Information Acquisition and Provision in School Choice: An Experimental Study

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School Choice and College Admissions

- School choice
  - Students choose which school to attend
  - Increased popularity of centralized public school choice
    - Amsterdam, Beijing, Boston, Chicago, Minnesota, New York City, Paris, etc.
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  - **hundreds** of colleges / college programs.

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  *"**It was very hard, and very time-consuming**," New Orleans resident Carrie Fisher said of trying to find a school for her daughter, who entered kindergarten last fall. **"I'm educated, I have a bachelor's degree, ... and I do have time to read articles online and research things."***

  – Arianna Prothero, "Parents Confront Obstacles as School Choice Expands," Education Week 2015

Theory versus Practice

- Matching theory typically assumes students have perfect information on own preferences
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- Matching theory typically assumes students have perfect information on own preferences
  - at least the ordinal preferences
- Evidence shows:
  - Providing more information changes student choices
    - Info on school quality (Hastings and Weinstein 2008)
    - Info on financial aid (Hoxby and Turner 2015)
    - many other field experiments.

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- Approaches:
  - a theoretical model
    - optimal strategies of every student
  - a lab experiment
    - extensive empirical evidence on sub-optimal strategies of students.

Literature

- An extensive literature on information acquisition in many fields: mostly theoretical.
- Information acquisition in mechanism design: Bergemann and Valimaki (2006)
- Information acquisition in market design
  - Bade (2015); Harless and Manjunath (2015): ordinal preferences.
- Information acquisition experiments
  - Voting:
    - Elbittar et al. (2014)
    - Bhattacharya, Duffy and Kim (2015)
  - Auctions:
    - Choi, Guerra, and Kim (2015); Davis et al. (2011); Gretschko and Rajko (2015);
- Advice giving in school choice (experiments):
  - Ding and Schotter (2014, 2015)

The (Typical) School Choice Model

- A school choice problem consists of:
  - a set of students $I = \{i_1, i_2, \ldots, i_{|I|}\}$
  - a set of schools $S = \{s_1, s_2, \ldots, s_{|S|}\}$
  - the number of available seats at school s: q_s
  - for simplicity: schools do not rank students ex ante
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  - Outcome: student-school matching.

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- Common knowledge
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- Costly information acquisition
  - Sequential: acquire info on ordinal then cardinal pref.
  - cost: $c(\alpha, \beta)$.
    1. Investment in acquiring ordinal preference: $\alpha \in [0, \bar{\alpha}]$
    2. Investment in acquiring cardinal preference: $\beta \in [0, \bar{\beta}]$

Incentives to acquire information about own preference

Under a set of conditions (including bounded cost and Inada conditions for information acquisition technology, $a(\alpha), b(\beta)$), we have:

Proposition

In any symmetric Bayesian Nash equilibrium under DA or IA,

(i) *students always have an incentive to learn their own ordinal preferences;*

(ii) *under DA, there is no incentive to learn own cardinal preferences;*

(iii) *under IA, there exists a distribution of preferences such that students have an incentive to learn their own cardinal preferences.*

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Remark

Part (ii) is true for all strategy-proof mechanisms that elicit ordinal information from students.

Incentives to acquire information about others' preferences

- Given everyone **knows her own preferences**, the incentive to learn others' preferences:
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- *Ex ante*, expected payoff of being assigned to B is 30.
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- Inefficiency: assign a type-$(100, 10, 0)$ student to school B if there is at least one other student of type-$(100, 110, 0)$

Experimental Design

2(mechanisms) $\times$ 2(information to acquire) $\times$ 2(cost conditions)

1. IA vs. DA (between-subject)
2. Own value vs. others' values (between-subject)
3. Free vs. costly info (within-subject)

Table: Features of Experimental Sessions

Info to acquire	Immediate Acceptance		Deferred Acceptance	
Own Value	free-costly	3×12	free-costly	3×12
	costly-free	3×12	costly-free	3×12
Others' Values	free-costly	3×12	free-costly	3×12
	costly-free	3×12	costly-free	3×12

