Naked exclusion in the lab: The case of sequential contracting[1]

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Abstract

In the context of the naked exclusion model of Rasmusen, Ramseyer and Wiley (1991) and Segal and Whinston (2000*b*), we examine whether sequential contracting is more conducive to exclusion in the lab, and whether it leads to lower exclusion costs for the incumbent, than simultaneous contracting. We find that an incumbent who proposes exclusive contracts to buyers sequentially, is better able to deter entry than an incumbent who proposes contracts simultaneously. In contrast to theory, this comes at a substantial cost for the incumbent.

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1. Introduction

Since the beginning of the 20th century courts have treated firms using exclusive contracts harshly for fear such contracts could be used to exclude rivals and, thus, hamper competition.[2] Starting in the 1950s, scholars belonging to the Chicago school (see, e.g., Director and Levi, 1956; Posner, 1976; Bork, 1978) argued that such fears are not warranted since using exclusive contracts for the sole purpose of anti-competitively excluding rivals would not be in the interest of rational profit-maximizing firms. Recently, this view on exclusive dealing has been challenged by various theorists who describe circumstances under which anti-competitive exclusion of rivals can be profitably used by dominant firms. One prominent contribution to this literature is the naked exclusion model put forward by Rasmusen, Ramseyer and Wiley (1991) and Segal and Whinston (2000*b*) [henceforth RRW-SW].[3]

Consider an incumbent seller, a more efficient entrant and two buyers with independent demand. Due to economies of scale caused by, for instance, fixed entry costs the entrant needs both buyers to be "free" (i.e., not bound by exclusive contracts with the incumbent) to enter the market profitably. An exclusive contract in this framework takes the form of a payment from the incumbent to a buyer in exchange for the buyer's promise to buy exclusively from the incumbent. RRW-SW show that, under mild assumptions, the incumbent needs to "convince" only one buyer in the market to sign an exclusive contract to deter entry and extract monopoly profits from both buyers. Indeed, compensating one buyer for the forgone consumer surplus that results from dealing with the incumbent—sometimes referred to as a "divide-and-conquer" strategy—is sufficient to obtain exclusion in the case different contracts can be proposed to the two buyers. Moreover, if buyers are approached sequentially, exclusion is achieved at negligible costs. The idea is that the first buyer anticipates that, if he rejects a contract, the incumbent can surely convince the second buyer to accept by making him an offer he cannot refuse. Hence, the first buyer will accept any, even a "lousy" offer, which deters entry. This stands in

[2]Early cases include *Standard Fashion Company v. Margrane-Houston Company* [258 U.S. 346 (1922)] and *United States v. Aluminum Co. of America* [148 F.2d 416 (1945)]. More recent cases include *Microsoft* [253 F.3d 34 (2001)], *U.S. v. Dentsply* [399 F.3d (2001)], *Conwood v. United State Tobacco* [290 f.3d 758 (2002)] in the US and the *Intel* case [C227 (2009)] in Europe.

[3]The term "naked" refers to the sole purpose of an exclusive deal to audaciously exclude a rival without offering any efficiency justification. Other models study exclusive dealing in a related context. Aghion and Bolton (1987), for example, include damage penalty provisions in their model. Innes and Sexton (1994) allow for buyers to vertically integrate. Bernheim and Whinston (1998) model exclusive dealing in a multi-market case. Fumagalli and Motta (2006), Simpson and Wickelgren (2007) and Wright (2009) take into account that buyers might be firms that compete in a downstream consumer market.

contrast to the case where it is impossible for the incumbent to discriminate between the buyers. In this case exclusion is not guaranteed: the monopoly profit the incumbent would earn under exclusion is not sufficiently high to compensate both buyers for their forgone surplus. The buyers' subgame is then a symmetric coordination game with multiple equilibria and exclusion occurs only if the buyers fail to coordinate on the (more efficient) rejection equilibrium.

In this paper we examine whether sequential (discriminatory) contracting is more conducive to exclusion in the lab than simultaneous contracting. Moreover, we study whether exclusion costs under sequential contracting are negligible as suggested by theory. In the light of the experimental literature on bargaining games, in particular the ultimatum game (see Güth, 1995; Roth, 1995, for overviews), it is questionable whether the first buyer will accept any offered payment, even very small ones—an assumption on which the result of exclusion at negligible costs rests.

Our paper is the first to study exclusive dealing in an experiment with sequential contracting. Spier and Landeo (2009) report experimental evidence showing that the theoretical difference in exclusion rates between simultaneous discriminatory and simultaneous non-discriminatory regimes is not that important from a behavioral perspective. In fact, when the buyers cannot communicate, the exclusion rate is not higher in a discriminatory than in a non-discriminatory regime.[4] Moreover, when the buyers can communicate, they succeed reasonably well in coordinating to reject their offered contracts such that no exclusion occurs. Spier and Landeo (2009) focus on the case of simultaneous contracting.[5] In our paper, we show that if the discriminatory regime is one of sequential contracting, exclusion rates *do* increase above the level obtained under no discrimination. We also show that, in contrast to theory, exclusion costs are substantial under sequential contracting.

There are only a few empirical studies analyzing the effects of exclusive contracts; most of them deal with analyzing their effect on prices and welfare in the beer industry. The results are mixed. For instance, whereas Slade (2000) finds a negative effect of exclusive contracts on consumer welfare, Sass (2005), Asker (2004), and Asker (2005) report a positive effect. Furthermore, Heide, Dutta and Bergen (1998) conducted survey research in the machinery and electronic equipment sector and find that "business efficiency factors play a significant role in firms' decisions regarding exclusive dealing" (p. 387). Whinston (2006) and Lafontaine and Slade (2008) have lamented the paucity of field studies

[4] When the buyers are able to communicate, the predicted difference in exclusion rates between both regimes occurs because the buyers coordinate better on the rejection equilibrium in the no-discriminatory case.

[5] Another experimental study on simultaneous exclusive dealing is Smith (2010). Smith focuses on the case where an incumbent cannot discriminate between buyers, and finds that the likelihood of exclusion increases when the incumbent needs fewer buyers to sign exclusive contracts for entry to be deterred.

analyzing the effect exclusive contracts have on competition. This report from the lab adds to the ongoing discussion of the effects of exclusive dealing.

The remainder of the paper is organized as follows. In Section 2, we introduce the naked exclusion model. Section 3 contains the experimental design and procedures, and the hypotheses. In Section 4, we report the results. Section 5 concludes.

