Preprints of the
Max Planck Institute for
Research on Collective Goods
Bonn 2013/14

Maverick

Making Sense of a Conjecture of Antitrust Policy in the Lab

Christoph Engel
Axel Ockenfels

MAX PLANCK SOCIETY

Preprints of the
Max Planck Institute
for Research on Collective Goods Bonn 2013/14

Maverick

Making Sense of a Conjecture of Antitrust Policy in the Lab

Christoph Engel / Axel Ockenfels

August 2013

revised version January 2014

Max Planck Institute for Research on Collective Goods, Kurt-Schumacher-Str. 10, D-53113 Bonn
http://www.coll.mpg.de

Maverick

Making Sense of a Conjecture of Antitrust Policy in the Lab*

Christoph Engel / Axel Ockenfels

Abstract

Antitrust authorities all over the world are concerned if a particularly aggressive competitor, a "maverick", is bought out of the market. Yet there is a lack of theoretical justification. One plausible determinant of acting as a maverick is behavioral: the maverick derives utility from acting competitively. We test this conjecture in the lab. In a pretest, we classify participants by their social value orientation. Individuals who are rivalistic in an allocation task indeed bid more aggressively in a laboratory oligopoly market. This disciplines incumbents. In our setting, this does not create sufficient incentives for buying out mavericks, though.

JEL: C91, D03, D22, D43, K21, L13, L41

Keywords: Oligopoly, aggressive sales, maverick, social value orientation, rivalry

* Helpful comments by Uwe Cantner, Dominik Grafenhofer and Marco Kleine on an earlier version, and discussion at the Rotterdam Department of Economics, are gratefully acknowledged. Ockenfels gratefully acknowledges financial support from the German Science Foundation (DFG) through the Gottfried Wilhelm Leibniz-Program and the Research Unit "Design & Behavior" (FOR 1371).

1. Introduction: Mavericks in Practice and in Economics

One man's meat is another man's poison, as they say. Antitrust is a field of application. For those forming a cartel, or coordinating tacitly, collusion is a dilemma. Individually, each is best off if the others are faithful cartelists, while this one firm undercuts price, or exceeds the quota for that matter. Antitrust authorities are therefore pleased to learn that one supplier in a market is particularly aggressive. The US Horizontal Merger Guidelines have coined the graphic term "maverick" for such firms. The Guidelines describe such firms as "*firms that are unusually disruptive and competitive influences in the market*".[1]

The Guidelines are particularly concerned with the elevated risk of tacit collusion if a merger eliminates a maverick firm. The European Horizontal Merger Guidelines express the same concern.[2] As a matter of fact, the notion of mavericks plays a key role in many merger review processes in the US, Europe and elsewhere. And in almost all the cases, the courts were explicitly concerned that a particularly competitive player – the maverick – would be removed from the market.[3]

Indeed, there is some field data suggesting that mavericks exist, and that they can substantially change market behavior. One econometric study compares prices for retail gas in the otherwise comparable metropolitan areas of Ottawa and Vancouver. In both regions, tacit collusion would be equally feasible. Yet data from Internet price data collection sites show that, in the Ottawa region, prices are much more dispersed and volatile. This market outcome can be

1 57 FR 41552, sec. 2.12 at note 19.

2 OJ 2004 C 31/5, no. 20, no. 42.

3 In *United States vs. ALCOA*, government sued ALCOA for divestiture of the acquisition of Rome Cable Corporation. The Supreme Court held that the acquisition constituted monopolization, on the argument that “Rome was an aggressive competitor” (377 U.S. 271 [281] (1964)). Likewise, in *Mahle GmbH*, the Federal Trade Commission forced Mahle GmbH to divest Metal Leve’s United States piston business on the argument that, before the merger, Metal Leve was “an aggressive and innovative competitor” (62 Fed.Reg. 10,566 [10,567] (1997)). The Antitrust Division of the Department of Justice opposed the acquisition by *Alcan Aluminium Corp. of Pechiney Rolled Products, LLC*, since this would “remove a low cost, aggressive, and disruptive competitor in the North American brazing sheet market” (Case No. 1:03CV02012, para. 21 (2003)). Likewise, the Federal Trade Commission opposed the proposed merger of *Staples, Inc. with Office Depot, Inc.*, on the argument that the merger would eliminate a “particularly aggressive competitor in a highly concentrated market” (Case No. 1:97CV00701, sec. IV A 2 (1997)). These decision are echoed by legal doctrine (Baker 2002; Kolasky 2002).
The European antitrust authorities have taken similar decisions. The European Commission cleared the merger of *T-Mobile Austria with tele.ring* only after the parties committed to selling major assets of tele.ring to an independent competitor. This undertaking was requested, although the new merged unit would not be the largest supplier in the Austrian market for the provision of mobile communication services to end customers since, before the merger, “for the last three years, tele.ring has played by far the most active role on the market in practising successfully a price aggressive strategy” (case M.3916, O.J. L 88/2007, 44, para. 10). Likewise the Commission cleared the merger of *Linde with BOC* only after both firms committed to selling a number of major supply contracts concerning helium. This removed the Commission’s original concern that, otherwise, Linde would stop “compet[ing] aggressively to expand its position on this market” (case M.4141, IP/06/737 (2006)). An interesting case is *Euler Hermes/OEKB*. Through the merger, the new unit reaches a share between 45 and 55% on the Austrian market for delcredere insurance. The Commission nonetheless does not see reason for concern, one counter argument being that an independent new entrant Atradius “has assumed the role of a maverick by its aggressive pricing policy and its increase of sales” (case M.4990, http://ec.europa.eu/competition/mergers/cases/decisions/m4990_20080305_20310_de.pdf, para. 29, 2008).

traced back to the presence of a maverick (Eckert and West 2004a; Eckert and West 2004b). Maverick behavior has also been identified in the Australian mortgage market (Breunig and Menezes 2008).[4]

That said, there is a gap between the practice of dealing with mavericks in competition policy and the economics of mavericks in theory. Simple economic explanations of why some firms are more competitive than others would include that mavericks have lower costs, are incentivized by sales volumes, or control more capacities than their competitors. All this would imply that mavericks have a rather large market share. Yet, as Breunig and Menezes (2008) pointed out, competition authorities often stress that mavericks are, in fact, likely to be small firms. The seeming contradiction may partly explain why the economic literature on mavericks is small (see below), and why courts, merger guidelines, and the economic literature tend to identify mavericks by their (competitive) *behavior* rather than by cost and other structural parameters.

As an example, observe that the New Zealand Merger Guidelines in their section 7.2 "Elimination of a Vigorous and Effective Competitor" explicitly list "features associated with a maverick". Most features relate to a behavioral tendency to disrupt coordination and similar phenomena, including the first feature ("a history of aggressive, independent pricing behavior") and the last feature ("a history of independent behavior generally") in the list.[5] In line with this, the only economic model that explicitly addresses the role of mavericks in competition policy that we are aware of adds a firm specific degree of conjectural variation in quantity choices to a fully symmetric Cournot model (Kwoka 1989). The conjectural variation is interpreted as capturing some more complex, yet unspecified, intertemporal interaction among competitors. The model shows that the absorption of a more rivalrous firm may lead to larger output contraction than that associated with a merger with a less rivalrous firm.

In the US the focus on "maverick" firms has recently come under attack. Antitrust authorities have been urged to put less weight on the issue, mostly because there is so little theoretical foundation in economics.[6] However, in our view, the economic discussion of the role of mavericks would greatly benefit if it were to take into account that people strongly differ with respect to social behavior, including their competitiveness, willingness to cooperate or collude, and ability to coordinate. In fact, individual heterogeneity in social and economic interaction

4 Another example to illustrate some of the issues we are dealing with here is behavior in the Dutch spectrum auction in 2000 (Van Damme 2002; see also Klemperer 2004). There were five incumbents and five licenses for sale, but several potential entrants. As Van Damme (2002) emphasized, the Dutch telecom regulator "hinted at the desirability to favour newcomers to the market in the auction", and that "there are several reasons why a new entrant might be a more aggressive player on the market". However, all but one potential entrant (Versatel) actually partnered with an incumbent bidder, removing them from the auction market. One of the incumbents (Telfort) later, during the action, accused Versatel of particularly aggressive bidding behaviors. As Van Damme (2002) reports: "Telfort claims that Versatel is bidding only to raise its rivals' costs or to get concessions from them."

5 http://www.comcom.govt.nz/assets/Imported-from-old-site/BusinessCompetition/MergersAcquisitions/ClearanceProcessGuidelines/ContentFiles/Documents/Mergers-and-AcquisitionsGuidelines-2003.pdf, accessed 1 January 2014.

