Promise Competition

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NHH

Motivation

- Consider a buyer who wants to *select one of several sellers* for a one-time purchase.
- Regard prices as *fixed*, buyer wants to select the seller who provides the best quality.
- In the standard setup, we assume sellers make perfectly binding offers.

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- Regard prices as *fixed*, buyer wants to select the seller who provides the best quality.
- ~~In the standard setup, we assume sellers make perfectly binding offers.~~
- *What if sellers can make* **promises***?*

Promise

Research Question

Does promise competition...

1. *lead to selection of better sellers?*
2. *improve quality provision of sellers?*

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This Study:

- Introduces signaling model with two-dimensional private information and competition.
- Tests predictions in a laboratory experiment.

Related Literature

- Literature on signaling with multiple dimensions of heterogeneity and communication.
  (Frankele & Kartik (2018), Crawford and Sobel (1982), Kartik (2009))
- Behavioral literature on lying and promises.
  (Corazzini et al. (2014); Fehrler et al. (2018); Abeler et al., 2018; Gneezy et al., 2018)
- Literature on signals about product quality and reputation.
  (Milgrom 1986; Shapiro, 1982; Zervas et al. 2015; Luca, 2016)

Structure of the talk

1. Model of Promise Competition
2. Predictions
3. Experimental Design
4. Experimental Results

A model of promise competition

- Buyer seeks a one-time service.
- Two competing sellers make non-binding promise p_i about service-quality x_i.
- Buyer chooses one of two promises $a(p_1, p_2)$.

  Utility $v(x)$ increasing in quality x and $v(0) \geq 0$.

A model of promise competition

- Seller-utility upon being selected with p and x:

$$U(p, x) = \pi - x + \alpha \cdot f(x) - \rho \cdot g(p, x),$$

where $g(x, p)$ cost of breaking a promise,

$f(x)$ intrinsic motivation,

α, ρ *type specific private information*.

Types

Sellers differ in two dimensions:

(1) **Motivation** α, (2) **Cost of breaking a promise** ρ.

Three types of sellers:

The good type: $\tau_g = (\overline{\alpha}, \overline{\rho})$.

The honest type: $\tau_h = (0, \overline{\rho})$.

The bad type: $\tau_b = (0, 0)$.

figure

Cost of promise breaking

- Follows Abeler et al. 2018 and Gneezy et al 2018.
  - $\Rightarrow$ Fixed cost and variable cost.
- $g(x,p) = \begin{cases} G(x,p) + \nu & \text{if } p \neq x; \\ 0 & \text{otherwise,} \end{cases}$

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  where $\nu \geq 0$.
- **Assumption 1** *(Cost of promise-breaking):*
  1. $G(x,x) = 0$ for all p, "No lie, no cost."
  2. $\frac{\partial G(x,p)}{\partial |x-p|} > 0$, for all x, p, "More lying, more cost."
  3. $\frac{\partial \partial G(x,p)}{\partial |x-p| \partial |x-p|} > 0$ for all x, p. "MC increasing."

Intrinsic motivation

- Some sellers are motivated to provide quality. Let $f(x)$ denote an agents motivation.
- **Assumption 2** *(Intrinsic Motivation):*
  - $f(x)$ is two times continuously differentiable.
  - $f'_x(x)$ is decreasing and $f'_x(0) > 1$.
- Define x^n as natural giving of τ_g.

Solution Concept

- Perfect Bayesian Equilibrium:

$\Rightarrow$ **Beliefs can support a large set of equilibria**
both pooling and separating equilibria

- Refinements that constrain beliefs: Criterion D1.

Ass. 3

Equilibria

Any promise $p \in [x^n, x^{max}]$ is the **single pooling promise.**

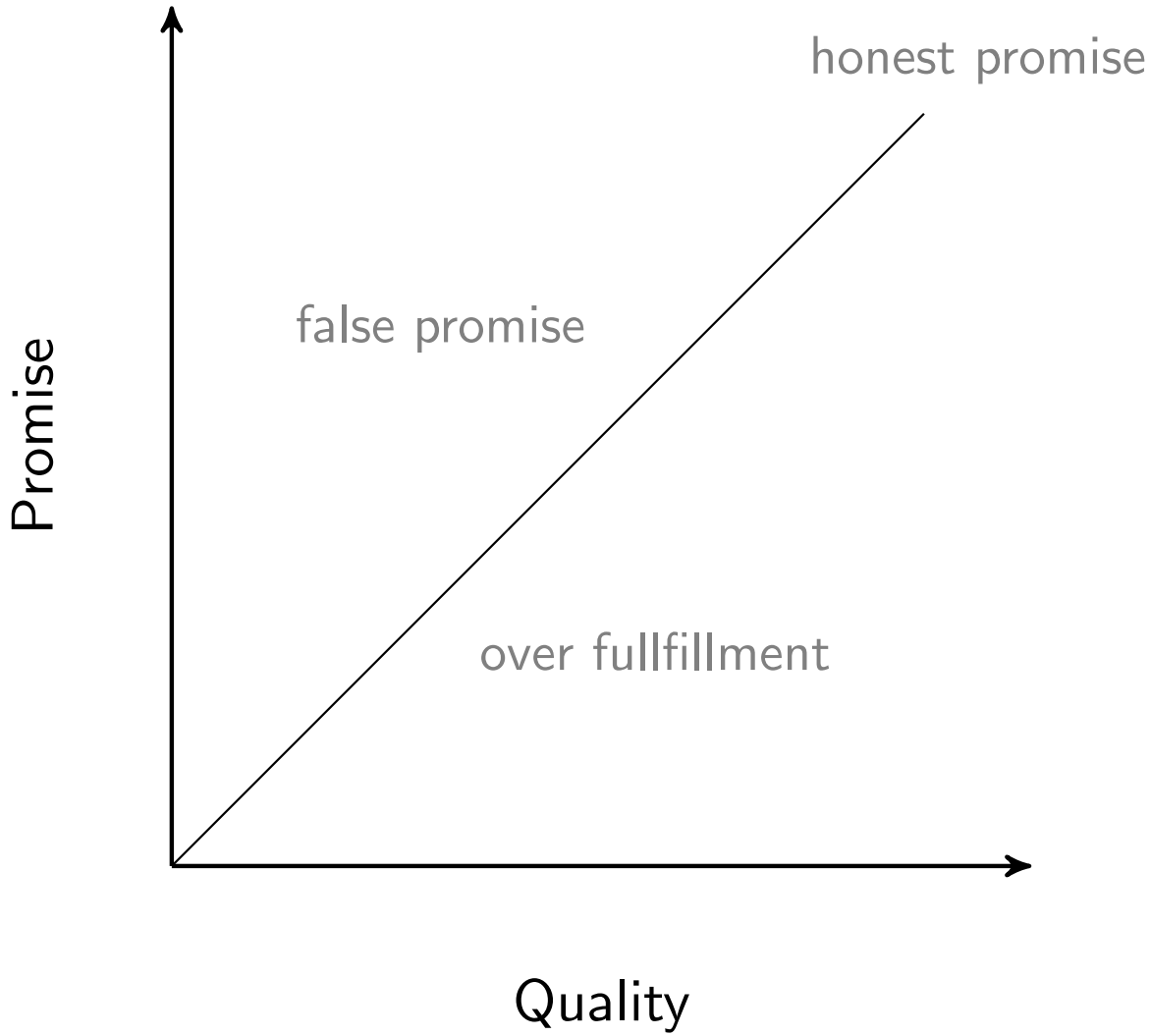
x^n - natural quality good type delivers, x^{max} - some higher promise.

1. Promises **carry no information**.
   - All sellers make same promise.
   - Buyer cannot use promise to select better seller.

2. Promises **raise quality provision on average**.
   - Competition induces sellers to make a high 'market' promise.
   - Sellers who find it costly to renege (partly) fulfill the high promise.