2. Theory

The RRW-SW model features an incumbent seller, a more efficient entrant, and, in our implementation, two buyers with independent demand who are final consumers. Due to, for instance, fixed entry costs, the entrant needs to sell to both buyers to make entry profitable. Therefore, if the incumbent can induce at least one of the two buyers to sign an exclusive contract, entry is deterred.[6]

The model has four stages. In a first stage, the incumbent offers to pay x_1, $x_2 \in \{0, 1, 2, ...\}$ to buyer 1 and 2, respectively, and, in a second stage, the buyers either accept or reject the proposed amount. By accepting, a buyer signs a contract with the incumbent in which he promises to buy exclusively from the incumbent. In a third stage, the decisions of the two buyers become publicly known and the entrant decides about entry. In a fourth stage, all active firms set prices and payoffs ensue.[7]

In the case where both buyers reject the incumbent's offer and entry occurs, the entrant will set a price slightly below or equal to the incumbent's unit production cost. The entrant will thus sell to both free buyers. This leaves the incumbent with zero profit and generates a "high" surplus for each buyer. If entry does not occur, the incumbent has monopoly power and monopoly pricing leads to higher prices and thus "low" buyer surplus.

In our experiment, the monopoly profit is equal to 500 such that the incumbent earns 500 minus the sum of the accepted payments in the case of exclusion. In the case of entry the incumbent earns 50. The payoff matrix of the buyers is as shown in Table 1.[8] To illustrate, if at least one buyer i

[6]RRW-SW analyze the general case with $N \geq 2$ buyers, where the entrant enters the market if and only if the number of buyers that sign exclusive contracts is smaller than N^* with $1 \leq N^* \leq N$.

[7] In our experiment, we will focus on the interaction between the incumbent and the buyers. Hence, we will collapse the four-stage game into a two-stage game assuming subgame-perfect behavior in stages 3 and 4. See Section 3 for more details on the design.

[8]In the parametric example underlying our experiment, the incumbent has unit production costs of $c_I = 20$ and the entrant has unit production costs of $c_E = 0$. A buyer's demand is given by $D(p) = 50 - p$. The consumer surplus for each buyer is $CS^E = 450$ under entry and $CS^I = 112.5$ (rounded at 115) under exclusion. The incumbent's profit is

Table 1: Payoff of buyers

		Decision of Buyer 2: Accept	Decision of Buyer 2: Reject
Decision of Buyer 1	Accept	$165+x_1$, $165+x_2$	$165+x_1$, 165
	Reject	165, $165+x_2$	500, 500

accepts payment x_i offered by the incumbent, entry is deterred and the accepting buyers earn $165+x_i$. A buyer who rejects, earns 165 in the case of entry deterrence. If both buyers reject, the more efficient entrant enters the market, and the buyers earn 500 each. The extra consumer surplus of entry for a single buyer is thus equal to 335.

In our experiment we focus on the case where the incumbent can offer payments to buyers sequentially. However, since we are interested in comparative statics, we study whether sequential contracting leads to different exclusion rates than simultaneous contracting. In particular, we compare outcomes under sequential contracting to two benchmark cases: one with simultaneous non-discriminatory contracting and one with simultaneous discriminatory contracting. Hence, we first discuss both cases of simultaneous contracting.

If the incumbent approaches both buyers simultaneously and cannot discriminate between buyers, such that $x_1 = x_2 = x$, both exclusionary and non-exclusionary equilibria exist. To ensure exclusion in this case, the incumbent would have to offer $x > 335$ such that both buyers are sure to accept. However, the incumbent is not in the position to offer an amount that high since it would lead to a loss on his side ($2 \times 335 > 500 - 50$). Therefore, given that $x \leq 335$, the buyers play a symmetric coordination game. In particular, there are two classes of subgame-perfect equilibria: exclusion equilibria where $x \in [0, 225]$ and both buyers accept[9] and no-exclusion equilibria where $x \in [0, 335]$ and both buyers reject. Successful exclusion is thus obtained if buyers fail to coordinate on rejecting the incumbent's payment.[10] We refer to the game in which the incumbent makes offers simultaneously and cannot

zero under entry and 450 minus the sum of the accepted offers under exclusion. In order to avoid zero earnings for the incumbent in the case entry occurs, and thus potential frustration on the part of subjects acting in the role of an incumbent in the experiment, we add 50 to the payoffs of *all* active players (so also to CS^I and CS^E). This generates payoffs as mentionned in the text and in Table 1.

[9] The upper bound on offers in this class of equilibria is due to the fact that for offers $x > 225$ incumbents would make losses.

[10] In the buyers' subgame, risk dominance predicts that both buyers reject if $x < 167.5$ and both buyers accept if

discriminate between buyers as SimNon.[11]

Let us now turn to the case in which the incumbent can discriminate between the buyers but still makes offers simultaneously—both of which are observable by the buyers before they make their decision. We refer to this game as SimDis. Given that the monopoly profit is sufficiently high to convince one buyer to sign an exclusionary contract ($450 > 335$), the entrant can be excluded with certainty (see case A of Proposition 3 in Segal and Whinston, 2000*b*) and only exclusionary equilibria exist. The costs of exclusion (i.e., the sum of *accepted* offers) lie anywhere between zero and 336. Indeed, in one subgame-perfect Nash equilibrium the incumbent offers a payment of 335 or 336 to one buyer, who accepts, and zero to the other buyer, who rejects. In other subgame-perfect Nash equilibria, offers to both buyers are positive and sum up to an amount smaller than or equal to 336 and both buyers accept.[12]

In the case of sequential contracting, which is the main focus of our experiment, the incumbent first makes an offer to one buyer ("buyer 1") who decides whether to accept or reject. Then—knowing the decision of buyer 1—the incumbent makes an offer to the other buyer ("buyer 2") who—after being informed about buyer 1's decision—also decides whether to accept or reject. In this game, exclusion again arises for sure and (almost) for free. Indeed, in the subgame-perfect Nash equilibrium the incumbent offers zero or one to buyer 1, who accepts, and zero to buyer 2, who rejects or accepts. The reason that buyer 1 accepts a payment of zero or one is that he knows that if he would reject, the incumbent would make buyer 2 an offer he cannot refuse (> 335). Given that buyer 1 accepts (which already deters entry), buyer 2 is offered zero.

In our experiment, we have two versions of the sequential contracting game. In both versions, buyer 2 observes the *decision* of buyer 1. But whereas in one version buyer 2 observes the offer made to buyer 1, in the other version buyer 2 does not observe the offer made to buyer 1. We refer to the first as Seq-P, where the "P" stands for publicity of offer 1, and to the second as Seq-S, where the "S" stands for secrecy of offer 1. Keeping secret offer 1 for buyer 2 is inconsequential for the

$x > 167.5$. Buyers are indifferent for $x = 167.5$ (Harsanyi and Selten, 1988). Note also that only non-exclusionary equilibria are perfectly coalition-proof (see Segal and Whinston, 2000*b*).

[11] We focus on pure strategy equilibria. There also exist mixed strategy equilibria in the buyers' subgame. These have the property that the probability of acceptance *decreases* with the offer in order to keep the other buyer indifferent between accepting and rejecting. As this property is clearly rejected by the data—the probability of acceptance *increases* with the offer (see Table 7)—we do not consider equilibria in mixed strategies here.

[12] In the buyers' subgame, risk dominance predicts that both buyers accept if $x_1x_2 > (335 - x_1)(x_2 - 335)$, or equivalently, $x_1 + x_2 > 335$. If $x_1 + x_2 < 335$ both buyers reject and if $x_1 + x_2 = 335$ they are indifferent (Harsanyi and Selten, 1988).

