

# Pricing and Trust

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## Abstract

We experimentally examine the effects of flexible and fixed prices in markets for experience goods in which demand is driven by trust. With flexible prices, we observe low prices and high quality in competitive (oligopolistic) markets, and high prices coupled with low quality in non-competitive (monopolistic) markets. We then introduce a regulated intermediate price above the oligopoly price and below the monopoly price. In monopolies volume increases and so does quality, such that overall efficiency is raised by 50%. Somewhat surprisingly, the same pattern emerges in oligopolies. In fact, across all market forms transaction volume and traded quality are maximal in regulated oligopolies.

## Keywords

Markets; Price competition; Price regulation; Reputation; Trust; Moral hazard; Experience goods

## JEL Classification Codes

C72, C90, D40, D80, L10

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## 1. Introduction

Buyers of an experience good are uncertain about its quality before they buy, but learn (or experience) the good's quality after having bought and consumed it. Experience goods cover the broad middle ground between the extremes of goods involving no quality uncertainty at all (so-called inspection or search goods) and goods for which quality is not fully revealed even after the consumption (credence goods). Whenever contracts for the exchange of a good are incomplete and sellers have leeway to shade its quality about which the consumer finds out only if it is too late, the good in question is an experience good. Hence, many are.

A key role in markets for such goods is assumed by *trust*. Buyers may buy an experience good if they trust sellers to provide high quality, and will abstain if they do not. In other words, trust *induces* the demand for experience goods. In contrast, lack of trust impedes mutually advantageous transactions and results in low market efficiency.

We experimentally examine the effects of flexible and fixed prices in markets for experience goods. To the best of our knowledge ours is the first study to investigate the role of prices and competition for trust and market outcomes. We study two types of markets, monopolies and four-firm oligopolies. In both cases, buyers can observe previous histories of sellers (their reputations) and the chosen or exogenously set price before they make their decisions.

With flexible prices, we observe low prices and high quality in competitive (oligopolistic) markets and high prices coupled with low quality in non-competitive (monopolistic) markets. We then introduce a regulated intermediate price roughly halfway between the observed oligopoly and monopoly prices. In monopolies trade volume increases and so does the quality of traded goods. Both effects together imply a rise in efficiency of around 50%. Somewhat more surprisingly, the same effects occur when we introduce the regulated intermediate price in oligopolies. In contrast to standard intuition, demand does not fall in reaction to the price increase and quality rises even further, rendering the regulated oligopoly the most efficient market by far.

This slightly counterintuitive effect of price regulation can be explained as follows. Under unregulated Bertrand competition prices fall to a level where buyers do no longer mind that much to buy a "lemon". Consequently, buyers in unregulated oligopolies are rather careless. If, on the other hand, higher prices are exogenously imposed, buyers are forced to

pay more attention to reputations as buying from a low-quality firm does hurt them now substantially. In addition, with regulated prices firms lose one of their two “marketing instruments”. The only dimension they can now compete in is quality. Thus, there are, both, demand- and supply-induced forces that push up quality. In unregulated oligopolies almost 20% of all traded goods are lemons (despite an accurate eBay-style feedback mechanism that allows all buyers to track the entire history of all sellers). With price regulation the lemon share falls to just 6%. This increase in quality more than offsets the increase in price such that the trade volume is higher despite the higher price.

Thus, we find that price regulation fosters trust in markets for experience goods in rather subtle ways. The causal chain in monopolies has only two simple steps. There, a lower regulated price increases demand. Given this increase in demand it now becomes more costly for monopolists to lose the trust buyers place in them and, consequently, they supply higher average quality. The channel through which regulation fosters trust in oligopoly is more complex. Here, the direct effect of regulation is that buyers become more selective. This increased sensitivity to reputations increases trustworthiness which, finally, increases trust.<sup>1</sup>

Our finding highlights reasons for why demand may not be downward sloping in markets that suffer from informational deficiencies. In the markets we implement, these deficiencies induce moral hazard but similar mechanisms may operate in case of adverse selection. Regulation may directly aim at removing such deficiencies (for example by introducing standardization, certification, or watch dogs) but in many cases such direct regulation may be very costly. Price regulation is much cheaper to implement, administer and enforce than most other alternatives. Yet, as we see here, it can be very effective.

Our study is the first experimental investigation into the relation of trust, competition, and the role of prices. While there is a sizeable literature on trust games investigating how different institutional features (such as feedback or enforcement mechanisms<sup>2</sup>) impact on levels of trust, our previous paper (HUCK, RUCHALA, and TYRAN (2006)) is the first to examine the impact of choice of trading partners on trust. The present paper can be seen as

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<sup>1</sup> This complex relation between price, quality and trust is at the core of an interesting book in the management literature (SAKO (1992)) comparing inter-firm relations in Britain (low price, low trust, low quality) and Japan (high price, high trust, high quality).

<sup>2</sup> See, e.g., KESER (2002), BOLTON, KATOK, and OCKENFELS (2004), BOHNET and HUCK (2004), BOHNET, HARMGART, HUCK, and TYRAN (2005) and FEHR and ZEHNDER (2004). There is also a related field experiment by Jin and Kato (2005) who investigate the relation of price and quality in a market with a reputation system

introducing the second element of competition into the trust game framework, that of price choice.

There is a small experimental literature on price controls in other types of markets. ISAAC and PLOTT (1981) study double oral auctions and find that the standard partial equilibrium model predicts the effects of price controls remarkably well if the price control (ceiling or floor) is binding. For non-binding controls (which according to the model should be neutral) they do, however, find some unpredicted effects: price ceilings slightly above the competitive equilibrium price lower the actual market price, price floors slightly below the competitive equilibrium price increase the actual market price. Similar findings are reported by SMITH and WILLIAMS (1981) who also study the dynamic response to the removal of price controls, and for posted-offer markets by COURSEY and SMITH (1983). More recently, DUFWENBERG, GNEEZY, GOEREE, and NAGEL (2007) report how the introduction of a binding price floor in a Bertrand duopoly, somewhat perversely, decreases actual prices. All of these studies examine, however, markets for inspection goods of known quality such that there are no informational asymmetries that would hinder market performance.

The paper that is perhaps most closely related to ours is BROWN, FALK, and FEHR (2004) who study endogenous relational contracts in markets that rely on gift-exchange and, thus, suffer from moral hazard.<sup>3</sup> They observe the endogenous emergence of long-term relations with generous rent sharing and high effort. There are, however, a number of crucial differences between their study and ours. First, in their study prices are always endogenous which prevents them from identifying the separate effects of the two elements of competition, freedom of choice and endogenous prices. Second, there is no random matching benchmark as agents' matching is *always* endogenous. This would correspond to having only oligopoly treatments in our study. Third, agents from both market sides have to form *pairs* which removes an important aspect of competition in many markets, namely competition for market shares.

