Learning in the Household

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Motivation

- Households: an important venue of social learning
  - Members have access to independent info + many opportunities to share
  - Virtually all household models assume full information pooling
  - Except: Strategic motives can inhibit information flow (Ashraf et al. 2014, 2020)

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  - Members have access to independent info + many opportunities to share
  - Virtually all household models assume full information pooling
  - Except: Strategic motives can inhibit information flow (Ashraf et al. 2014, 2020)
- In many situations, spouses have *common* objectives
  - Invest money wisely, send child to a good school, consult a competent doctor
  - Making good decisions here requires spouses to pool information
- Little evidence on:
  - How well spouses learn from each other
  - What factors inhibit learning

Social learning experiments with 400 couples and 500 strangers in Chennai

- Research questions
  (1) Do people respond similarly to info uncovered by themselves and by their spouse?
  (2) Does this vary by gender?
  (3) Is inefficient learning due to a lack of communication or incorrect use of info?
  (4) Do spouses learn from each other differently than strangers working in teams?

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- Simple, incentivized task: guess share of red balls in an urn.
  (1) Control condition: draw all signals on your own ('Individual' round)
  (2) Discussion treatment: can access some signals only via discussion with teammate
  (3) Draw-sharing treatment: *directly* inform participants of teammate's signals

Related literature

- Beliefs and learning in the household
  - Strategic hiding or mistrust of information
    Ashraf '09; Ashraf et al. '14, '20; Ambler '15; Apedo-Amah et al. '20;
  - Intra-household spillovers of information interventions
    Lowe & Mckelway '19; Fehr et al. '19; Ashraf et al. '20
- Role of gender in sharing and listening to information/ideas
  Coffman '14; Chen & Houser '17; Beaman & Dillon '18; BenYishay et al. '20; Coffman et al. '21
- Barriers to social learning more generally
  - Field: Barriers to information seeking and diffusion
    Mobius et al. '15; Chandrasekhar et al. '18; Banerjee et al. '18
  - Lab: People underreact to information implied by others' *actions*
    Weizsäcker '10; Angrisani et al. '18

First experiment with 400 married couples in Chennai, India

	Couples		Non-Couples	
	Husbands	Wives	Men	Women
Married	1.00	1.00	0.56	0.85
Years married | Married	12.33	12.23	13.00	15.09
	(8.47)	(8.45)	(7.65)	(8.66)
Age	36.46	31.86	34.92	34.39
	(9.10)	(8.34)	(8.69)	(8.48)
Highest grade attended	7.86	8.11	7.77	7.26
	(3.31)	(3.29)	(3.54)	(3.44)
Reads Tamil	0.86	0.83	0.77	0.75
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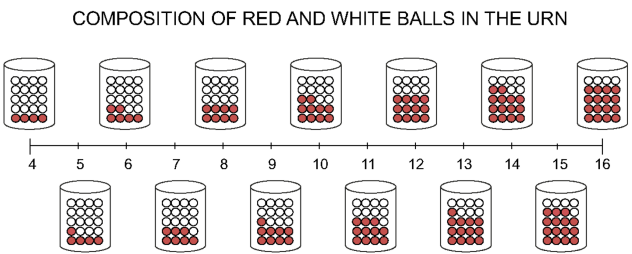
Days working per week | Works	5.73	5.90	5.27	5.75
	(1.05)	(1.15)	(1.26)	(1.31)
Daily earnings | Works	571.41	279.72	577.38	281.64
	(269.33)	(195.59)	(299.94)	(210.39)
N	400	400	250	250

- Couples married for over 12 years on average
- Similar education and literacy across husbands and wives
- Given cultural context, sample consists of heterosexual, married couples

Experimental task: guess number of red balls in urn of 20 balls

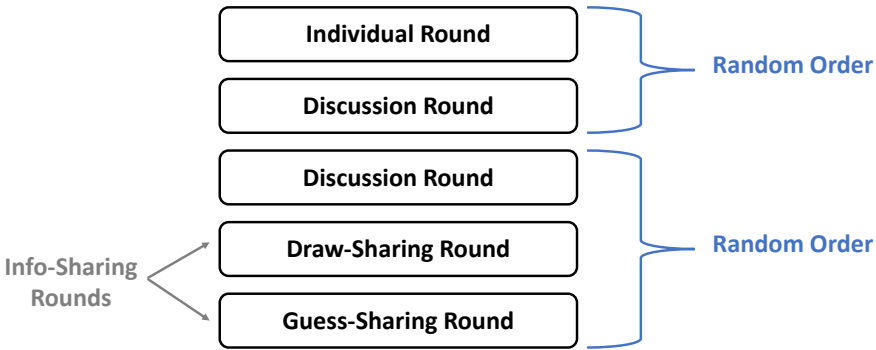


- Common prior: # red balls between 4 and 16 (equal prob)
- Each round: draw two sets of $n \in \{1, 5, 9\}$ balls (with replacement)
- Aligned incentives: Spouses paid equally for one randomly chosen guess (LINK)

Nature of task, complexity, and comprehension

- Why this design? Why in the lab?
  - Can create common prior + aligned incentives $\Rightarrow$ no strategic motives
  - Can precisely vary each person's info + calculate risk-neutral Bayesian's guesses (LINK)
- Broad design considerations for designing the task:
  - Simple enough to be well understood by sample with relatively low education
  - Yet sufficient complexity to allow some 'wiggle room'
  - Clear prediction for information-pooling: treat own and spouse's info equally

