Lisa Bruttel
Jochen Glöckner

Strategic Buyers and Market Entry

THURGAU INSTITUTE
OF ECONOMICS
at the University of Konstanz

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Lisa V. Bruttel[†]   Jochen Glöckner[‡]

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Abstract

This paper tests two basic assumptions underlying court made or statutory
provisions prohibiting predatory pricing. Such prohibitions are usually based
on the economic grounds that monopolistic pricing is likely to occur in the
long run, causing harm to competition and consumers. The first assumption
under scrutiny is that customers will accept monopolistic prices during the
subsequent phase of recoupment, even though they have become accustomed
to low prices during the price war. The second assumption is that no competi-
tor will (re-)enter the market in this subsequent phase. Our two experiments
indicate that both assumptions are not backed up by actual decision making
both of consumers and of competitors. Moreover, we find that consumers use
their market power in order to maintain long-run competition.

JEL classification: C91, D21, L11.

Keywords: Buyer Power, Predatory Pricing, Recoupment, Experiment.

[†]University of Konstanz, Faculty of Economics, Box 131, 78457 Konstanz, Germany, email:
lisa.bruttel@uni-konstanz.de

[‡]University of Konstanz, Faculty of Law, Box 98, 78457 Konstanz, Germany, email:
jochen.gloeckner@uni-konstanz.de

1 Introduction

Low-price strategies with the goal to deter market entry of competing firms are forbidden in many jurisdictions. For example, the European Courts[1] and German competition law support prohibitions of predatory pricing without an explicit requirement of recoupment. U.S. Antitrust Law represents a different view as it requires the proof of an existing significant likelihood of a rise in prices above a competitive level in the long run to forbid predatory pricing from the beginning.[2] Thus, there is international disagreement about the likelihood of recoupment. Prohibitions as in the European Courts are usually based on the concept that the incumbent is ultimately able to recoup the costs of the price war, thus causing harm to consumers and competition. However, recoupment will in fact only be possible if two conditions are met: First, consumers, accustomed to low prices, have to accept monopolistic prices afterwards. Second, neither the competitor having left the market, nor any other entrant firm must (re-)enter the market. Both requirements are tacitly assumed by jurisdictions prohibiting predatory pricing without a requirement of likelihood of recoupment. Yet, both assumptions seem questionable from an economic perspective. At least in the short run low prices in fact increase consumer surplus. Only if these low prices later almost automatically lead to a monopolistic market sustaining monopoly profits, recoupment is likely in the long run. The experiment in this paper is designed to help answer this question so crucial for competition policy and enforcement all over the world.[3]

We think that the experimental approach is the best to test both assumptions underlying recoupment. As Davis and Wilson (2008) state, for strategic buyer behavior there is no tractable formal equivalent to the standard Bertrand and Cournot models

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[1]The European Court of Justice explicitly repeated on several occasions that there is no need of recoupment to prohibit sale under costs: ECJ, Case C-333/94 P - Tetra Pak II, [1996] ECR I-5951 at para. 44; Case C-202/07 P - France Télecom, [2009] at para. 110.

[2]Brooke Group Ltd. v. Brown & Williamson Tobacco Corp., 509 U.S. 209, 225 (1993).

[3]van Damme et al. (2009) provide an excellent general overview over the utility of experimental work on market dominance for competition policy.

which could help us analyse the question formally. An empirical investigation is not possible because in real markets costs of firms hardly observable and consumers' willingness to pay is even more difficult to measure. Furthermore, in analogy to Tyran and Engelmann (2005), an experiment helps to disentangle two possible reasons for demand withholding after a drastic price increase: a certain decrease in demand due to a price increase is natural given a demand function. Our focus is on the additional reduction in demand resulting from reference-dependent preferences (for a formal model see Köszegi and Rabin, 2006) or from the perceived unfairness of the drastic price increase (see Ruffle, 2009, or, more generally, Falk and Fischbacher, 2006).[4] By assigning an appropriate willingness to pay to the buyers in the experiment we can easily separate the additional reduction in demand, which is a punishment of unfair prices, from the theoretically expected demand reduction due to the price increase.

In our experiment, we will explore buyers' strategic behavior in a market where they face a dominant firm trying to receive or maintain a monopoly position and some small firms making attempts to enter into the market. The buyers in the experiment have a relatively strong position as there are only one or two of them acting in the market. This enables us to study situations, in which not only the seller side comprises a dominant firm but also the buyer side is rather concentrated as in business-to-business trade relationships.

In the experimental literature so far, it turned out to be surprisingly difficult to generate predatory pricing in the laboratory.[5] Isaac and Smith (1985) are the first trying to reproduce predatory pricing in an experiment. They come to the conclusion that predation does not occur in the laboratory, even under very favorable circumstances. Harrison (1988), in contrast finds evidence for predatory pricing in the laboratory in a multiple market experiment. Goeree and Gomez (1998) cannot replicate the results of Harrison (1988) using the same design, but under a simplified setup they can. Capra et al. (2000) report on a classroom teaching experiment which uses a

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[4]Consumers might even be trying to punish the monopolist for the treatment of the entrant, which they observe from the outside and perceive as unfair (Fehr and Fischbacher, 2004).