6 Personal communication by the chief economist of the German Cartel Authority, Konrad Ost.

is one of the most robust insights from behavioral economics and psychology (e.g. Camerer 2003). Thus, heterogeneity of social preferences may be the missing link between antitrust practice and economic theory when it comes to understanding the presence of mavericks.[7]

There are many ways of modeling social preferences (for a survey see Cooper and Kagel 2013). However, many models include a concern about relative, not only absolute payoff. Such models describe, for instance, inequity averse players (Fehr and Schmidt 1999; Bolton and Ockenfels 2000) or rivalistic players, who are willing to trade some absolute payoff against a sufficiently higher relative payoff (Fouraker and Siegel 1963:chapter 9; Messick and Thorngate 1967; Frank 1984; Bolton 1991; Bazerman et al. 1992). These models resonate with an extended literature in social psychology on the "desire to win" (for a summary see Malhotra 2010). There is pronounced heterogeneity with respect to this desire (Van Lange et al. 1997; De Dreu and Boles 1998). The desire to win can lead to bidding more in an auction than the item is worth (Ku et al. 2005) and to engage in costly litigation rather than settling a case (Malhotra et al. 2008).

Rivalistic behavior is also sometimes characterized as status seeking (Frank 1985; Clark et al. 2008) and backed by solid experimental evidence (Ball and Eckel 1998; Huberman et al. 2004; Charness et al. 2010) and evidence from the field (Solnick and Hemenway 1998; Ferrer-i-Carbonell 2005; Luttmer 2005; Boes et al. 2010). The concept of status seeking has explicitly been extended to market behavior (Sobel 2009), entrepreneurial risk-taking (Clemens 2006) and managing a firm (Auriol and Renault 2008). Status seeking has been shown to affect behavior in experimental markets (Ball et al. 2001) and experimental supply chains (Loch and Wu 2008). In the field, status plays a strong role in motivating managers (Grund and Martin 2013; Ockenfels et al. 2013).

In our paper, we use a very simple, linear model of rivalistic preferences to derive hypotheses, and a standard measure to classify participants according to their social value orientation (Liebrand and McClintock 1988). We emphasize, however, that the details of the preferences and the measurement are not critical for our study and conclusions, as long as there is some heterogeneity in rivalistic behavior. This paper then tests in a laboratory experiment to which degree, and in which ways, a relatively rivalistic entrant in a market – the maverick – strengthens competition and improves consumer welfare, and what this implies for other firms' willingness to buy the maverick out of the market.

Our hypothesis is supported with a proviso. Conditional on local market conditions, firms perform worse on average, and consumer welfare increases, if the market entrant is classified as rivalistic. Yet local conditions matter. In particular, rivalistic entrants are not more competitive if they enter a market where competition was already fierce in the first place.

7 Of course, other areas of industrial organization have already been substantially influenced by behavioral research; see, e.g., Engel (2007) for the insights from experimental economics for the determinants of tacit collusion.

In conclusion, we also note that, somewhat surprisingly, the classic finding that mergers are unprofitable in simple Cournot markets (Salant et al. 1983) extends to markets with a maverick. Our theoretical prediction that mavericks are not bought out of the market is supported by the data: although rivalistic mavericks are very damaging for incumbents' profits, we only observe a single buyout.

The remainder of the paper is organized as follows: section 2 presents the design of the experiment and our hypotheses. Section 3 reports the results from the main experiment. Section 4 extends the analysis to buyouts. Section 5 concludes with a discussion of the potential role of mavericks for market competitiveness and merger policy.

2. Design of the Experiment and Hypotheses

In order to test the effect of heterogeneous preferences on competition and on the willingness to buy out a maverick, we first, in a pre-test, classify participants according to their social value orientation, using the standard procedure introduced by Liebrand and McClintock (1988).[8] This test has participants repeatedly choose between two different allocations of a sum to be distributed between an anonymous partner and themselves. Aggregating over all 32 incentivized choices, for each individual one defines a score, which is customarily called the "ringdegree" since the measure can be represented on a circle. Participants with a score of 0 only care about their own payoff. Participants with a positive score are willing to give up some payoff for themselves for the sake of giving their anonymous partner a higher payoff. Such participants are averse against advantageous inequity, consistent with Fehr and Schmidt (1999); Bolton and Ockenfels (2000). We are particularly interested in participants with a negative score. They are willing to give up some payoff for themselves in the interest of increasing the payoff difference between themselves and their partner. These participants are rivalistic. They hold a positive willingness to pay for improving their status.

In the main experiment, we form fixed markets of three suppliers to interact in a fully symmetric Cournot market over 20 rounds. In the first 10 rounds, only two suppliers, the incumbents, are active. The passive supplier, the entrant, is informed about price and total quantity, and enters the market in round 11. This allows incumbents to experience the profitability of the duopoly market, which will be relevant when we look at incentives to buy out the maverick in section 4. This also allows the entrant to observe the market before entering, which seems a reasonable thing to do for any potential entrant. The social value orientation of the entrant is our treatment variable. We have rivalistic entrants, selfish entrants, and entrants who are averse against advantageous inequity.

8 The only experiment referring to mavericks we are aware of is Li and Plott (2009). They create an environment that is particularly conducive to tacit collusion. Gains from collusion are strong, the traded goods are heterogeneous, and preferences are public knowledge. They test a battery of manipulations for their ability to restore competition. Only when preferences of one agent were privately changed such that the most preferred item was the same as for one of the other agents, the collusive equilibrium was disrupted. The authors note that this induced head-to-head competition between the two agents is "reminiscent of the concept of a 'maverick.'"

The social value orientation test is run a couple of days before the market experiment. Participants are invited on the understanding that a second experiment is to follow, but are not informed about the nature of the second experiment. To make matching in the main experiment possible, but preserve anonymity, we use the following procedure: at the end of the pre-test, participants generate themselves an identification code. Participants write this code on a card, put this card into an envelope, seal the envelope and write their name on it. The closed envelopes go to the lab manager. The manager opens them and writes a list that matches names and codes. The experimenter prepares a list with groups to be invited for the main experiment. In this list, participants are only identified by their code. The lab manager does not learn any choices participants have made, neither in the pre-test nor, later, in the main experiment. The lab manager only knows who shall be invited for which session. The experimenter never sees the list that matches codes and names. At the outset of the main experiment, participants identify themselves on the computer screen by their code. The program checks whether the invited participants are present.

Participants are completely informed about this procedure. They also know that information from the pre-test is used for inviting participants to one of the sessions of the main experiment. Yet participants neither know the nature of the main experiment, nor which information is used for matching (we run a battery of further personality tests the results of which are of no relevance for the main experiment). In particular, subjects are neither informed about behavior in the first experiment nor about social value scores of other participants; in the field, too, other firms usually only observe their competitors' behavior, not their preferences or decision making process.

In the main experiment, participants interact in fixed groups of three. The main experiment has two parts.[9] At the outset, participants only receive instructions for the first part. They are informed that more parts are to follow, and that new instructions will be distributed for the continuation. The first part of the main experiment has 10 rounds. In this part of the experiment, two incumbents of each group have the active role. The entrant has the passive role. Incumbents compete in a Cournot market where the profit of incumbent i in period t is given by (1).

$$\pi_{it} = (100 - q_{it} - q_{jt})q_{it} \tag{1}$$

We thus assume demand to be linear and normalize cost to zero. After each period, incumbents learn the resulting price and their individual profit. Entrants learn total quantity supplied and the price. After the end of period 10 there is a (surprise) restart of the market. Now entrants become active as well, so that the profit function changes to (2).

$$\pi_{it} = (100 - q_{it} - q_{jt} - q_{kt})q_{it} \tag{2}$$

9 Plus the third part meant to test the theoretical prediction that buyouts will not occur, see below section 4 for detail.

The second part of the experiment also lasts 10 periods.

Based on the results of the pre-test, three groups of participants are selected to have the entrant role in the main experiment: Those 9 participants with the most negative social value orientation score have the entrant role in the *Negative* treatment. These participants are rivalistic. We form two different comparison groups: 11 participants with a social value orientation score of zero have the entrant role in the *Zero* treatment. These participants are selfish. Those 11 participants with the highest positive social value orientation score have the entrant role in the *Positive* treatment. The remaining participants are randomly assigned to have the incumbent role in either treatment. Three of them have a mildly negative social value orientation score. 16 of them are selfish. 40 have a mildly positive social value orientation score.[10]

We have 9 groups (27 participants) in the *Negative* treatment, and 11 groups (33 participants) in the remaining two treatments. Participants are invited using the software ORSEE (Greiner 2004). 52 % of participants are female. Average age is 25.45 years.[11] Participants, most of whom are students, hold various majors. The experiment is programmed using the software zTree (Fischbacher 2007). It is run in the Bonn EconLab. In the pre-test, participants on average earn 13.20 € (16.05 $ on the days of the experiment). In the main experiment, they on average earn 9.36 €.

We can straightforwardly compute our null hypothesis under the standard assumption that all suppliers maximize their individual payoffs. There is a unique subgame-perfect equilibrium strategy for each phase of the experiment, conditional on the number of suppliers in the market. This gives us

> **H_0:** If all participants hold standard preferences, this is common knowledge, and there are two suppliers, they sell 33 units per round each. If there are three suppliers, they sell 25 units per round each.

