect connections do not cause costs for you. That is, each connection is paid by the player that the arrow points away from. In the case of double arrows ($\longleftrightarrow$) this means, that both players concerned have to pay.

<u>Earnings</u>: Your earnings are determined by the number of participants you are connected with.
For each participant you are connected with (actively, passively, or indirectly), you obtain an **earnings flow of 3 ExCU per minute**. The participants you are connected with (actively, passively, or indirectly) are **marked in blue** as mentioned before.
Multiple connections with a participant (e.g. simultaneously active and passive connections to the same participant) generate single earning only. Example: *T5* in Figure 1 earns only 3 ExCU per minute through his connection with *T3*, although he has an active, a passive, and an indirect connection with *T3*.
Your **earnings of one minute** are calculated as follows: Count the number of participants you are connected with (maximum 5) and multiply it by 3 ExCU per minute. Your earnings are then between 0 ExCU and $5 \cdot 3 = 15$ ExCU per minute. At building or deleting connections the earnings are calculated with respect to the duration of the respective situation.

<u>**Profit flow**</u>: Your **profit flow** is the difference of your earnings flow and your cost flow from active connections:

$$\textbf{Profit flow= (Earnings flow) - (Cost flow from active connections)}$$

<u>**Accumulated profits**</u>: Your actual **accumulated profits** are determined by continuously adding your profit flow. The accumulated profits are shown at the lower right corner of the screen. They are continuously updated according to the actual earning and cost flows.

Example:
Suppose you are confronted with an earnings flow of 3 ExCU per minute and a cost flow of 2 ExCU per minute. Then your accumulated profits grow in one minute by 1 ExCU.

Your accumulated profits are continuously updated in this minute. When you or another participant of your group changes a connection, for example, after 10 seconds, such that you now have a profit flow of 4 ExCU per minute then your accumulated profits will grow by 1 ExCU/60 · 10 = 0.17 ExCU during the first 10 seconds and afterwards with a rate equal to 4 ExCU per minute. Therefore, your accumulated profits would have grown in one minute by 0.17 ExCU +4 ExCU/60 · 50 = 0.17 ExCU +3.33 ExCU= 3.5 ExCU.

Information

At any point in time the actual values of the following variables will be displayed on the screen.

- your present earning flow (in ExCU per minute)

- your present cost flow (in ExCU per minute)

- your present profit flow (in ExCU per minute)

- your accumulated profits (in ExCU)

- your active connections (as arrows in the graphical illustration on the screen and as "0" or "1" in a table)

- all active connections in your group (as arrows in the graphical illustration)

- the participants whom you are connected with (by an active, passive or indirect connection) are displayed as blue colored squares in the graphical illustration

- the participants whom you are not connected with are displayed as gray colored squares in the graphical illustration

- the amount of time the experiment is already running

Payment

The total amount of ExCU which is flowing to you during the experiment will be accumulated as your profits. It will be converted into Euro and will be paid out in cash immediately after the experiment is finished. The conversion rate is 24 ExCU to 1 Euro. The payment will be made individually and anonymous.

Before the experiment starts, you will be asked some questions about the rules of this game. If there is anything you do not understand, let us know. Your questions will be answered directly at your seat. After having answered all questions the experiment starts.

Please, look only at your own screen and do not talk to other participants.