Motivated Skepticism - Online Appendix

Jeanne Hagenbach[*] Charlotte Saucet[†]

February 2, 2024

1 Complement to the theory

In this subsection, we consider the Receiver's payoff function $u_R(a;t) = -|a-t|$ and show that, under small modifications, our Propositions 1 and 2 go through. Before, we establish that, with this function, the Receiver's optimal action equals the median of his belief.

Proposition 4 - Optimal action for the Receivers
Let the Receiver's payoff be $u_R(a,t) = -|a-t|$ and his beliefs be that t is distributed according to the cdf $F(\cdot)$. The action that maximizes the Receiver's expected payoff is a median of F.

Proof. t is a real-valued random variable. First remark that, for any $a \in \mathbb{R}$, we have the following relation:

$$|a-t| = \int_{-\infty}^{a} \mathbb{1}\{t \leq x\}dx + \int_{a}^{+\infty} \mathbb{1}\{t \geq x\}dx$$

$F(x) = P(t \leq x)$ is a non decreasing function and is therefore differentiable almost everywhere. Moreover, remark that:

$$E\big[|a-t|\big] = \int_{-\infty}^{a} \underbrace{P(t \leq x)}_{F(x)} dx + \int_{a}^{+\infty} \underbrace{P(t \geq x)}_{1-F(x)} dx$$

Therefore, the function $u_R(a) = -E\big[|a-t|\big]$ is also differentiable almost everywhere and $u'_R(a) = 1 - 2F(a)$ wherever it exists. Finally, remark that the function u is concave: for every $a \in \mathbb{R}$, $u''_R(a) = -2F'(a) \leq 0$. Therefore, the Receiver's optimal action a^* is determined by the FOC, $F(a^*) = \frac{1}{2}$, which implies that a^* is a median of F.

Considering this payoff function for the Receiver, we can apply Hagenbach et al. (2014) directly to first show that there always exists a fully-revealing equilibrium in the *High* and *Low* games. Indeed, whatever the true type, the Sender's payoff is monotonic in the type the Receiver believes. It follows that we can construct an equilibrium in which every type

[*]CNRS, Sciences Po, CEPR, WZB - jeanne.hagenbach@sciencespo.fr
[†]University of Paris 1 - charlotte.saucet@univ-paris1.fr

fully discloses and, after every vague message, the Receiver believes with probability one the lowest type disclosed in *High* games and the highest type disclosed in *Low* games. Next, to show that *every* equilibrium is fully-revealing, we need to show that two Sender's types never pool in equilibrium. To show that, we need that, when a message is vague, the Receiver's action is always, with some probability at least, strictly between the highest and lowest type disclosed. It is true if we modify the game slightly and assume (as in Subsection 2.4) that, when a type t is disclosed, there is always a positive probability that the Receiver takes action $a = t$.

Next, let's consider a psychological Receiver with payoff $\tilde{u}_R(a; t, \beta) = -|a - t| - \alpha E_\beta(t)$ to recover Proposition 2. Making the same assumptions as in Subsection 2.3, the Receiver chooses the beliefs that maximize $-|\text{med}_{\beta_m}(t) - t_{skep}(m)| - \alpha E_{\beta_m}(t)$. In *High* games, the Receiver maximizes this objective by keeping the skeptical beliefs, that is, by assigning probability one to $t_{skep} = t_{inf}$. In *Low* games, the Receiver does not keep the skeptical beliefs: by assigning some small probability to any other type than t_{sup}, he can increase his psychological utility without affecting his material utility.

2 Sender's communication strategy per treatment

Table 2.1: Sender's communication strategy in *High* treatments

Treatment *High_Neutral*

	Message															
Type	{1}	{2}	{3}	{4}	{5}	{1,2}	{2,3}	{3,4}	{4,5}	{1,2,3}	{2,3,4}	{3,4,5}	{1,2,3,4}	{2,3,4,5}	{1,2,3,4,5}	Total
1	4.88	-	-	-	-	1.63	-	-	-	9.76	-	-	16.26	-	**67.48**	100
2	-	3.42	-	-	-	-	4.27	-	-	0.85	16.24	-	3.42	**53.85**	17.95	100
3	-	-	7.87	-	-	-	2.25	15.73	-	-	-	**61.80**	2.25	4.49	5.62	100
4	-	-	-	15.79	-	-	-	-	**81.05**	-	-	2.11	1.05	-	-	100
5	-	-	-	-	**87.93**	-	-	-	5.17	-	-	2.59	-	2.59	1.72	100
Total	1.11	0.74	1.30	2.78	18.89	0.37	1.30	2.59	15.37	2.41	3.52	11.11	5.00	12.96	20.56	100

Treatment *High_Loaded*

	Message															
Type	{1}	{2}	{3}	{4}	{5}	{1,2}	{2,3}	{3,4}	{4,5}	{1,2,3}	{2,3,4}	{3,4,5}	{1,2,3,4}	{2,3,4,5}	{1,2,3,4,5}	Total
1	5.66	-	-	-	-	3.77	-	-	-	8.49	-	-	14.15	-	**67.92**	100
2	-	8.93	-	-	-	-	3.57	-	-	0.89	19.64	-	0.89	**55.36**	10.71	100
3	-	-	6.25	-	-	-	0.89	8.93	-	0.89	8.93	**67.86**	0.89	0.89	4.46	100
4	-	-	-	17.95	-	-	-	2.56	**62.82**	-	2.56	10.26	1.28	-	2.56	100
5	-	-	-	-	**73.61**	-	-	-	15.28	-	-	6.94	-	1.39	2.78	100
Total	1.25	2.08	1.46	2.92	11.04	0.83	1.04	2.50	12.50	2.29	7.08	18.54	3.75	13.33	19.38	100

Note: The Table reports the frequency with which each message is sent conditionally on the Sender observing each type t, in the *High* treatments. Numbers in red highlight the most frequently sent message for each type. For instance, Senders of type $t = 5$ in the *High_ Neutral* treatment send the precise message $m = \{5\}$ 87.93% of the time. It is 73.61% in *High_ Loaded*.

