Online Appendix for "Contracting Environments and Efficiency in Markets with Hidden Information: An Experiment"

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This Online Appendix includes:

A Detailed discussion of Lemma 1

B Proof of Lemma 1

C The distribution of social preferences

D Full regression model on L-type excluding offers

E Figure: Exclusion over time for competitive *Common Values* treatments for the 3 good and 4 good treatments

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G Instructions for *PV Monopoly* and *CV Nonexclusive Competition* in the original German version and the translated English version.

A Lemma 1: Detailed Discussion

In the experiment, the prices that sellers can post are restricted to be integers. Under competition equilibria exist in which the equilibrium price is 1 above the cost, since undercutting does not increase profits in this case. In the following analysis, we will reason with cost pricing; however, everything holds for prices just above the costs.

In *PV Monopoly*, there is standard "no distortion at the top", i.e. the efficient good C for H-types is offered. In the chosen parametrization, a seller's profit from offering only good C at price $v_H^C = 120$ (thus excluding L-type buyers), is higher than the profit from offering any menu that includes either good A or good B at a price at which a L-type buyer would have a nonnegative payoff from buying either good.

Under competition, prices for each good are driven down to the cost of providing the respective good. At cost pricing, under both exclusive and nonexclusive competition, buyers of type H then maximize their payoff by choosing good C and buyers of type L maximize their payoff by choosing good B.

In *CV Monopoly*, although the costs of providing a good depend on the buyer's type, a seller's profit-maximization problem is similar to that under private values. There is standard "no distortion at the top", i.e., the efficient good C for H-types is offered. In the chosen parametrization, a seller's profit from offering only good C at price $v_H^C = 185$ (thus excluding L-type buyers), is higher than the profit from offering any menu that includes either good A or good B at a price at which an L-type buyer would have a nonnegative payoff from buying either good.

Under exclusive competition (common values), the prices for each good are driven down to the cost of providing the respective good. Good B, which is the efficient good for an L-type buyer, cannot be offered at a price at which an L-type buyer would purchase it without it also being preferred by a H-type buyer over good C even when good C is offered at cost pricing. However, pooling on B cannot be sustained, since $v_L^B < \frac{c_L^B + c_H^B}{2}$.[1] Good A can be offered at a price p^A with $p^A \in \{c_L^A, c_L^A + 1\}$ without being attractive to H-types if good C is offered at price p^C with $p^C \in \{c_H^C, c_H^C + 1\}$: The payoff of a H-type buyer from buying good A at price $c_L^A = 18$ is $v_H^A - c_L^A = 70 - 18 = 52$ which is lower than her payoff from buying good C at price $c_H^C + 1$ (which amounts to $v_H^C - (c_H^C + 1) = 54$), i.e. the menu of good C at H-type cost pricing and A at L-type cost pricing satisfies incentive compatibility.[2] As noted above, there is no profitable pooling deviation on good B; furthermore, the same is true for good C. Thus, an equilibrium exists in which H-type buyers receive good C and L-type buyers are distorted, receiving good A, and the equilibrium allocation is unique. In *CV Exclusive Competition-4*, the same as above applies. Crucially, neither good B nor good C can be offered at a price at which an L-type buyer would purchase it without it also being preferred by a H-type

[1] Note that, in adverse selection models with exclusive competition, pooling generally cannot be sustained: Due to single-crossing, a cream-skimming deviation is always possible. This is also the case here, where cream-skimming is possible with good A. However, in our parametrization there is an even simpler reason for the non-sustainability of pooling, namely the fact that the L-type's valuations are too low for a profitable pooling on good B or good C. Observe that this latter feature is chosen deliberately as it is necessary for existence of equilibrium under nonexclusive competition in the general model.

[2] With regard to the incentive compatibility for L-types, an L-type buyer's valuation for good C is lower than c_H^C.

buyer over good C even when good C is offered at cost pricing. Furthermore, there is no profitable pooling deviation on good X.

Under nonexclusive competition, in equilibrium good C must be offered at H-type cost pricing: Good C is the H-type's efficient good, and there is no pooling on goods A, B or C since L-types are not willing to purchase any good at a pooled price that does not entail losses for sellers.[3] Competition ensures that good C is always offered at H-type cost pricing. However, in contrast to *CV Exclusive Competition*, good A can not be offered in equilibrium to L-type buyers at a price at which L-type buyers would be willing to purchase good A:[4] At any such price, good B can be offered at a price that is would be profitable when taken out by H-types, and H-types would then prefer to purchase $A + B$ instead of C at H-type cost pricing. For an example, suppose that good A is offered at price $v_L^A = 30$ by some seller and good B is not offered. Then, another seller could offer good B at price $95 > c_H^B$, and H-types would receive a payoff of $v^{A+B} - 30 - 95 = 190 - 125 = 65$ which is larger than 55, an H-type's payoff from purchasing good C at price c_H^C. Thus, if good A is offered at a price at which an L-type would be willing to purchase it, either offering good B additionally would be a profitable deviation for some seller, or some H-type buyer would like to combine good A and already offered good B such that good A is loss-making. Thus, in equilibrium, H-type buyers receive good C, and L-type buyers are excluded.[5]

In treatment *CV Nonexclusive Competition-StrInc*, we slightly adapted H-type buyers' valuations for goods $A + C$ to $C + C$ such that these buyers have an incentive not only to purchase $A + B$ if B is offered, but also to purchase good $A + C$ if sellers offer good A at a price that is attractive for L-types (see *Table 4*).[6] Thus, *CV Nonexclusive Competition-StrInc* provides an even stronger incentive for sellers to exclude L-type buyers than in *CV Nonexclusive Competition.* Equilibrium predictions remain unchanged, H-types receive their efficient good C and L-type buyers are excluded. Equilibrium predictions also remain unchanged for control treatment *CV Nonexclusive Competition-4* with the same logic as for *CV Nonexclusive Competition* and *CV Nonexclusive Competition-StrInc.* The added good X even reinforces exclusion incentives again, as pivoting on an intended L-type contract can now be achieved not only with good B, but also good X, i.e. $A+X$ can be attractive to H-type buyers if A is on offer.

B Proof Lemma 1

Equilibria and Equilibrium Properties in Experimental Game.

[3]Furthermore, there cannot be pooling across sellers on combinations of goods since for any such market constellation, either a buyer type is unwilling to purchase at prices that do not entail losses for sellers, or there exists a profitable deviation by either a buyer or a seller as shown in proof of Lemma 1.

[4]The reasoning that explains why good B cannot be offered to buyers of type L is the same as under exclusive competition above.

[5]In our experimental set-up, to sustain equilibrium sellers offer good B at cost pricing. This is the equivalent, in terms of strategic logic, of latent contracts where H-types can buy any quantity at their unit costs in the continuous framework.

[6]Only valuations for goods $A+C$ to $C+C$, are modified compared to *CV Nonexclusive Competition.* The relevant modified valuation is v_H^{A+C}. The adjustments of valuations for the other 3 combinations are not strategically relevant and have been done for consistency.

Preliminaries:
Let $F := \{A, B, C\}$ and furthermore let $J := \{A, B, C, A+A, A+B, A+C, B+B, B+C, C+C\}$. With a slight abuse of notation, we will also use the same notation when referring to the corresponding sets of goods with good X for the parts pertaining to the control treatments *CV Exclusive Competition-4* and *CV Nonexclusive Competition-4*. For notational convenience, in the following cost and valuations are not indexed by private or common values experimental treatments, as these are always considered separately. The experimental parametrization satisfies:

- Costs:
  - General: For all $\theta \in \{L, H\}$, $c_\theta^C > c_\theta^B > c_\theta^X > c_\theta^A > 0$.
  - Private Values conditions: For all $i \in F$, $c_H^i = c_L^i$.
  - Common Values conditions: For all $i \in F$, $c_H^i > c_L^i$.
- Valuations (Private and Common Values):
  - For all $\theta \in \{L, H\}$, $v_\theta^C > v_\theta^B > v_\theta^X > v_\theta^A > 0$ and for all $j \in J$, $v_H^j > v_L^j$.
  - Single Crossing (w.r.t. goods A,B,C): $v_H^C - v_H^B > v_L^C - v_L^B$, $v_H^B - v_H^A > v_L^B - v_L^A$ and $v_H^A > v_L^A$.
- Efficient goods
  - Private Values: $v_L^B - (c^B + 1) > v_L^j - c^j \; \forall j \in J, j \neq B$ and $v_H^C - (c^C + 1) > v_H^j - c^j \; \forall j \in J, j \neq C$ such that good B is the efficient good for a type L buyer and good C is the efficient good for a type H buyer. Note that good B and C are the efficient goods even when the cost for the respective good is increased by 1.[7]
  - Common Values: $v_L^B - (c_L^B + 1) > v_L^j - (c_L^j + 1) \; \forall j \in J, j \neq B$ and $v_H^C - c_H^C > v_H^j - c_H^j \; \forall j \in J, j \neq C$ such that good B is the efficient good for an L-type L and good C is the efficient good for a H-type buyer.
- Incentive compatibility of the efficient allocation under Private Values:
  - $v_L^B - (c^B + 1) > v_L^C - c^C$ and $v_H^C - (c^C + 1) > v_H^B - c^B$, i.e. the efficient allocation is incentive compatible (even when prices are one above costs.)
- Profitability of undercutting:
  - To facilitate the exposition, we will introduce seller contracts here: Define seller contract $\omega = (j, x)$ where $j \in F$ and x is the integer price. Denote the profit of a seller from contract ω when taken out by a θ-type buyer by $b_\theta(\omega)$ and the payoff of a buyer from making a trade in which he buys this contract ω by $w_\theta(\omega)$.

