9 Online Appendix.

9.1 Human mediation treatment: equilibria

We concentrate on equilibria for which: $\tau_H = 1$, $r(l, l) = (50, 50)$ w.p.1, and dominant acceptance strategies are taken (both players accept 70, L accepts 50, and H rejects 30). We prove the following proposition, which corresponds to the equilibria discussed in the text.

Proposition HM. (i) $\underline{q = 1/2}$. There is an equilibrium in which $r(h, h) = w$ w.p. 1; $\tau_L = 1$; α_h sufficiently low, $\alpha_l = 0$, $\beta_l = 1$, β_h arbitrary; $P = \frac{3}{4}$. $\underline{q = 1/3}$. There is an equilibrium in which $r(h, h) = w$ w.p. 1; $\tau_L = \frac{2}{3}$; α_h sufficiently low, $\alpha_l = 0$, $\beta_l = 1$, β_h sufficiently low; $P = \frac{56}{81} \approx 0.691$.

(ii) $\underline{q = 1/2}$. There is an equilibrium in which $r(h, h) = w$ w.p. $p_w \approx 0.535$, $r(h, h) = (50, 50)$ w.p. $1 - p_w$; $\tau_L \approx 0.565$; $\alpha_h \approx 0.580$, $\alpha_l = 0$, $\beta_l = 1$, β_h arbitrary; $P \approx 0.605$.

To prove the proposition, we make use of Lemma A3 below. The significance of this lemma is that any PBE with the features of interest in which $r(h, l) = (70, 30)$ w.p. > 0 is such that (1) $r(l, l) = (50, 50)$ w.p. 1, which is accepted w.p. 1, (2) $r(h, l) = (70, 30)$ w.p. 1., which is accepted w.p. 1, (3) $\alpha_l = 0$, (4) $\beta_l = 1$, and (5) $\beta_h = 1$ if $r(h, h) = (70, 30)$ w.p. > 0 (otherwise any β_h is optimal for L). Hence, in addition to confirming the optimality of $\tau_H = 1$ and finding an optimal τ_L, it remains only to determine (a) HM's strategy following (h, h), and (b) α_h, H's probability of accepting 50 after messaging h. Furthermore, the optimality conditions for (a) and (b) are given by part (v) of the lemma.

Lemma A3. *In any PBE such that* $\tau_H = 1$, $r(l, l) = (50, 50)$ *w.p. 1, and dominant acceptance strategies are taken, the following must hold: (i) if* $r(h, l) = (70, 30)$ *w.p. > 0, then $\beta_l = 1$ and thus $r(h, l) = (70, 30)$ is accepted w.p. 1; (ii) if $r(h, h) = (70, 30)$ w.p. > 0 (randomizing which player receives 30), then $\beta_h = 1$; (iii) if $r(h, l) = (70, 30)$ w.p. > 0, then $r(h, l) = (70, 30)$ w.p. 1; (iv) if $r(h, l) = (70, 30)$ w.p. > 0, then $\alpha_l = 0$; and (v):*

- *HM prefers $r(h, h) = (70, 30)$ to $r(h, h) = w$ if and only if*

$$(1 - q_h)\beta_h \geq \frac{1}{2} \iff$$
$$\tau_L \leq \frac{1 - 2q}{1 - q} \text{ if } \beta_h = 1,$$

where $q_h = \frac{q}{q + (1 - \tau_L)(1 - q)} \in [q, 1]$.

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- *HM prefers $r(h,h) = (50,50)$ to $r(h,h) = w$ if and only if*

$$q_h^2 \alpha_h^2 + 2q_h(1-q_h)\alpha_h + (1-q_h)^2 \geq \frac{1}{2},$$

where $q_h = \frac{q}{q+(1-\tau_L)(1-q)} \in [q,1]$.

- *HM prefers $r(h,h) = (50,50)$ to $r(h,h) = (70,30)$ if and only if*

$$q_h^2 \alpha_h^2 + 2q_h(1-q_h)\alpha_h + (1-q_h)^2 \geq (1-q_h)\beta_h,$$

where $q_h = \frac{q}{q+(1-\tau_L)(1-q)} \in [q,1]$.

- *If $r(h,l) = (70,30)$ w.p. > 0 and $r(h,h) = (50,50)$ w.p. > 0, then H prefers to accept 50 after messaging h if and only if*

$$\tau_L \geq 1 - \frac{3}{4}(\frac{q}{1-q})\alpha_h.$$

Proof. *(i)* Define $\Delta_{Ll}(30)$ as the expected utility difference between accepting and rejecting 30 for L who messages l. Assuming $\tau_H = 1$, that dominant acceptance strategies are taken, and $r(h,l) = (70,30)$ w.p. > 0 (which implies Bayes rule applies),

$$\Delta_{Ll}(30) \propto p30_{hl}(q30 - (1-q)(1-\tau_L)5) - \tilde{p}30_{ll}(1-q)\tau_L 5,$$

where $p30_{hl}$ is the probability with which $r(h,l) = (70,30)$ and $\tilde{p}30_{ll}$ is *one-half* the probability with which $r(l,l) = (70,30)$ (i.e. the probability $(70,30)$ is offered *and* it is this player who is offered 30). Thus, if $\tilde{p}30_{ll} = 0$ and $p30_{hl} > 0$, $\Delta_{Ll}(30)$.

(ii) If $r(h,h) = (70,30)$ w.p. > 0, then players who message h and receive 30 know the other player messaged h. Since we assume $\tau_H = 1$, the belief that the other player is H is given by $q_h = \frac{q}{q+(1-\tau_L)(1-q)}$, which is between q and 1. Since the other player will always accept 70, the expected payoff of accepting is 30. The expected payoff of rejecting is $q_h 0 + (1-q_h)35$, which is strictly less than 30.

(iii) Since $r(h,l) = (70,30)$ is accepted w.p. 1 by part *(i)*, it cannot be that $r(h,l) = w$ w.p. > 0 since it yields a lower payoff for HM.

We suppose that $r(h,l) = (50,50)$ w.p. > 0 in equilibrium, and derive a contradiction. Since

$r(h, l) = (70, 30)$ is accepted w.p. 1, $r(h, l) = (50, 50)$ must be accepted w.p. 1 (or else HM would never offer it). Hence, if $r(h, h) = (50, 50)$ w.p. > 0, it is accepted w.p. 1 (same information set for those who message h).

Case 1: Suppose $r(h, h) = (50, 50)$ w.p. 0. This cannot be an equilibrium since $r(h, h) = (50, 50)$ yields a strictly higher payoff for HM than $r(h, h) = w$ and $r(h, h) = (70, 30)$ (H type will always reject 30).

Case 2: Suppose $r(h, h) = (50, 50)$ w.p. > 0. Since this yields a higher payoff for HM than $r(h, h) = w$ and $r(h, h) = (70, 30)$, it must be that $r(h, h) = (50, 50)$ w.p. 1. But this cannot be an equilibrium because then the L-type would strictly prefer to message h (all offers are accepted and types messaging h would sometimes get more), and then the H type would prefer to reject an offer of 50.

(iv) Assume $\tau_H = 1$ and $r(h, l) = (70, 30)$ w.p. > 0, which implies $r(h, l) = (70, 30)$ w.p. 1 by part (iii). Hence, if H deviates and messages l and receives 50, she knows her opponent is L and hence it is strictly optimal to reject, i.e. $\alpha_l = 0$.

(v) For simplicity, subtract 20 from HM's payoffs so that rejection yields 0, walking out yields 20, and acceptance yields 40. Let uW_{hh}, $u50_{hh}$, and $u70_{hh}$ be HM's expected payoffs from walking out, offering $(50, 50)$, and offering $(70, 30)$, respectively, after observing (h, h). These are given as

$$uW_{hh} = 20,$$

$$u50_{hh} = 40[q_h^2 \alpha_h^2 + 2q_h(1 - q_h)\alpha_h + (1 - q_h)^2],$$

$$u70_{hh} = 40[(1 - q_h)\beta_h].$$

HM prefers $r(h, h) = (70, 30)$ to $r(h, h) = w$ if and only if

$$40(1 - q_h)\beta_h \geq 20 \iff$$
$$(1 - q_h)\beta_h \geq \frac{1}{2}.$$

If $\beta_h = 1$, then this condition becomes

$$(1 - q_h)\beta_h \geq \frac{1}{2} \iff$$

$$\frac{(1 - \tau_L)(1 - q)}{q + (1 - \tau_L)(1 - q)} \geq \frac{1}{2} \iff$$

$$(1 - \tau_L)(1 - q) \geq \frac{1}{2}\{q + (1 - \tau_L)(1 - q)\} \iff$$

$$(1 - \tau_L)(1 - q) \geq q \iff$$

$$1 - \tau_L \geq \frac{q}{1 - q} \iff$$

$$\frac{1 - 2q}{1 - q} \geq \tau_L$$

HM's other indifference conditions are immediate.

Define $\Delta_{Hh}(50)$ as the expected utility difference between accepting and rejecting 50 for H who messages h. Assuming $\tau_H = 1$, that dominant acceptance strategies are taken, $r(h, l) = (70, 30)$ w.p. > 0 (which implies $r(h, l) = (50, 50)$ w.p. 0 by part (iii)), and $r(h, h) = (50, 50)$ w.p. > 0, then

$$\Delta_{Hh}(50) \propto p50_{hh}\{q\tau_H\alpha_h 15 - (1 - q)(1 - \tau_L)20\}+$$

$$p50_{hl}\{q(1 - \tau_H)\alpha_l 15 - (1 - q)\tau_L 20\}$$

and thus

$$\Delta_{Hh}(50) \geq 0 \iff$$

$$q\tau_H\alpha_h 15 - (1 - q)(1 - \tau_L)20 \geq 0 \iff$$

$$\tau_L \geq 1 - \frac{3}{4}(\frac{q}{1 - q})\alpha_h.$$

□

Proof of Proposition HM. (i) We search for equilibria in undominated strategies in which $\tau_H = 1$, $r(l, l) = (50, 50)$ w.p. 1, $r(h, l) = (70, 30)$ w.p. > 0, and $r(h, h) = w$ w.p. 1.

In such an equilibrium, by Lemma A3, it must be that $r(h, l) = (70, 30)$ w.p. 1 and $\beta_l = 1$.