Each couple plays five rounds, in randomized order



INDIVIDUAL ROUND

DISCUSSION ROUND

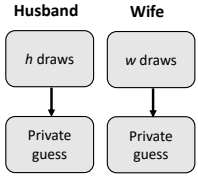
DRAW-SHARING ROUND

INDIVIDUAL ROUND

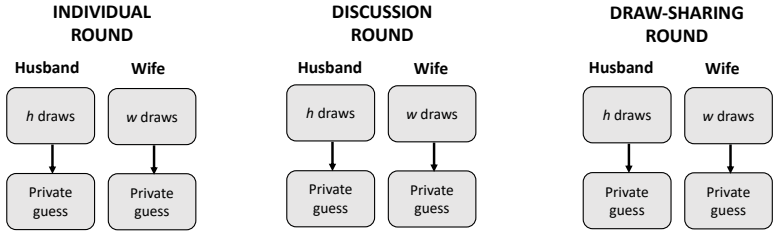
DISCUSSION ROUND

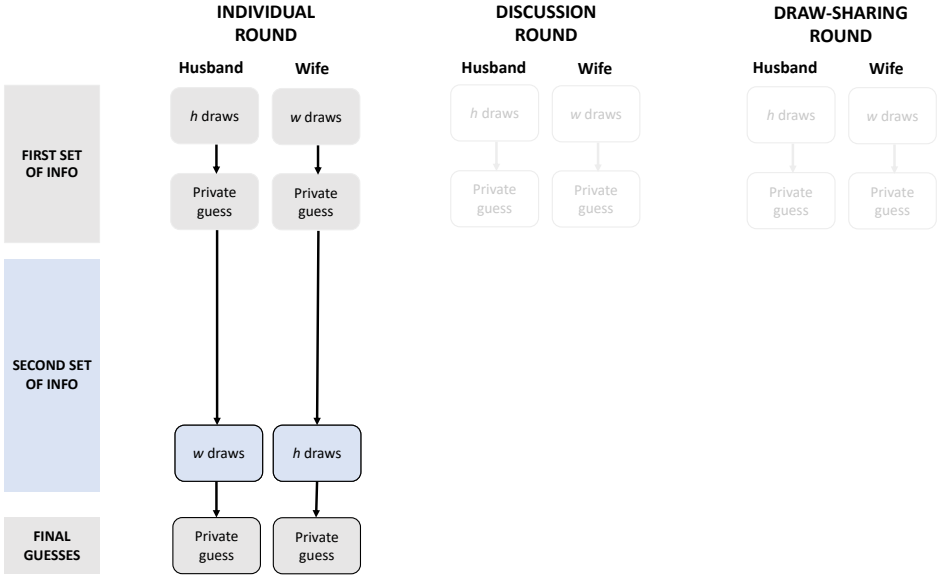
DRAW-SHARING ROUND

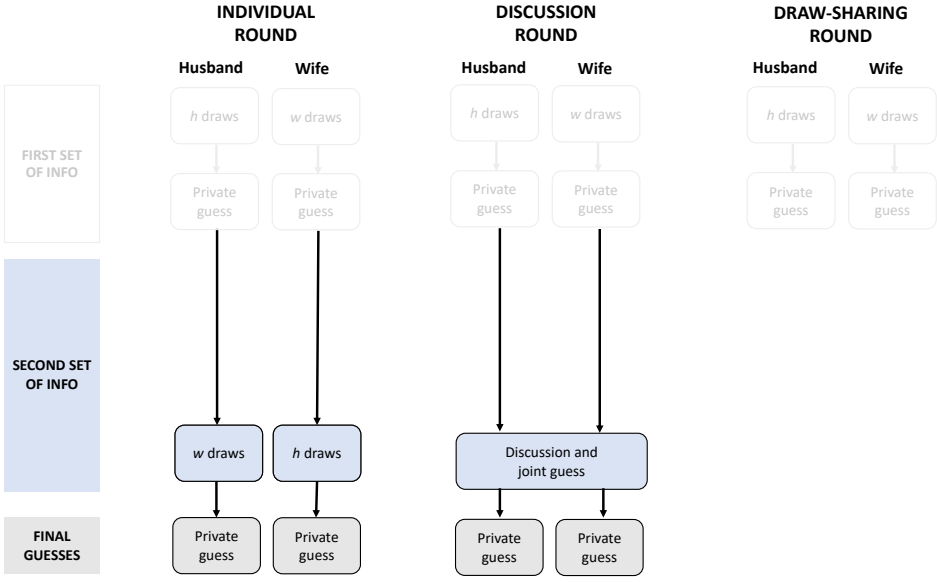
FIRST SET OF INFO

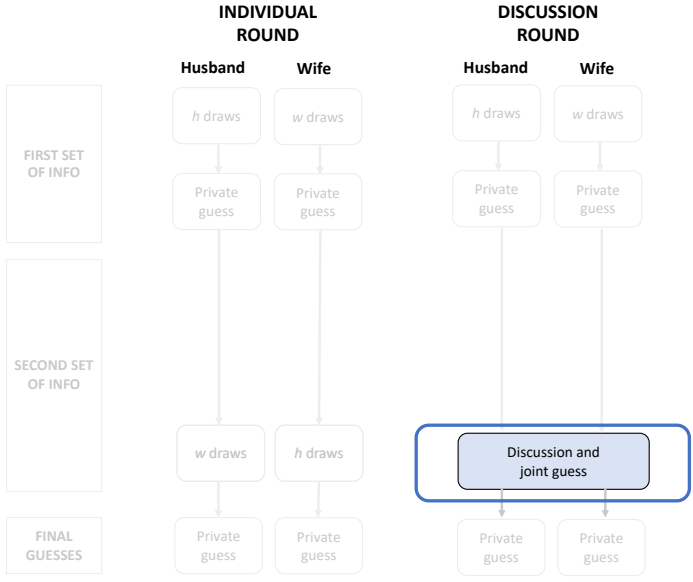


FIRST SET OF INFO




INDIVIDUAL ROUND
DISCUSSION ROUND
DRAW-SHARING ROUND
Husband
Wife
Husband
Wife
Husband
Wife
FIRST SET OF INFO
SECOND SET OF INFO
FINAL GUESSES
h draws
w draws
Private guess
Private guess
w draws
h draws
Private guess
Private guess
h draws
w draws
Private guess
Private guess
h draws
w draws
Private guess
Private guess


INDIVIDUAL ROUND
DISCUSSION ROUND
DRAW-SHARING ROUND
Husband
Wife
Husband
Wife
Husband
Wife
FIRST SET OF INFO
SECOND SET OF INFO
FINAL GUESSES
h draws
w draws
Private guess
Private guess
w draws
h draws
Discussion and joint guess
Private guess
Private guess



Unstructured, as much time as they want (usually ≈1-2 mins)