[7]Since, as is standard in experiments, prices are restricted to be integers, this takes account of the fact that sellers may not undercut at a price $c^j + 1$.

- Under exclusive competition, $w_\theta(\omega) = v^j - x$. Under nonexclusive competition, in case the buyer has made a second trade in which he purchased good $k \in F$, we define $w_\theta(\omega) = v^{k+j} - v^k - x$, i.e. as the increase in buyer valuation from trading contract ω minus the price specified in ω.
- For both Private Values and Common Values: Observe that for any type θ, any contract ω with $b_\theta(\omega) \geq 2$ and $w_\theta(\omega) > 0$, there exists a contract ω' such that $w_\theta(\omega') > w_\theta(\omega)$ and $b_\theta(\omega') \geq b_\theta(\omega) - 1$.

- Pooling costs under Common Values:
  - good A: $\overline{c}^A = \frac{c_L^A + c_H^A}{2} = 34$. It holds that $\overline{c}^A > v_L^A$.
  - good X: $\overline{c}^X = \frac{c_L^X + c_H^X}{2} = 51.5$. It holds that $\overline{c}^X > v_L^X$.
  - good B: $\overline{c}^B = \frac{c_L^B + c_H^B}{2} = 62.5$. It holds that $\overline{c}^B > v_L^B$.
  - good C: $\overline{c}^C = \frac{c_L^C + c_H^C}{2} = 90$. It holds that $\overline{c}^C > v_L^C$.

(i) PV Monopoly
A seller chooses which goods to offer at what prices to one randomly matched buyer. The matched buyer can either purchase one of the offered goods by the seller at the quoted price or abstain from trade. The seller maximizes her expected profit given the buyer's incentive compatibility and participation constraints. From standard arguments that can be applied since the parametrization complies with the relevant model assumptions as shown in the preliminaries above, the efficient quantity of buyer type H, good C, will be offered. We need to check whether the seller's profit is maximized by an incentive compatible menu such that type L would buy either good C, good B, good A or no good. The seller's profit from optimally, i.e. seller payoff-maximizing, implementing the allocation (Q_L, Q_H) where an L-type buyer purchases good Q_L and an H-type buyer purchases good Q_H, for

- (C, C) is $v_L^C - c^C = 5$
- (B, C) is $(1-\gamma)(v_L^B - c^B) + \gamma(v_H^C - (v_H^B - v_L^B) - c^C) = 22.5$
- (A, C) is $(1-\gamma)(v_L^A - c^A) + \gamma(v_H^C - (v_H^A - v_L^A) - c^C) = 27.5$,
- $(0, C)$ is $\gamma(v_H^C - c^C) = 30$.

Thus, to maximize profits, a seller offers good C at price $p^C = v_H^C$ and type L is excluded since $v_L^C = 65 < v_H^C$.

(ii) PV Exclusive Competition
We need to show that in equilibrium, each H-type buyer purchases good C and each L-type buyer purchases good B and that good C is traded at price p^C with $p^C \in \{c^C, c^C + 1\}$ and good B is traded at price p^B with $p^B \in \{c^B, c^B + 1\}$.
To show that an equilibrium with these properties exists, consider the following strategies: Each of the four sellers offers good C at price c^C and good B at price c^B. Buyers purchase goods at sellers such that, given goods and prices offered, their payoff is maximized. If there are more than one trade options such that a buyer's payoff is maximized,

a buyer randomizes equally between these trade options.
If all players behave accordingly, sellers make zero profits and a buyer of type L receives a payoff of $v_L^B - c^B$ and a buyer of type H receives a payoff of $v_H^C - c^C$. First, from above, $v_L^B - c^B > v_L^C - c^C$ and $v_H^C - c^C > v_H^B - c^B$ such that no buyer has an incentive to deviate. It remains to check whether a seller has an incentive to deviate. A seller cannot profitably deviate by lowering the price on either good B or C, since then he would make profits lower than zero, or by raising the price on either good B or good C, since then no buyer would trade with him. A seller can also not profitably deviate by offering good A, since, at any price $p^A = c^A + \epsilon$, $\epsilon > 0$, from the preliminaries above, no buyer would purchase good A.
To show that there are no other equilibrium allocations, assume to the contrary that an equilibrium exists in which either H-type buyers do not purchase good C at price p^C with $p^C \in \{c^C, c^C + 1\}$ or L-type buyers do not purchase good B at price p^B with $p^B \in \{c^B, c^B + 1\}$.
Let Ω denote the set of seller contracts taken out with positive probability in the equilibrium. Denote by $\overline{B}$ the maximum of $b(.)$ on this set, i.e. the highest profit made per contract on contracts taken out (see the preliminaries for the definition of $b(.)$), and denote by $\overline{\omega}$ a corresponding contract from Ω. Let the buyer type that takes out $\overline{\omega}$ with positive probability be $\overline{\theta}$. Suppose that $\overline{B} \geq 2$. Aggregate profits on all buyers of type $\overline{\theta}$ are at most equal to $2\overline{B}$, so one of the sellers, say seller 1, earns at most $2\overline{B}/4$ on average on buyers of type $\overline{\theta}$ and not more than $2\overline{B}/4$ on average on buyers of type $\theta \neq \overline{\theta}$. We will show how seller 1 can profitably attract all buyers of type $\overline{\theta}$ without losing anything from other buyers. First, since for any type θ, any contract ω with $b_\theta(\omega) \geq 2$ and $w_\theta(\omega) > 0$, there exists a contract ω' such that $w_\theta(\omega') > w_\theta(\omega)$ and $b_\theta(\omega') \geq b_\theta(\omega) - 1$, there exists a contract ω' such that $w_\theta(\omega') > w_\theta(\overline{\omega})$ and $b(\omega') = \overline{B} - 1$. Now let seller 1 deviate by adding contract ω'. All buyers of type $\overline{\theta}$ strictly profit from this deviation and buy ω', and seller 1 receives $2(\overline{B} - 1)$, which is larger than $2\overline{B}/4$ for $\overline{B} \geq 2$. Observe that, either buyers of the other type do not change their behavior since they do not profit from the new contract, or they also switch to ω'. But given the definition of $\overline{B}$, these buyers did not generate a profit larger than $2\overline{B}/4$ for seller 1, so this switch does not decrease seller 1's payoffs. Thus, there is a profitable deviation and we have a contradiction.
Therefore, $\overline{B} \leq 1$. Then, since $v_L^B - (c^B + 1) > v_L^j - c^j \; \forall j \in J, j \neq B$ and $v_H^C - (c^C + 1) > v_H^j - c^j \; \forall j \in J, j \neq C$, if goods B and C are offered, it cannot be that buyers of type L purchase a good different from good B and buyers of type H purchase a good different from good C. If either good B or good C is not offered, then again using $v_L^B - (c^B + 1) > v_L^j - c^j \; \forall j \in J, j \neq B$ and $v_H^C - (c^C + 1) > v_H^j - c^j \; \forall j \in J, j \neq C$, some seller can profitable deviate by offering the respective good $j \in \{B, C\}$ at price $c^j + 2$.

(iii) PV Nonexclusive Competition
The existence part is the same as for *PV Exclusive Competition* and is therefore omitted.
To show that there are no other equilibrium allocations, assume to the contrary that an equilibrium exists in which either H-type buyers do not purchase good C at price p^C with $p^C \in \{c^C, c^C + 1\}$ or L-type buyers do not purchase good B at price p^B with $p^B \in \{c^B, c^B + 1\}$. Let Ω denote the set of seller contracts taken out with positive

probability in the equilibrium. Denote by $\overline{B}$ the maximum of $b(.)$ on this set, i.e. the highest profit made per contract on contracts taken out (see the preliminaries for the definition of $b(.)$), and denote by $\overline{\omega}$ a corresponding contract from Ω. Let the buyer type that takes out $\overline{\omega}$ with positive probability be $\overline{\theta}$. Suppose that $\overline{B} \geq 2$. Buyers can make up to two trades, i.e. purchase up to two contracts, and there are two buyers of each type. However, since a buyer can only make one trade per seller, one of the sellers, say seller 1, earns at most $2\overline{B}/4$ on average on buyers of type $\overline{\theta}$ and at most $2\overline{B}/4$ on average on buyers of type $\theta \neq \overline{\theta}$.

