Thank you for taking part in our trading experiment. Please read these instructions carefully. After that, we will check your understanding by asking a few questions. At the same time, you will also have the opportunity to become acquainted with the experimental environment.

In this experiment you can earn money, whereby the sum of your earnings depends on your decisions and the decisions of others. Your earnings will be calculated in virtual money-units "GE". After the game is over, their Euro value will be calculated at an exchange rate of 450 virtual units for one Euro and you will receive this value together with a show-up-fee of 2.50 Euros.

Your situation

You and 15 other participants in the experiment will have the opportunity to trade with each other in a market. At no time will you be told who these other 15 participants are. Throughout the whole experiment you will be trading with the same 15 participants. Thus, the composition of your group will not change. Every participant was given these instructions.

You will receive an initial endowment of 5500 GE. You will then have the task of serving the demand for a good. The level of the demand will be a random number between 5 and 55. Every number will have the same probability. The demand you will have to serve will be independent of the demand the other participants will have to serve.

At the beginning you will not know the level of demand. It will change every trading period and will be disclosed to you in the information-box in the top left corner of your screen (see figure at the end of these instructions). For each unit of demand you are required to serve, you will be paid a fixed price of 25 GE. This means that as soon as you are informed about the level of the demand, your will receive – as an advance payment – 25 GE for every unit of the good demanded in this trading period. You will receive this advance payment regardless of whether you manage to serve the demand or not.

There are altogether 16 trading periods. After every four trading periods, we will check whether you have provided a sufficient amount of the good to serve the demand in these four trading periods. Should you not be able to serve the demand, you will have to pay a fee for every missing unit of the good and you will also have to retroactively provide any missing units. Details will be explained later in the text.

[A1, A4] You will have the following options to fulfill your demand-serving obligations:

1. You can produce units of the good by yourself;
2. You can trade units of the good in a market;
3. You can purchase units of the good in auctions organized by the experimenter.

[GA, G0] You will have the following options to fulfill your demand-serving obligations:

1. You can produce units of the good by yourself;
2. You can trade units of the good in a market;
3. You will be allocated free units of the good by the experimenter.

These options can be combined to satisfy the given demand. Details will be explained later in the text.

Self-Production

When a trading period is running, you will see the production-box below the infoformation-box (see screenshot at the end of the instructions). In this box, you can determine the number of units you want to provide through self-production. You can produce only once per trading-period. The amount of your self-production cannot exceed the demand level in the respective trading-period.

Self-production induces costs. These costs amount to 1 GE for the first produced unit, 2 GE for the second produced unit, 3 GE for the third produced unit, and increase by 1 GE for every additional unit you produce by yourself. The sum of the production costs over all units gives the total production costs. The following table illustrates how the production costs are calculated.

Amount of self-production	Additional costs caused by last produced unit	Total production costs for this amount
1	1	1
2	2	3
3	3	6
4	4	10
...	...	...
n	n	$\sum_{i=1}^{n} i$

If you click on the button "Calculate", we will calculate the total costs of production for you. In addition to that, at the end of these instructions we have provided you with a table which gives an overview of the costs per additional unit and the total costs resulting from any possible production amount.

Please keep in mind that you should take your decision regarding the level of self-production before the respective trading period is over.

Trading rules

Together with self-production you can serve some of the demand through trading in a market. In the market you can:

- make bids for buying an amount of the good ("bids"),
- make offers for selling an amount of the good ("asks"),
- or delete an already stated bid/ask.

[A1, A4] Both, units purchased at the auctions and self-produced units, can be traded. Every trading period takes at least 3 minutes and 30 seconds and at most 4 minutes. The exact time will be determined by chance. Every time spread between 3 minutes 30 seconds and 4 minutes can occur with the same probability. When a trading period is over, any open bid/ask will expire.

[GA, G0] Both, units allocated for free and self-produced units, can be traded. Every trading period takes at least 3 minutes and 30 seconds and at most 4 minutes. The exact time will be determined by chance. Every time spread between 3 minutes 30 seconds and 4 minutes can occur with the same probability. When a trading period is over, any open bid/ask will expire.

By posting bids and asks you can trade with the other participants in your market. Bids can only be posted if the bid's value does not exceed your disposable capital. Your disposable capital is calculated by subtracting the value of your open bids in the market from your total capital. Asks can only be posted if you posses at least as many units as you want to sell and these units are not reserved for other currently open asks of yours.