Table 2.2: Sender's communication strategy in *Low* treatments

Treatment *Low_Neutral*

	Message															
Type	{1}	{2}	{3}	{4}	{5}	{1,2}	{2,3}	{3,4}	{4,5}	{1,2,3}	{2,3,4}	{3,4,5}	{1,2,3,4}	{2,3,4,5}	{1,2,3,4,5}	Total
1	**76.60**	-	-	-	-	12.77	-	-	-	4.26	-	-	1.06	-	5.32	100
2	-	1.28	-	-	-	**71.79**	1.28	-	-	10.26	-	-	2.56	7.69	5.13	100
3	-	-	2.56	-	-	-	7.69	-	-	**76.92**	5.13	1.28	5.13	1.28	-	100
4	-	-	-	0.74	-	-	-	1.47	-	-	11.76	2.21	**71.32**	1.47	11.03	100
5	-	-	-	-	0.88	-	-	-	1.75	-	-	5.26	-	11.40	**80.70**	100
Total	14.40	0.20	0.40	0.20	0.20	13.60	1.40	0.40	0.40	14.40	4.00	2.00	20.80	4.40	23.20	100

Treatment *Low_Loaded*

	Message															
Type	{1}	{2}	{3}	{4}	{5}	{1,2}	{2,3}	{3,4}	{4,5}	{1,2,3}	{2,3,4}	{3,4,5}	{1,2,3,4}	{2,3,4,5}	{1,2,3,4,5}	Total
1	**69.31**	-	-	-	-	8.91	-	-	-	7.92	-	-	5.94	-	7.92	100
2	-	12.09	-	-	-	**70.33**	2.20	-	-	5.49	1.10	-	2.20	3.30	3.30	100
3	-	-	2.91	-	-	-	3.88	1.94	-	**74.76**	1.94	2.91	0.97	5.83	4.85	100
4	-	-	-	1.83	-	-	-	5.50	0.92	-	20.18	0.92	**51.38**	9.17	10.09	100
5	-	-	-	-	-	-	-	-	6.58	-	-	7.89	-	19.74	**65.79**	100
Total	14.58	2.29	0.62	0.42	0.00	15.21	1.25	1.67	1.25	18.75	5.21	2.08	13.54	7.08	16.04	100

Note: The Table reports the frequency with which each message is sent conditionally on the Sender observing each type t, in the *Low* treatments. Numbers in red highlight the most frequently sent message for each type. For instance, Senders of type $t = 1$ in the *Low_ Neutral* treatment send the precise message $m = \{1\}$ 76.60% of the time. It is 69.31% in *Low_ Loaded*.

3 Complementary experimental treatments

We have run two additional experimental treatments - *Low_ Loaded_ FixedPayIQ* and *Low_ Neutral_ ModifiedPriors* - with the objective to complement the findings of our four main treatments. We now describe them in detail.

3.1 Fixed payment for the IQ test

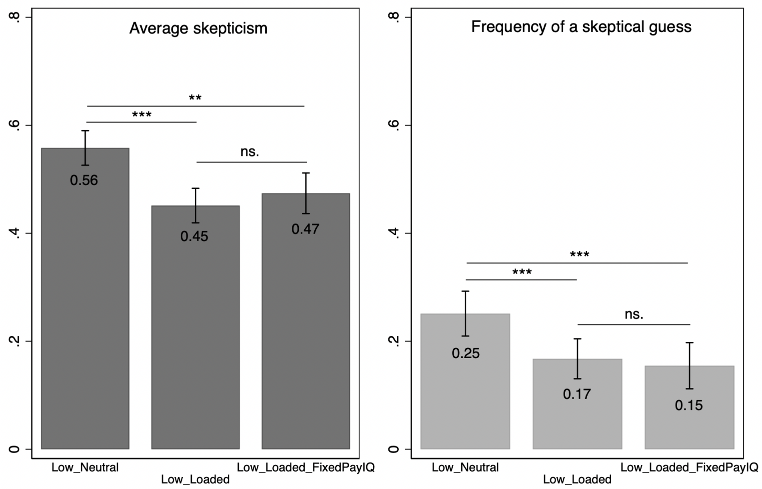
The *Low_ Loaded_ FixedPayIQ* treatment is exactly the same as the *Low_ Loaded* except for the fact that the payment for the IQ test that players do in Part 1 is fixed and not dependent anymore on individuals' performance. The objective of this treatment was to rule out the possibility that Receivers could lack skepticism in *Low_ Loaded* because they like to believe they will get a high payment for Part 1, and not because the type is ego-relevant.

In the Instructions, we say: *You will earn a fixed payment of 5 euros for having completed the Raven-IQ test.* Since performance is not incentivized anymore, we add: *It is important for our study that you do your best in the test.*

The implementation of the treatment was exactly the same as the one described in Subsection 3.4. A total of 74 subjects participated in this treatment. We kept the data of 30 Receiver-subjects who could play the 10 Sender-Receiver games without any computer bug, so we collected data for 300 games. Sessions took around one hour and subjects earned on average 19.51 euros (s.d.=1.25).

Figure 3.1 and Table 3.1 compare the average level of skepticism and the frequency of a skeptical guess in the *Low_ Neutral*, *Low_ Loaded* and *Low_ Loaded_ FixedIQ* treatments.

As it appears, there is no significant differences in skepticism between the *Low_ Loaded* and *Low_ Loaded_ FixedIQ* treatments ($p = 0.868$ and $p = 0.658$).