[5]Gomez et al. (2008) provide a summary of the different experimental results.

facilitated version of Harrison's multi-market experiment, finding mixed evidence regarding incumbents' strategies. They only sometimes reach a monopoly position. Jung et al. (1994) use a different, very stylized design with weak and strong types of incumbent monopolists. Weak monopolists have an incentive to pretend to be strong in order to deter entry in the long run. Their results show that weak incumbents in fact fight entry in early periods. However, their extreme simplifications in the strategy space limit the external validity of the results very much.

Thus, to study consumers' and competitors' reaction to predatory pricing we still lack an experimental design which reliably produces predatory pricing at all. Luckily, it is not necessary to observe actual predatory prices - prices below marginal costs - to study the mechanics of consumers' response to predatory pricing. What we are interested in are consumers' strategies which help them to avoid to be committed to a monopolistic seller. In particular, we want to consider consumers' reactions to drastic changes between low and high prices of the incumbent. Whether such a low price of the incumbent is below some specific measure of costs or (slightly) above, is irrelevant from the consumers' perspective. In our experiment, we will therefore build on the experimental design used in Capra et al. (2000), even though we do not necessarily expect frequent occurrence of predatory prices in this design.

Consumer's behavior in markets is neglected in most experimental studies on market behavior. Studying the strategic interaction between firms, the buyer side is usually represented by an automated demand function. There are only few exceptions. Davis and Wilson (2008) compare market outcomes of simulated and human buyers in a horizontal merger framework. They find that powerful human buyers on average induce lower prices and a larger variance in market outcomes than simulated ones. We will follow Davis and Wilson (2008) in implementing relatively powerful buyers in our experiments. With a less concentrated buyer side, we would expect that strategic buyer behavior becomes less pronounced or even disappears as the individual buyers' impact on total demand becomes smaller. Engle-Warnick and Ruffle (2005) compare monopolistic experimental posted-offer markets with two and four buyers on the demand side. With two buyers, prices are much lower than with four buyers, indicating that the monopolistic seller anticipates that only stronger buyers

refuse high prices. In Tyran and Engelmann (2005) five buyers in a market are already too many to organize an lastingly effective consumer boycott after seemingly unfair price increases.

In section 2 of this paper, we present the market models we use in the experiment. The experimental protocol is described in section 3 along with some behavioral predictions. Section 4 presents the main findings and section 5 concludes.

2 Design

Our study comprises two experiments. The first one is a multi-market design, while the second one is a simplified version of the first serving as a robustness test.

In the first part of our study, we use a design with three markets, which is a modified version of the experiment of Capra et al. (2000). We call this exeperiment 3Markets. In each of the three markets there is one consumer. There is one fixed incumbent firm in two of the three markets (markets I and II), whereas in the third market (market III) no firm is present by default. The game is repeated for 15 rounds. In the beginning of each round, four mobile sellers decide in a random sequential order which market to enter as in Capra et al. (2000). Figure 1 summarizes the cost and demand structure in our experiment. Fixed sellers can sell up to 10 units and mobile sellers can sell up to 5 units. Marginal costs for a fixed seller are 10 for the first 7 units and 40 for another 3 units. For a mobile seller marginal costs are 30 for the first 4 units and 80 for the fifth unit produced.[6] Consumers' willingness to pay is induced with a three-step function of resale values: the first 6 units are worth 105 points, another 5 units are worth 35 points, and two more units are worth 10 points.

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[6]In the pre-test with two matching groups, the mobile sellers could produce one unit less at the price of 30. As this had no fundamental impact on market behavior, we include the data from this pre-test into the analysis as well.
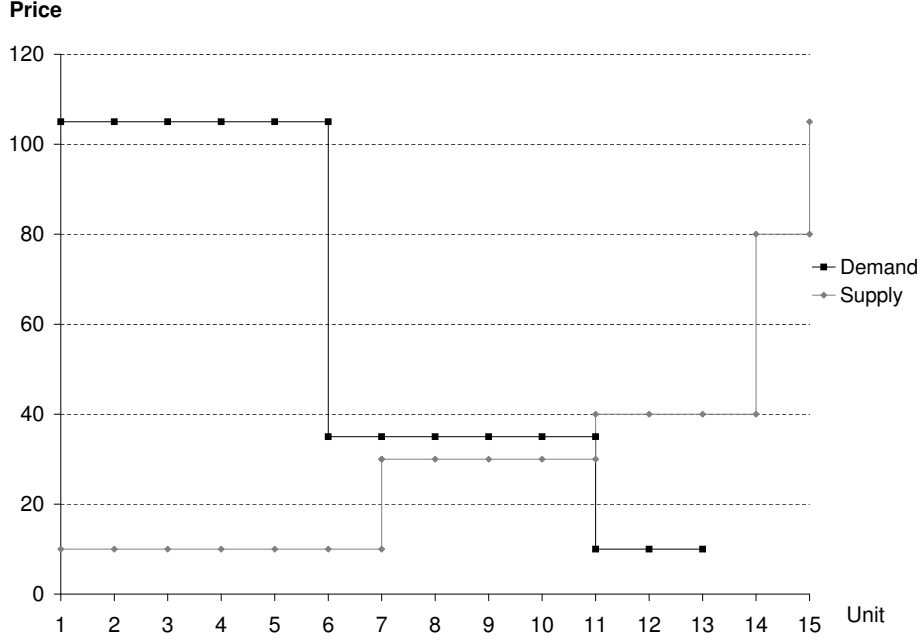
Figure 1: Cost and Demand Structure