You can see your "disposable capital" (German: "verfügbares Vermögen") and your "disposable goods" (German: "verfügbare Güter") at the top left corner of the trading period's screen. At the screen's bottom you see your currently open bids/asks (see screenshot at the end of the instructions).

Posting an ask

An example for an ask is "I offer 4 units for 48 GE per unit". The ask's price and amount must be in whole numbers and higher than or equal to 1. Your ask will be traded instantly only if it is the ask with the lowest price and if this price is equal to or lower than the price of the highest bid in the bids' queue. Otherwise, it will be listed in the asks' queue. Open asks are listed on the right, upper part of the screen (see screenshot at the end of the instructions).

Posting a bid

An example for a bid is "I would like to buy 8 units and I offer 12 GE per unit". The bid's price and amount must be in whole numbers and greater than or equal to 1.

Your bid will be traded instantly only if it is the bid with the highest price and if this price is equal to or higher than the lowest ask in the asks' queue.

Otherwise, it will be listed in the bids' queue. Open bids are listed on the right, bottom part of the screen (see figure at the end of production).
Attention: In the case of instant trading, every ask you post will be matched with precisely one bid (the highest). By the same token, every bid you post will be matched with precisely one ask (the lowest).

Transaction price

The price will be determined in the following manner:

- If the prices of the matched bid and ask are equal, they will be traded at this price.

- If prices differ, trade will take place at the price of the older post. Thus, if the bid you just posted is matched with an older ask with a lower price, the transaction will be carried out at the ask's price. If the ask you just posted is matched with an older bid with a higher price, the transaction will be carried out at the bid's price.
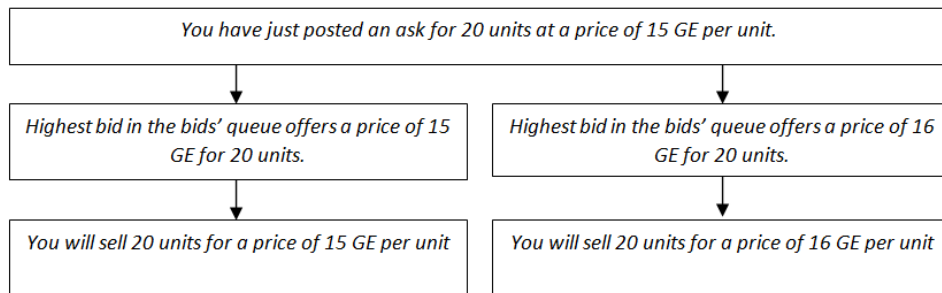
You have just posted an ask for 20 units at a price of 15 GE per unit.	
Highest bid in the bids' queue offers a price of 15 GE for 20 units.	Highest bid in the bids' queue offers a price of 16 GE for 20 units.
You will sell 20 units for a price of 15 GE per unit	You will sell 20 units for a price of 16 GE per unit

FIGURE 1: Example for the transaction price

Transaction amount

As in the case of instant trading every bid/ask will be matched with precisely one older ask/bid, the amount of goods to be transacted is determined in the following manner:

- If the bid or the ask you just posted has a lower or an equal amount to the ask or bid it is matched with, the complete amount of your bid or ask will be traded.

- If the bid or the ask you just posted has a higher amount than the ask or bid it is matched with, only the smaller amount amount of the older ask or bid will be traded. This means that your bid or ask will be only partly transacted. All remaining units from your offer will expire and

will not be served by another ask or bid in the queue. If you want to trade more units, you will have to post two sequential offers.
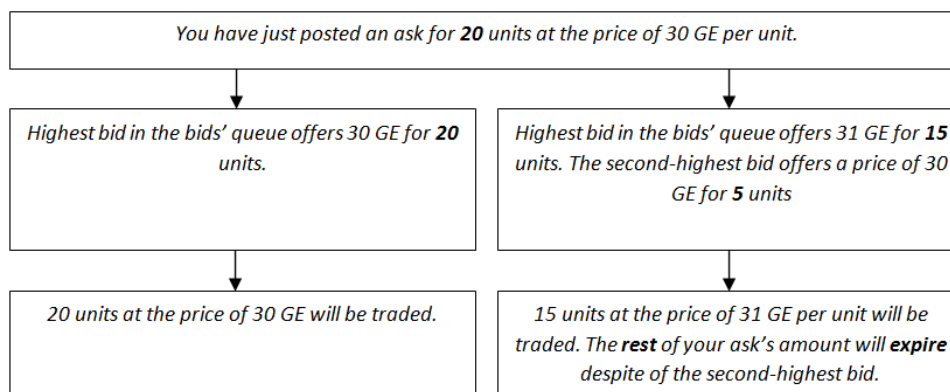

