Fishy Gifts: Bribing with Shame and Guilt

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Abstract

The following is a model of psychological contracting with unmonitorable performance, implicit offers, and screening for non-performance by the announcement of the expectation of performance. It is motivated by the $250 billion prescription drug industry, which spends $19 billion per year on marketing to US doctors, mostly on 'gifts', and often, as at Yale, with no monitoring for reciprocation. In one revealing incident, a drug firm representative closed her presentation to Yale medical residents by handing out $150 medical reference books and remarking, "one hand washes the other." By the next day, half the books were returned. I model this with a one shot psychological trust game with negative belief preferences and asymmetric information. I show that the 'shame' of accepting a *possible* bribe can screen for reciprocation inducing 'guilt'. An announcement can extend the effect. Current policies to deter reciprocation might aid such screening. I also discuss applications like vote buying when voting is unobservable and why taxis drivers in Naples announce inflated fares *after* their service is sunk.

JEL Codes: C72, D82, D86, H51, H75, I11, I18, M31, M37

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1 Introduction[1]

Medical professionals, health policy makers, and the public have become increasingly concerned at the coincidence of:

1) rising expenditure on prescription drugs: $64 billion in 1995, $151 billion in 2001 and $252 billion in 2006 [Herper and Kang, 2006] (with an estimated one-quarter of this increase

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resulting from a shift to the prescribing of more expensive drugs [Dana and Loewenstein, 2003])

2) extraordinary profitability of drug firms not commensurate with innovation: 76% were deemed only "moderately more efficacious" by the US Food and Drug Administration [Dana and Loewenstein, 2003], and

3) large expenditures on marketing to doctors: $18,000-$29,000 [Brennan et. al., 2006] per doctor per year – mostly on 'gifts.'

There has been much speculation about what is actually happening. (See Appendix B: Background on Pharmaceutical Industry Gift Giving for more details.) I focus on a revealing incident that occurred several years ago at Yale New Haven Hospital. After the pharmaceutical firm representative (Drug Rep) closed her presentation to Yale medical residents (doctors in training) by handing out medical reference books worth $150, she unexpectedly remarked, that "one hand washes the other" (from now on referred to as "insinuation"). By the next day, half the books were returned. According to an informal survey by the Director of the residency program, those who returned the books claimed that they were shocked by the Drug Rep's quid pro quo offer. The other half claimed that they had known the bribing intent all along, had discounted the gesture, and hence, would not have been influenced in their prescribing[2].

This incident raises several questions of economic interest.

A) Why are gifts given when they cannot be conditioned on increased prescribing? Yale, for example, does not release prescribing data to any firms[3].

B) How can an announcement make a good into a bad?

C) Under what conditions would the Drug Rep want to make such an announcement?

I address these questions in a model of psychological contracting where: 1) performance is unmonitorable, 2) offers are veiled (which captures the usual case where gifts are given and nothing is said), and 3) the mere announcement of the expectation of performance (e.g., "one hand washes the other...") can either enforce performance or screen for non-performance. Applied to Yale incident, I show that the shame of accepting a *possible* bribe, rather than being a hindrance to bribing, can in fact be instrumental to making effective bribes. (For more details on the psychological tactics used by drug firms to influence doctors, see [Fugh-Berman and Ahari, 2007].)

In this introduction, I will develop my model by ruling out simpler models. Due to unmonitorability, any model of this situation would have to be one shot. But, in a game where the Drug Rep (she) can give a gift, or not, and the Doctor (he) has a choice of

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[2]Reported by a former Yale Medical resident Melinda L. Randall.

[3]Private communication with the Director of Pharmacy Services at Yale-New Haven Hospital.

making reciprocating prescriptions (reciprocating) at some cost, or not, the Doctor would not reciprocate and hence, the Drug Rep would not give. Even if we were to make this a standard psychological game, where the Doctor felt **guilt**[4] (modelled as the product of guilt sensitivity and the Doctor's belief about the Drug Rep's belief in reciprocation) from disappointing the expectation of the Drug Rep for reciprocation, that would not explain the announcement and its effect – returned books. Similarly, "kindness" as in [Rabin, 1993], could be a motive for reciprocation, but not for rejection. Nor would the mere introduction of **shame**[5] (modelled as the product of shame sensitivity and the second order expectation for reciprocation) from the expectation of doing something bad, as also developed in [Tadelis, 2008][6]. Tadelis showed that the threat of merely being observed can deter a bad action. But here, the subsequent prescribing of the doctors was not observable. It's important to note that the gift (understood as a monetary incentive) was sunk and hence fixed. Behavior nonetheless changed after the mere announcement of expectations. Thus, models of monetary incentive schemes crowding other incentives like [Benabou and Tirole] would not apply. [Ong, 2008a] simulated aspects of the incentives of the above Yale incident in a controlled laboratory experiment and confirmed the prediction that a shame can sort.

To explain the announcement and rejection, I interact shame and guilt in the context of previously mentioned pyschological trust game. In this game, I introduce double sided asymmetric information, giving with insinuation as a second way of giving (from now on simply referred to as insinuating), and observable acceptance, but unobservable reciprocation. Reciprocation is now also shameful before other people[7].

There are now two types of Drug Reps h and l. l only benefits from reciprocation and thus, her expectation for reciprocation can be inferred from her giving. The h type of Drug Rep, which may only exist in the mind of the Doctor, is not so restricted[8]. h also suffers a cost from giving with insinuation, which makes it less preferred than mere giving. There are two types of Doctors, a highly shame averse type (H) and a not so highly shame averse type (L). The sequence of play is as follows. Nature moves to choose the types of Drug Reps and

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[4]See [Battigalli and Dufwenberg, 2008] for a general model of guilt, and [Charness and Dufwenberg, 2006] and [Fong et. al., 2007] for experimental evidence that guilt can induce reciprocation.

[5]Shame is distinct from guilt or even "blame from guilt" as in [Battigalli and Dufwenberg, 2007] because it need not involve disappointment of expectations. Rather, one is ashamed *because* of what others expect one to do, or has seen us do.

[6]I use second order beliefs, which allow for interesting off-equilibrium results. [Tadelis, 2008] only uses first order beliefs.