Asked to make joint guess

Husband can learn wife's *w* draws; wife can learn husband's *h* draws

INDIVIDUAL ROUND

DISCUSSION ROUND

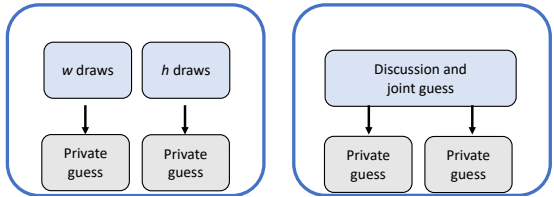
FIRST SET OF INFO

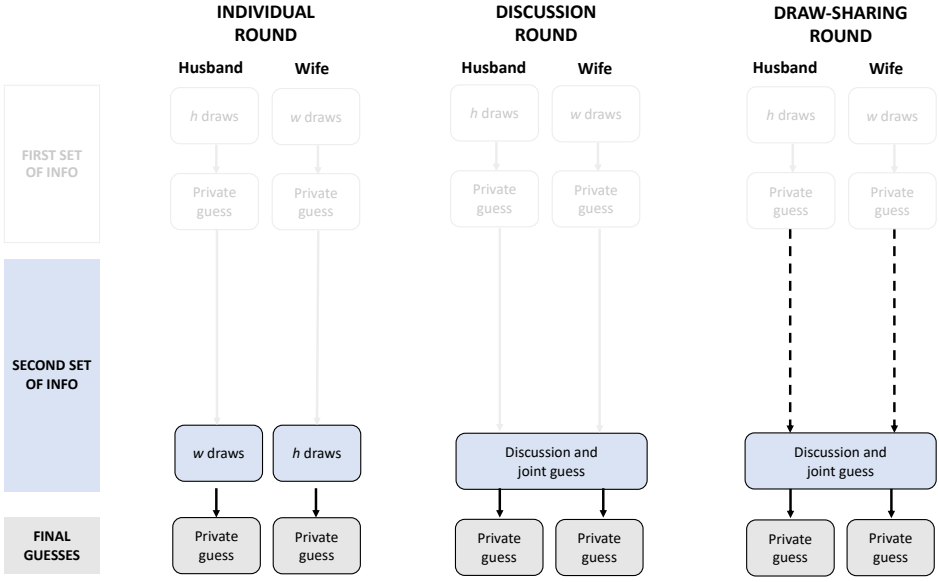
Individual vs. Discussion rounds:

Is info uncovered yourself weighted differently than info *potentially* learned via a discussion with your spouse?

SECOND SET OF INFO

FINAL GUESSES




INDIVIDUAL ROUND
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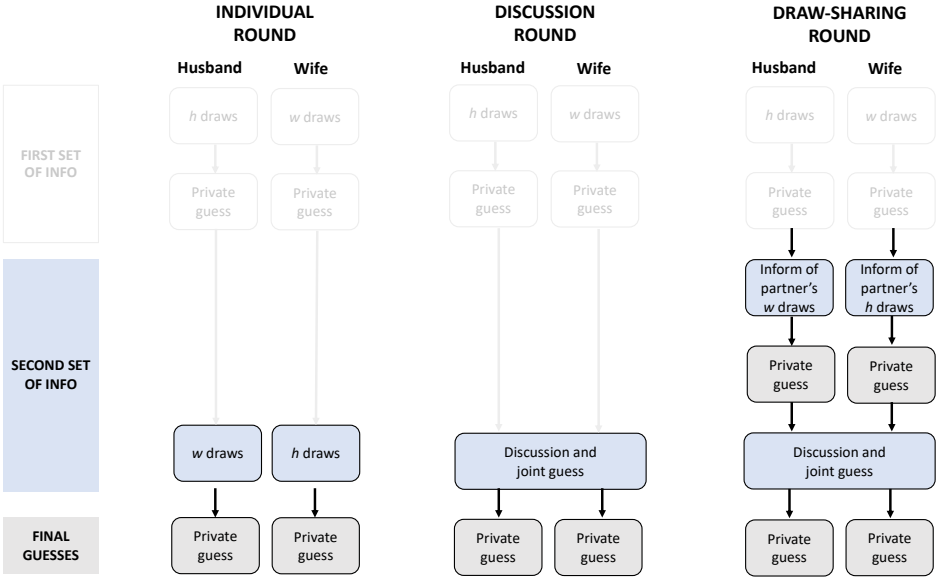
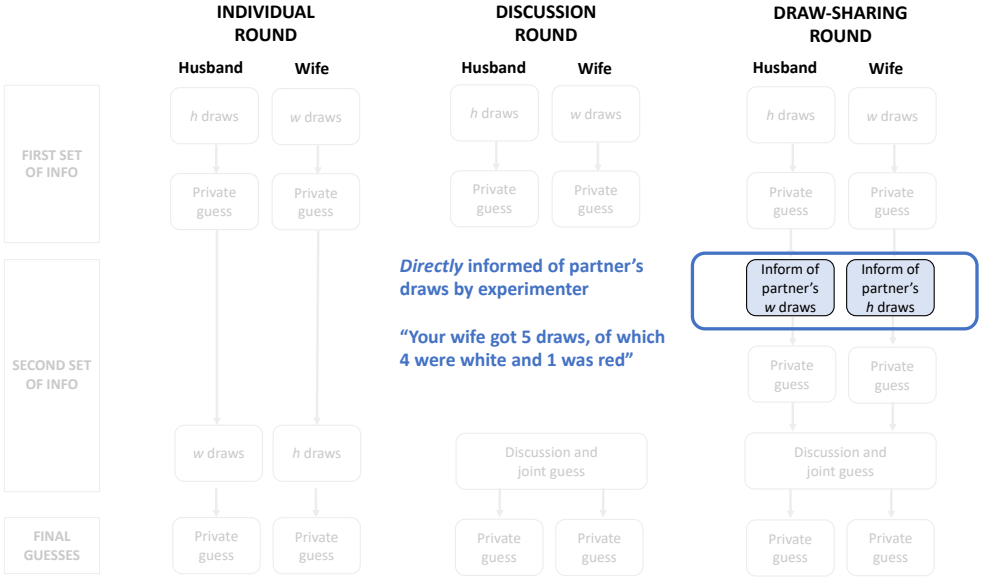
Husband
Wife
FIRST SET OF INFO
SECOND SET OF INFO
FINAL GUESSES
h draws
w draws
Private guess
w draws
h draws
Discussion and joint guess


INDIVIDUAL ROUND
DISCUSSION ROUND
DRAW-SHARING ROUND
Husband
Wife
FIRST SET OF INFO
SECOND SET OF INFO
FINAL GUESSES
h draws
w draws
Private guess
Inform of partner's w draws
Inform of partner's h draws
Discussion and joint guess


INDIVIDUAL ROUND
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Husband
Wife
Husband
Wife
Husband
Wife
FIRST SET OF INFO
SECOND SET OF INFO
FINAL GUESSES
h draws
w draws
Private guess
w draws
h draws
Discussion and joint guess
Inform of partner's w draws
Inform of partner's h draws
Directly informed of partner's draws by experimenter
"Your wife got 5 draws, of which 4 were white and 1 was red"

INDIVIDUAL ROUND

DRAW-SHARING ROUND

FIRST SET OF INFO

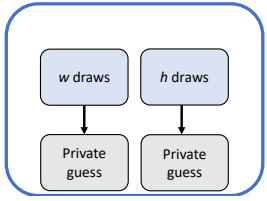
SECOND SET OF INFO

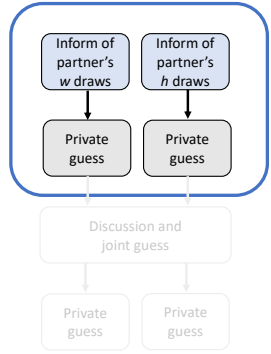
FINAL GUESSES

Individual vs. Draw-Sharing rounds:

Is info uncovered yourself weighted differently than info uncovered by your spouse but *perfectly* shared with you?