Note: The left part of the Figure displays the average level of skepticism. The right part of the Figure displays the average frequency of a skeptical guess. Black segments are 95% confidence intervals. P-values are from random-effects linear regressions on panel data with the Receivers' id as the group variable and the rounds as the time variable. Standard errors are clustered at the session level using bootstrapping. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

Figure 3.1: Receivers' average skepticism with fixed payment for the IQ test

Table 3.1: Skepticism with fixed payment for the IQ test

	Skepticism			Freq. of a skeptical guess		
	(1)	(2)	(3)	(4)	(5)	(6)
Low_ Loaded_ FixedPayIQ	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
	-	-	-	-	-	-
Low_ Neutral	0.102**	0.100**	0.185***	0.138***	0.137***	0.181***
	(0.043)	(0.044)	(0.044)	(0.044)	(0.043)	(0.057)
Low_ Loaded	-0.006	-0.020	0.030	0.020	0.004	0.021
	(0.038)	(0.039)	(0.049)	(0.049)	(0.044)	(0.065)
IQ performance		0.015***	0.014**		0.018***	0.014**
		(0.005)	(0.007)		(0.005)	(0.006)
Mess. size				-0.091***	-0.091***	-0.091***
				(0.012)	(0.011)	(0.011)
Rounds dummies		✓	✓		✓	✓
Demo.			✓			✓
Cons.	0.475***	0.318***	0.011	0.475***	0.255***	-0.034
	(0.031)	(0.059)	(0.192)	(0.067)	(0.083)	(0.257)
N	1094	1094	1094	1094	1094	1094

Note: The Table reports random-effects linear regressions on panel data with the Receivers' id as the group variable and the rounds as the time variable. Standard errors (in parentheses) are clustered at the session level using bootstrapping. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

3.2 Neutral treatment with modified priors

The *Low_ Neutral_ ModifiedPriors* treatment is exactly the same as the *Low_ Neutral* except for the fact that we make Receivers more optimistic about their neutral ranks than in the latter treatment. The goal was to mimic the optimism about IQ ranks that subjects have in *Low_ Loaded*.

In the instructions, when we explain subjects how the computer attributed them an integer number they keep for the whole experiment, we write: *The computer has randomly attributed to you a number which is an integer between 0 and 15. There are 80% chances that your number is between 8 and 15 and 20% chances that your number of between 0 and 7.* Later, when we explain subjects how their neutral type is generated in every round, we write: *In each round, the computer will randomly select 4 other integers between 0 and 15. All number between 0 and 15 are equally probable. Together with your own number, the number form a group of 5 integers. The computer program will compare these 5 numbers and generate a rank for the round as follows.*

The implementation was exactly the same as the one described in Subsection 3.4. A total of 76 subjects participated in this treatment. We kept the data of 34 Receiver-subjects who could play the 10 Sender-Receiver games without any computer bug, so we collected data for 340 games. Sessions took around one hour and subjects earned on average 19.60 euros (s.d.=1.80).

Figure 3 in the main text and Table 3.2 below compare the average level of skepticism and the frequency of a skeptical guess in the *Low_ Neutral*, *Low_ Neutral_ ModifiedPriors* and *Low_ Loaded* treatments. As explained in the main text, skepticism stays significantly lower in *Low_ Loaded* than in the two other treatments.

Table 3.2: Skepticism with modified priors

	Skepticism			Freq. of a skeptical guess		
	(1)	(2)	(3)	(4)	(5)	(6)
Low_ Neutral_ Modified Priors	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
	-	-	-	-	-	-
Low_ Neutral	-0.005	-0.006	0.031	-0.007	-0.005	0.026
	(0.046)	(0.045)	(0.0423)	(0.039)	(0.031)	(0.048)
Low_ Loaded	-0.115***	-0.126***	-0.125***	-0.124***	-0.133***	-0.142**
	(0.041)	(0.045)	(0.048)	(0.033)	(0.029)	(0.059)
IQ performance		0.013*	0.013*		0.015*	0.013
		(0.007)	(0.008)		(0.008)	(0.010)
Mess. Size				-0.084***	-0.085***	-0.085***
				(0.012)	(0.011)	(0.013)
Rounds dummies		✓	✓		✓	✓
Demo.			✓			✓
Cons.	0.582***	0.437***	0.111	0.595***	0.413***	0.062
	(0.034)	(0.069)	(0.212)	(0.042)	(0.084)	(0.313)
N	996	996	996	996	996	996

Note: The Table reports random-effects linear regressions on panel data with the Receivers' id as the group variable and the rounds as the time variable. Standard errors (in parentheses) are clustered at the session level using bootstrapping. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4 Regressions including inconsistent individuals

In this Section we present the regressions of Tables 4 and C.1 for the data set that includes the 16 individuals that made more inconsistent than consistent guesses.

Table 4.1: Determinants of skepticism, including inconsistent players

Dep. Var.	Skepticism								
	High treatments			*Low* treatments			*Difference-in-difference*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1 if *Loaded*	0.046	0.018	0.016	-0.118***	-0.136***	-0.165***	0.046	0.020	0.017
	(0.050)	(0.044)	(0.048)	(0.037)	(0.039)	(0.054)	(0.047)	(0.046)	(0.049)
1 if *Low*							-0.055	-0.059*	-0.044
							(0.038)	(0.032)	(0.037)
1 if *Low_ Loaded*							-0.165***	-0.158***	-0.166***
							(0.062)	(0.059)	(0.063)
IQ performance		0.026***	0.026***		0.022***	0.020**		0.024***	0.0224***
		(0.004)	(0.007)		(0.007)	(0.008)		(0.004)	(0.005)
Rounds dummies		✓	✓		✓	✓		✓	✓
Demo.			✓			✓			✓
Cons.	0.642***	0.348***	0.458***	0.586***	0.365***	0.124	0.642***	0.385***	0.426***
	(0.021)	(0.056)	(0.150)	(0.030)	(0.058)	(0.228)	(0.023)	(0.049)	(0.141)
N	803	803	803	832	832	832	1635	1635	1635

Note: The Table reports random-effects linear regressions on panel data with the Receivers' id as the group variable and the rounds as the time variable. Standard errors (in parentheses) are clustered at the session level using bootstrapping. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4.2: Determinants of a skeptical guess, including inconsistent players

