Uncertainty and the WTA-WTP Disparity for Private and Public Goods

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Camp Resources XX

Research Questions

1. Is there a systematic relationship between uncertainty and the WTA-WTP disparity?
2. In a private good setting, does the disparity disappear (or change direction) as the direction of risk changes?
3. In a public good setting, how do uncertainty and social preferences affect the WTA-WTP disparity?

Motivation

- Empirical evidence that WTA $>$ WTP for private goods and lotteries, disparity even greater for public goods (Horowitz & McConnell '02).
  - Studies typically focus on income and substitution effect in explaining the disparity.
  - Employ alternative theories to explain the gap but usually only apply in specific cases.
- Policies related to public good provision typically involve moving from one state of uncertainty to another.
  - Public policy can either increase or decrease uncertainty (e.g. improvements in health and safety risk).
- In estimating demand for public programs, focus is on changes in quantity and/or quality rather than uncertainty.

Motivation

- Laboratory experiments allow for
  - direct and incentive compatible elicitation of values
  - and clean identification of treatment effects in a controlled environment.
- Plott and Zeiler ('05) show that disparity disappears in the lab for ordinary private goods.
- Isoni, Loomes and Sugden ('11) still observe gap for monetary lotteries.
- Previous experimental work on the WTA-WTP for lotteries
  - One-directional assessment of uncertainty (no status quo uncertainty).
  - No systematic analysis of relationship between WTA-WTP disparity and uncertainty.

This Study

- First systematic assessment of the effect of uncertainty on the WTA-WTP disparity for private and public goods (monetary lotteries).
  - No substitution effects, minimized income effects.
- Look at the impact of
  - Increases in expected payout,
  - Changes in uncertainty (increases and decreases) and,
  - Social preferences

Experimental Design

Elicitation of WTP (or WTA) for lotteries (between-subject design):

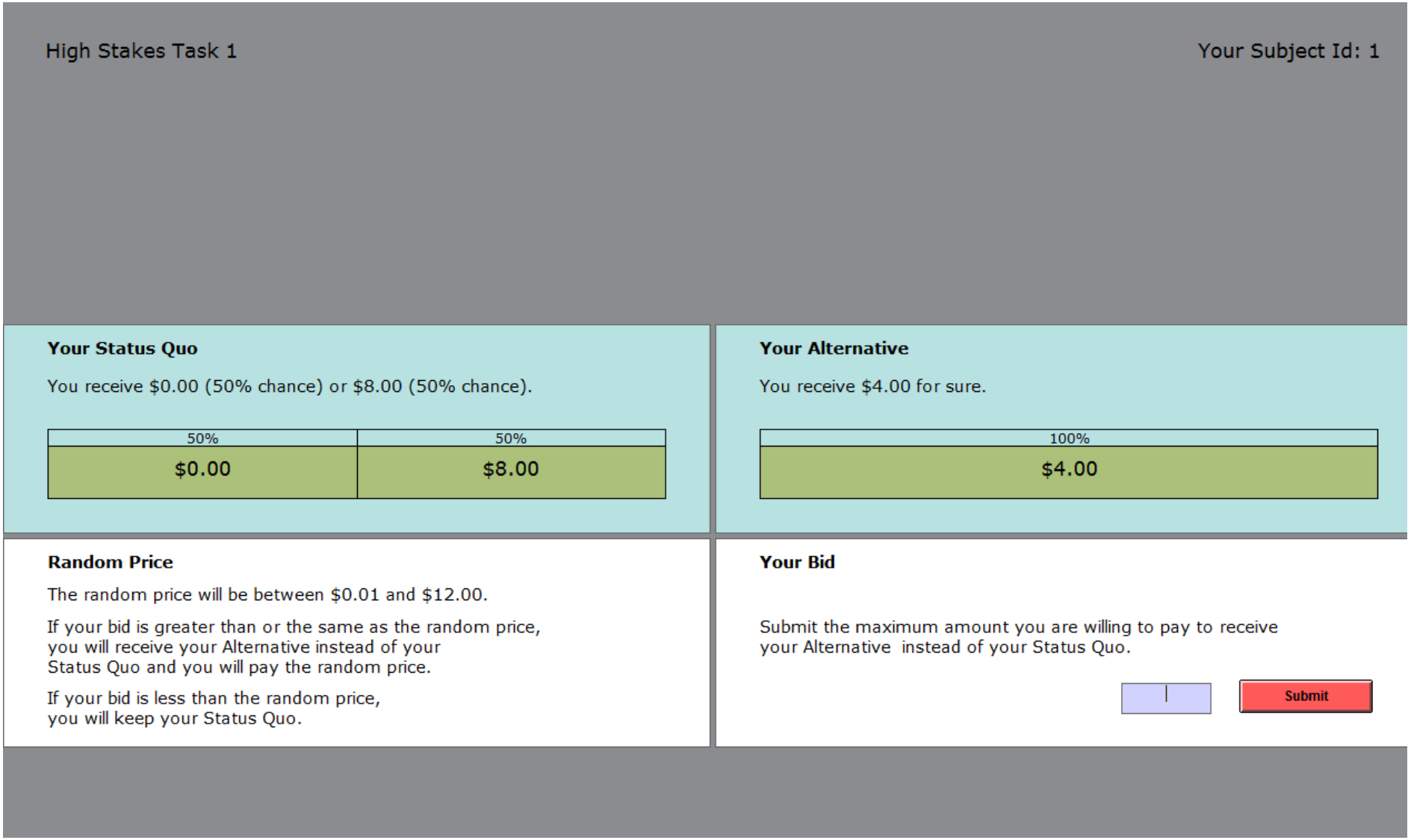
- Subjects start with initial asset (q° in WTP, $q^{\prime}$ in WTA), degenerate or symmetric binary lottery (50-50 chance),
- have opportunity to buy (or sell) alternative asset ($q^{\prime}$ in WTP, q° in WTA), degenerate or symmetric binary lottery, in exchange for initial asset and buying (or selling) price.
- Elicit subject's WTP for change from q° to $q^{\prime}$ (WTA for change from $q^{\prime}$ to q°) with BDM mechanism.

