Biased Recommendations

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Cheap Talk

Expert has some private information of interest to Decision Maker

- Stock analyst knows value of stock
- Lobbyist knows value of a project
- Salesperson knows quality of a product

Communication is through simple "cheap talk"

- Not costly like in a signaling game (e.g., Spence, 1973)
- Not verifiable like in a disclosure/persuasion game (e.g., Milgrom, 1981)
- No commitment like in a screening game (e.g., Stiglitz, 1975)

Crawford and Sobel (1982)

Crawford and Sobel provide canonical model

- How can cheap talk be credible?
- Need a tradeoff between messages
- Must be some commonality of interest

Expert biased toward higher action than Decision Maker

- So exact communication breaks down
- If the epert's bias is not too large then coarse communication is possible

Many, many applications, variations and extensions – primarily reputation and multiple experts

Comparative Cheap Talk

What if expert has information on multiple dimensions?

- Stock analyst - multiple stocks
- Lobbyist - multiple projects
- News network - multiple issues
- Salesperson - multiple goods or multiple attributes

Possibility raises lots of questions

- When can make credible tradeoffs across dimensions?
- Do players benefit from such tradeoffs?
- How much information can be revealed?
- Do asymmetries across dimensions make tradeoffs harder?
- How does transparency of Expert's preferences affect communication?

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What is simplest interesting "comparative cheap talk" model?

- Discrete choice environment
  - Expert has information on several choices
  - Expert benefits from choices to varying degrees
  - Expert indicates relative value of choices
  - Decision maker listens to expert and follows advice or not
- What insights from recent literature can super simple model capture?
- What insights and issues can't a simple model capture?
- Do undergrad business majors behave consistently with predictions?

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When are cheap talk recommendations credible?

- Suppose Expert benefits from two DM options A and B
- DM might take neither choice – option C instead
- Benefit to Expert from A or B is same
- Expert knows if A or B better for DM

- Why not recommend the better option?
  - Direct payoff is the same either way
  - (And indirect or nonmonetary payoffs likely favor honesty)
- Recommendation is cheap talk but it has an opportunity cost

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When are cheap talk recommendations "persuasive"?

- Expert recommends A the odds of A choice go up
- But odds of B choice go down
- Do these effects cancel each other out?

- Not if DM has choice to walk away – option C
- Recommending A or B reduces the chance of C
- So the Expert benefits – recommendation is persuasive
- And DM also benefits from more information

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Are cheap talk recommendations "discounted"?

- Suppose Expert gets higher payoff from A than B
- Does this destroy the value of a recommendation for A?

- Suppose DM is less likely to follow recommendation for A
- How much is recommendation discounted?
  - If don't discount at all Expert always pushes A
  - If completely discount A Expert always pushes B

- Discount the right amount and Expert tradeoff equalized
  - Push A and get higher payoff with lower probability
  - Push B and get lower payoff with higher probability

- Equilibrium where some lying and discounting

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Does the expert "pander"? (CDK, 2013)

- Suppose payoffs same to Expert, but DM known to be leaning toward A
- Tempting to just recommend A and push them over the edge
- But DM anticipates this and discounts A recommendation
- So recommendation for B is more credible

- So again expert faces a tradeoff
- Equilibrium where some pandering and discounting

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Does an unbiased expert benefit by lying?

- Suppose Expert might receive higher payoff from A
- Or might be "unbiased" with same payoff from A or B
- Since Expert might be biased, discount A recommendation
- But then an unbiased Expert wants to avoid pushing A even if A is really better!
- Equilibrium where biased Expert lies toward A
- And unbiased Expert lies toward B

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Recommendations need not be so literal ...

- Advertising platform chooses what products are advertised
  - Better for platform if a better match
  - But might have incentive to push some ads more
- Website implicity ranks different products for buyers
  - Top listed products are better?
- Store implicitly ranks different products
  - More prominent position given to better products?
- Friend suggests different products
  - Friend might get kickback for pushing product
  - Gets discount if “friends” a store’s website
- Human resources sets one plan as default
  - Can you trust the implied recommendation?

Recommendations need not be so literal ...

What does "World's best hotdogs" mean?

"Don't eat our hamburgers!"