If the incumbent fights the entrant, it will set a price of 29 (just below the marginal cost of the mobile sellers of 30) and offer a quantity of 10. This restricts the mobile seller to sell no more than one unit with a negligible profit of 5 at maximum while the fixed seller still receives a profit of up to 100. The other extreme benchmark is the monopoly price of 105. Selling the capacity limit of 6 units at this price a fixed seller will make a profit of 570 – given that the consumer is willing to pay the monopoly price.

Sellers in our experiment received the following information, similar to Capra et al. (2000). The fixed sellers have complete information about consumers' demand and all firms' costs. The mobile sellers only know their own costs. Consumers know their willingness to pay, but not the firms' costs. Fixed sellers receive an initial payment of 400 points to cover eventual losses if they choose prices below their own marginal costs in the very beginning of the experiment. Mobile sellers and consumers do not receive a show-up fee.

The timing in each round of the game is as follows. First mobile firms select in random order which market to enter. Each entrant is informed about the previous

entry decisions of the other mobile firms in this round before deciding itself. In a second step all sellers and buyers are informed about the market choices of the mobile sellers. Then, fixed and mobile sellers decide simultaneously about the price they would like to set in the current round and the maximum quantity they are willing to sell at this price. They only have to bear costs for the units they actually sell, there are no capacity installation costs. Consumers are informed about the offers of all firms in their market and can decide how many units to buy from which firm. We, thus, relax the assumption of efficient rationing that was made in Capra et al. (2000). Each consumer can buy up to 13 units per round.

The second experiment is a robustness test for two aspects of the first experiment. The main difference to the first experiment is that we now compare markets with only one buyer (treatment 1Buyer) and markets with two buyers (treatment 2Buyers) to see whether buyers' market power is crucial for their decisions in the first experiment. The second important difference is that we introduce a safe outside option for the high-cost sellers: if a high-cost seller does not enter the market, he receives a fixed payoff $s = 60$ which is roughly equal to the average earnings of mobile sellers in the first experiment.

Furthermore, we simplified the second experiment in many aspects eliminating all features of the first experiment which turned out to be behaviorally not relevant: the safe outside option for the high-cost sellers allows us to turn the three-market design into individually interacting groups of three or four players. In each of these markets, there is one low-cost sellers by default and either one buyer or two buyers depending on the treatment. The entry decision of the high-cost seller reduces to a yes-no-decision whether or not to enter the market. We restrict cost and demand functions to the first six units of those in the first experiment, because only very few trades in the first experiment included more than six units. Finally, we further extend the capacity of the high-cost sellers to six units so that we do not need to define a procedure how to proceed if aggregate demand for one seller in the two-buyer treatment exceeds supply. All participants in the second experiment receive a show-up fee of 4 euros.

3 Experiment

3.1 Procedures

For the 3Markets experiment, we have observations from nine experimental matching groups with nine market participants each: two incumbent firms, four potential entrants, and three consumers. For the second experiment, we have eight observations for 1Buyer markets and ten observations for 2Buyer markets. Matching groups do not change within the 15 rounds of an experiment. Table 1 provides a summary over the number of participants.

	1st Experiment	2nd Experiment	
Treatment Name	3Markets	1Buyer	2Buyers
# Participants	81	24	40
# Players per Matching Group	9	3	4
# Independent Observations	9	8	10

Table 1: Number of observations per treatment.

The experiments were computerized using Fischbacher's (2007) z-tree software. A total of 145 subjects participated in the experiments, 81 in the 3Markets experiment and the remaining 64 in the robustness test experiment. Subjects were students of the University of Konstanz recruited via ORSEE (Greiner 2004). The experiment took place in *lakelab*, the laboratory for experimental economics at the University of Konstanz. All sessions lasted less than two hours. Participants' earnings were the accumulated profits over all 15 rounds translated into Euros. Table 2 gives an overview over the payoffs of the participants, depending on their role in the experiment. Before the experiment, subjects received instructions about the experiment. An english translation of the instructions is available in the Appendix. After the actual experiment participants filled in a short questionnaire.

Treatment	Buyer	Fixed Seller	Mobile Seller
3MARKETS	30.88	21.70	6.23
	(7.76)	(5.90)	(3.33)
1BUYER	26.58	23.57	4.90
	(6.73)	(7.36)	(1.20)
2BUYERS	17.18	18.74	5.23
	(2.77)	(4.78)	(1.37)

Table 2: Average payoffs (in euros), excluding showup fees. Standard deviation in parentheses.

3.2 Behavioral Predictions

Automated consumers would buy every unit at a price below their willingness to pay, starting with the cheapest available offer. However, the perceiced unfairness or reference-dependent preferences might make human buyers willing to punish high prices. We expect that they might buy less than 6 units at the monopoly price, in particular if they experienced lower prices in the past. Furthermore, we expect that consumers intentionally pay a higher price to the high-cost seller hoping that this seller enters the market again in future rounds. Such competition then has a disciplining effect on the prices of a low-cost seller, who otherwise would have enjoyed monopolistic market power.