Dep. Var.	= 1 if the guess is skeptical, 0 if not								
	High treatments			*Low* treatments			*Difference-in-difference*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1 if *Loaded*	0.057	0.032	0.022	-0.132***	-0.151***	-0.176**	0.056	0.035	0.027
	(0.055)	(0.054)	(0.057)	(0.049)	(0.036)	(0.073)	(0.053)	(0.048)	(0.047)
1 if *Low*							-0.037	-0.039	-0.027
							(0.044)	(0.037)	(0.044)
1 if *Low_ Loaded*							-0.194***	-0.188***	-0.189***
							(0.075)	(0.065)	(0.071)
Mess. size	-0.158***	-0.159***	-0.161***	-0.092***	-0.093***	-0.0925***	-0.126***	-0.127***	-0.127***
	(0.019)	(0.018)	(0.017)	(0.016)	(0.013)	(0.016)	(0.013)	(0.013)	(0.013)
IQ performance		0.023**	0.023**		0.025***	0.022**		0.021***	0.019***
		(0.011)	(0.011)		(0.007)	(0.010)		(0.006)	(0.006)
Rounds dummies		✓	✓		✓	✓		✓	✓
Demo.			✓			✓			✓
Cons.	0.892***	0.567***	0.668***	0.630***	0.345***	0.0138	0.784***	0.509***	0.561***
	(0.065)	(0.106)	(0.178)	(0.088)	(0.093)	(0.325)	(0.047)	(0.069)	(0.185)
N	803	803	803	832	832	832	1635	1635	1635

Note: The Table reports random-effects linear regressions on panel data with the Receivers' id as the group variable and the rounds as the time variable. Standard errors (in parentheses) are clustered at the session level using bootstrapping. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

5 Skepticism and learning

In our experiment, despite the relatively small number of rounds and the absence of feedback between rounds, learning cannot be excluded. Two kinds of potential learning can be at play. On the one hand, repetitions of the game can help subjects learning how to play, read hard information and exercise skepticism.[1] On the other hand, as subjects get messages about their ranks, they may learn information about the underlying truth that we use to generate these ranks. In the *Loaded* treatments, Receivers may learn something about their performance in the IQ test (even if the IQ-rank is newly computed in every round). In the *Neutral* treatments, Receivers may learn something about the integer that has been attributed to them for the whole experiment and that we use to generate neutral ranks. While we cannot distinguish these two learning forces, they are common to all our treatments and we can check whether Receivers' level of skepticism changes over time. Our results show no clear evidence of such changes: Tables 4 and C.1 include dummy variables for each round of play and show no clear overall learning trend. Figure 5.1 displays the average skepticism, by treatment, over rounds. Skepticism appears quite stable.

We additionally look at whether subjects who are exposed to more than two singletons in the first five rounds play differently than other subjects in the next five rounds when facing vague messages. First, there are very few such Receivers, 11% of the sample. It should come at no surprise since the rank-generation process was designed to ensure that ranks (and messages) varied over the rounds. Second, we find no evidence that Receivers who see singletons early play differently than other Receivers when facing vague messages later in the game, and our results are robust to their exclusion.

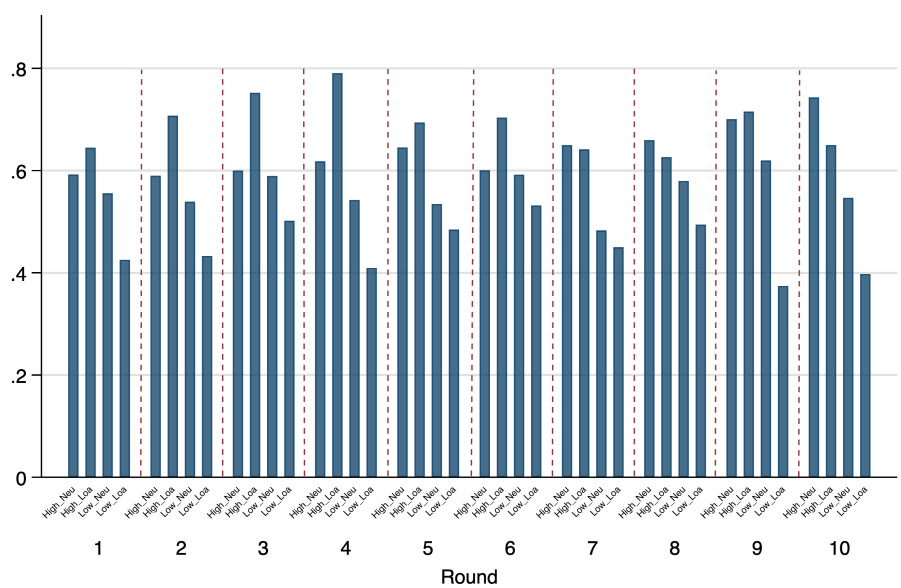


Figure 5.1: Receivers' average skepticism, over round

[1] In studies with more rounds and the presence of feedback between the rounds, this type of learning is shown to be important (see Jin et al., 2021).

6 Skepticism at the individual level

On Figure 6.1, every bar represents the 10 guesses of one individual. We classify each guess into 3 categories: when $Sk(a,m) > 0.5$, the guess a is *rather skeptical* (in green); when $Sk(a,m) < 0.5$, a is *rather anti-skeptical* (in red); when $Sk(a,m) = 0.5$, a is naive (in dark grey).[2]