We will show how seller 1 can profitably attract all buyers of this type without losing anything from other buyers. First, since for any type θ, any contract ω with $b_\theta(\omega) \geq 2$ and $w_\theta(\omega) > 0$, there exists a contract ω' such that $w_\theta(\omega') > w_\theta(\omega)$ and $b_\theta(\omega') \geq b_\theta(\omega) - 1$, there exists a contract ω' such that $w_\theta(\omega') > w_\theta(\overline{\omega})$ and $b(\omega') = \overline{B} - 1$. Note that this here can refer to the second trade of a buyer with $w_\theta(\omega)$ as defined in the Preliminaries for this case. Let seller 1 deviate by adding contract ω'. All buyers of type $\overline{\theta}$ strictly profit from this deviation and buy ω', and seller 1 receives $2(\overline{B} - 1)$, which is larger than $2\overline{B}/4$ for $\overline{B} \geq 2$. Observe that either buyers of the other type do not change their behavior since they do not profit from the new contract, or they also switch to ω', if they can switch to seller 1, i.e. they do not purchase another contract from seller 1. However, if they cannot switch, there is also no change in profit from these buyers. But given the definition of $\overline{B}$, these buyers did not generate a profit larger than $2\overline{B}/4$ for seller 1, so this switch does not decrease seller 1's payoffs. Thus, there is a profitable deviation and we have a contradiction.

Therefore, $\overline{B} \leq 1$. Then, it is easy to see that since $v_L^B - (c^B + 1) > v_L^j - c^j \; \forall j \in J, j \neq B$ and $v_H^C - (c^C + 1) > v_H^j - c^j \; \forall j \in J, j \neq C$, if goods B and C are offered, it cannot be that buyers of type L purchase a good different from good B and buyers of type H purchase a good different from good C. If either good B or good C is not offered, then again using $v_L^B - (c^B + 1) > v_L^j - c^j \; \forall j \in J, j \neq B$ and $v_H^C - (c^C + 1) > v_H^j - c^j \; \forall j \in J, j \neq C$, some seller can profitable deviate by offering the respective good $j \in \{B, C\}$ at price $c^j + 2$.

(iv) CV Monopoly

A seller chooses which goods to offer at what prices to one randomly matched buyer. The matched buyer can either purchase one of the offered goods by the seller at the quoted price or abstain from trade. The seller maximizes her expected profit given the buyer's incentive compatibility and participation constraints. From standard arguments that can be applied since the parametrization complies with the relevant model assumptions as shown in the preliminaries above, the efficient quantity of buyer type H, good C, will be offered. We need to check whether the seller's profit is maximized by an incentive compatible menu such that type L would buy either good C, good B, good A or no good. The seller's profit from optimally, i.e. seller payoff-maximizing, implementing the allocation (Q_L, Q_H) where an L-type buyer purchases good Q_L and an H-type buyer purchases good Q_H, for

- (C, C) is $v_L^C - (\gamma c_H^C + (1-\gamma) c_L^C) = 65 - 90 = -25$,
- (B, C) is $(1-\gamma)(v_L^B - c_L^B) + \gamma(v_H^C - (v_H^B - v_L^B) - c_H^C) = 0$
- (A, C) is $(1-\gamma)(v_L^A - c_L^A) + \gamma(v_H^C - (v_H^A - v_L^A) - c_H^C) = 13.5$,

- $(0, C)$ is $\gamma(v_H^C - c_H^C) = 27.5$.

Thus, the seller optimally sets a menu such that only good C is offered at price $p_C = v_H^C$ and type L is excluded.

(v) CV Exclusive Competition and *CV Exclusive Competition-4*
(*Additions for* CV Exclusive Competition-4 *are added in italics in parentheses.*)
We need to show that in equilibrium, each H-type buyer purchases good C and each L-type buyer purchases good A and that good C is traded at price p^C with $p^C \in \{c_H^C, c_H^C + 1\}$ and good A is traded at price p^A with $p^A \in \{c_L^A, c_L^A + 1\}$.
To show that an equilibrium with these properties exists, consider the following strategies: Each of the four sellers offers good C at price c_H^C and good A at price c_L^A. Buyers purchase goods at sellers such that, given goods and prices offered, their payoff is maximized. If there are more than one trade options such that a buyer's payoff is maximized, a buyer randomizes equally between these trade options. If all players behave accordingly, sellers make zero profits and a buyer of type L receives a payoff of $v_L^A - c_L^A = 30 - 18 = 12$ and and a buyer of type H receives a payoff of $v_H^C - c_H^C = 55$: First, the allocation is incentive compatible. The payoff of an H-type buyer from buying good A at price 18 is $v_H^A - c_L^A = 70 - 18 = 52$ which is lower than his payoff from buying good C which is $v_H^C - c_H^C = 55$ and an L-type buyer's valuation for good C is lower than c_H^C. For each buyer, purchasing the respective good also yields a higher payoff than abstaining from trade. It remains to show that there is no profitable seller deviation. First, a deviation to a higher price on goods C or A, is not profitable, since no buyer would be attracted. We need to check whether there is a profitable deviation by offering a different menu, e.g. trying to pool both types. First, notice that there cannot be a profitable pooling deviation with pooling on A, since good A is offered at c_L^A. Second, there cannot be a profitable pooling deviation with pooling on B, since $v_L^B < \frac{c_L^B + c_H^B}{2}$, nor on C, since $v_L^C < \frac{c_L^C + c_H^C}{2}$. *(Furthermore, there is no profitable pooling deviation with pooling on X, since $v_L^X < \frac{c_L^X + c_H^X}{2}$.)* It remains to check a deviation with a menu of goods B and C *(or X and C)*. For good B to be bought by an L-type buyer, the price has to be lower than v_L^B. However, we have $v_H^B - v_L^B > v_H^C - c_H^C$ such that good B would be bought by H-types as well, and since $v_L^B < \frac{c_L^B + c_H^B}{2}$, this is not profitable. *(Furthermore, for a menu in wich an L-type buyer is intended to buy good X and the H-type buyer is intended to buy good C, for good X to be bought by an L-type buyer, the price has to be lower than v_L^X. However, we have $v_H^X - v_L^X > v_H^C - c_H^C$ such that good X would be bought by H-types as well, and since $v_L^X < \frac{c_L^X + c_H^X}{2}$, this is not profitable.)*
It remains to show that there are no other equilibrium allocations. First, pooling on any good $j \in F$ cannot be an equilibrium, as for any non-loss making pooling prices L-type buyers are not willing to purchase the respective good (see Preliminaries). Let l^* and h^* denote the goods taken out with positive probability in equilibrium by L- and H-type buyers respectively. Observe that from single crossing, we must have that $v_H^{h^*} \geq v_L^{l^*}$, as otherwise, H-type buyers would strictly prefer to make the trade that L-types are taking. Since we have shown above that there cannot be pooling, we have $v_H^{h^*} > v_L^{l^*}$, ruling out allocations in which e. g. L-type buyers purchase good C and H-type buyers purchase good B.
We need to check other potential allocations. To do so, assume to the contrary that an