This effect, however, depends crucially on the number of buyers in the market. In our first experiment, we have only one buyer per market. This consumer has a strong incentive to make mobile sellers enter the market again in the future, because he himself fully benefits from future seller competition. With two buyers in one market, as implemented in the second experiment, the picture changes: losses (foregone earnings) today still only have an impact on the consumer himself while lower prices in the future now also benefit the other consumer. Due to this externality, we could expect that consumers buying from a more expensive high-cost seller become rare if there are other buyers in the market. This question is the major focus of our second experiment, where we compare markets with one buyer and markets with two buyers.

Mobile sellers can decide if they want to compete with a fixed seller in market I or II or whether they want to enter the 'exit' market III, where they meet up to three other mobile sellers. If the mobile sellers expect low prices by a fixed seller, whenever they enter market I or II, they should resort to market III. However, if the mobile sellers do not manage to collude in market III,[7] they cannot make reasonable profits in this market if all four of them enter into market III. Thus, there is a considerable incentive for at least one or two mobile sellers to try entry into markets I and II. We therefore expect that mobile sellers will repeatedly enter into markets I and II, even if they experienced predatory pricing in the past.

To test whether repeated market entry even after predatory prices is not only an artifact of our experimental design forcing mobile sellers to enter the fixed sellers' markets again and again because they cannot jointly survive in market III, we used a different outside option for the mobile sellers in the second experiment. Here, they have the opportunity to receive a safe alternative payoff if they decide to stay out of the market. This alternative payoff is a little higher than the expected profit in case of entry, such that risk-neutral and risk-averse high-cost sellers should never enter. Our second experiment therefore provides a robustness test for the mobile sellers' market entry decisions.

4 Results

4.1 Fixed Sellers

In line with previous research we find rare evidence for the existence of prices below marginal costs, even though we employed an experimental design which according to Gomez et al. (2008) facilitates predatory prices. Only 17% of the fixed sellers in the first experiment ever chose a price below the mobile sellers' marginal costs. Nevertheless, fixed sellers obviously condition their prices on the degree of competition

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[7]Note that collusion is unlikely in markets with three or four sellers, see Huck et al. (2004).

in the market: their prices are significantly higher when they enjoy a monopolistic position than when they have to share the market (Wilcoxon signed rank test, $p-value < 0.0001$). Higher prices of monopolists are also reflected in higher profits.

Fixed sellers only very rarely (in less than 2% of their decisions) set a price of 100 or more. Even when they are in a monopoly position, their prices are still far below consumers' induced willingness to pay, which is known to the fixed sellers. This finding is in line with van Damme et al. (2009) who summarize different experiments on monopoly pricing and find that a small number of human buyers on the demand side makes monopolistic prices unlikely. Such moderate prices are probably driven by similar motives like the proposers in an ultimatum game which offer almost half of the pie to the responder.[8] Fixed sellers are fair minded as well as anticipating that consumers would not be willing to pay very high prices.[9]

Behavior of the fixed sellers does not differ much between the first and the second experiment. For a detailed comparison of low-cost sellers' behavior in the two experiments see Table 3.

	3Markets	1Buyer	2Buyers
$p^{Monopolist}$	73.12	79.41	56.34
$p^{Competition}$	51.96	48.39	46.88
$q^{Monopolist}, p \geq 90$	4.13	4.14	4.50
$q^{Monopolist}, p < 90$	5.76	5.26	5.47
Low-cost ever set $p \geq 100$?	27.8%	50.0%	30.0%
Low-cost ever set $p \leq 35$?	55.6%	87.5%	70.0%

Table 3: Low-Cost Sellers Prices and Quantities (in Points).

[8]See Chapter 2 in Camerer (2003).

[9]This explanation for such moderate pricing anecdotally occurs also in the participants' answers in the questionnaire.

4.2 Entrants' Strategies

Low prices of the incumbent only have an effect for one round. From the experimental data we observe that 35 seems to be a lower bound of mobile sellers' prices.[10] We therefore use prices $p^{low} = \{p|p \leq 35\}$ as the limit of fixed sellers' prices below which we assume a predatory intend. We then compare the number of competitors of a fixed seller in rounds with $p > 35$ in the current and the two preceeding rounds to the number of competitors in rounds where the fixed seller set $p \leq 35$ one or two rounds before. If a fixed seller set $p \leq 35$ in several subsequent rounds, we consider the mobile seller's reaction in the two rounds after the last round of the series with $p \leq 35$. The number of competitors an incumbent firm faces in round $t+1$ after the last low price p_t is $N_{t+1} = 0.27$, compared to $N = 0.90$ competitors in rounds where the incumbents did not choose a low price in the current and the two preceeding rounds (see Figure 2). Only one round later the difference between the numbers of competitors in situations with and without preceeding low prices almost completely disappears.
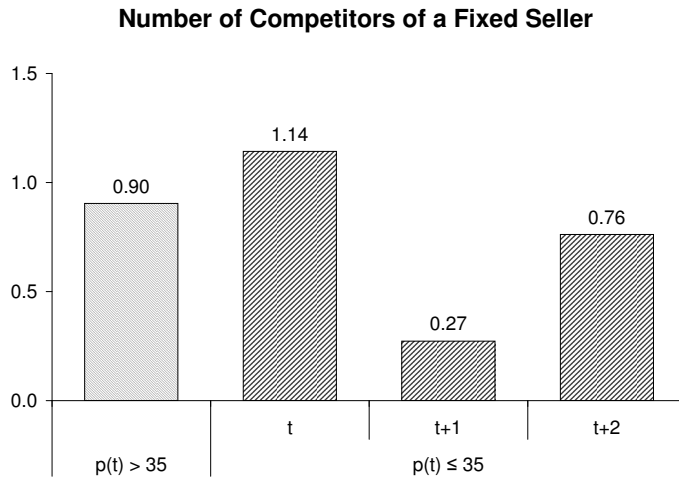
Number of Competitors of a Fixed Seller