Choosing to say one thing means choosing not to say something else

As long as there is an opportunity cost of the recommendation, there is some room for credibility

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The Model

- Actions A and B that Expert knows values of
- Values $(v_A, v_B) \in \{(a, 0), (0, b)\}$, $a, b > 0$
- Two states – either A is better or B is better – equally likely
- DM has alternative C with value v_C, uniform on $[0, 1]$
- DM knows value v_C, Expert does not
- DM chooses action with highest expected value
- Expert receives $\pi_A > 0$ or $\pi_B > 0$ if DM chooses A or B
- Expert receives nothing if DM chooses C
- Expert sends a message $m \in \{m_A, m_B\}$
- Sending m_A when $v_B > v_A$ or sending m_B when $v_A > v_B$ incurs a lying cost d with distribution G.

The Model

		Choose A	Choose B	Choose C
$v_A > v_B$	Send m_A	π_A, a	$\pi_B, 0$	$0, v_C$
	Send m_B	$\pi_A - d, a$	$\pi_B - d, 0$	$0, v_C$
$v_B > v_A$	Send m_A	$\pi_A - d, 0$	$\pi_B - d, b$	$0, v_C$
	Send m_B	$\pi_A, 0$	π_B, b	$0, v_C$

$$\pi_A, \pi_B > 0,\ 0 < a, b \leq 1,\ v_C \sim F,\ \ d \sim G$$

Table 1: Expert and Decision Maker Payoffs

Simplest case - symmetric payoffs and values

Suppose $(v_A, v_B) \in \{(1,0),(0,1)\}$ and $\pi_A = \pi_B = 1$
No communication:

- $E[v_A] = E[v_B] = 1/2$
- So $\Pr[\max\{E[v_A], E[v_B]\} > v_C] = 1/2$
- Recommendation accepted half the time

Expert recommends better action:

- Suppose Expert sends m_A and DM now believes A better
- Credible in equilibrium? No reason to lie even if d arbitrarily small (or zero)
- So $E[v_A|m_A] = 1$, $E[v_B|m_A] = 0$
- So $\Pr[\max\{E[v_A|m_A], E[v_B|m_A]\} > v_C] = 1$
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Asymmetric values and payoffs

Expert strategy captured by false claim probabilities:

- $\alpha = \Pr[m_A | v_B > v_A]$ (lie towards A)
- $\beta = \Pr[m_B | v_A > v_B]$ (lie towards B)

Suppose expert lies only toward A so $\alpha \geq 0, \beta = 0$

$$E[v_A|m_A] = \Pr[v_A > v_B|m_A]a = \tfrac{1-\beta}{1-\beta+\alpha}a = \tfrac{a}{1+\alpha}$$
$$E[v_B|m_A] = \Pr[v_B > v_A|m_A]b = \tfrac{\alpha}{1-\beta+\alpha}b = \tfrac{\alpha b}{1+\alpha}$$
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$$E[v_B|m_B] = \Pr[v_B > v_A|m_B]b = \tfrac{1-\alpha}{1-\alpha+\beta}b = b$$

Suppose DM accepts recommendation for A or B (if not C):

$$E[v_A|m_A] > E[v_B|m_A] \text{ or } \frac{a}{b} > \alpha$$
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First consider recommendations with pure cheap talk, d=0

Consider $\pi_A a \geq \pi_B b$ and suppose expert lies toward A if at all, so $\alpha \geq 0$ and $\beta = 0$

From expert's perspective acceptance probabilities are:

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\begin{aligned}
P_A &= \Pr[E[v_A|m_A] \geq v_C] = F\left(E[v_A|m_A]\right) \\
&= E[v_A|m_A] = \Pr[v_A > v_B|m_A]a = \frac{a}{1+\alpha}
\end{aligned}
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Pure cheap talk equilibrium

If Expert gets higher expected payoff from one message then will always send that message, so payoffs must be same:

$$\pi_A P_A = \pi_B P_B$$

or

$$\pi_A \frac{a}{1+\alpha} = \pi_B b$$

Tradeoff: if payoff from recommending an action is higher the probability of the action being accepted must be lower.