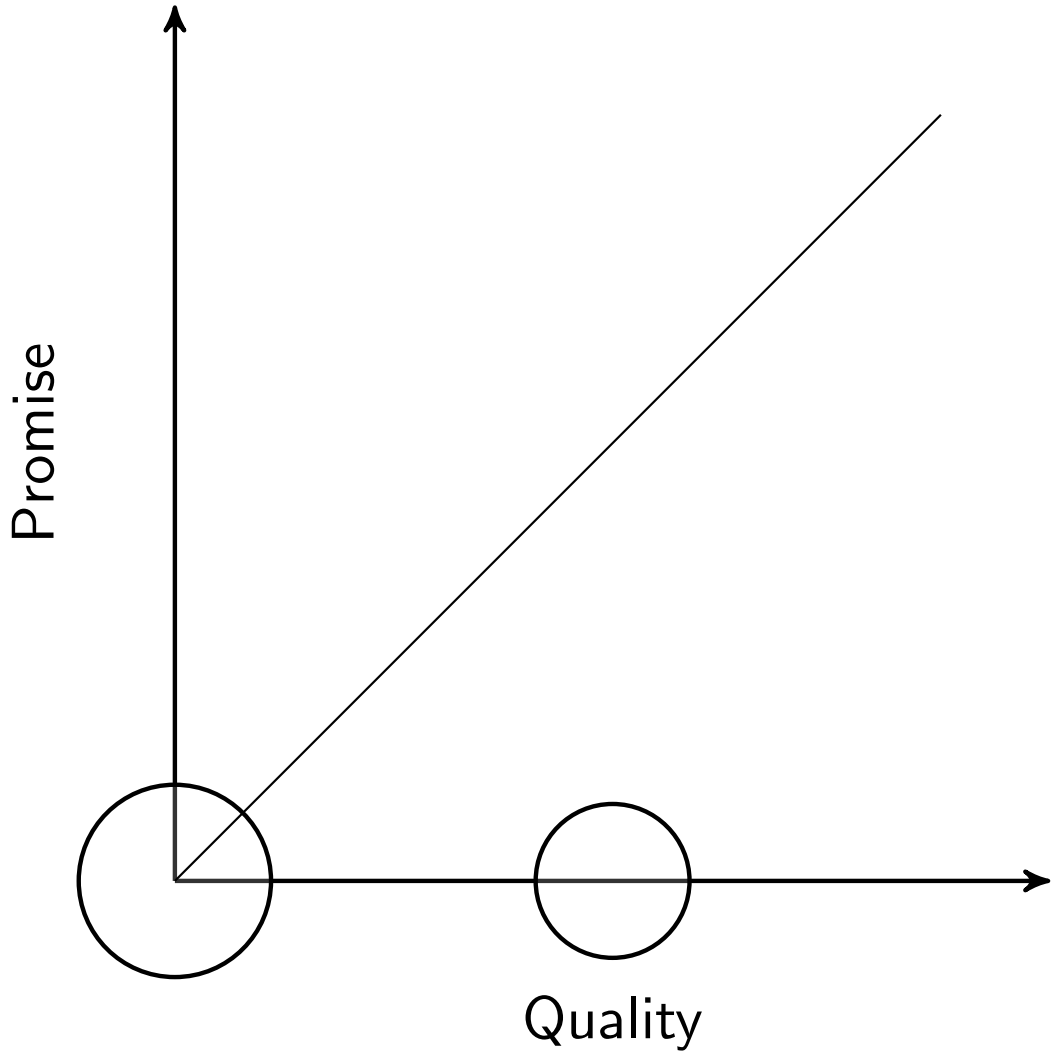
Details

How promise competition increases quality



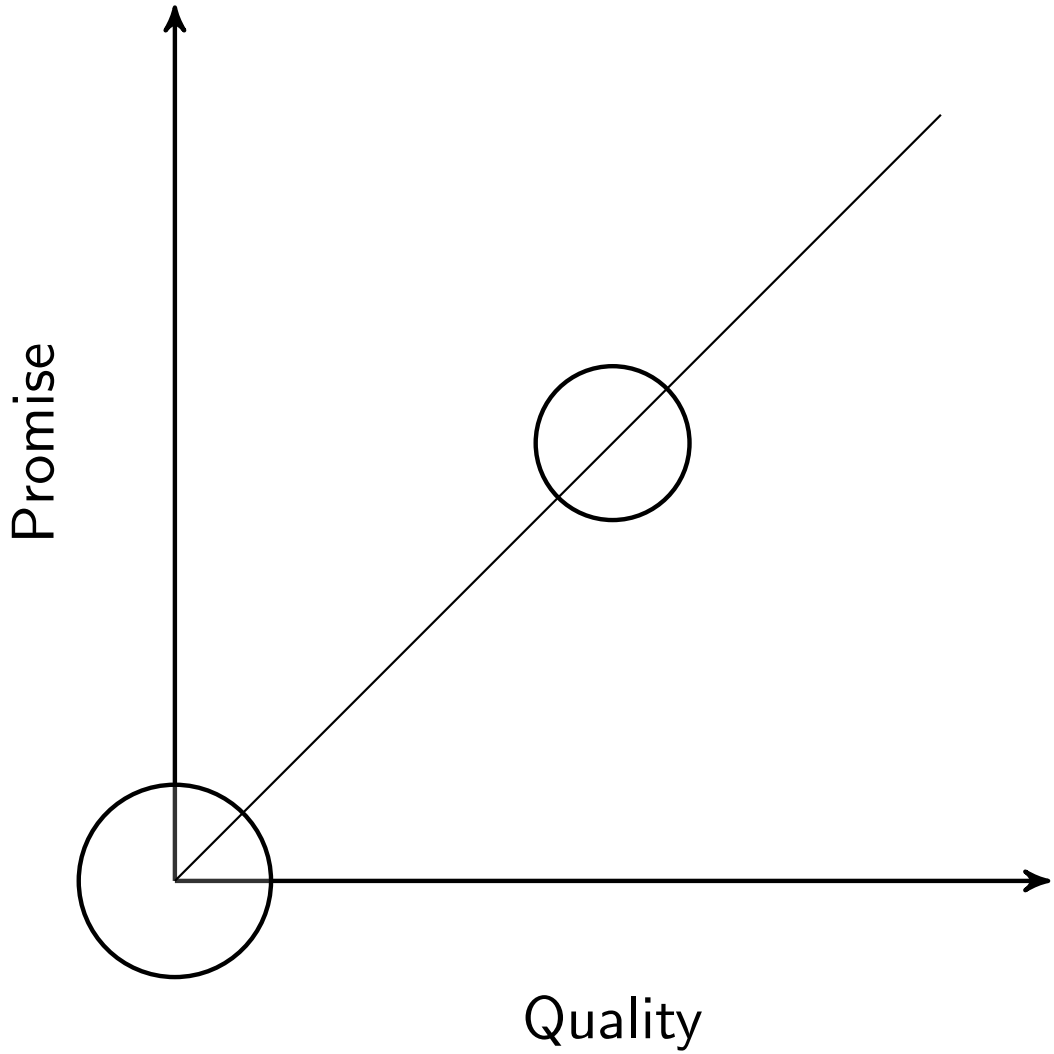
No communication

Different levels of quality provision absent promises.



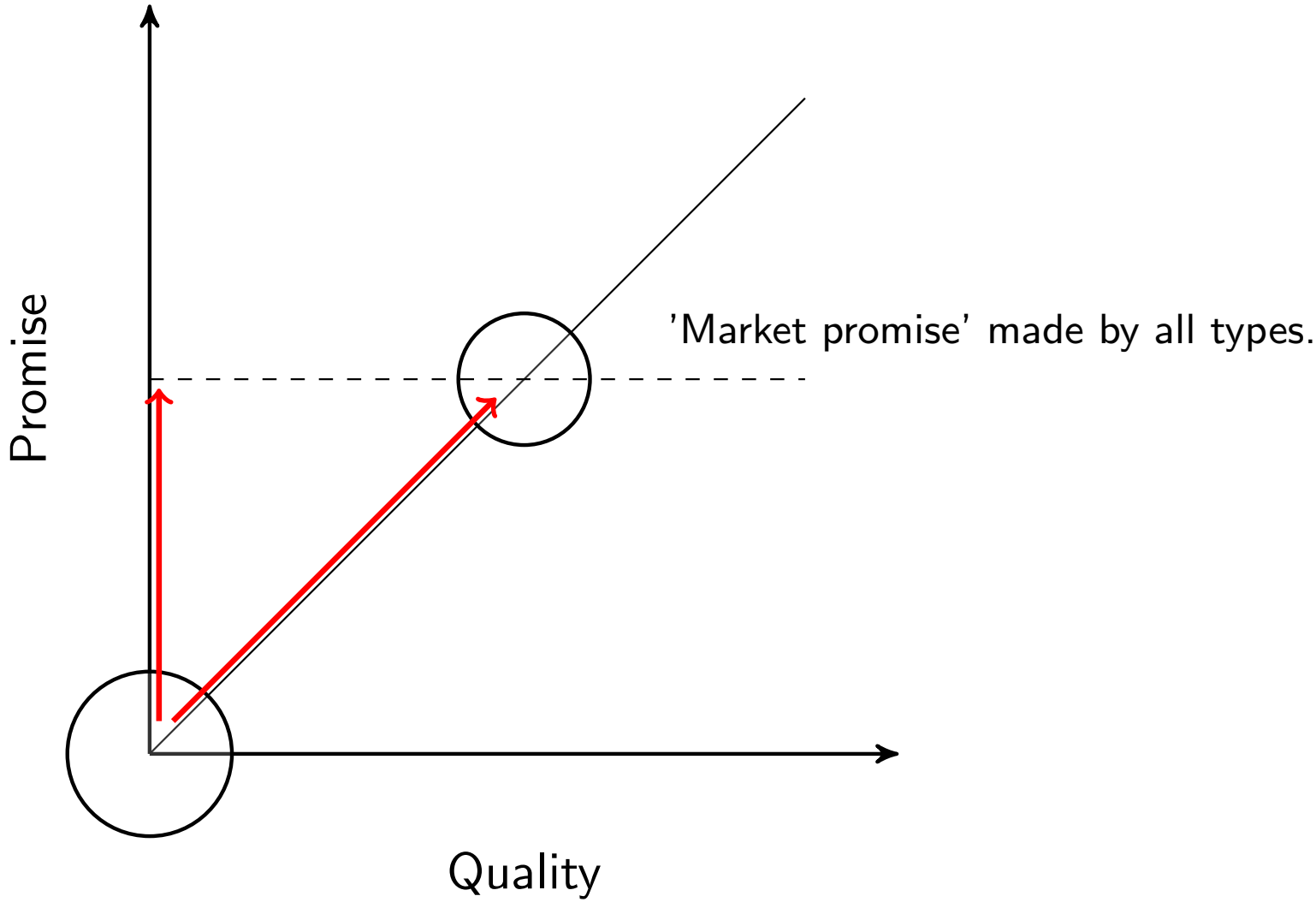
Promises without competition

No reason to lie without competition.