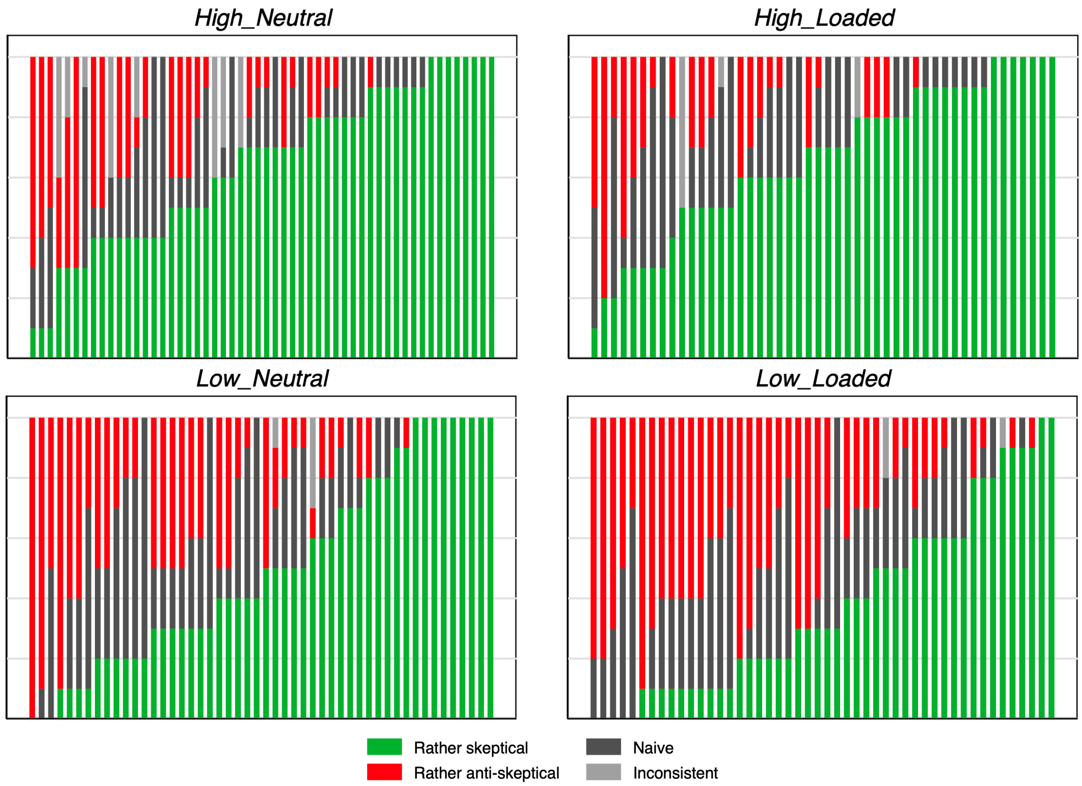
Figure 6.1 clearly shows that Receivers behave in various ways, from the ones making 10 rather skeptical guesses (13%) to the ones making no rather skeptical guess at all (4%). Over all treatments, almost half of the subjects (44%) make the three kinds of guesses. On average, over 10 guesses, a Receiver makes 5.54 rather skeptical guesses, 2.05 naive guesses and 2.21 rather anti-skeptical guesses. It is interesting to look at how these numbers vary across treatments. A first observation is that they do not vary significantly between the two *High* treatments.[3] There are however differences between the two *Low* treatments: on average, the number of rather skeptical guesses per person is higher in *Low_Neutral* than in *Low_Loaded* (5.06 and 3.85, $p = 0.064$, ttest); the number of rather anti-skeptical guesses per person is lower in *Low_Neutral* than in *Low_Loaded* (2.56 and 3.54, $p = 0.075$, ttest); there is no difference in the average number of naive guess per person between the *Low* treatments ($p = 0.564$, ttest). In short, when moving from the *Low_Neutral* to the *Low_Loaded* treatment, there is on average one guess per person that switches from the category rather skeptical to the category rather anti-skeptical. Finally, if we compare the two *Neutral* treatments, we see that the average number of rather skeptical guesses per person is significantly higher in *High_Neutral* than in *Low_Neutral* (6.46 and 5.06, $p = 0.017$).

7 IQ and skepticism

We begin by checking if there is a link between Receivers' performance in the IQ test and their ability to make skeptical inferences. Table 4 in the main text shows that, over all treatments, there is a small but significant, positive correlation between performance in the IQ test and average skepticism. To look at this correlation at the individual level, we split the group of Receivers into two based on the median performance in the IQ test: 93 subjects have a relatively *Low IQ* (they answered correctly up to 9 questions in the IQ test) and 107 subjects have a relatively *High IQ* (they answered correctly 10 to 15 questions in the IQ test). Pooling all treatments and vague messages, the average level of skepticism is significantly higher in the high IQ group than in the low IQ group (0.62 and 0.54 respectively, $p = 0.004$). The result that a higher IQ is associated to more skepticism is in line with Schipper and Li (2020) who document that subjects' performance in a Raven IQ test are positively correlated to

[2] If a Receiver is lost about the inference he is supposed to make about the disclosed ranks, he may "naively" pick the one in the middle simply because it is focal. This may be especially true for messages of odd size. We indeed observe a significantly higher fraction of naive guesses after messages of size 3 and 5 than after messages of size 2 and 4 ($p < 0.001$).

[3] The average number of rather skeptical guesses is 6.46 in *High_Neutral* and 6.69 in *High_Loaded* ($p = 0.663$, ttest). The average numbers of naive guesses are 1.56 and 1.88 respectively, ($p = 0.363$, ttest). The average numbers of rather anti-skeptical guesses are 1.56 and 1.27 respectively ($p = 0.467$, ttest).



Note: The Figure displays the distribution of guesses in our three categories, by individual. Each bar corresponds to the 10 guesses of one individual. Each color corresponds to a category of guess.

Figure 6.1: Receivers' individual guesses, by category

levels of reasoning in disclosure games.

In our experiment, we use Receiver's performance in the IQ test to construct type (IQ-ranks) in *Loaded* treatments. This has a subtle effect: a Receiver's performance affects the messages he sees in the *Loaded* treatments. To understand why this is the case, consider the Sender's communication strategy that consists in disclosing that the type is at least t in *High_Loaded*. According to this strategy, vaguer messages are sent when the Receivers' IQ-rank is higher.[4] The converse is true in *Low_Loaded*: vaguer messages are sent when the Receivers' IQ-rank is lower. Even if the correlation between Receivers' performance and IQ-rank is not perfect, it follows that subjects facing vague messages have, on average, a lower performance in the IQ test in *Low_Loaded* than in *High_Loaded*. One may then wonder whether, in the light of the correlation between IQ and skepticism, it could be that skepticism is lower in *Low_Loaded* simply because subjects have a lower performance in the IQ test. A first argument against this possibility is that we control for the performance of Receivers when studying skepticism in our regressions (Tables 4 and C.1). Second, and more importantly, we compare skepticism between the *Low* treatments in which the performance of Receivers is actually higher in *Low_Loaded* than in *Low_Neutral* (the average performance of Receivers is 10.14 and 9.14 respectively, $p = 0.026$, ttest).

[4]The message is $\{1, 2, 3, 4, 5\}$ when the IQ-rank is 1, and $\{5\}$ when the IQ-rank is 5.