equilibrium exists in which types are not pooled and for which $v_H^{h^*} > v_L^{l^*}$, but in which either H-type buyers do not purchase good C at price p^C with $p^C \in \{c^C, c^C+1\}$ or L-type buyers do not purchase good A at price p^A with $p^A \in \{c_L^A, c_L^A+1\}$.
Assume that the equilibrium is such that L-type buyers abstain from trading. First, it cannot be that H-type buyers purchase good A or good B *(or good X)*, since due to $v_H^C - c_H^C > v_H^j - c_H^j \; \forall j \in F, j \neq C$, for any non-loss-making price on the respective good, there exists a deviation by offering good C such that higher profits on H-types are made (and if L-types were attracted, deviation profits would even be higher. Thus, H-types purchase good C. We will now show that profits per contract with H-type buyers cannot be larger than 1. Let Ω_H denote the set of seller contracts taken out with positive probability in the equilibrium by H-types. Denote by $\overline{B}_H$ the maximum of $b(.)$ on this set, i.e. the highest profit made per contract on contracts taken out by H-types. Denote by $\overline{\omega_H}$ a corresponding contract from Ω_H. Suppose that $\overline{B} \geq 2$. Aggregate profits on all H-type buyers are at most equal to $2\overline{B}$, so one of the sellers, say seller 1, earns at most $2\overline{B}/4$ on average on H-type buyers of type $\overline{\theta}$ and no profits on L-type buyers since these abstain from trading. Since for any type θ, any contract ω with $b_\theta(\omega) \geq 2$ and $w_\theta(\omega) > 0$, there exists a contract ω' such that $w_\theta(\omega') > w_\theta(\omega)$ and $b_\theta(\omega') \geq b_\theta(\omega) - 1$, there exists a contract ω' such that $w_\theta(\omega') > w_\theta(\overline{\omega})$ and $b(\omega') = \overline{B} - 1$. Now let seller 1 deviate by adding contract ω'. All H-type buyers strictly profit from this deviation and buy ω', and seller 1 receives $2(\overline{B}-1)$, which is larger than $2\overline{B}/4$ for $\overline{B} \geq 2$. Thus, $\overline{B}_H \leq 2$. Then, however, some seller, say seller 1, can offer contract $\hat{\omega} = (A, 20)$. $\hat{\omega}$ attracts all L-types, since they receive a payoff of $30 - 20 = 10 > 0$, but it does not attract H-types, since for any contract $\omega = (C, x - c_H^C)$ with $0 \leq x - c_H^C \leq 1$, H-type buyers prefer ω to $\hat{\omega}$. Thus, we have a contradiction.
Now assume that the equilibrium is such that H-type buyers but not L-type buyers abstain from trading. However, from single-crossing, H-types would receive a higher payoff from taking out a contract that L-type buyers are buying, a contradiction. Furthermore, observe if all buyers abstain from trade, a seller can profitably deviate by offering some good, say good C, at a price x with $c_H^C < x < v_H^C$.
Now assume that in equilibrium, L-type buyers purchase good B with positive probability. Then, purchasing some contract with good B must yield at least a payoff of 0, as otherwise, L-type buyers would deviate by abstaining from trade. Then, however, for any contract $\omega = (B, x)$ with $x \leq v_L^B$ purchased with positive probability by L-type buyers, H-type buyers would prefer to buy contract (B, x) which gives them a payoff of at least $v_H^B - v_L^B = 130 - 55 = 75$, over any other contract that is non-loss-making on H-type buyers, since these can give a payoff of at most $v_H^C - c_H^C = 55$. Then, however, (B, x) would be loss-making, a contradiction. *(Similarly, assume that in equilibrium, L-type buyers purchase good X with positive probability. Then, purchasing some contract with good X must yield at least a payoff of 0, as otherwise, L-type buyers would deviate by abstaining from trade. Then, however, for any contract $\omega = (X, x)$ with $x \leq v_L^X$ purchased with positive probability by L-type buyers, H-type buyers would prefer to buy contract (X, x) which gives them a payoff of at least $v_H^X - v_L^X = 110 - 45 = 65$, over any other contract that is non-loss-making on H-type buyers, since these can give a payoff of at most $v_H^C - c_H^C = 55$. Then, however, (X, x) would be loss-making, a contradiction.)*
It remains to show that if L-type buyers purchase good A and H-type buyers good C, it cannot be that either is sold at per contract profit larger than 1. Let Ω denote the

set of seller contracts taken out with positive probability in the equilibrium. Denote by $\overline{B}$ the maximum of $b(.)$ on this set, i. e., the highest profit made per contract on contracts taken out and denote by $\overline{\omega}$ a corresponding contract from Ω. Let the buyer type that takes out $\overline{\omega}$ with positive probability be $\overline{\theta}$. Suppose that $\overline{B} \geq 2$. Assume that $\overline{\omega} = H$. From arguments analogous to those above, there is price undercutting, since this increases profits of some seller on H-type buyers, and would further increase them if L-type buyers were attracted.
Now assume that $\overline{\theta} = L$. Observe that, with the parametrization, for any $x > 0$ such that $v^A - c_L^A - x \geq 0$, $v_H^C - c_H^C - x > v_H^A - c_L^A - x - 1$, i.e., if there is undercutting on the price $c_L^A + x$ for good A, we can find an incentive compatible H-type contract with good C such that H-types prefer to buy good C and profits on H-types are not reduced. Then, analogously to above, since there are 2 L-type buyers and 4 firms, there would be a profitable deviation by undercutting on the price of good A for some firm. Thus, there is a profitable deviation and we have a contradiction.

(vi) CV Nonexclusive Competition, *CV Nonexclusive Competition-StrInc* and *CV Nonexclusive Competition-4*
(*Additions for* CV Nonexclusive Competition-4 *are in italics in parentheses.*)
We need to show that in equilibrium, each H-type buyer purchases good C and L-type buyers abstain from trading and that C is traded at price p^C with $p^C \in \{c_H^C, c_H^C + 1\}$.
To show that an equilibrium with these properties exists, consider the following strategies: Each of the four sellers offers good C at price c_H^C and good B at price c_H^B. Buyers purchase goods at sellers such that, given goods and prices offered, their payoff is maximized. If there are more than one purchase options such that a buyer's payoff is maximized, a buyer randomizes equally between these. If all players behave accordingly, sellers make zero profits, a buyer of type H buys good C and receives a payoff of $v_H^C - c_H^C = 55$, since H-type buyer's payoff from buying C at price c_H^C is higher than abstaining from trade, purchasing good $B+B$ at price $c_H^B + c_H^B$, purchasing good $B+C$ at price $c_H^B + c_H^C$ or purchasing good $C+C$ at price $c_H^C + c_H^C$. L-type buyers abstain from trade since their payoff from buying good $j \in \{B, B+B, C, C+C\}$ at the respective prices is lower than zero. It remains to show that there is no profitable seller deviation. First, there is no profitable deviation with a higher price on good C, as then no buyer would purchase from the deviating seller. Furthermore, there is no profitable deviation by raising the price on good B, since it would not be taken out by any buyer. We need to check whether there is a profitable deviation by offering a different menu.
First, there is no profitable deviation with offering good A at a price at which L-type buyers would prefer buying good A to abstaining from trade: For any price for good A with $c_L^A \leq p^A \leq v_L^A$, $v_H^{A+B} - c_H^B - p^A > v_H^C - c_H^C$, i.e. H-type buyers would buy good $A+B$. Then, however, A is loss-making and thus offering A such that L-type buyers would purchase A is not a profitable deviation. Furthermore, there is no profitable deviation by offering good A at a price such that no losses are made on H-types, since at such prices good A would not be taken out by H-types as their efficient good C at price c_H^C is on offer. Last, there is no profitable deviation by offering either good C or good B at prices lower than c_H^C and c_H^B since for any non-loss making pooling prices L-type buyers are not willing to purchase the respective good.
*(*CV Nonexclusive Competition-4*: Similarly, there is no deviation with offering good*

X at a price at which L-type buyers would prefer buying good X to abstaining from trade: For any price for good X with $c_L^X \leq p^X \leq v_L^X$, $v_H^{B+X} - c_H^B - p^X > v_H^C - c_H^C$, i.e. H-type buyers would buy good $B+X$. Furthermore, there is no profitable deviation by offering good X at a price such that no losses are made on H-types, since at such prices good X would not be taken out by H-types as their efficient good C at price c_H^C is on offer. Last, there is no profitable deviation by offering good X at a non-lossmaking pooling price since for any non-loss making pooling prices L-type buyers are not willing to purchase good X.)

It remains to show that there are no other equilibrium allocations. First, pooling on any good $j \in F$ cannot be an equilibrium, as for any non-loss making pooling prices L-type buyers are not willing to purchase the respective good (see Preliminaries). With decreasing marginal payoffs from goods $j \in F$ which are bought in a second trade (see parametrization), there is as well no pooling on any good $j \in J \setminus F$.

We will now show that in equilibrium, L-type buyers abstain from trade. Assume to the contrary that they are making at least one trade. Denote by $\hat{\omega}$ the contract that an L-type buyer trades with positive probability on which the corresponding seller does not make a loss. Note that, it cannot be that sellers make losses on all trades with L-type buyers, since, from the cost structure, L-types cannot be cross-subsidized on any contract by H-types, and then some seller would increase his payoff by not offering the contracts on which losses are made with L-types. Now since an L-type buyer trades $\hat{\omega}$ with positive probability, $w_L(\hat{\omega}) \geq 0$. We will show that then there is a profitable deviation by some seller or buyer. Observe that, if there is no pooling with L-types, each contract taken out by H-type buyers has to be non-loss-making on H-types. Furthermore, from arguments analogous to those in *CV Exclusive Competition*, in equilibrium no contract is taken out in which good $j \in F$ is offered at a price higher than $c_H^j + 1$, since otherwise there would be a profitable deviation by undercutting.

Thus, in equilibrium, the profit per contract on H-type buyers $\overline{B}_H$ satisfies $\overline{B}_H \leq 1$. Let some corresponding contract be denoted by $\tilde{\omega}$ and an H-type buyers payoff in the equilibrium by w_H^*. Observe that w_H^* can be at most 55.