Experimental Design

Subjects make private and public program decisions (within-subject design):

- In public good tasks, randomly and anonymously (re-) match subjects in groups of two, see own Status Quo and Alternative and matched person's Status Quo and Alternative.
- Subject's decision is pivotal - determines buy (or sell) for subject and matched other person.

Private Decision Screen



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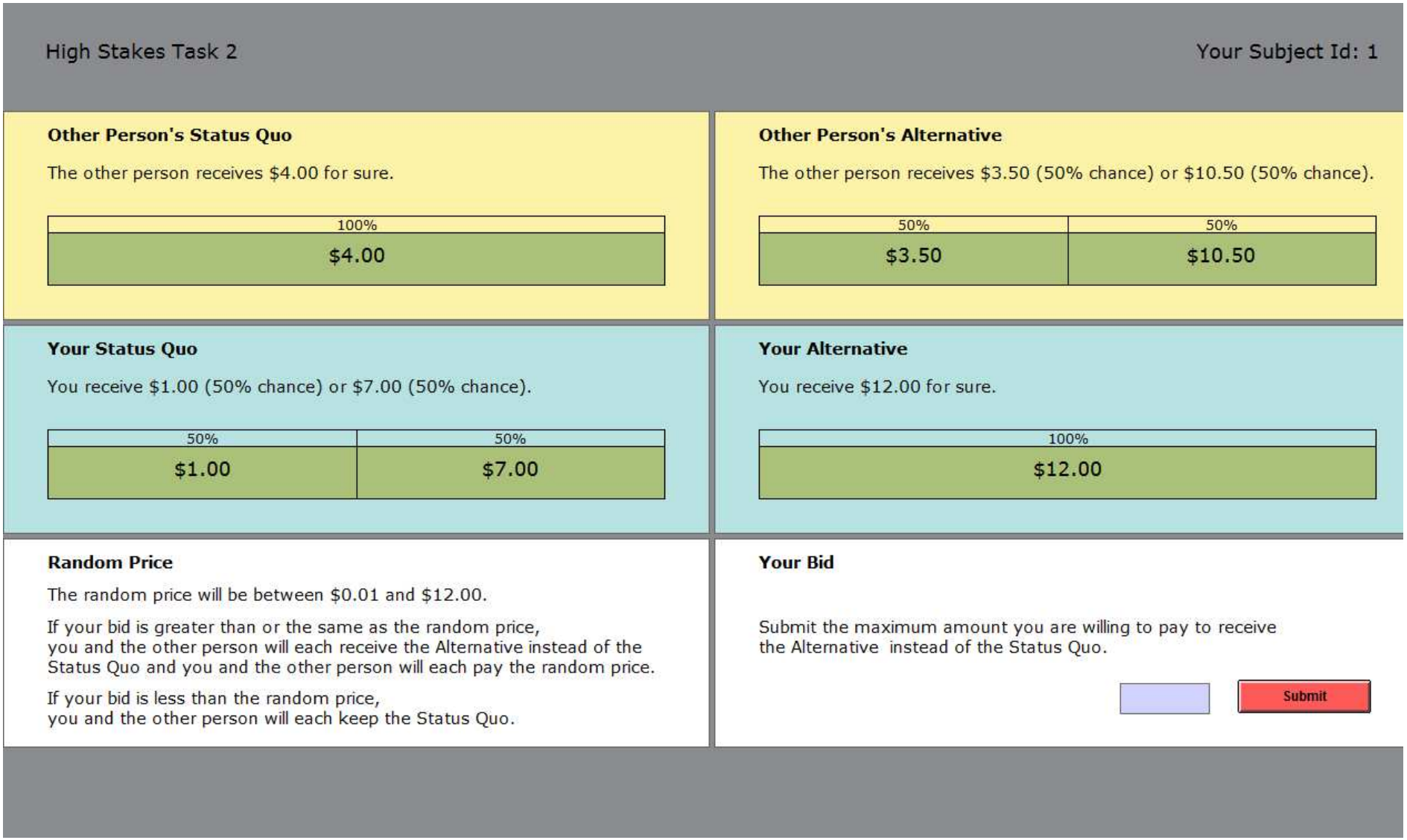