Table 2: Theoretical predictions

	Exclusion rate	Exclusion costs
SimNon	$\in [0, 100\%]$	$\in [0, 450]$
SimDis	100%	$\in [0, 336]$
Seq-P	100%	$\in [0, 1]$
Seq-S	100%	$\in [0, 1]$

Note: The predictions are derived from subgame perfect Nash equilibrium.

subgame-perfect equilibrium prediction. However, we include Seq-S in our experiment in order to bring the laboratory setting closer to a real-life setting as it is not likely that payments offered by incumbents are publicly observable.

Table 2 summarizes the theoretical predictions.

3. Experimental procedures and hypotheses

The experiment was run in June 2010 in the CEE lab at the University of Copenhagen with 198 students from different fields of study.[13] Sessions took about 90 minutes and participants earned EUR 19 on average.

As mentioned before, in our experiment we focus on the interaction between the incumbent and the buyers (like Spier and Landeo, 2009; Smith, 2010), which in our view is the crux of the naked-exclusion model. Therefore, there is no entrant present in our experiments and we collapse the multiple-stage game into a two-stage game, assuming subgame-perfect behavior of the entrant (and the incumbent) with respect to both entry and pricing decisions.[14] This allows the construction of a payoff table for buyers as shown in Table 1, which we also used in the experiments. All participants in a session received

[13] We used the z-Tree toolbox (Fischbacher, 2007) to program the software used in this experiment.

[14] In our opinion it is the coordination problem of the buyers and the (in)ability of the incumbent to take advantage of the externality buyers exert on each other that are the most interesting aspects of the naked-exclusion model. Moreover, Boone, Chaudhuri and Müller (2010) conduct experimental Bertrand markets with asymmetric unit costs. They show that these markets work as theory predicts in the sense that the most efficient firm sets a price slightly below the unit cost of the second most efficient firm. Given these results, the only question left in the context of the naked-exclusion model is whether entry happens when it is profitable. We thought this is of lesser interest. For a similar approach, see, e.g., the limit-pricing experiments by Cooper, Gravin and Kagel (1997).

Table 3: Overview of treatments and number of observations

	Treatment	Sequential	Full info	# Subjects	# Matching groups
1	SimNon	no	yes	45	5
2	SimDis	no	yes	54	6
3	Seq-P	yes	yes	45	5
4	Seq-S	yes	no	54	6
Total				198	22

the same instructions, containing the payoff function of the incumbent and the buyers.[15] Subjects were informed that monetary earnings would depend on the cumulative earnings made throughout the experiment. In the instructions, payoffs were denoted in points and, in order to cover potential losses of participants acting in the role of an incumbent, all participants were initially endowed with 1600 points. The conversion rate of points into DKK was 500 points = DKK 10. After reading the instructions, subjects were randomly assigned a role, which was fixed throughout the experiment.[16]

The experiment has four treatments that correspond to each of the four games described in Section 2, and each subject participated in one of the four treatments only. Table 3 provides an overview of our treatments. In all treatments, the same game was repeated twenty times in order to allow for learning. After each repetition, feedback was provided to incumbents and buyers about acceptance decisions and own payoffs, and participants were randomly rematched within matching groups of nine subjects each (three incumbents and six buyers). In SimDis buyers were informed about both offers before they made their decision. In Seq-P, buyer 2 was informed about buyer 1's decision before he made his decision, and about the offer buyer 1 received. In Seq-S, buyer 2 was informed about buyer 1's decision before he made his decision, but *not so* about the offer buyer 1 received.[17] In both of these sequential treatments, the incumbent made an offer to buyer 2 after having learned about the decision of buyer 1.

[15] Instructions can be found in Section A.3 of the Appendix.

[16] In the experiment we used neutral wording and did not mention the existence of a potential entrant. An incumbent was called an A-participant and buyers were called B-participants.

[17] Participants acting in the role of a buyer in the three discriminatory treatments alternated between being buyer 1 ("B1") and buyer 2 ("B2") and were informed about this. This switching was implemented in order to avoid the possibility that an incumbent always discriminated the same buyer subject.

The RRW-SW model predicts that under SimNon, there is a multiplicity of equilibria where either both buyers reject or both buyers accept the offer made by the incumbent. The exclusion rate can thus lie anywhere between 0 and 1. Under a discriminatory regime, however, both buyers rejecting cannot be part of a subgame perfect Nash equilibrium. Nor does it matter whether within the sequential regimes buyer 2 observes the (either accepted or rejected) amount offered to buyer 1. Knowing that the incumbent can always offer an amount such that it is a dominant choice for buyer 2 to accept, buyer 1 should accept any offer, irrespective of whether the information about the size of the offer is communicated to buyer 2. Therefore, in the discriminatory treatments the exclusion rate should be 100%. Hypothesis 1 is thus formulated as follows.

Hypothesis 1 *Exclusion rates in* SimDis*,* Seq-P *and* Seq-S *are higher than in* SimNon*, as long as the exclusion rate is strictly below 100% in the latter treatment.*

Exclusion costs are expected to be lower in the case of sequential contracting than in the case of simultaneous contracting. Indeed, under sequential contracting exclusion should be obtained at negligible costs.

Hypothesis 2 *Exclusion costs are lower in* Seq-P *and* Seq-S *compared to* SimNon *and* SimDis*, as long as they are strictly above zero in the latter two treatments.*

4. Results

In Subsection 4.1 we present the aggregate results and focus on differences across treatments. In Subsection 4.2 we take a closer look at behavior of incumbents and buyers in each of the different treatments.

4.1. Exclusion rates and costs: aggregate results

Table 4 gives an overview of aggregate exclusion rates and costs and (total) profits of incumbents and buyers averaged across all data points for the different treatments. The table shows that the exclusion rates in SimNon and SimDis are 53% and 59%, respectively. Table 4 also shows that in the sequential regimes, the exclusion rates are overall at least 15% higher than in both (non-discriminatory and discriminatory) simultaneous regimes. In particular, in Seq-P the exclusion rate is equal to 81% and in Seq-S it is equal to 74%. We also see that the costs of exclusion (i.e., the sum of the accepted offers given exclusion) for incumbents are on average between 247 and 256 in the three discriminatory

Table 4: Average exclusion rates and costs

	Exclusion rate	Exclusion costs	Profit incumbent	Profit buyers
SimNon	0.53 (0.50)	273 (117)	143 (123)	791 (216)
SimDis	0.59 (0.49)	254 (112)	166 (129)	755 (222)
Seq-P	0.81 (0.40)	247 (88)	214 (113)	658 (185)
Seq-S	0.74 (0.44)	256 (86)	194 (112)	693 (196)

Note: Averages across all data points are reported. Standard deviations are in parentheses.

treatments (SimDis, Seq-P, and Seq-S) and somewhat higher (273) in SimNon. The observed exclusion rates and costs translate into profits of incumbents being highest in the sequential regimes and those of buyers being highest in the simultaneous regimes.