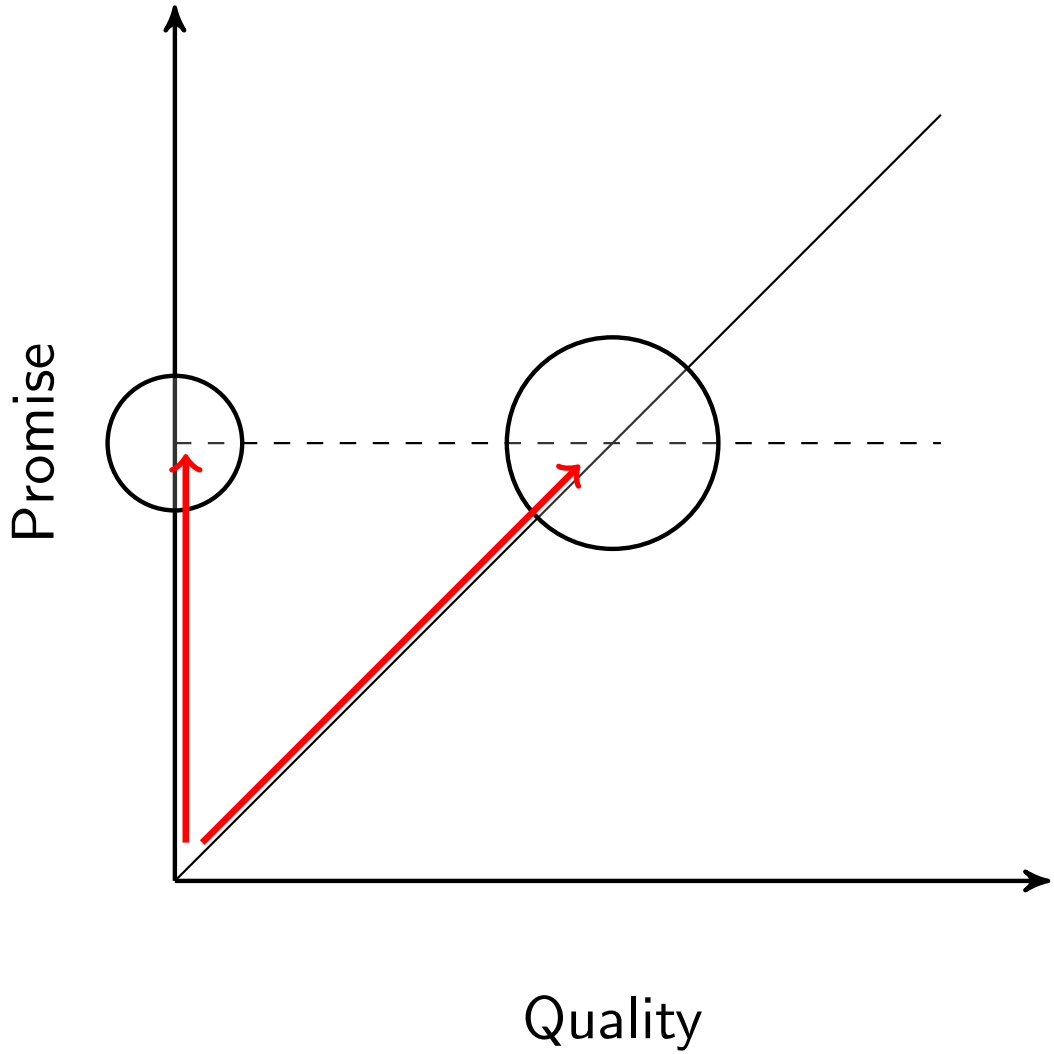
Promise with competition

Competition induces higher promises.



Promise with competition

Some sellers keep their promise!



Experiment

- Second part of study: Lab Experiment to test these predictions.
- Modified dictator game captures a seller's decision on quality provision after purchase.
- Abstract setting - Investigates whether mechanisms work in clean setting. Allows to measure selection.
- Natural heterogeneity in altruism and lying.
  (Andreoni & Bernheim, 2009; Abeler, Nosenzo & Raymond, 2018)

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- Natural heterogeneity in altruism and lying.
  (Andreoni & Bernheim, 2009; Abeler, Nosenzo & Raymond, 2018)
- *Preregistered study conducted at Incentive Labs at Rady School of Management, UCSD (155 participants).*

Design 1/3 - Promise Game

- Dictator game with two potential senders.
- Both senders make a promise to receiver about intentions.
- Receiver chooses who to play dictator game with.

$\Rightarrow$ chosen sender gets to split 100 points between herself and receiver.

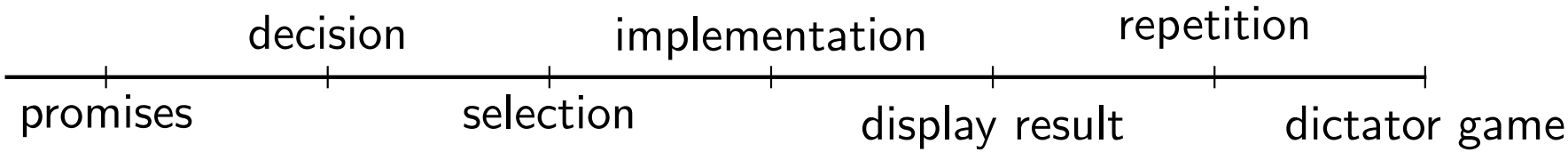
$\Rightarrow$ other sender receives nothing.

Design 2/3 - Issues

- Avoid salience of fair split.
  - Every point sent to receiver is doubled.
- Learning
  - 10 repetition with stranger matching.
  - Information about past decisions of own group.
- Want to compare givings to a non-promise situation.
  - Participants also play regular dictator game.
  - Random Order (beginning or end).

Design 3/3

Timeline of the experiment



- Decisions elicited with *strategy method*.
- Random re-matching each round.
- Ten rounds, get paid for a random round.

Prediction

- **Hypothesis 1**

  All participants pool their promises.

$\Rightarrow$ Selected senders give on average as many points as non-selected senders.

- **Hypothesis 2**

  Competition induces high promises which lead honest sellers to give more.

$\Rightarrow$ Participants give more in the promise than in the dictator game.

Prediction

- **Hypothesis 1**

  All participants pool their promises.

⇒ Selected senders give on average as many points as non-selected senders.

Uses all repetitions of the experiment.

- **Hypothesis 2**

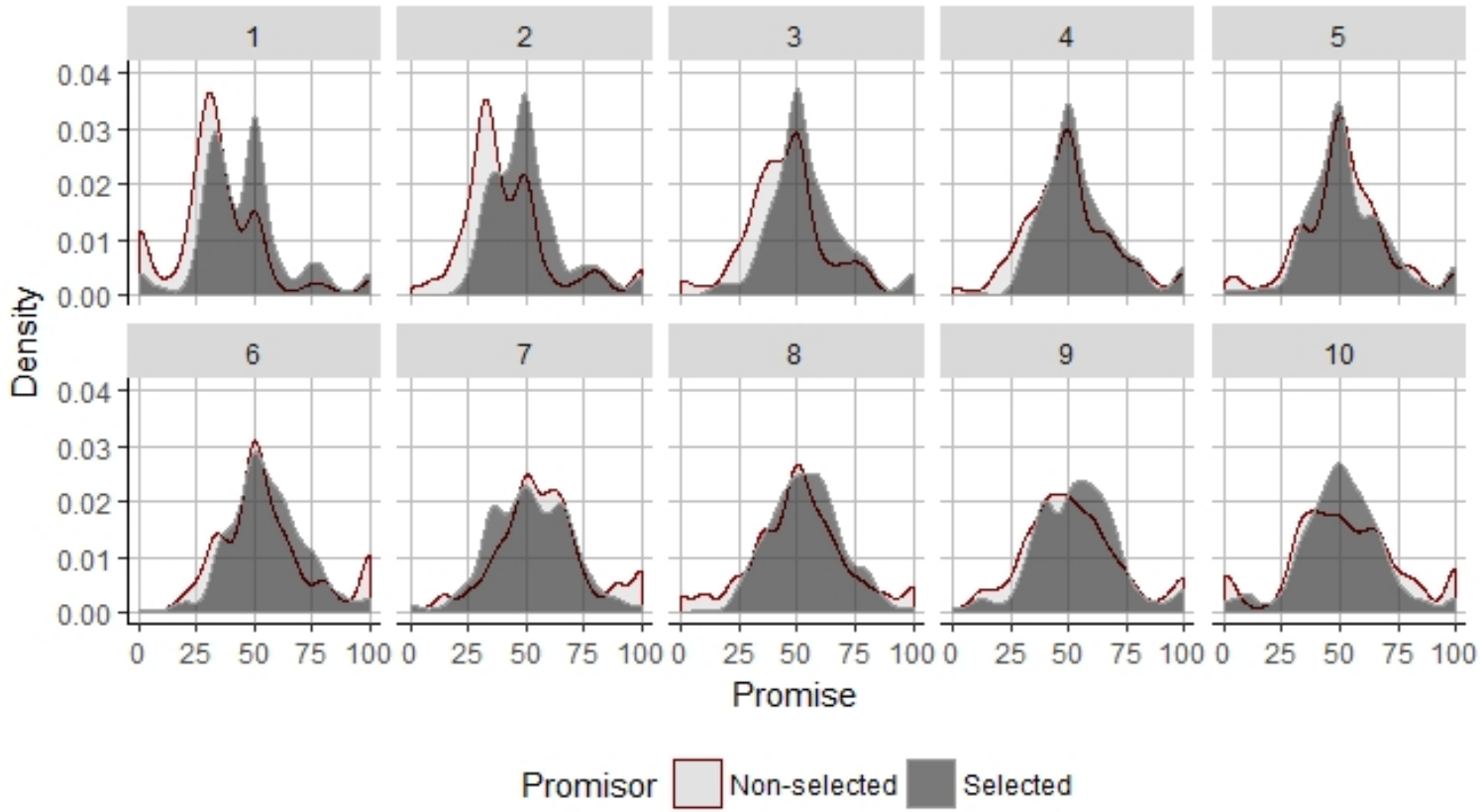
  Competition induces high promises which lead honest sellers to give more.

⇒ Participants give more in the promise than in the dictator game.

