No. 92

Lisa Bruttel

Buyer power in large buyer groups?

Research Paper Series
Thurgau Institute of Economics and Department of Economics
at the University of Konstanz

Member of

thurgauwissenschaft

www.thurgau-wissenschaft.ch

THURGAU INSTITUTE
OF ECONOMICS
at the University of Konstanz

Buyer power in large buyer groups?

Lisa Bruttel*

March 30, 2014

Abstract

This paper studies the exertion of market power in large buyer groups confronting an incumbent monopolist and a potential market entrant in a repeated trade situation. In the experiment, buyer power can either occur as demand withholding when only the incumbent is present in the market, or it can take the form of buying at higher prices from the entrant in order to foster future re-entry. Comparing markets with groups of two and eight buyers, we find that both forms are prevalent irrespective of the number of buyers. However, a control treatment shows that seemingly strategic behavior is better explained by inequality aversion of the buyers towards the two different sellers.

Keywords: buyer power, market entry, experiment

JEL-Classification: C92, D43, L11

*University of Konstanz, Department of Economics, Box 131, 78457 Konstanz, Germany, lisa.bruttel@uni-konstanz.de.

I would like to thank Jochen Glöckner and Wieland Mueller for very helpful comments. Alexandra Haas and Pauline Sanne provided valuable research support. I gratefully acknowledge financial support from the German Research Foundation (DFG), Grant BR 4180/1-1.

1 Introduction

In a recently published study Bruttel and Glöckner (2011) found that buyers in a monopolistic market threatened by entry are willing to voluntarily pay a higher price to the entrant than the price set by the incumbent monopolist in order to encourage future re-entry into the market. This behavior, called *strategic buying*, was observed in about 20% of buyer decisions. The setup was a repeated market entry game with one incumbent firm, one potential entrant, and one or two buyers per market. A key aspect in the setup was that the entrant had higher costs than the incumbent. Nevertheless, entry into the market was in the interest of buyers, because this created price competition and resulted in lower prices compared to the monopoly prices of the incumbent in periods when there was no entry.

Strategic buying is this setup was likely driven by the strong market power of consumers in the experiment, who could internalize the positive long-run effect of lower prices of the incumbent to a large extent. The more buyers were in a market, the larger would the positive externality be, as all buyers benefit from reduced future market prices due to entry, whereas the losses (in the form of forgone gains) of paying a higher price to the entrant are born individually by the buyer making such trades. In the present project, we therefore split demand over more (eight) buyers per market to test how robust such trades are. Furthermore, we broaden the focus by not only considering strategic buying but also demand withholding as an alternative way for consumers to exert market power. Finally, we introduce a control treatment to find out whether strategic buying is in fact driven by the motive to enforce long run competition.

Results from the experiment show that strategic buying and demand withholding persist when the number of buyers is large. However, for neither of the two effects the difference between the main treatment and a control treatments without incentives to behave strategically is not statistically significant, indicating that strategic motives cannot explain seemingly strategic behavior. Instead, fairness concerns - an disadvantageous inequality aversion towards the incumbent and advantageous inequality aversion towards the entrant - provide a tentative explanation for the observed behavior.

The present paper relates to two experimental paradigms, namely the ultimatum game and the public good game. The review article by Kritikos and Bolle (2004) summarizes typical behavioral patterns in these games and shows how experimental data can help understanding market behavior. The situation of trading in a market reflects the structure of ultimatum bargaining with sellers in the role of the proposer and buyers in the role of the responder. For the present study in particular studies with more than one responder are relevant, because be consider markets with several buyers. The existing studies in this field differ substantially from the setup of the present experiment, because their design assigns asymmetric roles to the different responders, while buyers in our study have symmetric incentives and decide simultaneously. In summary, Güth and van Damme (1998) study an ultimatum bargaining game with one active responder deciding for both himself and another, inactive responder whether to accept the proposer's offer. Kagel and Wolfe (2001) additionally introduce outside payments for the inactive responder and uncertainty about which responder will be active. Riedl and Vyrastekova (2003) vary whether the rejection by one responder has positive or negative consequences for the other responder. Finally, in Okada and Riedl (2005) proposers can choose between a two-player and a three-player game, where the latter has a larger pie size, and prefer the inefficient two-player game. In none of these studies the proposer makes the same offer to a number of buyers who can individually decide whether to accept or reject. Thus, the experiment in this paper also contributes insights relevant for the behavioral game theory literature.

