Appendix to Bertrand competition with asymmetric costs: Experimental evidence

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This document contains the appendix to the paper entitled "Bertrand competition with asymmetric costs: Experimental evidence". This appendix consists of two parts. The first part provides details of the analysis carried out to ensure that session size effect and order effects do not drive our results. The second part contains the set of instructions that was provided to participants during each session.

A   Additional analysis

Apart from the regressions reported in the paper, we ran four more regressions in order to verify that the size of the sessions (12 or 18 participants) did not affect our results and that there exist no order effects.

In regression (1) in Table A1 below, we use the regressions of the simple form $p = \beta_1 (\text{Case 1}) + \beta_2 (\text{Case 2}) + \beta_3 (\text{Case 3}) + \beta_4 (D_{\text{Group-Size}}) + \varepsilon$, where the variable $D_{\text{Group-Size}}$ is 1 (0) if the number of participants in a session is 12 (18). Two sessions were run with 12 participants and seven with 18. In regression (2) in Table A1, we repeat the analysis in regression (1), this time replacing the size dummy with interaction terms of the size dummy with the Case dummies.

In regression (3) in Table A1, we repeat the analysis in regression (1), this time replacing the size dummy with the variable "Parameter Set Dummy" which is 1 (0) if the first (second)

	(1)	(2)	(3)	(4)
Case 1	19.04***	19.08***	19.08***	18.96***
	(0.319)	(0.316)	(0.335)	(0.281)
Case 2	19.04***	19.05***	19.09***	19.14***
	(0.238)	(0.219)	(0.33)	(0.282)
Case 3	13.91***	13.84***	13.96***	14.08***
	(0.554)	(0.588)	(0.569)	(0.669)
$D_{\text{Group-Size}}$	0.43			
	(0.924)			
$D_{\text{Group-Size}} \times$ Case 1		0.16		
		(0.729)		
$D_{\text{Group-Size}} \times$ Case 2		0.38		
		(0.748)		
$D_{\text{Group-Size}} \times$ Case 3		0.92		
		(1.509)		
$D_{\text{Para-Set}}$			0.05	
			(0.652)	
$D_{\text{Para-Set}} \times$ Case 1				0.34
				(0.584)
$D_{\text{Para-Set}} \times$ Case 2				−0.05
				(0.452)
$D_{\text{Para-Set}} \times$ Case 3				−0.22
				(1.140)
N	3,200	3,200	3,200	3,200
R^2	0.976	0.976	0.976	0.976

Notes: Robust standard errors are in parentheses. *** indicates significance at the 1% level, respectively.

Table A1: Robustness checks

set is used for quasi-randomly determining the order of cases to be played. This is done to check for the existence of order effects. (Parameter set 1 was used in 1 (4) sessions with 12 (18) subjects and parameter set 2 was used in 1 (3) sessions with 12 (18) subjects.)

In regression (4) in Table A1, we repeat the analysis in regression (3), this time replacing the Parameter Set Dummy with interaction terms of the Parameter Set Dummy with the Case dummies.

As illustrated by Table A1, none of the coefficients of the Size and Parameter Set dummies and of the interaction terms of these with the Case dummies in regressions (1)-(4) are significant.

B Instructions

Note that for ease of exposition, in the paper and in Section 1 of this appendix, we switched the labels of Cases 2 and 3 relative to the labels used in the original set of instructions included below.

General information

- Please read these instructions closely.

- Please do not talk to your neighbors and remain quiet during the entire experiment.

- If you have a question, please raise your hand. We will come up to you to answer it.

- Currently, you are all reading the same instructions.

Introduction

- In this experiment you can earn money by interacting with other participants.

- Your earnings will be measured in "Points". The number of points that you will earn will depend on the decisions that you and the other participants make.

- At the beginning of the experiment, every participant will receive 30 Points as an initial endowment.

- Your total number of Points at the end of the experiment will be equal to the sum of the Points you have earned in each round plus your initial endowment.

- For every 15 Points you will be paid 1 Euro in cash.

- Your identity will remain anonymous to us as well as to the other participants.