Task Categories

Subjects make several decisions

Task Categories	1	2	3	4	5
$\Delta \mathrm{EV} = \mathrm{EV}[q'] - \mathrm{EV}[q^\circ]$	$\oplus$	$\bigcirc$	$\oplus$	$\oplus$	$\oplus$
$\Delta s = s[q'] - s[q^\circ]$	$\bigcirc$	$\ominus$	$\oplus$	$\ominus$	$\oplus/\ominus$

- 8 private good tasks (2 x Categories 1-4)
- 8 homogeneous public good tasks (2 x Categories 1-4)
- 15 heterogeneous public good tasks (3 x Categories 1-5)

Lottery Choices

Randomly draw expected value and standard deviation of lotteries across subjects and tasks

- $\mathrm{EV}[q^{\circ}] = \$4$ (fixed)
- $\mathrm{EV}[q^{\prime}] \sim U[\$5, \$12]$ in one dollar increments (excl. Category 2)
- $s[q] \sim U[\$0, \$4]$ in 50 cent increments
- In heterogenous public good tasks, q° and $q^{\prime}$ lotteries differ across the two subjects.

Private Bid/Offer Function

- WTP: $w + q^{\circ} \sim w - b^{*}(w; q^{\circ}, q^{\prime}) + q^{\prime}$
- WTA: $w + q^{\prime} \sim w + o^{*}(w; q^{\circ}, q^{\prime}) + q^{\circ}$
  where w: initial wealth
- Express optimal bid and optimal offer functions in terms of expected payout change, $\Delta\mathrm{EV}$, and risk premia, $\pi(\cdot)$:

$$b^{*}(w; q^{\circ}, q^{\prime}) = \Delta\mathrm{EV} + \pi(w, q^{\circ}) - \pi(w - b^{*}(\cdot), q^{\prime})$$

$$o^{*}(w; q^{\circ}, q^{\prime}) = \Delta\mathrm{EV} + \pi(w + o^{*}(\cdot), q^{\circ}) - \pi(w, q^{\prime})$$

