Online Appendix for the paper: "Redistribution and Market Efficiency: An Experimental Study"*

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ABSTRACT

This document contains supplementary materials for the paper *Redistribution and Market Efficiency: An Experimental Study*. It is organized in the following way: Section OA1 contains the output of all regressions mentioned in the paper's Section 3 (Results with exogenous redistribution) as well as the output of additional specifications; Section OA2 contains the output of all regressions mentioned in the paper's Section 5 (Results with endogenous redistribution) as well as the output of additional specifications; Section AO3 consists of a sample of the instructions used in the experiment, and Section AO4 contains the code used to simulate the zero-intelligence market trading described in the paper.

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* To readers who find that the appendix is somewhat long, our apologies. We decided to err on the side of being repetitive but thorough rather than providing a shorter text that might omit information.

OA1. Regressions for the results with exogenous redistribution

Here, we present the output of the regressions mentioned in Section 3 (Results with exogenous redistribution). In all the tables we report standard errors in parenthesis, and we indicate statistical significance at the 10, 5, and 1 percent level with the symbols *, **, and ***.

Differences in market outcomes and behavior

Table OA1 reports the regressions used to test differences in efficiency. In all cases, the dependent variable is the total number of points participants generate through trading per period in a group. In regression Tobit I, we test whether efficiency in Market-0 and Market-1 differs from that in the zero-intelligence simulation. We use group random effects, treatment dummy variables, and we censor at the maximum efficiency of 238 points (respectively, 75 percent, 48 percent, and 21 percent of the observations in Market-0, Market-1, and the zero-intelligence simulation are censored). In the remaining regressions, we test whether efficiency differs between Market-0 and Market-1. Tobit II is the same as Tobit I but it excludes the simulation results. In Tobit III, we control for potential time trends and order effects by including unconditional period fixed effects. GLS I uses the same specification as Tobit III but uses linear estimates. Finally, in regression GLS II, we replace the group random effects with group fixed effects. In all regressions, Market-0 exhibits significantly higher efficiency than Market-1 ($p \leq 0.014$) and both Market-0 and Market-1 deliver significantly higher efficiency than zero-intelligence traders ($p \leq 0.001$).

Table OA2 reports the regressions used to test differences in probability of reaching full efficiency. In all cases, the dependent variable is a dummy variable equal to one if a group's total number of points in a period equal 238 points and zero otherwise. Logit I, Logit II, Logit III, and Logit IV use the same specification as Tobit I, Tobit II, Tobit III, and GLS II except that they use logit estimates. Results in Table AO2 mirror those in Table AO1: Market-0 has higher efficiency than Market-1 ($p \leq 0.013$) and both Market-0 and Market-1 have higher efficiency than zero-intelligence traders ($p \leq 0.001$).

Table OA1 - Differences in efficiency

	Tobit I	Tobit II	Tobit III	GLS I	GLS II
Market-1	16.50***	–11.00***	–11.59***	–4.23**	–4.23**
	(4.05)	(4.21)	(3.73)	(1.67)	(1.67)
Market-0	30.97***				
	(4.76)				
Constant	223.65***	247.54***	249.51***	235.11***	235.11***
	(0.08)	(3.87)	(9.00)	(3.93)	(3.82)
Period fixed effects	No	No	Yes	Yes	Yes
Group fixed or random effects	Random	Random	Random	Random	Fixed
χ^2/F test for all variables	57.82***	6.81***	9.67***	6.43**	6.43**
Number of observations	100080	80	80	80	80
Number of groups	10004	4	4	4	4

Table OA2 - Differences in the probability of full efficiency

	Logit I	Logit II	Logit III	Logit IV
Market-1	1.25***	–1.20**	–1.45***	–1.51***
	(0.32)	(0.48)	(0.55)	(0.56)
Market-0	2.45***			
	(0.37)			
Constant	–1.35***	1.10***	1.98	
	(0.01)	(0.37)	(1.29)	
Period fixed effects	No	No	Yes	Yes
Group fixed or random effects	Random	Random	Random	Fixed
χ^2 test for all variables	58.83***	6.15**	6.91***	7.29***
Number of observations	100080	80	80	80
Number of groups	10004	4	4	4

Table OA3 reports the regressions used to test differences in the number of transactions. The dependent variable is the total number of transactions per period in a group. GLS I tests whether Market-0 and Market-1 differ from the zero-intelligence simulation. The other regressions test whether Market-0 and Market-1 differ. GLS II excludes the simulation results. GLS III includes unconditional period fixed effects. GLS IV replaces the group random effects with group fixed effects. Finally, given that most groups transact 6, 7, or 8 units per period (they account for 92 percent of all observations), we also run regressions with ordered probit

estimates. OP I and OP II mirror the specification of GLS I and GLS III expect that they use ordered probit estimates and do not use group random effects.[1] In all regressions, there is no difference between Market-0 and Market-1 ($p \geq 0.199$) or between Market-0 and Market-1 and the zero-intelligence traders ($p \geq 0.193$). Moreover, for the GLS regressions it is straight forward to construct linear hypotheses that test whether the number of transactions in a treatment differs significantly from the equilibrium. In all cases, the number of transactions in Market-0 and Market-1 are not significantly different from 7 ($p > 0.118$).

Table OA4 reports the regressions used to test differences in price volatility. The dependent variable is the standard deviation of transaction prices per period in a group. GLS I tests whether Market-0 and Market-1 differ from the zero-intelligence simulation. The other regressions test whether Market-0 and Market-1 differ. GLS II excludes the simulation results. GLS III includes unconditional period fixed effects. GLS IV replaces the group random effects with group fixed effects. In all regressions, there is a significant difference between Market-0 and Market-1 ($p \leq 0.001$) and between Market-0 or Market-1 and the zero-intelligence traders ($p \leq 0.001$).

Table OA3 - Differences in number of transactions

	GLS I	**GLS II**	**GLS III**	**GLS IV**	**OP I**	**OP II**
Market-1	0.18	0.13	0.13	0.13	0.18	0.42
	(0.14)	(0.10)	(0.10)	(0.10)	(0.17)	(0.33)
Market-0	0.06				0.00	
	(0.14)				(0.17)	
Constant	6.97***	7.03***	6.94***	6.94***		
	(0.00)	(0.10)	(0.24)	(0.24)		
Period fixed effects	No	No	Yes	Yes	Yes	Yes
Group fixed or random effects	Random	Random	Random	Fixed	None	None
χ^2/F test for all variables	1.86	1.62	1.48	1.48	1.10	1.65
Number of observations	100080	80	80	80	80	80
Number of groups	10004	4	4	4	4	4

[1] Unfortunately, ordered probit estimators with random or fixed effects do not exist.

Table OA4 - Differences in price volatility

	GLS I	GLS II	GLS III	GLS IV
Market-1	–7.34***	3.20***	3.20***	3.20***
	(0.57)	(0.63)	(0.63)	(0.63)
Market-0	–10.53***			
	(0.57)			
Constant	12.96***	2.43**	2.64	2.64*
	(0.01)	(0.95)	(1.66)	(1.43)
Period fixed effects	No	No	Yes	Yes
Group fixed or random effects	Random	Random	Random	Fixed
F test for all variables	505.94***	25.83***	26.30***	26.30***
Number of observations	100080	80	80	80
Number of groups	10004	4	4	4

Table OA5 reports the regressions used to test differences in the fraction of transactions that occur at equilibrium prices. The dependent variable is the fraction of transactions per period in a group that occur at prices in the range [48, 52]. GLS I tests whether Market-0 and Market-1 differ from the zero-intelligence simulation. The other regressions test whether Market-0 and Market-1 differ. GLS II excludes the simulation results. GLS III includes unconditional period fixed effects. GLS IV replaces the group random effects with group fixed effects. In all regressions, there is a significant difference between Market-0 and Market-1 ($p \leq 0.001$) and between Market-0 or Market-1 and the zero-intelligence traders ($p \leq 0.001$).