Now if either $\hat{\omega} = (B, x)$ with $35 \leq x \leq 55$ or $\hat{\omega} = (C, x)$ with $50 \leq x \leq 65$ *(or $\hat{\omega} = (X, x)$ with $28 \leq x \leq 45$)*, then H-types would purchase $\hat{\omega}$, since $v_H^B - 55 > v_H^C - c_H^C$, (i.e. higher payoff than the highest possible at their cost pricing with efficient good) and $v_H^C - 65 > v_H^C - c_H^C$ *(and $v_H^X - 45 > v_H^C - c_H^C$)*, a contradiction.

If $\hat{\omega} = (A, x)$ with $18 \leq x \leq 30$,

- and good B is offered at price $p^B \in \{c_H^B, c_H^B + 1\}$, then, independent of good C being offered at price $p^C \in \{c_H^C, c_H^C + 1\}$ or not a buyer of type H has the higher payoff from purchasing $\hat{\omega}$ in one trade and good B in a second trade. Then, however, $\hat{\omega}$ is loss-making, a contradiction.

- good B is not offered but good C is offered at price $p^C \in \{c_H^C, c_H^C + 1\}$, then some seller, say seller 1, can profitably deviate by offering good B at price $c_H^B + 2(x - c_L^A)/4 + 1 + 2(p^C - c_H^C)/4$, since then H-type buyers get a higher payoff from purchasing $\hat{\omega}$ in one trade and good B from seller 1 in a second trade, since $v_H^{A+B} - 2(30-18)/4 - 1 - 90 - 30 > 55$, and seller 1 makes a higher profit when the corresponding contract is taken out by H-types. Thus, there is a profitable deviation.

- and neither good B is offered at price $p^B \in \{c_H^B, c_H^B + 1\}$ nor good C is offered at price $p^C \in \{c_H^C, c_H^C + 1\}$, then either H-type buyers take out $\hat{\omega}$ or some seller can deviate by undercutting on good B or good C, a contradiction.

Thus, we have a contradiction.
It remains to show that H-type buyers do not purchase a good different from C. If C is not offered, there is a profitable deviation by offering good C since it is the efficient good for H-type buyers. If C is offered, then from arguments similar to above there will be undercutting until the profit per contract on good C is not larger than 1. Then, it is optimal to buy good C for H-type buyers.

C Distribution of Social Preferences

Figure 1 displays the distribution of the nine social preference types in our experiment that Kerschbamer (2015) differentiates:

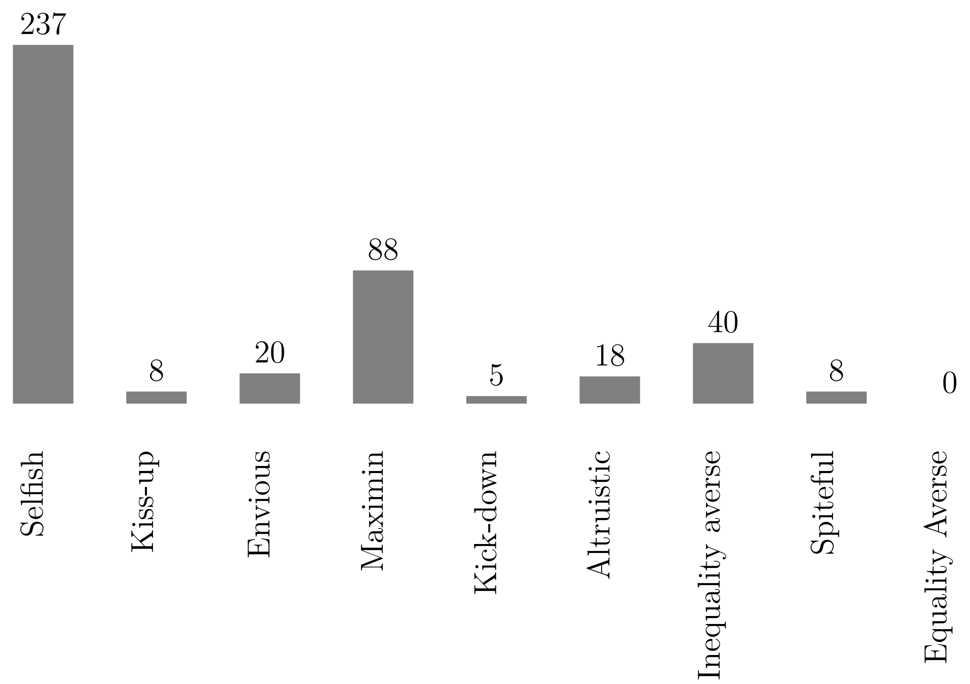

Figure 1: Distribution of social preference types across all 424 participants.

D Full regression model on L-type excluding offers

	PV Full Model	CV Full Model
Period	-0.009	-0.138***
	(0.024)	(0.021)
Risk aversion	0.059	-0.086
	(0.077)	(0.078)
Gender (=1 if female)	-0.278	0.172
	(0.374)	(0.258)
Age	0.081**	0.024
	(0.040)	(0.040)
PV Mon	0.947**	
	(0.372)	
PV CompNE	0.319	
	(0.461)	
PV Mon x Period	0.006	
	(0.037)	
PV CompNE x Period	0.032	
	(0.035)	
CV Mon		-1.175***
		(0.285)
CV CompNE		-1.159***
		(0.282)
CV CompNE Control		-0.451
		(0.364)
CV Mon x Period		0.190***
		(0.026)
CV CompNE x Period		0.191***
		(0.023)
CV CompNE Control x Period		0.267***
		(0.065)
Constant	-4.037***	0.936
	(1.092)	(1.073)
Social Preferences	Yes	Yes
Matching Group Dummies	Yes	Yes
Observations	1408	1600

Standard errors in parentheses

Exclusive competition is the treatment reference category.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

E Exclusion over time with 4 goods treatments

In the 4 good control treatments with 2 markets, the exclusion rate can only take the values 0, 0.5 or 1.

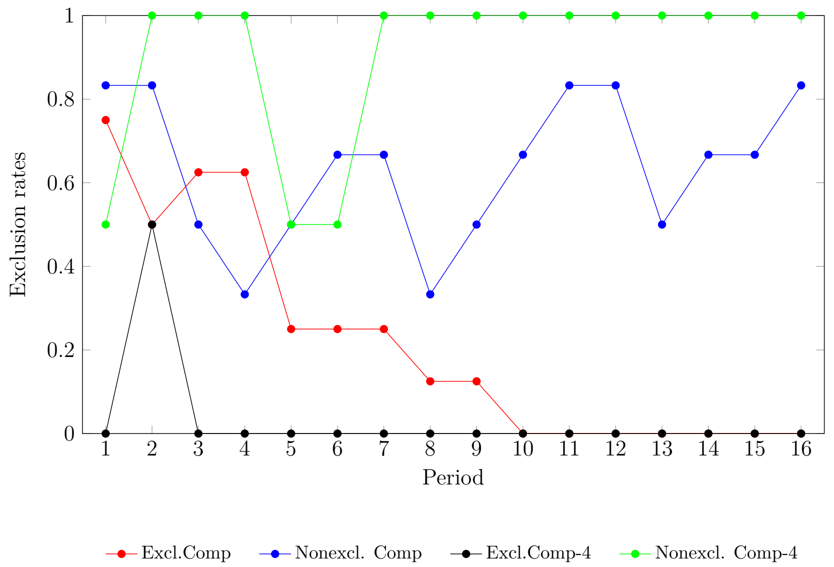

Figure 2: Exclusion rate over time for competitive CV treatments with 3 and 4 goods.

F Examples of seller behavior

The figures below show further examples of seller behavior for the common value competitive treatments that were not highlighted in the main text.

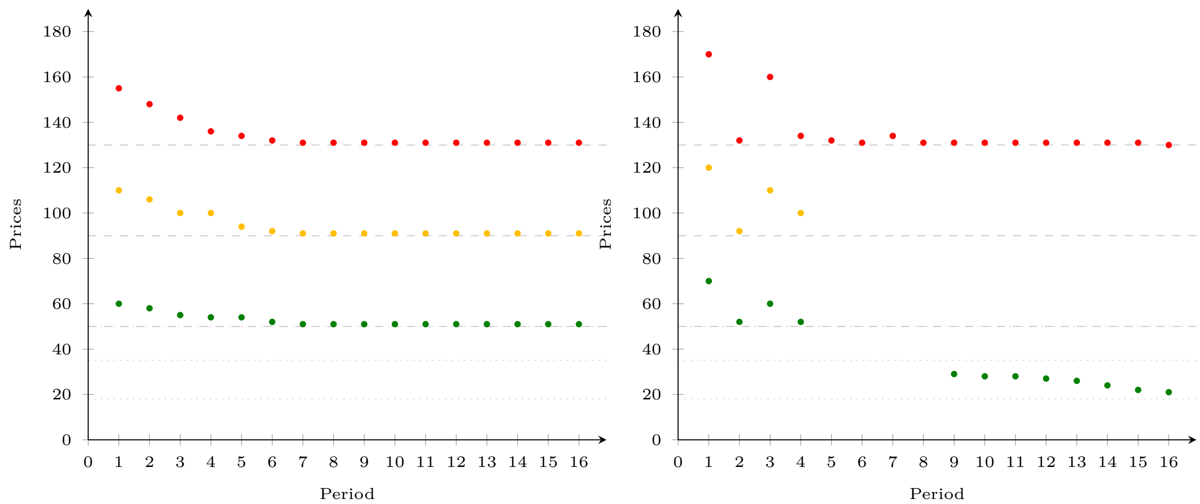

Figure 3: Offers of subjects 338 (left) and 319 (right) in *CV Exclusive Competition*.