Figure 2: Number of Entrants Before and After Low Prices of the Incumbent in 3Markets.

Finding 1 *Incumbents cannot push entrants out of the market for more than one round.*

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[10]Such a lower bound might be driven by a predetermined minimum profit goal of the mobile sellers.

As explained in the behavioral predictions, this finding could be seen as an artifact of our experimental design, providing mobile sellers no actual alternative to repeated entry into market I or II in the first experiment as competition in market III is too strong to make reasonable profits there. In the second experiment, we therefore introduce a fixed alternative payoff $s = 60$ which low-cost sellers can get in each round if they decide not to enter the low-cost seller's market. We find that this riskless alternative does not prevent market entry. Even though average profits of high-cost sellers in case of market entry are remarkably lower than s (34.92 in 1BUYER and 39.23 in 2BUYERS), they repeatedly choose to enter. Given that profits are lower in 1BUYER than in 2BUYERS it makes sense that the number of entrants is decreasing over time only in 1BUYER (see Figure 3).

There is one surprising difference between 1BUYER and 2BUYERS: prices of the low-cost sellers are significantly lower when there are two buyers in the market ($p^{LowCost} = 50.92$) than when they is only one buyer $p^{LowCost} = 62.87$ (Wilcoxon rank sum test, $p - value = 0.0058$). We would have expected the opposite, that lower market power of two buyers leads to higher rather than lower prices. We do not have an explanation for this.
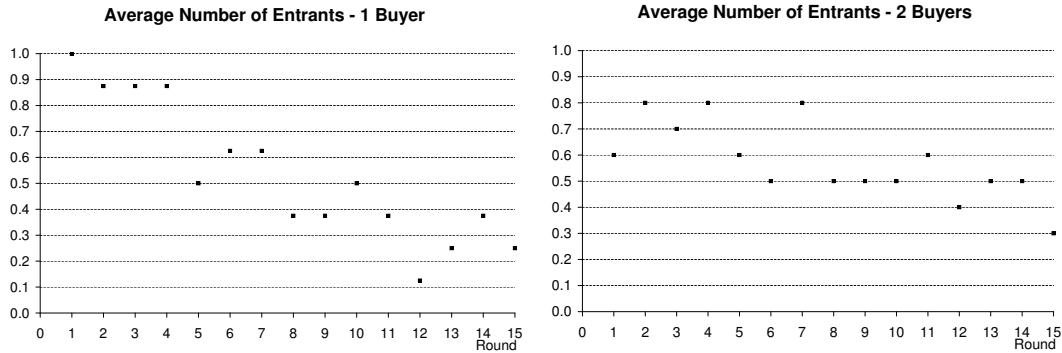
Figure 3: Number of Entrants in both Treatments of the Second Experiment

In an OLS regression (see Table 4) we test for the duration of the deterring effect of incumbents' low prices. We combine the entry data from the three treatments, using two dummy variables indicating whether an observation originates from the first or from the second experiment and whether one or two buyers are present in the market. In the regression, we explain the number of entrants as a function of the prices of the two preceding rounds, a round index, and two dummy variables

$p_{t-1} \leq 35$ and $p_{t-2} \leq 35$ indicating whether the price of the incumbent in the two preceeding rounds was smaller than or equal to 35. The dummy variable $p_{t-2} \leq 35$ takes the value 1 only if not only $p_{t-2} \leq 35$ but also $p_{t-1} > 35$. The regression results show that past prices in general do not explain entry, but a price below 35 in fact leads to significantly less entry in the consecutive round. If the price below 35 is followed by a larger price, entry rates recover immediately: $p_{t-2} \leq 35$ is not significant. The regression also shows that entry rates decrease over time and that there is more entry in the first experiment. This last result is not surprising as there are four potential entrants facing two fixed sellers compared to one one potential entrant per market in the second experiment.

Number of Entrants		
p_{t-1}	-0.0010	(0.0017)
p_{t-2}	0.0021	(0.0016)
$p_{t-1} \leq 35$	-0.2343**	(0.1026)
$p_{t-2} \leq 35$	-0.0673	(0.0847)
Round	-0.0234***	(0.0072)
Dummy 3 Markets	0.4077***	(0.1032)
Dummy 1 Buyer	-0.0832	(0.1195)
Constant	0.7378***	(0.1975)

Table 4: Regression Coefficients: Number of Entrants. Standard Error in Brackets. *** Denotes Significance at the 1% Level, ** at the 5% Level and * at the 10% Level.