[7]The Doctor can be interpreted as feeling shame at acceptance before a passive player, the Patient, or other doctors, or even before the Drug Rep herself.

[8]As reported in the Yale incident and as shown in surveys [Kaiser Foundation Survey, 2001], a significant portion did not suspect that drug firms are out to influence their prescribing with gifts. Drug firms promotional material try to confirm this impression. See their websites (e.g., www.pfizer.com). Hospitals, including Yale, have instructional interventions for doctors to explain how drug firms may be trying to influence them.

Doctors facing each other. The Drug Rep can then: 1) give a gift, 2) give and insinuate, and 3) not give, where 2) is more costly for the h Drug Rep. Each type of Doctor observes the Drug Rep's choice and updates his beliefs on the type of Drug Rep he faces. The Doctor then chooses to accept or reject given the shame of acceptance. Observers update their beliefs on which type of Doctor is accepting. Each type of Doctor chooses to reciprocate or not given his guilt.

Due to asymmetric information about the Drug Rep's type, the Doctor's guilt now depends upon his belief that he is facing the bribing Drug Rep *and* his belief that the bribing Drug Rep is expecting reciprocation from *his type*. Due to unobservability of the shameful act, reciprocation, an otherwise innocuous act, acceptance, is shameful for *everyone* when *anyone* reciprocates. Formally, the shame of acceptance is now the product of each type of Doctor's shame sensitivity and the *type weighted* average of *beliefs about beliefs* about the rates of reciprocation of *all types* of Doctors who accept. In other words, shame is here modelled as a function of ex ante beliefs, while guilt is modelled as a function of ex post beliefs[9]. Equilibrium behavior then becomes driven by the interplay between, shame, a 'public bad' among all types who accept, and guilt, a 'private bad' for each who disappoints an expectation for reciprocation from his type[10]. The announcement, which increases guilt at non-reciprocation, increases reciprocation, which increases the ex-ante expectation of reciprocation, which increases the shame of acceptance and hence, *decreases* acceptance. Thus, due to the interplay between shame and guilt, the Drug Rep is faced with a trade-off between reciprocation per acceptance and acceptance, when deciding how much to veil her offer[11].

The model is predictive given the correlation between shame and guilt sensitivities of the Doctors present. The most interesting cases are partial pooling equilibrium when both types of Doctors accept but only one is reciprocating, i.e., the other is free-riding. One such case is when there is strong negative correlation between shame and guilt sensitivities (Equilibrium

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[9]This is consistent with the psychological and economics literature. See [Tadelis, 2008] and [Tangney, Dearing, 2002].

[10]Thus, in a partial pooling equilibrium, where both types of Doctors are accepting, but only H is reciprocating, only the H type can feel guilt in deviating to not reciprocate. However, though L is not reciprocating (and hence, not expected to) he will nonetheless feel the same shame as H at acceptance, because the Patient cannot tell them apart. In other words, shame is a function of the ex-ante belief of reciprocation (because the Patient does not know which type of Doctor is accepting) and guilt is a function of the ex-post belief (because each type of Doctor knows what is expected of him in equilibrium). Thus, in a pooling equilibrium, shame is a public bad among all who accept, but guilt is a private bad for each who does not reciprocate, *when he is expected to reciprocate.* It is the interaction between these two bads that drives the behavior of the Doctors, and ultimately, the behavior of the Drug Rep.

[11]This trade-off between directness and indirectness may also explain why cash gifts are generally not used with doctors. They are too direct. Observers infer (perhaps incorrectly) that everyone who would accept would reciprocate. *Because of that*, no one would accept.

3). In this case, H, the type who is *most* sensitive to shame, and hence, *most* likely to reject, is *least* sensitive to guilt and hence, *least likely to reciprocate.* Then a gift alone can screen for non-reciprocation. To induce this H to reject, the Drug Rep can merely buy a cheaper gift before the game begins (Equilibrium 2). In contrast, when there is not strong negative correlation, a gift alone cannot screen for non-reciprocation. For example, with positive correlation, L, the type who is the *least* sensitive to shame, and hence, *least* likely to reject, is the *least* sensitive to guilt, and hence, *least likely to reciprocate* (Equilibrium $3H$)[12]. A gift rejected by L would also be rejected by H, the type who *is most likely to reciprocate.* In some of these cases, the Drug Rep can increase the guilt of L enough by insinuating to cause him to also reciprocate (Equilibrium 4)[13]. If instead H had been free-riding, as can be the case when there is weakly negative correlation (Equilibrium $3L$), the Drug Rep can in *some* of these cases get rid of H by insinuating (Equilibrium 6). Furthermore, even if H had been reciprocating (Equilibrium $\bar{3}H$), if the shame externality of L reciprocating would force a trade-off between either H accepting or L accepting, the Drug Rep could still choose L over H (Equilibrium $5L$). I show using the Intuitive Criterion that insinuation works as an equilibrium refinement of the partial pooling equilibrium, causing separation.

Assuming that the Drug Rep insinuated rationally in the Yale incident, my results show that those who kept the gift and said that they would not have reciprocated were in fact lying. Those who had rejected the gift were lying only if Equilibrium 4 applied.

In the policy section, I show that:

1. Perversely, gift registries and educational interventions can *help* the Drug Rep (Proposer) screen for reciprocation because they act like insinuation.

2. Bans on gifts imply off-equilibrium beliefs that shame all doctors, even those who would not have accepted. This helps to explain why bans, the most obvious solution, has been used only in a handful of hospitals.

3. Surveys of doctors beliefs about what their colleagues *would do,* had they accepted an expensive gift, can enlist non-credible shame to deter those *who would have accepted and not reciprocated* from accepting[14].

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[12]The numbers to denote these equilibria will be followed by the letter of the reciprocating type. For example, in "Equilibrium $3H$" both are accepting but only H is reciprocating. In contrast, in "Equilibrium 3", all types who accept are reciprocating.