Table OA6 reports the regressions used to test differences in conservativeness. The dependent variable is the mean conservativeness per period in a group. Recall that the conservativeness of a bid equals 50 points minus the bid and that of an ask equals the ask minus 50 points. GLS I tests whether Market-0 and Market-1 differ from the zero-intelligence simulation. The other regressions test whether Market-0 and Market-1 differ. GLS II excludes the simulation results. GLS III includes unconditional period fixed effects. GLS IV replaces the group random effects with group fixed effects. In all regressions, there is a significant difference between Market-0 and Market-1 ($p \leq 0.001$) and between Market-1 and the simulation ($p \leq 0.001$), but there is no significant difference between Market-0 and the simulation ($p = 0.161$).

Table OA5 - Differences in the fraction of transactions at equilibrium prices

	GLS I	GLS II	GLS III	GLS IV
Market-1	0.38***	–0.15***	–0.15***	–0.15***
	(0.02)	(0.05)	(0.04)	(0.04)
Market-0	0.52***			
	(0.02)			
Constant	0.17***	0.70***	0.69***	0.69***
	(0.00)	(0.08)	(0.11)	(0.09)
Period fixed effects	No	No	Yes	Yes
Group fixed or random effects	Random	Random	Random	Fixed
F test for all variables	882.86***	8.33***	14.43***	14.43***
Number of observations	100080	80	80	80
Number of groups	10004	4	4	4

Table OA6 - Differences in conservativeness

	GLS I	GLS II	GLS III	GLS IV
Market-1	2.35***	1.90***	1.90***	1.90***
	(0.33)	(0.53)	(0.43)	(0.53)
Market-0	0.46			
	(0.33)			
Constant	5.23***	5.68***	5.53***	5.53***
	(0.01)	(0.39)	(1.01)	(0.99)
Period fixed effects	No	No	Yes	Yes
Group fixed or random effects	Random	Random	Random	Fixed
F test for all variables	54.08***	12.87***	19.10***	19.10***
Number of observations	100080	80	80	80
Number of groups	10004	4	4	4

Determinants of conservative pricing

Table OA7 shows that the results concerning the link between unit efficiency and conservative pricing are robust to other specifications. In the paper, we run regressions using the following structure: $CON_{ikzx} = \alpha + \beta X_{ikzx} + \gamma_z + \mu_{ik} + \epsilon_{ikzx}$, where CON_{ikzx} is the conservativeness of trader i's x^{th} bid/ask for her k^{th} unit in period z; α is the constant; βX_{ikzx} are the vectors of independent variables/coefficients; γ_z are period fixed effects; μ_{ik} is a time invariant level of

conservativeness for each unit of each participant; and ϵ_{ikzx} is the error term. The time invariant conservativeness, μ_{ik}, is model as a random effect.

In GLS I and GLS II, we relax the assumptions made on the distribution of μ_{ik} by rerunning the specifications of Table 1 but treating μ_{ik} as a fixed effect. Specifically, in GLS I, the independent variables are a treatment dummy and the interaction between the treatment dummy and the efficiency of the respective unit (i.e., $v_{ik} - 50$ points if i is a buyer and $50 - c_{ik}$ points if i is a seller). In GLS II, we include the interaction between the treatment dummy and a dummy variable indicating the trader type (buyer vs. seller) and the three-way interaction between the treatment, trader type, and unit efficiency. Note that since we are using a fixed effect for each participant and unit, we cannot test whether there is a main effect on conservativeness of unit efficiency or trader type. In other words, GLS I is comparable to Regression II in Table 1 and GLS II to Regression III. In GLS III and GLS IV, we relax the assumptions made on the distribution of e_{ikzx} by clustering standard errors on each group and period. In other words, we allow errors to be correlated within the two-minute interval during which a market is open, which is quite reasonable as participants are reacting to each other's trades in real time such that the behavior of one participant might have an immediate effect on the actions that other participants can take.[2] GLS III uses the same independent variables as Regression II in Table 1 and GLS IV the same ones as Regression III. Note that in these regressions we set $\mu_{ik} = 0$ for all i, k. Finally, in GLS V and GLS VI, we combine these specifications by treating μ_{ik} as a fixed effect and clustering standard errors on each group and period. GLS I is comparable to Regression II in Table 1 and GLS II to Regression III.

As we can see, the main results in Table 1 hold with these alternative specifications. First, the Market-1 dummy variable is statistically significant ($p < 0.001$), which confirms that trading is more conservative under full redistribution. Second, there is a significantly negative interaction between the Market-1 dummy variable and unit efficiency, which implies that participants are less conservative when trading highly efficient units and more conservative

[2] We cluster on each group and period because clustering solely on groups implies using only four clusters, which means that the asymptotic results for the estimator are less likely to hold and the estimated standard errors might be substantially biased (see Wooldridge, 2003; Nichols and Schaffer, 2007; Cameron et al., 2010).

when trading inefficient units. Third, once we control for the type of trader, we see that all traders are more conservative in Market-1 than in Market-0 but the interaction with efficiency is driven by the behavior of buyers.

Table OA7 – Determinants of conservative pricing

	GLS I	**GLS II**	**GLS III**	**GLS IV**	**GLS V**	**GLS VI**
Market-1	2.61***	3.11***	2.49***	3.33***	2.61***	3.11***
	(0.35)	(0.48)	(0.56)	(0.88)	(0.58)	(0.78)
Unit efficiency			–0.10***	–0.08***		
			(0.02)	(0.02)		
Market-1 × unit efficiency	–0.07***	–0.13***	–0.07**	–0.13***	–0.07***	–0.13***
	(0.02)	(0.02)	(0.03)	(0.04)	(0.02)	(0.03)
Seller				–1.09		
				(1.09)		
Seller × Market-1		–1.26*		–1.51		–1.26
		(0.69)		(1.38)		(1.17)
Seller × unit efficiency				–0.08		
				(0.05)		
Seller × Market-1 × unit efficiency		0.15***		0.13**		0.15***
		(0.04)		(0.05)		(0.04)
Constant	4.81***	4.83***	5.96***	6.62***	4.81***	4.83***
	(0.56)	(0.56)	(1.68)	(1.74)	(1.68)	(1.68)
Period fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Trader × unit fixed effects	Yes	Yes	No	No	Yes	Yes
Clustering on period × group	No	No	Yes	Yes	Yes	Yes
F test for all variables	31.25***	19.98***	10.48***	6.09***	10.38***	7.81***
Number of observations	3173	3173	3173	3173	3173	3173
Number of traders	39	39	39	39	39	39
Number of groups	4	4	4	4	4	4

OA2. Regressions for the results with endogenous redistribution

Here, we present the output of the regressions mentioned in Section 5 (Results with endogenous redistribution). In all the tables we report standard errors in parenthesis, and we indicate statistical significance at the 10, 5, and 1 percent level with the symbols *, **, and ***.

Differences in tax rates, voting, and transfers

Table OA8 reports regressions used to test differences in behavior between No Transfers and Transfers in the election and tax competition stages. These regressions are not mentioned in the paper but are included here for completeness. Note that all these regressions include group random effects and period fixed effects. The dependent variable in the first regression is the fraction of insincere votes per period in a group. It uses tobit estimates censoring at 0 (77 percent of the observations are censored). The dependent variable in the second regression is the mean tax rate per period in a group. It uses tobit estimates censoring at 0 and 1 (51 percent of the observations are censored). The dependent variable in the third regression is the winning tax rate per period in a group. It uses tobit estimates censoring at 0 and 1 (82 percent of the observations are censored). The dependent variable in the fourth regression is the fraction of tax rates equal to 1 per period in a group. It uses tobit estimates censoring at 0 and 1 (66 percent of the observations are censored). Finally, the dependent variable in the fifth regression equals one if the winning tax rate equals 1 in a period in a group and zero otherwise. It uses logit estimates. There is no significant difference between No Transfers and Transfers in the fraction of insincere votes ($p = 0.326$) or in the chosen tax rates ($p > 0.205$). For the winning tax rate, the third regression reports significantly higher winning tax rates in Transfers ($p = 0.015$) but the fifth regression does not find a significantly higher probability that the winning tax rate is 1 ($p = 0.116$). Thus, we get a mixed result. However, it is nevertheless the case that the difference in winning tax rates between No Transfers and Transfers is not large in an economic sense (0.90 vs. 0.95).[3]

[3] If we make these comparisons using group means as observations and Wilcoxon signed rank tests, we find no treatment differences in insincere voting ($p = 0.394$), tax rates ($p = 0.575$), winning tax rates ($p = 0.225$), the fraction of tax rates equal to 1 ($p = 0.478$), or the fraction of winning tax rates equal to 1 ($p = 0.448$).