4.3 Consumers' Strategies

Let us next consider consumers' decisions and start again with the observations from the first experiment. We cannot say much about consumers' reaction to actual monopoly prices, because firms rarely set them. Alternatively we consider consumers' reaction to high prices larger or equal to 90: in the first experiment there are 15 of such high prices set by a monopolist. In these cases, monopolists in the first experiment sell only 4.13 units on average compared to 5.76 units of monopolists with prices below 90.

This evidence, however, does not refer to monopoly prices occurring immediately after predatory prices but to high prices at any time. In a next step, we therefore consider more specifically the reaction of consumers to price increases of the incumbent monopolist after low competitive prices in the past. To test this hypothesis we again use low prices with $p_t \leq 35$ as the threshold value and look whether this market in $t+1$ this market is a monopoly and the monopolist charges a higher price in $t + 1$. We do not find evidence that consumers buy less than 6 units in these situations. Buyers only rarely react to the price increase after a low price with an immediate reduction of demand.

Finding 2 *Consumers do not condition their demand on lower prices in the immediate past.*

Finally we find very interesting evidence for consumers' strategies which are not covered by standard theory. First of all, we observe 83.3% of the consumers in markets I and II in the first experiment regularly buying from the more expensive firm. Such expensive trades occur in 18.5% of the buyer decisions. If consumers decide to buy some units from a more expensive high-cost firm, they spend on average about 18 points more than if they had bought the same quantity from the (cheaper) fixed seller. In the post-experimental questionnaire, 44.4% of the consumers acting in markets I or II explain this as their strategy to make the mobile firms enter the market again in order to enforce competition. This result does not change substantially when we consider the data from the second experiment (see Table 5). The share of consumers buying from the more expensive firm is 62.5% in the one-buyer treatment and 60.0% in the two-buyers treatment. Neither the difference between the one-buyer treatment and the first experiment, nor the difference between the two treatments of the second experiment is statistically significant in a Wilcoxon rank-sum test at any reasonable significance level. Also the comparison of foregone earnings due to expensive trades shows no significant difference. We conclude that the finding of consumers buying from the more expensive high-cost firm is robust in both experiments.

	3Markets	1Buyer	2Buyers
Buy expensive?	83.3%	62.5%	60.0%
Mentioned in questionnaire?	44.4%	12.5%	70.0%
Extra expenses = $q * \Delta p$	18.03	17.01	18.21

Table 5: Buyers Decisions

Finding 3 *Many consumers are willing to pay a higher price to the mobile firms to maintain long run competition.*

5 Conclusion

We conducted two experiments testing two common assumptions regarding the likelihood of recoupment of losses after an incuments' predatory pricing. More specifically, we consider consumers' and entrants' reaction if the incumbent monopolist returns to high prices after a phase of low pricing. Our data shows that consumers are in fact foresighted and willing to sacrifice some of their short run welfare in order to enhance competition over time. To some extend, they refuse to buy at monopolistic prices.

Entrants in the experiment react only in the very short run to predation by leaving the market but enter soon again. This is consistent with the facts presented by McGee (1958) concerning the Standard Oil refinery monopoly case. McGee (1958) argues that, contrary to what was stated before, Standard Oil did not obtain a monopoly position by pricing local competitors out of the market but rather by buying their refineries. According to McGee (1958), predatory pricing would be an inferior strategy compared to purchase of competitors, because competitors may just interrupt operations temporarily and proceed with production when the monopolist raises prices again. This is exactly what we observe in the experiment and it is most likely the reason why Standard Oil rather bought the competitors' physical capacity and in some cases even dismantled it to avoid re-entry.

The result that consumers are ready to pay a higher price to the mobile firms to maintain long run competition is driven by the strong market power of consumers in our experiment as there are only one or two of them in one market. The situation in our laboratory experiment corresponds quite well with the situation in many professional markets: suppliers in business-to-business trade relationships are often confronted with a demand side comprising only a few large buyers. Such buyers then in fact have strong incentives to maintain long-run competition at the supply side. A natural next step in future research would be a repetition of our experiment with more buyers per market to find the threshold value of buyers above which such trades do no longer occur.

6   Appendix: Translation of the Instructions

6.1   First Experiment

General Instructions

Thank you for participating in this experiment.

From now on we ask you to remain seated and stop communicating with other participants. These instructions are identical for all participants. Please read the instructions carefully. In case you have any questions or should any uncertainties occur please ask one of the supervisors for help. We will come to your place to answer your questions in private.

Your payoff in this experiment depends on your own decisions and the decisions of other participants. You will not find out who these other participants are, as will they not learn anything about your identity.

This experiment consists of **15 rounds**. You will be interacting with the same 8

other participants in each round. After you have participated in all of the 15 rounds, we will add up your incomes, which will be denoted in points during the experiment. The **exchange rate is 140 points to 1 euro**. You will be payed in cash right after the experiment.