Punishment of a seller by a buyer can be seen as a public good, because also other buyers may benefit from future price reductions. More specifically, demand withholding and consumer boycotts (for a review see Ruffle, 2009) resemble the public good character of the problem. The literature starts with Ruffle (2000). He considers markets with two symmetric sellers and two or four buyers and finds that demand withholding is effective only in markets with two buyers. However, this study has to be interpreted carefully as there were relatively few observations resulting in rather weak statistical power of the results. Engle-Warnick and Ruffle (2005) focus on the effect of concentration on the buyer side in markets with a monopolistic seller. They find that prices in markets with stronger buyer concentration have lower prices, which is not a consequence of demand withholding but

rather the effect of monopolists anticipating it. Tyran and Engelmann (2005) allow buyers in markets with three capacity constrained sellers and five buyers to vote on a consumer boycott, which is automatically enforced if majority of buyers votes for the boycott. They find that boycotts are not effective in lowering prices.

The next sections are ordered as follows. Section 2 introduces the experimental design and procedures. The experimental results are discussed in section 3. Section 4 concludes.

2 Design and procedures

The experiment studies the market entry decision of an entrant, the pricing decisions of an incumbent and the potential entrant and the demand of buyers. Costs of the incumbent are equal to $c_I = 10$, costs of the entrant are $c_E = 30$. Both the incumbent and the entrant have a capacity of 200 units which is sufficient to individually serve the whole market. The value of the product for the buyers is $v = 105$. Each buyer can buy up to 100 units per round.

The experiment lasts 20 rounds with fixed matching. After each round, sellers receive full feedback about past entry decisions, prices, quantities and their own profit. Buyers are informed about prices, their individually bought quantities and profits.

Treatments vary with respect to the number of sellers in a market (two or eight) and whether the sellers can set their prices themselves. Table 1 summarizes the treatments.

	Number of buyers	Sellers set prices
Main2	2	Yes
Main8	8	Yes
Control2	2	No
Control8	8	No

Table 1: Treatments.

Varying the number of buyers in a market would create a confound for comparing the treatments when we would just split the same total demand among a larger number of sellers.

The expected profit per buyer in a market would then decrease with an increasing number of buyers. This creates a confound, because not only the possibility to internalize the long-run gains of strategic buying decreases with the number of buyers, but also the stake size gets smaller. Ruffle (2000) deals with this problem by increasing buyers' exchange rates from points to euros with an increasing number of buyers. However, this approach creates a new problem, because efficiency concerns could make the seller set lower prices the more buyers are in the market, because each point is worth more in the hands of a buyer. Alternatively, Engle-Warnick and Ruffle (2005) decided to give each individual buyer the same demand function irrespective of the treatment, and adjust the sellers' capacities and costs in order to keep their (expected) stakes constant as well. We decided against this solution, because the exact adjustment depends on the reference split of profits between the seller and one buyer, which is still unknown when conducting the experiment. Therefore, we implemented the following, new approach: when increasing the number of buyers, we not only reduce the number of units they can buy in one market, but also proportionally increase the number of independent markets in which they can buy. Figure 1 in the Appendix illustrates the way how this was implemented. While buyers in markets with two buyers could buy their 100 units from the incumbent or entrant of one single market, buyers in markets with eight buyers could buy 25 units in each of four markets with one incumbent and one entrant each. Thus, total demand per buyer and, thus the size of the stake per buyer was the same in all treatments, but the extent to which they could internalize the externalities they created different.