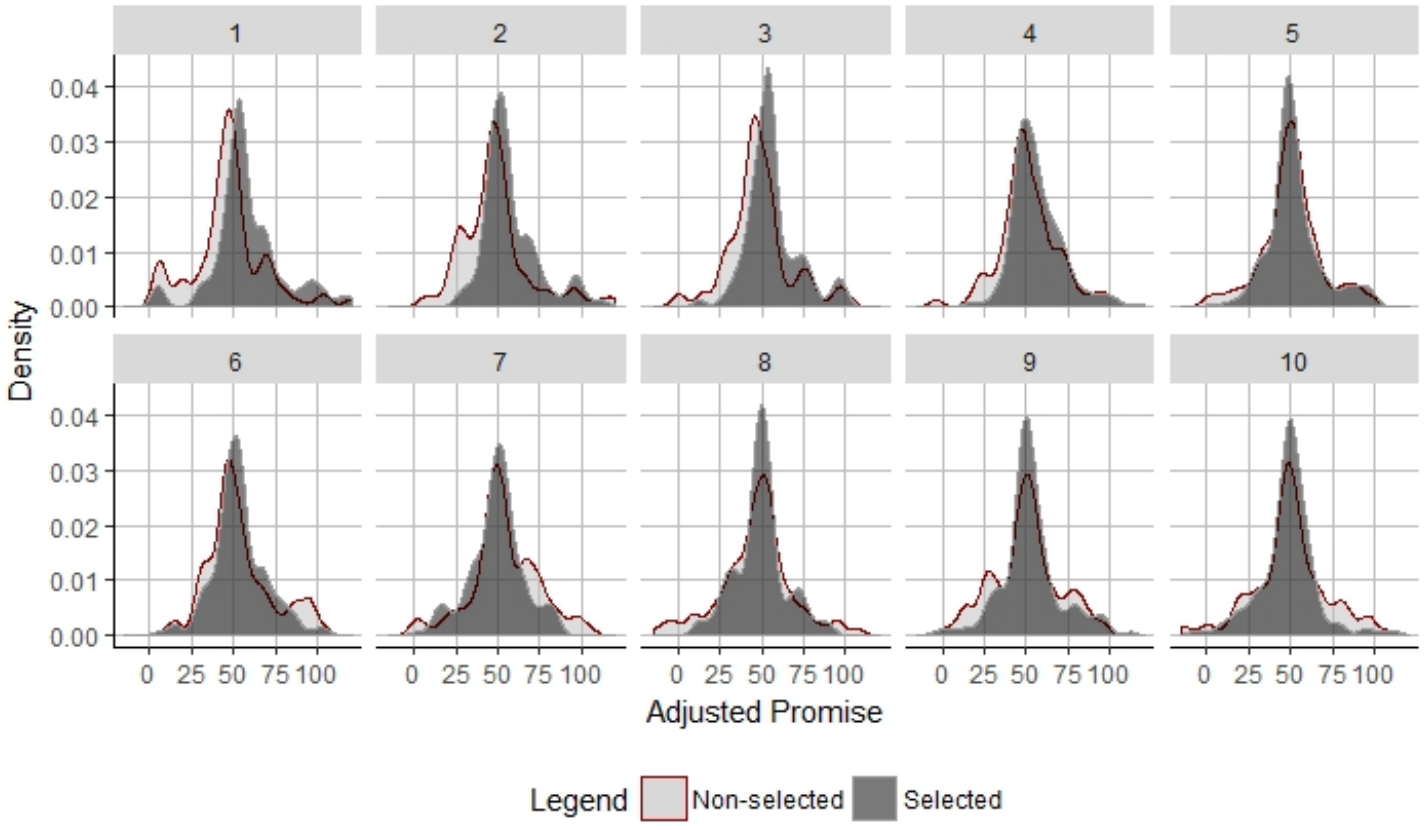
Direct comparison only in FIRST repetition. Will investigate later repetitions correlationally.

Results - Selected and non-selected promisors

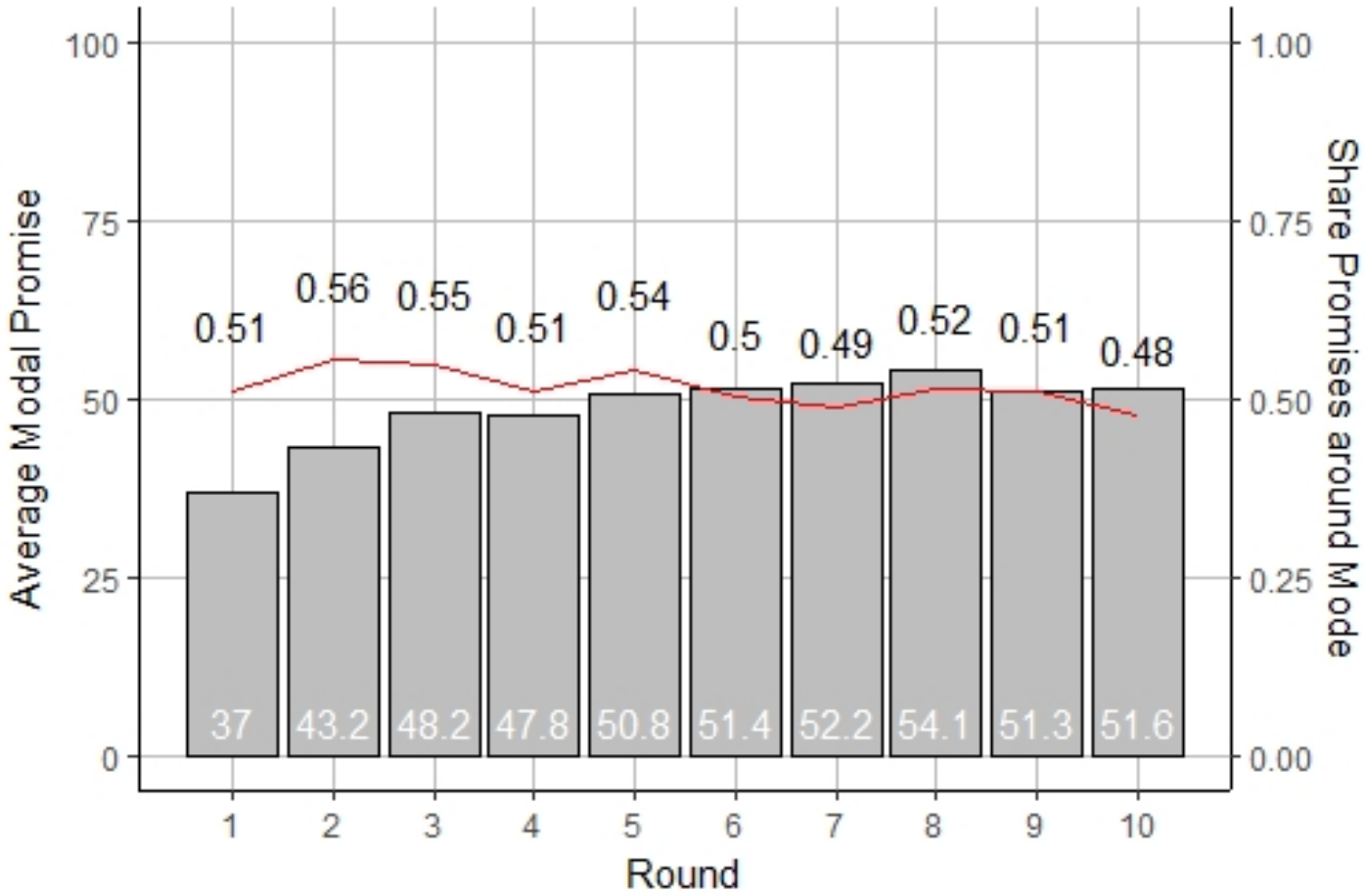
Figure: Density of Promises of selected and not selected agents by round.



Density of promises relative to the modal promise



The Modal Promise



Modal promise - promise with most participants in 5 point environment.

Red line - share of participants around modal promise.

Gray bars - average height of modal promise.