For our alternative hypothesis, assume that there is some heterogeneity of preferences. In particular, assume that the entrant is a maverick, competing more aggressively than standard theory would predict. Specifically, assume that the entrant not only cares about absolute profits but also about earning more than the competitors, and that this is common knowledge. Then, like commitment power favoring the Stackelberg leader, the rivalistic supplier sells a larger quantity than in a standard analysis of the Cournot market, and the incumbents sell a smaller

10 The fact that three participants with a negative social value orientation score are incumbents results from a mistake of the lab manager. Since the lab manager did not know their social value orientation scores, these participants were randomly assigned to one of the groups. For five incumbents we do not know the social value orientation score. These subjects replaced invited participants who did not show up.

11 From the five replacement subjects, we do not have demographic information since the demographic questionnaire was part of the first experimental battery.

quantity. Total quantity and thereby consumer welfare is larger than if all suppliers hold standard preferences.[12] This leads to

H_1: If the entrant is rivalistic while the incumbents hold standard preferences, and assuming preferences are common knowledge,[13] the incumbents sell a smaller quantity than in a standard Cournot market. The entrant sells a larger quantity than in a standard Cournot market. Total quantity and thereby consumer welfare is larger than if all suppliers hold standard preferences. The opposite holds if the entrant is averse against exploiting others.

We only mention here that we get qualitatively similar results if we allow incumbents to be rivalistic, too, as long as they are less rivalistic than the entrant (see Appendix I).

3. Results

Figure 1 informs about the distribution of social value orientation in our sample. We have 12 (13.64%) rivalistic, 27 (30.68%) selfish, and 49 (55.68%) participants with a more or less pronounced positive social value orientation. Figure 1 also shows our matching. Participants at the lower end of the distribution are entrants in the *Negative* treatment. These are the subjects with the supposedly most competitive behavior in oligopoly markets, and they are thus the focus of our study on the impact of mavericks. Participants at the upper end of the distribution are entrants in the *Positive* treatment. 11 participants with a social value orientation score of zero are entrants in the *Zero* treatment. The remaining participants are randomly assigned to being incumbents in either treatment. To make sure that the 16 selfish incumbents are equally distributed across treatments, randomization is separate for participants with a social value orientation score of 0, and for the remaining incumbents.

12 We focus on *consumer* welfare for two reasons. Enhancing consumer welfare is the primary stated goal of antitrust policy (Crandall and Winston 2003). Moreover we model mavericks as agents holding social preferences, so that the definition of supply side welfare is not obvious. By focusing on the opposite market side, we are able to bracket this debate in normative economic theory.

13 This is a common assumption not only in large parts of the social preferences literature, but also in the economics literature that does not address social preferences. The assumption simplifies theoretical derivations, although it seems incorrect in most applications. However, in our setting any rivalistic motivation leads to more aggressive bidding, regardless of the extent to which competitors are (believed to be) rivalistic. In this sense, the general insight that rivalry leads to larger quantities is robust.

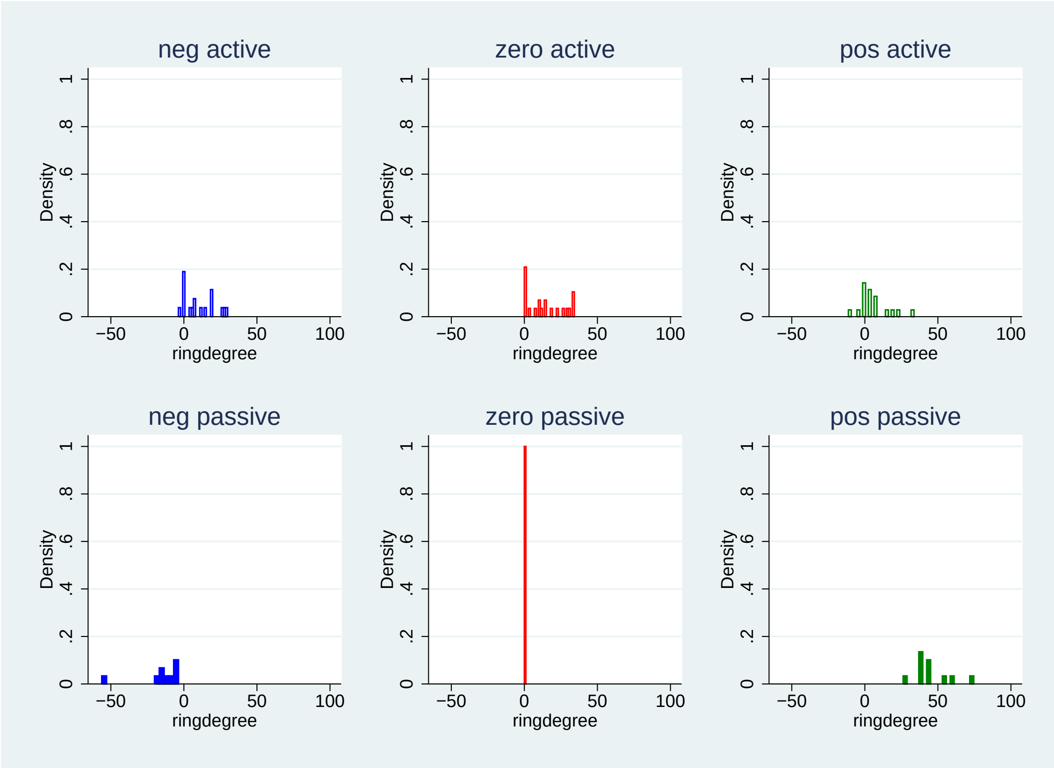


Figure 1
Social Value Orientation per Treatment and Role

As Figure 2 shows, overall quantity choices are fairly close to the standard Cournot predictions. In markets of 2, average quantity is close to 33. In markets of three, it is close to 25. We thus provisionally support our null hypothesis $\mathbf{H_0}$. Looking at average quantities only, social value orientation is not a plausible candidate for identifying maverick behavior. As suggested by Figure 2, if we work with averages, we do not find treatment effects, neither non-parametrically nor parametrically.

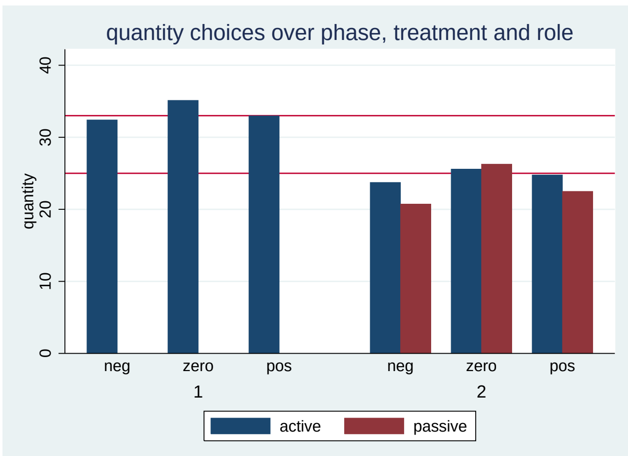


Figure 2
Aggregate Quantity Choices

Yet, as Figure 3 illustrates, aggregates per treatment hide a more complex story. First of all, there is quite some variation that is hidden by looking at averages only. In phase 1 of the Cournot market, quantity choices have mean 33.57, but standard deviation 10.34. That explains why quantity choices in the second phase of the experiment heavily depend on experiences from the first phase. Independent of treatment, what the group has experienced while the market was a duopoly is a strong predictor of quantity choices after the entrance of the new competitor. Suppliers only adjust quantities to reflect greater competition: the trend line is close to 75% of the average quantity in the first 10 periods (which would be the quantity ratio of a triopoly compared to a duopoly as predicted by standard theory). That is, all three suppliers seem to take the idiosyncratic and largely varying level of competitiveness in their group as given, and on average adjust their choices to the entrance of a new competitor by approximately the same ratio that a group of perfectly selfish suppliers would.