Assuming all of these conditions, the expected payoffs to L of messaging l and h, respectively, are:

$$EU_L(l) = q\{\tau_H 30 + (1 - \tau_H)(\alpha_l 50 + (1 - \alpha_l)0)\} + (1 - q)\{\tau_L 50 + (1 - \tau_L)30\}$$

$$= q30 + (1 - q)(30 + \tau_L 20)$$

$$= q30 + 30 + \tau_L 20 - q30 - q\tau_L 20$$

$$= 30 + \tau_L 20 - q\tau_L 20$$

and

$$EU_L(h) = q\{\tau_H 0 + (1 - \tau_H)0\} + (1 - q)\{\tau_L 70 + (1 - \tau_L)(35)\}$$

$$= (1 - q)\{35 + \tau_L 35\}$$

$$= 35 + \tau_L 35 - q35 - q\tau_L 35,$$

and so

$$EU_L(l) \geq EU_L(h) \iff$$

$$30 + \tau_L 20 - q\tau_L 20 \geq 35 + \tau_L 35 - q35 - q\tau_L 35 \iff$$

$$q\tau_L 15 \geq 5 + \tau_L 15 - q35 \iff$$

$$q35 - 5 \geq \tau_L(15 - q15)$$

$$\frac{q35 - 5}{15 - q15} \geq \tau_L.$$

Hence, if $q = \frac{1}{2}$, this is always satisfied strictly, meaning it must be that $\tau_L = 1$.

If $q = \frac{1}{3}$, then the condition becomes $EU_L(l) \geq EU_L(h) \iff \frac{2}{3} \geq \tau_L$. If $\frac{2}{3} > \tau_L$, then $EU_L(l) > EU_L(h)$ and it must be that $\tau_L = 1$, a contradiction. If $\frac{2}{3} < \tau_L$, then $EU_L(l) < EU_L(h)$ and it must be that $\tau_L = 0$, a contradiction. Hence it must be that $\tau_L = \frac{2}{3}$.

Following (h, h), HM must prefer to walk out rather than offer $(70, 30)$:

$$(1 - q_h)\beta_h \leq \frac{1}{2}.$$

When $q = \frac{1}{2}$, $\tau_L = 1$ and $q_h = 1$, so this condition is satisfied for any β_h. When $q = \frac{1}{3}$, $\tau_L = \frac{2}{3}$ and $q_h = \frac{3}{7}$, so the condition is satisfied for sufficiently low β_h.

Following (h, h), HM must prefer to walk out rather than offer $(50, 50)$:

$$q_h^2 \alpha_h^2 + 2q_h(1 - q_h)\alpha_h + (1 - q_h)^2 \leq \frac{1}{2},$$

which is satisfied for both values of q for sufficiently low α_h.

Finally, we must now check that $\tau_H = 1$ is optimal. First note that if H messages l and receives 50, it is optimal for her to reject, i.e. $\alpha_l = 0$, since she will be facing an L type and so she would receive 70. So H will always reject 50 and below and accept 70 and above. Hence, no matter the message she sends, she will always receive 35 against an H-type and 70 against an L-type. So H is indifferent between messages, meaning $\tau_H = 1$ is optimal in particular.

Summarizing, for $q = \frac{1}{2}$, there is an equilibrium involving $\tau_L = 1$, α_h sufficiently low, $\alpha_l = 0$, $\beta_l = 1$, β_h arbitrary, and the resulting probability of peace is $1 - q^2 = \frac{3}{4}$. For $q = \frac{1}{3}$, there is an equilibrium involving $\tau_L = \frac{2}{3}$, α_h sufficiently low, $\alpha_l = 0$, $\beta_l = 1$, β_h sufficiently low, and the resulting probability of peace is

$$
\begin{aligned}
1 - (q^2 + 2q(1-q)(1 - \tau_L) + (1-q)^2(1 - \tau_L)^2) &= \\
1 - (\frac{1}{9} + 2(\frac{1}{3})(\frac{2}{3})\frac{1}{3} + (\frac{2}{3})^2(\frac{1}{3})^2) &= \\
1 - (\frac{1}{9} + \frac{4}{27} + \frac{4}{81}) &= \\
1 - (\frac{9}{81} + \frac{12}{81} + \frac{4}{81}) &= \\
1 - \frac{25}{81} &= \\
\frac{56}{81} &\approx 0.691.
\end{aligned}
$$

(ii) We search for equilibria in undominated strategies in which $\tau_H = 1$, $r(l, l) = (50, 50)$ w.p. 1, $r(h, l) = (70, 30)$ w.p. > 0, and $r(h, h) = w$ w.p. $p_w \in (0, 1)$ and $r(h, h) = (50, 50)$ w.p. $1 - p_w$.

By Lemma A3, since $r(h, l) = (70, 30)$ w.p. > 0 and $r(h, h) = (50, 50)$ w.p. > 0, $r(h, l) = (70, 30)$ w.p.1 and H prefers to accept 50 after messaging h if and only if

$$\tau_L \geq 1 - \frac{3}{4}(\frac{q}{1 - q})\alpha_h.$$

Following (h, h), HM must be indifferent between walking out and offering $\{50, 50\}$:

$$q_h^2 \alpha_h^2 + 2q_h(1 - q_h)\alpha_h + (1 - q_h)^2 = \frac{1}{2}.$$

If $\alpha_h = 0$, then this cannot be satisfied (the LHS is $(1 - q_h)^2$, and $q_h \in [q, 1]$). If $\alpha_h = 1$, then this can also not be satisfied as the LHS equals $q_h^2 + 2q_h(1 - q_h) + (1 - q_h)^2 = q_h^2 + 2q_h - 2q_h^2 + 1 - 2q_h + q_h^2 = 1$. Hence, a necessary condition is that

$$\tau_L = 1 - \frac{3}{4}\left(\frac{q}{1 - q}\right)\alpha_h$$

Plugging this into HM's indifference condition yields a non-linear equation in α_h where the LHS is strictly increasing in α_h. Solving the equation numerically gives a unique solution for each parameter value:

- $q = \frac{1}{2}$: $\alpha_h^* \approx 0.580$ and $\tau_L^* \approx 0.565$

- $q = \frac{1}{3}$: $\alpha_h^* \approx 0.580$ and $\tau_L^* \approx 0.783$

Since $\tau_L \in (0, 1)$, we must have that $EU_L(l) = EU_L(h)$, where

$$\begin{aligned}
EU_L(l) &= q\{\tau_H 30 + (1 - \tau_H)(\alpha_l 50 + (1 - \alpha_l)0)\} + (1 - q)\{\tau_L^* 50 + (1 - \tau_L^*)30\} \\
&= q30 + (1 - q)(30 + \tau_L^* 20) \\
&= q30 + 30 + \tau_L^* 20 - q30 - q\tau_L^* 20 \\
&= 30 + \tau_L^* 20 - q\tau_L^* 20
\end{aligned}$$

and

$$EU_L(h) = q\{\tau_H(p_w 0 + (1 - p_w)50\alpha_h^*) + (1 - \tau_H)0\}$$

$$+ (1 - q)\{\tau_L^* 70 + (1 - \tau_L^*)(p_w 35 + (1 - p_w)50)\}$$

$$= q(1 - p_w)50\alpha_h^* + (1 - q)\{\tau_L^* 70 + (1 - \tau_L^*)(50 - 15p_w)\}$$

$$= q(1 - p_w)50\alpha_h^* + (1 - q)\{\tau_L^* 70 + 50 - 15p_w - \tau_L^* 50 + \tau_L^* p_w 15\}.$$

Equating $EU_L(l) = EU_L(h)$ gives an equation in p_w where the RHS is strictly decreasing in p_w. For $q = \frac{1}{3}$, and the values of α_h^* and τ_L^* we found, there is no solution in p_w, and thus no equilibrium. For $q = \frac{1}{2}$, there is a solution, $p_w \approx 0.535$.

We must check that HM prefers walking out to offering $(70, 30)$:

$$(1 - q_h)\beta_h \leq \frac{1}{2}.$$

For the value of τ_L^* we found, $q_h \approx 0.697$, and so this is satisfied for any β_h.

Finally, we must now check that $\tau_H = 1$ is optimal. First note that if H messages l and receives 50, it is optimal for her to reject, i.e. $\alpha_l = 0$, since she will be facing an L type and so she would receive 70. So if she messages l, she will receive 70 against an L who messages l, 70 against an L who messages h (she would be offered 30, which she will reject), and 35 against an H (H messages h, so she will be offered 30 which she will reject). So messaging l gives H a payoff of $EU_H(l) = (1-q)70+q35 = 70-35q$. If instead, she messages h, then against another H, either HM will walk out in which case she gets 35 or she will be offered 50, which she is indifferent between accepting and rejecting; suppose she rejects and receives 35. Against an L who messages l, she will be offered 70 which she will accept and receive (the L will accept 30 ($\beta_l = 1$) by Lemma A3. Against an L who messages h, either HM will walk out in which case she gets 70 or she will be offered 50, which she is indifferent between accepting and rejecting; suppose she rejects and receives 70. Hence, messaging h gives H a payoff of $EU_H(h) = (1 - q)70 + q35 = 70 - 35q$. So H is indifferent between messages, meaning $\tau_H = 1$ is optimal in particular.

Summarizing, for $q = \frac{1}{3}$, there is no equilibrium. For $q = \frac{1}{2}$, there is an equilibrium involving $\tau_L \approx 0.565$, $\alpha_h \approx 0.580$, $\alpha_l = 0$, $\beta_l = 1$, β_h arbitrary, $p_w \approx 0.535$, and the resulting probability of peace is

$$q^2(1 - p_w){\alpha_h}^2 +$$

$$2q(1 - q)\{(1 - \tau_L)(1 - p_w)\alpha_h + \tau_L\} +$$

$$(1 - q)^2\{(1 - \tau_L)^2(1 - p_w) + 2\tau_L(1 - \tau_L) + \tau_L^2\} \approx 0.605.$$

□

9.2 Human mediation with no incentive to walk out

For the human mediation game, why do we set the mediators payoffs as we do, as opposed to giving the mediator no incentive to walk out (i.e. giving her a payoff of 1 if an offer is accepted and a payoff of 0 otherwise)? Our main justification is the following result. Concentrating on equilibria for which $\tau_H = 1$, $r(l, l) = (50, 50)$ w.p.1, dominant acceptance strategies are taken (both players accept 70, L accepts 50, and H rejects 30), and $r(h, l) = (70, 30)$ w.p. > 0, we find that there can be no non-pooling equilibrium for $q = \frac{1}{3}$.

Proposition HM*. *For $q = \frac{1}{3}$, there is no non-pooling equilibrium in which $\tau_H = 1$, $r(l, l) = (50, 50)$ w.p. 1, and dominant acceptance strategies are taken (both players accept 70, L accepts 50, and H rejects 30), and $r(h, l) = (70, 30)$ w.p. > 0.*

To prove this proposition, we make use of the following Lemma A4 below, which is a version of Lemma A3 for this alternate specification of the mediator's payoffs. Most of the proof is identical to that of Lemma A3.