Selection and giving

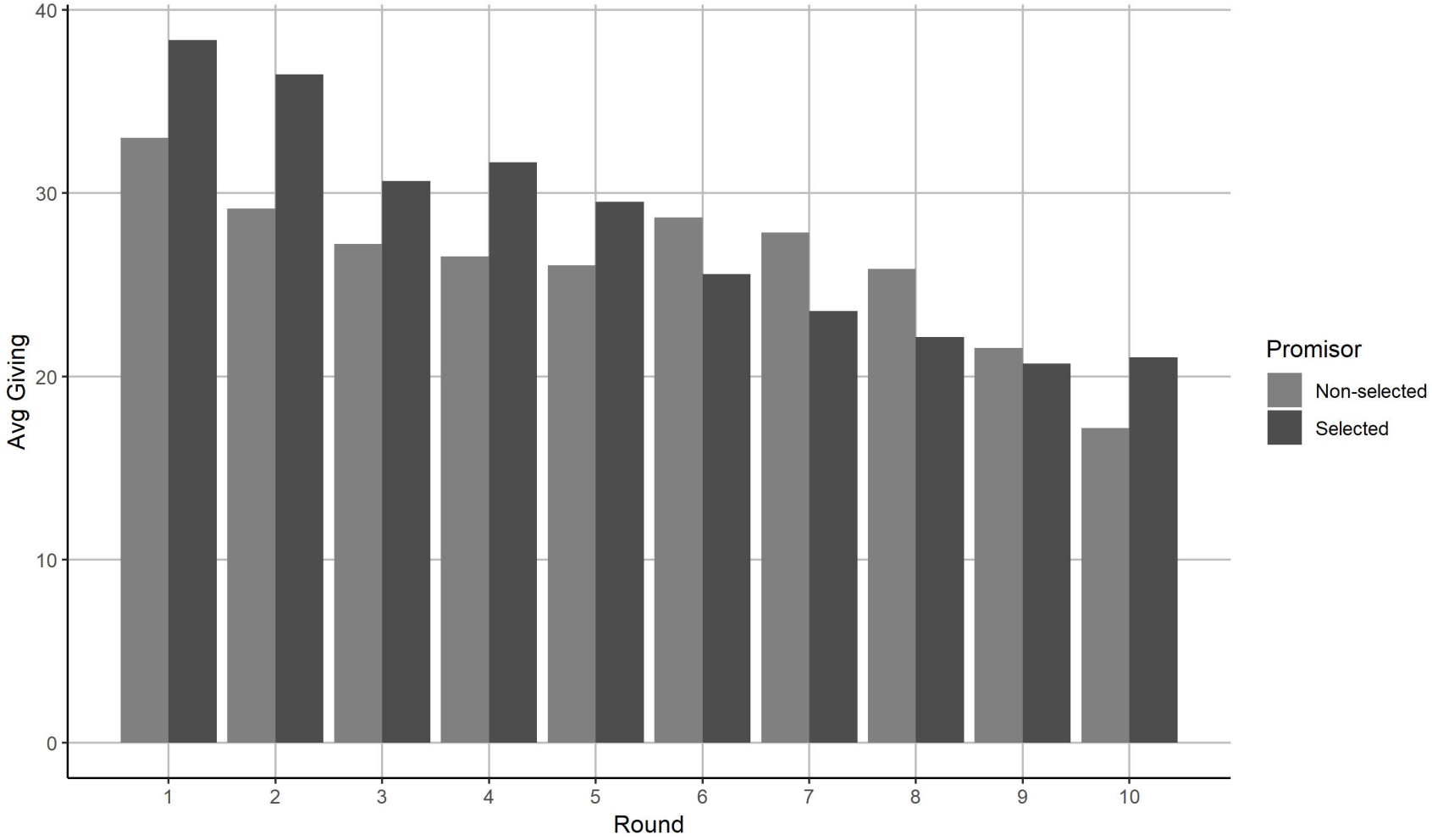


Table Distribution

Selection and giving

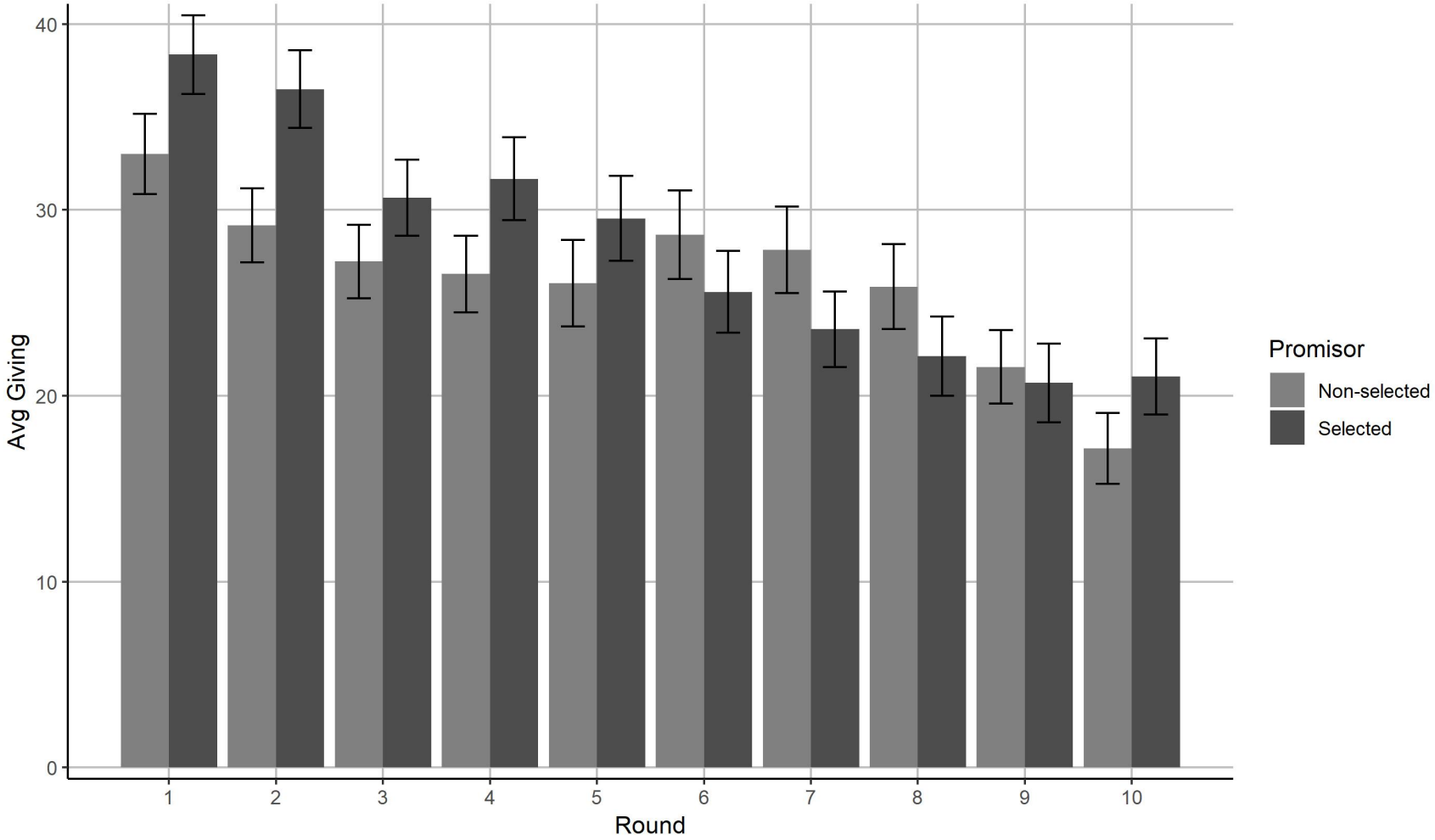


Table Distribution

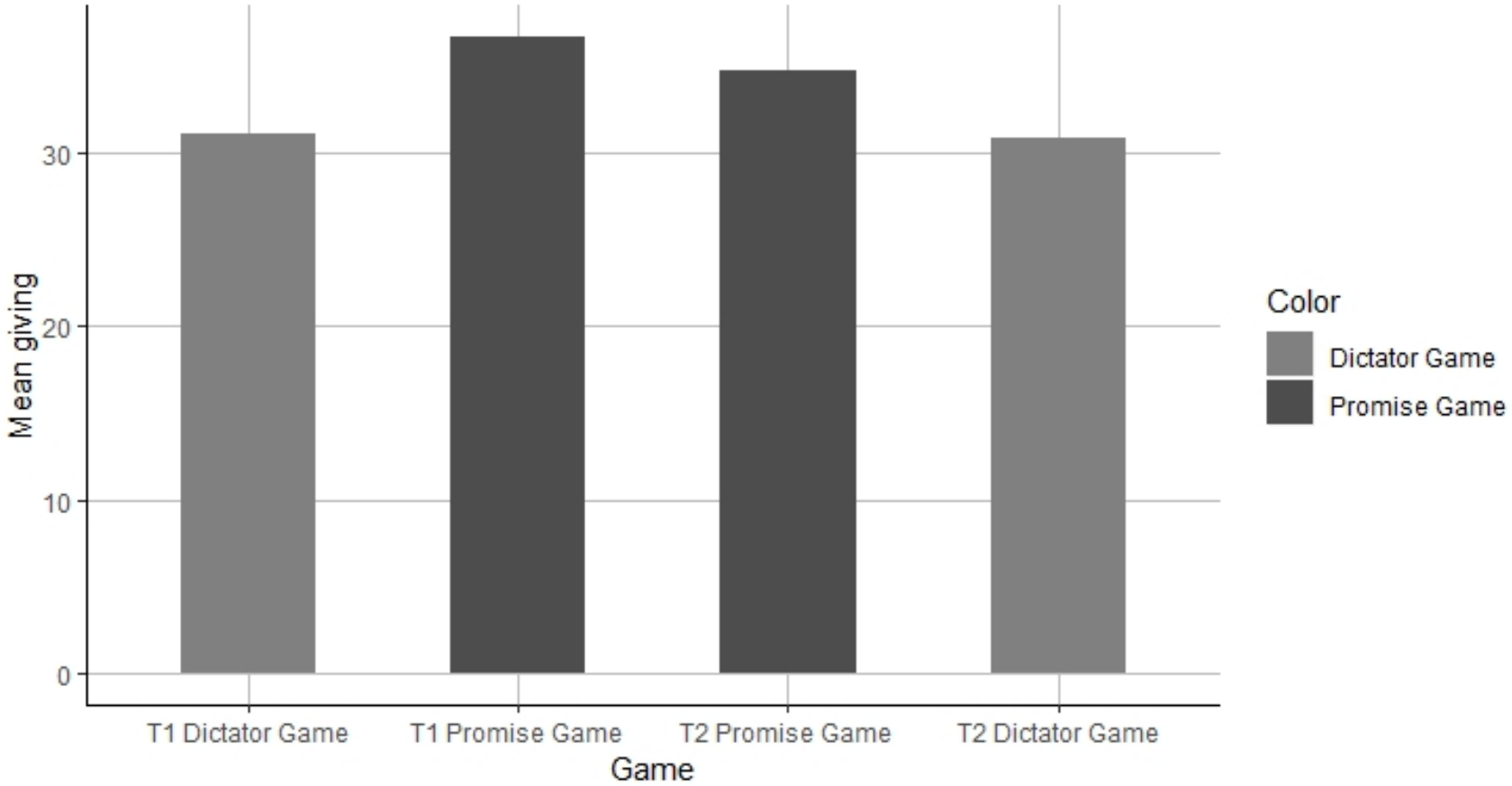
Finding 1

- Participants pool their promises after a few repetitions.
- No selection of better/worse senders.

  Although

- Initially positive selection.

Giving in Dictator vs Promise Game, by timing



by round | distributions

Test of Differences

Table: Giving in first round of promise game vs dictator game.

	Mean sending		**Difference**	
Treatment	Promise Game	Dictator Game	absolute	p-value
all	35.75	30.97	4.78	0.017
1	36.67	31.12	5.54	0.025
2	34.71	30.79	3.92	0.227

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However, giving decreases over repetitions of the game!

Correlation of Promising and Giving

Table: Regression of change in giving on change in promising

	$\Delta_{t/t-1}$ Giving		
	(1)	(2)	(3)
$\Delta_{t/t-1}$ Promise	0.265^{***}	0.273^{***}	0.282^{***}
	(0.065)	(0.065)	(0.069)
($\Delta_{t/t-1}$ Promise) sqrt			-0.001
			(0.001)
Constant	-2.179^{***}		
	(0.207)		
Individual FE			X
Round FE		X	X
N	1,377	1,377	1,377
R^2	0.075	0.091	0.115

Notes: Clustered standard errors (individual) in parenthesis.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

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By type

Finding 2

- Participants give more in first round of promise game than dictator game.
- Giving decreases over repetitions.
- Perhaps surprising restart effect for dictator game in the end.
- Change in promise correlated with change in giving.

Summary

- I analyze competition with non-binding promises.
- Introduces a model and an experiment.