Equilibrium amount of lying in favor of A (mixed strategy) is

$$\alpha = \frac{\pi_A a}{\pi_B b} - 1$$

Expert lies too much (α large) then the expected value of favored action falls and not worth it to lie more

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Pure cheap talk equilibrium

Proposition

For sufficiently symmetric incentives and values weakly favoring A, there exists a pure cheap talk equilibrium with acceptance rates

$$P_A = \frac{a}{1+\alpha}, P_B = b$$

and lying rates

$$\alpha = \frac{\pi_A a}{\pi_B b} - 1, \beta = 0.$$

For $\alpha \in [0,1]$ need $\frac{\pi_A a}{\pi_B b} \in [1,2]$

For $\alpha < \frac{a}{b}$ need $\frac{\pi_A a}{\pi_B b} - 1 < \frac{a}{b}$ or $\frac{\pi_A a}{\pi_B b} < \frac{a+b}{b}$

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Now allow for lying aversion

Assume cost of lying d has continuous distribution G

- In any equilibrium Expert types with low lying costs will lie and those with high lying costs will not
- Define d_A as type indifferent to lying that A is better: $\pi_A P_A - d_A = \pi_B P_B$, so $\alpha = G(d_A)$
- Define d_B as type indifferent to lying that B is better: $\pi_A P_A = \pi_B P_B - d_B$, so $\beta = G(d_B)$
- Clearly cannot have $d_A, d_B > 0$, so cannot have $\alpha, \beta > 0$

Lying aversion reduces lying

- Also equilibrium selection - lying in only one direction
- Also ensures pure strategies by expert

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Proposition

For sufficiently symmetric incentives and values weakly favoring A, the unique costly cheap talk equilibrium has acceptance rates given by

$$P_A = \frac{a}{1+\alpha}, P_B = b$$

and lying rates given by

$$\alpha = \frac{\pi_A a}{\pi_B b + d_A(\alpha)} - 1,\ \beta = 0.$$

Does Expert benefit from communication?

- Consider $a \geq b$ and $\pi_A \geq \pi_B$ (as will do in experiment)
- If no communication $E[v_A] = a/2$ so Expert receives at most $\pi_A \Pr[E[v_A] > v_C] = \pi_A a/2$
- With communication $\beta = 0$ and $P_A = \frac{a}{1+\alpha}$ and $P_B = b$
- In eq., $\pi_A P_A - d_A = \pi_B P_B$, so payoff at least $\pi_B P_B$ or just $\pi_B b$
- So Expert benefits from communication if $\pi_B b \geq \pi_A a/2$ or

$$\frac{\pi_A a}{\pi_B b} \leq 2$$

Persuasiveness Hypothesis: *For sufficiently symmetric incentives and values, communication increases the probability that the decision maker chooses A or B rather than C and benefits every expert type.*

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Persuasiveness in the literature

- Crawford and Sobel model – expert benefits from communication since makes decisions less noisy
- Comparative cheap talk with state dependence – expert also benefits from less noisy decisions
- Comparative cheap talk with state independence – communication is persuasive if preferences are quasiconvex
- Here statements are necessarily comparative and preferences are convex in one dimensional space of updated estimates
- Similar to Bayesian persuasion (Kamenica and Gentzkow, 2011) except credibility constraint

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How is communication affected if Expert is biased?

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- With lying aversion $\pi_A P_A - d_A = \pi_B P_B$ or

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- Either case as π_A rises α rises and P_A falls

Discounting Hypothesis: *For sufficiently symmetric incentives and values weakly favoring A, a higher expert incentive for A or lower expert incentive for B increases the probability of a lie that A is better, resulting in a lower probability that a recommendation for A is accepted.*

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- Sobel (1986) binary recommendation model with reputation – stronger incentive to push action relative to reputation costs implies recommendation more discounted
- Comparative cheap talk models – if expert receives higher payoff in one dimension then decision maker less influenced by expert pushing that dimension
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Che, Dessein, and Karthik (2011) analyze this issue in similar game

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- Comparative cheap talk with state-independent expert preferences – pandering distorts communication but does not preclude it
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What if Expert preferences are not certain?