12 subjects per session, random re-matching, 20 rounds
24 independent sessions and 288 participants

Willingness to Pay for Information: Becker-Degroot-Marshak

- Enter WTP for own value (others' values) in $[0, 15]$
- Server collects WTP and generates a random number between $[0, 15]$ for each participant
  - If her WTP $>$ random number, she finds out information and pays the random number
  - Otherwise, she does not find out the information and pays zero
- Instructions adapted from Benhabib, Bisin and Schotter (2010)

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- Implementation of Binarized Scoring Rule (BSR)
  - Each subject submits a guess for the average WTP of the other two participants;
  - Server computes the squared error of the guess and the actual average, MSE;
  - Server randomly draw a number, R, uniformly from $[0, 49]$.
    - If the MSE $\leq$ R, the subject gets a fixed prize of 5 points
    - Otherwise, she gets zero from guessing
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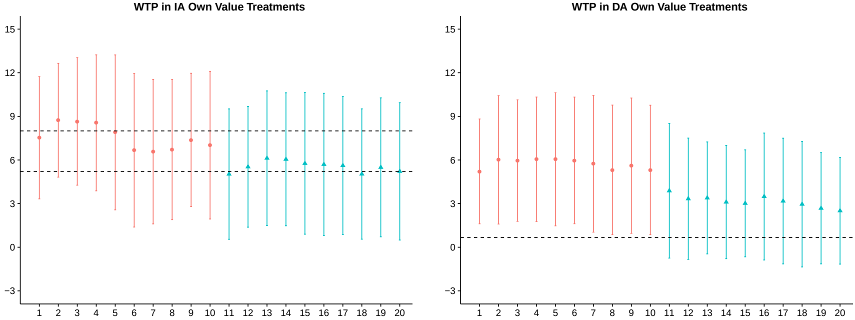
  - Most relevant literature
    - Hossain and Okui (2013)
    - Schotter and Trevino (2014)

Risk Attitude Elicitation; Curiosity

- Risk attitude elicitation
  - Holt and Laury lottery choice
- Curiosity
  - Informed of payoff from lottery choice
  - WTP for the realization of lottery decision
    - non-instrumental information
    - Golman and Loewenstein (2016)

WTP for Own Values



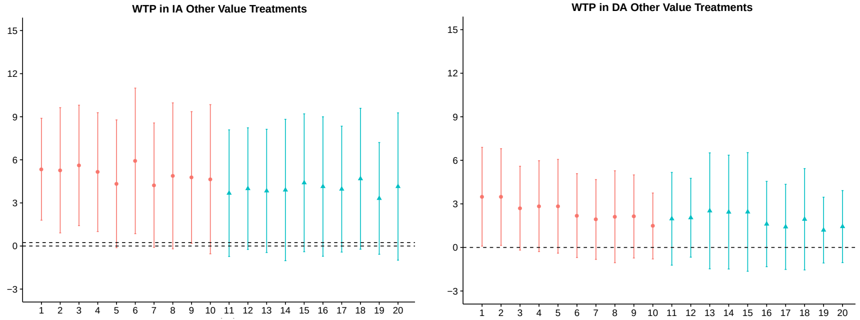
Hypothesis

IA $>$ DA $>$ 0.

Result (session average)

$IA > DA$ ($p = 0.03$), $IA > 0$, $DA > 0$ ($p < 0.01$)

WTP for Others' Values



Hypothesis

$\text{IA} > \text{DA} = 0$

Result (session average)

$IA > DA$ ($p = 0.01$), $IA > 0$, $DA > 0$ ($p < 0.01$)

Excessive WTP

- Excessive WTP for information (except IA OwnValues)
- Excess information acquisition in the literature
  - Jury/committee voting: Bhattacharya, Duffy and Kim (2015)
  - Auctions: Gretschko and Rajko (2015), "regret avoidance"
- Why?