Note: no joint deliberation, no communication frictions

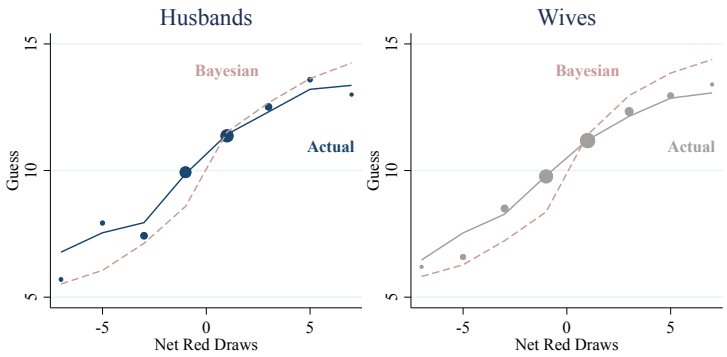




Three empirical approaches lead to very similar conclusions

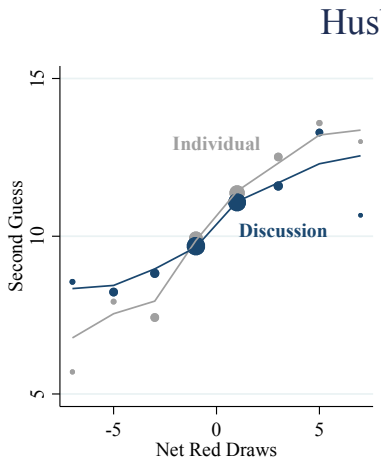
- **Non-parametric**: Plot average guesses as function of signals
  - By source of information (own draws vs. spouse's draws)
- **Reduced-form**: Linear regressions of guesses on signals
  - By source of information
- **Structural**: Quasi-Bayesian updating (not today) (LINK)
  - Weights on signals allowed to differ by source of information

Individual round: Men and women perform very similarly

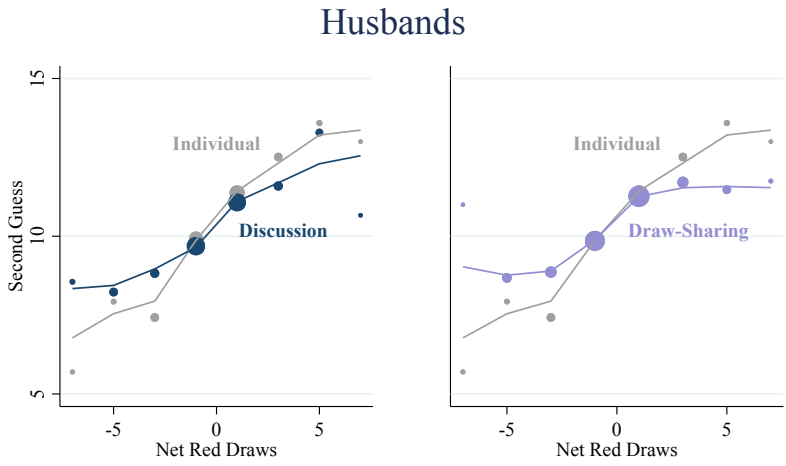


- Guesses as a function of "net red draws", i.e. red minus white draws
- On average, both spouses fairly close to risk-neutral Bayesian
- Men and women also have similar levels of confidence
- Not a 'gendered' task.

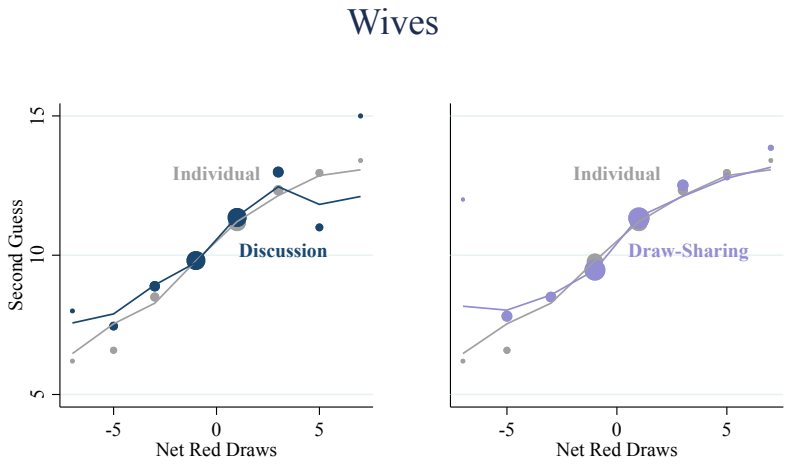
Husbands' guesses less sensitive to wife's signals than to own...



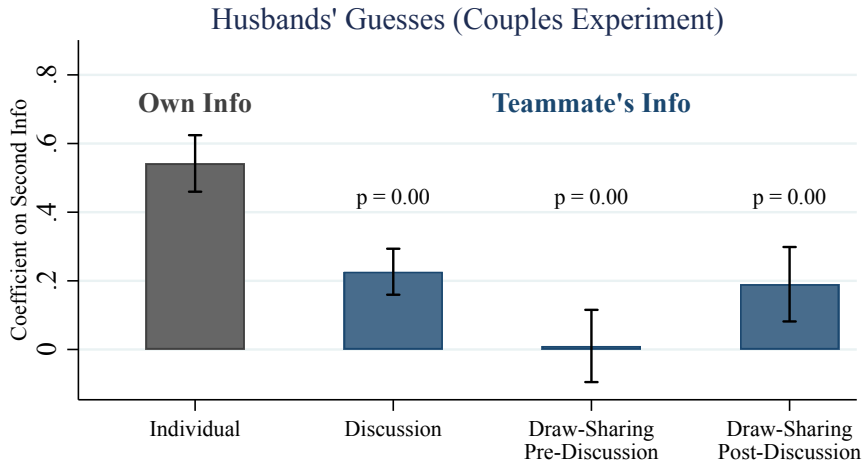
...even when this info is directly communicated to them!