Results:

1. Promises are not informative for beliefs or selection.
2. Promise competition does improve quality.

competition $\rightarrow$ *high promises* $\rightarrow$ *honest sellers: higher quality*

May explain why promises are prevalent in economic transactions even though they are regularly broken and uninformative.

Future Research

- Topics
  - Communication in markets.
  - Selection into leadership.
  - Social signaling.
- Methodology
  - Empirical research.

    Empirical methods
  - Lab experiments, field experiments.
  - Out of lab data: Textual analysis, Machine Learning.

Ongoing Research

1. A Man's World? The Impact of a Male Dominated Environment on Female Leadership, *Working Paper*, with Anna Sandberg and Eva Ranehill.

2. Do district elected MPs favor their district or their party? A textual analysis of parliamentary speeches using machine learning, *Work in Progress,* with Aljoscha Janssen.

3. Modest Altruism. Endogenous choice of anonymity and public goods, *Early stage project.*

Who increases giving in promise game?

Table: Regression difference in giving on dictator game giving

	Diff. Giving
Giving Dictator game	-0.715^{***}
	(0.082)
Constant	18.322^{***}
	(2.557)
N	153
R^2	0.499

Notes: *Regression of difference in giving between promise and dictator game on giving in the dictator game. Robust standard errors in parenthesis.*
** $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.*

Why do participants decrease their giving?

	(1)	(2)
Giving $t-1$	0.678***	0.677***
	(0.031)	(0.031)
Giving $t-1$ Select Sender	0.111***	0.087**
	(0.019)	(0.033)
Previous Role: Receiver		−4.648*
		(1.912)
Previous Role: Selected Sender		1.294
		(1.504)
Giving Selected Sender * Receiver		0.111*
		(0.049)
Giving Selected Sender * Selected Sender		−0.032
		(0.041)
Constant	4.052*	5.092*
	(1.809)	(2.032)
Round FE	X	X
Individual FE	X	X
N	1,377	1,377
R^2	0.493	0.499

Notes: *Regression of giving in round t on giving in previous round. Individual fixed effects. Clustered standard errors on individual level in parenthesis. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.*

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Distribution Promises and Giving

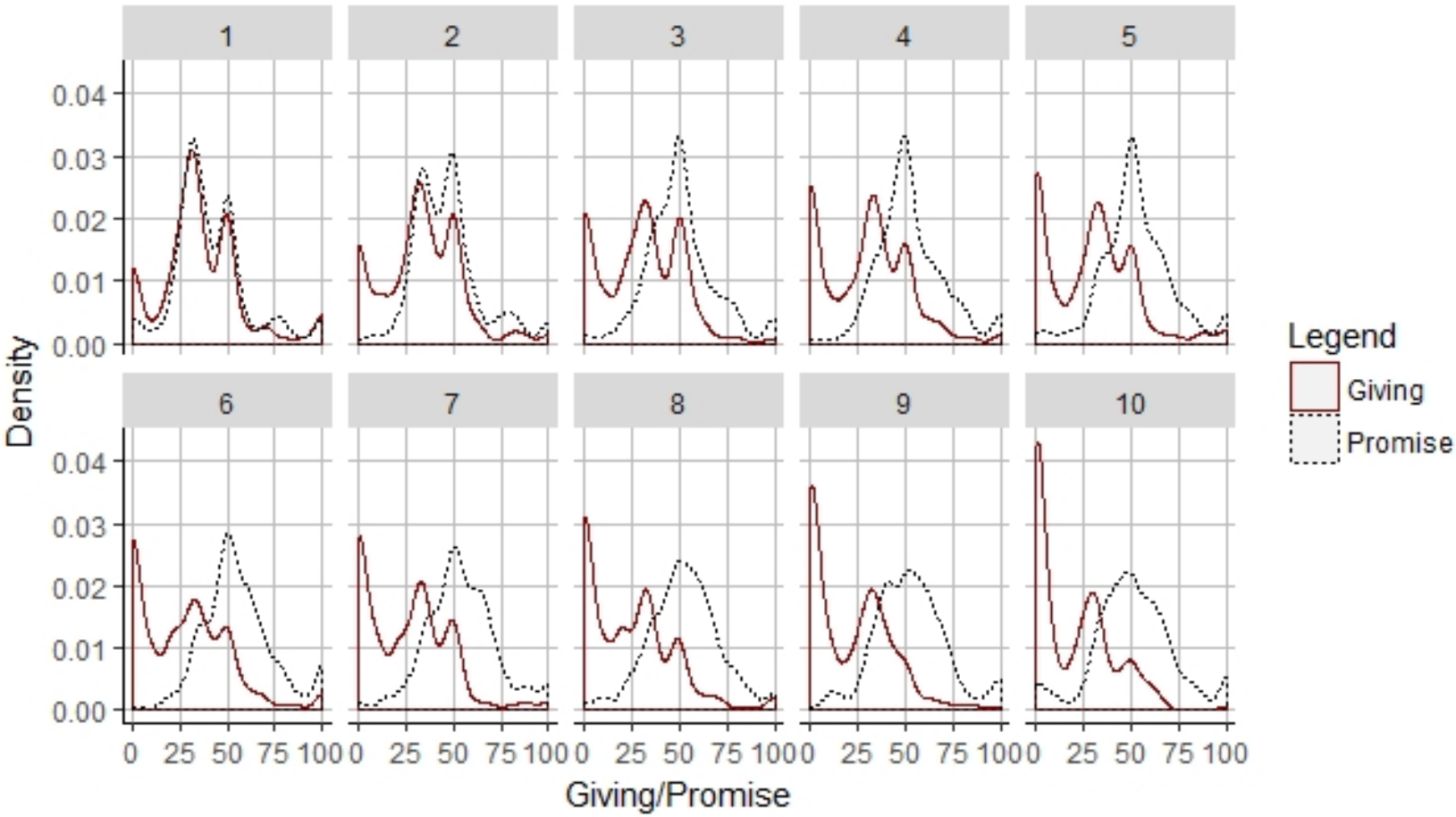

Figure: Density of promises and giving by round.

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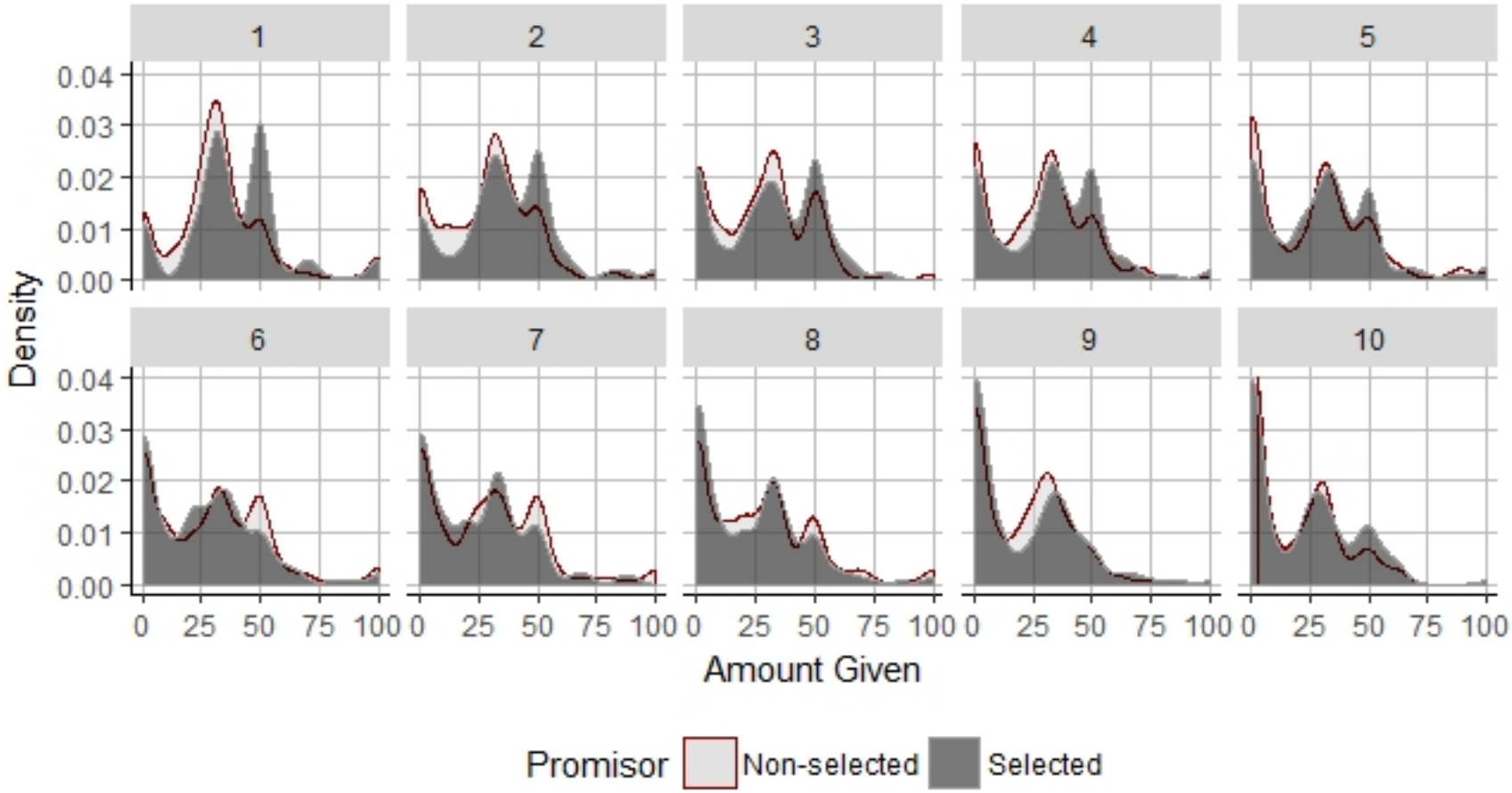
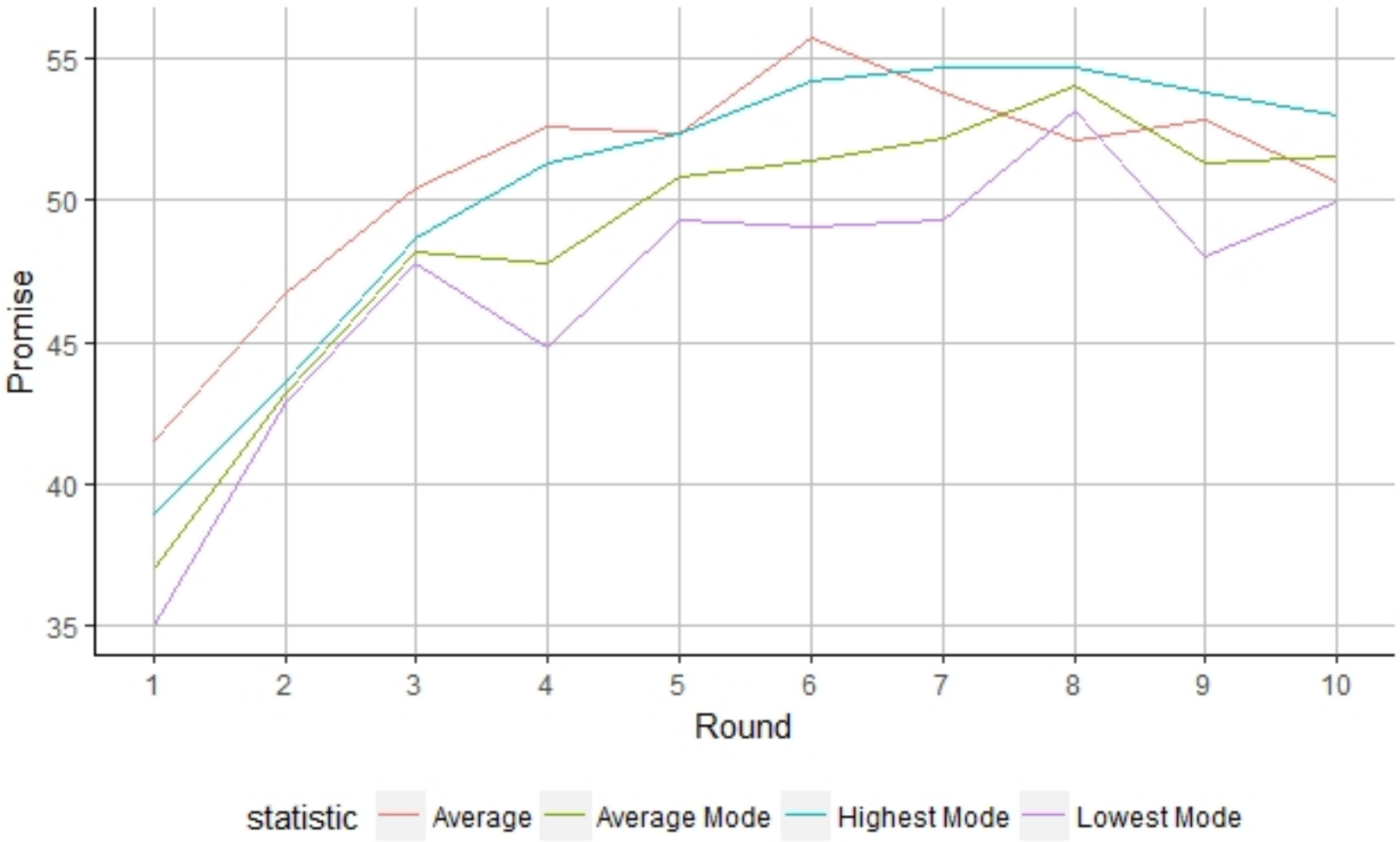
Distribution of giving by selection and round