While buyers necessarily new whether they could buy in one or four different markets, sellers were – as in Engle-Warnick and Ruffle (2005) – not informed about the number of buyers, but only learned the total amount traded. This was done in order to avoid that sellers set lower prices in the treatment with fewer buyers, because they anticipate differences in the exertion of market power across treatments. Otherwise, in the treatment with two buyers strategic buying to discipline the incumbent would not even be necessary.

In order to test whether strategic trades (if observed) are actually driven by the motive to enforce long run competition, we run a control treatment in which sellers' entry and pricing

decisions were fixed. In the practical implementation, we feed the decisions of sellers in the main treatment into the computer program to obtain a one-to-one match with the data from real players. This way, we ensured that buyers in the control treatments decide how many units to buy are these fixed prices, knowing that their decisions cannot put pressure on the sellers' future price setting behavior. Thus, strategic trades should not occur in these treatments, at least not for truly strategic reasons.

The experiment was computerized using z-Tree (Fischbacher 2007). A total of 320 students from various disciplines took part in the experiment. They were recruited via ORSEE (Greiner 2004). The experiment took place in the *Lakelab*, the laboratory for experimental economics at the University of Konstanz, in November 2011 and November 2012. The experimental currency was points. 8000 points were converted into 1 euro after the experiment. To cover potential losses during the experiment, participants received an initial endowment of 3 Euros. On average, participants earned 14.90 euros in the experiment which lasted for about one hour. The protocol during the experiment was as follows: After welcoming participants and explaining the main rules for participation in the experiment, they were randomly assigned seats in the laboratory. Subjects received instructions[1] on their computer screen. All participants read the same instructions without knowing which role they would take and whether they would act in a market with 2 or with 8 buyers. Roles were assigned after reading the instructions. Then the experiment started. At the end of a session, participants were asked to complete a short questionnaire.

3 Results

We start the presentation of behavior in the experiment with an analysis of entry and pricing decisions in the two main treatments with sellers actually making their decisions. The corresponding regressions are presented in Tables 2 and 3. In Table 2 it can be seen that entry rates increase with the quantity sold by the entrant in the past two periods and with the incumbent's past prices, indicating that entrants react to past experience in a

[1] An English translation of the instructions can be found in the appendix.

meaningful way. Furthermore, there is a downward trend in entry over time. According to Table 3, incumbents do not seem to adjust their pricing to past quantities, but reduce their prices on average by about 26 points in periods when there is entry.

Sold quantity in $t-1$	0.00191**	0.00218**
	(0.000850)	(0.000875)
Sold quantity in $t-2$		0.00170**
		(0.000861)
Other's price in $t-1$	0.0166***	0.0180***
	(0.00327)	(0.00349)
Other's price in $t-2$		0.00277
		(0.00298)
Period	-0.0855***	-0.0788***
	(0.0104)	(0.0116)
Constant	0.0940	-0.293
	(0.230)	(0.290)
Observations	760	720
Number of subjects	40	40

Table 2: Probit regression on entry, subject random effects included. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Sold quantity in $t-1$	-0.00767
	(0.00902)
Entry in t?	-25.58***
	(1.362)
Period	0.0705
	(0.112)
Constant	70.36***
	(2.469)
Observations	760
Number of subjects	40

Table 3: OLS regression on price setting of the incumbent, subject random effects included. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

We next turn to our main interest, the behavior of buyers. Table 4 summarizes the results of the main treatments with sellers making their decisions themselves, Table 5 represents the data for the two control treatments. Table 4 shows in the first and second row how many buyers ever buy from the entrant at a price higher than the one of the incumbent and

the average total extra expenses per buyer (including those who never bought expensive from the entrant) for such trades. Similarly, the third and fourth row show how many buyers ever withhold some demand in periods in which only the incumbent is present and the resulting forgone gains due to not realized trades at prices below the induced value of the fictitious product for the buyer. The percentage values suggest that there is frequent evidence for both strategic buying and demand withholding, but the total magnitude in terms of monetary consequences is relatively small. With respect to treatment differences, we find that with eight buyers expensive trading reduces both in terms of frequency and size. Surprisingly, the frequency of demand withholding even goes up for the larger number of buyers, but the average loss taken into account decreases. None of these differences is statistically significant in Wilcoxon rank sum tests.