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similar to ours. However, the focus of their study is to investigate the role of advertisement (quality claims about baseball cards) and prices. In our market, sellers could not advertise product quality.

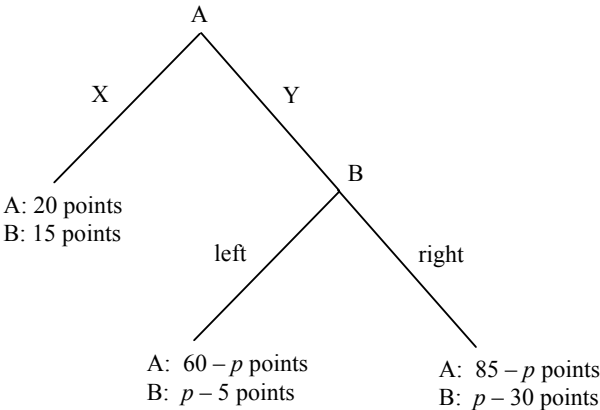
<sup>3</sup> A similar study for search goods can be found in KIRCHSTEIGER, NIEDERLE, and POTTERS (2005).

**2. Experimental design, procedures and a little bit of theory**

Figure 1 shows the basic game used in all treatments of the experiment, a binary trust game with a price  $p$ . This game is a stylized representation of a situation in which a buyer has to decide whether or not to buy an experience good the quality of which is chosen by the seller after the buyer’s choice. In case the buyer decides not to buy the good (move “X” in Figure 1) we assume that he buys a simple item of known quality (an inspection good) that all sellers carry in their shops, just so that he does not leave empty-handed. This results in payoffs of 20 for the buyer and 15 for the seller. This simply captures the idea that for a seller it is always good to attract a buyer to his shop even if the buyer does not choose the more expensive experience good. As we will see this is particularly important in the competition case where a seller’s worst nightmare is an empty store which gives a zero payoff. While the inspection good provides a low but certain payoff, the payoff from the experience good can be high but is uncertain because it depends on the seller’s choice of quality. While we effectively assume that the price of the inspection good is fixed (say, due to perfect competition in that market) the price,  $p$ , of the experience good is, in principle, flexible but will be regulated in some treatments.

In Figure 1, if the buyer decides to trust the seller (move “Y”), the seller can choose between low quality (move “left”) and high quality (move “right”). Delivering low quality is more profitable for the seller (due to lower costs) but harms the buyer. The buyer in fact prefers not to buy the experience good at all over buying a low-quality good as long as the price is not below 40 (which we rule out in our experiment).

**Figure 1:** A trust game with a variable price  $p$



In all our experiments there are four sellers and four buyers who interact over 30 periods. To implement monopolistic markets we randomly assign buyers to sellers. Each buyer is assigned with probability  $\frac{1}{4}$  to each seller which implies that sellers can have multiple (or no) buyers in any given period. In oligopolistic markets buyers choose sellers, knowing each seller's price. In markets with endogenous prices, prices are chosen by sellers at the very beginning of each period. In treatments with a regulated price this price-setting stage is simply omitted.

**Table 1:** Treatments in the 2x2 design

		<i>partner choice</i>	
		<i>no</i>	<i>yes</i>
<i>price choice</i>	<i>no</i> ( $p = 55$ )	<i>MON-REG</i>	<i>OLI-REG</i>
	<i>yes</i> ( $40 \leq p \leq 85$ )	<i>MON-FREE</i>	<i>OLI-FREE</i>

We implement a 2x2 design. Table 1 gives an overview of the treatments. In MON-FREE there is random matching and (monopolistic) sellers freely choose a price from a range between 40 and 85. In OLI-FREE matching is endogenous, i.e., buyers choose sellers once sellers have chosen their prices, again with  $40 \leq p \leq 85$ . In MON-REG matching is random again but now the price is exogenously fixed to  $p = 55$ . Finally, in OLI-REG matching is endogenous but the price is again fixed to  $p = 55$ .

We recruited 288 participants, mostly students from various fields, via the internet.<sup>4</sup> Upon arrival subjects were provided with written instructions and randomly assigned to cubicles in the laboratory.<sup>5</sup> Each subject only participated in one session and we made sure that no subject had participated in other related trust studies. The instructions employed neutral language, avoiding terms like “trust”, “trustworthiness”, “buyer”, “seller” and “price”. Buyer and sellers were simply called “A”-participants and “B”-participants, respectively. Decisions were labeled as in Figure 1. In treatments with endogenous price choice “B”-participants decided upon a “number  $p$ ” at the beginning of each round. Several control questions were included at the end of the instructions to ensure that the participants understood the game. The experiment started after all participants had answered all the control questions correctly and there were no further questions regarding the game. Subjects

<sup>4</sup> We used GREINER's (2004) *ORSEE*.

were randomly and anonymously matched into groups of eight and were randomly assigned one of two roles: four participants took the role of buyers and four participants the role of sellers. Additionally, to identify participants over rounds, buyers and sellers were randomly assigned a number between one and four. The role and the number were communicated to subjects via the first computer screen. Matching groups of eight, roles, as well as assigned numbers stayed constant throughout the entire experiment.

For each treatment we have nine independent matching groups with eight subjects each. Sessions lasted on average between 60 and 90 minutes including instruction time. Participants received a lump sum depending on their role in the experiment.<sup>6</sup> During the experiment payoffs were given in points which in the end were changed into Euro by a previously known exchange rate of 0.015 Euro per point. All subjects were paid anonymously.

As mentioned before, in the FREE treatments sellers chose a price  $p$  at the beginning of each period. Prices were displayed to all buyers and sellers.<sup>7</sup> Following this, depending on the matching procedure, buyers were either randomly assigned to a seller or chose one. After that they chose between “X” or “Y”. Then sellers learned how many buyers were matched with them as well as how many of those also decided to buy the experience good. Note that the outside option of 15 is paid to a seller if he is first matched with a buyer who then decides not to buy the experience good, while the seller’s payoff is zero if no buyer is matched with him.<sup>8</sup> Then finally, given a seller had at least one buyer of the experience good, the seller had to decide between “left” and “right” – and this decision determined the quality sold to all his buyers, i.e., sellers could not discriminate between different buyers (who they could not identify anyway).

At the end of each period, buyers who decided to buy the experience good were reminded of the respective price  $p$  and informed about the choice their seller had made as well as about the resulting payoff. Sellers were simply reminded of their price  $p$  and of the number of buyers who bought the experience good from them, their own choice and the resulting

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<sup>5</sup> A translation of the instructions is given in Appendix A. The original text was written in German and is available from the authors on request. The experimental software was programmed in FISCHBACHER’s (2007) z-Tree and the experiment was run in the experimental laboratory at the University of Erfurt.