In order to test whether the differences between treatments are statistically significant, we estimate regressions for the exclusion rate and exclusion costs that include treatment dummies. For the exclusion rate, we estimate the following logit regression model:

$$P(\text{Exclusion}_{ijt}) = F(\beta_0 + \beta_1 \text{SimDis-P}_{ij} + \beta_2 \text{Seq-P}_{ij} + \beta_3 \text{Seq-S}_{ij} + \eta_i + \eta_{ij} + \varepsilon_{ijt}), \tag{1}$$

where $P(\text{Exclusion}_{ijt})$ is the probability of observing exclusion in matching group $i = 1$ to 22, market $j = 1$ to 3, and period $t = 1$ to 20. F represents the logit function. With respect to exclusion costs, we estimate the following linear model:

$$\text{Exclusion cost}_{ijt} = \beta_0 + \beta_1 \text{SimDis-P}_{ij} + \beta_2 \text{Seq-P}_{ij} + \beta_3 \text{Seq-S}_{ij} + \eta_i + \eta_{ij} + \varepsilon_{ijt}, \tag{2}$$

with $i = 1$ to 22 matching groups, $j = 1$ to 3 markets, and $t = 1$ to 20 periods.

The dummy variable K_{ij} with $K \in \{$SimDis, Seq-P, Seq-S$\}$ is equal to 1 when the treatment for matching group i and market j is treatment K and 0 otherwise. The benchmark treatment is thus SimNon. In both regression models, we take into account that markets are nested in matching groups by including nested random effects, which are assumed to be independently normally distributed (cf. η_i and η_{ij}). Estimating these models allows us to test whether differences between treatments are statistically significant, taking into account all data points *and* using standard errors that are robust to potential dependency within matching groups. First, statistics associated with $\hat{\beta}_1$, $\hat{\beta}_2$, and $\hat{\beta}_3$ indicate whether differences between the three discriminatory treatments and the non-discriminatory treatment are statistically significant. Second, whether differences between different disciminatory treatments are statistically significant can be tested by comparing the different $\hat{\beta}_k$ for $k = 1, 2, 3$.

Table 5: Exclusion rate and costs: regression results

	Exclusion rates			Exclusion costs	
Periods:	Estimates		Marginal Effects	Estimates	
β_0 (SimNon)	0.103	(0.469)		274.7	(13.2)***
β_1 (SimDis)	0.276	(0.481)	0.059	−24.1	(15.1)
β_2 (Seq-P)	1.530	(0.569)***	0.284	−30.1	(13.4)**
β_3 (Seq-S)	1.140	(0.627)*	0.224	−17.2	(29.0)
log L	−758.859			−5243.526	
# data points	1320			879	
# clusters	22			22	

Note: The table reports the results from estimation of models (1) and (2) with standard errors corrected for potential dependency within matching groups in parentheses. ***, **, and * refer to rejection of $H_0 : \beta_k = 0$ at the 1%, 5% and 10% level, respectively.

The regression results are in Table 5, and results from tests that compare between discriminatory treatments are in Table 6.[18]

We first consider the results related to the exclusion rates. Table 5 shows that the probability of exclusion in SimDis is not significantly different from SimNon. This result is in line with results reported in Spier and Landeo (2009), who neither find that discrimination significantly increases the likelihood of exclusion.[19] The table also shows that the exclusion rate in both sequential contracting regimes is significantly higher (between 22% and 28%) than in SimNon. Table 6 shows that the difference between each of the sequential regimes and SimDis is significant at least at the 5% level. Also, differences between Seq-P and Seq-S are not significant.[20] Our first results can thus be summarized as follows:

Result 1 *(i) Exclusion rates in* SimDis *and* SimNon *are not significantly different. (ii) Exclusion rates are higher in* Seq-P *and* Seq-S *than in* SimNon. *(iii) Exclusion rates are higher in* Seq-P *and* Seq-S *than in* SimDis.

[18] Using a linear regression model to estimate the treatment effects on the exclusion rate gives the same qualitative results.

[19] Our treatment SimNon corresponds to their treatment "EN/ND/NC" while our treatment SimDis-P corresponds to their treatment "EN/D/NC".

[20] When period dummies or a linear time trend are included in order to control for time effects, the same qualitative results hold.

Table 6: Between-treatment comparisons: χ^2-statistics

	Exclusion rate	Exclusion costs
$H_0 : \beta_1 = \beta_2$	14.93***	0.24
$H_0 : \beta_1 = \beta_3$	3.97**	0.06
$H_0 : \beta_2 = \beta_3$	0.54	0.22

Note: The reported statistics are LR χ^2-statistics related to comparisons between the discriminatory treatments based on the estimations reported in Table 5. *** and ** refer to rejection of $H_0 : \beta_k = 0$ at the 1% and 5% level, respectively.

Result 1(i) basically confirms an earlier result in Spier and Landeo (2009) that discrimination *per se* does not increase the exclusion rate. Results 1(ii) and 1(iii) are new. Result 1(ii) is in line with the theoretical prediction. Result 1(iii), on the contrary, is not. Indeed, whereas theory does not predict exclusion to be sensitive to the type of disciminatory regime, the experiment reveals that a necessary condition for discrimination to facilitate exclusion is that contracts are offered sequentially.

Why doesn't the possibility of discrimination between buyers *alone* significantly increase the incidence of exclusion, but, rather, does it also take sequentiality of offers to do so? A possible reason is that without sequentiality, buyers still have the possibility to coordinate on the more efficient entry outcome in the buyers' subgame. Indeed, when the incumbent's offers are both below 336, the buyers' subgame is a coordination game. In the sequential treatments, the buyers never play a coordination game. In Section 4.2 we not only show that the buyers' subgame is often a coordination game in SimDis, but also that, on average, incumbents make higher profits when proposing offers that turn the buyers' subgame into a coordination game than when proposing divide-and-conquer offers.[21]

With respect to exclusion costs, the estimation results in Table 5 indicate that they are significantly lower in Seq-P than in SimNon. Those in SimDis and Seq-S are also lower than in SimNon, but not significantly so.[22] These comparisons are thus partly in line with the comparative statics as predicted

[21]In another set of sessions we implemented the naked exclusion games in a within-subject design. Here, all subjects first play the non-discriminatory regime before playing (with the player roles kept fixed) one of the three discriminatory regimes. The comparative statics are the same as in this study, except that sequential contracting alone is not sufficient to obtain a higher exclusion rate. Instead, it only increases exclusion rates over those in simultaneous regimes if the contract terms offered to the first buyer are unknown to the second buyer (cf. Seq-S). The fact that in this other experiment subjects first play the non-discriminatory game, where exclusion is not guaranteed, may make behavior in subsequently played discriminatory games more "sticky". Indeed, the relatively favorable outcomes for buyers obtained in the non-discriminatory game may form an aspiration for outcomes in games played thereafter, such that more than sequentiality alone is needed to break coordination between buyers.

[22]In the final five periods exclusion costs are also significanly lower in Seq-S than in SimNon (at the 10% level).

by theory. However, it is clear that also under sequential contracting exclusion costs are substantially above zero—a finding we come back to in Section 4.2. We summarize our second result as follows.