Table OA8 - Differences in voting and tax rates

	Insincere voting	Tax rate	Winning tax rate	Tax rate = 1	Winning tax rate = 1
Transfers	–0.03	0.07	0.36**	0.08	1.44
	(0.03)	(0.05)	(0.15)	(0.11)	(0.92)
Constant	–0.14	0.96***	1.77***	0.88***	3.19
	(0.09)	(0.14)	(0.43)	(0.32)	(2.19)
Period fixed effects	Yes	Yes	Yes	Yes	Yes
Group fixed or random effects	Random	Random	Random	Random	Random
χ^2 test for all variables	0.97	1.60	5.91**	0.55	2.48
Number of observations	160	160	160	160	160
Number of groups	8	8	8	8	8

Table OA9 - Relationship between transfers and tax rates

	Tobit I	Tobit II	GLS I	GLS II
Difference in transfers between rich and poor	–3.73***	–3.77***	–1.64***	–1.57**
	(1.12)	(1.41)	(0.57)	(0.62)
Constant	134.19***	129.52***	86.64***	83.04***
	(13.88)	(25.86)	(9.10)	(5.56)
Period fixed effects	No	Yes	Yes	Yes
Candidate fixed or random effects	Random	Random	Random	Fixed
χ^2/F test for all variables	11.17***	7.10***	8.21***	6.48**
Number of observations	160	160	160	160
Number of candidates	8	8	8	8

The regressions in Table OA9 evaluate the relationship between the candidates' tax rate choice and the amount of monetary transfers they receive from the citizens. The dependent variable is the tax rate chosen per period by a candidate (in percent) and the independent variable equals the sum of transfers form the rich minus the sum of transfers from the poor. In Tobit I, we use tobit estimates censoring at 0 and 1 (70 percent of the observations are censored) and candidate random effects. In Tobit II, we control for potential time trends and order effects by including unconditional period fixed effects. GLS I uses the same specification as Tobit II but with linear estimates. Finally, GLS II replaces the candidate random effects with candidate fixed effects. We find a significantly negative relationship between the chosen tax rate and the difference in transfers between the rich and the poor ($p \leq 0.012$).

Differences in market outcomes and behavior

The regressions in Table OA10 compare the efficiency levels in No Transfers and Transfers vis-à-vis those in Market-0, Market-1, and the zero-intelligence simulation. In all cases, the dependent variable is the total number of points participants generate through trading per period in a group. Moreover, we use tobit estimates censoring efficiency at the maximum of 238 points (respectively, 55 percent and 58 percent of the observations in No Transfers and Transfers are censored) and group random effects. In 'Zero-Intelligence', we test whether efficiency in No Transfers and Transfers differs from that in the zero-intelligence simulation. In 'Market-0 I' and 'Market-0 II', we test whether efficiency in No Transfers and Transfers differs from that in Market-0. 'Market-0 I' and 'Market-0 II' differ in that the latter includes period fixed effects. Finally, in 'Market-1 I' and 'Market-1 II', we test whether efficiency in No Transfers and Transfers differs from that Market-1. 'Market-1 I' and 'Market-1 II' differ in that the latter includes period fixed effects. In all cases, the omitted variable is the treatment that we test against. Table OA11 follows the same structure as Table OA10, but reports instead regressions that test differences in probability of reaching full efficiency. In all cases, it uses logit estimates where the dependent variable is a dummy variable equal to one if a group's total number of points in a period equal 238 points and zero otherwise.

Table OA10 - Differences in efficiency

	Zero-Intelligence	**Market-0 I**	**Market-0 II**	**Market-1 I**	**Market-1 II**
No Transfers	18.56***	–11.06	–11.55	2.84	2.78
	(2.95)	(7.64)	(7.32)	(6.92)	(6.03)
Transfers	18.19***	–11.91	–11.96**	1.97	1.96
	(2.96)	(7.62)	(5.96)	(6.91)	(4.57)
Constant	223.65***	253.50***	254.27***	238.96***	241.99***
	(0.08)	(6.58)	(11.75)	(4.66)	(9.99)
Period fixed effects	No	No	Yes	No	Yes
Group fixed or random effects	Random	Random	Random	Random	Random
χ^2 test for all variables	75.23***	2.47	4.53*	0.19	0.21
Number of observations	100160	200	200	200	200
Number of groups	10008	12	12	12	12

Table OA11 - Differences in the probability of full efficiency

	Zero-Intelligence	Market-0 I	Market-0 II	Market-1 I	Market-1 II
No Transfers	1.54***	–0.93*	–1.00**	0.31	0.34
	(0.23)	(0.49)	(0.50)	(0.51)	(0.54)
Transfers	1.65***	–0.82**	–0.89**	0.43	0.46
	(0.23)	(0.37)	(0.35)	(0.38)	(0.40)
Constant	–1.35***	1.14***	1.23	–0.10	0.12
	(0.01)	(0.33)	(0.87)	(0.32)	(0.88)
Period fixed effects	No	No	Yes	No	Yes
Group fixed or random effects	Random	Random	Random	Random	Random
χ^2 test for all variables	94.94***	4.90*	6.33**	1.45	1.56
Number of observations	100160	200	200	200	200
Number of groups	10008	12	12	12	12

Tables OA10 and OA11 both clearly find that the DA in both No Transfers and Transfers deliver significantly higher efficiency than zero-intelligence traders ($p \leq 0.001$). Similarly, it is also clear that there are no significant differences in efficiency between Market-1 and either No Transfers or Transfers ($p \geq 0.254$). The comparisons with Market-0 are a bit more ambiguous as some of the p values are above 10 percent. Specifically, we see from 'Market-0 II' that, compared to Market-0, Transfers has significantly lower efficiency ($p = 0.045$) and a lower probability of attaining full efficiency ($p = 0.028$). For No transfers, these comparisons have slightly higher p values so that only the probability of attaining full efficiency is significantly lower at the 10 percent level ($p = 0.058$; for the efficiency level $p = 0.115$). Finally, as we can see, adding the period fixed effects, lowers the p values a little, which is due to differences in efficiency being larger in latter periods (see Figure 6 in the main body of the paper). Hence, as stated in the paper, the differences observed between Market-1, Market-0, and the zero-intelligence simulation translate to market behavior in DAs with endogenous redistribution, but they are somewhat weaker.[4]

[4] If we test the treatment differences in efficiency using group means as observations and Mann Whitney U tests, we find that No Transfers does not differ significantly from either Market-0 ($p = 0.461$) or Market-1 ($p = 0.570$), and that Transfers differs significantly from Market-0 ($p = 0.016$) but not from Market-1 ($p = 0.933$).

Table OA12 - Differences in the number of transactions

	Zero-Intelligence	Market-0 I	Market-0 II	Market-1 I	Market-1 II
No Transfers	0.01	−0.05	−0.05	−0.18	−0.18
	(0.10)	(0.10)	(0.10)	(0.15)	(0.16)
Transfers	−0.09	−0.15	−0.15	−0.28*	−0.28
	(0.10)	(0.10)	(0.10)	(0.16)	(0.18)
Constant	6.97***	7.03***	6.99***	7.15***	7.09***
	(0.00)	(0.08)	(0.16)	(0.14)	(0.18)
Period fixed effects	No	No	Yes	No	Yes
Group fixed or random effects	Random	Random	Random	Random	Random
F test for all variables	0.87	3.30	3.27	3.15	3.31
Number of observations	100160	200	200	200	200
Number of groups	10008	12	12	12	12

The regressions in Table OA12 test differences in the number of transactions. The dependent variable is the number of transactions per period in a group. We use GLS estimates and group random effects. Moreover, we use the same structure as Table A10. Namely, No Transfers and Transfers are compared first to the zero-intelligence traders, then to Market-0 (with and without period fixed effects), and lastly to Market-1 (with and without period fixed effects). There are no significant differences between either No Transfers or Transfers and the zero-intelligence traders ($p \geq 0.345$) or Market-0 ($p \geq 0.117$). The same is true for Market-1 in regressions with period fixed effects ($p \geq 0.116$, else $p \geq 0.089$). We also find that the number of transactions in No Transfers and Transfers are not significantly different from 7 (the equilibrium, $p > 0.118$).