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Transparency in the literature

- In Crawford-Sobel model uncertainty over the expert's bias can facilitate rather than hinder communication (Li and Madarasz, 2008)
- Experiments find that transparency often hurts communication – gives lying averse experts more justification for lying (Cain, Loewenstein, and Moore, 2005)
- Comparative cheap talk with state-independence – transparency ensures communication and communication robust to some lack of transparency

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- Related to political correctness literature (Morris, 2001)

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Experiment Design

- Four sessions, 20 subjects each from business classes
- Each session 10 subjects "Consultant", 10 subjects "Client"
- Exactly same rules, payoffs, information as in model
- Each session has 4 series of 10 rounds
- Consultant/Client pairs never the same in a series
- Each series is a treatment testing one of the 4 phenomena – within subject
- One round from each series is randomly chosen for payment
- For statistical analysis we use average behavior across subjects in last five rounds of a treatment as a single data point
- So for each treatment there are 4 data points

Instructions

"You will be a consultant or client in this experiment. There will be ten consultants and ten clients.

This experiment consists of four series of ten rounds each. In each series, there will be a different treatment in that the rules or the payoffs will be a little different.

In each round, every consultant is randomly matched with a client. You will never have the same partner in the same series. There are ten rounds in each series so each of you will match up with a different consultant or client in each round.

At the end of the experiment, one round from each series will be randomly chosen as the round that everyone is paid for. You will be told which four rounds, one from each series, were randomly chosen and you will be paid in cash for those four rounds."

"The consultant has two projects - Project A and Project B. One is a good project worth $10 to the client and the other is a bad project worth $0 to the client. Each round the computer randomly assigns one project to be good and tells the consultant. The client does not know which project is good and which is bad.
The client has his/her own project - Project C. Each round Project C is randomly assigned by the computer to be worth any value between $0.00 and $10.00. Any such value is equally likely. The computer tells the client how much Project C is worth, but the consultant does not know.
The consultant will give a recommendation to the client via the computer. The recommendation will be "I recommend Project A" or "I recommend Project B".
After getting the recommendation, the client will make a decision. The client earns the value of the project that is chosen. If the client chooses Project A or Project B the consultant will earn $8 in that round. However, if the client chooses his/her own Project C instead, the consultant will earn $0. One round from this series will be randomly chosen at the end as the round you are actually paid for."

Does Expert benefit from communication?

Persuasion Hypothesis: *For sufficiently symmetric incentives and values, communication increases the probability the decision maker chooses A or B rather than C and benefits every expert type.*

$\pi_A = \pi_B = 8$,

$\Pr[v_A = 10, v_B = 0] = \Pr[v_A = 0, v_B = 10] = 1/2$, $v_C \sim U_{[0,10]}$

No communication:

- Expected value of either action is 5
- So choose A or B (not C) half the time, $\Pr[5 > v_C] = 1/2$

Communication:

- Expert payoffs symmetric so no incentive to lie
- DM believes recommended action better, other action worse
- So choose recommended action always, $\Pr[10 > v_C] = 1$

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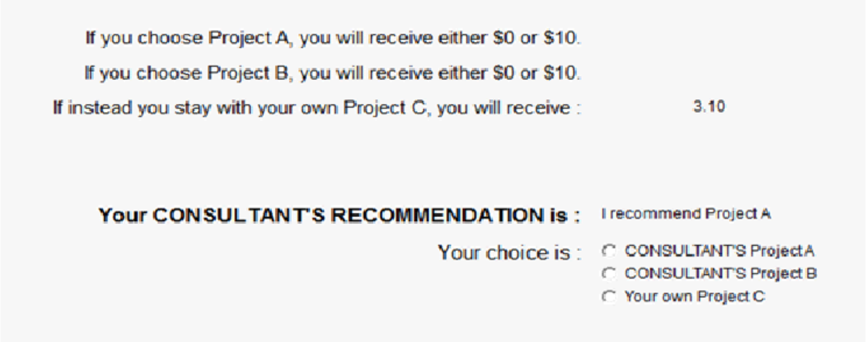
Sample Client screen



If you choose Project A, you will receive either $0 or $10.