Private Bid/Offer Function

- WTP: $w + q^{\circ} \sim w - b^{*}\left(w; q^{\circ}, q^{\prime}\right) + q^{\prime}$
- WTA: $w + q^{\prime} \sim w + o^{*}\left(w; q^{\circ}, q^{\prime}\right) + q^{\circ}$
  where w: initial wealth
- Express optimal bid and optimal offer functions in terms of expected payout change, $\Delta\mathrm{EV}$, and risk premia, $\pi(\cdot)$:

$$b^{*}\left(w; q^{\circ}, q^{\prime}\right) = \Delta\mathrm{EV} + \pi\left(w, q^{\circ}\right) - \pi\left(w - b^{*}(\cdot), q^{\prime}\right)$$

$$o^{*}\left(w; q^{\circ}, q^{\prime}\right) = \Delta\mathrm{EV} + \pi\left(w + o^{*}(\cdot), q^{\circ}\right) - \pi\left(w, q^{\prime}\right)$$

Example

$\mathrm{EV}[q^\circ] = \$4$, $s[q^\circ] = \$4$, $\mathrm{EV}[q'] = \$4$, $s[q'] = \$3$
$\Delta\mathrm{EV} = \$0$, $\Delta s = (-\$1)$; CRRA (DARA) Preferences

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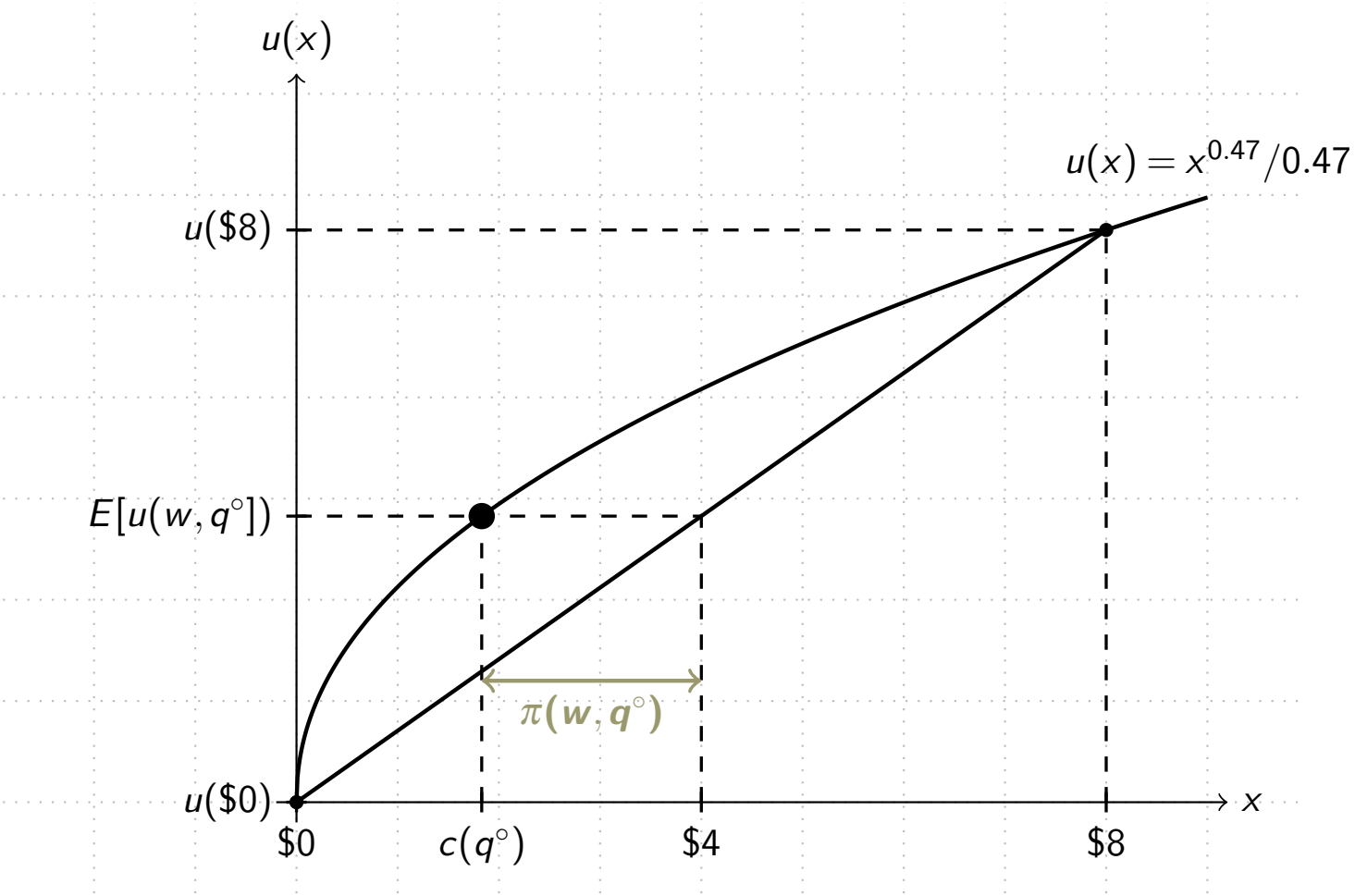