In the experiment there are **three totally independent markets** (market I, II and III) with the same fictitious product being traded in all of them. Each participant is **either a seller or a buyer** of the product in one of the three markets. In total there are three buyers and six sellers which **will keep their roles during the entire experiment**.

For the 3 buyers and for 2 of the 6 sellers **the market they will be acting in** has been determined beforehand. The buyers with the identification numbers 1, 2 and 3 will stay in the same market for the duration of the entire experiment: buyer 1 in market I, buyer 2 in market II and buyer 3 in market III. Seller 1 will be in market I and seller 2 in market II. At the beginning of each round the remaining four sellers 3, 4, 5 and 6 can freely choose the market they want to sell their product on. One of the four sellers will be randomly chosen do decide first on which market he wants to sell his product. The remainig sellers will be informed about the made decision before the next seller will be randomly chosen to make his choice. The third and fourth sellers choose their markets in the same way. The information about which markets the previous sellers have entered will be available for all sellers before they have to choose their markets. At the beginning of each round all participants will receive the information about which seller has decided in favour of which market.

Each seller is able to produce and sell a given quantity of units. You have fixed costs for each selled unit. This will be explained further on another information sheet. After being informed about how many sellers entered your market in the current round, you will be asked to decide on a price for which you want to sell the product in this round and determine the maximal quantity you are willing to sell at this price. **A seller must determine the same price for all units which he wants to sell in one round**.

After all sellers have decided on their prices and quantities the buyers will be informed about the offers on their market. **Then the buyers may decide freely on how many units they want to buy from which seller on the market**. As a buyer you may buy a total of up to 13 units of the fictitious product. After the experiment you will **resell** the bought units to the experimenters at a beforehand defined price. The resale price depends on how many units you buy in the particular round.

The profit of a buyer is the sum of the differences between the price he payed for a certain unit and the beforehand defined resale price for this unit. Buyers will find an overview and some model calculations on a private extra sheet. The profit of a seller results from the number of sold units multiplied by the price per unit in the particular round minus the costs of production for the sold units. Only actually sold units will generate costs.

A round is over after all buyers have decided on how many units they wish to buy from which seller. The computer will calculate the traded quantities in all three markets. At the end of each round all sellers **will be informed** about sellers' actions on particular markets and about the quantities they offered at which price as well as how many units were actually sold by whom. Furthermore the sellers of the three markets will see the prices they decided on in all previous rounds and the height of their own profit during the rounds. The buyers will be informed about the offers (prices and maximum quantities) made on their market during this round and about how many units they bought. Furthermore the buyers will see how many units they bought at which price during all previous rounds and how high their payoff in the according rounds was.

In addition to these instructions all participants received **private information** concerning the production costs or resale values. The other participants may (partially) know your information, possibly they do not. You can also find your identification number on the information sheet.

In the end of the experiment you will be informed about your payoffs from all rounds

as well as about your total profit. Your payoffs will be added up and payed out in cash. After you have read these instructions please answer the **test questions** on your private information sheet. After all participants have answered the control questions, the experiment begins with two **testing rounds** which will have no influence on your payoff. After the experiment we will ask you to fill in a **brief questionnaire**.

Private Information Buyers

You are a buyer.

Your identification number is:

You will buy the product on market   in all rounds.

You can buy up to 13 units of the product. The resale prices of the units you buy are the following: the first 6 units you buy can be resold for 105 points. 5 more units can be resold for 35. The last 2 can be resold for 10 points. The following table is a summary of the resale prices:

Unit	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
Resale Price	105	105	105	105	105	105	35	35	35	35	35	10	10

You must buy the units in the given order.

Sample calculation:

Supposed there are two sellers in your market in one round. Seller 1 offers you 7 units for a price of 80 and seller 4 offers you 4 units for a price of 90. You decide to buy 4 units from both of them. Your profit will then be calculated as follows:

Unit	1.	2.	3.	4.	5.	6.	7.	8.	Sum
Resale Price	105	105	105	105	105	105	35	35	700
Price	80	80	80	80	90	90	90	90	680
Profit	25	25	25	25	15	15	-55	-55	**20**

Control question:

Supposed there are two sellers in your market in one round. Seller 2 offers you 7 units for a price of 20 and seller 6 offers you 4 units for a price of 40. You decide to buy all of the 7 units from seller 2 and 1 unit from seller 6. What is your profit?

Private Information Fixed Sellers

You are a seller.

Your identification number is:

You will sell the product on market   in all rounds.

You will receive a seed capital of 400 points at the beginning of the experiment.

You may sell up to 10 units of the product. You can see the production costs of each of the 10 units in the following table:

Unit	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Costs	10	10	10	10	10	10	10	40	40	40

You must sell the units in the given order. Costs only occur for units which are actually sold to a buyer. You cannot offer more than 10 units.If you offer less than 10 units in a round you cannot sell more units than you have offered in that particular round. Offered but not sold units won't generate any costs.

If another seller enters your market it will always be a mobile seller. Each mobile seller can offer a maximum of 5 units. The production costs of a mobile seller can be seen in the following table:

Unit	1.	2.	3.	4.	5.
Costs	30	30	30	30	80

The resale prices of the buyer in your market are as follows: he can sell the first 6 of the bought units for 105 points, the next 5 for 35. The last 2 can be resold for 10 points.