[13]Equilibria a) $3H$ and 4, b) $3L$ and 6, c) $\bar{3}H$ and $5L$ are pairs of equilibria for the same parameter ranges of shame and guilt sensitivities. The Drug Rep can move from the first to the second of the pair if she insinuates. I show that she will insinuate if doing so would increase her profits and if she believes that the Doctor can forward induct, i.e., are rational enough to reason through an equilibrium refinement.

[14]The off-equilibrium belief results arise from a novel notion of "belief supports," which contain beliefs about what a type of Doctor *would have done, had he accepted.* Such an unreached belief support may

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1.0.1 Other Applications

Beyond the $252 billion US prescription drug market, the $89 billion student loan industry also employed gifts to market loan products to financial aid councilors. See [New America Foundation, 2009] for a large listing of articles on the topic. Preliminary research indicates that, like drug firms, loan firms could not monitor for reciprocation in the form of recommendations of their products to students, and may also have relied upon psychological factors like guilt and shame to target gifts to get reciprocation. Guilt and shame may have important unobservable influence on the subjective judgments of credit rating and accounting agencies when their consulting arms get lucrative contracts. Reciprocation for bribes in elections are also unobservable. After voters accept the bribe, they can still vote however they like. Shame modulated by insinuation may also be used there to screen for reciprocation.

My model may also help explain more mundane behavior like why taxi drivers in Naples, who have no meters, tell you the price of the ride after you arrive, when their service is sunk. Announcing a high price after arrival would be rational, if those who were less likely to ask for the price before the ride, e.g., out of shame from looking cheap, would also be averse to disappointing the expectations of the taxi driver, formed perhaps during the ride, after arriving.

A scandal in a fiduciary field can change expectations just like insinuation did in the Yale incident. In [Ong, 2008a], I show how the shame from a scandal may sort out those who are most trustworthy from a fiduciary field, as Enron may have done in accounting. That raises the question of how expert professions might select for trustworthy people and hence, conserve the trust they need to function. Using another variant of this model, I demonstrate in [Ong, 2008b] why the pro bono work among doctors, which amounted to $12 billion in 2001, may help screen out people who would cheat on their patients, and hence damage the reputation of all doctors. I use another variant of this model to capture the phenomena of bundling to avoid shame in consumer products (e.g., the inclusion of political articles with female nudes in Playboy during the 1950s or Biblical themes in nudes from the Renaissance). (See [Ong, 2008c] for details.)

The model is in section 2. I define the equilibrium concept in section 3.1, develop aspects of equilibria in section 3.2 and list propositions proved in section 3.3. Proofs are in Appendix D, which is available upon request.

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contain non-credible beliefs about what that doctor H *would have done had he accepted.* More details about this and the Weak Sequential Equilibrium concept in Appendix C.

2   The Model

2.1   Game Structure

The model can be summarized as a standard trust game with two types of Proposers $\theta_1 \in \{l, h\}$ facing two types of Responders $\theta_2 \in \{H, L\}$, with observable acceptance a but unobservable reciprocation r. Proposers also have two ways of giving g_1 and g_2 with g_1 standing for giving and g_2 standing for giving and insinuating. Here H stands for highly shame averse and L stands for not so highly shame averse.

The sequence of play is:

> **1.** Nature moves first to choose pairs of Proposers and Responders; the l Proposer with probability p_1 and L Responder with probability p_2.

> **2.** Each type of Proposer may give a gift g_1 or give and insinuate g_2 or not give [15].

> **3.** Each type of Responder may accept a or not accept $\neg a$.

> **4.** If he accepts, he may reciprocate r or not reciprocate $\neg r$, unobserved by the Proposer (and Patient).

The game tree is in Appendix A.

I look at parameter ranges in which the 'not give' is dominated, so that it can be omitted, since nothing interesting happens if the Proposer does not want to give. To avoid introducing further notation in an already complicated model, I will let action letters a and r also stand for mixed behavioral strategies in those few places where they are needed, e.g., when they determine equilibrium beliefs. My analysis is otherwise limited to pure strategy equilibria.

2.2   Responder's Payoff and Information

v =value of the gift. e =cost of reciprocation. $v > e > 0$. For each type of Responder $\theta_2 \in \{H, L\}$:

- γ_{θ_2} =guilt sensitivity where $\gamma_{\theta_2} > 0$.

- σ_{θ_2} =shame sensitivity where $\sigma_{\theta_2} > 0$ and $\sigma_H > \sigma_L > 0$.

- The presence of a passive observer (the Patient) is reflected in the Responder's heightened shame sensitivity.

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[15]I only look at the situations where the Proposer wants to give in at least one of the two ways. To avoid clutter, I omit notation of not giving.

$I \in \mathcal{I}$ is information set of the Proposer after Responder accepts, modelling the Proposer's uncertainty as to which type of Responder accepted and whether that type is reciprocating or not. There are four such information sets, one for each combination of Proposer and her actions: $\mathcal{I} = \{I_{lg_2}, I_{lg_1}, I_{hg_2}, I_{hg_1}\}$. Each of those information sets contain four possible histories, which differ only as to whether a certain type of Responder reciprocated or not[16].

Let:

- μ_1 =updated belief that the Proposer is the l type given that she gives, gives and insinuates or does not give.

- μ_2 =updated belief that the Responder is the L type given observed acceptance. In equilibrium, $\mu_2 = \frac{p_2 a_L}{p_2 a_L + (1-p_2) \neg a_H}$: the prior weighted ratio of the rate of acceptance of the L type to acceptances by either types.

Since the Responder has preferences over Proposer's beliefs, in equilibrium, he will, in a sense to be defined in the equilibrium concept below in section 3, have *beliefs in his utility function*. $\bar{\rho}(I)$ and $\rho_{\theta_2}(I)$ should be interpreted as payoff parameters when in utility functions and beliefs otherwise. They are equal in equilibrium.

- $\bar{\rho}(I)$ =Responder's belief about the observer's belief about the rate of reciprocation of whoever is accepting at $I \in \mathcal{I}$. Hence, $\bar{\rho}(I) = 1$ would be the second order belief that "whoever accepts reciprocates."

- $\rho_{\theta_2}(I)$ =Responder θ_2's belief of observers' belief about θ_2's rate of reciprocation after acceptance. Hence, $\rho_{\theta_2}(I) = 1$ would be the θ_2's second order belief that "if I accept, I would be expected to reciprocate."