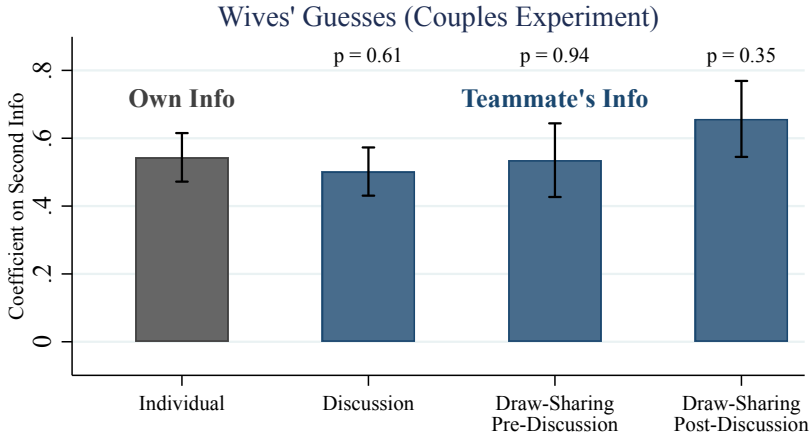
Wives' guesses equally sensitive to own and husband's signals



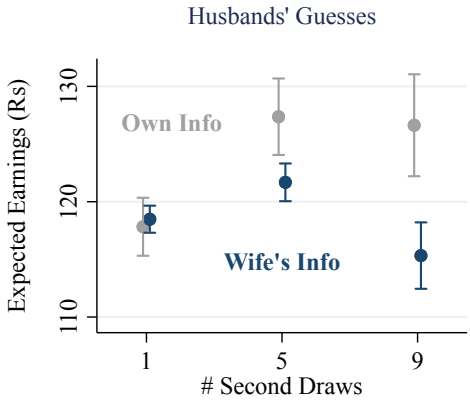
Reduced-form approach: Husbands heavily discount wife's info

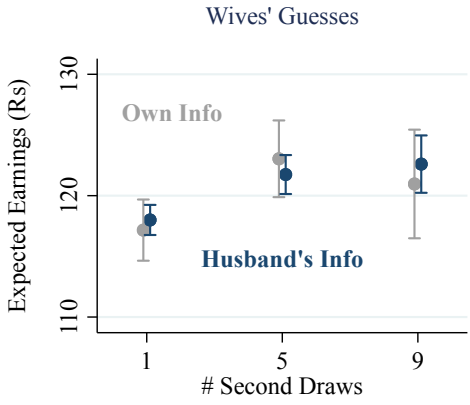


Wives treat own and husband's info the same



Discounting of wives' information is costly when she is well-informed





Are these gender differences specific to married couples?

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Daily earnings | Works	571.41	279.72	577.38	281.64
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- Second experiment with 500 strangers, randomly assigned to mixed- and same-gender teams of two
- Similar recruitment procedures, similar demographics (but also include unmarried people)

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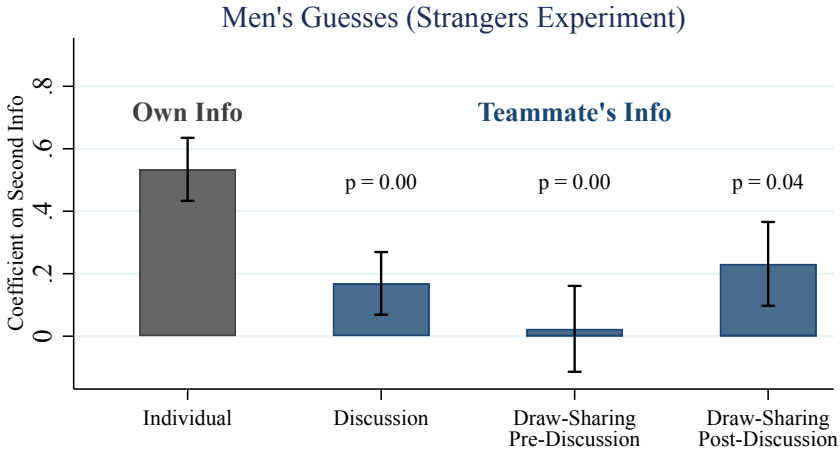
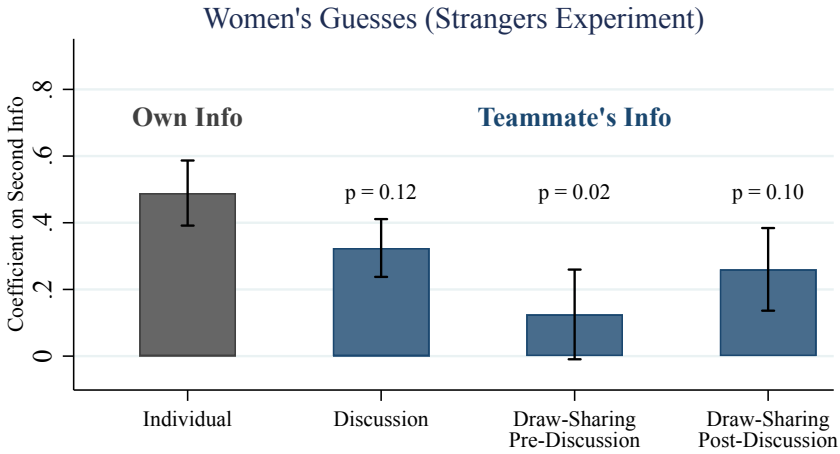
Men behave quite similarly with strangers as with their wives



But now women also put lower weights on strangers' information!