FIGURE 2: EXAMPLE FOR TRANSACTION AMOUNT OF AN INSTANT OFFER

If your ask is already listed in the asks' queue, though, and a bid, which was posted later demands a smaller amount than the amount your ask offers, the non-transacted part of your ask remains listed. By the same token, the rest of your bid remains listed if it was already listed in the bids' queue and an ask, which was posted later, offers a smaller amount than your bid demands.
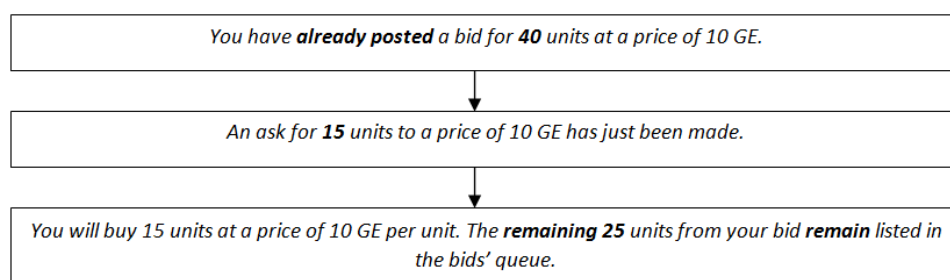

FIGURE 3: EXAMPLE FOR TRANSACTION AMOUNT OF A STANDING OFFER

Deleting bids and asks

In the left, bottom part of the screen you see a list of your posted bids and asks. You can delete these at any time. Keep in mind that you cannot alter any posted bids or asks – you can only delete them. Bids or asks cannot be deleted after they have been accepted by other traders.

Rankings of bids and asks

Posted bids are listed in the bids' queue. Posted asks are listed in the asks' queue. Both lists are sorted by price and time of the posting. When two or more bids/asks with the same price are listed in a queue, they are ranked by time, the older one coming first.

In the middle you can see the price of the last transaction. If there has not been any trading yet, you will see a "-". A bid/ask remains in its queue until it is deleted or accepted by another trader and, as a consequence, trade takes place.

Self-trade

It is allowed to trade with yourself. This does not change the most recent price being displayed and is not listed as a trade either. Trading with oneself can be regarded as withdrawing part of your own offer.

[A1, A4] Auction rules

How to make a bid in the auction

[A1] In addition to self-production and trading, you can serve parts of the demand by purchasing units of the good in auctions organized by the experimenter. These auctions are scheduled before the control period (see picture at the end of the instructions). Furthermore, there will be an auction at the beginning of the experiment, before the first trading period starts. There will not be any auctions after the last trading period, before the last control period at the end of the experiment, though. Overall, there will be 4 auctions. In each auction, 960 units of the good will be sold.

[A4] In addition to self-production and trading, you can serve parts of the demand by purchasing units of the good in auctions organized by the experimenter. These auctions are scheduled after each trading period (see picture at the end of the instructions). Furthermore, there will be an auction at the beginning of the experiment, before the first trading period starts. There will not be any auctions after the last trading period, before the last control period at the end of the experiment, though. Overall, there will be 16 auctions. In each auction, 240 units of the good will be sold.

You can submit bids in the auction as price-quantity combinations. We will specify 11 prices for which you will have to state how many units you are willing to buy at this particular price. The stated amount for a certain price cannot be higher than the amount for a lower price. Furthermore, only whole numbers – starting from "0" – will be accepted as valid numbers for the amount you wish to buy at a certain price. By clicking on "Check", you can see if your set of auction bids is consistent with these rules without making a binding bid schedule.

You will be given 2 minutes to state your set of requested amounts as a binding bid schedule. Your auction bids will remain unknown for the other participants, so that the time you make the bid will not influence in any way your chances to win units in the auction. Only your final auction bids, which you transmit through clicking on "Send", will be taken into account.