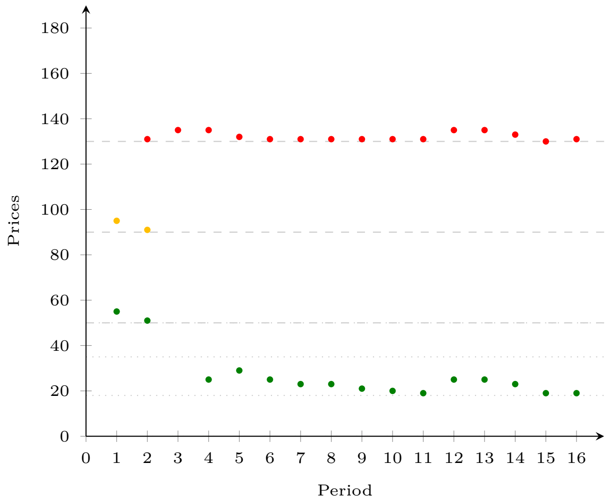

Figure 4: Example subject no 52 in *CV Exclusive Competition*: Fast learning, play close to equilibrium play.

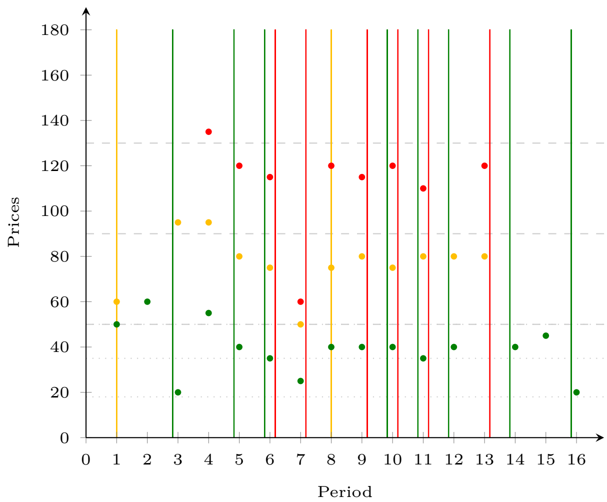

Figure 5: Example subject no 426 in *CV Nonexclusive Competition-StrInc*: Presumably no understanding of the market game.

G Instructions

In the following, we present the instructions for the *PV Monopoly* and the *CV Non-exclusive Competition* treatments. Similar instructions were used for the other four main treatments. We provide both the original German version as well as an English translation.

G.1 Original instructions: German version

G.1.1 PV Monopoly

Anleitung zum Experiment

Herzlichen Dank für Ihre Teilnahme am Experiment. Bitte lesen Sie die folgenden Informationen aufmerksam durch. Falls Sie Fragen zu den Instruktionen haben, heben Sie bitte die Hand. Wir werden dann zu Ihrer Kabine kommen und Ihnen die Fragen beantworten. Bitte sprechen Sie bis zum Ende des Experiments nicht mehr mit anderen Teilnehmern.

Für Ihr rechtzeitiges Erscheinen erhalten Sie 10 Franken. Für das Beantworten der sich an die Instruktionen anschliessenden Kontrollfragen erhalten Sie 5 Franken. Während des Experiments können Sie weiteres Geld verdienen. Die Höhe Ihres Verdienstes hängt von Ihren Entscheidungen und den Entscheidungen anderer Teilnehmer ab. Alle Entscheidungen werden anonym getroffen, d. h. keiner der anderen Teilnehmer erfährt Ihre Identität. Auch die Auszahlung am Ende des Experiments erfolgt anonym, d.h. kein anderer Teilnehmer erhält über Ihre Auszahlung Bescheid. Der Verdienst während des Experiments wird in ECU (=Experimental Currency Unit) angegeben. Sie erhalten eine Anfangsausstattung in Höhe von 30 ECU. Das Experiment hat mehrere Runden. In jeder dieser Runden können Sie **Gewinne, aber auch Verluste** machen. Zum Ende des Experiments wird **eine Runde zufällig ausgewählt**. Der Gesamtgewinn aus dieser zufällig ausgewählten Runde wird zu der Anfangsausstattung hinzugerechnet bzw. der Gesamtverlust aus der zufällig ausgewählten Runde von der Anfangsausstattung abgezogen. Der resultierende Betrag wird Ihnen zu folgendem Umrechnungskurs ausgezahlt:

2 ECU = 1 Franken

Auf den folgenden Seiten erklären wir den genauen Ablauf des Experiments.

Ablauf des Experiments:

- Das Experiment besteht aus 16 Runden. Innerhalb jeder dieser 16 Runden treffen Sie dieselbe Abfolge an Entscheidungen.

- Es gibt 2 verschiedene Rollen: Verkäufer und Käufer. Die Käufer sind entweder vom Typ 1 oder vom Typ 2. Ihnen wird zum Beginn des Experiments zufällig entweder die Rolle des Verkäufers oder die Rolle des Käufers vom Typ 1 oder Typ 2 zugewiesen. Sie behalten diese Rolle und die Käufer auch Ihren Typ während des gesamten Experiments. Ihre Rolle und bei Käufern auch Ihr Typ wird Ihnen zu Beginn des Experiments auf dem Bildschirm angezeigt.

- Zu Beginn des Experiments werden Sie ausserdem zufällig einer Gruppe zugeordnet. Jede Gruppe setzt sich aus vier Verkäufern, zwei Käufern vom Typ 1 und zwei Käufern vom Typ 2 zusammen. Die Zusammensetzung Ihrer Gruppe ändert sich während des Experiments nicht.

Ablauf einer Runde:

1. Jedem Verkäufer wird zufällig genau einer der vier Käufer aus seiner Gruppe zugeordnet.

2. Jeder Verkäufer wählt, ob und welche der drei Güter A, B, C er dem ihm zugeordneten Käufer anbietet. Jeder Verkäufer kann mehrere Güter anbieten, also z.B. Gut A und Gut B. Für jedes Gut, das der Verkäufer anbietet, wählt er einen Preis.

3. Der Käufer sieht die vom Verkäufer angebotenen Güter und die dafür verlangten Preise. Der Käufer kann maximal ein Gut kaufen. Alternativ kann der Käufer auch kein Gut kaufen.

4. Der Kauf eines Gutes hat für einen Käufer den folgenden Wert:

Käufer vom Typ 1	
Gut	Wert
A	30
B	55
C	65

Käufer vom Typ 2	
Gut	Wert
A	45
B	85
C	120

   Kauft ein Käufer kein Gut, so hat dies einen Wert von 0 für den Käufer.

5. Beim Kauf eines Gutes durch den Käufer entstehen dem Verkäufer durch den Verkauf des Gutes folgende Kosten:

Gut	Kosten
A	20
B	40
C	60

6. Informationen zum Ende jeder Runde:

   - Jeder Käufer sieht zum Ende jeder Runde, welches Gut er zu welchem Preis gekauft hat. Er erhält ausserdem die Information, wie hoch sein Gesamtgewinn in der Runde ist.
   - Jeder Verkäufer sieht zum Ende jeder Runde, ob der ihm zugeordnete Käufer ein Gut gekauft hat. Falls der Käufer ein Gut gekauft hat, sieht der Verkäufer welches Gut der Käufer gekauft hat. Er erhält zudem die Information, welche Kosten ihm durch den Verkauf des Gutes entstanden sind, welchen Preis er pro Gut verlangt hatte, welchen Gewinn er pro Gut gemacht hat und wie hoch sein Gesamtgewinn in der Runde ist. Jeder Verkäufer sieht ausserdem, welche Güter in der Runde zu welchen Preisen von ihm angeboten wurden.

Gesamtgewinn pro Runde:

- Verkäufer:
  - Falls kein Gut verkauft wurde: Gesamtgewinn = 0.
  - Falls ein Gut verkauft wurde: Gesamtgewinn = Preis des verkauften Gutes – Kosten des verkauften Gutes.
- Käufer:
  - Falls kein Gut gekauft wurde: Gesamtgewinn = 0.
  - Falls ein Gut gekauft wurde: Gesamtgewinn = Wert des gekauften Gutes – Preis des gekauften Gutes.