Summary of findings

- Husbands discount information collected by their wives at cost of lower expected earnings, especially when wife is well-informed (9% lower earnings).
- In contrast, wives treat their own and their husband's information the same.
- Men and women *both* discount information from teammates who are strangers, both in mixed- and same-gender teams (LINK)
- All the above results hold even when information is perfectly communicated
- *Not* explained by observables such as ability, beliefs, demographics, marital status (LINK)

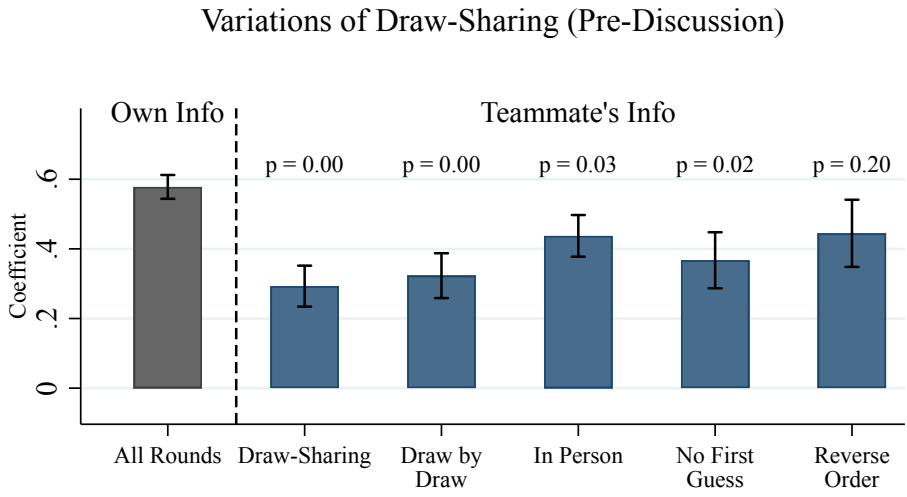
Ruling out confounds

- **Confusion and errors in probabilistic reasoning**
  - Don't require people to be Bayesian. Simple test if treat info *similarly* across treatments
  - Comprehension scores are excellent (and no heterogeneity in effect by comprehension)
- **Order effects**
  - Always compare weights on second info. Order of own and spouse's info thus held fixed
  - Recency effects, base-rate neglect therefore cannot explain our results
- **Punishment by spouse**
  - Wives might worry about repercussions from their husband for not using information
  - But post-discussion guesses are *not* revealed (even if selected for payment)
- **Competitiveness**
  - Aligned monetary incentives
  - Competitive person might conceal info but should themselves *use* all available info
- Differences in **ability, confidence, or risk aversion**
- **Mistrust** of the experimenter and/or **signaling** to the experimenter

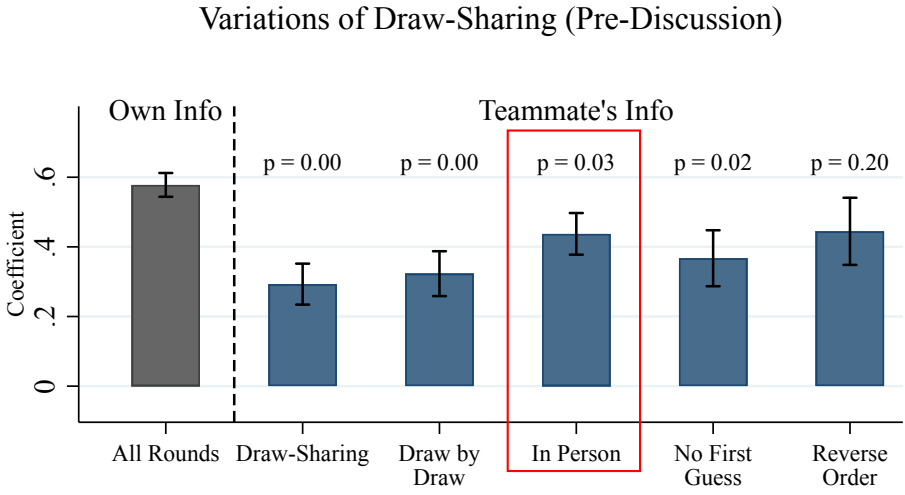
Exploring the limits of these effects

- Third experiment (with strangers): variants of draw-sharing rounds
- None of the following eliminate underweighting of others' info:
  (1) In person: Participant is in the same booth while their teammate draws their signals
  (2) No first guess: Do not elicit first guess after seeing own private draws
  (3) Reverse order: Learn partner's info before receiving own draws
  (4) Stakes: Randomizing 50% higher stakes has no effect
- Caveat: Limited power as this experiment stopped well short of target sample size (146 out of 400 pairs) due to pandemic-induced shutdown

Discounting of others' info persists...



...even when people can see their teammate's draws with their own eyes!



Discussion (I): general propensity to underweight others' information

- Possible interpretations
  (1) Ownership: 'Own' information considered innately more accurate and worthy of attention, as in egocentric bias (Ross et al., 1977) or ownership effects (e.g. Kahneman et al., 1991; Hartzmark et al., 2021)
  (2) Vividness: Info from personal experience may be more vivid than info conveyed by others (e.g. Malmendier and Nagel, 2011)
  (3) Heuristics: Misapplication of otherwise-reasonable heuristic if own info is usually *much* more precise.

- Implications:
  - Could be a powerful barrier to social learning
  - Happens even when underlying info can be perfectly shared (unlike Weizsäcker 2010)
  - People may not learn much from others' experiences and knowledge
  - Cannot expect information to be efficiently aggregated within teams

Discussion (II): wives place equal weight on their husband's info

- Why?
  - Not explained by observables such as competence, beliefs, or marital status
  - Not explained by gender differences per se: men and women treat strangers similarly.
  - Marital context *itself* appears to generate differences in behavior
  - e.g. role of internalized norms and experience effects

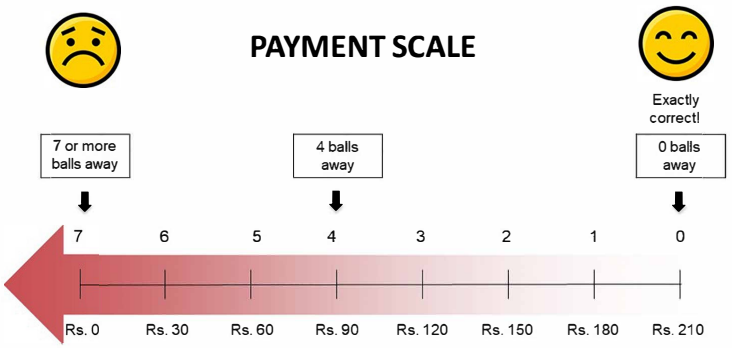
- Implications (if results are more generally true):
  - Women might make better decisions than their husbands when information pooling in the household is required.
  - Policymakers cannot expect that informing one spouse will inform the other.
  - Expect lower pass-through of info from wives to husbands than vice versa, at least in similar cultural contexts

Shortcomings and open questions

- Need for more systematic measurement of economically-important beliefs of different household members
- Studying info-pooling in household in natural field settings and with higher stakes
- Is learning in the household different in gender-stereotyped domains, as in Coffman et al. (2021a,b)?
- Settings where even 'own' info is learned from others rather than discovered through personal experience, e.g. "I heard X and you heard Y"

Thank you!