In equilibrium, the average rate of reciprocation conditional on acceptance $\bar{\rho}(I)$ is the μ_2 weighted average of *beliefs about the rate of reciprocation* $\rho_{\theta_2}(I)$ of each type θ_2 conditional on acceptance. The conditional beliefs are used here because I assume that Responders care about the beliefs of Proposers only if they accept.

$$\bar{\rho}(I) = \rho_L(I) \cdot \mu_2 + \rho_H(I) \cdot (1 - \mu_2) \tag{1}$$

The support of $\rho_{\theta_2}(I)$ is represented by dashed 'belief support sets' in the tree in Appendix A. The standard information sets which enclose the belief support sets represent the

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[16]In I_{bi}, where the bribing Proposer (b) has insinuated (i), for example, the possible histories would be:

$$\{(BL, i, a, r), (BL, i, a, \neg r), (BH, i, a, r), (BH, i, a, \neg r)\}$$

uncertainty of an observer who knows neither which type is accepting, nor whether they are reciprocating.

Payoff of Responder after:

1. non-acceptance: 0.

2. accepting and reciprocating: $v - e - \sigma_{\theta_2} \bar{\rho}(I)$.

3. accepting and not reciprocating: $v - \mu_1 \gamma_{\theta_2} \rho_{\theta_2}(I) - \sigma_{\theta_2} \bar{\rho}(I)$.

2.3 Proposer's Payoff

Though I do provide justifications for how I model the Proposer, the Proposer's actions should be regarded as providing the framework for the main focus of the paper – the analysis of how shame and guilt can be used to manipulate the behavior of the Responder. What the reader should take away is that

1. The l Proposer must anticipate reciprocation whenever it gives in equilibrium.

2. Upon observing g_2, Responders should believe that they are facing l, since g_2 is dominated for h but not for l [17].

More specifically, I assume that the insinuation is free for the l Proposer and she cares only about material payoffs. Hence, her payoffs from insinuating or not depends only upon the Responder's consequent acceptance and rate of reciprocation. (There are many ways to model the above assumptions. I outline somewhat cumbersome way below.) Acceptance increases costs by k and reciprocation increases revenue by R. Let $\boldsymbol{g}_2 \in \{0, 1\}$ be the rate of insinuation for the Proposer and $\mathbf{r}_{\boldsymbol{g}_2}$ be the rate of reciprocation for the Responder. The profits for the l Proposer is then:

$$\pi_l\left(\boldsymbol{g}_2, \mathbf{r}_{\boldsymbol{g}_2}\right) = \left(\mathbf{r}_{\boldsymbol{g}_2} \cdot R + \left(1 - \mathbf{r}_{\boldsymbol{g}_2}\right) \cdot 0 - k\right) = \left(\mathbf{r}_{\boldsymbol{g}_2} R - k\right) \tag{2}$$

Since the l Proposer is not sure about which type of Responder she is facing, she chooses $\boldsymbol{g}_2$ to maximize her expected payoffs:

$$\max_{\boldsymbol{g}_2} E\left(\pi_l\left(\boldsymbol{g}_2, \mathbf{r}_{\boldsymbol{g}_2}\right)\right) = \max_{\boldsymbol{g}_2} \left\{\mu_2\left(\mathbf{r}_{L\boldsymbol{g}_2} R - k\right) + \left(1 - \mu_2\right)\left(\mathbf{r}_{H\boldsymbol{g}_2} R - k\right)\right\} \tag{3}$$

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[17] A casual perusal of drug firm websites will show that drug firm promotion portray drug firms as altruistic, or the least, not just profit maximizing. As late as 2001, 40% of doctors did not realize that drug firms monitored their prescribing patterns [Kaiser Foundation Survey, 2001]. According to [Madhavan et. al., 1997], "physicians *slightly agreed* that pharmaceutical companies give gifts to physicians to influence their prescribing." Hospitals like Yale New Haven Hospital have educational interventions that basically tell doctors that drug firms are very likely trying to affect their prescribing through gifts. Again, see [Fugh-Berman and Ahari, 2007] for more details on the psychological/relationship tactics used by drug firms to influence doctors.

Clearly, the l Proposer will only give if she is making non-negative profits. This requires that, if either type of Responder accepts, at least one reciprocates; fixing a choice of either $\mathbf{g}_2 = \mathbf{1}$ or $\neg \mathbf{g}_2 = \mathbf{1}$, if $\mathbf{r}_L = 1$ or $\mathbf{r}_H = 1$, the Proposer earns positive profits.

$$R\left(p_2\left(\mathbf{r}_L\right) + (1 - p_2)\left(\mathbf{r}_H\right)\right) > k \tag{4}$$

3 Equilibrium Analysis

3.1 Psychological Weak Sequential Equilibrium

I weaken the psychological sequential equilibrium (PSE) concept introduced by [Battigalli and Dufwenberg, 2008] so as to get some novel off-equilibrium path results (See Appendix C). However, for the basic results in the body of the paper, PSE and Weak Psychological Equilibrium (WPSE), discussed below, are equilivalent.

A psychological Bayesian extensive form game is a collection of Bayesian extensive form games Γ parametrized by $\rho_{\theta_2}, \theta_2 \in \{H, L\}$.

$$\Gamma = \left\langle N, H, (\Theta_i), (p_i), \left(u_i\left(\rho_{\theta_2}\right)\right)_{\forall \rho_{\theta_2} \in \{0,1\}, \forall \theta_2 \in \{H, L\}} \right\rangle \tag{5}$$