Calculation of the clearing price and serving the auction bids

After everyone has submitted their demand schedule, your demand function will be estimated based on your auction bids. For every price the sum of the requested amounts by all participants will be calculated. Then, every price-amount-combination formed in the described way will be connected linearly. This gives the aggregated demand function. As the figure below shows, it is decreasing.

For every price the total, aggregated requested amount by all participants will be calculated. The price, for which the aggregated demand matches the amount supplied by the experimenter, is the auction's clearing price. Please, keep in mind that this price can be between those specified by us for you to bid on. It will be calculated how many units of the good every participant would want to buy at the clearing price given the individual bids. This amount will be credited to the winners. They will pay the clearing price for every unit they receive.
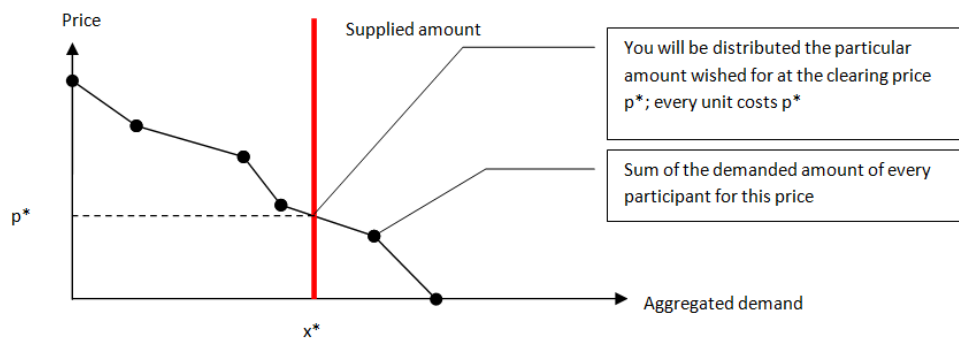

FIGURE 4: CALCULATING THE AUCTION CLEARING PRICE

Should the aggregated demand over all participants at the lowest price of "0" be lower than the supply amount in the auction, surplus units would be distributed among participants in the group proportionately to their bids at the price "0". Should the aggregate demand at the highest price of "50" exceed the supply amount in the auction, all bids at the highest price would be served only partially.

After the end of the auction you will be informed about the auction clearing price and the amount you bought.

[GA, G0] Free allocation

In addition to self-production and trading, you can serve some of the demand with those units the experimenter will hand you for free. These allocations are scheduled before the control period (see picture at the end of the instructions). Furthermore, there will be an allocation at the beginning of the experiment, before the first trading period starts. There will not be an allocation after the last trading period, before the last control period at the end of the experiment, though. Overall, there will be 4 free allocations.

[GA] In each allocation 960 units of the good will be distributed amongst the participants in your group. Each time the number of free units a participant receives may vary. The individual amounts can also vary across participants. You will be informed about the number of units you will receive for free the moment they are given to you.

[G0] In each allocation 960 units of the good will be distributed amongst the participants in your group. Each time every participant will receive 60 units of the good for free.

Before the experiment starts, the amount of free units for each participant will be randomly chosen according to the values from above. The resulting amount set for each participant at the beginning will not change during the experiment. Thus, the participant will receive this amount at each of the free allocations.

You will be told the amount you receive along with your initial endowment when the experiment starts.

Control and punishment

[A1, A4] Four times throughout the experiment – after every fourth trading period – we will check whether you can serve the demand from these periods through self-production and purchases. With this aim, the amount of goods you provided through self-production and purchases will be compared to the last 4 trading periods' summed up demand. The summed up demand from the last 4 trading periods will be subtracted from the amount of goods you have provided up to this point. If the difference is smaller than "0", this would mean that you are not able to serve the demand. In this case you will be charged 40 GE for every missing unit. This punishment will not release you from the obligation to retroactively provide any missing units. Thus, in case of punishment, any missing amounts will be transferred into the next period.

[GA, G0] Four times throughout the experiment – after every fourth trading period – we will check whether you can serve the demand from these periods through self-production, purchases and free allocations. With this aim, the amount of goods you provided through self-production and purchases will be compared to the last 4 trading periods' summed up demand. The

summed up demand from the last 4 trading periods will be subtracted from the amount of goods you have provided up to this point. If the difference is smaller than "0", this would mean that you are not able to serve the demand. In this case you will be charged 40 GE for every missing unit. This punishment will not release you from the obligation to retroactively provide any missing units. Thus, in case of punishment any missing amounts will be transferred into the next period.