The regressions in Table OA13 test differences in price volatility. The dependent variable is the standard deviation of transaction prices per period in a group. We use GLS estimates and group random effects. Moreover, we use the same structure as Table A10. Namely, No Transfers and Transfers are compared first to the zero-intelligence simulation, then to Market-0 (with and without period fixed effects), and lastly to Market-1 (with and without period fixed effects). There are significant differences between both No Transfers and

Transfers and the zero-intelligence traders ($p \leq 0.001$) and Market-0 ($p \leq 0.013$), but not with Market-1 ($p \geq 0.254$).[5]

The regressions in Table OA14 test differences in the fraction of transactions that occur at equilibrium prices. The dependent variable is the fraction of transactions per period in a group that are traded at prices in the range [48, 52]. We use GLS estimates and group random effects. Moreover, we use the same structure as Table A10. Namely, No Transfers and Transfers are compared first to the zero-intelligence simulation, then to Market-0 (with and without period fixed effects), and lastly to Market-1 (with and without period fixed effects). There are significant differences between No Transfers and Transfers and the zero-intelligence simulation ($p \leq 0.001$). Compared to Market-0, the same is true for Transfers but only with period fixed effects ($p = 0.049$) and for No Transfers but only at the 10 percent level ($p = 0.098$). By contrast, there are no significant differences between these two treatments and Market-1 ($p \geq 0.689$).

Table OA13 - Differences in price volatility

	Zero-Intelligence	**Market-0 I**	**Market-0 II**	**Market-1 I**	**Market-1 II**
No Transfers	–8.05***	2.49***	2.49***	0.71	0.71
	(0.40)	(0.80)	(0.76)	(1.79)	(1.85)
Transfers	–9.24***	1.29***	1.29**	–1.90	–1.90
	(0.40)	(0.50)	(0.52)	(0.67)	(0.76)
Constant	12.96***	2.43***	3.13***	5.62***	6.68***
	(0.01)	(0.27)	(0.75)	(1.62)	(1.62)
Period fixed effects	No	No	Yes	No	Yes
Group fixed or random effects	Random	Random	Random	Random	Random
F test for all variables	921.50***	15.85***	14.21***	2.58	2.90
Number of observations	100160	200	200	200	200
Number of groups	10008	12	12	12	12

[5] If we test the treatment differences in price volatility using group means as observations and Mann Whitney U tests, we find that both No Transfers and Transfers do not differ significantly from Market-1 ($p = 0.610$ for both) but differ significantly from Market-0 ($p = 0.089$ and $p = 0.062$).

Table OA14 - Differences in the fraction of transactions at equilibrium prices

	Zero-Intelligence	Market-0 I	Market-0 II	Market-1 I	Market-1 II
No Transfers	0.32***	–0.20	–0.20*	–0.06	–0.06
	(0.02)	(0.13)	(0.12)	(0.15)	(0.14)
Transfers	0.34***	–0.19*	–0.19**	–0.04	–0.04
	(0.02)	(0.10)	(0.09)	(0.12)	(0.12)
Constant	0.17***	0.70***	0.58***	0.55***	0.43***
	(0.00)	(0.08)	(0.11)	(0.11)	(0.14)
Period fixed effects	No	No	Yes	No	Yes
Group fixed or random effects	Random	Random	Random	Random	Random
F test for all variables	907.21***	3.46	3.97	0.15	0.16
Number of observations	100160	200	200	200	200
Number of groups	10008	12	12	12	12

Table OA15 reports the regressions used to test differences in conservativeness. The dependent variable is the mean conservativeness per period in a group. Recall that the conservativeness of a bid equals 50 points minus the bid and that of an ask as the ask minus 50 points. We use GLS estimates and group random effects. Moreover, we use the same structure as Table A10. Namely, No Transfers and Transfers are compared first to the zero-intelligence simulation, then to Market-0 (with and without period fixed effects), and lastly to Market-1 (with and without period fixed effects). There are significant differences between No Transfers and Transfers and the zero-intelligence traders ($p \leq 0.002$). By contrast, there are no significant differences between these two treatments and Market-0 ($p \geq 0.667$). For comparisons vis-à-vis Market-1, there is no significant differences between No Transfers and Market-1 ($p \geq 0.163$) and there is a significant difference between Transfers and Market-1 ($p \leq 0.012$).[6]

[6] If we test the treatment differences in conservativeness using group means as observations and Mann Whitney U tests, we find that No Transfers does not differ significantly from either Market-0 ($p = 0.734$) or Market-1 ($p = 0.396$), and that Transfers differs significantly from Market-1 ($p = 0.089$) but not from Market-0 ($p = 0.734$).

Table OA15 - Differences in conservativeness

	Zero-Intelligence	Market-0 I	Market-0 II	Market-1 I	Market-1 II
No Transfers	0.97***	0.52	0.52	–1.38	–1.38
	(0.23)	(1.31)	(1.20)	(1.06)	(0.99)
Transfers	0.73***	0.27	0.27	–1.63**	–1.63***
	(0.23)	(1.01)	(0.87)	(0.65)	(0.55)
Constant	5.23***	5.69***	5.63***	7.58***	7.52***
	(0.01)	(0.91)	(0.65)	(0.98)	(0.42)
Period fixed effects	No	No	Yes	No	Yes
Group fixed or random effects	Random	Random	Random	Random	Random
F test for all variables	27.49***	0.18	0.19	7.68**	9.93**
Number of observations	100160	200	200	200	200
Number of groups	10008	12	12	12	12

Determinants of conservative pricing

In Table AO16, we run a similar analysis as the one reported in Table 1 of the paper. We run two GLS regressions with conservativeness as the dependent variable. Unfortunately, due to slight differences in the computer program, the saved market data in the No Transfers and Transfers treatments does not allow us to differentiate between a trader's bids/asks for his first and second unit.[7] Therefore, we cannot a run the same specifications as in Table 1. In particular, we cannot include a random effect for each of the participants' units. Moreover, we cannot construct a variable measuring the expected efficiency of the unit being traded and, instead, we have to use a variable measuring a participant's expected efficiency (i.e., the average reservation value of a buyer's two units minus 50 points or 50 points minus the average production cost of a seller's two units). In both regressions, we use data from treatments with exogenous and the endogenous redistribution. In our first regression, we simply include treatment dummy variables while in our second regression, we interact the treatment dummies with the participants' expected efficiency. Both regressions use period

[7] The information can be reconstructed by doing a case by cases analysis of each posted price in each period and group. However doing so requires a significant investment of time.

fixed effects and standard errors clustered on each group and period (i.e., allowing errors to be correlated during the time a market is open).

From the first regression, we see that the Market-1 dummy variable is significantly positive ($p < 0.001$), which confirms that traders are more conservative in that treatment. The No Transfers and Transfers dummies are also positive, but they are not statistically significant ($p \geq 0.154$). Hence, the effect is not as clear in those treatments. Once again, the more interesting result is the negative interaction between participant efficiency and the treatment dummies, which implies that participants are less conservative when the average efficiency of their units is high. As seen in the second regression, this interaction is significant in Market-1 ($p < 0.001$), which mirrors the result in Table 1, in No Transfers ($p < 0.001$), but not in Transfers ($p = 0.155$). We can also see from the magnitude of the coefficients that the effect is weaker in Transfers.

Table AO16 – Determinants of conservative pricing

	Regression I	**Regression II**
Participant efficiency		–0.12***
		(0.03)
Market-1	1.87***	3.19***
	(0.46)	(0.65)
Market-1 × participant efficiency		–0.17***
		(0.05)
No Transfers	0.67	1.92***
	(0.47)	(0.63)
No Transfers × participant efficiency		–0.17***
		(0.04)
Transfers	0.23	0.45
	(0.36)	(0.47)
Transfers × participant efficiency		–0.05
		(0.04)
Constant	5.72***	6.83***
	(0.52)	(0.60)
F test for all variables	6.44***	49.19***
Number of observations	8855	8855
Number of participants	112	112

OA3. Experimental instructions

These instructions are translated from the original German version and contain all possible stages of the game: double auction market, lobbying, tax competition, and election stage. Instructions for treatments with fewer stages use identical parts of the present instructions, and they are available from the authors on request. The experiment was programmed in z-Tree (Fischbacher 2007).