	2 Buyer	8 Buyers
Ever buy expensive?	50%	33%
Extra expenses $= q * \Delta p$ per subject (mean, in points, 8000 points = 1 euro)	1199	106
Ever withhold demand?	69%	81%
Resulting loss (mean) per subject	5499	3138

Table 4: Overview of the results in the main treatments.

	2 Buyer	8 Buyers
Ever buy expensive?	31%	59%
Extra expenses $= q * \Delta p$ per subject (mean, in points, 8000 points = 1 euro)	1201	298
Ever withhold demand?	63%	80%
Resulting loss (mean) per subject	1863	4160

Table 5: Overview of the results in the control treatments.

Neither of the frequency nor the total extent of expensive buying and demand withholding reduce systematically in the control as compared to the main treatments. Indeed, expensive buying occurs *more* frequently in the control treatment than in the main treatment with eight buyers ($p = 0.01$, two-sided test), and also average expenses for such trades are larger ($p = 0.01$). Furthermore, in the control treatment expensive buying is also more

frequent with eight than with two buyers ($p = 0.03$). As these effects are in sharp contrast to the expected effects, and as all other comparisons between treatments are insignificant, we tend to interpret the few statistically significant differences as likely resulting from multiple statistical comparisons.

Period	1.047***	1.304***	1.302***
	(0.373)	(0.256)	(0.256)
Price	-1.584***	-1.529***	-1.435***
	(0.119)	(0.0815)	(0.141)
Entry?	-70.72***	-69.80***	-70.23***
	(5.370)	(3.674)	(3.805)
Main treatment?		2.593	8.778
		(3.784)	(8.464)
Large market?		-0.703	2.958
		(4.735)	(9.836)
Price * Large market?			-0.0646
			(0.152)
Price * Main treatment?			-0.111
			(0.135)
Constant	266.0***	257.6***	252.6***
	(10.01)	(8.186)	(10.20)
Observations	800	1,600	1,600
Number of subjects	40	80	80

Table 6: Probit regression on quantities sold by the incumbent, subject random effects included. In the first regression only data from the main treatments are included. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

For another test of treatment differences, Tables 6 and 7 report the results from OLS regressions explaining sold quantities of the incumbent and of the entrant. Quite intuitively, both types of sellers sell less the higher their price is. Quantities sold by the incumbent increase over time while quantities sold by the entrant decrease, with corresponds to the reduces entry rates in lower rounds reported in the regression in Table 2. Similarly, the incumbent sells more in periods without entry. However, the interactions of the price variable with the treatment dummies are clearly insignificant, indicating that buyers to not respond differently to a given price depending on whether this price was set by their counterpart in the experiment or was predetermined.

Period	-0.641	-0.405	-0.405
	(0.573)	(0.391)	(0.392)
Price	-2.151***	-2.119***	-2.146***
	(0.198)	(0.135)	(0.181)
Other's price	2.461***	2.357***	2.357***
	(0.199)	(0.136)	(0.136)
Main treatment?		-0.0868	-2.864
		(4.350)	(13.11)
Price * Main treatment?			0.0539
			(0.240)
Constant	65.56***	66.56***	67.95***
	(12.97)	(9.118)	(11.02)
Observations	438	876	876
Number of subjects	40	80	80

Table 7: Probit regression on quantities sold by the entrant if there is entry, subject random effects included. In the first regression only data from the main treatments are included. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

To conclude, the reported evidence does not support the hypothesis that buying from the entrant at higher prices or demand withholding are strategic. In the final section, we discuss an potential alternative explanation for why such trades nevertheless occur relatively frequently in all treatments.