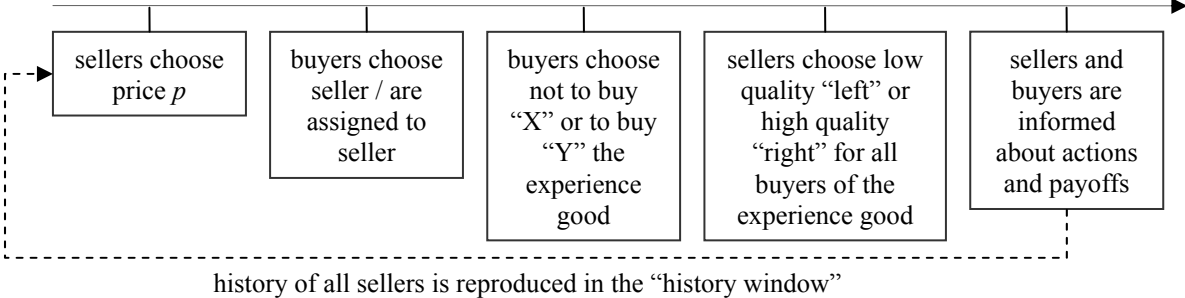
<sup>6</sup> While buyers received 150 points, sellers received 330 points. A higher lump sum fee for sellers was paid in order to provide a suitable payoff for sellers who did not very often interact with buyers.

<sup>7</sup> We kindly asked subjects to note the respective number  $p$  on a provided blank for all buyers in all rounds.

<sup>8</sup> Remember that even if a buyer might not trust the seller with the experience good, the seller has also an inspection good to sell which the buyer buys.

payoff.<sup>9</sup> The sequence of the game with price competition is displayed in Figure 2; without price competition, of course, the first stage is missing, i.e. sellers did not get to choose the price  $p$  at the beginning of the game.

**Figure 2:** Sequence of the game with price competition



In all treatments the same feedback information is provided: all subjects (buyers and sellers) have access to the entire history of the population game, i.e. there is a “history window” which visualizes past decisions of sellers with respect to quality levels. This simple graphical tool contains four columns of different colored hash (#) signs, each column representing one seller and each row representing one period. Originally, each column consists of thirty *white* hash signs, white representing the not-yet-reached future. Then, following a given color code hash signs changed their color according to what happened in the game: a hash turned *black* if a seller did not have a buyer; a hash turned *red* if a seller had at least one buyer and chose low quality; finally, a hash turned *green* if a seller had at least one buyer and chose high quality.<sup>10</sup> Additionally, in case of the colors red or green, hash signs were followed by a number showing how many buyers had bought the experience good from this seller. A sample screen shot for buyers and sellers respectively is shown in Appendix B.

For the one-shot game theoretical predictions do not depend on whether or not there is competition. With a fixed price all sellers will choose “left” if the subgame is actually reached. This will be anticipated by buyers who will choose the outside option “X”. With a flexible price a monopolist would, of course, try to extract as much rent as possible but he cannot raise the price above 40 without losing the custom of the buyer. The subgame perfect equilibrium prediction is, hence, that the seller will choose  $p = 40$ , the buyer will choose “Y,” and the seller will, finally, pick low quality by playing “left.” With Bertrand competition the price would be driven down to  $p = 5$  but in order to ensure better comparability between the

<sup>9</sup> Note that sellers who interacted with more than one buyer received a payoff from each interaction.



treatments we cut the possible price range at the monopoly level. This makes also sure that the nature of the subgame, after the price is determined, is identical in all games: With a price (weakly) above 40 the subgame remains a trust game where the buyer has to think about whether or not he really wants to purchase the good. With prices below 40 the nature of the subgame would crucially change since buyers would then prefer to buy the good regardless of its quality. The bottom line is that the theoretical predictions for the one-shot game are identical for both, monopoly and oligopoly. And this is true under both price setting mechanisms. The one-shot theory predicts that it only matters whether the price is exogenous or endogenous – whether there is competition via endogenous matching or not is irrelevant.

In finitely repeated games, the predictions remain the same. In case of exogenous prices all Nash equilibria predict no trade; in case of price competition all trembling-hand perfect equilibria predict low-quality trade at a price of  $p = 40$ .

Of course, these predictions are rather naïve in that they assume that all subjects are fully rational selfish money maximizers and have common knowledge of this fact. As such they just provide a simple benchmark helping to organize some basic facts. More realistic models would allow for incomplete information and reputation building or for the presence of some behavioral types. In such environments competition can easily make a difference as sellers would compete for custom not only via price but also via their reputations (in the REG treatments *only* via their reputations). The extent to which market outcomes would react to the presence of behavioral types and incomplete information would, of course, depend on the precise details of a model. Our results below document the *actual* impact of changes in market structure on market outcomes. They should be useful to inform future theoretical modeling.

### 3. Experimental Results

#### *Aggregate data*

Table 2 summarizes the data from our experiment. The upper part of the table reports average posted prices, trust rates (the average share of trade), quality (the average share of high-quality among traded goods) and efficiency (the average share of buyer-seller pairings that

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<sup>10</sup> Our color coding is purposely suggestive. It serves the purpose of making the complex history window easily

resulted in high quality trade).<sup>11</sup> The lower part of the table reports tests for significance of price regulation and competition. These MWU tests use market-level averages over 30 periods (i.e. 9 observations per treatment) as a unit of observation.

Notice first the highly significant and substantial effect of endogenous matching. Both oligopoly treatments vastly outperform the monopolies, roughly tripling efficiency rates. This boost is driven by, both, higher average quantity and quality. In addition, average prices are much lower with competition (47.06) than without (59.60).

Similarly clear effects are observed with respect to regulation. In both market forms, price regulation improves performance. In MON, price regulation boosts trust from 36% to 51%, quality from 60% to 73% and efficiency from 22% to 37%. In OLI, a similar picture arises. Trust increases from 85% to 90%, quality from 80% to 94%, and efficiency from 68% to 85%. As can be seen in the bottom part of the table, all these effects are statistically significant with the exception of the demand effect in the oligopoly treatments.

How do all these effects translate into payoffs for buyers and sellers? Figure 3 shows buyers' and sellers' earnings averaged over all periods in the four treatments. Forcing up prices by regulation in a competitive market harms buyers (their average incomes fall by 21%, from 1058 to 831), but benefits sellers (their average incomes increase by 50%, from 504 to 758). In contrast, forcing prices down by regulation benefits both buyers and sellers in non-competitive markets (MON). Buyer incomes increase by 6%, and, surprisingly, seller incomes also increase by 9%.<sup>12</sup> Figure 7 also shows that, quite remarkably, the regulated oligopoly is the most profitable market institution for sellers, while it is perhaps less surprising that Bertrand competition is best for buyers.