Lemma A4. *In any PBE such that $\tau_H = 1$, $r(l, l) = (50, 50)$ w.p. 1, and dominant acceptance strategies are taken: (i) if $r(h, l) = (70, 30)$ w.p. > 0, then $\beta_l = 1$ and thus $r(h, l) = (70, 30)$ is accepted w.p. 1; (ii) if $r(h, h) = (70, 30)$ w.p. > 0 (randomizing which player receives 30), then $\beta_h = 1$; (iii) if $r(h, l) = (70, 30)$ w.p. > 0, then $r(h, l) = (70, 30)$ w.p. 1; (iv) if $r(h, l) = (70, 30)$ w.p. > 0, then $\alpha_l = 0$; and (v):*

- *HM is willing to choose $r(h, h) = w$ over $r(h, h) = (70, 30)$ if and only if*

$$\tau_L = 1 \text{ or } \beta_h = 0.$$

- *HM is willing to choose $r(h,h) = w$ over $r(h,h) = (50,50)$ if and only if*

$$\tau_L = 1 \text{ and } \alpha_h = 0.$$

- *HM prefers $r(h,h) = (50,50)$ to $r(h,h) = (70,30)$ if and only if*

$$q_h^2 \alpha_h^2 + 2q_h(1 - q_h)\alpha_h + (1 - q_h)^2 \geq (1 - q_h)\beta_h,$$

where $q_h = \frac{q}{q + (1 - \tau_L)(1 - q)} \in [q, 1]$.

- *If $r(h,l) = (70,30)$ w.p. > 0 and $r(h,h) = (50,50)$ w.p. > 0, then H prefers to accept 50 after messaging h if and only if*
$$\tau_L \geq 1 - \frac{3}{4}\left(\frac{q}{1 - q}\right)\alpha_h.$$

Proof. The proofs for parts *(i)-(iv)* are exactly the same as those for parts *(i)-(iv)* of Lemma A3.

(v) For simplicity, normalize payoffs such that an accepted offer gives HM a payoff of 1 and rejection or walking out gives HM a payoff of 0. Let uW_{hh}, $u50_{hh}$, and $u70_{hh}$ be HM's expected payoffs from walking out, offering $(50,50)$, and offering $(70,30)$, respectively, after observing (h,h). These are given as

$$uW_{hh} = 0,$$

$$u50_{hh} = [q_h^2 \alpha_h^2 + 2q_h(1 - q_h)\alpha_h + (1 - q_h)^2],$$

$$u70_{hh} = [(1 - q_h)\beta_h].$$

HM is willing to choose $r(h,h) = w$ over $r(h,h) = (70,30)$ if and only if

$$0 \geq (1 - q_h)\beta_h \iff$$
$$q_h = 1 \text{ or } \beta_h = 0 \iff$$
$$\tau_L = 1 \text{ or } \beta_h = 0,$$

where we have used that, given $\tau_H = 1$, $q_h = 1 \iff \tau_L = 1$.

HM is willing to choose $r(h, h) = w$ over $r(h, h) = (50, 50)$ if and only if

$$0 \geq [q_h^2 \alpha_h^2 + 2q_h(1 - q_h)\alpha_h + (1 - q_h)^2] \iff$$

$$q_h = 1 \text{ and } \alpha_h = 0 \iff$$

$$\tau_L = 1 \text{ and } \alpha_h = 0,$$

where, again, we have used that, given $\tau_H = 1$, $q_h = 1 \iff \tau_L = 1$. The remaining indifference condition for HM and the indifference condition for Hh to accept 50 are derived exactly as in Lemma A3. $\square$

Proof of Proposition HM*. We search for equilibria in undominated strategies in which $\tau_H = 1$, $r(l, l) = (50, 50)$ w.p. 1, $r(h, l) = (70, 30)$ w.p. > 0, and $\tau_L > 0$, i.e., non-pooling equilibria. In such an equilibrium, by Lemma A4, it must be that $r(h, l) = (70, 30)$ w.p. 1, $\beta_l = 1$, and $\alpha_l = 0$.

For any equilibrium in this class, HM's strategy is determined up to what she does following (h, h). The proof proceeds by going through all HM's possible strategies following (h, h) and determining if the strategy can be supported in an equilibrium with the necessary features.

Case 1: $r(h, h) = w$ w.p. 1.

From Lemma A4, in order for HM to be willing to do this, it must be that $\tau_L = 1$; and it also must be that $\beta_l = 1$. Thus, L's payoff from messaging l is such that she receives 30 against an H type and 50 against an L type for a payoff of $30q + 50(1 - q) = 50 - 20q$. If instead, she lies and messages h, she will receive 0 against an H type and 70 against an L type for a payoff of $0q + 70(1 - q) = 70 - 70q$. Hence, when $q = \frac{1}{3}$, the L-type prefers to lie and there is no equilibrium.

Case 2: $r(h, h) = (50, 50)$ w.p. 1.

From Lemma A4, in order for HM to be willing to do this, it must be that

$$q_h^2 \alpha_h^2 + 2q_h(1 - q_h)\alpha_h + (1 - q_h)^2 \geq (1 - q_h)\beta_h.$$

If $\alpha_h = 1$, this is satisfied (the LHS equals 1), but then L's optimal strategy would involve messaging h w.p. 1, i.e. $\tau_L = 0$.

If $\alpha_h = 0$, then the condition becomes

$$(1 - q_h)^2 \geq (1 - q_h)\beta_h,$$

which may be satisfied for sufficiently low β_h. Can it be that $\tau_L = 1$? Since H must reject 50, this cannot be for $q = \frac{1}{3}$ since this then effectively becomes Case 1 in which h, h leads to rejection w.p. 1: the same expressions govern L's payoffs for each message, and she would prefer to lie and message h. What about $\tau_L \in (0, 1)$? This requires that $EU_L(l) = EU_L(h)$ (X refers to payoffs conditional on reaching off-path nodes, which do not matter):

$$
\begin{aligned}
EU_L(l) &= q \cdot \{\tau_H \cdot 30 + (1 - \tau_H)X\} + (1 - q)\{\tau_L \cdot 50 + (1 - \tau_L) \cdot 30\} \\
&= q \cdot \{30\} + (1 - q)\{\tau_L \cdot 50 + (1 - \tau_L) \cdot 30\} \\
&= q \cdot \{30\} + (1 - q)\{30 + 20 \cdot \tau_L\} \\
&= 30q + 30 + 20 \cdot \tau_L - 30q - 20\tau_L q \\
&= 30 + 20\tau_L - 20\tau_L q
\end{aligned}
$$

and

$$
\begin{aligned}
EU_L(h) &= q \cdot \{\tau_H \cdot 50 \cdot \alpha_h + (1 - \tau_H)X\} + (1 - q)\{\tau_L \cdot 70 + (1 - \tau_L) \cdot 50\} \\
&= q50 \cdot \alpha_h + (1 - q)(50 + 20\tau_L) \\
&= q50 \cdot \alpha_h + 50 + 20\tau_L - 50q - 20\tau_L q,
\end{aligned}
$$

and thus

$$EU_L(l) = EU_L(h) \iff$$

$$30 + 20\tau_L - 20\tau_L q = q50 \cdot \alpha_h + 50 + 20\tau_L - 50q - 20\tau_L q \iff$$

$$50q = q50 \cdot \alpha_h + 20 \iff$$

$$\alpha_h = \frac{50q - 20}{50q} = \begin{cases} \frac{1}{5} & q = \frac{1}{2} \\ -\frac{1}{5} & q = \frac{1}{3}, \end{cases}$$

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and this is not possible for $q = \frac{1}{3}$.

If $\alpha_h \in (0,1)$, then it must be that H who messages h is indifferent between accepting or rejecting 50. Since $r(h,h) = (50,50)$ is offered w.p. > 0, the condition for this is $\tau_L = 1 - \frac{3}{4}(\frac{q}{1-q})\alpha_h$, which implies that $\tau_L \in (0,1)$, and so it must be that $EU_L(l) = EU_L(h)$. But the above expression shows that this is not possible for $q = \frac{1}{3}$

Case 3: $r(h,h) = (70,30)$ w.p. 1.

That $r(h,h) = (70,30)$ w.p. > 0 implies that $\beta_h = 1$ from Lemma A4. The lemma then implies that, in order for HM to be willing to offer $r(h,h) = (70,30)$, it must be that

$$(1 - q_h) \geq q_h^2 \alpha_h^2 + 2q_h(1 - q_h)\alpha_h + (1 - q_h)^2.$$

This is satisfied if α_h is sufficiently low, which we can set since H who messages h is never offered 50, and so low α_h is optimal given some beliefs (i.e. if the opponent is L with sufficiently high probability). Is it possible that L is willing to sometimes message l so that $\tau_L > 0$? This requires that $EU_L(l) \geq EU_L(h)$ (X refers to payoffs conditional on reaching off-path nodes, which do not matter):

$$
\begin{aligned}
EU_L(l) &= q \cdot \{\tau_H \cdot 30 + (1 - \tau_H)X\} + (1 - q)\{\tau_L \cdot 50 + (1 - \tau_L) \cdot 30\} \\
&= q \cdot \{30\} + (1 - q)\{\tau_L \cdot 50 + (1 - \tau_L) \cdot 30\} \\
&= q \cdot \{30\} + (1 - q)\{30 + 20 \cdot \tau_L\} \\
&= 30q + 30 + 20 \cdot \tau_L - 30q - 20 \cdot \tau_L q \\
&= 30 + 20 \cdot \tau_L - 20 \cdot \tau_L q
\end{aligned}
$$

and

$$
\begin{aligned}
EU_L(h) &= q \cdot \{\tau_H(\frac{1}{2}30 + \frac{1}{2}0) + (1 - \tau_H)X\} + (1 - q)\{\tau_L \cdot 70 + (1 - \tau_L) \cdot (\frac{1}{2}30 + \frac{1}{2}70)\} \\
&= q \cdot 15 + (1 - q)\{\tau_L \cdot 70 + (1 - \tau_L) \cdot (50)\} \\
&= q \cdot 15 + (1 - q)\{50 + 20\tau_L\} \\
&= q \cdot 15 + 50 + 20\tau_L - 50q - 20\tau_L q \\
&= -35q + 50 + 20\tau_L - 20\tau_L q,
\end{aligned}
$$

and thus

$$EU_L(l) \geq EU_L(h) \iff$$

$$30 + 20\tau_L - 20\tau_L q \geq -35q + 50 + 20\tau_L - 20\tau_L q \iff$$

$$0 \geq 20 - 35q \iff$$

$$35q \geq 20 \iff$$

$$q \geq \frac{4}{7},$$

and this is false. Hence, any such equilibrium involves $\tau_L = 0$.

Case 4: HM mixes between $r(h, h) = w$, $r(h, h) = (50, 50)$, and $r(h, h) = (70, 30)$.