Result 2 *While in* Seq-P *exclusion costs are significantly lower than in* SimNon*, under sequential contracting exclusion generally comes at a substantial cost for the incumbent.*

How do our results translate into payoffs of the incumbent and buyers? The incumbent earns significantly more in the sequential treatments than in the simultaneous treatments. That is, taking both sequential treatments together, the incumbent is estimated to earn 60 points more than in SimNon and 38 points more than in SimDis (significant with $p < 0.015$ in regressions of the type in equation (2)). Buyers are worse off under sequentiality. They are estimated to earn 115 points less in the sequential treatments than in SimNon, and 79 points less than in SimDis ($p < 0.014$ in regressions of the type in equation (2)).[23]

4.2. Behavior of incumbents and buyers

In this subsection we look more closely at behavior of incumbents and buyers in the different treatments. In particular, we study the distribution of amounts offered by incumbents and acceptance rates of buyers. Table 7 shows the distribution of offers made by incumbents and the acceptance rates of buyers for the four games separately (see Appendix A.1 for histograms). Offers are grouped into intervals ([1-35], [35-135], etc.). For SimNon, where incumbents made just one offer relevant for both buyers, Table 7 shows the distribution of these offers and corresponding acceptance rates in brackets. For SimDis, Table 7 shows the distribution of *all* offers made, neglecting the fact that each incumbent always made two offers at a time. We do this in an effort to have one consistent way of displaying the results across the four different games. For more information on the distribution of pairs of offers (minimum and maximum offer) in SimDis, and the associated exclusion rates, we refer to Table A1 in Appendix A.2. Finally, for Seq-P and Seq-S we distinguish between offers made to buyer 1, to buyer 2 after buyer 1 rejected, and to buyer 2 after buyer 1 accepted.

Table 7 shows that in SimNon 81.3% (488 out of 600) of the offers are between 136 and 235. Moreover, the buyers' acceptance rate increases as the amount offered increases, which is consistent

[23] We also ran a simultaneous discriminatory treatment where buyers were not informed about the offer made to the other buyer. In this case, assuming passive beliefs, the unique (perfect Bayesian) Nash equilibrium predicts the incumbent to offer $(x_1, x_2) = (0, 0)$ and both buyers accept. Results from this treatment are very similar to those reported by Spier and Landeo (2009): the exclusion rate is not significantly different from the ones observed in treatments SimNon and SimDis and exclusion costs are significantly lower than in treatment SimNon.

Table 7: Distribution of offers (in %) and acceptance rates

	0-35	36-135	136-235	236-335	> 335	total	#
SimNon	1.0	7.3	81.3	10.0	0.3	100	600
	[0.00]	[0.05]	[0.36]	[0.48]	[1.00]	[0.35]	
SimDis	30.6	20.8	24.2	10.8	13.6	100	720
	[0.09]	[0.31]	[0.40]	[0.54]	[0.71]	[0.34]	
Seq-P							
to buyer 1	5.0	22.7	43.7	27.3	1.3	100	300
	[0.00]	[0.43]	[0.63]	[0.82]	[1.00]	[0.61]	
to buyer 2 after 1 reject	8.5	11.0	6.8	10.2	63.5	100	118
	[0.00]	[0.00]	[0.00]	[0.33]	[0.75]	[0.51]	
to buyer 2 after 1 accept	96.7	2.7	0.0	0.6	0.0	100	182
	[0.59]	[0.80]	-	[1.00]	-	[0.60]	
Seq-S							
to buyer 1	7.2	18.1	50.0	19.7	5.0	100	360
	[0.04]	[0.31]	[0.60]	[0.69]	[1.00]	[0.54]	
to buyer 2 after 1 reject	14.6	5.5	9.8	14.6	55.5	100	164
	[0.00]	[0.00]	[0.13]	[0.21]	[0.70]	[0.43]	
to buyer 2 after 1 accept	98.5	1.0	0.0	0.5	0.0	100	196
	[0.36]	[0.50]	-	[1.00]	-	[0.37]	

Note: The table reports observed frequencies of offered amounts and average acceptance rates by buyers in brackets.

with experimental evidence from coordination (stag hunt) games. Indeed, players in such games take *ceteris paribus* less risk to coordinate on the efficient equilibrium when the "risky" payoff is lower or the payoff corresponding to the safe alternative is higher (see, e.g., Battalio, Samuelson and Huyck, 2001; Schmidt et al., 2003). Translated into the naked exclusion context, buyers take less risk to reject an offer made by the incumbent if the offer, and thus the payoff from accepting, is higher (see also Smith, 2010; Spier and Landeo, 2009).

With respect to SimDis, we see in Table 7 that the distribution of offered amounts is different from SimNon. The majority of offers (30.6%) now falls within the range [0,35]. This peak partly stems from divide-and-conquer offers of incumbents where one buyer is offered a very small amount (within the range [0,35]) and the other buyer an amount higher than 335, which makes it a dominant strategy to accept in the subgame. From all offer combinations, about 27% correspond to divide-and-conquer strategies (97 out of 360). As shown in Table A1 in Appendix A.2, the exclusion rate is among the highest for strategies where the minimum offer is within the range [0,35] and the maximum offer above 335.[24] All other offer combinations (with the exception of one observation) transform the buyers' subgame into a coordination game. These are pairs of offers where the maximum offer is below 335. About 73% of the offer combinations (262 out of 360) are such that the buyers' subgame is a coordination game (see again Table A1).[25] Interestingly, incumbents who use divide-and-conquer offers earn on average much less than incumbents who do not use these, particularly compared to incumbents who propose combinations of (sufficiently high) offers that create a coordination game in the buyers' decision stage. To illustrate, the average profit calculated across all divide-and-conquer offers is 119, whereas it is 183 across all other offers, and 208 across all combinations of offers for which each of the two individual offers lie in the interval between 36 and 236.[26] This suggests that it might be a clever strategy for incumbents to avoid divide-and-conquer offers.

With respect to the sequential games Seq-P and Seq-S, Table 7 shows that the majority of amounts (44% and 50%, respectively) offered to buyer 1 again lies in the range [136, 235], which is far above the theoretical prediction of zero or one. Amounts offered to buyer 2, however, are more in line with what is to be expected from a rational, payoff-maximizing incumbent: very low amounts are offered when buyer 1 has accepted and amounts above 335 are offered when buyer 1 has rejected. The reason why incumbents offer relatively large amounts to buyers 1 is most likely that the latter (almost) never accept "low" offers. Indeed, in Seq-P and Seq-S, buyers 1 almost never accept offers below 35. Basically, acceptance rates of buyers 1 are positively related to the size of the offer, for both Seq-P and Seq-S, and incumbents seem to realize this.