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to read. Of course, their might have been problems with color-blind subjects but fortunately there were none.

<sup>11</sup> Note that, as long as the buyer trusts, the sum of payoffs is maximal. Only the distribution of payoffs depends on the sellers' quality choice. But, crucially, the outcome after (Y, left) is not *individually rational* as the buyer would prefer X. Hence, we shall in what follows refer to (Y, right), the outcome with successful trade, as "the efficient outcome" (short for "the individually rational efficient outcome").

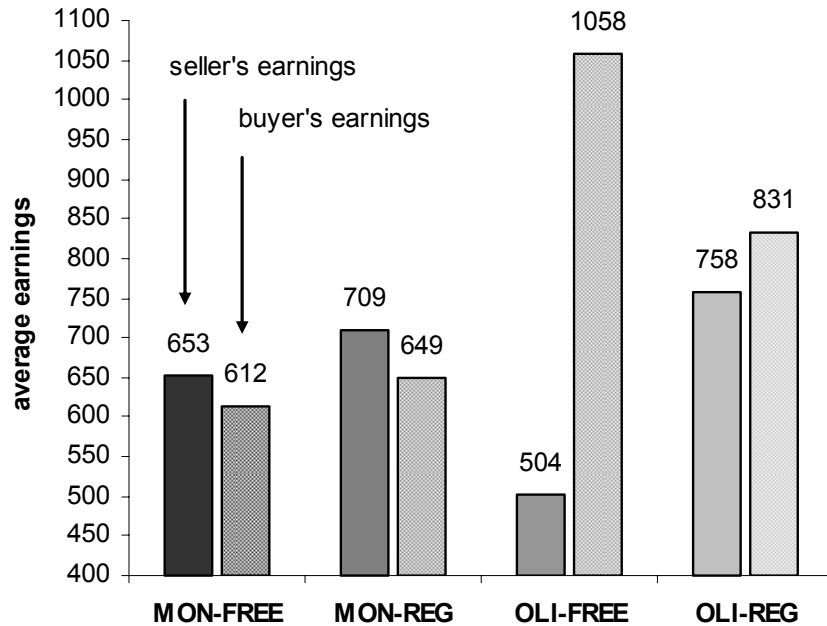
<sup>12</sup> The increase for buyers and sellers is, however, not significant in a monopolistic market (Mann-Whitney U-tests: for buyers 0.340 and for sellers 0.113, two-tailed). The change in buyer and seller payoffs in an oligopolistic market, on the other hand, is (Mann-Whitney U-tests: for buyers 0.001 and sellers 0.002, two-tailed).

**Table 2:** Overview of aggregated results

	Price	Trust / Quantity	Quality <sup>13</sup>	Efficiency
<i>MON-FREE</i>	59.60 (2.50)	0.36 (0.19)	0.60 (0.27)	0.22 (0.20)
<i>MON-REG</i>	55.00 [n.a.]	0.51 (0.16)	0.73 (0.16)	0.37 (0.19)
<i>OLI-FREE</i>	47.06 (5.99)	0.85 (0.16)	0.80 (0.23)	0.68 (0.26)
<i>OLI-REG</i>	55.00 [n.a.]	0.90 (0.07)	0.94 (0.03)	0.85 (0.07)
effect of price regulation				
<i>MON-FREE – MON-REG</i>	<i>n.a.</i>	$p = 0.039$	$p = 0.081$	$p = 0.047$
<i>OLI-FREE – OLI-REG</i>	<i>n.a.</i>	$p = 0.423$	$p = 0.031$	$p = 0.083$
effect of competition				
<i>OLI-REG – MON-REG</i>	<i>n.a.</i>	$p = 0.000$	$p = 0.000$	$p = 0.000$
<i>OLI-FREE – MON-FREE</i>	$p = 0.000$	$p = 0.000$	$p = 0.016$	$p = 0.001$

Standard deviations are given in parentheses. Treatment effects are tested by one-tailed Mann-Whitney U-tests.

**Figure 3:** Average earnings over all periods



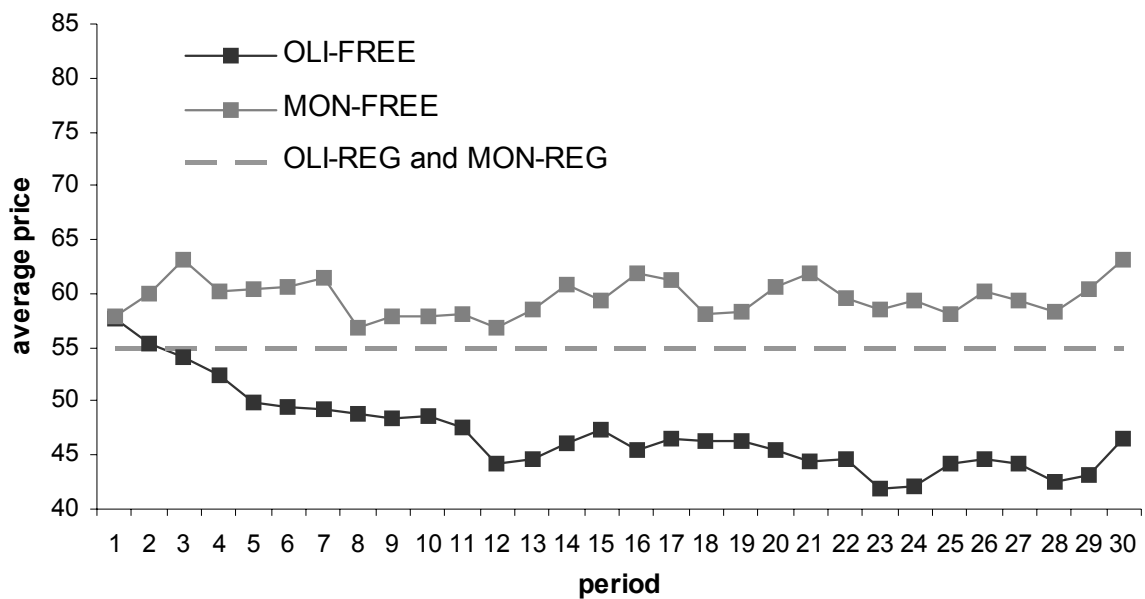
<sup>13</sup> The reported quality corrects for the number of interactions a seller had in a period. Thus, if a seller had  $n \leq 4$  buyers his quality choice enters the average  $n$ -times. If one considers each seller's decision only once following average qualities are obtained: MON-FREE 0.58, MON-REG 0.73, OLI-FREE 0.78, and OLI-REG 0.94.