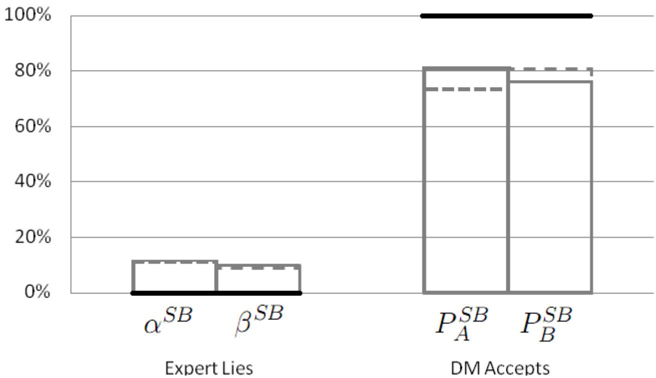
If you choose Project B, you will receive either $0 or $10.

If instead you stay with your own Project C, you will receive : 3.10

Your CONSULTANT'S RECOMMENDATION is : I recommend Project A

Your choice is :
- CONSULTANT'S Project A
- CONSULTANT'S Project B
- Your own Project C

Symmetric Baseline Treatment – Persuasion



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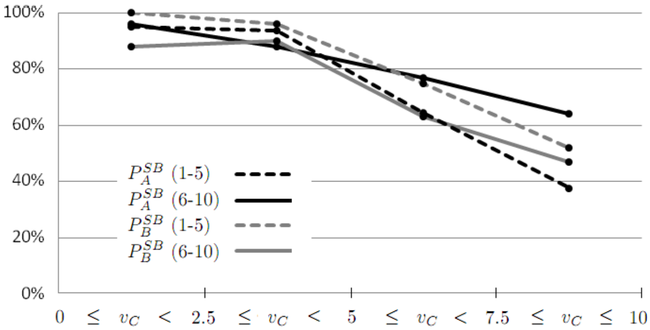

Acceptance Rates as Function of Value of Outside Option

Baseline Symmetric Treatment – Persuasion

		S. 1	S. 2	S. 3	S. 4	Avg
Rec A When B Better	α^{SB}	.14	.13	.11	.07	.11
Rec B When A Better	β^{SB}	.14	.15	.04	.04	.10
A Rec Accepted	P_A^{SB}	.63	.77	.92	.96	.81
B Rec Accepted	P_B^{SB}	.39	.71	.88	1.00	.76
A or B Rec Accepted	P_{AB}^{SB}	.52	.74	.90	.98	.74

	Wilcoxon	T-test
Hypothesis: $P_{AB}^{SB} < \frac{1}{2}$	$p = .063$	$p = .032$

Asymmetric Incentives Treatment – Discounting

Discounting Hypothesis: *For sufficiently symmetric incentives and values weakly favoring A, a higher expert incentive for A or lower expert incentive for B increases the probability of a lie that A is better, resulting in a lower probability that a recommendation for A is accepted.*

"Everything is the same as the first series, except if the client chooses Project A the consultant will earn \$10 and if the client chooses Project B the consultant will earn \$5."

$\pi_A = 10$, $\pi_B = 5$,
$\Pr[v_A = 10, v_B = 0] = \Pr[v_A = 0, v_B = 10] = 1/2$, $v_C \sim U_{[0,10]}$

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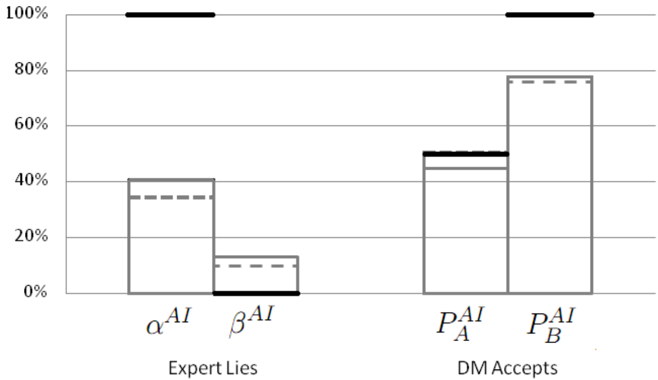

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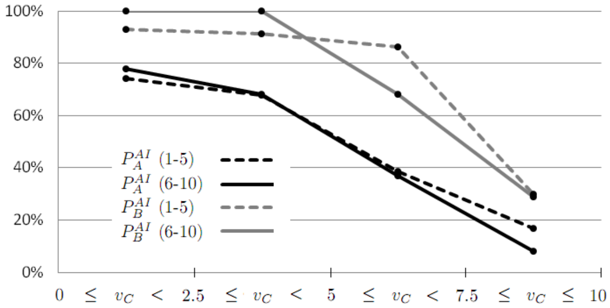