The relation between offers and acceptance rates also appears in ultimatum game experiments where one typically sees a positive relation between proposers' offers and responders' acceptance rates (see Güth, 1995; Roth, 1995, for overviews). Anticipating this, most proposers offer substantial amounts to the responder. An incumbent knows that once his offer to buyer 1 is rejected, he needs to make a very large offer to buyer 2 to achieve exclusion with certainty and this would make him earn only very little. Hence, anticipating rejections of small payments by buyer 1 that result in "low"

[24]Spier and Landeo (2009) observe these divide-and-conquer offers more frequently than we do, which is, arguably, not surprising given that the action space for the incumbent is restricted to four possible payments.

[25]As long as the sum of these offers is below 336, they could be part of a subgame-perfect Nash equilibrium. However, since the corresponding exclusion rates are well below 1, most of these cases are *not* part of a subgame perfect Nash equilibrium.

[26]These differences are statistically significant ($p < 0.001$) in linear regressions where the incumbents' profit is regressed on a divide-and-conquer dummy (including random effects for individuals and matching groups, and standard errors adjusted for potential dependency within matching groups).

profits, the incumbent appears to offer relatively high amounts to buyer 1 in order to convince him to accept.[27]

5. Conclusion

We find that in the context of the naked exclusion model of Rasmusen, Ramseyer and Wiley (1991) and Segal and Whinston (2000*b*) with two buyers, an incumbent who proposes exclusive contracts to buyers sequentially, is better able to deter entry than an incumbent who proposes contracts simultaneously. Thus, in contrast to the theoretical predictions, it is not discrimination *per se* that increases the exclusion rate. Rather, it is the combination of discrimination and sequentiality of contracting that increases the exclusion rate. Furthermore, when the offered amounts are too low, also under sequential contracting buyers reject offers. Therefore, also under sequential contracting, the incumbent carries a substantial cost for excluding rivals.

Our results are relevant for antitrust policy. Indeed, exclusivity clauses are not necessarily aimed at foreclosure but can also have an efficiency rationale. Besanko and Perry (1993) and Segal and Whinston (2000*a*), for example, show that such clauses can enhance manufacturers' incentives to invest. Therefore, regulatory bodies and courts have to judge which of the two effects of exclusive contracts—the efficiency-enhancing or the foreclosure effect—outweighs the other.[28] This task is not straightforward and, in this respect, our results provide some insights. In particular, we find that the most effective way to achieve exclusion is to approach buyers sequentially. As there is no reason why efficiency-enhancing or investment-protecting exclusivity clauses should be offered sequentially to buyers, an argument can be made that contracts offered in this form should be interpreted as aiming at exclusion only. For practical purposes, this would mean that an antitrust authority should be on high alert if

[27] An alternative but related and more formal explanation for the high offers to buyer 1 is based on a simple bargaining mechanism in which players share surplus from "trade". Using backward induction, we first consider the second buyer. The surplus created by the incumbent and buyer 2 equals $S_2 = 500 + 165 - (500 + 50) = 115$. Using Nash bargaining with—for concreteness—a 50:50 split of the surplus leads to an offer $x_2 = 392.5$ and a surplus for the incumbent equal to 107.5. Now consider buyer 1. The surplus created at this stage equals $S_1 = 500 + 165 - (107.5 + 165) = 392.5$. Again using Nash bargaining with a 50:50 split of the surplus leads to $x_1 = 196.25$. This prediction is not too far from the average observed offers: 182 in Seq-P and 186 in Seq-S. But the offer of $x_2 = 392.5$ to buyer 2 after buyer 1 rejected compares less favorably to the average observed offers: 274 in Seq-P and 263 in Seq-S. Apparently buyer 2 has less bargaining power than the 50:50 we assumed.

[28] See, for example, Segal and Whinston's (2000a) discussion of a DoJ investigation of Ticketmaster's contracting practice, or the recent Microsoft case in which Microsoft was accused of entering exclusive deals with original computer equipment manufacturers in an effort to exclude Microsoft's rivals.

the suspected company staggered its contracting with buyers over a certain period of time to get the required sequencing of offers (see also Whinston, 2006, p. 147f).

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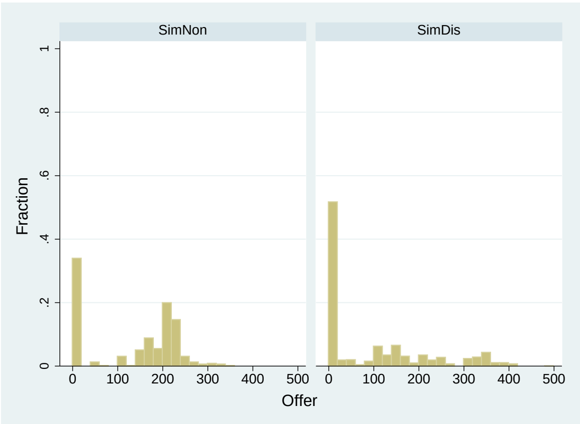
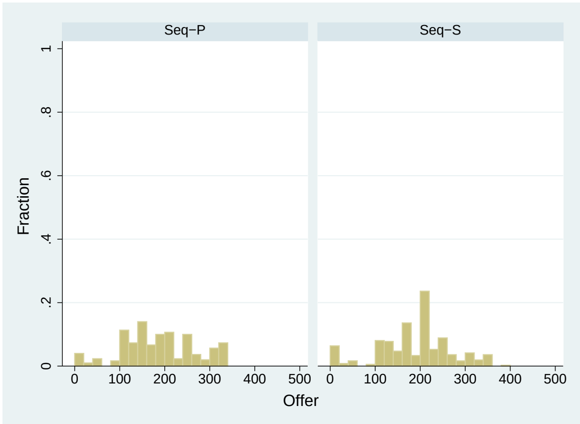
A. Appendix

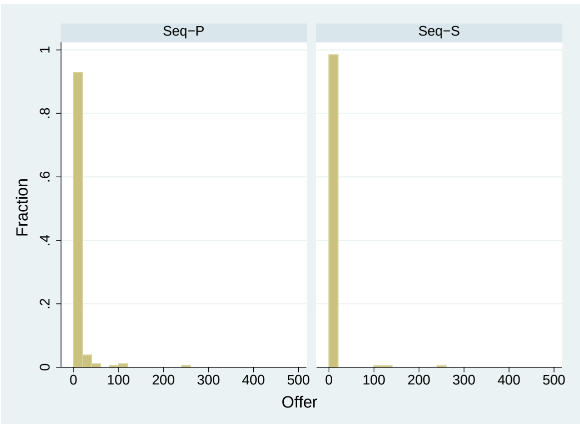
A.1. Histograms of amounts offer by incumbents