As in a standard Bayesian extensive form game, N is the set of players, H is the set of histories, Θ_i is the set of types for each player i, p_i is the prior probability distribution of player i over other player's types and u_i is the utility of player i. The key difference here is the use of the utility parameters $\rho_{\theta_2}, \theta_2 \in \{H, L\}$ to specify each of the standard games $G \in \Gamma$. Within each of these games, which fixes the value of $\rho_{\theta_2}, \theta_2 \in \{H, L\}$, each type of Proposer chooses to give g_1 or insinuate and give g_2, or not give, given her belief μ_2 of facing L and expected rates of reciprocation after acceptance. Each type of Responder decides on acceptance or non-acceptance given his shame aversion $\sigma_{\theta_2}\bar{\rho}$, the value of the gift v and his anticipated consequent guilt, should he not reciprocate, or his cost of reciprocation e, should he reciprocate. After acceptance, each type of Responder would choose to reciprocate r or not, given his guilt aversion $\gamma_{\theta_2}\rho_{\theta_2}$, his cost of reciprocating e, and his belief about the Proposer's expectation of type θ_2's reciprocation rate ρ_{θ_2}. Consistency between beliefs and actions requires that

$$\rho_{\theta_2}(I) = \mathbf{r}_{\theta_2}(I), \forall I \in \mathcal{I}, \forall \theta_2 \in \{H, L\} \tag{6}$$

This defines the WSEs for each $G \in \Gamma$. The PWSEs are what remains of the WSEs in Γ after we throw out every WSEs in which the beliefs ρ_{θ_2} are not consistent with the payoff

parameter ρ_{θ_2} that they should stand in for, for every type θ_2 at every information set I on the equilibrium path [18]. In other words, the PWSEs are the restriction of $G \in \Gamma$ such that:

$$\rho_{\theta_2}(I) \ \{\text{beliefs}\} = \rho_{\theta_2}(I) \ \{\text{utility parameter}\}, \forall I \in \mathcal{I}, \forall \theta_2 \in \{H, L\}$$

I will call my equilibrium concept 'psychological weak sequential equilibrium' (PWSE), which is based on the weak sequential equilibrium concept (WSE)[19]. In a WSE, every player maximizes his utility at every information set and beliefs are Bayesian where possible.

3.2   Aspects of Equilibria

The Responder needs to rank four pure strategies (r, a), $(r, \neg a)$, $(\neg r, a)$ and $(\neg r, \neg a)$. Let these rankings be represented in the following short hand:

$$\begin{aligned}
(r \succeq \neg r) &:= (r, a) \succeq (\neg r, a) \\
(\neg r \succeq \neg a) &:= (\neg r, a) \succeq (r, \neg a) \text{ and } (\neg r, a) \succeq (\neg r, \neg a) \\
(r \succeq \neg a) &:= (r, a) \succeq (r, \neg a) \text{ and } (\neg r, a) \succeq (\neg r, \neg a)
\end{aligned} \tag{7}$$

the conditions for which I will derive in the following.

The $(r \succeq \neg a)$ Condition: At each information set $I \in \mathcal{I}$ for each type $\theta_2 \in \{H, L\}$, reciprocate is better than not accept iff:

$$v - e - \sigma_{\theta_2}\bar{\rho}(I) \geq 0$$

The $(\neg r \succeq \neg a)$ Condition: At each information set $I \in \mathcal{I}$ for each type $\theta_2 \in \{H, L\}$, not reciprocate is better than not accept iff:

$$v - \mu_1 \gamma_{\theta_2} \rho_{\theta_2}(I) - \sigma_{\theta_2}\bar{\rho}(I) \geq 0$$

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[18] A psychological game can be interpreted as a short hand for a larger signaling game. Take Beer Quiche. In a separating equilibrium, Player 2 (he) is sure of Player 1's type after observing her action. Therefore, Player 2's belief about what action would occur in such an equilibrium can only depend upon his prior on each type. Because Player 2's beliefs influence Player 2's reaction to Player 1's signal, Player 1's payoffs depends upon Player 2's belief about what Player 1 will do. Player 1's payoffs are then functions of Player 2's beliefs about Player 1's actions. Even in the signaling game, the beliefs of Player 1 about Player 2's beliefs must be consistent with the actual beliefs of Player 2, which must be consistent with the payoff parameter that models the effect of those beliefs upon Player 1's payoffs. Hence, we have the essentials of a psychological game. Player 1's has induced preferences upon Player 2's beliefs. See also [Gul and Pesendorfer, 2005] for comments along the same lines.

[19] The established psychological sequential equilibrium concept (See [Battigalli and Dufwenberg, 2008])would preclude a number of interesting and realistic off-equilibrium phenomena (e.g., the screening effect of non-credible shame discussed in section 3.4.5).

The ($r \succeq \neg r$) Condition: At each information set $I \in \mathcal{I}$ for each type $\theta_2 \in \{H, L\}$, reciprocate is better than not reciprocate iff:

$$v - e - \sigma_{\theta_2} \bar{\rho}(I) \geq v - \sigma_{\theta_2} \bar{\rho}(I) - \mu_1 \gamma_{\theta_2} \rho_{\theta_2}(I)$$

$$\mu_1 \gamma_{\theta_2} \rho_{\theta_2}(I) \geq e$$

The ($r \succeq \neg r, r \succeq \neg a$) Condition: At each information set $I \in \mathcal{I}$ for each type $\theta_2 \in \{H, L\}$, accept and reciprocate is best iff:

$$v - e \geq \sigma_{\theta_2} \bar{\rho}(I) \text{ and } \mu_1 \gamma_{\theta_2} \rho_{\theta_2}(I) \geq e$$

The ($a \succeq \neg a$) Condition: At each information set $I \in \mathcal{I}$, for each type $\theta_2 \in \{H, L\}$, accept is better than reject iff:

$$\max \left\{ v - e - \sigma_{\theta_2} \bar{\rho}(I), v - \mu_1 \gamma_{\theta_2} \rho_{\theta_2}(I) - \sigma_{\theta_2} \bar{\rho}(I) \right\} \geq 0$$

$$\min \left\{ e, \mu_1 \gamma_{\theta_2} \rho_{\theta_2}(I) \right\} < v - \sigma_{\theta_2} \bar{\rho}(I)$$

3.3 Characterization of Equilibria

In the following, equilibrium will be abbreviated to "Eq.". Since, I only need distinguish beliefs that are after insinuation g_2 and those that are after non-insinuation g_1, I will only write beliefs as a function of g_2 or g_1 (e.g., write $\rho_{\theta_2}(g_2)$ for $\rho_{\theta_2}(I_{\theta_1 g_2}), I_{\theta_1 g_2} \in \mathcal{I}, \theta_1 \in \Theta_1, \theta_2 \in \Theta_2$). In equilibria 1-3, the Proposers pool to g_1. In equilibria 4-6, the l Proposer separates to g_2. To avoid repetition, I state only what each type of Responder does in the following proposition.