Hence, you do not have to serve every trading period's demand by the end of the respective trading period, but only the summed up demand of 4 trading periods within the respective control period.[1]

> *The demanded amount was **10** in the first, **20** in the second, **30** in the third and **40** in the forth trading period of a control period. Hence, the summed up demand in this control period, which you need to provide for **at the end of the control period**, is **100**.*
>
> ↓
>
> *At the time you are controlled you have provided **80** units: **20** through auctions, **50** through trade, and **10** through production.*
>
> ↓
>
> *When you are being controlled, the summed up demand of 100 will be subtracted from your 80 available units. After the control your remaining supply is -20. For the demand of 20 units you could not serve you will be charged a punishment of **40* 20 GE**.*
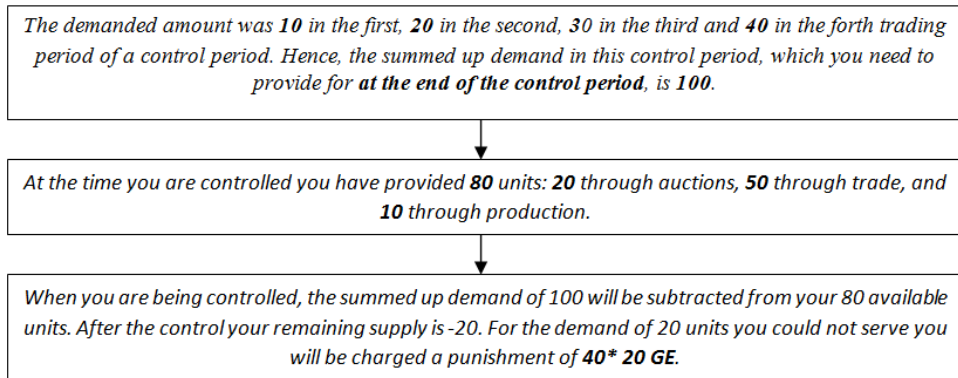
FIGURE 5: [A1, A4] Example for the control procedure

Because the experiment ends after the last control period, you will not be able to retroactively provide any missing units. These will be sold to you at the long-term equilibrium price. As a result, your GE capital will be decreased by the value of the missing units. By the same token, any surplus units after the end of the experiment will be bought from you at the long-term equilibrium price leading to an increase of your GE capital by the value of the surplus units.

The long-term equilibrium price is the price resulting from the best possible combination of all participants' purchase and self-production of units of the good. This price is a theoretical value and cannot be influenced by any of the participants.

[A1] Experimental procedure

The experimental procedure is identical for all participants from your group. It is depicted in the figure below. Details on the different stages were explained above.

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[1] A respective example for the control procedure was provided in GA and G0.
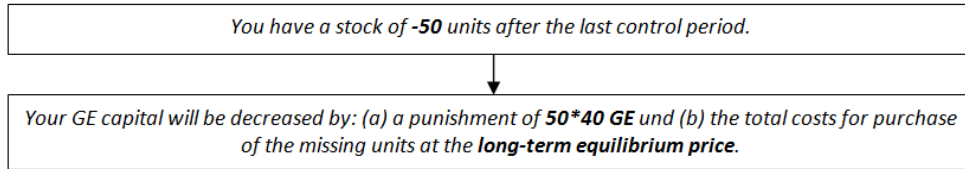
FIGURE 6: Example for credits at the end of the experiment
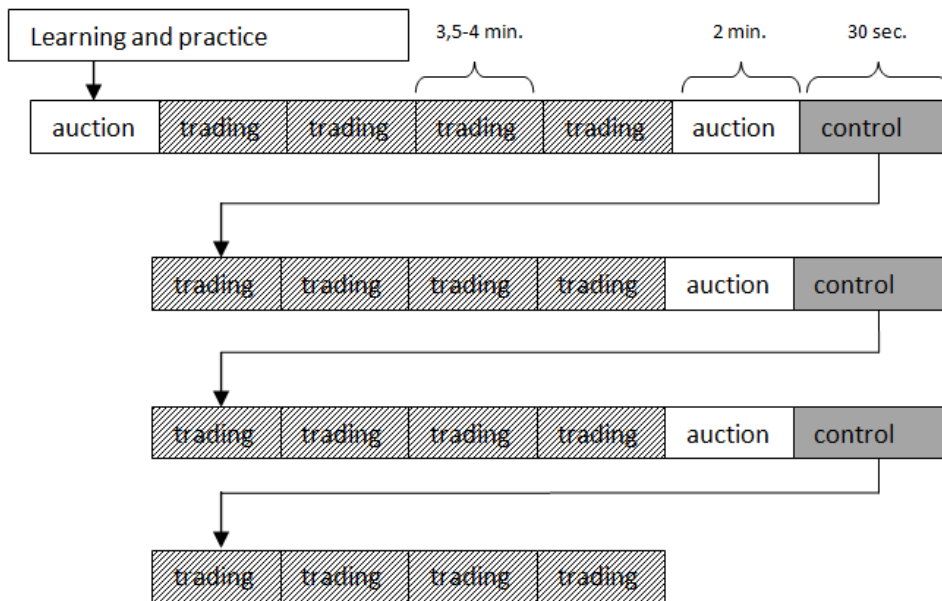