From Lemma A4, in order for HM to be willing to do this, it must be that

$$\tau_L = 1 \text{ and } \alpha_h = 0.$$

Can it be that $\tau_L = 1$? Since H must always reject 30 and 50, this cannot be for $q = \frac{1}{3}$ since this then effectively becomes Case 1 in which (h, h) leads to rejection w.p. 1: the same expressions govern L's payoffs for each message, and she would prefer to lie and message h.

Case 5: HM mixes between $r(h, h) = w$ and $r(h, h) = (50, 50)$.

From Lemma A4, in order for HM to be willing to do this, it must be that

$$\tau_L = 1 \text{ and } \alpha_h = 0,$$

Can it be that $\tau_L = 1$? Since H must reject 50, this cannot be for $q = \frac{1}{3}$ since this then effectively becomes Case 1 in which (h, h) leads to rejection w.p. 1: the same expressions govern L's payoffs for each message, and she would prefer to lie and message h.

Case 6: HM mixes between $r(h, h) = w$ and $r(h, h) = (70, 30)$.

From Lemma A4, in order for HM to be willing to do this, it must be that

$$\tau_L = 1 \text{ or } \beta_h = 0$$

Can it be that $\tau_L = 1$? Since H must always reject 30, this cannot be for $q = \frac{1}{3}$ since this then

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effectively becomes Case 1 in which (h, h) leads to rejection w.p. 1: the same expressions govern L's payoffs for each message, and she would prefer to lie and message h.

Case 7: HM mixes between $r(h, h) = (50, 50)$ and $r(h, h) = (70, 30)$.

That $r(h, h) = (70, 30)$ w.p. > 0 implies that $\beta_h = 1$ from Lemma A4. The lemma then implies that, in order for HM to be willing to mix between $r(h, h) = (50, 50)$ and $r(h, h) = (70, 30)$, it must be that

$$(1 - q_h) = q_h^2 \alpha_h^2 + 2q_h(1 - q_h)\alpha_h + (1 - q_h)^2.$$

If $\alpha_h = 0$, then this is satisfied only if $q_h = 1 \iff \tau_L = 1$. But then this cannot be part of an equilibrium for $q = \frac{1}{3}$ since this then effectively becomes Case 1 in which (h, h) leads to rejection w.p. 1: the same expressions govern L's payoffs for each message, and she would prefer to lie and message h.

If $\alpha_h = 1$, then the RHS of the above equals 1, and so it cannot be satisfied given $\tau_H = 1 \implies q_h > 0$.

Hence, we require that $\alpha_h \in (0, 1)$. Since $r(h, h) = (50, 50)$ is offered w.p. > 0, the condition that must be satisfied is

$$\tau_L = 1 - \frac{3}{4}\left(\frac{q}{1 - q}\right)\alpha_h,$$

which implies

$$q_h = \frac{q}{q + (1 - \tau_L)(1 - q)} = \frac{1}{1 + \frac{3}{4}\alpha_h} = \frac{4}{4 + 3\alpha_h}.$$

Plugging into HM's indifference condition, letting $q = \frac{1}{3}$, and numerically solving yields

$$\alpha_h^* \approx 0.300 \text{ and } \tau_L^* \approx 0.887.$$

Since L must be indifferent between both messages, a necessary condition for equilibrium is that $p50_{hh} \in (0, 1)$, the probability with which $r(h, h) = (50, 50)$, is such that $EU_L(l) = EU_L(h)$ (X refers to payoffs conditional on reaching off-path nodes, which do not matter):

$$EU_L(l) = q \cdot \{\tau_H \cdot 30 + (1 - \tau_H)X\} + (1 - q)\{\tau_L^* \cdot 50 + (1 - \tau_L^*) \cdot 30\}$$

$$= q \cdot \{30\} + (1 - q)\{\tau_L^* \cdot 50 + (1 - \tau_L) \cdot 30\}$$

$$= q \cdot \{30\} + (1 - q)\{30 + 20 \cdot \tau_L^*\}$$

$$= 30q + 30 + 20 \cdot \tau_L^* - 30q - 20 \cdot \tau_L^* q$$

$$= 30 + 20 \cdot \tau_L^* - 20 \cdot \tau_L^* q$$

and

$$EU_L(h) = q \cdot \{\tau_H(p50_{hh} \cdot 50 \cdot \alpha_h^* + (1 - p50_{hh})(\frac{1}{2}30 + \frac{1}{2}0)) + (1 - \tau_H)X\}$$

$$+ (1 - q)\{\tau_L^* \cdot 70 + (1 - \tau_L^*)(p50_{hh} \cdot 50 + (1 - p50_{hh})(\frac{1}{2}30 + \frac{1}{2}70))\}$$

$$= q \cdot \{\tau_H(p50_{hh} \cdot 50 \cdot \alpha_h^* + (1 - p50_{hh})(15)) + (1 - \tau_H)X\}$$

$$+ (1 - q)\{\tau_L^* \cdot 70 + (1 - \tau_L^*)(p50_{hh} \cdot 50 + (1 - p50_{hh})(50))\}$$

$$= q \cdot \{p50_{hh} \cdot 50 \cdot \alpha_h^* + 15 - 15 \cdot p50_{hh}\} + (1 - q)\{50 + 20\tau_L^*\}$$

$$= p50_{hh}\{50\alpha_h^* - 15\}q + \{15q + (1 - q)(50 + 20\tau_L^*)\}$$

$$= p50_{hh}\{50\alpha_h^* - 15\}q + \{50 - 35q + 20\tau_L^* - 20\tau_L^* q\},$$

and thus

$$EU_L(h) - EU_L(l) = p50_{hh}\{50\alpha_h^* - 15\}q + \{20 - 35q\},$$

which is greater than zero for all $p50_{hh} \in [0, 1]$. This means that there does not exist $p50_{hh} \in (0, 1)$ such that $EU_L(l) - EU_L(h)$, and so there is no such equilibrium. □

9.3 Unmediated communication in the lab: equilibria

We focus on equilibria in undominated strategies where no player demands w, and, given $\theta/2 > 1 - \theta$, H types never demand $1 - \theta$. The logic guiding the characterization of the equilibria is straightforward. Whether different demand strategies are best responses to each other depends on the posterior probabilities of the opponent's types, given the messages. The necessary restrictions

on the posterior probabilities amount to restrictions on the probabilities τ_T and σ_T. In equilibrium, messages are random, and both types are indifferent over sending any of the three messages. Denote by $\delta_d(T, m, m')$ the probability that type T who has sent message m and received message m' demands d. Then:

Proposition A2.

(1) *For any $q < (2\theta - 1)/\theta$, $\theta/2 > 1 - \theta$, there exist equilibria in undominated strategies such that, at the demand stage:*

$$\delta_\theta(H, m, m') = 1 \ \text{for all} \ m, m'$$

$$\delta_\theta(L, m, m') = 1 - \delta_{1-\theta}(L, l, m') = 2\left(1 - \frac{1 - \theta}{\theta(1 - \pi_m)}\right)$$

where π_m is the posterior probability that a player who sent message m is of type H, or:

$$\pi_l = \frac{(1 - \sigma_H - \tau_H)q}{(1 - \sigma_H - \tau_H)q + \tau_L(1 - q)}; \quad \pi_h = \frac{q\tau_H}{q\tau_H + (1 - q)(1 - \sigma_L - \tau_L)}; \quad \pi_s = \frac{q\sigma_H}{q\sigma_H + (1 - q)\sigma_L}.$$

At the message stage, $(\tau_L + \sigma_L) \in (0, 1)$, $\sigma_L > 0$, and for any such τ_L and σ_L, τ_H and σ_H satisfy the constraints

$$\tau_H \geq \max\left[\left(\frac{3\theta - 2}{2(1 - \theta)}\right)\left(\frac{1 - q}{q}\right)(1 - \sigma_L - \tau_L), 1 - \sigma_H - \left(\frac{2\theta - 1}{1 - \theta}\right)\left(\frac{1 - q}{q}\right)\tau_L\right] \quad (16)$$

$$\tau_H \leq \min\left[\left(\frac{2\theta - 1}{1 - \theta}\right)\left(\frac{1 - q}{q}\right)(1 - \sigma_L - \tau_L), 1 - \sigma_H - \left(\frac{3\theta - 2}{2(1 - \theta)}\right)\left(\frac{1 - q}{q}\right)\tau_L\right]$$

$$\sigma_H \in \left[\left(\frac{3\theta - 2}{2(1 - \theta)}\right)\left(\frac{1 - q}{q}\right)\sigma_L, \left(\frac{2\theta - 1}{1 - \theta}\right)\left(\frac{1 - q}{q}\right)\sigma_L\right]$$

$(\tau_H + \sigma_H) \in (0, 1)$.

Given θ and q, the ex ante probability of peace, P is constant and given by:

$$P = \frac{[\theta(5 - q) - 2][2 - \theta(3 - q)]}{\theta^2}.$$

(2) *If $q \leq 2\theta - 1$, there exist equilibria in undominated strategies such that, at the demand stage:*

$$\delta_\theta(H, m, m') = 1 \text{ for all } m, m'$$

$$\delta_{1/2}(L, m, m') = 1 \text{ for all } m, m'$$

At the message stage, $(\tau_L + \sigma_L) \in (0, 1)$, $\sigma_L > 0$, and for any such τ_L and σ_L, τ_H and σ_H satisfy the constraints

$$\tau_H \in \left[1 - \sigma_H - \left(\frac{2\theta - 1}{1 - \theta} \right) \left(\frac{1 - q}{q} \right) \tau_L, \left(\frac{2\theta - 1}{1 - \theta} \right) \left(\frac{1 - q}{q} \right) (1 - \sigma_L - \tau_L) \right]$$

$$\sigma_H \leq \left(\frac{2\theta - 1}{1 - \theta} \right) \left(\frac{1 - q}{q} \right) \sigma_L \tag{17}$$

$$(\tau_H + \sigma_H) \in (0, 1).$$

The ex ante probability of peace is $P = (1 - q)^2$.

Proof.

The logic of the proof is straightforward, but the derivation is cumbersome. We begin by proving result (1). It is convenient to start by ignoring the option of silence.

(1). Step 1. Suppose $m \in \{l, h\}$ only. Denote by $S_{T, m|m'}(x)$ the expected share of a player of type T who sent message m, received message m' and demands x, where $x \in X = \{1 - \theta, 1/2, \theta\}$, the set of possible (undominated) demands. Ignoring silence, there are eight different $(T, m|m')$ combinations, which we distinguish by labels: $A \equiv (L, l|l)$; $B \equiv (L, l|h)$; $C \equiv (L, h|l)$; $D \equiv (L, h|h)$; $E \equiv (H, h|l)$; $F \equiv (H, h|h)$; $G \equiv (H, l|l)$; $R \equiv (H, l|h)$. These labels correspond to the information state a player moves from when expressing a demand, including the player's privately known type, and can be used to identify players at that stage of the game. Call α_x the probability that A demands x, and similarly for the other labels: β_x for B, κ_x for C, δ_x for D, η_x for E, φ_x for F, γ_x for G, and ρ_x for R. Because labels depend on the messages exchanged, only some matches are possible: A can be matched either with another A or with a G (and similarly G can only be matched with A or with another G); D can be matched either with another D or with an F (and similarly F can only be matched with D or with another F); B can be matched with either E or C, C can be matched with either B or R, R can be matched with either C or E, and finally E can be matched with either R or B.