*Market measures over time*

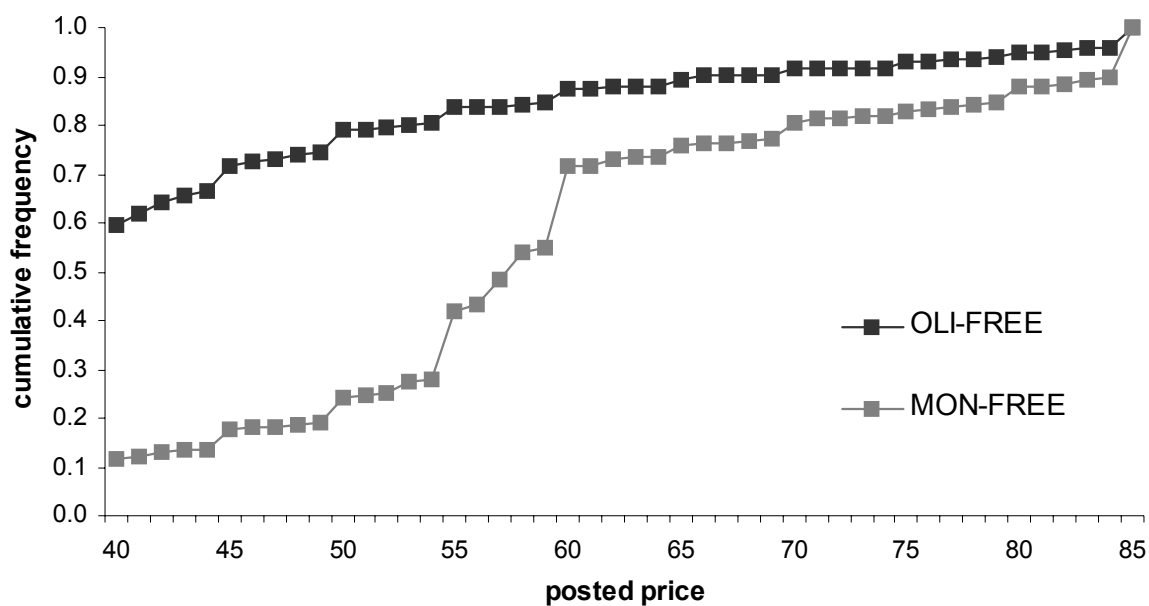
Figures 4a and 5 to 7 show how the measures of Table 2 behave over time. Additionally, Figure 4b shows the distribution of posted prices in treatments with FREE price choice.

Figure 4a shows posted prices averaged over all 9 markets in the two treatments with FREE price choice along with the regulated price of 55 as a benchmark. Competition unfolds its effect in OLI-FREE only over time. Over the first 12 periods, posted prices continuously fall from 57.67 to around 45, and then remain close to this value for the rest of the periods. While prices start out at the same level in MON-FREE as in OLI-FREE, they remain at high levels. The average price in MON-FREE is 59.60 and in OLI-FREE it is 47.06 over all periods. Therefore, the regulated price is about 8% below the average posted price in MON-FREE, and about 22% above the convergence price of 45 in OLI-FREE.

**Figure 4a:** Average posted price in treatments with FREE prices



**Figure 4b:** Cumulative distribution of posted prices in treatments with FREE prices



On average, buyers were more likely to buy from sellers who posted low prices in both treatments with FREE prices. In fact, the average transaction price was 54.18 in MON-FREE and 42.85 in OLI-FREE over all periods. In the second half of the game, the average transaction price in OLI-FREE falls to 40.76 with a small standard deviation of 1.35. This illustrates how intense price competition was in OLI-FREE.

Evidence of the intensity of price competition in OLI-FREE also comes from a comparison of the cumulative distribution of posted prices with MON-FREE (see Figure 4b). For example, 66.57% of all posted prices are below 45 in OLI-FREE, but only 13.61% are in MON-FREE. Prices in MON-FREE are highly concentrated between 54 and 60 (more than 40% of all prices), while only few sellers (about 7%) choose prices in this range in OLI-FREE.

**Figure 5:** Average trust rates (average quantity) over time

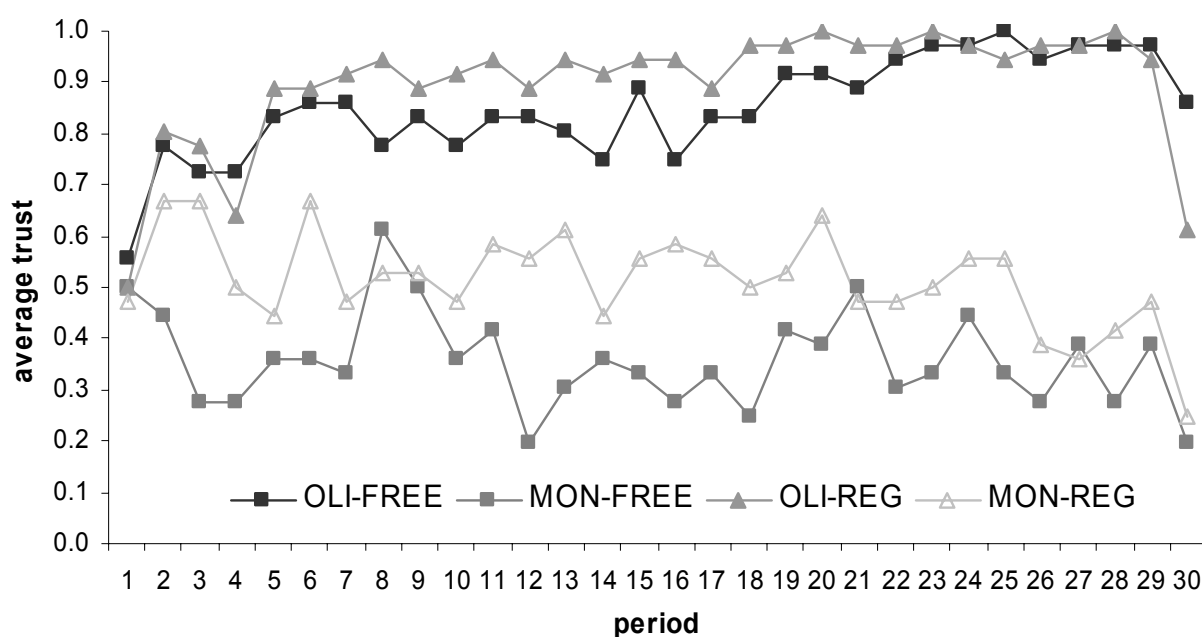
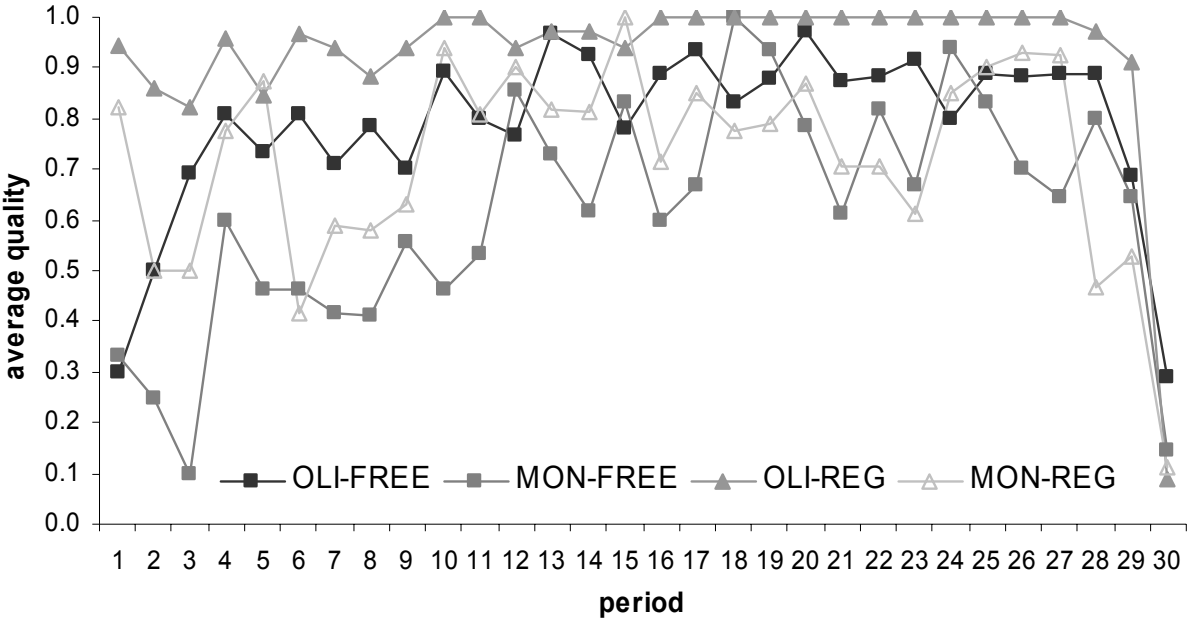