FIGURE 7: [A1] Experimental Procedure

There are four control periods. Every control period consists of 4 trading periods. Before each control there is an auction. There is no auction before the last control. Furthermore, an auction precedes the first trading period at the beginning of the experiment. Thus, altogether there are 4x4=16 trading periods and 4 auctions. In every auction 960 units of the good are auctioned off. After each auction you receive the units you have won and your capital of GE is charged accordingly.

At the beginning of every trading period you will be informed about the demand you have to serve in this trading period. Simultaneously, you will receive an advance payment for this demand regardless of your ability to serve it. Please note that at the beginning of every new trading period, open bids or asks from the previous trading period expire.

Every four trading periods are followed by a control stage, which checks whether you have met the sum of the demand of the 4 preceding trading periods. In case of missing units you are punished. After the last control

stage, the missing units will be sold to you and any surplus units will be bought from you by the experimenter automatically.

[A4] Experimental procedure

The experimental procedure is identical for all participants from your group. It is depicted in the figure below. Details on the different stages were explained above.
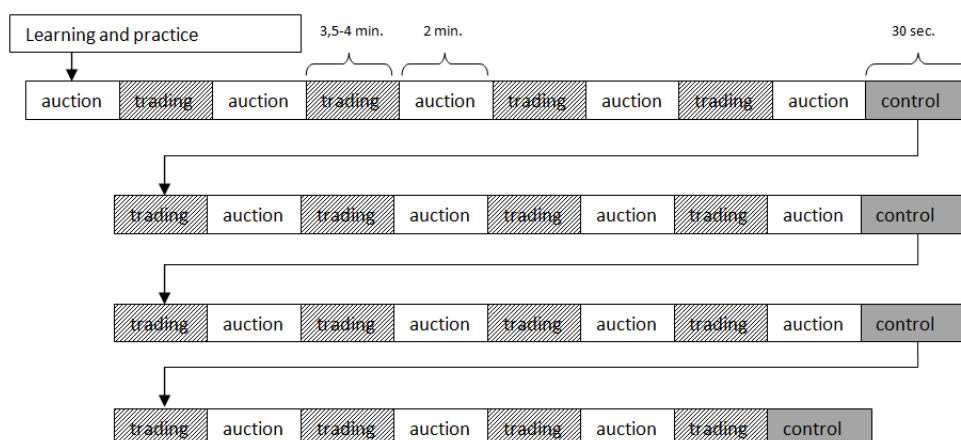

FIGURE 8: [A4] EXPERIMENTAL PROCEDURE

There are four control periods. Every control period consists of 4 trading periods. After each trading period there is an auction. There is no auction before the last control. Furthermore, an auction precedes the first trading period at the beginning of the experiment. Thus, altogether there are 4x4=16 trading periods and 16 auctions. In every auction 240 units of the good are auctioned off. After each auction you receive the units you have won and your capital of GE is charged accordingly.

At the beginning of every trading period you will be informed about the demand you have to serve in this trading period. Simultaneously, you will receive an advance payment for this demand regardless of your ability to serve it. Please note that at the beginning of every new trading period, open bids or asks from the previous trading period expire.