3.3.1 No Insinuation Equilibria

To shorten my proofs, I characterize off-equilibrium beliefs, which are all the same, in the following lemma, which apply to all propositions that follow. Since beliefs on the equilibrium path are true and can be substituted away with their corresponding actions, they too are omitted in the propositions.

Lemma 1 *For a fixed action of the l Proposer $s_1 \in \{g_2, g_1\}$, both Responders will accept and not reciprocate*

$$((\mathbf{a}_H(s_1) = 1, \mathbf{r}_H(s_1) = 0), (\mathbf{a}_L(s_1) = 1, \mathbf{r}_L(s_1) = 0)) \tag{8}$$

when $\rho_H(s_1) = \rho_L(s_1) = 0$. The l Proposer's payoff will be $-k$.

Proposition 2 (Eq. 1) *There exist equilibria in which both types of Responders accept and reciprocate iff*

$$v - e \geq \sigma_{\theta_2} \text{ and } p_1 \gamma_{\theta_2} \geq e, \forall \theta_2 \in \{H, L\} \tag{9}$$

$$\rho_H(g_1) = \rho_L(g_1) = 1 \tag{10}$$

Proposition 3 (Eq. 2) *There exist equilibria in which the L type of Responder accepts and reciprocates and the H type does not accept iff*

$$\rho_L(g_1) = 1, \bar{\rho}(g_1) = 1, v - e \geq \sigma_L \text{ and } p_1 \gamma_L \geq e \tag{11}$$

$$\rho_H(g_2) = 0 \text{ and } \rho_L(g_2) = 0 \tag{12}$$

and

$$\left\{ \begin{array}{ll} a) & \rho_H(g_1) = 1, v - p_1 \gamma_H < \sigma_H \text{ and } p_1 \gamma_H < e \\ & or \\ b) & \rho_H(g_1) = 0, \sigma_H > v \text{ and } p_1 \gamma_H < e \end{array} \right\} \tag{13}$$

Proposition 4 (Eq. 3L) *There exist equilibria in which both types of Responders accept but only L reciprocates iff*

$$v - e \geq \sigma_L p_2 \text{ and } p_1 \gamma_L \geq e \tag{14}$$

$$0 \leq v - \sigma_H p_2 \text{ and } p_1 \gamma_H < e \tag{15}$$

$$\rho_H(g_1) = 0, \rho_L(g_1) = 1, \bar{\rho}(g_1) = p_2 \tag{16}$$

$$\rho_L(g_2) = \rho_L(g_2) = 0 \tag{17}$$

Proposition 5 (Eq. 3H) *There exist equilibria in which both types of Responders accept but only H reciprocates iff*

$$v - e \geq \sigma_H(1 - p_2) \text{ and } p_1 \gamma_H \geq e \tag{18}$$

$$0 \leq v - \sigma_L(1 - p_2) \text{ and } p_1 \gamma_L < e \tag{19}$$

$$\rho_H(g_1) = 1, \rho_L(g_1) = 0, \bar{\rho}(g_1) = (1 - p_2) \tag{20}$$

$$\rho_H(g_2) = \rho_L(g_2) = 0 \tag{21}$$

Corollary 6 (Eq. $\bar{\mathbf{3}}H$) *Consider Eq. 3H. If $v - e < \sigma_H$, then H only accepted if L also accepted and but did not reciprocate.*

3.3.2 Insinuation Equilibrium

In the following equilibrium, the l Proposer separates from the h Proposer by insinuating g_2.

Proposition 7 (Eq. 4) *There exist equilibria in which the L type of Responder accepts and reciprocates and the H type does not accept iff*

$$\rho_L(g_2) = 1, \bar{\rho}(g_2) = 1, v - e \geq \sigma_L \text{ and } \gamma_L \geq e \tag{22}$$

$$\rho_H(g_1) = \rho_L(g_1) = 0 \tag{23}$$

and

$$\left\{ \begin{array}{ll} a) & \rho_H(g_2) = 1, \sigma_H > v - e \text{ and } \gamma_H \geq e \\ & or \\ b) & \rho_H(g_2) = 0, \sigma_H > v \text{ and } \gamma_H \geq e \end{array} \right\} \tag{24}$$

Proposition 8 (Eq. 5L) *There exist equilibria in which the L type of Responder accepts and reciprocates and the H type does not accept. More specifically iff*

$$\rho_L(g_2) = 1, \bar{\rho}(g_2) = 1, v - e \geq \sigma_L \text{ and } \gamma_L \geq e \tag{25}$$

$$\rho_H(g_1) = 0 \text{ and } \rho_L(g_1) = 0 \tag{26}$$

and

$$\left\{ \begin{array}{ll} a) & \rho_H(g_2) = 1, v - \gamma_H < \sigma_H \text{ and } \gamma_H < e \\ & or \\ b) & \rho_H(g_2) = 0, \sigma_H > v \text{ and } \gamma_H < e \end{array} \right\} \tag{27}$$

Proposition 9 (Eq. 6) *There exist equilibria in which both types of Responders accept and reciprocate. More specifically iff*

$$v - e \geq \sigma_{\theta_2} \text{ and } \gamma_{\theta_2} \geq e, \forall \theta_2 \in \{H, L\} \tag{28}$$

$$\rho_H(g_1) = \rho_L(g_1) = 1 \tag{29}$$

Proposition 10 *Suppose that either Eq. 4 or Eq. 3H can hold. If the not highly shame averse type L are numerous enough*

$$p_2 > \frac{k}{(R+k)} \tag{30}$$

the Proposer would prefer the outcome in Eq. 4. Then, Eq. 3H can be eliminated with the Intuitive Criterion.