Figure 5 shows that trust rates (i.e. the average share of experience goods traded) start out at similar levels of around 50% in all treatments. While, as with prices, there are no initial differences between the treatments already after 5 periods, demand is clearly higher in the treatments where sellers compete for the business of buyers (i.e. in OLI) than in those without competition (MON), and the difference becomes more pronounced over time. In the two treatments with oligopolistic competition, trust rates approach 100% in the last third of the experiment while they hover around 30-40% in treatments without competition. Clearly, competition via reputation induces trust in the sellers.

Figure 6 plots average quality over time. In contrast to what we have seen with regard to prices and demand, there are huge initial differences between treatments. Both treatments with regulation exhibit far higher initial quality than the unregulated treatments (despite similar initial prices). How can this difference be explained? We conjecture that having just one “marketing instrument”, namely quality, makes firms much more aware of its importance. Perhaps sellers in the unregulated treatments believe that they can always compensate for a damaged reputation by lowering prices later on (which is, of course, true as the unregulated oligopoly treatment shows where prices fall to very low levels). Average quality increases in all markets over time and is higher in the second half of the experiment (up to period 28) than

in the first half.<sup>14</sup> Apparently, it takes some time for sellers to understand the value of a good reputation.<sup>15</sup> Yet, treatment effects on the levels of quality are substantial even if we average over all 30 periods (see Table 2). The most stable treatment is OLI-REG. Remarkably the nine regulated oligopolies have average qualities of exactly 100% over almost all periods in the second half of the experiment.

**Figure 6:** Average quality over time

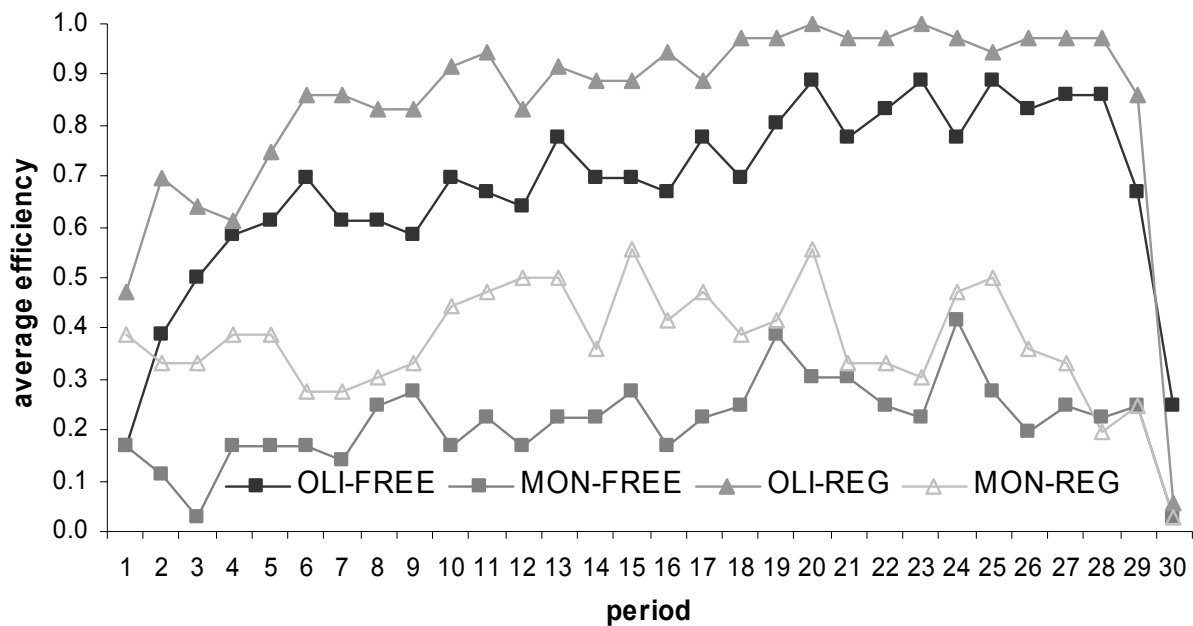


End-game effects are pronounced in all treatments which is in line with previous findings on finitely repeated games. The significance of these end-game effects is twofold. First, we see that markets do not make people more trustworthy or more trusting in general. Competition simply induces incentives for strategic behavior.<sup>16</sup> Second, the end-game effect illustrates that participants do have a proper understanding of the strategic nature of the stage game. Sellers simply stop providing high quality when it ceases to have a beneficial effect on their reputation. Remarkably, this only happens in the very last (and to some extent in the next-to-last) period.

<sup>14</sup> In OLI-REG the average quality for periods 1-15 is 0.75 and rises to 1.00 for periods 16-28. The respective values for the other treatments are: MON-FREE 0.49 / 0.77; MON-REG 0.72 / 0.78 and OLI-FREE 0.75 / 0.89.