Unit	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
Resale Price	105	105	105	105	105	105	35	35	35	35	35	10	10

Sample calculation:

Supposed you sell 8 units of the product at a price of 100 in one round. Your profit will then be calculated as follows:

Unit	1.	2.	3.	4.	5.	6.	7.	8.	**Sum**
Costs	10	10	10	10	10	10	10	40	110
Price	100	100	100	100	100	100	100	100	800
Profit	90	90	90	90	90	90	90	60	**690**

If you sell the 8 units at a price of 35 your profit would be:

Unit	1.	2.	3.	4.	5.	6.	7.	8.	**Sum**
Costs	10	10	10	10	10	10	10	40	110
Price	35	35	35	35	35	35	35	35	280
Profit	25	25	25	25	25	25	25	-5	**170**

Control question: Supposed you sell 10 units of the product at a price of 20 in one round. What is your profit?

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Private Information Mobile Sellers

You are a seller.

Your identification number is:

You can decide on which market you want to sell the product at the beginning of each round.

You may sell up to 5 units of the product. The production cost for each of the 5 units can be seen in the following table:

Unit	1.	2.	3.	4.	5.
Costs	30	30	30	30	80

You must sell the units in the given order. Costs only occur for units which are actually sold to a buyer. You cannot offer more than 5 units. If you offer less than 5 units in a round you cannot sell more units than you have offered in that particular round. Offered but not sold units won't generate any costs.

Sample calculation:

Supposed you offer and sell 5 units in a round at a price of 100. Your profit will then be calculated as follows:

Unit	1.	2.	3.	4.	5.	**Sum**
Costs	30	30	30	30	80	200
Price	100	100	100	100	100	500
Profit	70	70	70	70	20	**300**

If you offered and sold all 5 units at a price of 45 your profit would be:

Unit	1.	2.	3.	4.	5.	**Sum**
Costs	30	30	30	30	80	200
Price	45	45	45	45	45	225
Profit	15	15	15	15	-35	**25**

Control question: Supposed you sell 3 units of the product at a price of 20. What is your profit?

6.2 Second Experiment

Thank you for participating in this experiment.

From now on we ask you to remain seated and stop communicating with other participants. These instructions are identical for all participants. Please read the instructions carefully. In case you have any questions or should any uncertainties occur please ask one of the supervisors for help. We will come to your place to answer your questions in private.

Your payoff in this experiment depends on your own decisions and the decisions of other participants. You will not find out who these other participants are, as will they not learn anything about your identity

This experiment consists of **15 rounds**. You will be interacting with the same three other participants in each round. After you have participated in all of the 15 rounds, we will add up your incomes, which will be denoted in points during the experiment . The **exchange rate is 140 points to 1 euro**. You will be payed in cash right after the experiment. At the beginning you will additionally receive 4 euro to compensate potential losses during the experiment

Each participant is either a buyer or a seller of a fictitious product in a market. **You will keep your role of a buyer or seller during the entire experiment**. There are **constant groups** of two buyers and two sellers each

For the two buyers and one of the sellers it has been determined to be active on their market. The other seller can decide freely wether he wants to enter the market at the beginnig of each round. If he does not enter the market he will receive a fixed payment (as if it were a grant). The amount of this grant remains equal in all rounds and will be disclosed on the screen of the seller. If he does enter the market he will sell his product in competition with the other seller. He will not receive a grant in this case. All participants will be informed whether the second seller has entered the market at the beginning of each round.

Each seller is able to produce and sell up to 6 units of the product. You have fixed costs for each selled unit. The other seller may have lower or higher costs than you have. The seller's cost per unit remains equal during all rounds. Your own cost per unit will be disclosed on the screen at the beginning of the experiment. Possibly the other seller will be informed about your costs as well. After the sellers are informed about how many sellers entered their market in the current round, we will ask you to decide on a **price** for which you want to sell the product in this round. **A seller must determine the same price for all units which he wants to sell in one round**. The number of sold units by a seller will be determined later as a result of the demand of the buyers. Only actually sold units induce costs.

After both of the sellers have decided on a price the buyers will be informed about the available offers on their market. **Then the buyers may decide freely on how many units they want to buy from which seller on the market**. As a buyer you may buy a total of up to 3 units of the fictitious product. After the experiment you will **resell** the bought units to the experimenters at a beforehand defined price of 105 points each.

The **profit** of a buyer is the sum of the differences between the price he payed for a certain unit of the product and the resale price of 105 poins. The profit of a seller results from the number of sold units multiplied by the price per unit in the particular round minus the costs of production for the sold units.

A round is over after both buyers have decided on how many units they want to

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buy from which seller. At the end of each round both sellers **will be informed** about the price charged by the sellers and about how many units were actually sold. Furthermore the sellers will see the prices they both decided on in all previous rounds and the height of their own profit during the rounds. The buyers will be informed about the prices charged in their market during this round and about how many units they bought. Furthermore the buyers will see how many units they bought at which price during all previous rounds and what their payoff in the according rounds was.

In the end of the experiment you will be informed about your total profit. You will be paid in cash. After the experiment we will ask you to fill in a brief **questionnaire**.

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