Different aggregations of the promises



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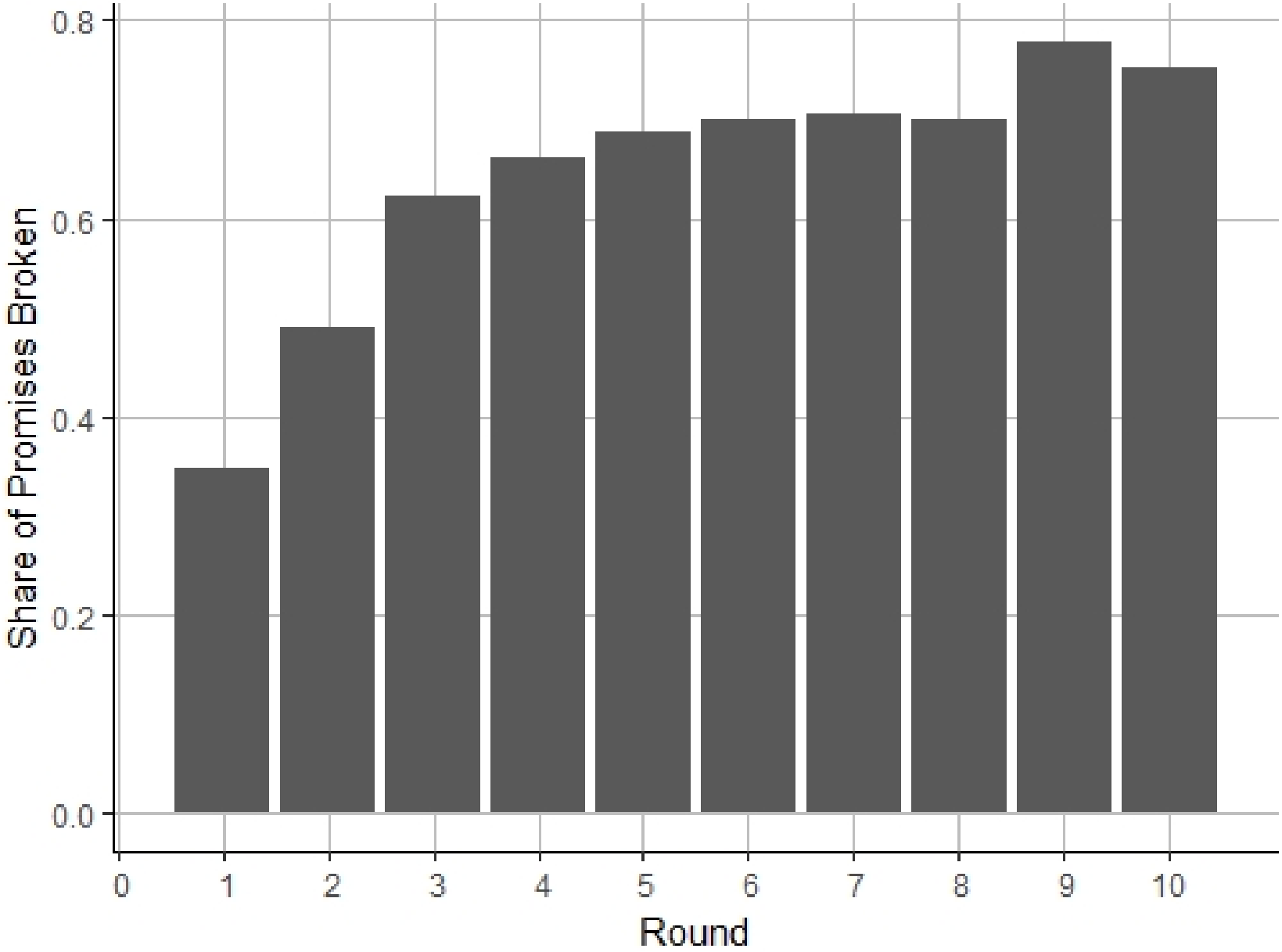
Broken Promises



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Broken Promises - Table

Round	**senders**			Chi-2 test
	all	selected	not-selected	p-value
1	0.346	0.359	0.294	0.273
2	0.490	0.523	0.477	0.493
3	0.621	0.667	0.588	0.193
4	0.660	0.654	0.654	1
5	0.686	0.693	0.686	1
6	0.699	0.739	0.660	0.170
7	0.706	0.719	0.706	0.899
8	0.699	0.778	0.641	0.012
9	0.778	0.797	0.784	0.888
10	0.752	0.725	0.771	0.429

Notes: *The table displays the share of senders who break their promise by round of the promise game. The last column displays the p-value of a test of proportions comparing the share of broken promises by selected and not-selected senders.*

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Example Parametrization

$$g(\rho, x) = \begin{cases} 5 + \frac{(p-x)^2}{p} & \text{if } \rho \neq x; \\ 0 & \text{otherwise,} \end{cases}$$

$\overline{\rho} = 1.$

$f(x) = \frac{-(49.5-x)^2}{33}.$

$\overline{\alpha} = 1.$

$\Rightarrow$ $\underline{x}^n = 0$; $\overline{x}^n = 33.$

$\overline{x}^{max} = 78.87.$

Pooling equilibria with p between 33 and 78.87
Type τ_h fulfills $1/2$ of her promise

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Equilibria - Refinement D1

- Perfect Bayesian Equilibrium:
  - Worst belief is that any p comes from type τ_b. Buyer would never select such promise.

Equilibria - Refinement D1

- Perfect Bayesian Equilibrium:
  - Worst belief is that any p comes from type τ_b. Buyer would never select such promise.
- Refinements that constrain beliefs: Criterion D1.
- D1 restricts *beliefs about none-equilibrium promises*
- Requires that a Principal beliefs a none-equilibrium promise belongs to type who would deviate for the lowest *selection probability*.
- In other words: The principal beliefs a promise comes from the agent-type who gains the most utility relative to the equilibrium level.

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Assumption 3

- The probability of type τ_b relative to τ_g is low enough such that if all types promise $\overline{x}^n$, the promise yields higher expected value than a lower promise by τ_h exclusively,

$$\frac{\phi_{\tau_g}}{\phi_{\tau_g} + \phi_{\tau_b}} \overline{x}^n > x^*(\overline{x}^n, \tau_h).$$

where ϕ_τ denotes the likelihood of type τ,

and $x^*(p, \tau)$ the optimal action of type τ after promise p.