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Proposition 11 *Eq. 3L can be eliminated with the Intuitive Criterion. Eq. 5L would hold instead.*

3.4 Graphical Analysis of Equilibria

An equilibrium will be a pair of points on the shame and guilt plain $(\sigma, \gamma) \in R_+^2$ below. Though in fact, we need a graph for each type of Responder $\theta_2 \in \{H, L\}$, if we assume that priors on Responders' types are symmetric, i.e., $p_2 = \frac{1}{2}$, we can use one graph, say for type H, to represent best response regions for both types, when both are expected to reciprocate. When one is not expected to reciprocate, then the best response graph for that one has a vertical boundary at infinity. In that case I only show the graph of the one that is reciprocating. Even for the type who is expected to reciprocate, the boundary is "one sided"; it only exists for decreasing guilt sensitivity. For increasing guilt sensitivity, if the Responder had not been expected to reciprocate, no degree of guilt sensitivity will make him want to reciprocate. (These graphs are a little strange and tricky to draw. I ask for the readers patience.) Now, I will indicate how the boundaries of these best response regions for figures 1-5 below were determined.

3.4.1 Horizontal Boundary for $H : (r \succeq \neg r)$

The horizontal axis is divided up by the 'reciprocate is better than not reciprocate' or $(r \succeq \neg r)$ condition : $\mu_1 \gamma_H \rho_H \geq e$, in which $\mu_1(g_1) = p_1$ in a pooling equilibrium (figure 2) and $\mu_1(g_2) = 1$ and $\mu_1(g_1) = 0$ in a separating equilibrium (figure 3). Since, $\rho_H \in \{0, 1\}$, when $(r \succeq \neg r)$ is rewritten as $\gamma_H \geq \frac{e}{\mu_1 \rho_H}$, the horizontal boundaries for $\gamma_H \in \left\{0, e, \frac{e}{p_1}, \infty\right\}$.

3.4.2 Vertical Boundary for $H : (r \succeq \neg a)$

The vertical boundary to the right of $(r \succeq \neg r)$ boundary is divided by the 'reciprocate is better than not accept' or $(r \succeq \neg a)$ condition: $v - e \geq \sigma_H \bar{\rho}$, in which $\bar{\rho} = 1 - p_2$ when both are accepting but only H is reciprocating (see figure 1), or $\bar{\rho} = 1$, when only the reciprocating type accepts (figure 2). (If both were accepting and only L was reciprocating then, the dividing line would be where $\bar{\rho} = p_2$.) Hence, when $(r \succeq \neg a)$ is rewritten $\frac{v-e}{\bar{\rho}} \geq \sigma_H$: the vertical boundaries for $\sigma_H \in \left\{\frac{v-e}{1}, \frac{v-e}{1-p_2}\right\}$.

3.4.3 Diagonal Boundary for $H : (\neg r \succeq \neg a)$

The diagonal is divided by the 'not reciprocate is better than not accept' or $(\neg r \succeq \neg a)$ condition for $H : v - \mu_1 \gamma_H \rho_H - \sigma_H \bar{\rho} \geq 0^{20}$. This condition, which can be more conveniently written as $\frac{v - \mu_1 \gamma_H \rho_H}{\bar{\rho}} \geq \sigma_H$ only matters when not reciprocating is better than reciprocating $(\neg r \succeq r) : \mu_1 \gamma_H \rho_H < e$ and H has not accepted, i.e., H is in region $\neg a$. There are two possibilities: H accepts or not.

- Should H have accepted and not reciprocated, consistency between beliefs and actions would require that $\rho_H = \mathbf{r}_H = 0$. Thus, from the perspective of the H Responder who has accepted and not reciprocated, the shame σ_H boundary for accepting would be defined by $\frac{v}{\bar{\rho}} \geq \sigma_H$ in which $\bar{\rho} = p_2$. (Not shown in any figure.)

- Should H not have accepted, then beliefs about H's rate of reciprocation *had he accepted* are not constrained $\rho_H \in \{0, 1\}$. Recall from 1 that

$$\bar{\rho} = \rho_L \cdot \mu_2 + \rho_H \cdot (1 - \mu_2)$$

  - Suppose that H believes that had he accepted, he would have been expected to reciprocate, then $\rho_H = 1$ and $\frac{v - \mu_1 \gamma_H}{\bar{\rho}} \geq \sigma_H$, in which $\bar{\rho} = 1 \cdot 1 + 0 \cdot 1 = 1$.
  - If on the other hand, H believes that had he accepted, he would not have been expected to reciprocate, then $\rho_H = 0$ and $\frac{v}{\bar{\rho}} \geq \sigma_H$, in which $\bar{\rho} = 1 \cdot 1 + 0 \cdot 0 = 1$.

Hence, when $(\neg r \succeq \neg a)$ is rewritten as $\frac{v - \mu_1 \gamma_H \rho_H}{\bar{\rho}} \geq \sigma_H$, the possible diagonal boundaries are $(\sigma_H, \gamma_H) \in \left\{ (\sigma_H, \gamma_H) : \sigma_H = \frac{v}{p_2} \text{ or } v - \mu_1 \gamma_H - \sigma_H = 0 \right\}$.

The diagonal for L is comparable except that $\bar{\rho} = 1 - p_2$ when both accept and H reciprocates, but L does not reciprocate. See figure 2.

If both H and L have high enough guilt sensitivity to reciprocate, then the Proposer only has to choose a gift v that will cause them to accept. This is the situation in Eq. 1 (not figured). If however, one type is not sensitive enough to guilt, and guilt and shame are negatively correlated, the Proposer can choose a gift that only the less shame sensitive type would accept. This is the situation Eq. 2 in figure 1.