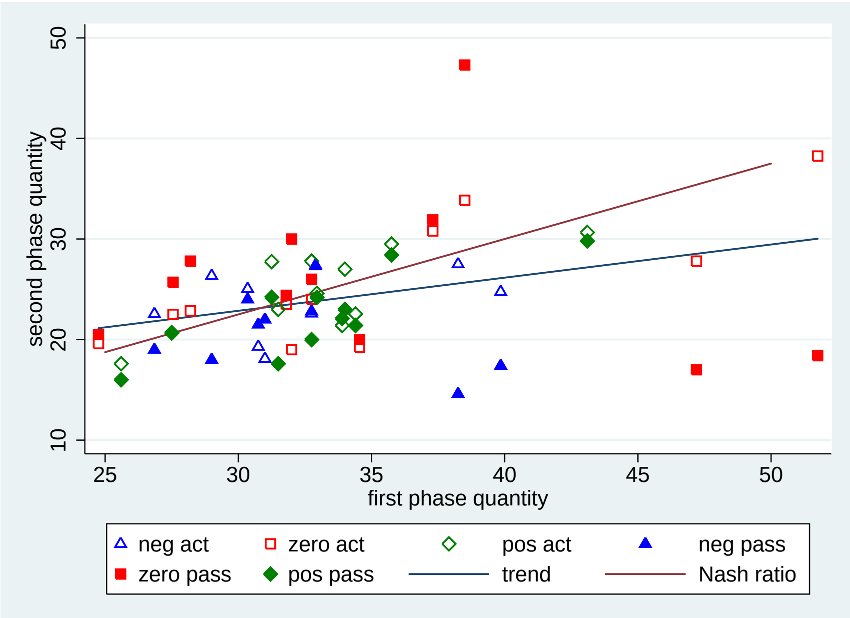


Figure 3
Dependence on Local Conditions
x-axis: mean quantity sold by the two members of the duopoly, in periods 1-10
y-axis: mean quantity sold in periods 11-20
separately for incumbents (hollow markers) and for entrants (solid markers)
trend: linear prediction
Nash ratio: 3/4 of first phase quantity

The visual impression that local market competitiveness in periods 1-10 matters is supported by statistical analysis, Table 1.[14]

14 The coefficient of the average quantity in phase 1 is smaller than .75 since the model has a constant. If we estimate the same model (as a population averaged regression) without a constant, the coefficient come very close to the theoretical expectation and is .714.

average quantity in periods 1-10	.414*** (.110)
cons	10.367** (3.373)
N	930
p model	.0002
R^2 within	0
R^2 between	.1165
R^2 overall	.0477

Table 1

Effect of Local Conditions

dv: quantity, data from periods 11-20

random effects, robust standard errors clustered at the group level

Hausman test insignificant on mirror model with period as additional regressor (to enable fixed effects estimation)

standard errors in parenthesis

* = p < .05

This gives us

> ***Result 1:*** *Market conditions in a repeated Cournot duopoly market vary widely. If a new competitor enters, competitiveness pre-entry determines competitiveness post-entry.*

Knowing that local market conditions matter, we revisit the effects of our manipulation. The critical issue is the effect of entry on incumbents' quantity choices, which is what we investigate in Table 2.[15] As one sees, merely controlling for local conditions is not sufficient (model 1). It also is not enough to allow for the reaction to local conditions to differ by treatment (model 2). Yet the picture almost perfectly clears if we further control for the individual degree of competitiveness of the entrant (model 3); note that the social value orientation of entrants is only fix in the *Zero* treatment, while there is variance (within defined limits) for the remaining two treatments. It is this variance that regressor SVO uses for explanation. In this final model, for both treatments we find a strong and highly significant negative effect. Incumbent firms, post entry, set smaller quantities if the entrant is selfish or even socially minded, compared with a rivalistic entrant. If the entrant is rivalistic, the entire market is more competitive. This strongly supports our alternative hypothesis $\mathbf{H_1}$.

Moreover, we find that, whenever a treatment main effect (*Zero* or *Positive*) is significant, the interaction between treatment and the effect of experiences made during the first 10 periods is significant as well. The interaction effect always has the opposite, i.e. a positive sign. Whether the entrant is rivalistic matters the more the more collusive incumbents had been pre-entry. A further interesting observation results from comparing the main effect of local conditions across statistical models. While it is very strong and highly significant in model 1, it is smaller and only weakly significant in model 2, and it becomes insignificant in the final model. The treatment where entrants are rivalistic is our reference category. That is, while pre-entry com-

15 The fact that "overall" all models seem to explain little variance is an artefact of the fact that, by their design, these models only explain between, not within variance.

petitiveness is mainly a critical determinant of post-entry competitiveness with non-rivalistic entrants, rivalistic behavior strengthens competition independent of pre-entry conditions.

	model 1	model 2	model 3
Zero	.264 (1.494)	-10.240 (6.874)	-25.565** (8.453)
Pos	.711 (1.339)	-12.313^{+} (6.838)	-84.170*** (23.023)
av ph 1	.584*** (.092)	.292^{+} (.160)	-.152 (.198)
*Zero**av ph 1		.322 (.202)	.765** (.233)
*Pos**av ph 1		.400* (.197)	2.545*** (.683)
SVO score of entrant			1.385** (.406)
av ph 1*SVO score of entrant			-.042** (.012)
Cons	4.791 (3.250)	14.282* (5.661)	29.606*** (7.497)
N	620	620	620
p model	<.0001	<.0001	<.0001
R^2 within	0	0	0
R^2 between	.2093	.2179	.2366
R^2 overall	.1108	.1153	.1252

Table 2

Treatment Effects Conditional on Local Conditions

dv: quantity, data from periods 11-20 and from incumbent firms only
random effects, robust standard errors clustered at the group level
Hausman test insignificant on mirror models with period as additional regressor (to enable fixed effects estimation)
av ph 1: average quantity, in the respective market of 2, in periods 1-10
SVO: social value orientation, i.e. score from ring measure test
standard errors in parenthesis
*** p < .001, ** p < .01, * = p < .05, $^{+}$ p < .1

To make the reactions of incumbents to the competitive attitude of entrants visible, individually for each incumbent we regress quantities sold in the first phase on time. This procedure gives us for each individual incumbent the trend, had there not been entry. From these regressions, for each individual we derive an out of sample prediction for the remaining 10 periods. For this, we adjust the predicted quantity to the market entry of one more supplier by multiplying it by the theoretically predicted ratio of ¾ (see above).

Figure 4 shows the difference, per treatment and period, between the mean actual and predicted quantity. In the *Positive* treatment, actual quantities are much higher than the prediction. In the *Zero* treatment, actual quantities exhibit more variance, but have about the same level as the prediction. By contrast in the *Negative* treatment, and only in this treatment, for all periods but the final actual quantities are below the predicted trend. Depending on the social preferences of the entrant, incumbents come under additional competitive pressure and react by reducing the quantity they sell, as predicted by our model.

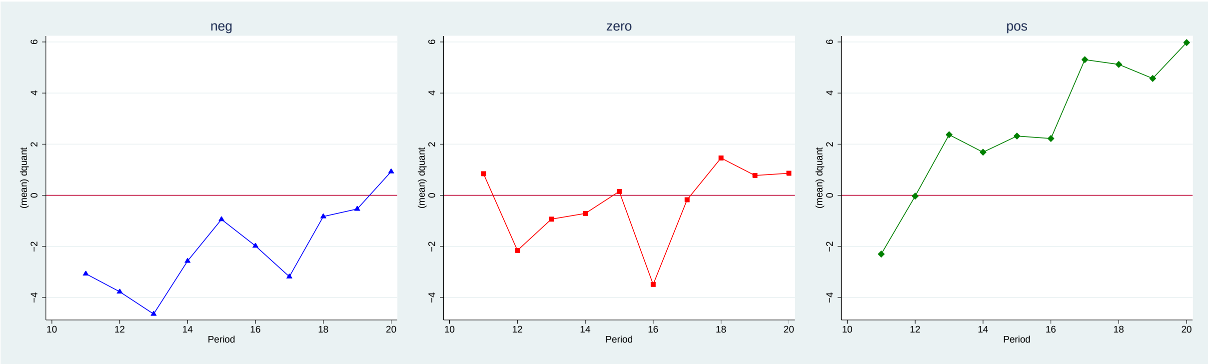


Figure 4
Effect of Entry on Choices of Incumbents
periods 11-20 only
dependent variable: difference, per treatment and period, between the mean predicted and actual quantity

Overall, this gives us strong support for our alternative hypothesis:

> ***Result 2:*** *Conditional on pre-entry local market competitiveness, firms are more competitive if the entrant is rivalistic.*

Learning that the relevance of a "maverick" firm depends on the competitiveness of the market before the maverick enters is important news for the debate in antitrust that has motivated our experiment. Mavericks matter the more the more a market is collusive, i.e. when their presence has the biggest effect on welfare.

4. Buyout

The antitrust debate over mavericks takes mostly place in merger control. Antitrust authorities are concerned that incumbents might stifle competitive pressure by buying out the maverick. We have shown theoretically and experimentally that the competitiveness of market entrants indeed matters.

Reflecting previous theoretical results that cast doubt on the private profitability of mergers (starting with Salant et al. 1983), there is no scope for buying out the entrant in our setting with selfish preferences. This section, along with the Appendix, contributes to the literature by showing that, possibly against one's intuition, mergers with rivalistic mavericks are also not profitable. In fact, a concern for falling behind competitors might well work into the opposite direction (see Appendix I): An incumbent who is buying out the maverick is providing a public good to other incumbents, which implies a disadvantageous profit comparison and is thus rejected if incumbents care about social comparison. In line with this reasoning, we observe that laboratory incumbents' willingness to pay for a merger with the maverick is even *below* the theoretical prediction under the assumption of selfish preferences.