8 Instructions

Subjects do not see what appears in italic. Instructions are in English and given along the way on the computer screens. The instructions for Part 1 are common to all treatments. The instructions for Part 2 vary depending on the treatment and the role of the subject. Overall, there are two sets of instructions for Senders – High and Low – and four sets for Receivers, one for each treatment. For the sake of brevity, we only report below the instructions corresponding to the High_Loaded treatment.

Welcome!

If you have any question during the experiment, please use the zoom chat.
The experiment has 2 parts.

- ◇ Part 1: IQ-test,
- ◇ Part 2: 10 rounds of a game

Instructions are given along the way. It is in your interest to read them carefully! At the end of the experiment, you will receive the earnings made in the 2 parts plus a 5 euros show-up fee. You will additionally receive a participant's fee of 5 euros for today's online experiment. You will be paid on your PayPal account within 48h after the end of the experiment.

Part 1

Part 1 consists of a Raven IQ-test, a test frequently used to measure intelligence. It measures the ability to reason clearly and grasp complexity. Performance in the test is often associated with educational success and high future income.

The test has 15 questions. For every question, you will see a pattern with a missing piece. Your task is to complete the pattern by choosing one of the pieces that are proposed to you. You will have 15 minutes to answer all the questions.

Payoff: you will earn 0.50 cents for each correct answer. In this part, you can earn up to 7.5 euros $(15 * 0.50)$.

Subjects then see an example of a Raven matrix and are given the correct answer. Then they move on to the 15 questions, one per screen.

(Future receivers only) The same IQ test was also done by a large number of participants who previously came at WZB-TU lab. We have divided the group into five quintiles, from the 20% of participants who had the best performance in the IQ-test, to the 20% of participants who had the worst performance in the IQ-test. What do you think is the likelihood that you belong to each quintile? On the next screen, you must state an estimate for each of the 5 quintiles. The sum of the 5 estimates must equal 100%.

Payoff: You will be paid for this short estimation task. Your payment will be highest if you estimate your chances to belong to each quintile as accurately as possible. The maximal payment for the estimation task is 2 euros, negative payment is not possible. If you are interested, here is the detailed information about the payoff: One quintile will be picked at random by the computer. You will be paid according to the following formula: Your payoff (euros) $= 2 - 2 * (I - p/100)^2$ where I is an indicator variable that takes value 1 if the quintile you actually belong to is equal to the quintile drawn at random and 0 otherwise, and p is your estimate in percent.

Receiver-subjects fill in a table with their 5 estimates.

Part 2

Part 2 consists of 10 rounds of a 2-player game. The computer has randomly assigned you the role of Sender or the role of Receiver. You will learn your role on the next screen and keep it for the 10 rounds. In each round, if you are a Sender, you will be randomly matched with a Receiver, and vice-versa. You will never know the identity of the other player and this player can be new in each round.

Subjects then see either "Today, you are a Receiver" or "Today, you are a Sender".

**** Instructions for SENDERS - High treatment ****

Description of the game: Each round of the game has 4 steps.

- ◇ **Step 1:** In each round, the computer program will generate a secret number, which is 1, 2, 3, 4, or 5.
- ◇ **Step 2:** You will be informed of the secret number. The Receiver will not know this secret number, but his/her task is to guess it.
- ◇ **Step 3:** Before the Receiver guesses the secret number, you can send him/her information about it. This information will take the form of a set of numbers, with the only constraint that the secret number must be part of the set. For instance, if the secret number is 3, then you can send any of the sets of numbers given in the table below:

Available sets of numbers	
$\{1,2,3,4,5\}$	☐
$\{1,2,3,4\}$	☐
$\{2,3,4,5\}$	☐
$\{1,2,3\}$	☐
$\{2,3,4\}$	☐
$\{3,4,5\}$	☐
$\{2,3\}$	☐
$\{3,4\}$	☐
$\{3\}$	☐

- ◇ **Step 4:** The information you will give to the Receiver will be displayed on his/her screen, and the Receiver will finally make his/her guess. His/her guess can be any number between 1 and 5. We allow for guesses with one digit with the idea that a Receiver who, for instance, thinks 1 and 2 are equally likely can guess 1.5, or that a Receiver who, for instance, thinks it is either 4 or 5 but most likely 5 can make a guess between 4 and 5 but closer to 5. Once the Receiver made his/her guess, the round is over and a new round starts.

In each round, the payoffs are as follows. The Receiver knows these payoffs too.

Your Payoff: Your payoff corresponds exactly to the guess of the Receiver in this round.

$$\text{Your payoff} = \text{guess of the Receiver.}$$

Simply put, you earn more when the Receiver guesses a higher secret number.

Receiver's payoff: The Receiver's payoff depends on how close is his/her guess to the secret number.

$$\text{Receiver's payoff} = 5 - |\text{ guess - secret number }|$$

where | guess - secret number | is the distance between the guess and the secret number in the round. For instance, if the Receiver correctly guesses the secret number, he/she gets 5 euros. If the Receiver guesses 4 while the secret number is 3, he/she gets 4 euros (5 - 1). Simply put, the Receiver earns more when his/her guess is closer to the secret number.

Summary: To sum up, each round of the game goes as follows:

1. The computer generates a secret number.
2. You are informed about this secret number.
3. You can give information to the Receiver about it.
4. The Receiver receives this information and guesses the secret number.

You earn more when the Receiver guesses a higher number. The Receiver earns more when his/her guess is closer to the true secret number. Part 2 of the experiment ends after 10 rounds of the game. One of the 10 rounds will be randomly selected at the end of the experiment for effective payment in this part.

After some comprehension questions, the game starts. In every round, the Sender is shown the secret number and has to choose the message about this number that he/she wants to send to the receiver.

**** Instructions for RECEIVERS - High_Loaded treatment ****

Description of the game: Each round of the game has 4 steps.

- ◇ **Step 1:**As you know, the same IQ-test that you did earlier was also done by a large number of previous participants. In each round of the game, the computer will randomly selects 4 previous participants. Together with these 4 participants, you will form a group of 5 participants. Within this group, the computer program will compare the performances in the IQ-test. It will then compute your IQ-rank for the round as follows:
  - ◇ If you have the highest perf. in the group of 5, your IQ-rank will be 1.
  - ◇ If you have the second highest perf. in the group of 5, your IQ-rank will be 2.
  - ◇ If you have the third highest perf. in the group of 5, your IQ-rank will be 3.
  - ◇ If you have the fourth highest perf. in the group of 5, your IQ-rank will be 4.
  - ◇ If you have the lowest perf. in the group of 5, your IQ-rank will be 5.
  - ◇ If you have the same perf. as other participants in the group, the computer program randomly decides the ranking between these participants and yourself.