4 Discussion and conclusion

The data reported in this paper indicate that about 30 to 50 percent of all buyers occasionally buy some units from the entrant even when the price of the incumbent is lower. Furthermore, about 60 to 80 percent of the buyers engage in demand withholding when their incumbent demands monopolistic prices. However, comparing these numbers across treatments in which sellers make their decisions themselves and those in which seller decisions are predetermined, we observe no differences in buyer behavior. Thus, we conclude that buyers' seemingly strategic behavior is actually not driven by strategic considerations.

Behaviorally, a likely alternative explanation for demand withholding and strategic buying may be a combination of two different variants of inequality aversion of buyers towards

the incumbent and entrant seller. On the one hand, buyers may exhibit disadvantageous inequality aversion towards the incumbent monopolist in the sense that they dislike the seller getting a much larger share of the surplus between seller's cost and buyers' valuation. This may explain demand withholding irrespective of its strategic aspects, in analogy to the rejection of unfair offers in an ultimatum game. On the other hand, buyers may also dislike being in an advantageous position compared to the entrant. To reduce the distance between buyers' and entrant's payoffs, they accept paying a relatively higher price to the entrant, which may serve as an alternative explanation for seemingly strategic buying.

References

Bruttel, L. and J. Glöckner (2011), Strategic buyers and market entry. Journal of Competition Law and Economics 7(2), 381-402.

Engle-Warnick, J. and B.J. Ruffle (2005). Buyer concentration as a source of countervailing power: evidence from experimental posted-offer markets, Working Paper.

Fischbacher, U. (2007). z-Tree: Zurich toolbox for ready-made economic experiments. Experimental Economics 10(2), 171-178.

Greiner, B. (2004). An online recruitment system for economic experiments. In: Kremer, K. and V. Macho (Eds.): Forschung und wissenschaftliches Rechnen 2003. GWDG Bericht 63, Göttingen: Gesellschaft für Wiss. Datenverarbeitung, 79-93.

Güth, W. and E. van Damme (1998). Information, strategic behavior, and fairness in ultimatum bargaining: an experimental study. Journal of Mathematical Psychology 42, 227-247.

Kagel, J.H. and K.W. Wolfe (2001). Tests of fairness models based on equity considerations in a three-person ultimatum game. Experimental Economics 4, 203-219.

Kritikos, A. and F. Bolle (2004). Punishment as a public good. When should monopolists care about a consumer boycott? Journal of Economic Psychology 25, 355-372.

Okada, A. and A. Riedl (2005). Inefficiency and social exclusion in a coalition formation game: experimental evidence. Games and Economic Behavior 50, 278-311.

Riedl, A. and J. Vyrastekova (2003). Responder behavior in three-person ultimatum game experiments. Working Paper.

Ruffle, B.J. (2009). Buyer countervailing power: a survey of the theory and experimental evidence, in: Hinloopen and Normann (Eds.), Experiments and Competition Policy, Cambridge University Press, Cambridge, 160-182.

Ruffle, B.J. (2009). Some factors affecting demand withholding in posted-offer markets. Economic Theory 16, 529-544.

Tyran, J.-R. and D. Engelmann (2005). To buy or not to buy? An experimental study of consumer boycotts in retail markets, Economica 72, 1-16.

Appendix: translation of the instructions

(In italics: text of the control treatment with fixed seller decisions.)

Welcome and thank you for participating in this economic experiment.

From now on we ask you to stay at your place and stop communicating with other participants. These instructions are identical for all participants. Read the instructions carefully. If you have any questions regarding this experiment raise your hand. We will then come directly to your place.

Your payment in this experiment depends on your decisions and other participants' decisions. You will not learn who these participants are, neither will other participants learn about your identity.

This experiment will last 20 rounds, in which you will always interact with the same other participants. After participating in all 20 rounds of this experiment, we will add up the earnings you achieved. Your earnings during this experiment will be counted in points. The conversion rate is 8000 points to 1 Euro. You will have your earnings paid in cash directly after this experiment. In order to balance possible losses during the experiment, you will get additional 3 Euros at the beginning.