Characterizing demand strategies, as function of type and messages, amounts to comparing expected shares for different demands, taking into account the possible matches and the opponent's expected demand. Which demand results in a higher expected share depends on the demand strategy used by the opponent and on the posterior probabilities of the different types, given the messages. Two preliminary observations are useful: (1) Any player can guarantee herself $1 - \theta$ by demanding it. (2) Given $\theta/2 > 1 - \theta$ and the restriction on players never playing w, demanding $1 - \theta$ is dominated for any H player (since war against an L yields θ, and war against an H yields $\theta/2 > 1 - \theta$). Demands of $1 - \theta$ by H players are ignored in what follows.

Thus, for example, A and G's expected shares for different demands are given by:

$$S_A(1 - \theta) = 1 - \theta,$$

$$S_A(1/2) = \pi_l(1 - \gamma_\theta)/2 + (1 - \pi_l)[(1 - \alpha_\theta)/2 + \alpha_\theta(\theta/2)],$$

$$S_A(\theta) = \pi_l(1 - \gamma_{1/2} - \gamma_\theta)\theta + (1 - \pi_l)[\theta(1 - \alpha_{1/2} - \alpha_\theta) + (\alpha_{1/2} + \alpha_\theta)(\theta/2)],$$

$$S_G(1/2) = \pi_l[(1 - \gamma_\theta)/2 + \gamma_\theta(\theta/2)] + (1 - \pi_l)[(1 - \alpha_\theta)/2 + \alpha_\theta \theta],$$

$$S_G(\theta) = \pi_l[(1 - \gamma_\theta)\theta + \gamma_\theta(\theta/2)] + (1 - \pi_l)\theta,$$

where, in the absence of silence, π_l, the posterior probability that the opponent is H after the opponent has sent message l, is given by:

$$\pi_l = \frac{q(1 - \tau_H)}{q(1 - \tau_H) + (1 - q)\tau_L}.$$

Note that if $\tau_H = 1 - \tau_L$ the messages are fully uninformative, and $\pi_l = \pi_h = q$.

In characterizing equilibria that are relevant for the lab, allowing for a small but positive probability of any message is a simple and realistic means of guaranteeing that posterior probabilities are always well-defined. In other words, we select equilibria such that any information state allowed by the structure of the game is reached with positive probability along the equilibrium path. When silence is ruled out, we impose $\tau_L \in (0, 1)$, with open bounds.

The equations corresponding to the other labels can be written in similar fashion and are not reported here.

Demand stage.

At the demand stage, given messages, the following demands are mutual best responses.

A and G: (1) G demands θ; A demands θ if $\pi_l \leq (3\theta - 2)/\theta$, mixes between θ and $1 - \theta$ if $\pi_l \in ((3\theta - 2)/\theta, (2\theta - 1)/\theta)$, and demands $1 - \theta$ if $\pi_l \geq (2\theta - 1)/\theta$. (2) G demands θ; A demands $1/2$ if $\pi_l \leq 2\theta - 1$. (3) G demands $1/2$; A demands $1/2$ if $\pi_l \geq (2\theta - 1)/\theta$.

D and F: (1) F demands θ; D demands θ if $\pi_h \leq (3\theta - 2)/\theta$, mixes between θ and $1 - \theta$ if $\pi_h \in ((3\theta - 2)/\theta, (2\theta - 1)/\theta)$, and demands $1 - \theta$ if $\pi_h \geq (2\theta - 1)/\theta$. (2) F demands θ; D demands $1/2$ if $\pi_h \leq 2\theta - 1$. (3) F demands $1/2$; D demands $1/2$ if $\pi_h \geq (2\theta - 1)/\theta$.

B, C, R and E: (1) Both E and R demand θ, B demands $1 - \theta$ and C demands θ if $\pi_l \leq (2\theta - 1)/\theta$ and $\pi_h \geq (3\theta - 2)/\theta$. (2) Both E and R demand θ, C demands $1 - \theta$ and B demands θ if $\pi_h \leq (2\theta - 1)/\theta$ and $\pi_l \geq (3\theta - 2)/\theta$. (3) Both E and R demand θ, and both B and C mix between $1 - \theta$ and θ if $\pi_h \in [(3\theta - 2)/\theta, (2\theta - 1)/\theta]$ and $\pi_l \in [(3\theta - 2)/\theta, (2\theta - 1)/\theta]$. (4) Both E and R demand θ, B and C demand $1/2$ if $\pi_l \leq 2\theta - 1$ and $\pi_h \leq 2\theta - 1$.

Message stage

Consider now the problem for an L and an H type, choosing which message to send at the message stage. The objective is to maximize the expected share of the pie, which we now denote as $S_T(m)$ for a player of type T who sends message m. We use the symbol $\widehat{S}_Y$ to indicate the expected share of player with label Y at the allocation stage under mutual best response demand strategies. Thus:

$$
\begin{aligned}
S_L(l) &= [(1 - q)\tau_L + q(1 - \tau_H)]\widehat{S}_A + [q\tau_H + (1 - q)(1 - \tau_L)]\widehat{S}_B \\
S_L(h) &= [(1 - q)\tau_L + q(1 - \tau_H)]\widehat{S}_C + [q\tau_H + (1 - q)(1 - \tau_L)]\widehat{S}_D \qquad (18) \\
S_H(h) &= [(1 - q)\tau_L + q(1 - \tau_H)]\widehat{S}_E + [q\tau_H + (1 - q)(1 - \tau_L)]\widehat{S}_F \\
S_H(l) &= [(1 - q)\tau_L + q(1 - \tau_H)]\widehat{S}_G + [q\tau_H + (1 - q)(1 - \tau_L)]\widehat{S}_R.
\end{aligned}
$$

The terms in square brackets are the probabilities of being matched with an opponent who sends message l (the first term) or h (the second term).

Equilibria

Consider the following candidate equilibria: $\{\tau_L \in (0, 1),\ \tau_H \in (0, 1),\ \gamma_\theta = \eta_\theta = \rho_\theta = \varphi_\theta = 1,$
$\alpha_\theta = 1 - \alpha_{1-\theta} = \beta_\theta = 1 - \beta_{1-\theta} =$
$= 2\left(1 - \frac{1-\theta}{\theta(1-\pi_l)}\right) \in (0, 1),\ \delta_\theta = 1 - \delta_{1-\theta} = \kappa_\theta = 1 - \kappa_{1-\theta} = 2\left(1 - \frac{1-\theta}{\theta(1-\pi_h)}\right) \in (0, 1)\}$. That is, a set of equilibria indexed by τ_L and τ_H where: all H types always demand θ at the demand stage, regardless of messages; all L types mix between demanding $1 - \theta$ and demanding θ at the

demand stage, with strictly positive mixing probabilities that depend on the message sent; all types, L and H, send an untruthful message with positive probability. If such an equilibrium exists, then $\widehat{S}_A = \widehat{S}_B = \widehat{S}_C = \widehat{S}_D = 1 - \theta$, $\widehat{S}_G = \widehat{S}_E = \pi_l(\theta/2) + (1 - \pi_l)\theta$, and $\widehat{S}_F = \widehat{S}_R = \pi_h(\theta/2) + (1 - \pi_h)\theta$. It follows from (18) above that randomizing between a truthful and untruthful message is indeed a best response. From the analysis of the demand strategies above, we know that the conjectured solution imposes constraints on the posterior probabilities π_h and π_l. More precisely, we require:

$$\pi_h \in [(3\theta - 2)/\theta, (2\theta - 1)/\theta] \tag{19}$$

$$\pi_l \in [(3\theta - 2)/\theta, (2\theta - 1)/\theta].$$

For any $\tau_L \in (0,1)$, ruling out silence, conditions (19) correspond to the restrictions on τ_H identified in Proposition A2 (inequalities (16), with $\sigma_H = \sigma_L = 0$).

Finally, call p the probability that an L player demands $(1 - \theta)$, unconditional on message, or:

$$p \equiv 1 - \tau_L\alpha_\theta - (1 - \tau_L)\delta_H.$$

Given $\alpha_\theta = 2\left(1 - \frac{1-\theta}{\theta(1-\pi_l)}\right)$ and $\delta_\theta = \left(1 - \frac{1-\theta}{\theta(1-\pi_h)}\right)$, we find:

$$p = \frac{2 - \theta(3 - q)}{\theta(1 - q)} = p(\theta, q).$$

The probability that an L player demands $(1 - \theta)$ depends on q and θ, but not on the message sent: even when the message is informative, that is, away from the babbling line $\tau_H = 1 - \tau_L$, the mixing probabilities at the demand stage effectively nullify the information provided by the message. The probability of the opponent demanding $(1 - \theta)$ does not vary with the message. Hence neither does the ex ante probability of peace, denoted by P:

$$P = 2q(1 - q)p + (1 - q)^2[1 - (1 - p)^2]$$
$$= \frac{[\theta(5 - q) - 2][2 - \theta(3 - q)]}{\theta^2}.$$

The semi-pooling equilibria where types partially distinguish themselves through their messages do not have higher peace than the corresponding equilibria with babbling,[47] or in the absence of com-

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[47]We say "corresponding" equilibria with babbling because we have not ruled out other equilibria where the messages

munication.

<u>Step 2. Adding silence: $\sigma_L > 0$, $\sigma_H > 0$.</u>

Adding silent messages does not affect the logic of the derivation above. It complicates the analysis because new information states must be considered at the demand stage, reflecting players who either received or sent (or both sent and received) a silent message. Consider for example a player labeled $A_{s2}(L, l|s)$, an L player who sent an l message and received a silent message. A_{s2} can be matched either with $A_{s1}(L, s|l)$ or with $G_{s1}(H, s|l)$ (with index $s1$ denoting a player who sent a silent message, and $s2$ denoting a player who received it). Replicating the steps above, it is not difficult to verify that mixing between $d = 1 - \theta$ and $d = \theta$ is a best response for A_{s2} if G_{s1} demands θ with certainty and A_{s1} randomizes between θ (with probability α_{s1}) and $1 - \theta$ (with probability $1 - \alpha_{s1}$) as long as:

$$\alpha_{s1} = 2 \left(1 - \frac{1 - \theta}{\theta(1 - \pi_s)} \right) \in [0, 1]$$

where π_s is the posterior probability that an opponent who sent a silent message is H. Or:

$$\pi_s = \frac{q\sigma_H}{q\sigma_H + (1 - q)\sigma_L}.$$

The constraint $\alpha_{s1} \in [0, 1]$ corresponds to $\pi_s \in [(3\theta - 2)/\theta, (2\theta - 1)/\theta]$, or:

$$\sigma_H \in \left[\frac{3\theta - 2}{2(1 - \theta)} \left(\frac{1 - q}{q} \right) \sigma_L, \frac{2\theta - 1}{1 - \theta} \left(\frac{1 - q}{q} \right) \sigma_L \right] \tag{20}$$

for $\sigma_L \in [0, 1 - \tau_L]$.