Description of the experiment

In this experiment, you represent a firm that, like other firms, produces and sells one and the same product in a market. In each round, all firms will make one decision, namely, to decide about the price they wish to charge for the product.

In the course of the experiment, you will act in markets that consist of either two or three firms (including you). The firms in a market may or may not differ in terms of per-unit production costs they incur for producing one unit of the good. (There will be no further costs.) In general, there are three different cases.

Case 1: There are two firms in the market. The first firm has production cost 10 and the second firm has production cost 20. (Note that there are two subcases here depending on whether you are the low- or the high-cost firm.)

Case 2: There are three firms in the market. The first two firms have production cost 10 and the third firm has production cost 30. (Note that there are two subcases here depending on whether you are a low- or the high-cost firm.)

Case 3: There are three firms in the market. The first firm has production cost 10, the second firm has production cost 20, and the third firm has production cost 30. (Note that there are three subcases here depending on whether you are the low-, the middle, or the high-cost firm.)

Note that there are in total seven different subcases.

Order of events in each round

The experiment will consist of 56 rounds. The order of events in each round will be as follows:

1. At the beginning of each round, the computer will first randomly determine whether everyone in the room will act in a market with two or three firms. In the case that everyone will act in a market with three firms, the computer will randomly decide whether Case 2 or Case 3 (as above) will apply to all markets.

2. Then you will be randomly assigned into a group of either 2 or 3 participants, depending on the outcome of the chance move in 1.

3. Then each of the 2 or 3 firms in a market will be randomly assigned production costs as described above. That is: In Case 1, where there are two firms in a market, one firm will be assigned production cost 10 while the other firm will be assigned production costs 20. In Case 2, two firms will be assigned cost of 10 each, and one firm a cost of 30: In Case 3, one firm will be assigned a cost of 10; another firm will be assigned a cost of 20; and a third firm will be assigned a cost of 30.

4. Everyone will be informed about the number of firms in the markets in the current round and their own production cost as well as about the production cost of the other firm(s) in their own market.

5. Everyone will make a price decision. Prices can be chosen from the set {0,1,2,...100}

Profits

- The firm that chooses the lowest price earns a profit that is equal to the difference between its price and its production cost (that is, profit = own price - own production costs), whereas the other firm(s) earn zero.

- In markets with two or three firms, if two firms choose the same lowest price, it is assumed that each of these two firms sells half a unit. Consequently, each firm choosing the lowest price earns a profit that is equal to the difference between the lowest price and its own production cost divided by 2: (In markets with three firms, the other firm charging a higher price earns zero.) That is, if two firms choose the same lowest price, each of these firms earns the profit (own price - own production costs)/2. (In markets with 3 firms, the other firm earns profit 0.)

- In markets with three firms, if all three firms choose the same lowest price, it is assumed that each firm sells one third of a unit. Consequently, each firm earns a profit that is equal to the difference between the lowest price and its own production cost divided by 3. That is, each firm earns the profit (own price - own production costs)/3.

- Note that you make losses in case you chose the lowest price (or one of the lowest prices) and your price is below your production costs. You can avoid making losses by choosing a price that is not lower than your production costs.

- Choice of market size, assignment of production costs, matching, and information during the experiment

- As mentioned above, the experiment will consist of 56 rounds.

- Recall from above that in principle there are three different cases with a total of seven different subcases, depending on the number of firms in the market and your own costs.

- Each participant will act in each of the seven different subcases in exactly 8 rounds.

- As mentioned above, the assignment of the market size and the assignment of costs within each market will be random across rounds. However, the computer program will make sure that you act in a market with two firms (case 1) in exactly 16 periods, that you act in a market with three firms (case 2) in exactly 16 rounds, and that you act in a market with three firms (case 3) in exactly 24 rounds. The computer program will also make sure that you will act in each of the seven different subcases in exactly 8 rounds.

- Please remember that in every round, groups of two or three participants are randomly selected from the pool of all participants in the room.

- In every round, your computer screen will inform you about the market size, your own cost and the costs of the other firm(s) with which you are matched.

- At the end of each round, you will be given the following information about what happened in your own market during the round: your own cost and the cost of the other firm(s) in your market, your price and the price(s) of the other firm(s) in your market, and your own profit.