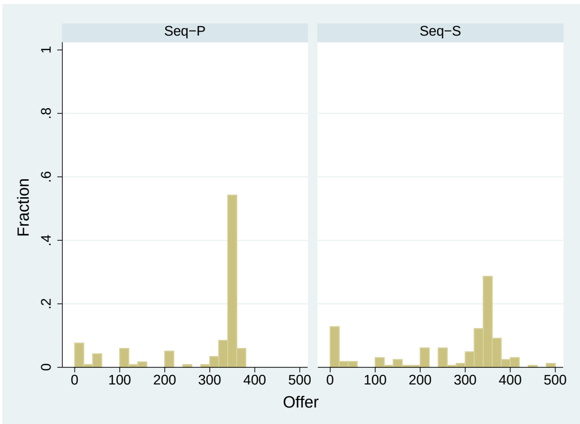
(a) Offers in SimNon and SimDis



(b) Offers to Buyer 1 in Seq



(c) Offers to Buyer 2 in Seq after Buyer 1 accepted



(d) Offers to Buyer 2 in Seq after Buyer 1 rejected

A.2. Distribution of minimum and maximum offers in SimDis

Table A1: Frequency of minimum and maximum offers and exclusion rates in SimDis

	max offer					
min offer	0-35	36-135	136-235	236-335	> 335	total
0-35	10	8	31	64	97	210
	[0.10]	[0.00]	[0.19]	[0.63]	[0.72]	[0.56]
36-135	-	49	36	7	1	93
	-	[0.49]	[0.61]	[0.86]	[1.00]	[0.57]
136-235	-	-	50	7	0	57
	-	-	[0.72]	[0.86]	-	[0.74]
total	10	57	117	78	98	360
	[0.10]	[0.42]	[0.55]	[0.67]	[0.72]	[0.59]

Note: The table reports for SimDis observed frequencies of minimum and maximum offers and average *exclusion* rates by buyers in parentheses.

A.3. Instructions

A.3.1. General for all treatments

- Please read these instructions closely.
- Do not talk to your neighbours and remain quiet during the entire experiment.
- If you have a question, raise your hand. We will come up to you to answer it.
- In this experiment you can earn money by interacting with other participants.
- Your earnings are measured in "Points." The number of points that you earn depends on the decisions that you and other participants make.
- For every 500 Points you earn, you will be paid 10 DKK in cash.
- You will start the experiment with 1600 Points in your account.
- 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 the show-up fee.
- Your identity will remain anonymous to us as well as to the other participants.

A.3.2. Specific for SimNon

The experiment consists of 20 rounds. The events in each round are as follows:

At the beginning of each round, you will be randomly assigned to a group of 3 participants. In each group, one participant will act in role A and two participants will act in role B. Then there will be two stages:

Stage 1: The A participant can offer each of the two B participants in his group a payment of $X \geq 0$. The payment X is the same for both B participants.

Stage 2: The two B participants will be informed about X. Then both B participants simultaneously and independently have to decide whether to accept or reject this payment.

Payoffs

The payoffs of the A participant

Imagine that you are an A participant and that you offer the payment $X \geq 0$. Then your payoffs as an A participant are as follows:

If no B accepts	If one B accepts	If the two B's accept
50	$500 - X$	$500 - 2X$

This means:

- If none of the B participants accepts the offer, you earn 50;
- If only one B participant accepts the offer, you earn $500 - X$;
- If the two B participants accept the offer, you earn $500 - 2X$;
- Please note that as an A participant you can make losses. This is the case when only one B participant accepts and the payment X is larger than 500 or when both B participants accept and the payment X is larger than 250.

The payoffs of the B participants

Imagine that you are a B participant and imagine that you choose rows (Accept or Reject) in the table below. Then your payoffs as a B participant are as follows:

		Decision of the other B participant	
		The other B accepts	The other B rejects
Your decision as participant B	Accept	$165 + X$	$165 + X$
	Reject	165	500

This means:

- If you choose "Accept," you earn $165 + X$ (whether the other B participant accepts or rejects.)
- If you choose "Reject," your payoff depends on what the other B participant chooses.
  - If the other B participant accepts, you earn 165.
  - If the other B participant rejects, you earn 500.

Role assignment and information

- The experiment consists of 20 rounds.
- Your role as either an A or a B participant will be determined at the beginning of the experiment and then remains fixed for the entire experiment.
- Your computer screen (see the top line) indicates which role you act in.
- Please remember that in every round, groups of 3 participants are randomly selected from the pool of participants in the room. We will make sure that each of the groups will always consist of one A participant and two B participants.
- At the end of each round, you will be given the following information about what happened in your own group during the round: the offer made by the A participant, the decisions of the two B participants, and your own payoff.

A.3.3. Specific for SimDis

The experiment consists of 20 rounds. The events in each round are as follows:

At the beginning of each round, you will be randomly assigned to a group of 3 participants. In each group, one participant will act in role A and two participants will act in role B. The two participants acting in role B will be called B1 and B2. Then there will be two stages:

Stage 1: The A participant can offer each of the two B participants in his group a payment. That is, the A participant can offer B1 a payment $X1 \geq 0$ and B2 a payment of $X2 \geq 0$. The two payments $X1$ and $X2$ can be the same or they can be different.

Stage 2: The two B participants will be informed about $X1$ and $X2$. Then both B participants simultaneously and independently have to decide whether to accept or to reject their own offered payment. That is, B1 decides whether to accept or to reject $X1$ and (at the same time) B2 decides whether to accept or to reject $X2$.

Payoffs

The payoffs of the A participant

Imagine that you are an A participant and that you offer the payments $X1 \geq 0$ and $X2 \geq 0$. Let the B participants be denoted by Bi where $i = 1, 2$. Then your payoffs as an A participant are as follows:

If no B accepts	If only Bi accepts	If the two B's accept
50	$500 - Xi$	$500 - X1 - X2$

This means:

- If none of the B participants accepts the offer, you earn 50.
- If only participant Bi ($i = 1, 2$) accepts the offer, you earn $500 - Xi$;
- If the two B participants accept the offer, you earn $500 - X1 - X2$;
- Please note that as an A participant you can make losses. This is the case when only participant Bi ($i = 1, 2$) accepts and the payment Xi is larger than 500 or when both B participants accept and the sum of the payments $X1$ and $X2$ is larger than 500.

The payoffs of the B participants

Imagine that you are participant Bi ($i = 1, 2$) who is offered the payment Xi ($i = 1, 2$) by the A participant, and imagine that you choose rows (Accept or Reject) in the table below. Then your payoffs as participant Bi are as follows:

		Decision of the other B participant: The other B accepts	Decision of the other B participant: The other B rejects
Your decision as participant Bi	Accept	$165 + Xi$	$165 + Xi$
	Reject	165	500

This means:

- If you choose "Accept," you earn $165 + Xi$ (whether the other B participant accepts or rejects.)
- If you choose "Reject," your payoff depends on what the other B participant chooses.
  - If the other B participant accepts, you earn 165.
  - If the other B participant rejects, you earn 500.

Role assignment and information

- The experiment consists of 20 rounds.
- Your role as either an A or a B participant will be determined at the beginning of the experiment and then remains fixed for the entire experiment. As a B participant you will alternate acting in role B1 and role B2 across rounds. That is, if you are B1 (or B2) in round 1, you will be B2 (or B1) in round 2. Then, in round 3 you will again be B1 (or B2) and so on.
- Your computer screen (see the top line) indicates in every round which role you act in.
- Please remember that in every round, groups of 3 participants are randomly selected from the pool of participants in the room. We will make sure that each of the groups will always consist of one A participant and two B participants.
- At the end of each round, you will be given the following information about what happened in your own group during the round: the offers made by the A participant to the two B participants, the decisions of the two B participants, and your own payoff.