Übersicht für Käufer über den Wert des gekauften Gutes abhängig von Ihrem Typ

Käufer vom Typ 1	
Gut	Wert
A	30
B	55
C	65

Käufer vom Typ 2	
Gut	Wert
A	45
B	85
C	120

Übersicht für Verkäufer über Ihre Kosten pro verkauftem Gut abhängig vom gekauften Gut

Gut	Kosten
A	20
B	40
C	60

G.1.2 CV Nonexclusive Competition

Anleitung zum Experiment

Herzlichen Dank für Ihre Teilnahme am Experiment. Bitte lesen Sie die folgenden Informationen aufmerksam durch. Falls Sie Fragen zu den Instruktionen haben, heben Sie bitte die Hand. Wir werden dann zu Ihrer Kabine kommen und Ihnen die Fragen beantworten. Bitte sprechen Sie bis zum Ende des Experiments nicht mehr mit anderen Teilnehmern.

Für Ihr rechtzeitiges Erscheinen erhalten Sie 10 Franken. Für das Beantworten der sich an die Instruktionen anschliessenden Kontrollfragen erhalten Sie 5 Franken. Während des Experiments können Sie weiteres Geld verdienen. Die Höhe Ihres Verdienstes hängt von Ihren Entscheidungen und den Entscheidungen anderer Teilnehmer ab. Alle Entscheidungen werden anonym getroffen, d. h. keiner der anderen Teilnehmer erfährt Ihre Identität. Auch die Auszahlung am Ende des Experiments erfolgt anonym, d.h. kein anderer Teilnehmer erhält über Ihre Auszahlung Bescheid. Der Verdienst während des Experiments wird in ECU (=Experimental Currency Unit) angegeben. Sie erhalten eine Anfangsausstattung in Höhe von 30 ECU. Das Experiment hat mehrere Runden. In jeder dieser Runden können Sie **Gewinne, aber auch Verluste** machen. Zum Ende des Experiments wird **eine Runde zufällig ausgewählt**. Der Gesamtgewinn aus dieser zufällig ausgewählten Runde wird zu der Anfangsausstattung hinzugerechnet bzw. der Gesamtverlust aus der zufällig ausgewählten Runde von der Anfangsausstattung abgezogen. Der resultierende Betrag wird Ihnen zu folgendem Umrechnungskurs ausgezahlt:

$$2 \text{ ECU} = 1 \text{ Franken}$$

Auf den folgenden Seiten erklären wir den genauen Ablauf des Experiments.

Ablauf des Experiments:

- Das Experiment besteht aus 16 Runden. Innerhalb jeder dieser 16 Runden treffen Sie dieselbe Abfolge an Entscheidungen.
- Es gibt 2 verschiedene Rollen: Verkäufer und Käufer. Die Käufer sind entweder vom Typ 1 oder vom Typ 2. Ihnen wird zum Beginn des Experiments zufällig entweder die Rolle des Verkäufers oder die Rolle des Käufers vom Typ 1 oder Typ 2 zugewiesen. Sie behalten diese Rolle und die Käufer auch Ihren Typ während des gesamten Experiments. Ihre Rolle und bei Käufern auch Ihr Typ wird Ihnen zu Beginn des Experiments auf dem Bildschirm angezeigt.
- Zu Beginn des Experiments werden Sie ausserdem zufällig einer Gruppe zugeordnet. Jede Gruppe setzt sich aus vier Verkäufern, zwei Käufern vom Typ 1 und zwei Käufern vom Typ 2 zusammen. Die Zusammensetzung Ihrer Gruppe ändert sich während des Experiments nicht.

Ablauf einer Runde:

1. Jeder Verkäufer wählt, ob und welche der drei Güter A, B, C er den Käufern in seiner Gruppe anbietet. Jeder Verkäufer kann mehrere Güter anbieten, also z.B. Gut A und Gut B. Für jedes Gut, das der Verkäufer anbietet, wählt er einen Preis. Jeder Verkäufer kann mehrere Einheiten von jedem angebotenen Gut verkaufen.

2. Jeder Käufer sieht alle innerhalb seiner Gruppe angebotenen Güter und die dafür verlangten Preise. Die Liste der angebotenen Güter ist nach Gütern und innerhalb von Gütern nach dem aufsteigenden Preis sortiert. Bieten mehrere Verkäufer dasselbe Gut zum gleichen Preis an, so werden die Angebote in zufälliger Reihenfolge dargestellt. Ausserdem sieht ein Käufer, welche Güter durch denselben Verkäufer angeboten werden. Die dazu genutzte Verkäufer-Nummer wird in jeder Runde neu und zufällig einem Verkäufer zugewiesen, sodass keine Rückschlüsse auf die Identität des Verkäufers gezogen werden können. Jeder Käufer kann insgesamt maximal zwei Einheiten kaufen. Die zwei Einheiten können von einem Gut oder von zwei verschiedenen Gütern sein. Ein Käufer kann zwei Einheiten nicht von demselben Verkäufer kaufen, sondern nur bei zwei verschiedenen Verkäufern. Zum Beispiel kann ein Käufer eine Einheit von Gut A bei Verkäufer mit Nr. 3 kaufen und eine Einheit von Gut B von Verkäufer mit Nr. 4. Alternativ kann ein Käufer auch kein Gut kaufen.

3. Der Kauf einer Einheit eines Gutes, zweier Einheiten eines Gutes oder einer Einheit zweier Güter hat für einen Käufer den folgenden Wert:

Käufer vom Typ 1	
Gut	Wert
A	30
B	55
C	65
A + A	50
A + B	68
A + C	75
B + B	78
B + C	85
C + C	90

Käufer vom Typ 2	
Gut	Wert
A	70
B	130
C	185
A + A	120
A + B	190
A + C	200
B + B	210
B + C	230
C + C	255

   Kauft ein Käufer kein Gut, so hat dies einen Wert von 0 für den Käufer.

4. Beim Kauf eines Gutes durch den Käufer entstehen dem Verkäufer durch den Verkauf des Gutes folgende Kosten. Die Höhe der Kosten hängt davon ab, ob ein Käufer vom Typ 1 oder ein Käufer vom Typ 2 das Gut kauft:

Kosten bei einem Käufer vom Typ 1	
Gut	Kosten
A	18
B	35
C	50

Kosten bei einem Käufer vom Typ 2	
Gut	Kosten
A	50
B	90
C	130

Kaufen mehrere Käufer bei einem Verkäufer, so entstehen dem Verkäufer Kosten, die sich aus der Summe der Kosten pro Gut zusammensetzen.

5. Informationen zum Ende jeder Runde:

   - Jeder Käufer sieht zum Ende jeder Runde, welches Gut er zu welchem Preis gekauft hat. Er erhält ausserdem die Information, wie hoch sein Gesamtgewinn in der Runde ist.
   - Jeder Verkäufer sieht zum Ende jeder Runde, wie viele Käufer vom Typ 1 und Käufer vom Typ 2 bei ihm welches Gut gekauft haben. Er erhält zudem die Information, welche Kosten ihm durch den Verkauf pro Gut entstanden sind, welchen Preis er pro Gut verlangt hatte, welchen Gewinn er pro Typ und Gut gemacht hat, welchen Gewinn er pro Gut gemacht hat und wie hoch sein Gesamtgewinn in der Runde ist. Jeder Verkäufer sieht ausserdem, welche Güter in seiner Gruppe in der Runde zu welchen Preisen von anderen Verkäufern und von ihm angeboten wurden.

Gesamtgewinn pro Runde:

- Verkäufer:
  - Falls kein Gut verkauft wurde: Gesamtgewinn = 0.
  - Falls ein/mehrere Güter verkauft wurden: Gesamtgewinn = Summe der Preise der verkauften Güter – Summe der Kosten der verkauften Güter.
- Käufer:
  - Falls kein Gut gekauft wurde: Gesamtgewinn = 0.
  - Falls ein Gut gekauft wurde: Gesamtgewinn = Wert des gekauften Gutes – Preis des gekauften Gutes.
  - Falls zwei Einheiten von Gütern gekauft wurden: Gesamtgewinn = Wert der gekauften Güter – Summe der Preise der gekauften Güter.

    Hinweis: Der Wert zweier Einheiten von Gütern entspricht nicht der Summe der Werte der einzelnen Güter.