To test the willingness to buyout mavericks, in each treatment after the end of period 20 (when incumbents have experienced both, the market with and without the maverick), participants are informed that a third part of the experiment will consist of another 10 rounds of the same market. However, before the start of the 21st period, the two incumbents and the entrant may negotiate over the exit of the entrant from the market. The negotiation protocol is as follows: each of the incumbents commits to the maximum price she is willing to pay for the entrant to exit the market. The entrant commits to the price she asks for leaving the market. The computer randomly selects one of the two offers from the incumbents, with equal probability. If this offer is greater than or equal to the price demanded by the entrant, the deal is struck at the price demanded by the entrant. The entrant leaves the market. For the final 10 rounds the market is again a duopoly. If negotiations fail, the three suppliers continue to be active.

In line with the theoretical prediction, we only have a single buyout.[16] In order to better understand why buyout negotiations almost invariably fail, Figure 5 shows stated willingness to accept (to leave the market) and stated willingness to pay (for having the entrant to leave the market).[17] In all treatments, the entrants' mean and median willingness to accept a buyout is substantially above the 'true' willingness to accept predicted by standard theory (see corresponding horizontal line), which may of course be due to strategic considerations. Likewise, in all treatments, the incumbents' mean and median willingness to pay for a buyout is very substantially below the theoretical prediction. Here, however, because the price incumbents would have to pay in case of a buyout is independent of one's stated willingness to pay, incumbents have a weakly dominant strategy to state 'true' values. Moreover, the left bars in Figure 5 quantify each incumbent's monetary advantage from buying out the entrant.[18] In all treatments, willingness to pay is below the empirical advantage either of the original suppliers expects if the entrant leaves the market.

16 In treatment *Negative*, a single entrant with social value orientation score of -16.86 offered to leave the market if she was given 2,000 tokens, which was exactly matched by the offer from an incumbent with social value orientation score of 18.50. In the same group, the second incumbent had also offered 2,000 tokens, so that the deal did not hinge on the selection of the buyer. In one more group, also from treatment *Negative*, there would have been room for trade, had another offer been selected randomly. Here, the entrant was content with merely 20 tokens, while one incumbent had offered 2,500 tokens. In all other groups, negotiations failed, and they would also have failed had the other incumbent’s offer been singled out.

17 In treatment *Neg*, single entrants ask for extreme amounts. Despite this observation, we do not find significant treatment effects on either WTA or WTP. To avoid a misleading impression, in Figure 5 we report the median, not the mean.

18 This advantage is calculated the following way: for each individual, we calculate profit under two alternative conditions. In the first condition, the entrant remains in the market, the two other suppliers are assumed to continue setting the same quantity as in period 20, while this player sets her best response. In the second condition, we assume that the entrant has left the market, and that the two remaining participants set Nash quantities. We get similar results if we compute the value of buyout by just looking at the difference of total profits between rounds 11-20 and 1-10: *Neg* first method 4985, second method 4193; *Zero* first method 4089, second method 4695; *Pos* first method 4735, second method 4038.

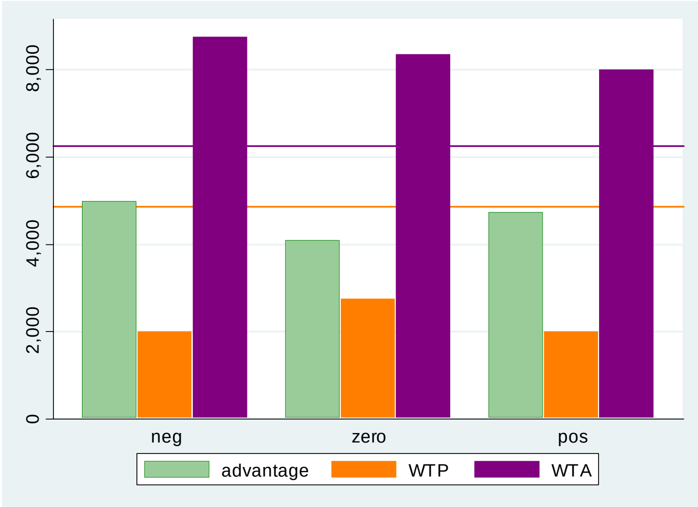


Figure 5
Negotiations over Buyout
Figure reports median values, per treatment and role

1. Conclusion

Antitrust authorities have repeatedly opposed mergers on the argument that they would remove a particularly aggressive competitor from the market. In Germany, for instance, a pertinent case has recently made it into the newspapers. The German Cartel Office has to decide upon a merger among providers of mobile phone services that would have EPlus disappear. The President of the Office has let the press know that the authority is concerned since this implies that a provider with a reputation for particularly aggressive market behavior would disappear from the market.[19] In this paper we experimentally investigate one potential cause for “maverick” behavior: a firm may derive utility from relative, not only from absolute payoff.

In our experiment, we do indeed find that market entry by a participant with a particularly rivalistic attitude makes the market more competitive, improving consumer welfare and hampering incumbents' profits. Of course, we cannot claim that rivalistic preferences are the only justification for mavericks. However, we have demonstrated that behavioral heterogeneity may be sufficient to organize the observation that some suppliers act more competitively than others. Yet this result only holds conditional on the level of competition pre-entry. The entry of a “maverick” is socially most beneficial when it is most needed, i.e. when the market was collusive. This suggests that mavericks can play an important role for entertaining competitive markets, and so competition authorities may be indeed well-advised to appreciate this role in their policies.

That said, we also emphasize that we do not find evidence for the intuition that mavericks are a likely candidate for buyouts. In fact, theory and laboratory behavior indicate that incum-

19 FAZ July 25, 2013.

bents are not willing to buy out aggressive entrants. One reason for their reluctance stems from the fact that, along with easing competitive pressure, they would have to give other incumbents a free lunch and thus put themselves in a disadvantageous profit situation.

One should always be cautious when drawing policy conclusions from a lab experiment. Experiments are tools for identifying effects. In the interest of identification, they clean the situation from all contextual factors that might interfere with the treatment effect. Yet from a policy perspective, these contextual factors may well matter. Caution is particularly well advised if one studies anonymously interacting students while policymakers have to deal with firms that interact in a specific market. Firms are highly aggregate corporate actors (for a survey of the experimental research specifically addressing such actors see Engel 2010); suppliers in a real market of three do not interact anonymously; and markets are differently organized and structured - to name only some obvious simplifications.

Yet people choose for firms. It does not seem unlikely that the social preferences of these individuals bear themselves out in the firm's policy, regardless of the various institutional factors that may affect market outcomes. More importantly, firms as corporate entities may themselves, in different degrees, care about relative, not only about absolute payoff. One reason is the embeddedness of firms into financial markets, possibly also into a market for corporate control. In these markets, comparative performance may be, for one or the other firm, a very relevant signal. Provided firms are partly motivated by relative payoff, our experiment shows that this may lead to maverick behavior, and that the presence of mavericks thus generated generally improves welfare.

Casual empiricism suggests that mavericks, with their aggressive behaviors, are small compared with their competitors. We have excluded this phenomenon by the design of our experiment: Structurally, our incumbents and entrants are perfectly symmetric. However, small firms might be even more concerned with relative payoffs, and moreover should be a more tempting target for a buyout. Buyouts of mavericks might also be a more attractive option in markets with price competition, where rivalistic behavior in an otherwise collusive market environment is more harmful to competitors. Future research should test the robustness of our findings both, in asymmetric market environments and with price competition. We believe that such complementary studies might cumulate in a sound and robust behavioral model of maverick behavior, which bridges the gap between the practice of dealing with mavericks in competition policy and the economics perspective on mavericks.

References

AURIOL, EMMANUELLE and RÉGIS RENAULT (2008). "Status and Incentives." Rand Journal of Economics **39**(1): 305-326.

BAKER, JONATHAN B. (2002). "Mavericks, Mergers, and Exclusion: Proving Coordinated Competitive Effects Under the Antitrust Laws." New York University Law Review **77**: 135-203.

BALL, SHERYL and CATHERINE C. ECKEL (1998). "The Economic Value of Status." Journal of Socio-Economics **27**(4): 495-514.

BALL, SHERYL, CATHERINE ECKEL, PHILIP J. GROSSMAN and WILLIAM ZAME (2001). "Status in Markets." The Quarterly Journal of Economics **116**(1): 161-188.

BAZERMAN, MAX H., GEORGE F. LOEWENSTEIN and SALLY BLOUNT WHITE (1992). "Reversals of Preference in Allocation Decisions. Judging an Alternative versus Choosing among Alternatives." Administrative Science Quarterly **37**: 220-240.

BOES, STEFAN, KEVIN STAUB and RAINER WINKELMANN (2010). "Relative Status and Satisfaction." Economics Letters **109**(3): 168-170.