Aligned incentives: Spouses paid equally for one randomly chosen guess



- Incentives aligned across spouses
- Can calculate risk-neutral Bayesian guess

⇒ Back

Why do couples and strangers behave differently?

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Own Net Red	0.49***	0.52***	0.48***	0.52***	0.55***	0.50***	0.32***	0.50***
	(0.04)	(0.05)	(0.04)	(0.04)	(0.07)	(0.06)	(0.07)	(0.09)
Teammate's Net Red	0.24***	0.20***	0.25***	0.20***	0.13	0.26***	0.10	-0.05
	(0.04)	(0.05)	(0.04)	(0.05)	(0.07)	(0.06)	(0.08)	(0.10)
Teammate's Net Red X Guesser Is Husband In Couple	0.07	0.04	0.09	0.07	0.12*	0.09	0.07	0.10
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)
Teammate's Net Red X Guesser Is Woman	0.09	0.09	0.11	0.08	0.09	0.10	0.10	0.10
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Teammate's Net Red X Guesser Is Wife In Couple	0.14*	0.17**	0.14**	0.14**	0.16**	0.14*	0.13*	0.20***
	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)	(0.06)
Teammate's Net Red X Guesser Is Older		0.08						0.09
		(0.05)						(0.05)
Teammate's Net Red X Guesser Thinks Sole HHDM			-0.08					-0.06
			(0.04)					(0.04)
Teammate's Net Red X Teammate Better				0.07				0.06
				(0.04)				(0.04)
Teammate's Net Red X Guesser Thinks Teammate Better					0.10			0.10
					(0.06)			(0.06)
Teammate's Net Red X Guesser Is Married						-0.04		-0.03
						(0.06)		(0.07)
Teammate's Net Red X Guesser Comprehension index							0.14*	0.15*
							(0.06)	(0.06)
Constant	10.67***	10.67***	10.67***	10.66***	10.66***	10.67***	10.66***	10.66***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
N	5200	5200	5200	5200	5200	5200	5200	5200

- Not explained away by observables such as relative age, ability, confidence
- Being married vs. single *per se* does not significantly explain behavior
- But married women behave differently *when paired with their spouse*

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Comparing couples and strangers

	All rounds (Pre- & Post-Disc.)	
	(1)	(2)
Own Net Red	0.53***	0.49***
	(0.03)	(0.04)
Teammate's Net Red	0.28***	0.24***
	(0.03)	(0.04)
Teammate's Net Red X Guesser Is Husband In Couple		0.07
		(0.06)
Teammate's Net Red X Guesser Is Woman	0.13***	0.09
	(0.04)	(0.06)
Teammate's Net Red X Guesser Is Wife In Couple		0.14*
		(0.05)
Constant	10.67***	10.67***
	(0.06)	(0.06)
N	5200	5200

- Pooling couples and strangers
- On average, less discounting of others' info for women (col 1).
- But this difference is primarily driven by wives paired with their spouses (col 2).
- Not explained by observables such as competence, beliefs, marital status, etc.

Mixed-gender vs. same-gender teams

	Pooled (1)	Men (2)	Women (3)
β_1: First Info	0.51***	0.51***	0.49***
	(0.05)	(0.07)	(0.07)
β_2: Second Info	0.51***	0.53***	0.48***
	(0.06)	(0.10)	(0.10)
$\beta_{3,1}$: Second Info X Discussion	-0.29***	-0.39***	-0.19
	(0.08)	(0.13)	(0.12)
$\beta_{3,2}$: Second Info X Discussion X Same-Gender Pair	0.06	0.06	0.06
	(0.07)	(0.10)	(0.11)
α: Constant	10.71***	10.73***	10.69***
	(0.13)	(0.19)	(0.19)
Observations	1500	750	750
Includes Info X Order FEs	Yes	Yes	Yes

- For Discussion round only, can compare same-gender and mixed-gender pairs of strangers
- No significant differences depending on same vs mixed-gender team, for either men or women (but somewhat limited power)

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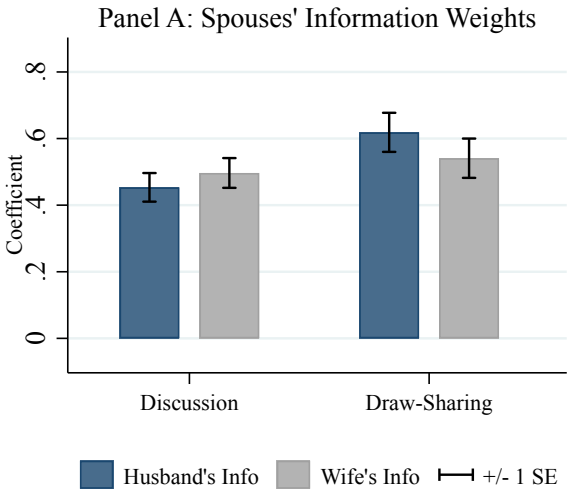
No significant differences in weights on spouses' info in joint decisions



- Both spouses' info weighted similarly in joint decision
- Husbands don't seem personally convinced by their wife's info (since deviate in subsequent private guesses)
- Joint guesses earn more than husbands guessing privately, especially when wives hold a lot of info

Joint guesses earn more money than private guesses

	Joint Guess Compared to Private Guesses Made by:					
	Pooled	Husbands	Wives	Pooled	Husbands	Wives
	(1)	(2)	(3)	(4)	(5)	(6)
Private Guess	-2.17***	-2.70***	-1.72*	1.77	2.97	0.63
	(0.70)	(0.91)	(0.90)	(1.48)	(1.84)	(2.00)
# Husband's Draws				2.34***	2.49***	2.19***
				(0.42)	(0.44)	(0.44)
# Wife's Draws				2.76***	2.80***	2.65***
				(0.41)	(0.45)	(0.43)
Private Guess X # Husband's Draws				-0.27	-0.11	-0.45
				(0.25)	(0.30)	(0.34)
Private Guess X # Wife's Draws				-0.81***	-1.46***	-0.17
				(0.26)	(0.34)	(0.34)
Constant	121.32***	121.44***	120.74***	102.26***	101.69***	102.55***
	(2.32)	(2.55)	(2.55)	(3.42)	(3.73)	(3.70)
Observations	4400	2800	2800	4400	2800	2800

- Outcome of interest: expected earnings
- Compare private to joint guesses in Draw-sharing and Discussion rounds.
- Joint guesses earn significantly more money.