General instructions

Welcome to today's experiment. You will receive 2.50 € for participation. Depending on your *own decisions* and the *decisions of other participants*, you can earn more money. During the experiment, you have the opportunity to collect *points*. **17 points are worth 1 €**. At the end of the experiment, your total points will be exchanged to € and be paid to you in cash, together with your participation fee. The payment remains *anonymous*, that is, we do not inform any other participant about your payment.

Note that you are not allowed to ask questions *aloud* or communicate with other participants during the entire experiment. If you have questions, please raise your hand. One of the experimenters will come to you and answer your questions.

Part I and part II

The experiment consists of two parts (*part I* und *part II*). At the moment, you only have the instruction for part I on hand. After part I has finished, you will receive the instructions for part II.

Instructions part I

Decisions rounds and Your group

There are *10 decision rounds*. At the *beginning of the experiment*, the computer will *randomly* divide the participants into *groups of 12 participants*. *Your group* consists of you and eleven other participants. No matter in which round you are, you and the other participants in your group will never be introduced to each other. **The composition of your group does not**

change during the entire experiment. You do not interact in any way with other groups in this experiment!

Candidates and Members

At the beginning of the experiment, the computer will *randomly* divide your group into *2 candidates* ("candidate 1" and "candidate 2") and *10 members* ("member 1", …, "member 10"). Each participant in your group has the same probability of becoming a candidate or a member. At this point, you will be informed about your own type, candidate or member, but not about the types of other participants in your group. The same holds for other participants in your group. (You can always see your own type in the top right corner of the screen.) **Please note that your type candidate or member will *never* change during the entire experiment.**

Different phases of a decision round

Each decision round consists of *4 phases* ("*market*", "*transfers to candidates"*, *"transfers between members"* and "*voting"*). The two candidates only make decisions in the phase 'transfers between members' and the ten members only make decisions in the three phases 'market', 'transfers to candidates', and 'voting'. (You can always see the current phase in the top left corner of the screen.) Precisely what kind of decisions these are and how these influence your payment and the payment of other participants in your group will be explained in the following sections in detail for each phase.

Phase 'market'

In this phase, the 10 members make decisions in a market. The two candidates do *not* make decisions in this phase and only watch the market activity.

Sellers and buyers:

At the beginning of the experiment, the computer will *randomly* divide the 10 members into 5 *sellers* and 5 *buyers*. Each member has the same probability of becoming a seller or buyer. This division does not change during the entire experiment. That is, no matter in which round a member is, he or she is always a seller or a buyer in the 'market' phase.

Goods, costs, and maximum willingness to pay:

Each seller can *sell 2 units* of an 'imaginary' good, and each buyer can *buy 2 units* of the good. In the following, we denote these goods for each seller and buyer by *'good 1'* and *'good 2'*. *At the beginning of the experiment*, each seller will be assigned *costs* for the two goods. Similarly, *at the beginning of the experiment* each buyer will be assigned a *maximum willingness to pay* for each of the two goods. For each seller and buyer, the respective costs and willingness to pay do not change during the entire experiment. An individual's costs or willingness to pay are only known to the respective seller and buyer and are different between the sellers and between the buyers.

Market periods, asks, and bids:

In each round, there is one *market period* in the 'market' phase. Each market period lasts *2 minutes*. During a market period, all sellers can make *asks* and all buyers can make *bids*, visible to everyone. Each seller can first sell his or her good 1 (with *lower* costs) and can only thereafter sell good 2 (with *higher* costs). Each buyer can first buy good 1 (with *higher* maximum willingness to pay) and can only thereafter buy good 2 (with *lower* maximum willingness to pay). Sellers can only sell and buyers can only buy. An *ask* must always be *lower* than the current ask on the market (but larger or equal to the own costs). A *bid* must always be *larger* than the current bid in the market (but lower or equal to the own maximum willingness to pay).

Transactions:

A *transaction* occurs if *either* a seller accepts a bid *or* a buyer accepts an ask (the transaction price is then equal to the accepted amount of the bid or ask, respectively).

Earnings from the market:

Earnings of sellers for each sold good:

- For each *sold* good, a seller earns points that are calculated as the difference between the transaction price and the costs of this good:
  (Earnings from sold good = transaction price – costs).

- For each good that is *not* sold, a seller earns nothing **(0 points)**. Hence, there are *no* costs for a good if it is not sold!

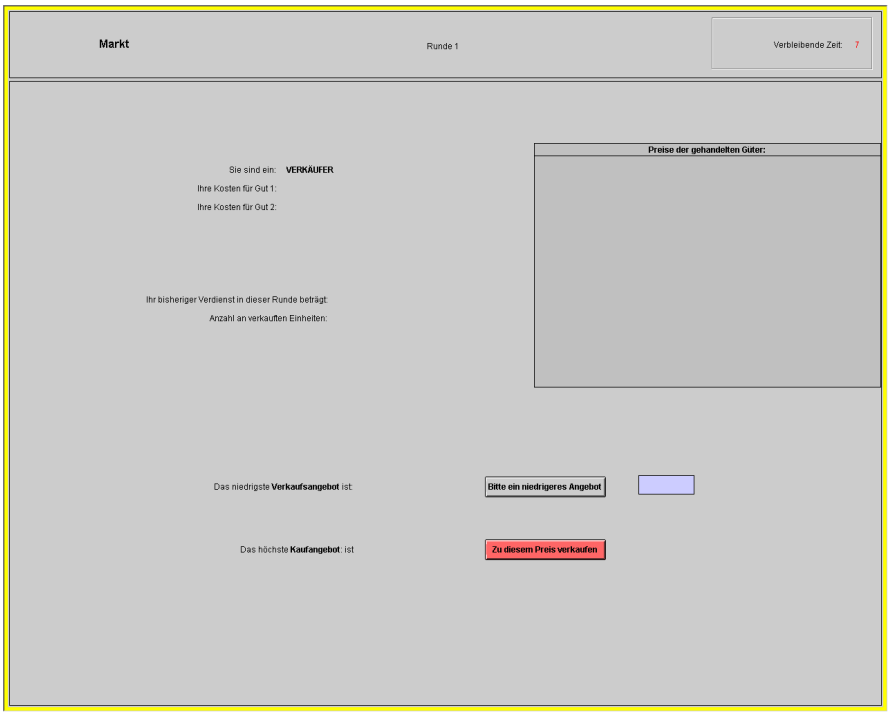
Earnings of buyers for each good bought:

- For each *bought* good, a buyer earns points that are calculated as the difference between the maximal willingness to pay for this good and the transaction price:
  (Earnings from bought good = maximal willingness to pay – transaction price).
- For each good that is *not* bought, a buyer earns nothing **(0 points)**.

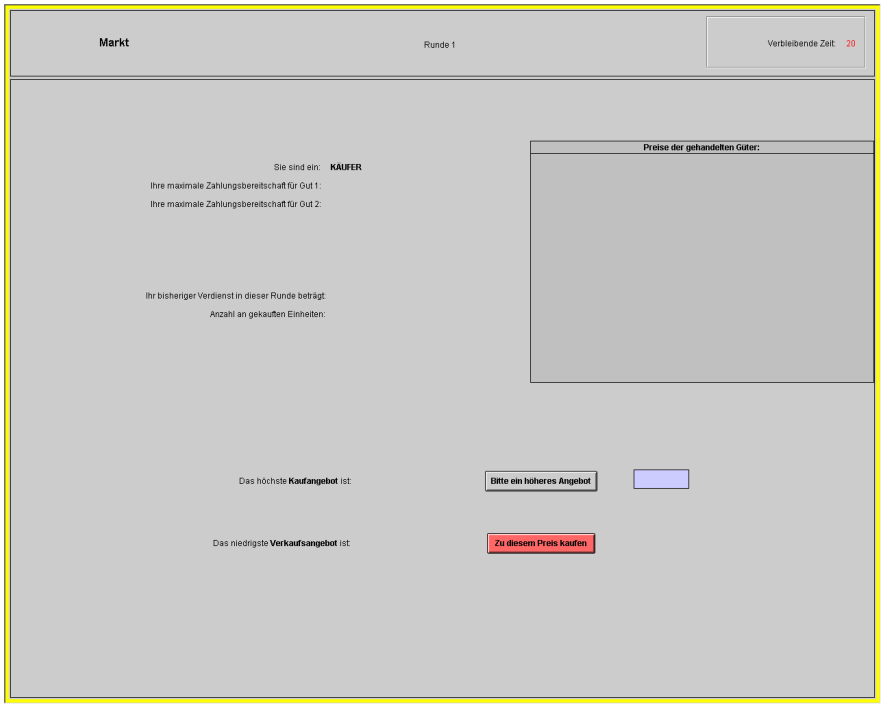
In this phase, *candidates* cannot earn any points.