Condition (20) must be satisfied, together with conditions (19). With $\sigma_L > 0$, $\sigma_H > 0$, and imposing $(\tau_H + \sigma_H) \in (0, 1)$, the conditions amount to the boundaries on τ_H and σ_H reported in Proposition A2. The boundaries continue to include the possibility of babbling: $(\tau_H = 1 - \tau_L - \sigma_L$, $\sigma_L = \sigma_H)$. Note that the open boundaries $\sigma_T > 0$, $(\tau_T + \sigma_T) \in (0, 1)$ guarantee that the all posterior probabilities are well-defined.

Now consider the message choices for an L player. Taking silence into account, expected shares become:

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are fully uninformative but are used as coordinating devices.

$$S_L(l) = [(1-q)\tau_L + q(1-\sigma_H-\tau_H)]\widehat{S}_A + [(1-q)\sigma_L + q\sigma_H]\widehat{S}_{A_{s2}} + [q\tau_H + (1-q)(1-\sigma_L-\tau_L)]\widehat{S}_B$$

$$S_L(h) = [(1-q)\tau_L + q(1-\sigma_H-\tau_H)]\widehat{S}_C + [(1-q)\sigma_L + q\sigma_H]\widehat{S}_{D_{s2}} + [q\tau_H + (1-q)(1-\sigma_L-\tau_L)]\widehat{S}_D$$

$$(21)$$

$$S_L(s) = [(1-q)\tau_L + q(1-\sigma_H-\tau_H)]\widehat{S}_{A_{s1}} + [(1-q)\sigma_L + q\sigma_H]\widehat{S}_{L_{ss}} + [q\tau_H + (1-q)(1-\sigma_L-\tau_L)]\widehat{S}_{Ds1}$$

where we use label D_{s1} for player $(L,s|h)$, D_{s2} for $(L,h|s)$, and L_{ss} for $(L,s|s)$. In the candidate equilibrium, all expected shares at the demand stage, conditional on messages and on best response demand strategies, equal $(1-\theta)$. Thus the player is indifferent over all three messages, and messages can be randomized. The same observation applies to an H player, who thus again is indifferent. The randomization over the messages is supported.

As above, call p the probability that an L player demands $(1-\theta)$, unconditional on message, or:

$$p \equiv 1 - \tau_L\alpha_\theta - \sigma_L\alpha_{\theta,s1} - (1-\tau_L-\sigma_L)\delta_H$$

where $\alpha_{\theta,s1} = 2\left(1 - \frac{1-\theta}{\theta(1-\pi_s)}\right)$ is the probability with which an L player demands θ after a silent message. Given $\alpha_\theta = 2\left(1 - \frac{1-\theta}{\theta(1-\pi_l)}\right)$ and $\delta_\theta = \left(1 - \frac{1-\theta}{\theta(1-\pi_h)}\right)$, once again we find:

$$p = \frac{2-\theta(3-q)}{\theta(1-q)} = p(\theta,q).$$

As before, p does not depend on the message sent, and hence is not affected by the possibility of a silent message. As before, even informative communication has no impact on the ex ante probability of peace P:

$$P = \frac{[\theta(5-q)-2][2-\theta(3-q)]}{\theta^2}.$$

(2). Result (2) follows from the identical logic. It is not difficult to verify that, at the demand stage, all H players demanding θ and all L players demanding $1/2$ are mutual best responses if $\pi_l \leq 2\theta-1$, $\pi_h \leq 2\theta-1$, and, when incorporating the possibility of silence, $\pi_s \leq 2\theta-1$. The inequalities correspond to constraints (17) in the proposition. As long as these constraints are satisfied, messages are irrelevant and mixing over messages is indeed a best response at the message stage. $\square$

With $\theta = 0.7$, conditions (16) become:

$$\tau_H \in [\max\left[(1/6)(1 - \sigma_L - \tau_L), 1 - \sigma_H - (4/3)\tau_L\right], \min[(4/3)(1 - \sigma_L - \tau_L), 1 - \sigma_H - (1/6)\tau_L]$$

$$\sigma_H \in [(1/6)\sigma_L, (4/3)\sigma_L]$$

if $q = 1/2$, and:

$$\tau_H \in [\max\left[(1/3)(1 - \sigma_L - \tau_L), 1 - \sigma_H - (8/3)\tau_L\right], \min[(8/3)(1 - \sigma_L - \tau_L), 1 - \sigma_H - (1/3)\tau_L]$$

$$\sigma_H \in [(1/3)\sigma_L, (8/3)\sigma_L]$$

if $q = 1/3$.

The constraints corresponding to the second equilibrium, if $q = 1/3$, are reported in the text.

9.4   Additional Experimental Results

9.4.1   Sincerity and Peace in UC and CM, between Subjects

We report in Figures 14 and 15 evidence on sincerity and the frequency of peace in UC and CM, comparing sessions where the two treatments are played by subjects in rounds 11-30, i.e. just after the NC treatment, and with the same experience.
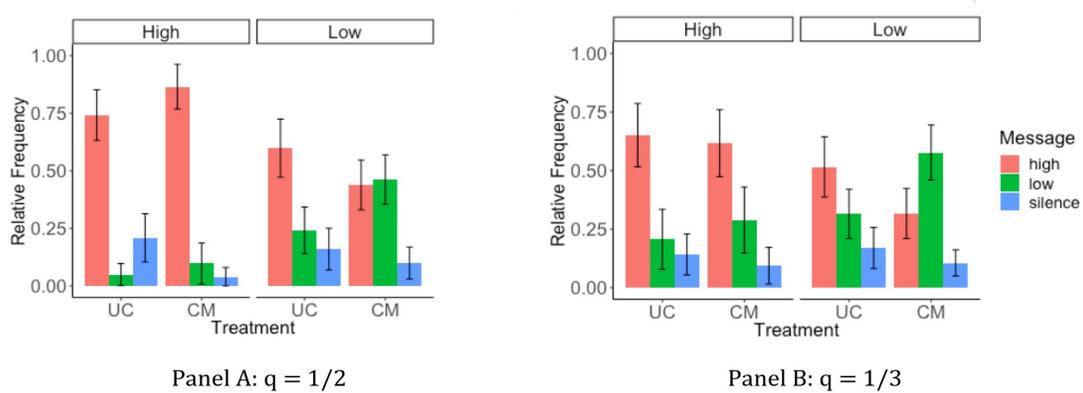

Panel A: q = 1/2   Panel B: q = 1/3

Figure 14: UC and CM: sincerity with equal experience.

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<div align="center">Panel A: q = 1/2   Panel B: q = 1/3</div>
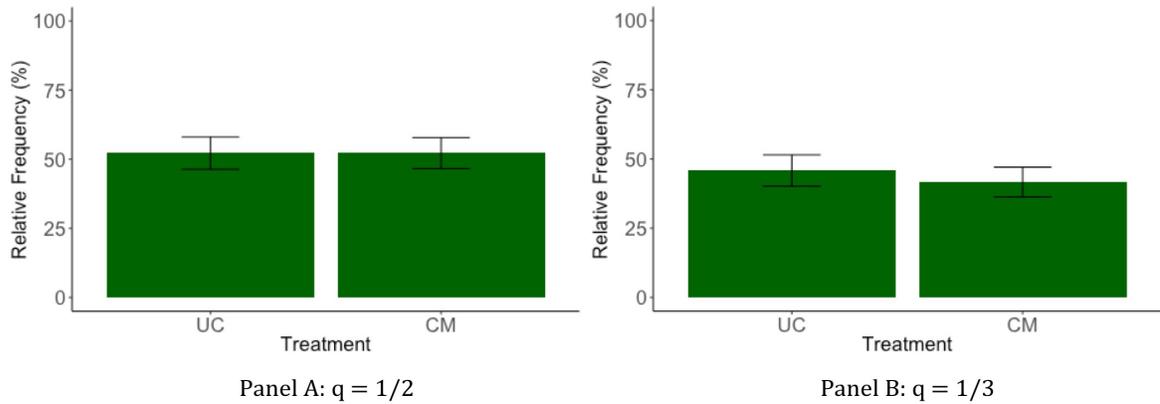
<div align="center">Figure 15: UC and CM: frequency of peace with equal experience.</div>

9.4.2   Peace Regressions with Full Interactions Terms and by Treatments

We report in Table 6 the results of a linear regression of the frequency of peace on treatment, param-eterization, types-pair, order, and round as in Table 2 in the text but with the full set of interaction terms. The substantive results are unchanged but the regression clarifies two points: first, HM's lower frequency of peace is particularly noticeable with $L - L$ pairs, where the negative effect is not only very significant statistically but also large quantitatively; second, it is $L - L$ pairs again, and only $L - L$ pairs, that drive the small but positive effect of learning identified in Table 2.

In the text, we concluded the description of Table 2 by remarking that the frequency of peace was significantly higher under $q = 1/2$ than under $q = 1/3$. The result is shown more transparently in regressions specialized by treatment, Table 7 below. Recall that although higher frequency of peace when the probability of H type realizations is higher is superficially counterintuitive, the result is in line with the theory. It is predicted in the HMS equilibrium under CM and in all the equilibria our analysis selects under both HM and UC.

<div align="center">85</div>

	Dependent variable:
	Peace
HM Treatment	0.082**
	(0.037)
CM Treatment	−0.028
	(0.032)
Order 2	0.066**
	(0.029)
$q = 1/2$	0.154***
	(0.025)
H-L pair	0.322***
	(0.049)
L-L pair	0.635***
	(0.053)
Round	0.0002
	(0.001)
HM Treatment $\times$ H-L pair	−0.129***
	(0.047)
CM Treatment $\times$ H-L pair	0.011
	(0.040)
HM Treatment $\times$ L-L pair	−0.300***
	(0.047)
CM Treatment $\times$ L-L pair	0.016
	(0.042)
Order 2 $\times$ H-L pair	−0.082**
	(0.035)
Order 2 $\times$ L-L pair	−0.050
	(0.037)
$q = 1/2 \times H$-L pair	0.066**
	(0.033)
$q = 1/2 \times L$-L pair	−0.002
	(0.033)
Round $\times$ H-L pair	0.0002
	(0.001)
Round $\times$ L-L pair	0.002**
	(0.001)
Constant	0.017
	(0.037)
Observations	4,320
R^2	0.206
Adjusted R^2	0.203
Residual Std. Error	0.446 (df = 4302)

Note:	*p<0.1; **p<0.05; ***p<0.01

The default treatment is UC, Order 1, $q = 1/3$, and when looking at different pair types, the default pair is H-H. Standard errors are clustered by pairs of subjects.