Übersicht für Käufer über den Wert des gekauften Gutes/der gekauften Güter abhängig von Ihrem Typ

Käufer vom Typ 1	
Gut	Wert
A	30
B	55
C	65
A + A	50
A + B	68
A + C	75
B + B	78
B + C	85
C + C	90

Käufer vom Typ 2	
Gut	Wert
A	70
B	130
C	185
A + A	120
A + B	190
A + C	200
B + B	210
B + C	230
C + C	255

Übersicht für Verkäufer über Ihre Kosten pro verkaufter Einheit abhängig vom Typ des Käufers und vom gekauften Gut

Kosten bei einem Käufer vom Typ 1	
Gut	Kosten
A	18
B	35
C	50

Kosten bei einem Käufer vom Typ 2	
Gut	Kosten
A	50
B	90
C	130

G.2 Translated instructions: English version

G.3 PV Mon

Instructions of the Experiment

Thank you very much for participating in this experiment. Please read the following information carefully. If you have any questions regarding the instructions please raise your hand. We will answer your questions at your cubicle. Please note that communication between participants is strictly prohibited until the end of the experiment.

For your arrival on time you receive 10 Swiss Francs. For answering the control questions after the instructions you receive 5 Swiss Francs. During the experiment, you can earn additional money. The amount of earnings during the experiment depends on your decisions and the decisions of other participants. All decisions will be made anonymously meaning no other participant will know your identity. At the end of the experiment you will be paid out anonymously meaning no other participant will know the amount of payment you received. During the experiment the earnings will be measured in ECU (= Experimental Currency Unit). You receive an initial endowment of 30 ECU. The experiment consists of several periods. In each period you can make **profits or losses**. At the end of the experiment **one period** will be randomly chosen to be payoff relevant. The total gain or loss in the randomly chosen period is added to the initial endowment resulting in the total amount of ECU earned. The exchange rate is:

$$2 \text{ ECU} = 1 \text{ Swiss Franc}$$

The exact procedure of the experiment is explained on the following pages.

The Experimental Procedure:

- The experiment consists of 16 periods. Each period consists of the same sequence of decisions.
- There are two different roles: sellers and buyers. The buyers are either of type 1 or type 2. Your role as a seller, a buyer of type 1 or a buyer of type 2 will be drawn randomly at the beginning of the experiment. Your role remains the same during the entire experiment. Your role will be displayed to you on your screen at the beginning of the experiment.
- At the beginning of the experiment you will be randomly matched to a group. Each group consists of four sellers, two buyers of type 1 and two buyers of type 2. The composition of the group does not change during the entire experiment.

The procedure in each period:

1. Each seller will be matched randomly with one of the four buyers of his group.
2. Each seller decides which of the three goods A, B, C (if any) he or she will offer to the matched buyer. Each seller can offer several goods, e.g. good A and good B. For each good that the seller offers he chooses a price.
3. The buyer observes the offered goods and the respective prices. The buyer can at most buy one good. Alternatively, he could also purchase no good at all.
4. The purchase of one good has following values for a buyer:

Buyer of type 1	
Good	Value
A	30
B	55
C	65

Buyer of type 2	
Good	Value
A	45
B	85
C	120

   If the buyer does not buy any good his value is 0.

5. If a good is purchased by a buyer, a seller has the following costs for the provision of the good:

Good	Costs
A	20
B	40
C	60

6. Information at the end of each period:
   - At the end of each period each buyer observes which good was sold at which price. Besides, the buyer observes his total profit in this period.
   - At the end of each period each seller observes if the appropriate buyer purchased a good. If the buyer bought a good, the seller observes which good was purchased. Besides, the seller observes the costs per good, the price stated per good, the profit made per good and the total profit in this period. Moreover, each seller observes which goods was offered at which prices.

Total profit per period:

- Seller:
  - If no good was sold: Total profit = 0.
  - If one good was sold: Total profit = Price of sold good – Costs of sold good.
- Buyer:
  - If no good was bought: Total profit = 0.
  - If one good was bought: Total profit = Value of purchased good – Price of purchased good.

Overview for buyers on the value of purchased good dependent on the buyer's type

Buyer of type 1	
Good	Value
A	30
B	55
C	65

Buyer of type 2	
Good	Value
A	45
B	85
C	120

Overview for sellers on costs per unit sold dependent on the purchased good

Good	Costs
A	20
B	40
C	60

G.3.1 CV Nonexclusive Competition

Instructions of the Experiment

Thank you very much for participating in this experiment. Please read the following information carefully. If you have any questions regarding the instructions please raise your hand. We will answer your questions at your cubicle. Please note that communication between participants is strictly prohibited until the end of the experiment.

For your arrival on time you receive 10 Swiss Francs. For answering the control questions after the instructions you receive 5 Swiss Francs. During the experiment, you can earn additional money. The amount of earnings during the experiment depends on your decisions and the decisions of other participants. All decisions will be made anonymously meaning no other participant will know your identity. At the end of the experiment you will be paid out anonymously meaning no other participant will know the amount of payment you received. During the experiment the earnings will be measured in ECU (= Experimental Currency Unit). You receive an initial endowment of 30 ECU. The experiment consists of several periods. In each period you can make **profits or losses**. At the end of the experiment **one period** will be randomly chosen to be payoff relevant. The total gain or loss in the randomly chosen period is added to the initial endowment resulting in the total amount of ECU earned. The exchange rate is:

$$2 \text{ ECU} = 1 \text{ Swiss Franc}$$

The exact procedure of the experiment is explained on the following pages.

The Experimental Procedure:

- The experiment consists of 16 periods. Each period consists of the same sequence of decisions.
- There are two different roles: sellers and buyers. The buyers are either of type 1 or type 2. Your role as a seller, a buyer of type 1 or a buyer of type 2 will be drawn randomly at the beginning of the experiment. Your role remains the same during the entire experiment. Your role will be displayed to you on your screen at the beginning of the experiment.
- At the beginning of the experiment you will be randomly matched to a group. Each group consists of four sellers, two buyers of type 1 and two buyers of type 2. The composition of the group does not change during the entire experiment.

The procedure in each period:

1. Each seller chooses which of the three goods A, B, C (if any) he or she will offer to buyers in his group. Each seller can offer several goods, e.g. good A and good B. For

each good that the seller offers he chooses a price. Each seller can sell several units of the goods offered.

2. Each buyer observes all goods offered in his group and the respective prices. The list of the offered goods is sorted by good and within goods by increasing prices. If several sellers offer the same good at the same price, offers are displayed in a random order. Moreover a buyer observes which of the goods are offered by the same seller. The seller number used for this purpose is randomly drawn for each seller in each period such that no inferences on the sellers' identity can be made. Overall, each buyer can at most buy two units. The two units may be from the same good or from two different goods. A buyer cannot buy two units from the same seller but only from two different sellers. E.g., a buyer may buy one unit of good A from seller n° 3 and one unit of good B from seller n° 4. Alternatively a buyer might also buy no good at all.

3. The purchase of one unit of one good, two units of one good or one unit of two goods has following value for a buyer:

Buyer of type 1	
Good	Value
A	30
B	55
C	65
A + A	50
A + B	70
A + C	78
B + B	85
B + C	90
C + C	95

Buyer of type 2	
Good	Value
A	70
B	130
C	185
A + A	125
A + B	175
A + C	220
B + B	225
B + C	255
C + C	270

If the buyer does not buy any good his value is 0.

4. If a good is purchased by a buyer, a seller has the following costs for the provision of good. The costs depends on whether buyers of type 1 or type 2 buy the good:

Costs for buyers of type 1	
Good	Costs
A	18
B	35
C	50

Costs for buyers of type 2	
Good	Costs
A	50
B	90
C	130

If several buyers buy from the same seller, seller's costs amount to the sum of each cost per good.

5. Information at the end of each period:

- At the end of each period each buyers observes which good the buyer bought at which price. Besides, the buyer observes his total profit in this period.
- At the end of each period each seller observes how many buyers of type 1 and how many buyers of type 2 bought which good from him. He additionally observes the costs per good and sale, the price posted per good, the profit made per type and good, the profit made per good and the total profit in this period. Moreover, each seller observes which goods were offered in his group in this period by other sellers and at which price.

Total profit per period:

- Seller:
  - If no good was sold: Total profit = 0.
  - If one/several good/s were sold: Total profit = Sum of prices of sold goods - Sum of costs of sold goods.
- Buyer:
  - If no good was bought: Total profit = 0.
  - If one good was bought: Total profit = Value of purchased good - Price of purchased good.
  - If two units of goods were bought: Total profit = Value of purchased goods - Sum of prices of purchased goods.

    Hint: The value of two units of good is not the same as the sum of values of the single goods.

Overview for buyers on the value of purchased good/s dependent on the buyer's type

Buyer of type 1	
Good	Value
A	30
B	55
C	65
A + A	50
A + B	70
A + C	78
B + B	85
B + C	90
C + C	95

Buyer of type 2	
Good	Value
A	70
B	130
C	185
A + A	125
A + B	175
A + C	220
B + B	225
B + C	255
C + C	270

Overview for sellers on costs per unit sold dependent on buyer's type and the good sold

Costs for buyers of type 1	
Good	Costs
A	18
B	35
C	50

Costs for buyers of type 2	
Good	Costs
A	50
B	90
C	130