The following screens (*"Seller"* and *"Buyer"*) can be seen during the experiment by the sellers and buyers, respectively (candidates see a screen that shows the current earnings of members).

Screen 'Market' for sellers



Screen ‚Market' for buyers



A seller who wants to accept the current bid in the market must press the button "Sell at this price". If the seller wants to make a new ask, he or she can do this in the input field to the right of the button "Please make a smaller ask", and confirm his or her decision by clicking the button.

A buyer who wants to accept a current ask in the market must press the button "Buy at this price". If the buyer wants to make a new bid, he or she can do this in the input field to the right of the button "Please make a higher bid", and confirm his or her decision by clicking the button.

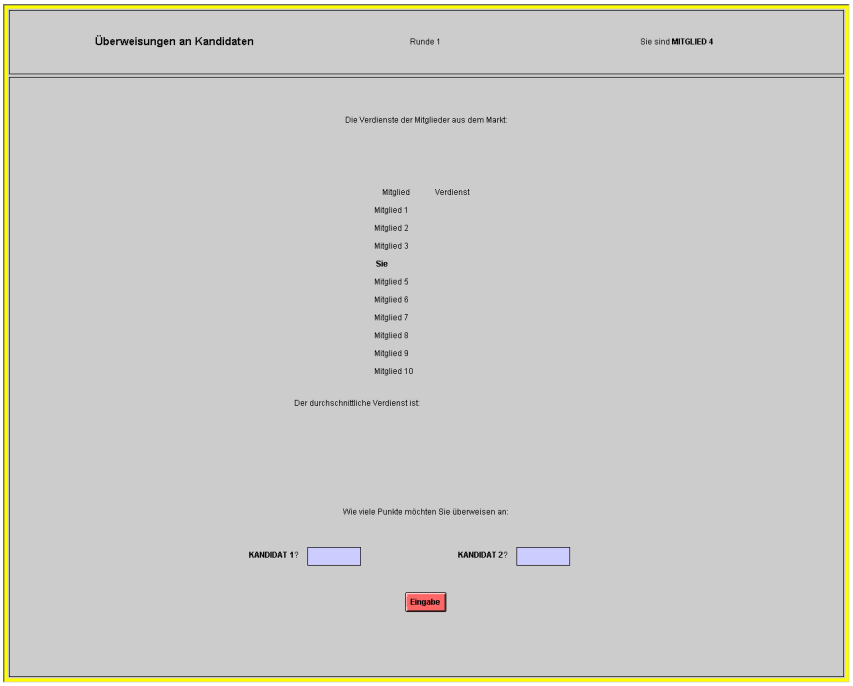
Phase 'Transfers to candidates'

In this phase, once again, only the ten members make decisions. Candidates do not make decisions in this phase. At the beginning of the phase, *all* participants in your group (candidates and members) will be informed about each member's market earnings. Each member will be asked to transfer an amount (in points) to candidate 1 *and/or* to candidate 2, with the restriction that the sum of transfers to both candidates cannot exceed the own market earnings. Hence, *in total*, each member can transfer *any* amount between 0 points (0 inclusive) and his or her own market earnings (this point-amount inclusive) to the two candidates together. As long as this restriction is fulfilled, a member can transfer *any possible*

combination of points to the two candidates. While making their decisions, no member knows the decision of any other member in the group.

The following screen *Transfers to candidates* can be seen by the ten members in the experiment.

On the screen, members can see their *own market earnings* (Line "You"), the *market earnings of the other nine members*, and the *average market earnings* of *all* members. Below, the members are asked to decide on their transfers to the two candidates. This can be done by entering the chosen amount in the input fields for candidate 1 and candidate 2, respectively. The transfers must be confirmed by clicking the *"Enter" button*.



Phase 'Transfers between members'

In this phase, only the two candidates (candidate 1 and candidate 2) make decisions. Members do not make decisions in this phase. After all members have made their decisions in the phase 'transfers to candidates', both candidates will be informed about these decisions. Then, each candidate will be asked to choose a *percentage between 0 and 100* (0 and 100

inclusive). While candidates choose their percentages, they do not know the other candidate's decision.

The percentage determines the amount of transfers (in points) *between* members, where some members must pay points and other members receive points. The transfer of *each member* is calculated as follows:

Transfer of member = percentage × (average market earnings – own market earnings).

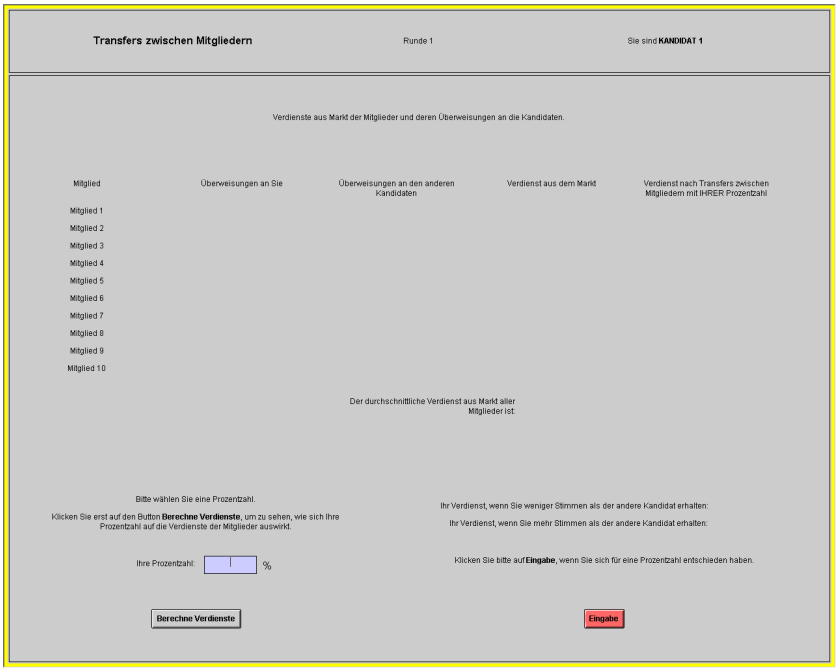
There are three possible situations for a member:

1) The transfer of a member is **negative** (he or she must pay a point-amount), if the own market earnings are **greater** than the average market earnings of all members.
2) The transfer of a member is **positive** (he or she receives a point-amount), if the own market earnings are **smaller** than the average market earnings of all members.
3) The transfer of a member is **equal to zero** (he or she neither pays nor receives a point-amount), if the own market earnings are **equal to** the average market earnings of all members.

There are two extreme cases: A percentage of 0 results in no transfers between members (the market earnings of members do not change). With a percentage of 100, the earnings change such that all members have the same after-transfer earnings (which are equal to the average market earnings of all members). Please note that the after-transfer earnings are not necessarily the final earnings of the current round because possible transfers to the candidates still need to be subtracted.

Which percentage, the one chosen by candidate 1 or by candidate 2, finally determines the transfers between the members, will be explained in more detail in the next phase, "voting".

The following screen *Transfers between members* can be seen by both candidates in the experiment.