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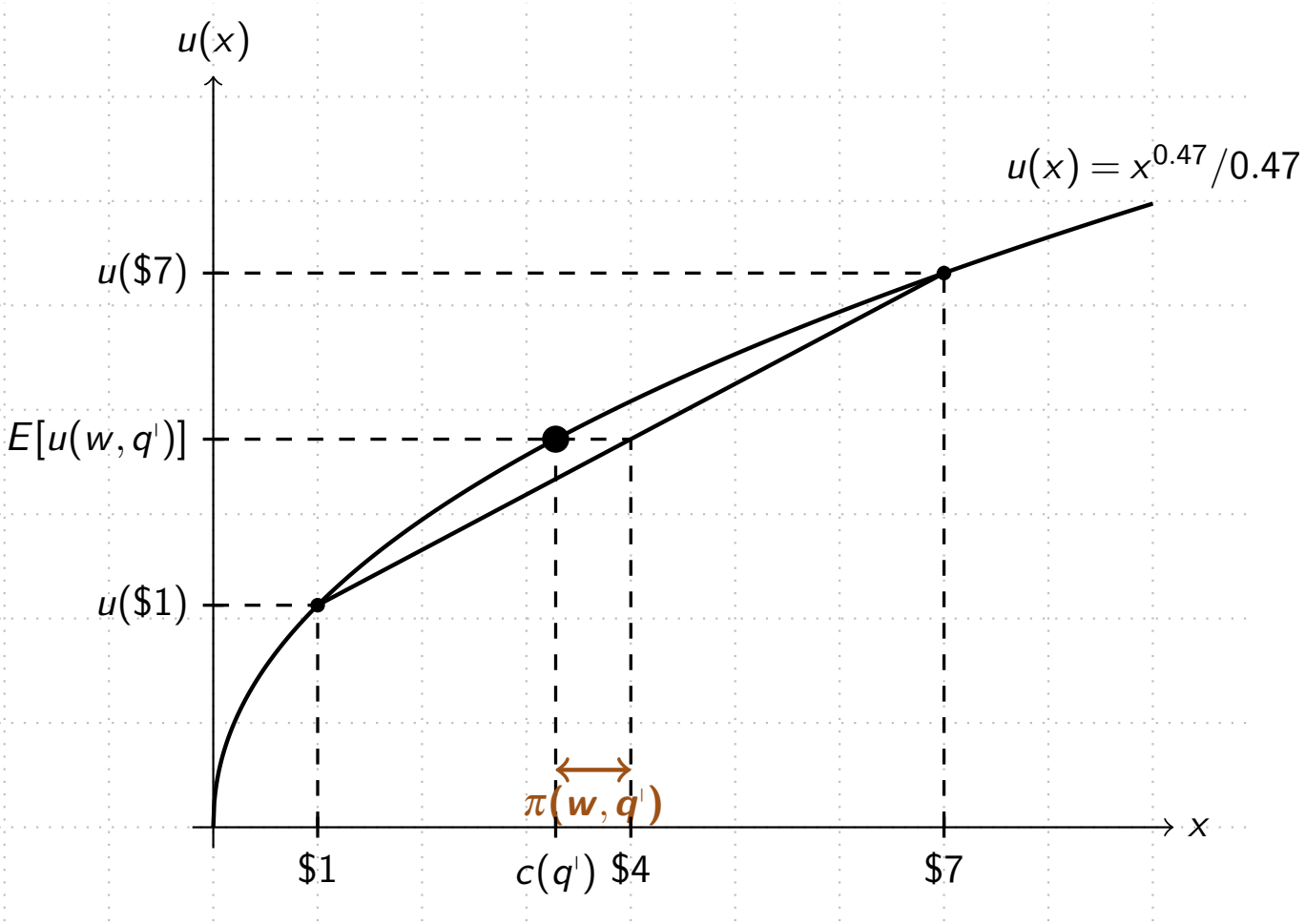