<sup>15</sup> BOHNET, HARMGART, HUCK, and TYRAN (2005) show that many traders who initially do not understand the mechanics of reputation building benefit from observing others who do.

**Figure 7: Average efficiency over time**



Finally, Figure 7 shows the compound effects of demand and quality on market efficiency over time. There is a clear and consistent ranking of average market efficiency in the four treatments. Competitive markets outperform monopolies and price regulation improves efficiency in both types of markets for experience goods.

*Understanding the benefits of price regulation*

The most striking finding in our experiment is the beneficial effect of price regulation in oligopolistic markets. The flip side of this is the detrimental effects of price competition in these markets. Price competition is fierce in OLI-FREE and quality is significantly lower in OLI-FREE than in OLI-REG. One consequence of this price differential is that buyers can be much less cautious in OLI-FREE as receiving low quality hurts less when prices are very low as well. A further consequence of very low prices is that firms' profit margin of high-quality goods becomes dangerously low. Both forces may depress quality. But why is price competition so fierce in OLI-FREE in the first place? And why is there not more competition via quality? The reason, it turns out, is that buyers seem to pay much more attention to prices than to reputations when firms compete in both. One possible reason for this is that prices are less noisy than reputations. While the posted price cannot be changed, a good reputation is no

<sup>16</sup> BOHNET, FREY, and HUCK (2001) report data from a finite-horizon trust experiment where trustworthiness reaches its maximum in the very last period. A conjecture is that this is driven by the public *aggregate* feedback



guarantee of high quality, In any case, a more detailed analysis shows that buyers are reluctant to trade-off higher prices against higher reputations. In 85.34% of all cases buyers buy in OLI-FREE from the seller with the lowest price, while only 57.55% of all goods were bought from the seller with the best reputation.<sup>17</sup> (As the numbers indicate, it happened quite often that the seller with the lowest price also had the best reputation, namely in 65.46% of all cases in which buyers bought the cheapest good.)

Buyers' focus on low prices *forces* sellers to engage in cut-throat Bertrand competition. While sellers could reap some price premium of higher quality in MON, this was not the case in OLI. For example, in MON, sellers who provided high quality charged prices of 55.35 on average, while sellers who sold low quality could only charge a price of 52.55. In contrast, the high-quality sellers in OLI charged lower prices (42.42) than the low-quality sellers (44.35).

Fierce price competition in OLI-FREE is not only explained by the sale of relatively unprofitable experience goods . Posting low prices was also attractive for sellers in OLI-FREE because it helped to attract non-trusting buyers who instead of choosing a good of unknown quality preferred to buy the low-value inspection good. The profit from these buyers is also 15 (see Figure 1). Hence, at prices of 45 which are typical in much of OLI-FREE, a seller is indifferent between selling a high-quality experience good or an inspection good. In fact, we find that even buyers who decide not to buy the experience good typically buy the inspection good from the seller who posts the lowest price. It appears, thus, that buyers like the idea of fierce price competition as such. Perhaps they want to reward low-price sellers hoping that one day these sellers will also offer high quality. Alas, this hope is in vain. Of course, all this happens in an environment where average quality is with 80% pretty high. Yet, for the 20% disappointments buyers have to endure, they have nobody to blame but their own focus on price.

#### **4. Conclusion**

Competition has generally two elements: choice of trading partners and choice of price. In this paper we show that while the former is unambiguously good for market performance, the latter can be problematic in markets that suffer from informational deficiencies. In

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they provide.

<sup>17</sup> For our purpose, we define the seller who most frequently choose high quality for the experience good as the seller with the best reputation. Of course, one can think of several ways to match this characteristic.

particular, we show that in markets with experience goods (suffering from moral hazard) regulated fixed prices can outperform endogenous prices in both, monopolistic *and* oligopolistic markets. This is surprising but has, as we argued above, an intuitive reason. If both, trading partners and prices, are endogenously chosen, price competition becomes so fierce that sellers' incentives to build up pristine reputations are diminished, simply because profits from high-quality goods become too small. In other words, if consumers do not reward high quality with a willingness to pay higher prices, they should not be surprised if quality is less than perfect.

Anecdotally, our finding seems to resemble a string of recent scandals in the German meat market that was plagued by huge amounts of extremely low-quality meat (well past its sell-by date, in fact, in some cases biologically hazardous). An interesting discussion ensued with two main lines of arguments: calls for more regulation were as abundant as fierce criticism of German consumers' obsession with everything that is cheap. (In particular, when it comes to non-durables Germans tend to have a low willingness to pay. For food, for example, they spend, in relative terms, only around three quarters of what Italian consumers spend, see SEALE, REGMI, and BERNSTEIN (2003).) In the context of our stylized study both arguments appear to be valid. Clearly, we find that it is consumers' choice behavior that diminishes sellers' incentives to provide high quality. Yet, regulation can also overcome the problem.

But the intriguing aspect of our findings is that regulation needs not target quality. Of course, quality regulation constitutes one way to improve market outcomes but it is notoriously complicated and costly. Again, this is anecdotally reflected in the example of the German meat market where quality controls differ hugely between different states and there is no sign of reaching a consensus on how monitoring should be improved. Our study suggests that there might be an inexpensive yet efficient short-cut: price regulation. With higher enforced prices consumers become more careful in choosing sellers. They pay more attention to reputations and, consequently, sellers face much steeper incentives to provide high quality.

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## Appendix A: Instructions (Treatment OLI-FREE)

*(Original instructions were in German. They are available from the authors upon request. In treatments without choice of sellers A-participants were randomly assigned to one of the four B-participants. In the ones without price choice, i.e. with a regulated price, B-participants didn't have to choose a number  $p$ . There, the figure in the instructions already displayed the unambiguous resulting payoffs.)*

*Welcome to the experiment!*

*Please read these instructions carefully! Do not speak to your neighbors and keep quiet during the entire experiment! In case you have a question raise your hand! We will then come to you.*

At the beginning of the experiment you are randomly separated into **subpopulations of 8 participants**. During the experiment you solely interact with the participants of your subpopulation.

In this experiment you will repeatedly make decisions. Doing this you can earn points. Your total sum of points plus a show-up fee, which is dependent on your role in the experiment, will be converted into Euros at the end of the experiment and paid to you in cash. The show-up fee amounts to 150 points for A-participants and 330 points for B-participants. Following rule applies to the conversion of points into Euros:

$$1 \text{ point} = 0.015 \text{ €}$$

How much you earn depends on your decisions and on the decisions of other participants in your subpopulation. All participants receive the same instructions. All decisions are made anonymously. No other participant will get to know your name and your payoff.