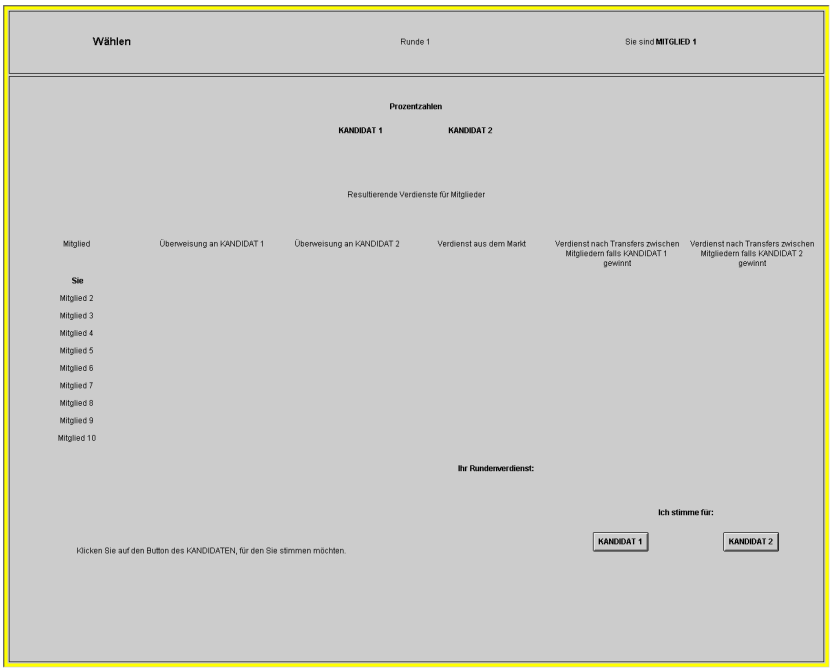


The screen contains the following information for candidates: the *transfers of each member, respectively to him- or herself* (column "Transfers to you") and *the other candidate* (column "Transfers to other candidate"), the *market earnings of each member* (column "Market earnings") and below, the *average market earnings* of all members. To the right below the table, a candidate can see her *earnings* in case he or she receives *fewer* votes than the other candidate in the voting phase (= Sum of transfers + 15 points) and in case he or she receives *more* votes than the other candidate (= Sum of transfers + 25 points) (this will be explained in more detail in the instructions for the phase "voting"). At the bottom left, the candidates can enter their chosen percentages in the input field. Thereafter, they must first click the *button "Calculate earnings"*, which will then also appear in the right column "Earnings after transfers between members with your percentage" in the table. Please note that these earnings of the members do not include their possible transfers to the candidates (see column "Transfers to you" and "Transfers to the other candidates"). If the candidate does no longer want to change his or her chosen percentage, he or she must confirm by clicking the *"Enter" button*.

Phase 'voting'

In this phase, only the ten members make decisions. Candidates do not make decisions in this phase. All members are asked to vote for either *candidate 1* or *candidate 2*. Members make their own decisions and do not know the decisions of any other members. After all members have voted, the computer calculates the *number of votes for candidate 1* and the *number of votes for candidate 2* and compares both numbers. The candidate with **more** votes receives **25 points**, and his or her percentage chosen in phase "Transfers between members" determines the point-transfers between the members. The candidate with **fewer** votes receives **15 points**, and his or her chosen percentage will not be considered.

The following screen *Voting* can be seen by the ten members in the experiment.



The screen contains the following information for the members: The chosen *percentage of candidate 1 and candidate 2*, respectively (upper part of the screen) and in row "You", the *own transfers to candidate 1 and candidate 2* (column "Transfers to candidate 1" and "Transfers to candidate 2"), the *own market earnings* (column "Market earnings") and *earnings after transfers, if candidate 1 and candidate 2 receives more votes*, respectively (columns "Earnings after transfers between members if candidate 1 wins" and "Earnings after transfers between

members if candidate 2 wins"). Members receive the same information about each of the other members. At the bottom of both columns on the right, members can see their *earnings in this round* (earnings after transfers *and* after subtracting his or her potential transfers to candidates) for the cases that candidate 1 or candidate 2 wins, respectively. The members' decisions on whether to vote for candidate 1 *or* for candidate 2 are made by clicking the *button "Candidate 1"* or the *button "Candidate 2"* at the lower right part of the screen. While members make their decisions, the candidates see a similar screen (without the two decision buttons "Candidate 1" and "Candidate 2").

After all members have made their decisions, both candidates and all members will be informed about the result of the 'voting' phase. All participants in your group can see the *number of votes for candidate 1* and the *number of votes for candidate 2*, who of the two candidates has won, and the *own round earnings* in points (and the composition of these earnings). The round earnings of candidates consists of the sum of transfers received from the members and the 25 points or 15 points if the candidate wins or does not win, respectively. The round earnings of members consist of the market earnings minus possible transfers to the candidates and minus or plus possible transfers according to the percentage of the winning candidate.

Further procedures of part I

Before we will begin with part I, we will conduct a "*Quiz*". *Please fill out the quiz.* The quiz will make sure that all participants are familiar with the instructions of part I. *Please raise your hand* if you have questions about the instructions of part I or if you have *finished the quiz*. One of the experimenters will come to you and answer your questions or check your answers to the quiz. Please wait until all participants have finished the quiz. Only then will we begin with part I of the experiment, in which you can earn points.

Control questions

Please answer the following questions.

1) The composition of your group does not change across rounds.

   Correct ( ) Incorrect ( )

2) Your group consists of 2 candidates and 10 members during the entire experiment.

   Correct ( ) Incorrect ( )

3) Your type (candidate or member) and the types of the other participants in your group do not change during the entire experiment.

   Correct ( ) Incorrect ( )

4) The experiment consists of 4 phases, which proceed in the following order. Please tick the phases in which candidates and members make decisions.

	Candidates	Members
- Markets	( )	( )
- Transfers to candidates	( )	( )
- Transfers between members	( )	( )
- Voting	( )	( )

5) Each seller will be assigned costs for good 1 and good 2 and each buyer will be assigned a maximal willingness to pay for good 1 and good 2. These values differ between sellers and between buyers, respectively, and do not change across rounds for the respective members.

   Correct () Incorrect ()

6) Suppose you are a member, and a buyer in the 'market' phase. Your maximum willingness to pay for buying good 1 is 65 points and that of good 2 is 45 points. You only buy one good in the market at a price of 55 points. What are your market earnings?

7) Suppose you are a member, and a seller in the 'market' phase. Your costs for good 1 are 20 points and those for good 2 are 35 points. You sell both goods on the market; good 1 at a price of 50 points and good 2 at a price of 45 points. What are your market earnings?

8) Suppose you are a member and your market earnings are 40 points. From these, you want to transfer 10 points to candidate 1 and 5 points to candidate 2. Is this possible?

   Yes ( ) No ( )

9) Suppose you are a member and your market earnings are 15 points. From these, you want to transfer 7 points to candidate 1 and 10 points to candidate 2. Is this possible? Yes ( ) No ( )
10) Suppose you are candidate 1 and choose in the phase 'transfers between members' a percentage of 50%. The average market earnings of all members are 25 points. What is the transfer amount for member 2 who has market earnings of 45 points, if you receive more votes than candidate 2? And what is the transfer amount for member 3 who has market earnings of 15 points?
11) Suppose you are candidate 2. In the 'voting' phase, there were three votes for candidate 1 and seven votes for yourself. The sum of transfers in the phase 'transfers to candidates' is 40 points for candidate 1 and 30 points for yourself. Candidate 1 has chosen a percentage of 40% in the phase 'transfers between members' and you have chosen a percentage of 100%. The average market earnings of all members are 23 points. What are the earnings after transfers between members of the ten members (without considering possible transfers to the candidates)? What are the round earnings of candidate 1 and candidate 2?
12) Suppose candidate 1 has chosen a percentage of 0% in the phase 'transfers between members' and receives more votes in the 'voting' phase than candidate 2. The average market earnings of all members are 25 points. Member 5 has market earnings of 17 points and has transferred 3 points in total to the candidates. What are the round earnings of member 5? And what would his or her round earnings be if candidate 1 had chosen a percentage of 50% and had won in the 'voting' phase?