BOLTON, GARY E. (1991). "A Comparative Model of Bargaining. Theory and Evidence." American Economic Review **81**: 1096-1136.

BOLTON, GARY E. and AXEL OCKENFELS (2000). "ERC: A Theory of Equity, Reciprocity and Competition." American Economic Review **90**: 166-193.

BREUNIG, ROBERT and FLAVIO MENEZES (2008). "Empirical Approaches for Identifying Maverick Firms. An Application to Mortgage Providers in Australia." Journal of Competition Law and Economics **4**(3): 811-836.

CAMERER, COLIN F. (2003). Behavioral Game Theory. Experiments in Strategic Interaction. New York, NY, Sage u.a.

CHARNESS, GARY, DAVID MASCLET and MARIE-CLAIRE VILLEVAL (2010). Competitive Preferences and Status as an Incentive. Experimental Evidence http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1634889.

CLARK, ANDREW E., PAUL FRIJTERS and MICHAEL A. SHIELDS (2008). "Relative Income, Happiness, and Utility. An Explanation for the Easterlin Paradox and Other Puzzles." Journal of Economic Literature **46**: 95-144.

CLEMENS, CHRISTIANE (2006). "Status Concerns and Occupational Choice under Uncertainty." Advances in Theoretical Economics **6**(1): 1-25.

COOPER, DAVID J. and JOHN H. KAGEL (2013). Other-Regarding Preferences. The Handbook of Experimental Economics II. John H. Kagel und Alvin E. Roth**:** ***.

CRANDALL, ROBERT W. and CLIFFORD WINSTON (2003). "Does Antitrust Policy Improve Consumer Welfare? Assessing the Evidence." Journal of Economic Perspectives **17**: 3-26.

DE DREU, CARSTEN K. W. and TERRY L. BOLES (1998). "Share and Share Alike or Winner Take All? The Influence of Social Value Orientation upon Choice and Recall of Negotiation Heuristics." Organizational Behavior and Human Decision Processes **76**(3): 253-276.

ECKERT, ANDREW and DOUGLAS S. WEST (2004a). "Retail Gasoline Price Cycles across Spatially Dispersed Gasoline Stations." Journal of Law and Economics **47**(1): 245-273.

ECKERT, ANDREW and DOUGLAS S. WEST (2004b). "A Tale of Two Cities. Price Uniformity and Price Volatility in Gasoline Retailing." Annals of Regional Science **38**(1): 25-46.

ENGEL, CHRISTOPH (2007). "How Much Collusion? A Meta-Analysis on Oligopoly Experiments." Journal of Competition Law and Economics **3**: 491-549.

ENGEL, CHRISTOPH (2010). "The Behaviour of Corporate Actors. A Survey of the Empirical Literature." Journal of Institutional Economics **6**: 445-475.

FEHR, ERNST and KLAUS M. SCHMIDT (1999). "A Theory of Fairness, Competition, and Cooperation." Quarterly Journal of Economics **114**: 817-868.

FERRER-I-CARBONELL, ADA (2005). "Income and Well-being. An Empirical Analysis of the Comparison Income Effect." Journal of Public Economics **89**(5): 997-1019.

FISCHBACHER, URS (2007). "z-Tree. Zurich Toolbox for Ready-made Economic Experiments." Experimental Economics **10**: 171-178.

FOURAKER, LAWRENCE E. and SIDNEY SIEGEL (1963). Bargaining Behavior. New York,, McGraw-Hill.

FRANK, ROBERT H. (1984). "Are Workers Paid Their Marginal Products?" American Economic Review **74**: 549-571.

FRANK, ROBERT H. (1985). Choosing the Right Pond. Human Behavior and the Quest for Status, Oxford University Press.

GREINER, BEN (2004). An Online Recruiting System for Economic Experiments. Forschung und wissenschaftliches Rechnen 2003. Kurt Kremer und Volker Macho. Göttingen**:** 79-93.

GRUND, CHRISTIAN and JOHANNES MARTIN (2013). Monetary Reference Points of Managers. An Empirical Investigation of Status Quo Preferences and Social Comparisons http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2196762.

HUBERMAN, BERNARDO A., CHRISTOPH H. LOCH and AYSE ÖNÇÜLER (2004). "Status as a Valued Resource." Social Psychology Quarterly **67**(1): 103-114.

KLEMPERER, PAUL (2004). Auctions. Theory and Practice. Princeton, N.J., Princeton University Press.

KOLASKY, WILLIAM J. (2002). Coordinated Effects in Merger Review. From Dead Frenchmen to Beautiful Minds and Mavericks http://www.globalcompetitionforum.org/regions/n_america/USA/11050.pdf.

KU, GILLIAN, DEEPAK MALHOTRA and J. KEITH MURNIGHAN (2005). "Towards a Competitive Arousal Model of Decision-making. A Study of Auction Fever in Live and Internet Auctions." Organizational Behavior and Human Decision Processes **96**(2): 89-103.

KWOKA, JOHN E. (1989). "The Private Profitability of Horizontal Mergers with non-Cournot and Maverick Behavior." International Journal of Industrial Organization **7**(3): 403-411.

LI, JIN and CHARLES R. PLOTT (2009). "Tacit Collusion in Auctions and Conditions for its Facilitation and Prevention. Equilibrium Selection in Laboratory Experimental Markets." Economic Inquiry **47**(3): 425-448.

LIEBRAND, WIM B. and CHARLESG. MCCLINTOCK (1988). "The Ring Measure of Social Values. A Computerized Procedure for Assessing Individual Differences in Information Processing and Social Value Orientation." European Journal of Personality **2**: 217-230.

LOCH, CHRISTOPH H. and YAOZHONG WU (2008). "Social Preferences and Supply Chain Performance. An Experimental Study." Management Science **54**(11): 1835-1849.

LUTTMER, ERZO F. P. (2005). "Neighbors as Negatives. Relative Earnings and Well-being." Quarterly Journal of Economics **120**(3): 963-1002.

MALHOTRA, DEEPAK (2010). "The Desire to Win. The Effects of Competitive Arousal on Motivation and Behavior." Organizational Behavior and Human Decision Processes **111**(2): 139-146.

MALHOTRA, DEEPAK, GILLIAN KU and J. KEITH MURNIGHAN (2008). "When Winning is Everything." Harvard business review **86**(5): 78.

MESSICK, DAVID M. and WARREN B. THORNGATE (1967). "Relative Gain Maximization in Experimental Games." Journal of Experimental Social Psychology **3**(1): 85-101.

OCKENFELS, AXEL, DIRK SLIWKA and PETER WERNER (2013). Bonus Payments and Reference Point Violations

SALANT, STEPHEN W., SHELDON SWITZER and ROBERT J. REYNOLDS (1983). "Losses from Horizontal Merger. The Effects of an Exogenous Change in Industry Structure on Cournot-Nash Equilibrium." Quarterly Journal of Economics **98**(2): 185-199.

SOBEL, JOEL (2009). "Generous Actors, Selfish Actions. Markets with Other-regarding Rreferences." International Review of Economics **56**(1): 3-16.

SOLNICK, SARA J. and DAVID HEMENWAY (1998). "Is More Always Better?: A Survey on Positional Concerns." Journal of Economic Behavior and Organization **37**(3): 373-383.

VAN DAMME, ERIC (2002). The Dutch UMTS-Auction http://www.cesifo-group.de/DocDL/722.pdf.

VAN LANGE, PAUL A. M., ELLEN DE BRUIN, WILMA OTTEN and JEFFREY A. JOIREMAN (1997). "Development of Prosocial, Individualistic, and Competitive Orientations. Theory and Preliminary Evidence." Journal of Personality and Social Psychology **73**(4): 733-746.

Appendix I: Model

In the general case of a Cournot market with linear demand, intercept *m*, and *n* suppliers, all with marginal cost of zero, the Cournot-Nash quantity is given by:

$$q_i = \frac{m}{n+1} \tag{3}$$

For one supplier *i* the expected benefit from reducing market size to a duopoly for the duration of 10 periods is given by

$$WTP_i = 10(\pi_{i2} - \pi_{i3}) = 10\left(\frac{1}{9}m^2 - \frac{1}{16}m^2\right) = \frac{35}{72}m^2 \tag{4}$$

If the entrant *e* stays in the market, instead of leaving, she expects

$$WTA_e = \frac{10}{16}m^2 = WTP_i + \frac{5}{36}m^2. \tag{5}$$

Since $WTA_e > WTP_i$, there is no room for trade.