Calculating the risk-neutral Bayesian Guess

- Prior (told to participants beforehand) is that number of red balls R in urn is drawn uniformly from $\{4, 5, ..., 16\}$. So, $Prior(R = r) = \frac{1}{13}$
- Given signal s, can calculate

$$Posterior(R = r|s) = \frac{P(s|r)Prior(R = r)}{\sum_{r'=4}^{16} P(s|r')Prior(R = r')}$$

- Then can calculate expected payoff $EP(g|s)$ of guess g given incentive scheme:

$$EP(g|s) = \sum_{r=4}^{16} Posterior(R = r|s)\Big(\max\{0, 210 - 30 * |g - r|\}\Big)$$

- Bayesian risk-neutral optimal guess g^* is then

$$g^* = \underset{g}{\text{argmax}} \;\; EP(g|s)$$

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Quasi-Bayesian updating

- Recall that there are 13 possible states corresponding to the number of red balls in the urn: $s \in \{4, 5, ..., 16\}$, with a uniform prior
- Agents update about the likelihood of state s after observing two sets of draws from the urn, d_1 and d_2, which are sequences of 1, 5, or 9 red-or-white signals.
- Do agents put more "weight" on d_2 if they made the draws themselves? To model this, suppose agents' posterior takes the following form:

$$Posterior(s|d_1, d_2) \propto P(d_1|s)^{\omega_1} P(d_2|s)^{\omega_2} Prior(s)$$

- Thus, ω_1 and ω_2 are the weights she puts on the first and second sets of draws, respectively. For a Bayesian, $\omega_1 = \omega_2$. We'll ask how ω_2 depends on who gathered the information.

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Weight on first set of signals is simple: just order effects

- First, we allow for "order effects:" recall that there were five rounds, and we want to allow for agents to improve over time (in practice, we find no evidence of this)
- The guesser herself always gathers the first set of draws, so these order effects are the only thing we need to consider for ω_1:

$$\omega_1 = \alpha_1 + \sum_{r=2}^{5} \mu_{1,r} * \mathbb{1}(\text{Round Order is } r)$$

- For a Bayesian w/o communication frictions, $\alpha_1 = 1$ and $\mu_{1,r} = 0$.

$\Rightarrow$ Back

Weight on second set of signals depends on who gathered it

- For the second set of draws d_2, weight also depends on whether guesser drew them herself or by her spouse:

$$\begin{aligned}\omega_2 = \alpha_2 + \sum_{r=2}^{5} \mu_{2,r} * \mathbb{1}(\text{Round Order is } r) \\ + \beta_1 * \mathbb{1}(\text{Only Accessible via Discussion}) \\ + \beta_2 * \mathbb{1}(\text{Only Informed by Experimenter}) \\ + \beta_3 * \mathbb{1}(\text{Informed by Experimenter and Discussion})\end{aligned}$$

- For a Bayesian w/o communication frictions, $\alpha_2 = 1$, $\mu_{1,r} = 0$, and all βs are zero.

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Finally, noisy choice

- Given the agents' posteriors, we can use the experimental incentives to calculate the implied expected payoff of making guess g given signals d_1 and d_2:

$$EP(g|d_1,d_2) = \sum_{s=4}^{16} Posterior(s|d_1,d_2)\Big(\max\{0, 210 - 30 * |g-s|\}\Big)$$

- We assume the agent sometimes makes mistakes: she perceives the expected payoff to be $EP(g|d_1,d_2) + \gamma\epsilon_g$, where ϵ_g are iid Type 1 extreme value.
- This yields a simple functional form for the likelihood the agent chooses guess g:

$$P(g|d_1,d_2) = \frac{\exp\{EP(g|d_1,d_2)\}}{\sum_{g'=4}^{16}\exp\{EP(g'|d_1,d_2)\}}$$

- We can then estimate the model by MLE

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Model estimates

	Pooled (1)	Husbands (2)	Wives (3)
α_1	0.82***	0.82***	0.71***
	(0.15)	(0.16)	(0.25)
α_2	1.37***	1.29***	1.32***
	(0.27)	(0.30)	(0.42)
β_1	-0.73***	-1.00***	-0.33
	(0.21)	(0.24)	(0.36)
β_2	-0.99***	-1.32***	-0.31
	(0.24)	(0.28)	(0.51)
β_3	-0.29	-0.86***	0.44
	(0.27)	(0.34)	(0.53)
γ	2.25***	2.03***	2.38***
	(0.15)	(0.17)	(0.18)

Table shows MLE regressions with bootstrapped standard errors, clustered at the couple level, in parentheses. *, **, and *** indicate significance at the $p < 0.05$, 0.01, and 0.001 levels.

Takeaways:

- When gathering all info themselves, agents put more weight on second set of signals ($\alpha_2 > \alpha_1$)
- For husbands (but *not* wives), less weight on wives info when must be communicated to them through discussion ($\beta_1 < 0$ for husbands but not wives)
- Pattern *more* pronounced when husband is only told of wife's information by experimenter, with no discussion ($\beta_2 < \beta_1$ for husbands)
- When told by experimenter *and* allowed to discuss with wife, somewhat less neglect of wife's info, but still lots of neglect ($0 > \beta_3 > \beta_1$)

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	Pooled (1)	Husbands (2)	Wives (3)
First Info	0.82***	0.82***	0.71***
	(0.17)	(0.18)	(0.27)
Second Info	1.37***	1.29***	1.32***
	(0.27)	(0.31)	(0.41)
Second Info X Only Accessible via Discussion	-0.73***	-1.00***	-0.33
	(0.20)	(0.26)	(0.38)
Second Info X Only Informed by Experiment	-0.99***	-1.32***	-0.31
	(0.24)	(0.31)	(0.55)
Second Info X X Informed by Experiment and Discussion	-0.29	-0.86***	0.44
	(0.27)	(0.36)	(0.56)
Logit Noise Parameter	2.25***	2.03***	2.38***
	(0.15)	(0.17)	(0.19)
p-value: First interaction term equal for husbands and wives		0.07	
p-value: Second interaction term equal for husbands and wives		0.07	
p-value: Third interaction term equal for husbands and wives		0.04	

- Husbands discount wives' information by 78% in discussion rounds (compared to own info).

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- Husbands "discount" wives' info even more when it's directly given to them!
- No such effects for wives

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- Discussion mitigates this but still 67% less weight given to wives' info.
- Significant difference between husbands and wives for all 3 variants

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