At the end of the experiment you will be informed about your total earnings from the experiment. After the experiment, we will ask you to fill out a short questionnaire.

Every participant in this experiment is either buyer or seller of a fictitious product in a market. You will keep your role as buyer or seller during the whole experiment. There are fixed groups in this experiment each comprising the same number of buyers and sellers in one group. In a group there can be each two or eight buyers and sellers, so that one group consists either of four participants (two buyers and two sellers) or of 16 participants (eight buyers and eight sellers). In a group of eight buyers, the sellers are divided up evenly on four markets, so that in every market there are two sellers. Every buyer in this group can buy in all four markets. In a group with only two buyers there is only one market in which both buyers and sellers are trading.

The two figures at the end of this instruction illustrate both groups' structure.

At the beginning of the experiment, the buyers will learn in which group they are, while the sellers are not going to be informed if they are on a market with two buyers or eight buyers.

(*In this experiment, only the buyers themselves will make decisions. The sellers decisions are fixed and* ***not*** *going to be made by the participants in the role of sellers. Instead, in each round, the computer program displays decisions for the sellers, which were defined beforehand for this experiment. The participants in the role of a seller are not able to influence these decisions.*)

For one of the sellers in each market, being active in the market is predetermined. The other seller can choose at the begin of every round, if he wants to enter into the market in this round or not. (*For the other seller, the computer program displays at the beginning of each round, whether he enters the market or not.*) If he is not entering, he will get a fixed payment (a subsidy so to say). The amount of the subsidy is the same in every round and will be communicated to the seller on the computer screen. By entering into the market, he sells the product in competition with the other seller. In this case he will not get a subsidy. The information about the second seller's entry decision will be communicated to

all participants in the group.

In each round every seller can produce and sell 200 units of the product. If a seller sells a unit, he has certain costs for this unit. The sellers' unit costs are the same in all rounds. However the costs of the two sellers in one market can differ. Before the start of the experiment the sellers will be informed about there own unit costs. One seller might obtain information regarding the other seller's costs in the market.

After the sellers have been informed whether there are one or two sellers in the market this round, they are asked to set the price at which they are willing to sell the product in this round. (*After the sellers have been informed whether there are one or two sellers in the market this round, the price at which they sell in this round will be displayed by the computer program.*) All units a seller sells in one round have to be sold for the same price. The volume a seller sells is not defined at this point, but results in the next step from the demand of buyers. For the sellers, production costs only occur for units they actually sell.

After all sellers set their prices, the buyers are informed about existing offers. (*After the computer program displayed all prices towards the sellers, the buyers are informed about existing offers.*) The buyers than may freely decide how many units they want to buy from which seller. Every unit a buyer buys during the experiment has a value of 105 points for the buyer. Each buyer can buy up to 100 units of the fictitious good in each round.

A buyer in a group with two sellers may decide freely how many of the 100 units he wants to buy from which of the two sellers. If in one round one of the sellers did not enter the market, the buyers only can decide how many of the maximum 100 units they want to buy from the first seller.

Also a buyer in a group with eight sellers can buy up to 100 units, though the amount is divided evenly over the four markets, so that these buyers can buy up to 25 units in each market. Every buyer than can decide freely how many of the 25 units per market he wants to buy at which seller. If in one round the second seller did not enter the market, buyers can only decide how many of the maximum 25 units in this market they want to buy from the first seller.

The buyers' profit arises as the sum of the differences between the price he payed for the respective product unit and the value of 105 points. The sellers' profit results from the number of sold units multiplied by there price per unit in the respective round minus the costs of production for the sold amount.

A round ends when the buyers decided how many units they want to buy from which seller. After every round both sellers are informed about which prices the sellers charged and how many units they sold. Moreover the seller gets to know which price both seller charged in all previous rounds and how high there own profits were in each round. The buyers will get to know which prices existed in the current round and how many units they themselves bought in the recent round. Furthermore, the buyers get to know how many units at which price they themselves bought in all previous rounds and how high there payments in all previous rounds were.