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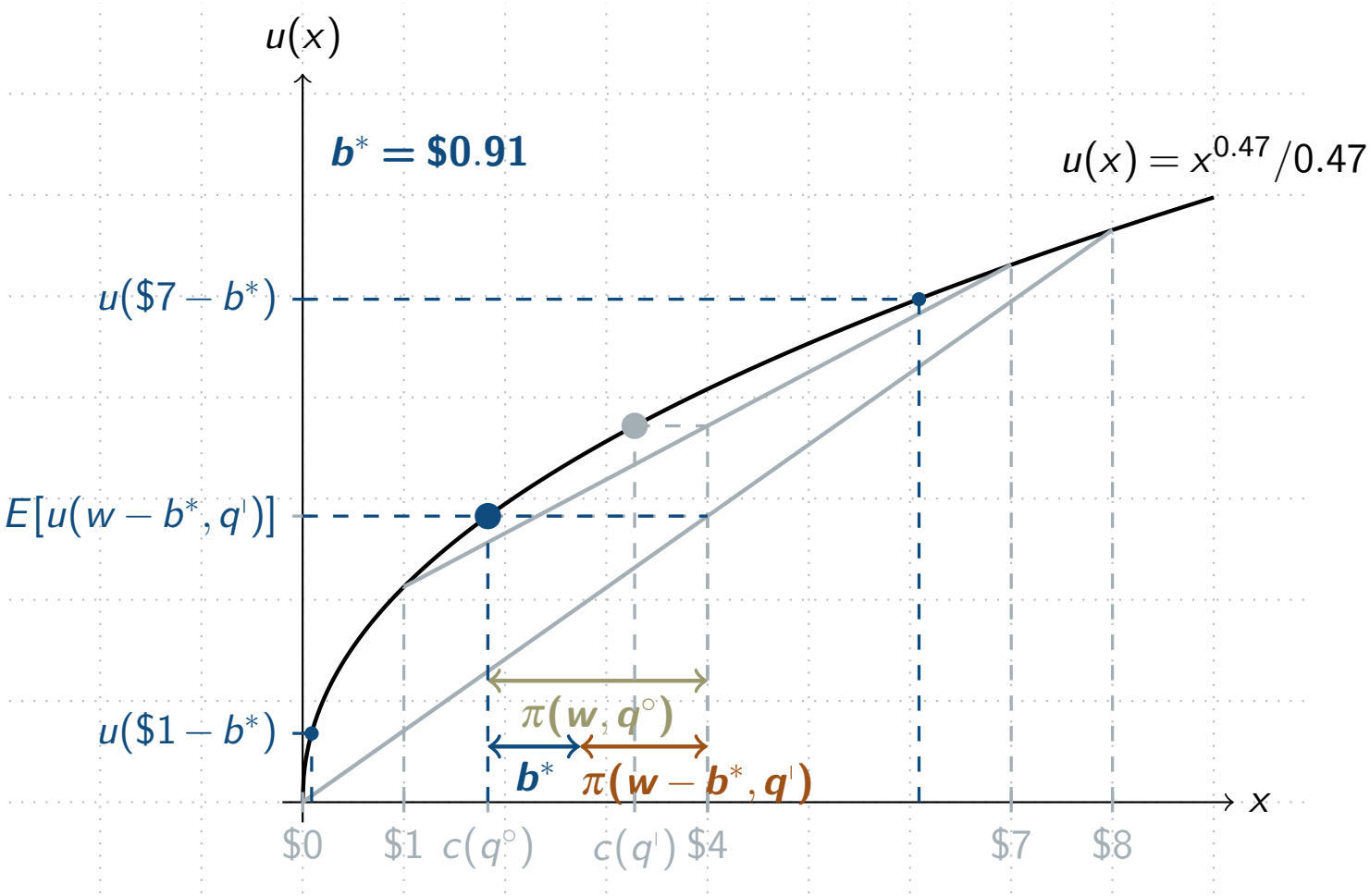