  In each round, your IQ-rank will be 1, 2, 3, 4 or 5. The higher your IQ-rank, the better you performed in the IQ-test relative to the 4 randomly selected participants. A lower IQ-rank also means that you made more mistakes in the IQ-test than these 4 participants.

  Note: In each round, the computer randomly selects 4 new previous participants whose performance is compared to yours, so your IQ-rank can change across rounds.
- ◇ **Step 2:** The Sender with will be informed of a number, which is 1, 2, 3, 4 or 5. This number corresponds to your IQ-rank, but the Sender does not know that this is the case. For him/her, this number has no particular meaning. You will not be informed of this IQ-rank, but your task is to guess it.

- ◇ **Step 3:** Before you guess your IQ-rank, the Sender will give you information about it. This information will take the form of a set of numbers, with the only constraint that your IQ-rank must be part of the set. Said differently, your IQ-rank is always one of the numbers sent by the Sender. For instance, if your IQ-rank is 3, then the Sender can send you any of the sets of numbers given in the table below:

Available sets of numbers	
$\{1, 2, 3, 4, 5\}$	☐
$\{1, 2, 3, 4\}$	☐
$\{2, 3, 4, 5\}$	☐
$\{1, 2, 3\}$	☐
$\{2, 3, 4\}$	☐
$\{3, 4, 5\}$	☐
$\{2, 3\}$	☐
$\{3, 4\}$	☐
$\{3\}$	☐

- ◇ **Step 4:** The information given by the Sender will be displayed on your screen, and you will finally make your guess. Your guess can be any number between 1 and 5. We allow for guesses with one digit with the idea that a Receiver who, for instance, thinks 1 and 2 are equally likely can guess 1.5, or that a Receiver who, for instance, thinks it is either 4 or 5 but most likely 5 can make a guess between 4 and 5 but closer to 5. Once you made your guess, the round is over and a new round starts.

In each round, the payoffs are as follows. The Sender knows these payoffs too.

Sender's Payoff: The Sender's payoff corresponds exactly to your guess in this round.

$$\text{Sender's payoff} = \text{your guess.}$$

For instance, if you guess 5 (the lowest IQ-rank), the Sender gets 5 euros. If you guess 1.4, the Sender gets 1.40 euros. Simply put, the Sender earns more when you guess a lower IQ-rank (closer to 5).

Your Payoff: Your payoff depends on how close is your guess to your IQ-rank.

$$\text{Your payoff} = 5 - |\text{ your guess - your IQ-rank }|$$

where | your guess - your IQ-rank | is the distance between your guess and your IQ-rank in the round. For instance, if you correctly guess your IQ rank, you get 5 euros. If you guess 4 while your IQ-rank is 3, you get 4 euros (5 - 1). Simply put, you earn more when your guess is closer to your IQ-rank.

Summary: To sum up, each round of the game goes as follows:

1. Your IQ-rank is computed.
2. The Sender is informed about a number that corresponds to your IQ-rank. For him/her, this number has no meaning.
3. The Sender gives you information about this number.
4. You receive this information and guess your IQ-rank.

You earn more when your guess is closer to your IQ-rank. The Sender earns more when you guess a lower IQ-rank (closer to 5). Part 2 of the experiment ends after 10 rounds of the game. One of the 10 rounds will be randomly selected at the end of the experiment for effective payment in this part.

No feedback: In the experiment, you will never receive more information about your IQ-ranks than the information given by the Senders.

After some comprehension questions, the 10 repetitions of the game start. In every round, the Receiver is told that his/her IQ-rank has been computed, shown the information given by the Sender and asked to guess his/her IQ-rank.
**** Instructions for RECEIVERS - High_Neutral treatment ****

Description of the game: The computer has randomly attributed to you a number which is an integer between 0 and 15. All number between 0 and 15 are equally likely. You will keep this number for the 10 rounds of the game. Each round of the game has 4 steps.

- **Step 1:** In each round, the computer will randomly select 4 other integers between 0 and 15. All numbers are equally probable. Together with your own number, the numbers form a group of 5 integers. The computer program will compare these 5 numbers and generate a rank for the round as follows:
  - If your number is the highest of the 5 numbers, the rank will be 1.
  - If your number is the second highest of the 5 numbers, the rank will be 2.
  - If your number is the third highest of the 5 numbers, the rank will be 3.
  - If your number is the fourth highest of the 5 numbers, the rank will be 4.
  - If your number is the lowest of the 5 numbers, the rank will be 5.
  - If your number is the same as some other numbers, the computer program randomly decides the rankin between these numbers and your.

  In each round, your IQ-rank will be 1, 2, 3, 4 or 5.
  Note: In each round, the computer randomly selects 4 new numbers to be compared to your number, so the rank can change across rounds.
- **Step 2:** The Sender with will be informed of the rank, which is 1, 2, 3, 4 or 5. The Sender does not know how this rank has been generated. You will not be informed of this rank but your task is to guess it.
- **Step 3:** Before you guess the rank, the Sender will give you information about it. This information will take the form of a set of numbers, with the only constraint that the rank must be part of the set. Said differently, the rank is always one of the numbers sent by the Sender. For instance, if the rank is 3, then the Sender can send you any of the sets of numbers given in the table below:

Available sets of numbers	
$\{1,2,3,4,5\}$	☐
$\{1,2,3,4\}$	☐
$\{2,3,4,5\}$	☐
$\{1,2,3\}$	☐
$\{2,3,4\}$	☐
$\{3,4,5\}$	☐
$\{2,3\}$	☐
$\{3,4\}$	☐
$\{3\}$	☐

- **Step 4:** The information given by the Sender will be displayed on your screen, and you will finally make your guess. Your guess can be any number between 1 and 5. We allow for guesses with one digit with the idea that a Receiver who, for instance, thinks

1 and 2 are equally likely can guess 1.5, or that a Receiver who, for instance, thinks it is either 4 or 5 but most likely 5 can make a guess between 4 and 5 but closer to 5. Once you made your guess, the round is over and a new round starts.