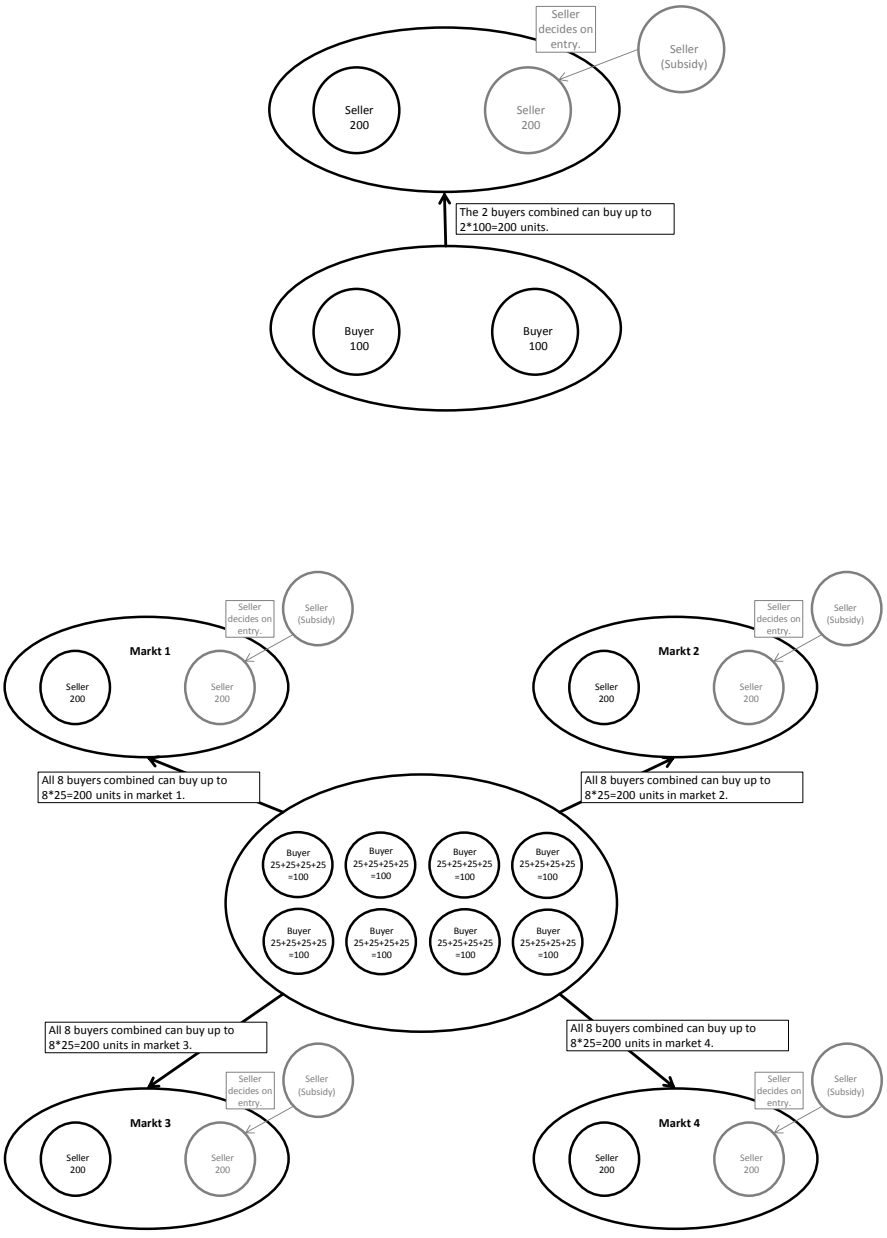

Figure 1: Setup of the markets in the experiment

THURGAU INSTITUTE
OF ECONOMICS
at the University of Konstanz

Hauptstr. 90
CH-8280 Kreuzlingen 2

Telefon: +41 (0)71 677 05 10
Telefax: +41 (0)71 677 05 11

info@twi-kreuzlingen.ch
www.twi-kreuzlingen.ch