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Diff Correlation by Type

	$\Delta_{t/t-1}$ Giving	
	keepers	breakers
$\Delta_{t/t-1}$ Promise	0.345***	0.110
	(0.082)	(0.090)
($\Delta_{t/t-1}$ Promise) sqrt	−0.002	−0.002
	(0.001)	(0.002)
Individual FE	X	X
Round FE	X	X
N	900	477
R^2	0.157	0.050

Notes: Regression of difference of giving in round t to $t-1$ on difference of promise. Regression (1) uses participants that keep their promise in round 1. Regression (2) uses participants that break their promise in round 1. Round and individual fixed effects. Clustered standard errors (individual level) in parenthesis.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Types

- Promisors differ in two dimensions: (1) Motivation a, (2) Cost of breaking a promise c.
  $\rightarrow$ four types of promisors:

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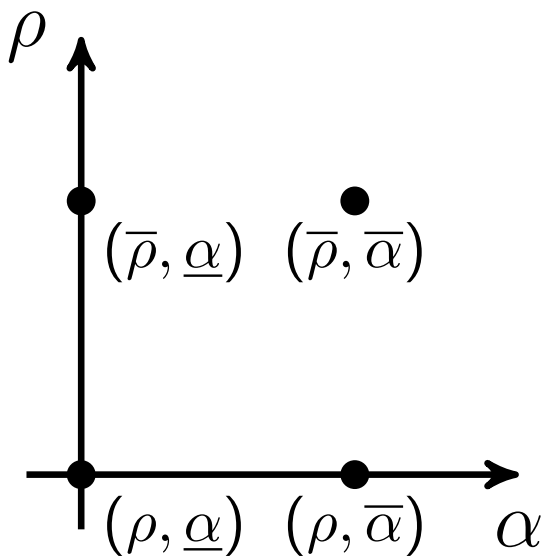

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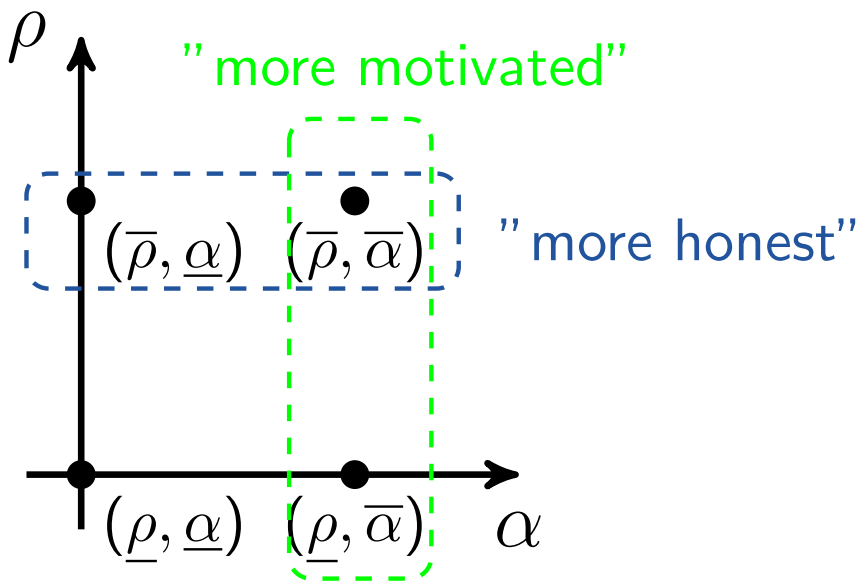
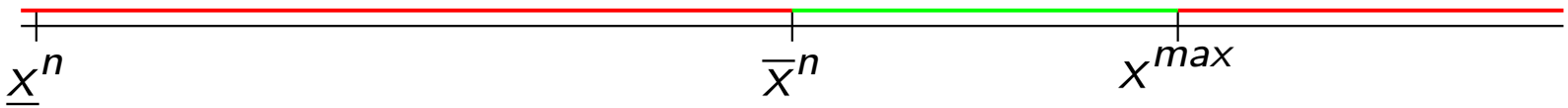
Types

- Promisors differ in two dimensions: (1) Motivation a, (2) Cost of breaking a promise c.
  $\rightarrow$ four types of promisors:



D1 Equilibria



- Below $\overline{x}^n$ type τ_g gains most from increasing promise •
- Above x^{max} the principal prefers a lower promise by τ_h •
- Between $\overline{x}^n$ and x^{max} beliefs are that lower promise comes from τ_h and higher promise from τ_b •

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Selection and giving

Table: Amount given by round

Round	**senders**			**difference**	
	all	selected	not-selected	t-statistic	p-value
1	35.883	38.353	33.007	2.116	0.035
2	32.349	36.490	29.163	3.054	0.002
3	28.970	30.654	27.222	1.443	0.150
4	28.361	31.667	26.549	2.019	0.044
5	27.762	29.536	26.052	1.284	0.200
6	27.135	25.588	28.660	-1.136	0.257
7	25.623	23.575	27.843	-1.659	0.098
8	23.968	22.131	25.869	-1.434	0.153
9	21.565	20.686	21.549	-0.358	0.720
10	18.663	21.046	17.170	1.664	0.097

Notes: The table displays the amount senders give in the promise game by round. The different columns represent all senders or only those who got selected or did not. The final two columns display the test statistic and p-value of a two sided t-test.

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- Two reasons why reputation systems *can be uninformative*
- In these situations consumers can only rely on goodwill and honesty of the sellers.

Can promises alone work in favor of buyers?

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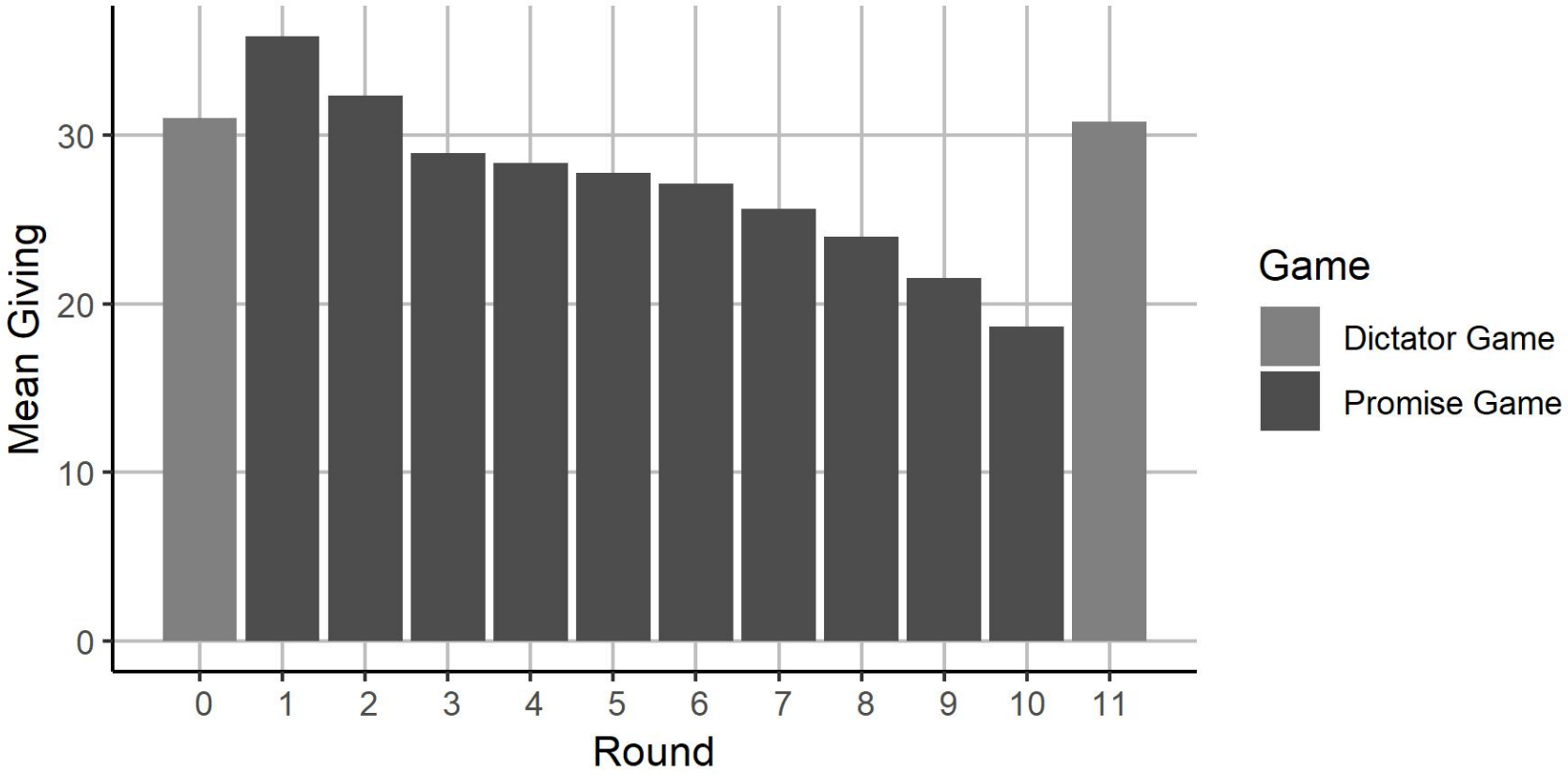
Giving in Dictator vs Promise Game, by Round



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Test of Differences

Table: Comparison promise and dictator game giving

	Mean sending		**Difference**	
Round	Promise Game	Dictator Game	t-statistic	p-value
1	35.745	30.967	2.417	0.017
all	27.141	30.967	-2.086	0.039

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What is a Promise?

- *A declaration or assurance that one will do something or that a particular thing will happen.*

  Oxford dictionary

- Here: A quantifiable statement about the quality of the good or service on offer.

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Assumption 3 (Minimum likelihood good type)

"Likelihood of good type can't be too low, otherwise equilibrium does not exist."

- Assume,

$$\frac{\phi_{\tau_g}}{\phi_{\tau_g} + \phi_{\tau_b}} \overline{x}^n > x^*(x^n, \tau_h).$$

where ϕ_τ denotes the likelihood of type τ,

and $x^*(p, \tau)$ the optimal action of type τ after promise p.

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