Table 6: Peace with Interactions.

	Dependent variable:		
	Peace		
	(UC)	(HM)	(CM)
Order 2	0.235**	0.001	−0.110
	(0.115)	(0.028)	(0.117)
$q = 1/2$	0.078***	0.099***	0.083***
	(0.030)	(0.028)	(0.028)
Round	−0.003	−0.003**	−0.001
	(0.002)	(0.002)	(0.002)
Constant	0.515***	0.554***	0.553***
	(0.053)	(0.077)	(0.161)
			Observations
Observations	1,440	1,440	1,440
R^2	0.014	0.013	0.012
Adjusted R^2	0.012	0.011	0.010
Residual Std. Error (df = 1436)	0.496	0.495	0.498

Note: *p<0.1; **p<0.05; ***p<0.01

The excluded category in the regression is $q = 1/3$ under Order 1. Standard errors are clustered by pairs of subjects.

Table 7: Peace by Treatment.

9.4.3 Sincerity and information transmission: Kullback-Leibler measures

As noted in the text, how much information a message transmits depends on the use of that same message by the opposite type. We can use the Kullback-Leibler (KL) measure of dispersion to generate a summary indicator of the impact of a message on the posterior probability of a given type, relative to the prior, taking into account the use of the message by both types. For the two messages h and l, the respective KL measures are:

$$KL(h) = \Pr(H|h) \log \left(\frac{\Pr(H|h)}{\Pr(H)} \right) + \Pr(L|h) \log \left(\frac{\Pr(L|h)}{\Pr(L)} \right)$$

$$KL(l) = \Pr(H|l) \log \left(\frac{\Pr(H|l)}{\Pr(H)} \right) + \Pr(L|l) \log \left(\frac{\Pr(L|l)}{\Pr(L)} \right).$$

KL measures are always non-negative and equal 0 when the posterior equals the prior (no information has been conveyed). In our setting, maximal values are $-\log(q)$ for $KL(h)$ and $-\log(1-q)$ for $KL(l)$.

Figure 16 reports, for the three treatments and the two parameterizations, the corresponding KL measures for messages l and h, expressed as fractions of the maximum value for each parameterization and averaged over the relevant sessions.
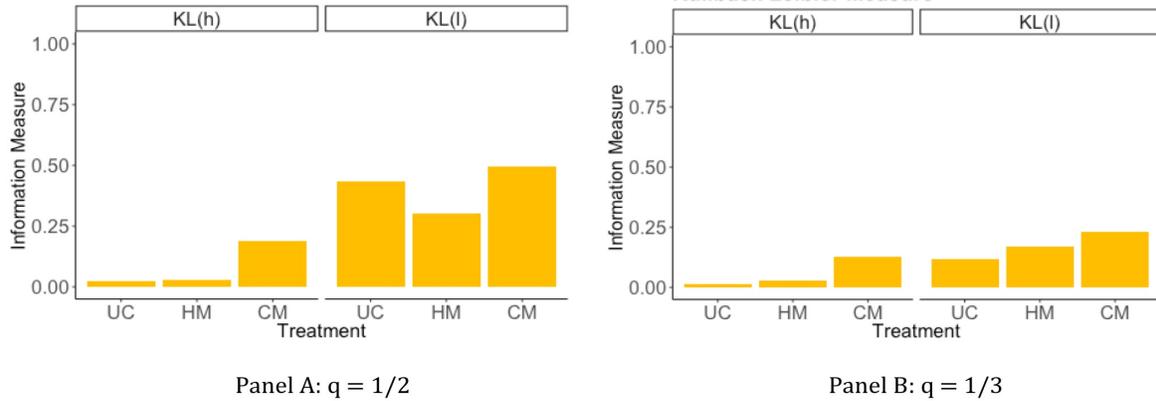

Figure 16: KL measures.

Although it remains true that the treatment conveying most information is CM, the lesson from

the KL measures is more nuanced than Figure 2 in the text and Figure 14 above suggest. The high sincerity of the H types does not translate into high information from the h message, since the same message is also used by the L types. Message l on the other hand, is more informative even though sincerity is less common among L's because few are the H types who send message l. The importance of the interaction in the use of the messages between the two types becomes very clear when comparing the two parameterizations. Even though L's tend to be more sincere with $q = 1/3$, the more common use of message l by H types severely reduces the information transmitted by the messages, relative to the $q = 1/2$ parameterization.

9.4.4 The No Communication (NC) rounds

All subjects started a session by playing 10 rounds of the unmediated treatment without any communication. After being matched in pairs and independently assigned types, each subject submitted a demand in the set $\{1 - \theta, 1/2, \theta, w\}$; if the two demands were compatible, the resource was split accordingly, if not, conflict followed, the resource shrank to θ and was split according to the subjects' types–$\theta/2$ to each if the types were equal, θ to H and 0 to L otherwise.

These initial 10 rounds were always played before any other treatment and had the goal of familiarizing subjects with the computer interface and the bargaining game, in a simpler environment. For completeness, we briefly report here the theoretical results for the NC game as well as the main regularities observed in the data.

As mentioned in the text, the UC equilibrium demand strategies described in Section 6.2 are equilibrium demand strategies under NC if the posterior probability of the opponent being H is set equal to the prior, i.e. to q. Denoting by $\delta_d(T)$ the probability that type T demands d, and by P the ex ante probability of peace, the equilibria under NC are as follows:

$\underline{q = 1/2.}$ *There is a unique equilibrium:* $\delta_{70}(H) = 1; \delta_{70}(L) = 0.29$ *and* $\delta_{30}(L) = 0.71;$ $P = 0.586.$

$\underline{q = 1/3.}$ *There are three equilibria: (1)* $\delta_{70}(H) = 1; \delta_{50}(L) = 1;$ $P = 0.444.$ *(2)* $\delta_{70}(H) = 1; \delta_{70}(L) = 0.71$ *and* $\delta_{30}(L) = 0.29;$ $P = 0.345.$ *(3)* $\delta_{70}(H) = 1; \delta_{70}(L) = 0.33,$ $\delta_{50}(L) = 0.38,$ *and* $\delta_{30}(L) = 0.29;$ $P = 0.409.$

The equilibrium under $q = 1/2$, as well as the first two equilibria under $q = 1/3$ can be obtained from the UC equilibria discussed in Section 6.2. We have not attempted to characterize a UC equilibrium under $q = 1/3$ that would parallel the third equilibrium above.

The frequency of peace observed in the data is 0.556 under $q = 1/2$ (with s.e.'s clustered at the

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session level, the 95 percent CI is $[0.454, 0.657]$) and 0.528 under $q = 1/3$ (with $CI = [0.468, 0.587]$); thus peace fits the prediction quite well for $q = 1/2$ and is higher than expected under $q = 1/3$. (The predicted treatment effect, with higher peace under $q = 1/2$, is observed in the data, but with large confidence intervals). On the other hand, as shown in Table 8, demand strategies in the lab align qualitatively with the first equilibrium under $q = 1/3$ but deviate from predictions otherwise, in great part because in no other equilibrium does the L type demand 50 with high probability, a regularity we instead see consistently in the data.

demand		70	50	30	w	demand		70	50	30	w
		$q = 1/2$						$q = 1/3$			
H	data	0.66	0.29	0.003	0.04	H	data	0.80	0.14	0	0.06
	equil	1	0	0	0		equil1,2,3	1	0	0	0
L	data	0.07	0.63	0.30	0	L	data	0.10	0.85	0.04	0.01
	equil	0.29	0	0.71	0		equil1	0	100	0	0
							equil2	0.71	0	0.29	0
							equil3	0.33	0.38	0.29	0

Table 8: Data from the initial NC rounds.

9.5 Experimental procedures and instructions

Upon entering the lab, subjects were seated at random computer posts, divided by partitions; each subject was identified exclusively by a randomly assigned id and all communication among subjects took place exclusively via computers. After subjects were seated and consent forms were signed, the experimenter read the instructions aloud and showed images of the experimental screenshots, answering aloud and publicly any question that did arise. We reproduce here instructions and screenshots for a representative $q = 1/2$, Order 1 session.

MEDIATION INSTRUCTIONS

Four parts: NC, UC, M, MC.

$q = 1/2; \theta = 0.7.$

(Payoffs for HM: M=60, W=40, m=20).

Make yourself comfortable, put your phones away, and please don't talk or use the computer. Thank you for agreeing to participate in this experiment.

You will be paid for your participation privately and in cash, at the end of the experiment. Your earnings during the experiment are denominated in POINTS. For this experiment every 100 POINTS earns you 10 DOLLARs. The experiment will consist of multiple rounds. At the end, five rounds will be selected randomly, and you will be paid the sum of your earnings over those five rounds. Pay attention to each round because it may well end up being one of those for which you will be paid.

If you have any questions during the instructions, please raise your hand.

The experiment studies a game of negotiation: you will be matched with another person, and the two of you will decide how to share a resource worth 100 points. In case of disagreement, the resource shrinks to 70 points (think of the 30 points lost as time and resources wasted to disagreement). You will be randomly assigned types, High or Low, and how the resource is divided in case of disagreement will depend on your types.

I will describe each part of the experiment before it starts.

PART 1

We begin with PART 1.

At the start of each round, the computer will assign you a type, which, as we said, can be either High or Low. The two types are equally probable: each person is likely to be H with probability 1/2, and L with probability 1/2.

You will see a screenshot like this: [SCREENSHOT ON TYPE]

Here, as at several other points during the experiment, you will move to the next screen by clicking the Continue button. Please remember to do so.

After having been assigned your type, you will be randomly matched with another person in the room. You will not know which person you are matched to, nor will you know the person's type. Knowing your type does not give you any information about your match's type. All you know is that he or she is equally likely to be H or L with probability 1/2 each. Your type and your match's type matter because they affect how the resource is shared in case of Disagreement.

After having been informed of your assigned type, you will be asked to say how much of the resource you demand for yourself. Remember that the resource is worth 100. You can ask for 30, 50, 70, or you can Walk Out of the negotiation.

- If your demand and the demand of your match are compatible (i.e. do not sum to more than

100), then they will satisfied. You will receive what you asked for, and the round will end.

- If the two demands are instead incompatible (they sum to more than 100), or if one of you Walks Out, then there is Disagreement. The resource shrinks from 100 to 70 points. The reduced resource is then allocated automatically by the computer. If one of you is H and the other is L, then H receives the full 70 points, and L receives 0. If both of you are H, or both of you are L, then each receives one half of the reduced resource, that is, 35 points. This will conclude the round.