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Asymmetric Incentives Treatment – Discounting

		S. 1	S. 2	S. 3	S. 4	Avg
Rec A When B Better	α^{AI}	.35	.31	.52	.53	.41
Rec B When A Better	β^{AI}	.21	.24	.04	.06	.13
A Rec Accepted	P_A^{AI}	.36	.32	.53	.53	.45
B Rec Accepted	P_B^{AI}	.68	.80	.71	1.00	.77

	Wilcoxon	T-test
Hypothesis: $\alpha^{AI} > \beta^{AI}$	$p = .063$	$p = .037$
Hypothesis: $P_A^{AI} < P_B^{AI}$	$p = .063$	$p = .007$

Opaque IncentivesTreatment – Transparency

Transparency Hypothesis: *For symmetric values, if the expert is equally likely to be biased toward A or unbiased, then biased and unbiased experts lie in opposite directions and are more likely to lie than if the expert is known to be biased or known to be unbiased. The probability that a recommendation for either A or B is accepted is lower than if the expert is known to be unbiased, and the probability that a recommendation for B is accepted is lower than if the expert is known to be biased.*

"Everything is the same as before, except the Computer will randomly assign the consultant's payoff scheme. Half of the consultants will earn \$8 if either Project A or B is chosen, and half of consultants will earn \$10 if project A is chosen but only \$5 if project B is chosen. The consultant knows his/her payoff scheme but the client does not know which payoff scheme the Computer assigned the consultant."

$$\Pr[\pi_A = 8, \pi_B = 8] = \Pr[\pi_A = 10, \pi_B = 5] = 1/2$$
$$\Pr[v_A = 10, v_B = 0] = \Pr[v_A = 0, v_B = 10] = 1/2, \; v_C \sim U_{[0,10]}$$

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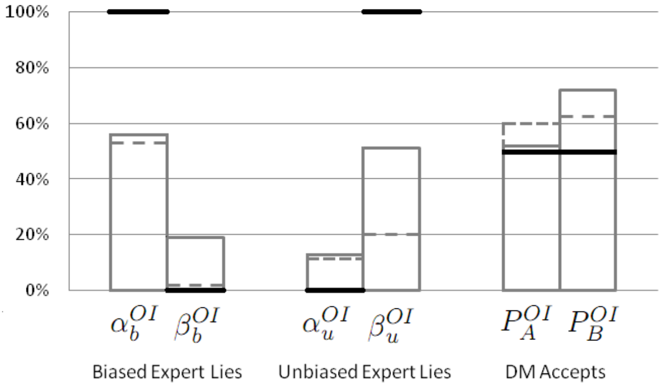

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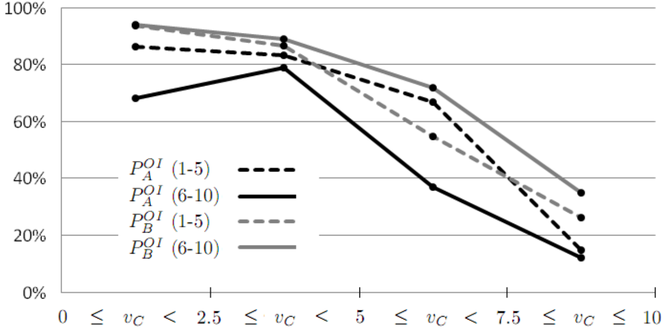

Acceptance Rates as Function of Value of Outside Option

Opaque IncentivesTreatment – Transparency

		S.1	S.2	S.3	S.4	Avg
Biased: Rec A When B Better	α_b^{OI}	.45	.45	.58	.78	.56
Biased: Re B When A Better	β_b^{OI}	.36	.07	.00	.31	.19
Unbiased: Rec A When B Better	α_u^{OI}	.33	.15	.00	.00	.13
Unbiased: Rec B When A Better	β_u^{OI}	.38	.58	.58	.50	.51
A Rec Accepted	P_A^{OI}	.58	.28	.68	.54	.52
B Rec Accepted	P_B^{OI}	.54	.64	.80	.92	.72