In each round, the payoffs are as follows. The Sender knows these payoffs too.

Sender's Payoff: The Sender's payoff corresponds exactly to your guess in this round.

$$\text{Sender's payoff} = \text{your guess.}$$

For instance, if you guess 5 (the lowest IQ-rank), the Sender gets 5 euros. If you guess 1.4, the Sender gets 1.40 euros. Simply put, the Sender earns more when you guess a lower rank (closer to 5).

Your Payoff: Your payoff depends on how close is your guess to the rank.

$$\text{Your payoff} = 5 - |\text{ your guess} - \text{the rank }|$$

where | your guess - the rank | is the distance between your guess and the rank in the round. For instance, if you correctly guess the rank, you get 5 euros. If you guess 4 while the rank is 3, you get 4 euros (5 - 1). Simply put, you earn more when your guess is closer to the rank.

Summary: To sum up, each round of the game goes as follows:

1. The rank is computed.
2. The Sender is informed about the rank.
3. The Sender gives you information about this number.
4. You receive this information and guess the rank.

You earn more when your guess is closer to the rank. The Sender earns more when you guess a lower rank (closer to 5). Part 2 of the experiment ends after 10 rounds of the game. One of the 10 rounds will be randomly selected at the end of the experiment for effective payment in this part.

No feedback: In the experiment, you will never receive more information about the ranks than the information given by the Senders.

After some comprehension questions, the 10 repetitions of the game start. In every round, the Receiver is told that the rank has been computed, shown the information given by the Sender and asked to guess the rank.

At the end of the 10 rounds, all subjects answer some questions about themselves (gender, age, education etc.). They learn their aggregate payoff and the experiment ends.

9 Screens

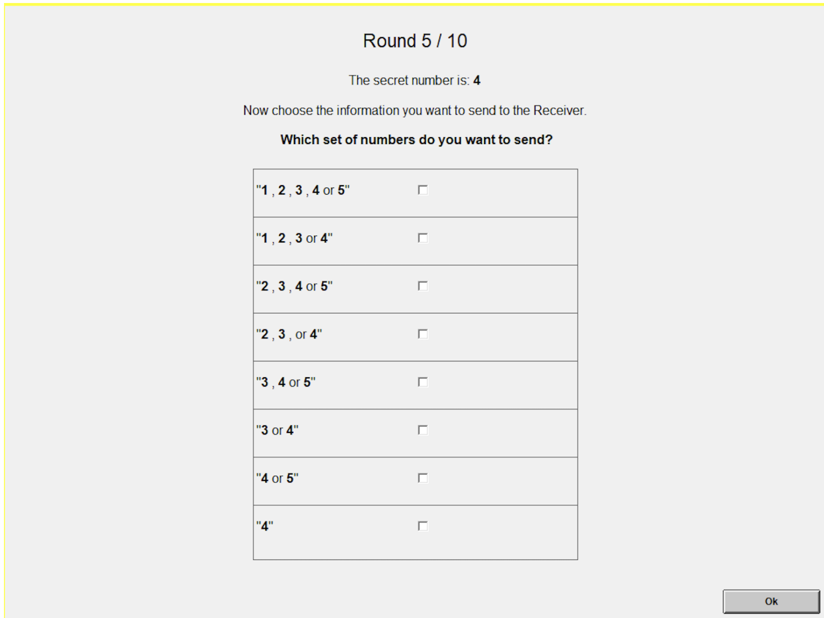


Figure 9.1: Example of a screen seen by a Sender when type is 4

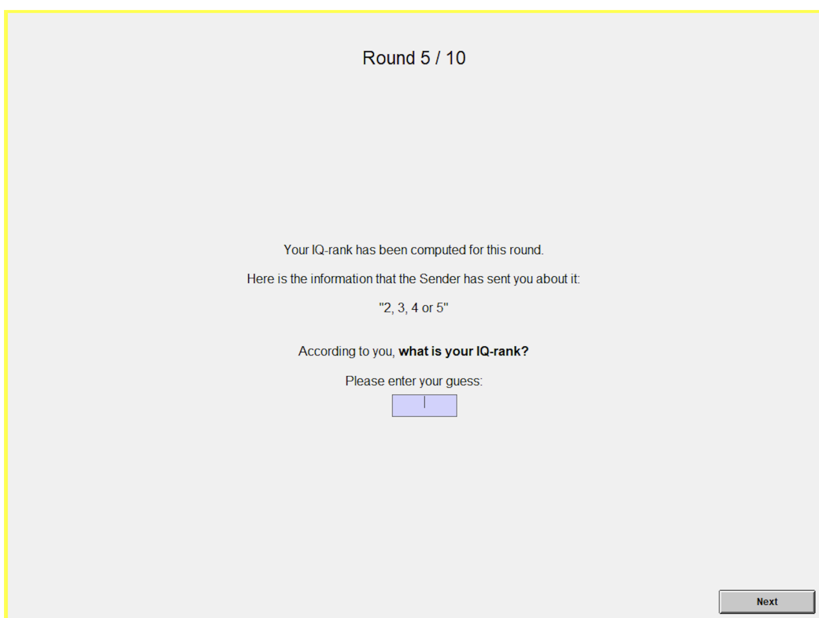


Figure 9.2: Example of a screen seen by a Receiver who received message $\{2, 3, 4, 5\}$

References

Hagenbach, J., Koessler, F., and Perez-Richet, E. (2014). Certifiable pre-play communication: Full disclosure. *Econometrica*, 82(3):1093–1131.

Jin, G. Z., Luca, M., and Martin, D. (2021). Is no news (perceived as) bad news? an experimental investigation of information disclosure. *American Economic Journal: Microeconomics*, 12:141–173.

Schipper, B. C. and Li, Y. X. (2020). Strategic reasoning in persuasion games: an experiment. *Games and Economic Behavior*, 121:329–367.