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- Decomposition of WTP at subject level

Determinants of Subject-Average WTP: Tobit Model

	Full Sample	Subsample 1	Subsample 1	Subsample 2
IA_OwnValue	6.45***	6.26***	5.22***	5.77***
	(0.56)	(0.57)	(1.10)	(1.74)
IA_OtherValue	4.32***	4.05***	3.46***	3.91**
	(0.62)	(0.72)	(1.21)	(1.91)
DA_OwnValue	4.13***	3.78***	2.94***	3.60**
	(0.71)	(0.82)	(1.07)	(1.71)
DA_OtherValue	1.47***	1.01**	0.91	1.98
	(0.45)	(0.47)	(1.13)	(1.79)
% playing a dominated strategy with free info			6.85***	6.29***
			(2.02)	(2.21)
Curiosity			0.34***	0.33***
			(0.05)	(0.04)
Costly-Free			1.88***	1.87***
			(0.45)	(0.36)
Risk Aversion			-0.28**	-0.20
			(0.13)	(0.13)
Demographics				Yes
N	288	241	241	233

Decomposition of Subject WTP for Information

	IA Own	IA Other	DA Own	DA Other
WTP: data	6.49	4.29	4.30	1.78
(i) Cognitive load	-0.70	0.36	0.99	0.45
(ii) Learning	0.30	0.10	0.63	0.71
(iii) Conformity	4.10	2.10	2.78	1.30
(iv) Misunderstand			0.41	0.25
(v) Curiosity	1.36	1.69	0.75	0.57
(vi) Risk aversion	-1.43	-0.24	-0.51	0.31
Total explained	3.60	3.17	3.73	1.68
Remaining/unexplained	2.88	1.13	0.58	0.11
Theoretical prediction	[5.2, 8]	[0, 0.24]	0.67	0
# of Obs.	549	495	558	495
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Heterogenous types: Zero-demand for information

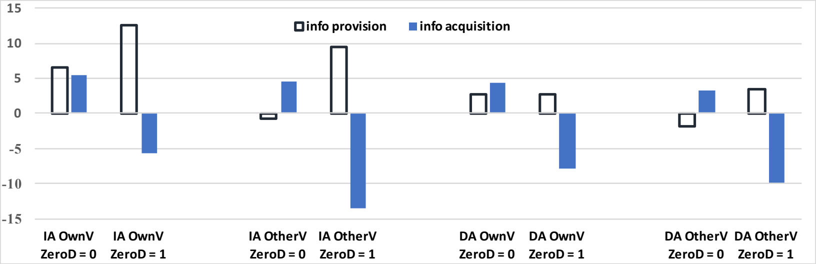
Table: Participants who always submit 0 WTP for information

	$ZeroD_i = 1$	
Treatment	n	Proportion
IA OwnV	6	8%
IA OtherV	7	10%
DA OwnV	11	15%
DA OtherV	20	28%
Total	44	15%

Who have zero demand for information (linear probit model with treatment dummies)?

- Curiosity (-0.02, $p < 0.01$)
- Asian (0.10, $p < 0.05$)

Effects of Information Provision & Costly Acquisition (relative to no relevant information)



- **Hypothesis 1**: Zero-demand participants use free information less efficiently than others.
  - Reject
- **Hypothesis 2**: Costly information acquisition hurts zero-demand participants, while benefiting others who have the opportunity to obtain more information.
  - Fail to reject.

Concluding Remarks

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- **A strong case for information provision**

Concluding Remarks: Information Provision

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  - Accessible presentation material on school offerings and performance (Hastings and Weinstein 2008)
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- Providing information on others' preferences
  - School choice mechanism in Wake County, North Carolina (Dur, Hammond and Morrill 2018)
  - Japan Residency Matching program (# students list each hospital program as first choice: 9/22-10/5)
  - University of Tokyo: matching students to departments
  - College admissions in Inner Mongolia (Gong and Liang 2017)