Every four trading periods are followed by a control stage, which checks whether you have met the sum of the demand of the 4 preceding trading periods. In case of missing units you are punished. After the last control stage, the missing units will be sold to you and any surplus units will be bought from you by the experimenter automatically.

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[GA, G0] Experimental procedure

The experimental procedure is identical for all participants from your group. It is depicted in the figure below. Details on the different stages were explained above.
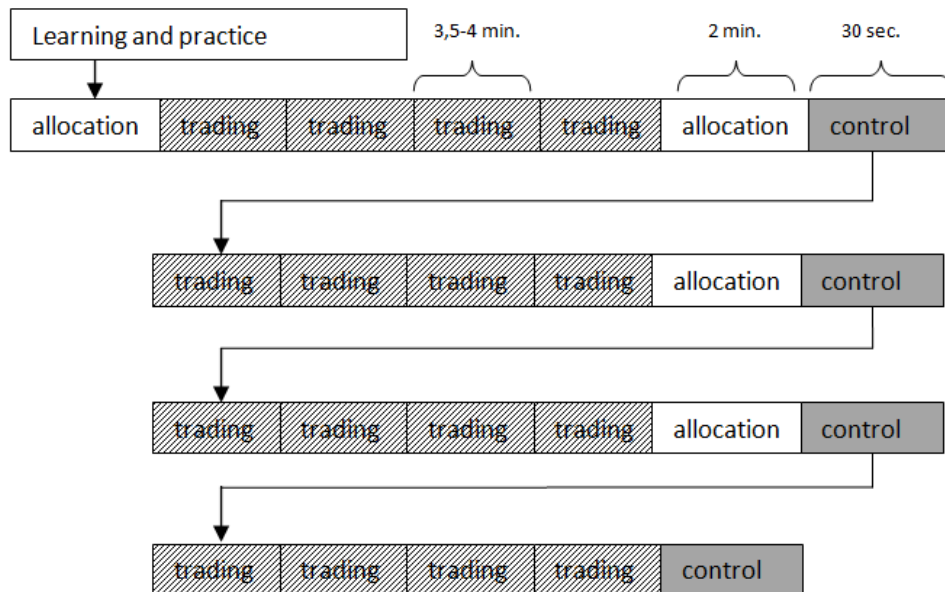

FIGURE 9: [G] EXPERIMENTAL PROCEDURE

There are four control periods. Every control period consists of 4 trading periods. There is an allocation before each control. There is no allocation before the last control. Furthermore, an allocation precedes the first trading period at the beginning of the experiment. Thus, altogether there are 4x4=16 trading periods and 4 allocations. In every allocation 960 units of the good are distributed amongst the participants in your group.

At the beginning of every trading period you will be informed about the demand you have to serve in this trading period. Simultaneously, you will receive an advance payment for this demand regardless of your ability to serve it. Please note that at the beginning of every new trading period, open bids or asks from the previous trading period expire.

Every four trading periods are followed by a control stage, which checks whether you have met the sum of the demand of the 4 preceding trading periods. In case of missing units you are punished. After the last control stage, the missing units will be sold to you and any surplus units will be bought from you by the experimenter automatically.

FIGURE 10: Screenshot from the Trading Period

Amount of production	Additional costs caused by last produced unit	Total costs of production for this amount	Amount of production	Additional costs caused by last produced unit	Total costs of production for this amount
1	1	1	31	31	496
2	2	3	32	32	528
3	3	6	33	33	561
4	4	10	34	34	595
5	5	15	35	35	630
6	6	21	36	36	666
7	7	28	37	37	703
8	8	36	38	38	741
9	9	45	39	39	780
10	10	55	40	40	820
11	11	66	41	41	861
12	12	78	42	42	903
13	13	91	43	43	946
14	14	105	44	44	990
15	15	120	45	45	1035
16	16	136	46	46	1081
17	17	153	47	47	1128
18	18	171	48	48	1176
19	19	190	49	49	1225
20	20	210	50	50	1275
21	21	231	51	51	1326
22	22	253	52	52	1378
23	23	276	53	53	1431
24	24	300	54	54	1485
25	25	325	55	55	1540
26	26	351			
27	27	378			
28	28	406			
29	29	435			
30	30	465			