We now assume that the utility of the rivalistic supplier *e* (given that the other two suppliers make identical profits π_i, which will be the case in equilibrium) is given by

$$\begin{gathered} u_e = \pi_e + (n-1)\gamma(\pi_e - \pi_i) \\ = (1+2\gamma)(m-(n-1)q_i - q_e)q_e - 2\gamma(m-(n-1)q_i - q_e)q_i \end{gathered} \tag{6}$$

Profit for one of the incumbents is now given by

$$\pi_i = \big(m - q_i - (n-2)q_j - q_e\big)q_i \tag{7}$$

Taking first order conditions, and solving the resulting system of equations, we get

$$q_i = q_j = \frac{m(2\gamma+1)}{2\gamma n + n + 1 + 4\gamma}, q_e = \frac{m(4\gamma+1)}{2\gamma n + n + 1 + 4\gamma} \tag{8}$$

E.g., with the parameters of the experiment, and letting the entrant be mildly rivalistic, i.e. with $\gamma = \frac{1}{2}$, we get $q_i = q_j = 22.22, q_e = 33.33$. The rivalistic player is better off the larger γ, that is the more she is rivalistic. If all sellers hold standard preferences, in equilibrium they sell $Q_N = nq_i = \frac{nm}{n+1}$ units. If one seller is rivalistic, total quantity is given by

$$Q_R = (n-1)\frac{m(2\gamma+1)}{2\gamma n + n + 1 + 4\gamma} + \frac{m(4\gamma+1)}{2\gamma n + n + 1 + 4\gamma} \tag{9}$$

which is larger than Q_N for any $\gamma > 0$; with $\gamma = 0, Q_R = Q_N$. Hence consumer welfare increases if there is a rivalistic player.

If the entrant is rivalistic, the change of gains from trade for an incumbent switching from a market with three to a market with two suppliers are given by

$$WTP_i = 10(\pi_{i-e} - \pi_{ie}) = \frac{10}{9}m^2 - \frac{10m^2(2\gamma+1)^2}{(2\gamma n + n + 1 + 4\gamma)^2} \quad (10)$$

Taking the first derivative wrt γ we get

$$\frac{\partial WTP_i}{\partial \gamma} = \frac{40m^2(2\gamma+1)}{(2\gamma n + n + 1 + 4\gamma)^3} > 0 \quad (11)$$

incumbents' willingness to pay for the entrant leaving the market strictly increases in the entrant's aggressiveness.

The entrant expects to gain

$$WTA_e = \frac{10m^2(2\gamma+1)(1+4\gamma+4\gamma^2)}{(2\gamma n + n + 1 + 4\gamma)^2} \quad (12)$$

if she stays in the market. There is still no room for trade:

$$WTP_i - WTA_e = -\frac{10m^2((8\gamma^3 + 12\gamma^2 + 6\gamma + 1)n^2 - (16\gamma^2 + 12\gamma + 2)n - 16\gamma^2 - 8\gamma - 1)}{(2\gamma n + 4\gamma + n + 1)^2 n^2} \quad (13)$$

This is negative for any $n \geq 3, \gamma > 0$. With no degree of rivalistic preferences is there a deal.

Qualitatively similar results are obtained if we also allow incumbents to be rivalistic as shown in (6), if we keep the assumption that the entrant is more rivalistic $(\gamma_e \geq \gamma_i)$.[20] Specifically, let us assume that $\alpha = \gamma_i < \gamma_e = \gamma$. Taking first order conditions, and solving the resulting system of equations, we get

$$q_i = q_j = \frac{m(4\alpha\gamma + 2\alpha + 2\gamma + 1)}{4\alpha\gamma n + 2\alpha n + 2\gamma n + n + 1 + 4\gamma}, \quad q_k = \frac{m(4\alpha\gamma + \alpha + 4\gamma + 1)}{4\alpha\gamma n + 2\alpha n + 2\gamma n + n + 1 + 4\gamma} \quad (14)$$

Similar to our previous results, each incumbent sells less than the entrant, and consumer welfare increases both in α and γ.

Proceeding the same way as before, we also investigate whether there is room for trade. The negotiation range is defined by

20 In fact, the result can even be generalized by noting that our model is related to the model by (Fehr and Schmidt 1999). The difference is that the Fehr-Schmidt model allows players to also suffer from advantageous inequality. However, as long as the entrant is assumed to be more aggressive than the incumbents, the incumbents will in equilibrium always fall behind the entrant and so never experience advantageous inequality. Since in (6) utility from the difference between one's own payoff and the payoff of a peer is not constrained to positive differences , (6) also captures disutility from falling behind one's peers. So, technically, this leads to a market of n players who all hold preferences as in (6).

$$WTP_i - WTA_e = \frac{10}{n^2}m^2 - \frac{m^2(\alpha + 2\gamma + 1)(\alpha^2 + 2\alpha + 2\gamma + 2\alpha\gamma + 1)}{(2\alpha n + 2\gamma n + 4\gamma + 4\alpha\gamma n + n + 1)^2} - \frac{10m^2(\alpha + 2\gamma + 1)(\alpha + 2\alpha\gamma + 4\gamma^2 + 4\gamma + 1)}{(2\alpha n + 2\gamma n + 4\gamma + 4\alpha\gamma n + n + 1)^2} \quad (15)$$

This term can be positive, as Figure 6 shows for a market of three, as in the experiment.

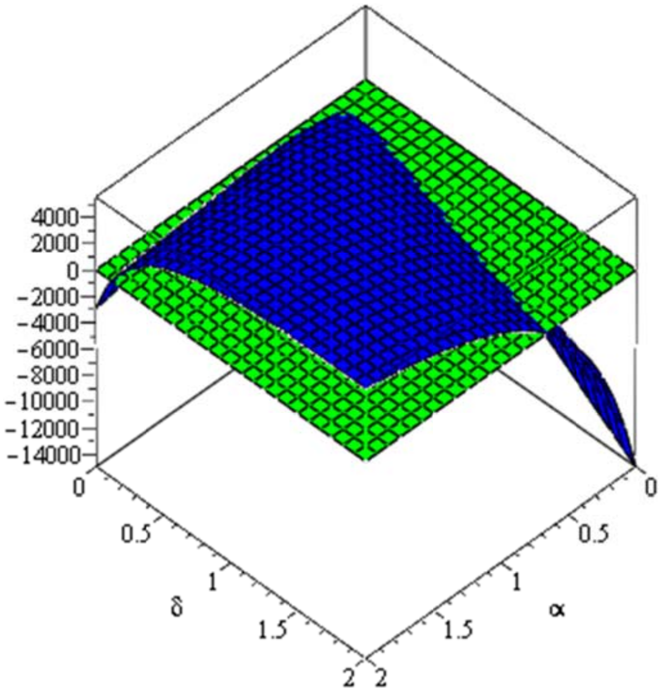


Figure 6
Room for Trade in Negotiations over Buyout

Seemingly once all individuals hold social preferences, there is room for a buyout. Yet this analysis neglects another social comparison problem: the incumbent making the deal must pay the price for the buyout and thus, in equilibrium, falls behind the other incumbent. As a result, the utility from the deal is reduced by $(1 + \alpha)p$. This reduces willingness to pay to

$$WTP_i = \frac{10}{n^2(1+\alpha)}m^2 - \frac{10m^2(\alpha + 2\gamma + 1)(\alpha^2 + 2\alpha + 2\gamma + 2\alpha\gamma + 1)}{(2\alpha n + 2\gamma n + 4\gamma + 4\alpha\gamma n + n + 1)^2(1+\alpha)} \quad (16)$$

which is smaller than unchanged WTA_e (the last term of (14)). That is, there is no room for trade in this model either. However, as in the previous model, WTP_i is increasing in the entrant's rivalry parameter γ:

$$\frac{\partial WTP_i}{\partial \gamma} = \frac{40m^2(\alpha + 2\gamma + 1)(2\alpha^2 n + \alpha n + 2\alpha + 1)}{(2\alpha n + 2\gamma n + 4\gamma + 4\alpha\gamma n + n + 1)^3} > 0 \quad (17)$$

Appendix II: Instructions

Instructions: First Session

General Instructions

Thank you for taking part in our experiment. From your invitation you already know that the experiment is in two parts. These instructions explain the first part of the experiment, taking place today. We will pay you your earnings from today's part of the experiment at the end of today's session. However, it is very important for our experiment that you also participate in the second session.

You can earn money in this experiment. How much you earn depends on your decisions and the decisions of other participants. Your earnings will be paid to you in cash at the end of the experiment.

Please switch off your mobile phone now, and please do not communicate any longer with the other participants as of this moment. Should you have a question about the experiment, please raise your hand. We will come to you and answer your query.