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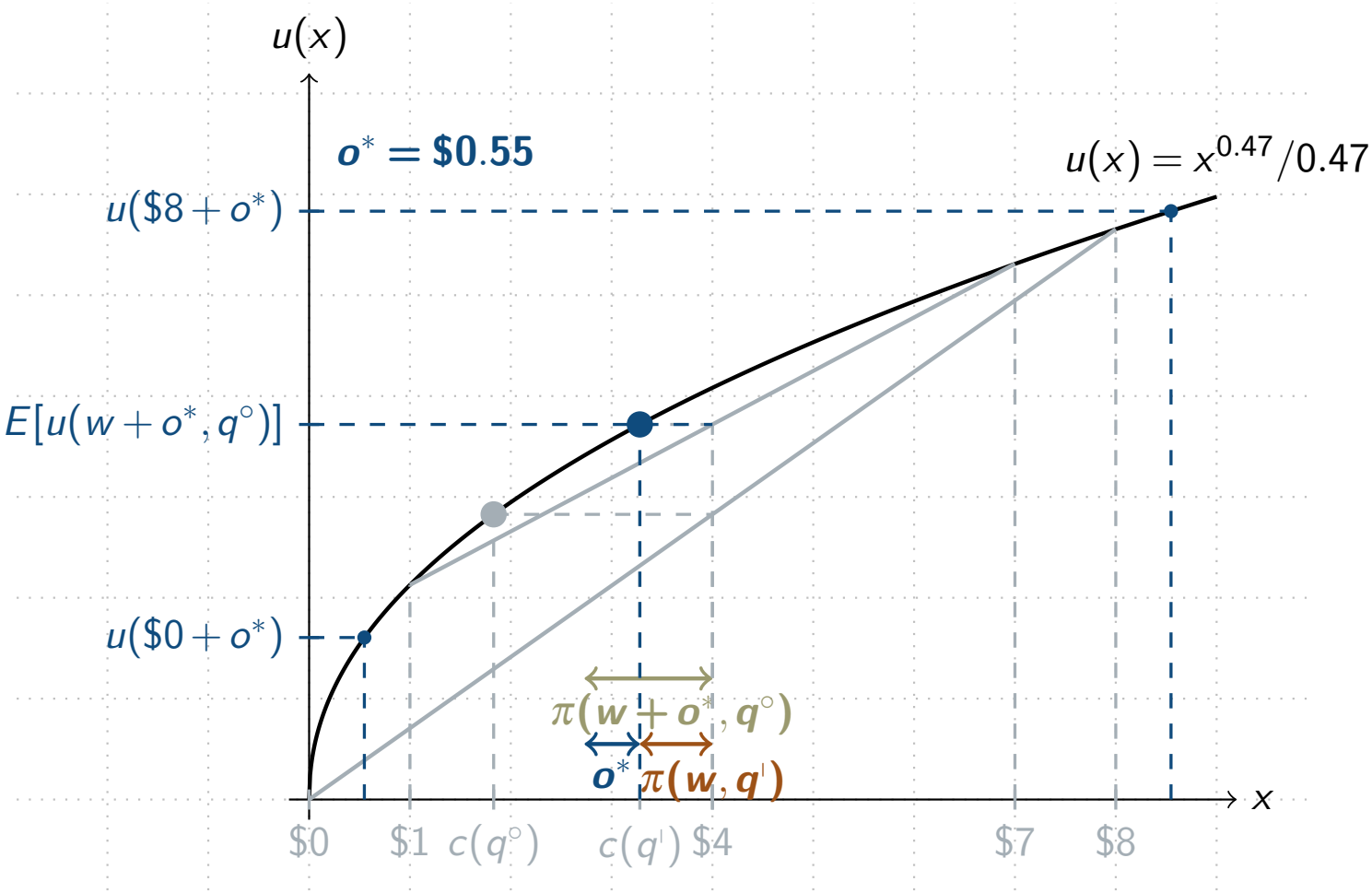

Hypothesis 1

The decrease in WTP for a relative risk increase in $q^{\prime}$ is greater in magnitude than the increase in WTP for an equivalent risk decrease.

Hypothesis 2

The decrease in WTA for a relative risk increase in $q^{\prime}$ is greater in magnitude than the increase in WTA for an equivalent risk decrease.

Hypothesis 3

WTP $\leq$ WTA for a relative risk increase in $q^{\prime}$, $\Delta\sigma > 0$.