	Wilcoxon	T-test
Hypothesis: $\alpha_b^{OI} > \beta_b^{OI}$	$p = .063$	$p = .017$
Hypothesis: $\alpha_u^{OI} < \beta_u^{OI}$	$p = .063$	$p = .022$

Asymmetric Values Treatment – Pandering

Pandering Hypothesis: *For sufficiently symmetric incentives and values weakly favoring A, a higher decision maker value for A increases the probability of a lie that A is better and increases the probability that a recommendation for A is accepted, and a lower decision maker value for B increases the probability of a lie that A is better and decreases the probability that a recommendation for either action is accepted.*

"Everything is the same as the first series, including the consultant's payoff scheme of earning \$8 if either Project A or B is chosen, except the value of Project B to the client if it is good is only \$5 instead of \$10. If project A is good its value to the client is still \$10. A bad project is still worth \$0 to the client."

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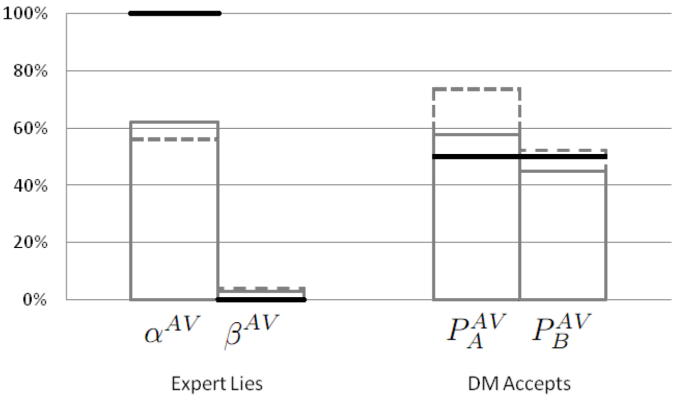

Asymmetric Values Treatment – Pandering

		S.1	S.2	S.3	S.4	Avg
Rec A When B Better	α^{AV}	.46	.68	.63	.70	.62
Rec B When A Better	β^{AV}	.00	.05	.00	.09	.03
A Rec Accepted	P_A^{AV}	.46	.40	.68	.75	.58
B Rec Accepted	P_B^{AV}	.62	.30	.44	.40	.45

	Wilcoxon	T-test
Hypothesis: $\alpha^{AV} > \beta^{AV}$	$p = .063$	$p = .000$

Hypothesis Tests – Across Treatments

	Hypothesis	Wilcoxon	T-test
A Lying Rates AI vs. SB	$\alpha^{AI} < \alpha^{SB}$	.063	.010
A Acceptance Rates AI vs. SB	$P_A^{AI} < P_A^{SB}$	.063	.001
A Lying Rates Biased OI vs. SB	$\alpha_b^{OI} > \alpha^{SB}$	.063	.008
B Lying Rates Unbiased OI vs. SB	$\beta_u^{OI} > \beta^{SB}$	.063	.004
A Lying Rates Biased OI vs. AI	$\alpha_b^{OI} > \alpha^{AI}$	.063	.018
B Lying Rates Unbiased OI vs. AI	$\beta_u^{OI} > \beta^{AI}$	.063	.008
A Acceptance Rates OI vs. SB	$P_A^{OI} < P_A^{SB}$	.063	.027
A Acceptance Rates OI vs. AI	$P_A^{OI} > P_A^{AI}$	.188	.137
B Acceptance Rates OI vs. SB	$P_B^{OI} < P_B^{SB}$	.438	.372
B Acceptance Rates OI vs. AI	$P_B^{OI} < P_B^{AI}$	.188	.137
A Lying Rates AV vs. SB	$\alpha^{AV} > \alpha^{SB}$	.063	.002
A Acceptance Rates AV vs. SB	$P_A^{AV} < P_A^{SB}$	.063	.005
B Acceptance Rates AV vs. SB	$P_B^{AV} < P_B^{SB}$	.125	.096

Conclusion – policy implications

Support for measures that equalize expert incentives

- Decision makers can discount expert recommendations
- But less information is then communicated

Support for measures requiring transparency

- Lack of transparency encourages lying by biased experts
- And even by unbiased experts!
- And decision makers fall for lying by unbiased experts

Highlights problem of pandering

- More information about decision maker preferences helpful for accurate advice
- But expert then panders to decision maker's favored choice

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