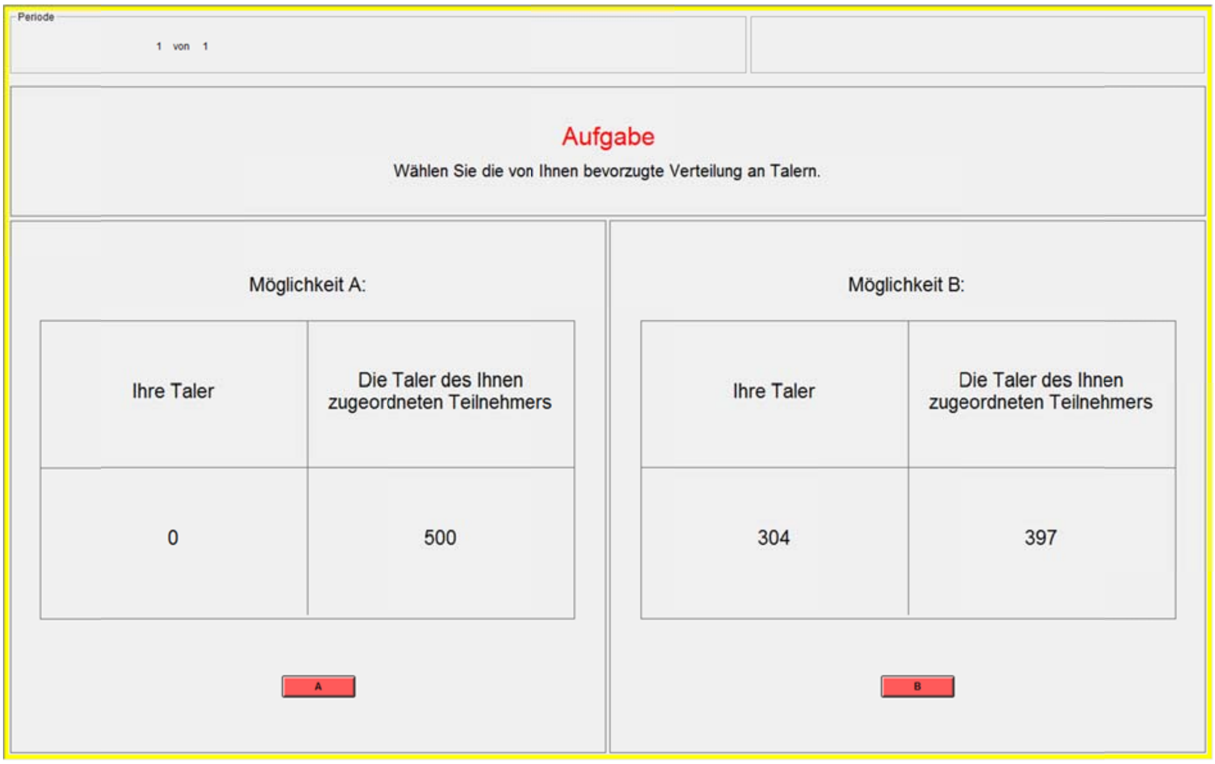
Today's part of the experiment consists of different sections. In these instructions, we explain the first section. For the following sections, you will find your instructions on the screen in front of you.

In order for us to keep track of your performance in the second part of the experiment, we would ask you please to generate an identification code at the end of the experiment, and to enter this code on your computer screen. We will use this identification code to connect your data from the first and second parts of the experiment. At no time do we know your name or address. Only the laboratory administration has that information. However, the laboratory administration does not know your decisions. This way we can ensure that **anonymity is guaranteed at all times**. Please write down this number and bring it with you when you are invited to the second experiment. At the beginning of the the second experiment, we will ask you to enter this number on your computer screen. **If you enter the wrong number, you cannot take part in the second experiment. Therefore, please check whether you have made a note of the correct number.**

First Section

We are now going to ask you to make several decisions. For this to happen, you will be randomly matched with another participant. You can allocate Taler to this participant and to yourself in the course of several distribution decisions. In order to do this, you will have to choose repeatedly between two distributions, X and Y (e.g., distribution X: 10 Taler for yourself and 12 Taler for the other player; and distribution Y: 8 Taler for yourself and 20 Taler for the other player). The Taler you allocate to yourself are paid out to you at the end of the experiment, at a rate of **100 Taler = 1 €**. At the same time, you are also randomly matched with yet another experiment participant who, in turn, can allocate Taler by way of distribution decisions. This participant is **not the same** as the one to whom you can allocate Taler. The Taler allocated to you are also transferred to your account and paid out to you at the end of the experiment, at a rate of 100 Taler = 1 €.

The individual decision tasks will look like this:



[translation of screenshot

Period 1 of 1

Task

Please choose your preferred distribution of Taler.

Possibility A

Possibility B

Your Taler

The Taler of the participant matched with you]

Instructions: Second Session

General Instructions

Welcome to the experiment! This is the second part of the experiment. The first part took place a few days ago. We would like to thank you for showing up once again. Please enter your identification number on your screen now. Let us remind you that we will not connect this number with your name and your address. You will therefore remain anonymous for both today's experiment and the earlier one. Your number will be used exclusively to relate your decisions from both experiments to you.

You can earn money in this experiment. How much you earn depends on your decisions and the decisions of other participants.

Please switch off your mobile phone now, and please do not communicate any longer with the other participants as of this moment. Should you have a question about the experiment, please raise your hand. We will come to you and answer your query.

This experiment is in three parts. You will find the instructions for the first part below. The instructions for the following parts will be handed out to you after the respective previous parts have been completed. As we will explain to you later on, participants can take on different roles in the course of the experiment.

Each of these parts consists of several rounds. All rounds of all parts are payoff-relevant. In this experiment, we use the Experimental Currency Unit ECU. All sums in ECU are always rounded off to whole numbers. At the end of the experiment, the

sum of all ECU contributions is converted into Euro at a rate of **2000 ECU = 1 €.** The converted sum will be paid to you in cash at the end of the experiment.
You will remain in a group of three participants for the duration of the entire experiment. The constellation of the group does not change.
All decisions in this experiment, as well as the payoffs at the end, remain anonymous. Please do not discuss these with any of the other participants, even when the experiment has ended.

Instructions: First Part
CAUTION: One-third of the participants pauses in this part of the experiment and will not continue until the second part. However, these participants are also informed about what is happening. We will inform you at the beginning of the experiment about the role you have in the first part.
This part of the experiment consists of 10 rounds. In each round, two participants are actors in a market. Both participants produce an identical product at no production costs. At the beginning of each round, each producer chooses the amount he or she wishes to produce. The market price (*P*), at which each unit is sold on the market, depends on the total amount (*Q*) produced by both participants. The market price is calculated as follows:

$$P = \begin{cases} 100 - Q & \text{falls } Q < 100 \\ 0 & \text{sonst} \end{cases}$$

This means, first of all, that both producers receive the same market price for their amounts. Secondly, the higher the total amount *Q* is that both producers sell, the lower is the market price. As of a total amount of 100, the market price equals zero.
For each of the two producers, the payoff for the round is his or her chosen production amount, multiplied by the market price. The total payoff for this part of the experiment is the sum of all individual payoffs per round.
After each round, you will receive feedback on the amount the producers have chosen in total, on the market price, and on your earnings.

Instructions: Second Part

This part of the experiment consists of a 10-round market, just like the first part. The only difference now is that there is a further producer, in addition to the two "*older*" *producers*. The "*new producer*" has paused in the first part of the experiment, but received the same instructions as the two other producers, for the purpose of information. In addition, this new producer has also been informed about the market prices and amounts of the past ten rounds, concerning the group this new producer has joined.
Apart from the fact that there are now three producers, nothing else changes. As before, the market price is calculated for all three producers – the two old and the new – using the same formula:

$$P = \begin{cases} 100 - Q & \text{falls } Q < 100 \\ 0 & \text{sonst} \end{cases}$$

This means all three producers receive the same market price *P* for their amounts, and that the market price that can be attained falls proportionally to the total amount *Q* rising.

Instructions: Third Part

This part of the experiment consists of a further continuation of the market by an additional ten rounds. However, both the two old producers who were active in the first part and the new producer who joined the market in the second part have the opportunity to negotiate a possible departure of the new producer from the market. Negotiations are conducted according to the following rules.
Independently of the second producer, each of the two old producers names a *maximum* price figure, in ECU, which he or she would pay the new producer if this producer were prepared, in return, to quit the game for the additional ten rounds. However, the highest possible price that the two old producers can name is the figure you have earned in the first two parts of the experiment.
At the same time, the new producer names a figure *B* (in ECU), beginning with which he or she is willing to forfeit participation in the additional ten market rounds.
Then, one of the two offers made by the old producers is chosen randomly, with each offer having a 50-percent chance of being chosen. There are two possibilities:

- If the maximum offer *A* of the old producer who has been chosen is at least as high as the new producer's demand *B*, then the old producer who has been chosen pays the new producer demand *B*. (Offer *A* hence describes the chosen old producer's *maximum* willingness to pay; usually, less is paid.) Then, the additional ten market rounds take place *without* the new producer – as in the first part of the experiment.

- If the maximum offer *A* of the old producer who has been chosen is smaller than the new producer's demand *B*, then the additional ten market rounds take place *with* the new producer – as in the second part of the experiment. In this case, there is no exchange of any payment between the chosen old and the new producer.