OA4. Zero-intelligence trading simulation

Below is the code we used to simulate the double-auction market with random players as in Gode and Sunder (1993). The description of the procedure used is available in Appendix B of the paper. The simulation is programmed for Visual Basic for applications and is set to run within Microsoft Excel (version 2003 or later). The Excel file should contain three black sheets

titled: Profit, Trades, and Results. Moreover, it should contain a sheet named PostsDist in which the distribution *X* (see Appendix B). The Excel file used is available with the experimental dataset.

Code

```
Sub MainSimulation()
'Note: Define all variables
    Dim simnum As Long, pricenum As Integer, tradenum As Integer, x As Integer, bidnum As
        Integer, asknum As Integer, MaxValue As Integer, MinCost As Integer, ActivePlayer As
        Integer, MaxPosts As Integer, Buyer(1 To 5, 0 To 2) As Integer, Seller(6 To 10, 0 To 2) As
        Integer, GoodsLeft(1 To 10) As Integer, BuyerPrice(1 To 2) As Integer, SellerPrice(1 To
        2) As Integer, RndPrice As Integer, AvgAsk As Variant, AvgBid As Variant
'Note: Set random seed and clear sheets for data generation
    Randomize
    Sheets("Trades").Cells.ClearContents
    Sheets("Profit").Cells.ClearContents
    Sheets("Trades").Range("A1") = "Trades"
    Sheets("Trades").Range("B1") = "Prices"
    Sheets("Trades").Range("A1").Offset(0, 12) = "Avg. Ask"
    Sheets("Trades").Range("A1").Offset(0, 13) = "Avg. Bid"
    Sheets("Profit").Range("A1") = "Posts"
    Sheets("Profit").Range("B1") = "Marginal Earnings"
' Note: Introduce the buyers' values and the sellers' costs
    Buyer(1, 2) = 80
    Buyer(1, 1) = 72
    Buyer(2, 2) = 88
    Buyer(2, 1) = 52
    Buyer(3, 2) = 67
    Buyer(3, 1) = 37
    Buyer(4, 2) = 62
```

```
    Buyer(4, 1) = 42
    Buyer(5, 2) = 57
    Buyer(5, 1) = 47
    For x = 1 To 5
        Buyer(x, 0) = 0
    Next x
    Seller(6, 2) = 24
    Seller(6, 1) = 30
    Seller(7, 2) = 18
    Seller(7, 1) = 48
    Seller(8, 2) = 36
    Seller(8, 1) = 61
    Seller(9, 2) = 40
    Seller(9, 1) = 57
    Seller(10, 2) = 44
    Seller(10, 1) = 53
    For x = 6 To 10
        Seller(x, 0) = 100
    Next x
'Note: Simulation starts for 50,000 periods
    For simnum = 1 To 50000
'Note: Initiate market variables
        For x = 1 To 10
            GoodsLeft(x) = 2
        Next x
        MaxValue = 88
        MinCost = 18
        BuyerPrice(1) = 18
        BuyerPrice(2) = 0
```

```
        SellerPrice(1) = 88
        SellerPrice(2) = 0
        tradenum = 1
        pricenum = 1
'Note: Draw the maximum number of posts from the distribution X
        MaxPosts = Int(240 * Rnd + 1)
        Do Until MaxPosts <= Sheets("PostsDist").Range("C1").Offset(pricenum, 0).Value
            pricenum = pricenum + 1
        Loop
        MaxPosts = Sheets("PostsDist").Range("A1").Offset(pricenum, 0).Value
        pricenum = 1
        bidnum = 1
        asknum = 1
        AvgAsk = 0
        AvgBid = 0
'Note: Run period until there are no feasible trades
        Do Until MaxValue <= MinCost
'Note: Activate a buyer/seller
            ActivePlayer = Int(10 * Rnd + 1)
            If GoodsLeft(ActivePlayer) > 0 Then
'Note: If buyer or seller has goods left then generate a random bid/ask
                If ActivePlayer <= 5 Then 'Note: Buyer activated
                    RndPrice = Int((Buyer(ActivePlayer, GoodsLeft(ActivePlayer)) - BuyerPrice(1)
                        + 1) * Rnd + BuyerPrice(1))
'Note: If the bid is higher than the current one then replace it
                    If RndPrice > BuyerPrice(1) + 0.5 Then
                        BuyerPrice(1) = RndPrice
                        BuyerPrice(2) = ActivePlayer
                        AvgBid = (RndPrice + AvgBid * (bidnum - 1)) / bidnum
```

```
            bidnum = 1 + bidnum
            pricenum = 1 + pricenum
        End If
    ElseIf ActivePlayer > 5 Then  'Note: Seller is activated
        RndPrice = Int((SellerPrice(1) - Seller(ActivePlayer, GoodsLeft(ActivePlayer))
            + 1) * Rnd + Seller(ActivePlayer, GoodsLeft(ActivePlayer)))
'Note: If the ask is lower than the current one then replace it
        If RndPrice < SellerPrice(1) - 0.5 Then
            SellerPrice(1) = RndPrice
            SellerPrice(2) = ActivePlayer
            AvgAsk = (RndPrice + AvgAsk * (asknum - 1)) / asknum
            asknum = 1 + asknum
            pricenum = 1 + pricenum
        End If
    End If
'Note: If the new bid (ask) is higher (lower) than the posted ask (bid) then make transaction
    If BuyerPrice(1) > SellerPrice(1) Then
        If ActivePlayer <= 5 Then 'Note: Record trade at the buyers bid
            Sheets("Trades").Range("A1").Offset(simnum, tradenum) = SellerPrice(1)
            Sheets("Profit").Range("A1").Offset(simnum, tradenum * 2 - 1) =
                Buyer(BuyerPrice(2), GoodsLeft(BuyerPrice(2))) - SellerPrice(1)
            Sheets("Profit").Range("A1").Offset(simnum, tradenum * 2) = SellerPrice(1)
                - Seller(SellerPrice(2), GoodsLeft(SellerPrice(2)))
        Else 'Note: Record trade at the sellers ask
            Sheets("Trades").Range("A1").Offset(simnum, tradenum) = BuyerPrice(1)
            Sheets("Profit").Range("A1").Offset(simnum, tradenum * 2 - 1) =
                Buyer(BuyerPrice(2), GoodsLeft(BuyerPrice(2))) - BuyerPrice(1)
            Sheets("Profit").Range("A1").Offset(simnum, tradenum * 2) =
                BuyerPrice(1) - Seller(SellerPrice(2), GoodsLeft(SellerPrice(2)))
```

```
                End If
'Note: Calculate the remaining goods of the buyers and sellers and reset the posted prices
                GoodsLeft(SellerPrice(2)) = GoodsLeft(SellerPrice(2)) - 1
                GoodsLeft(BuyerPrice(2)) = GoodsLeft(BuyerPrice(2)) - 1
                BuyerPrice(1) = 18
                BuyerPrice(2) = 0
                SellerPrice(1) = 88
                SellerPrice(2) = 0
                tradenum = tradenum + 1
'Note: Check whether there are still feasible trades
                MaxValue = 0
                For x = 1 To 5
                    If Buyer(x, GoodsLeft(x)) > MaxValue Then MaxValue = Buyer(x,
                        GoodsLeft(x))
                Next x
                MinCost = 100
                For x = 6 To 10
                    If Seller(x, GoodsLeft(x)) < MinCost Then MinCost = Seller(x, GoodsLeft(x))
                Next x
            End If
        End If
'Note: Stop after too much trading activity
        If pricenum >= MaxPosts Then
            MaxValue = 0
            MinCost = 100
        End If
    Loop
'Note: Period had ended, record aggregate period statistics
    Sheets("Trades").Range("A1").Offset(simnum, 0) = tradenum - 1
```

```
        Sheets("Profit").Range("A1").Offset(simnum, 0) = pricenum - 1
        Sheets("Trades").Range("A1").Offset(simnum, 12) = AvgAsk
        Sheets("Trades").Range("A1").Offset(simnum, 13) = AvgBid
    Next simnum
End Sub
```

References

Fischbacher, Urs. 2007. "Z-tree: Zurich toolbox for ready-made economic experiments." *Experimental Economics* 10: 171-78.

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