A.3.4. Specific for Seq-P

The experiment consists of 20 rounds. The events in each round are as follows:

At the beginning of each round, you will be randomly assigned to a group of 3 participants. In each group, one participant will act in role A and two participants will act in role B. The two participants acting in role B will be called B1 and B2. Then there will be four stages:

Stage 1: The A participant can offer the B1 participant in his group a payment. That is, the A participant can offer B1 a payment $X1 \geq 0$.

Stage 2: The B1 participant will be informed about $X1$. Then the B1 participant has to decide whether to accept or to reject the offered payment. That is, the B1 participant decides whether to accept or to reject $X1$.

Stage 3: The A participant will be informed about whether B1 has accepted or rejected the offer $X1$. Then the A participant can offer the B2 participant in his group a payment. That is, the A participant can offer B2 a payment $X2 \geq 0$.

Stage 4: The B2 participant will be informed both about $X1$ and $X2$ as well as about whether the B1 participant has accepted or rejected the payment $X1$. Then the B2 participant has to decide whether to accept or to reject the offered payment. That is, B2 decides whether to accept or to reject $X2$.

Payoffs

The payoffs of the A participant

Imagine that you are an A participant and that you offer the payments $X1 \geq 0$ and $X2 \geq 0$. Let the B participants be denoted by Bi where $i = 1, 2$. Then your payoffs as an A participant are as follows:

If no B accepts	If only Bi accepts	If the two B's accept
50	$500 - Xi$	$500 - X1 - X2$

This means:

- If none of the B participants accepts the offer, you earn 50.
- If only participant Bi ($i = 1, 2$) accepts the offer, you earn $500 - Xi$;
- If the two B participants accept the offer, you earn $500 - X1 - X2$;
- Please note that as an A participant you can make losses. This is the case when only participant Bi ($i = 1, 2$) accepts and the payment Xi is larger than 500 or when both B participants accept and the sum of the payments $X1$ and $X2$ is larger than 500.

The payoffs of the B participants

Imagine that you are participant Bi ($i = 1, 2$) who is offered the payment Xi ($i = 1, 2$) by the A participant, and imagine that you choose rows (Accept or Reject) in the table below. Then your payoffs as participant Bi are as follows:

		Decision of the other B participant: The other B accepts	The other B rejects
Your decision as participant Bi	Accept	$165 + Xi$	$165 + Xi$
	Reject	165	500

This means:

- If you choose "Accept," you earn $165 + Xi$ (whether the other B participant accepts or rejects.)
- If you choose "Reject," your payoff depends on what the other B participant chooses.
  - If the other B participant accepts, you earn 165.
  - If the other B participant rejects, you earn 500.

Role assignment and information during the experiment

- The experiment consists of 20 rounds.
- Your role as either an A or a B participant will be determined at the beginning of the experiment and then remains fixed for the entire experiment. As a B participant you will alternate acting in role B1 and role B2 across rounds. That is, if you are B1 (or B2) in round 1, you will be B2 (or B1) in round 2. Then, in round 3 you will again be B1 (or B2) and so on.
- Your computer screen (see the top line) indicates in every round which role you act in.
- Please remember that in every round, groups of 3 participants are randomly selected from the pool of participants in the room. We will make sure that each of the groups will always consist of one A participant and two B participants.
- At the end of each round, you will be given the following information about what happened in your own group during the round: the offers made by the A participant to the two B participants, the decisions of the two B participants, and your own payoff.

A.3.5. Specific for Seq-S

The experiment consists of 20 rounds. The events in each round are as follows:

At the beginning of each round, you will be randomly assigned to a group of 3 participants. In each group, one participant will act in role A and two participants will act in role B. The two participants acting in role B will be called B1 and B2. Then there will be four stages:

Stage 1: The A participant can offer the B1 participant in his group a payment. That is, the A participant can offer B1 a payment $X1 \geq 0$.

Stage 2: The B1 participant will be informed about $X1$. Then the B1 participant has to decide whether to accept or to reject the offered payment. That is, the B1 participant decides whether to accept or to reject $X1$.

Stage 3: The A participant will be informed about whether B1 has accepted or rejected the offer $X1$. Then the A participant can offer the B2 participant in his group a payment. That is, the A participant can offer B2 a payment $X2 \geq 0$.

Stage 4: The B2 participant will be informed about $X2$ (not about $X1$) as well as about whether the B1 participant has accepted or rejected his payment. Then the B2 participant has to decide whether to accept or to reject the offered payment. That is, B2 decides whether to accept or to reject $X2$.

Payoffs

The payoffs of the A participant

Imagine that you are an A participant and that you offer the payments $X1 \geq 0$ and $X2 \geq 0$. Let the B participants be denoted by Bi where $i = 1, 2$. Then your payoffs as an A participant are as follows:

If no B accepts	If only Bi accepts	If the two B's accept
50	$500 - Xi$	$500 - X1 - X2$

This means:

- If none of the B participants accepts the offer, you earn 50.
- If only participant Bi ($i = 1, 2$) accepts the offer, you earn $500 - Xi$;
- If the two B participants accept the offer, you earn $500 - X1 - X2$;
- Please note that as an A participant you can make losses. This is the case when only participant Bi ($i = 1, 2$) accepts and the payment Xi is larger than 500 or when both B participants accept and the sum of the payments $X1$ and $X2$ is larger than 500.

The payoffs of the B participants

Imagine that you are participant Bi ($i = 1, 2$) who is offered the payment Xi ($i = 1, 2$) by the A participant, and imagine that you choose rows (Accept or Reject) in the table below. Then your payoffs as participant Bi are as follows:

		Decision of the other B participant	
		The other B accepts	The other B rejects
Your decision as participant Bi	Accept	$165 + Xi$	$165 + Xi$
	Reject	165	500

This means:

- If you choose "Accept," you earn $165 + Xi$ (whether the other B participant accepts or rejects.)
- If you choose "Reject," your payoff depends on what the other B participant chooses.
  - If the other B participant accepts, you earn 165.
  - If the other B participant rejects, you earn 500.

Role assignment and information during the experiment

- The experiment consists of 20 rounds.
- Your role as either an A or a B participant will be determined at the beginning of the experiment and then remains fixed for the entire experiment. As a B participant you will alternate acting in role B1 and role B2 across rounds. That is, if you are B1 (or B2) in round 1, you will be B2 (or B1) in round 2. Then, in round 3 you will again be B1 (or B2) and so on.
- Your computer screen (see the top line) indicates in every round which role you act in.
- Please remember that in every round, groups of 3 participants are randomly selected from the pool of participants in the room. We will make sure that each of the groups will always consist of one A participant and two B participants.
- At the end of each round, you will be given the following information about what happened in your own group during the round: the offer made to you by the A participant (in case you are a B participant), the decisions of the two B participants, and your own payoff.