Hypothesis 4

WTP $\geq$ WTA for a relative risk decrease in $q^{\prime}$, $\Delta\sigma < 0$.

Hypothesis 5

For $\Delta\sigma > 0$, WTP decreases at a faster rate than WTA as $\Delta\sigma$ increases.

Hypothesis 6

For $\Delta\sigma < 0$, WTP increases at a slower rate than WTA as $|\Delta\sigma|$ increases.

Procedures

- UT Knoxville undergraduate students, N = 168, ~10-20 subjects per session
- Instructions follow Plott & Zeiler procedure: emphasize optimal strategy
- 6 low-stakes practice tasks (private good, degenerate lotteries)
- Private/Public tasks in blocks
- Randomize order of task blocks and treatments w/in task block
- 4 (3) paid rounds in WTP (WTA)
- Average earnings $19.40 ($35.90) in WTP (WTA)

Estimation Results, $y = o - \Delta EV\ (b - \Delta EV)$

		Variable	*WTA*		*WTP*		*Difference*	
Homogen.	Private	Intercept	1.49***	(0.24)	0.32*	(0.18)	1.17***	(0.29)
		$\Delta s^{\oplus}$	-0.02	(0.13)	-0.21**	(0.08)	0.19	(0.15)
		$\Delta s^{\ominus}$	0.68***	(0.10)	0.38***	(0.07)	0.30**	(0.12)
	Public	Intercept	1.69***	(0.28)	0.50**	(0.20)	1.19***	(0.35)
		$\Delta s^{\oplus}$	-0.06	(0.11)	-0.33***	(0.09)	0.27*	(0.14)
		$\Delta s^{\ominus}$	0.67***	(0.09)	0.29***	(0.08)	0.37***	(0.11)
Heterog.	Public	Intercept	2.53***	(0.29)	0.67***	(0.25)	1.86***	(0.38)
		$\Delta s^{\oplus}$	-0.19*	(0.10)	-0.06	(0.09)	-0.13	(0.13)
		$\Delta s^{\ominus}$	0.40***	(0.06)	0.15***	(0.06)	0.25***	(0.08)
		$\delta EV^{\oplus}$	-0.40***	(0.05)	-0.38***	(0.04)	-0.01	(0.06)
		$\delta EV^{\ominus}$	0.24***	(0.05)	0.16***	(0.04)	0.08	(0.06)
		$\delta s^{\oplus}$	-0.06	(0.06)	-0.02	(0.07)	-0.04	(0.09)
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$N = 5,208$, $R^2 = 0.38$, $F = 29.44$***. Coefficients estimates based on pooled model. WTA and WTP specific parameters across columns. Coefficient estimates are in dollars. Robust standard errors, clustered at the subject level (168 subjects) in parantheses.

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Result 1

The increase in WTP for a risk decrease in $q^{\prime}$ is greater in magnitude than the decrease in WTP for an equivalent risk increase. (not H1)

Result 2

The increase in WTA for a risk increase in $q^{\prime}$ is greater in magnitude than the decrease in WTA for an equivalent risk increase. (not H2)

Result 3

There is a positive WTA-WTP disparity for both $\Delta\sigma > 0$ and $\Delta\sigma < 0$. (H3 but not H4)

Result 4

For $\Delta s > 0$, the WTA-WTP disparity does not increase as $\Delta s \uparrow$. (not H5)

Result 5

For $\Delta s < 0$, the WTA-WTP disparity increases as $|\Delta s| \uparrow$. (H6)

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Results

Estimated WTA-WTP Disparity

- Scenario 1: $\Delta \mathrm{EV} \geq 0, \Delta s = (-\$4)$
- Scenario 2: $\Delta \mathrm{EV} > 0, \Delta s = \$4$

	Scenario 1		Scenario 2	
Private	2.39***	(0.46)	1.94***	(0.59)
Homogen. Public	2.69***	(0.41)	2.28***	(0.56)
Heterog. Public	2.86***	(0.36)	1.33**	(0.62)

Result 6

WTA and WTP decrease (increase) when the individual's expected payout gain is more (less) than the other person's expected payout gain.

Result 7

WTA increases when the individual's proposed relative risk change is greater than the other person's proposed risk improvement.

Result

There is a positive WTA-WTP disparity that cannot be explained by uncertainty.

Discussion

Suggestions welcome.