Altogether there are (in your subpopulation) eight participants. At the beginning of the experiment all participants are randomly assigned one of two roles (**A** or **B**) which is displayed on the computer screen. There are four A-participants ( $A1, A2, A3$  and  $A4$ ) and four B-participants ( $B1, B2, B3$  and  $B4$ ). All participants keep their role and the number assigned to them throughout the experiment.

At the beginning of each round each B-participant **chooses** a **number  $p$  from 40 to 85** which is after that revealed to all A- and B-participants. This number  $p$  has an impact, as will be explained later on, on the payoffs for A- and B-participants (see also figure). Thereafter each A-participant **chooses** one of the four B-participants with whom he interacts in this period, this means that A-participants decide whether they want to interact with  $B1, B2, B3$  or  $B4$ . Therefore, a B-participant can interact with zero to four A-participants in one round. This process is repeated in the next round.

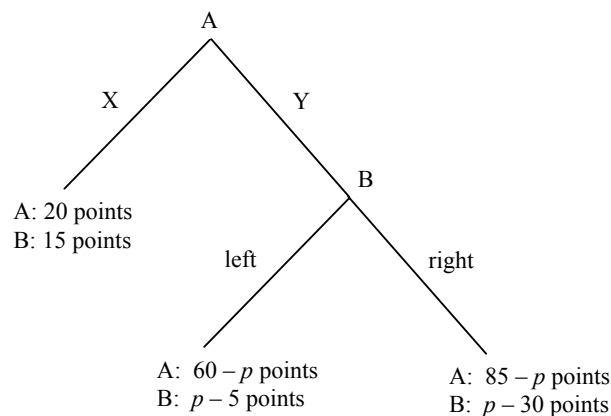
B-participants only learn the number of A-participants who chose them, but not who has chosen them.

After the A-participants have chosen the B-participants, it is each A-participants turn to make a decision. More specifically, each A-participant has to choose between option **X** and **Y** (see figure). If he picks option X, the A-participant will earn 20 points and the B-participant chosen by him will earn 15 points from this interaction. If he picks option Y, the payoffs

depend on the choice of the B-participant chosen by him who has to decide whether he wants to go “left” or “right”. If he decides to pick “left”, the A-participant will earn  $60 - p$  points and the B-participant will earn  $p - 5$  points from this interaction. If he decides to pick “right”, the A-participant will earn  $85 - p$  points and the B-participant will earn  $p - 30$  points.

If a B-participant is not chosen by at least one A-participant or if all A-participants who have chosen him picked X, he does not have to make a decision. Otherwise the B-participant additionally learns the number of A-participants who have chosen him and picked Y and has to make the **same** decision for all these A-participants, that is whether he wants to go “left” or “right” for all A-participants. A B-participant who has not been chosen by at least one A-participant earns 0 points.

Payoffs for an A-participant and a B-participant from one interaction.



(B-participants can receive payoffs from several interactions in one round.)

The experiment consists of **30 rounds**. After each round you will be informed about what has happened and you will be reminded of your payoff and your total sum of points so far.

Moreover, **all** (A- and B-) **participants can keep track of the entire history of B-participants**. For all participants there will be a screen depicting the history of all B-participants. For each round and each B-participant there will be a colored little # (hash) with a number behind.

- A **black** # indicates that the B-participant had nothing to decide because either no A-participant chose him or *all* A-participants who chose him picked X.
- A **red** # indicates that the B-participant picked “left”.
- A **green** # indicates that the B-participant picked “right”.
- The integer behind the # shows the number of A-participants who picked Y after choosing this B-participant.

Please note on the additionally distributed blank the respective number  $p$  of each B-participant which is displayed to you above the relevant column on the screen.

These are the rules. You can trust us that everything will happen exactly according to these rules. Take your time going over these instructions again and feel free to ask questions. But don't shout! Simply raise your hand.

## Appendix B: Screenshot (Example: OLI-FREE)

### A-participant's screen

Period: 18 out of 30 remaining time [sec]: 20

number p:	40	40	40	41
Round	B1	B2	B3	B4
30	#0	#0	#0	#0
29	#0	#0	#0	#0
28	#0	#0	#0	#0
27	#0	#0	#0	#0
26	#0	#0	#0	#0
25	#0	#0	#0	#0
24	#0	#0	#0	#0
23	#0	#0	#0	#0
22	#0	#0	#0	#0
21	#0	#0	#0	#0
20	#0	#0	#0	#0
19	#0	#0	#0	#0
18	#0	#0	#0	#0
17	#0	#1	#2	#0
16	#1	#0	#1	#0
15	#0	#0	#1	#2
14	#0	#1	#1	#0
13	#1	#1	#0	#0
12	#1	#0	#2	#0
11	#2	#0	#2	#0
10	#1	#0	#2	#1
9	#0	#1	#2	#1
8	#0	#0	#4	#0
7	#1	#1	#2	#0
6	#1	#0	#3	#0
5	#1	#0	#3	#0
4	#3	#0	#0	#0
3	#0	#0	#1	#0
2	#2	#0	#1	#0
1	#0	#1	#0	#1

Choose a B-participant:  B1  
 B2  
 B3  
 B4

Choose which way to go:  X  
 Y

OK

Key:  
 # Not done yet  
 # Didn't participate  
 # Went left  
 # Went right

The number next to the hash shows the number of A-participants who chose Y.

The number above each column shows the number p in the current period for the respective B-participant.

### B-participant's screen

Period: 18 out of 30 remaining time [sec]: 26

number p:	40	40	40	41
Round	B1	B2	B3	B4
30	#0	#0	#0	#0
29	#0	#0	#0	#0
28	#0	#0	#0	#0
27	#0	#0	#0	#0
26	#0	#0	#0	#0
25	#0	#0	#0	#0
24	#0	#0	#0	#0
23	#0	#0	#0	#0
22	#0	#0	#0	#0
21	#0	#0	#0	#0
20	#0	#0	#0	#0
19	#0	#0	#0	#0
18	#0	#0	#0	#0
17	#0	#1	#2	#0
16	#1	#0	#1	#0
15	#0	#0	#1	#2
14	#0	#1	#1	#0
13	#1	#1	#0	#0
12	#1	#0	#2	#0
11	#2	#0	#2	#0
10	#1	#0	#2	#1
9	#0	#1	#2	#1
8	#0	#0	#4	#0
7	#1	#1	#2	#0
6	#1	#0	#3	#0
5	#1	#0	#3	#0
4	#3	#0	#0	#0
3	#0	#0	#1	#0
2	#2	#0	#1	#0
1	#0	#1	#0	#1

You have chosen 40 as number p.

3 A-participants chose you.  
 Thereof 3 A-participants chose Y.

Choose which way to go:  left  
 right

OK

Key:  
 # Not done yet  
 # Didn't participate  
 # Went left  
 # Went right

The number next to the hash shows the number of A-participants who chose Y.

The number above each column shows the number p in the current period for the respective B-participant.