The screen where you express your demand will look like this:

[SCREENSHOT: NO COMMUNICATION DEMAND]

Notice that you have a reminder of your type on the upper left corner.

Disagreement occurs if either of you chooses W (Walk Out), or if the two of you choose (70, 50), or (70, 70). Remember: If there is disagreement, the resource shrinks from 100 to 70 points.

After the two demands have been submitted, you will be told your match's demand; whether there is Agreement or Disagreement, and your payoff for the round.

If there is Agreement, your payoff will equal your demand. Your screen will look like this [SCREEN-SHOT: OUTCOME WITH AGREEMENT].

If there is disagreement, your payoff will depend on your type and your match's type. Your screen will look like this [SCREENSHOT: OUTCOME WITH DISAGREEMENT]. In this example, you asked for 70 and your match asked for 50 points. The two demands were incompatible, and the resource shrank to 70 points in total. Your payoff consists of 0 points which indicates that your match is of type H and you are of type L.

This will conclude the round. We will then move to the next round: you will again be assigned a type randomly (H or L with equal probability of 1/2), and will be matched randomly with another person in the room. The type you were in round 1 or the person you were matched with do not influence in any way the type you are assigned in round 2 or your new match. The experiment will then continue as described earlier.

The REMINDER slide summarizes this part of the experiment.

Are there any questions?

We will begin with two practice rounds. You will not be paid for these rounds, whose purpose is only to familiarize yourself with the computer interface and the rules of the experiment.

[OPEN ZTREE; copy program]

Please double-click on the icon marked Leaf16 on your desktop. If asked, click RUN.

If you have any questions from now on, raise your hand, and an experimenter will come and assist you.

RUN PRACTICE ROUNDS: [RUN; START TREATMENT]

We have now concluded the practice rounds. Are there any questions? Remember that you will not be paid for these rounds.

CLOSE THE TREE

Please click Alt F4. Then double-click on the icon marked Leaf16 and if asked click RUN.

We will now begin the experiment. The first part will last 10 rounds.

[RUN; START TREATMENT]

PART 2

We will now move to the second part of the experiment. Part 2 will run in a similar fashion to part 1. At the start of each round, the computer will again assign you a type, High or Low, with equal probability of $\frac{1}{2}$ each. You will again be matched randomly with another person in the room, whose type you will not know.

Now, unlike in Part 1, after types are assigned and matches are made, you will be asked to send a message to your match, communicating your type. You have three options: High, Low, or Silence. You can be truthful, or not truthful, as you choose, or you can be silent. The screen you will see will look like this:

[SCREENSHOT: SEND MESSAGE] As before, in the upper blue strip is a reminder of your type.

You will then receive the message sent by your match, which again can be either H or L or S. After having seen the message, you will be asked to say how much of the resource you demand for yourself. Remember that the resource is worth 100 points. As in Part 1, you can ask for 30, 50, 70, or you can Walk Out of the negotiation. Payoffs will work exactly as in the previous round: you will receive what you asked if the two demands do not sum up to more than 100 (and thus there is Agreement); if the demands sum up to more than 100, there is Disagreement, the resource shrinks to 70 points and is allocated according to your type and the type of your match.

The only difference with respect to Part 1 is your ability to send a message communicating your type before deciding on your demands.

The screen where you express your demand will look like this:

[SCREENSHOT: DEMAND] Note that blue strip at the top now reminds you both of your type and of the message you have sent. The screen also communicates to you the message your partner

has sent.

After the two demands have been submitted, you will be told your match's demand; whether there is Agreement or Disagreement, and your payoff for the round.

This will conclude the round. We will then move to the next round: you will again be assigned a type randomly (H or L, each with equal probability 1/2), and will be matched randomly with another person in the room. The experiment will then continue as described earlier.

The Reminder slide will remain projected to remind you of the rules.

Part 2 will last 20 rounds.

Please move the cursor to the top left corner of your screen. Click and the Continue button will appear at the bottom right corner. Click Continue and begin Part 2.

PART 3.

We will now move to the third part of the experiment.

At the start of each round, you will be matched randomly in groups of three people. One person in the group will be called Mediator. The Mediator receives confidential messages and makes recommendations on how the other two people in the group—who will be called the two Players—are to share the resource. For convenience, the two Players will sometimes be identified as Player 1 and Player 2, but 1 and 2 are just labels with no other meaning.

The computer will tell you if you are the Mediator or a Player.

After the match has occurred, the two Players will be randomly assigned a type. As before, each type can be either H or L with equal probability, and which type is assigned to one Player has no influence on the type assigned to the other Player. If you are a Player, you will know your own type, but will not know the other Player's type. If you are the Mediator, you will not know the type of either Player. Everyone knows that a Player is assigned type H or L with equal probability of $\frac{1}{2}$ each.

After matches are made and roles and types are assigned, if you are a Player, you will be asked to send a message communicating your type, as you did in Part 2. As before, you have three options: High, Low, or Silence. The difference is that now you will send the message to the Mediator, and not to the other Player in your group. As before you can be truthful, or not truthful, or you can be Silent.

The screen will look like this:

[SCREENSHOT: SEND MESSAGE]

The message you send to the Mediator is confidential and will not be seen by the other Player.

Once the two messages are received by the Mediator, the Mediator can make a recommendation

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on how to share the resource, or can choose to Walk Out of the mediation.

- If the Mediator makes a recommendation and both Players accept it, then there is Agreement, the resource is shared according to the recommendation, and the Mediator earns 60 points.

- If one or both Players reject the recommendation, then there is Disagreement, the resource shrinks to 70 points and is allocated by the computer to the two Players according to their type, as in Parts 1 and 2. In case of Disagreement, the Mediator's payoff is 20 points.

- If the Mediator Walks out of the negotiation, the Disagreement scenario is triggered automatically: the resource shrinks, and the Players' payoffs depend on their type, as in the regular Disagreement case. However if Disagreement is triggered by the Mediator Walking out, the Mediator's payoff is 40 points (as opposed to 20 when Disagreement comes from the Players rejecting the Mediator's recommendations).

The reminder slide that remains projected during this part of the experiment will remind you of the rules.

Note that the Mediator can make a recommendation but has no power to force the Players to accept it.

The Mediator's screen will look like this:

[SCREENSHOT: MEDIATOR'S CHOICE]. The screen shows the two messages received from the two Players, and the options the Mediator has for a feasible recommendation. The first number indicates the amount recommended for Player 1, and the second the amount recommended for Player 2. The choices are (50,50), (30,70), (70, 30). Alternatively, the Mediator can choose to Walk Out of the mediation task.

The Mediator's choice is then transmitted to the two Players.

If the Mediator has chosen to Walk Out, then each Player will see a screen like this:

[SCREENSHOT: MEDIATOR WALKED OUT].

At the same time, the Mediator will also see a screen repeating the decision to Walk Out and reporting the Mediator's corresponding payoff. [SCREENSHOT: YOU WALKED OUT].

If the Mediator has made a recommendation, each Player's screen will look like this: [SCREEN-SHOT: PLAYER'S RESPONSE TO THE MEDIATOR'S PROPOSAL]. The Player is asked whether to accept or reject the recommendation.

Each Player is then told whether the other Player accepted the recommendation, and the final outcome of the mediation, including the Player's payoff for the round. [SCREENSHOT: OUTCOME

FOR PLAYER, AGREEMENT].

At the same time, the Player's decisions and the outcome are communicated to the Mediator. The Mediator is also reminded of the messages received and the recommendation made. [SCREENSHOT: OUTCOME FOR MEDIATOR, AGREEMENT]. Because the outcome is Agreement, the Mediator earns 60 points.

This concludes the round. We will then move to the next round, where groups of three will again be formed randomly, and roles will be assigned randomly. Although roles are assigned randomly and groups are formed randomly, each of you will be Mediator for the same number of rounds. Types are then assigned, again randomly, with each Player being of type H or L with equal probability of $\frac{1}{2}$ each. The experiment will then continue as just described.

[SCREENSHOT: REMINDER SLIDE SUBJECT MEDIATOR]

Part 3 will last 30 rounds.

Are there any questions?

Please move the cursor to the top left corner of your screen. Click and the Continue button will appear at the bottom right corner. Click Continue and begin Part 3.

PART 4

Part 4 is almost identical to Part 3. The only difference is that the Mediator is played by the computer.

As in Part 3, the two Players in each group send their messages to the Computer-Mediator, the Mediator chooses whether to Walk Out or to make a recommendation, and each Player decides whether to accept or to reject the Mediator's recommendation.

If either the Mediator Walks Out or one or both Players reject the Mediator's recommendation, then there is Disagreement, the resource shrinks to 70 points and is allocated according to Players' types (divided equally if the Players are of the same type, given fully to the H type if the two Players have type H and L).

If the Mediator makes a recommendation and both Players accept it, then there is Agreement, the recommendation is implemented, each Player earns the corresponding points.

The Computer Mediator follows the following plan:

If the two messages are (L, L), it recommends (50, 50).

If they are (H, L), it recommends either (70, 30) with probability 5/8 or (50, 50) with probability 3/8.

If they are (H, H), it recommends either (50, 50) with probability 1/2 or Walks Out with probability 1/2.

If the computer receives a Silent message from a player, it interprets it interprets it according to the likely frequency of each type—as an H with probability 1/2 and an L with probability 1/2. Thus if, for example, the two messages are (S,L), the computer reads them as (L,L) with probability 1/2 (and acts accordingly) or as (H,L) with probability 1/2 (and acts accordingly).

[SCREENSHOT COMPUTER MEDIATOR PLAN]

This screenshot will remain up throughout Part 4 to remind you of the Computer Mediator plan.

After each round, you will be rematched randomly with another player, and types will be reassigned.

Part 4 will last for 20 rounds.

Are there any questions?

Please move the cursor to the top left corner of your screen. Click and the Continue button will appear at the bottom right corner. Click Continue and begin Part 4.

[Before the end of the last round: remind them to remain with the final screen with their earnings].

END OF THE EXPERIMENT

This is the end of the experiment. You should now see a popup window, which displays your total earnings. Please divide the number of points by 10, round up to the nearest dollar, and record this on your payment receipt sheet. Please also enter $10.00 on the show-up fee row. Add your earnings and the show-up fee and enter the sum as the total. Finally, please record your Computer ID on the form. Add some not intelligible signature. When you are done, click "Continue".

[Run Questionnaire]

We will pay each of you in private in the next room in the order of your computer numbers. Please do not use the computer; be patient, and remain seated until we call you to be paid. Do not converse with the other participants. Thank you for your cooperation.

[SAVE DATA and erase from folder]