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[20]If H is considering $\neg r \succeq \neg a$ then, by the positive profit condition 4 and consistency 6, L must be accepting and reciprocating: $\rho_L = \mathbf{r}_L = 1$.
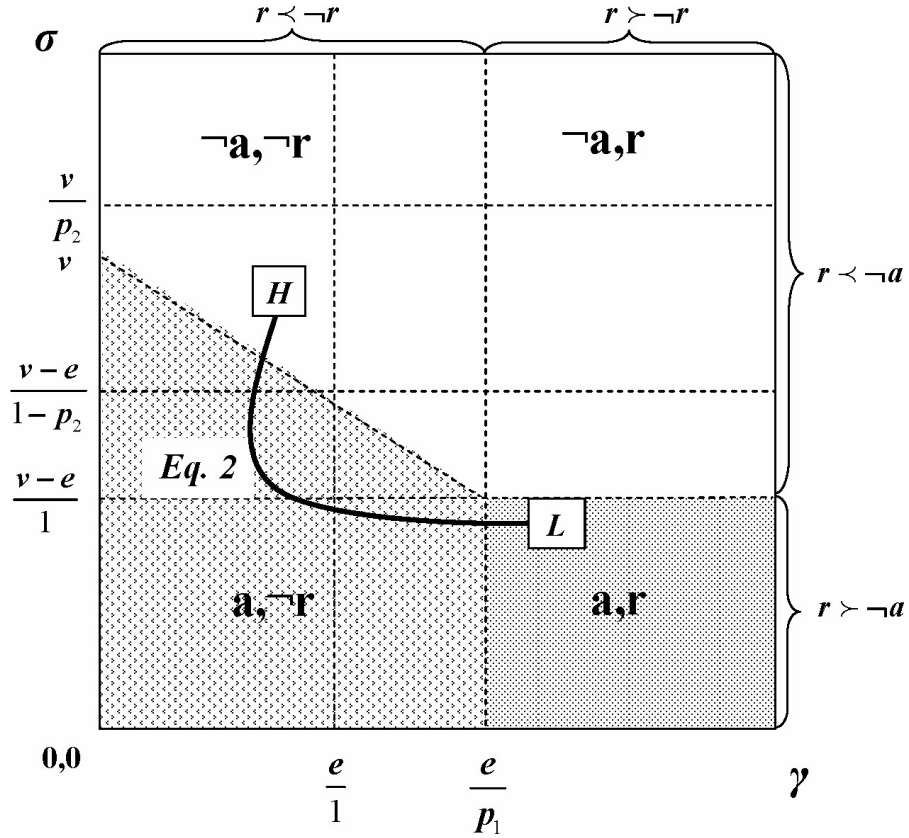
Figure 1: Only L accepts and reciprocates.

However, if guilt and shame are positively correlated, we may have the situation in Eq. $3H$ in figure 2.

3.4.4 Screening With Shame Spillovers

In Eq. $3H$, the highly shame averse Responder H, who has high shame and guilt sensitivity, is accepting and reciprocating, while L, who has lower shame and guilt sensitivity, is accepting but not reciprocating. In Eq. 4, the same H has not accepted, while L has accepted and reciprocated. Eq. $3H$ has the L type of Responder in region $\neg r$ and H in region r. Eq. 4 has this same L in region r and H in region $\neg a$. The bribing Proposer l, by separating with an insinuation, increases guilt causing the L Responder with guilt range $e \leq \gamma_L \leq \frac{e}{p_1}$ and shame range $0 \leq \sigma_L \leq v - e$ (figure 2) to accept and reciprocate.
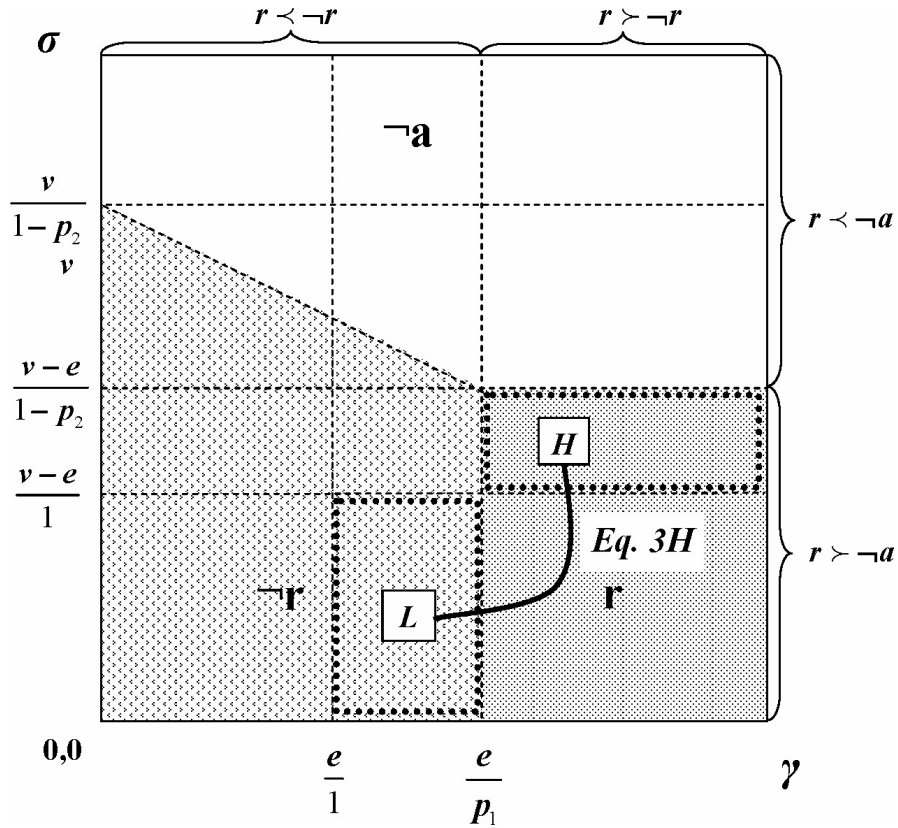
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Figure 2: Both accept. Only H reciprocates.

When they do so, they exert a negative externality for their paired type in the guilt range $\frac{e}{p_1} \leq \gamma_H$ and shame range $1 - e \leq \sigma_H \leq \frac{v-e}{1-p_2}$ that causes H to not accept (figure 3). The solid arrow in figure 3 indicates the *necessary* marginal increase in the r region which occurs when insinuation separates: $\mu_1(g_1) = p_1 \rightarrow \mu_1(g_2) = 1$. The dotted arrows indicate the *possible* changes in the boundaries after an insinuation, driven by changes in the value of $\bar{\rho} = p_2 \rightarrow \bar{\rho} = 1$.
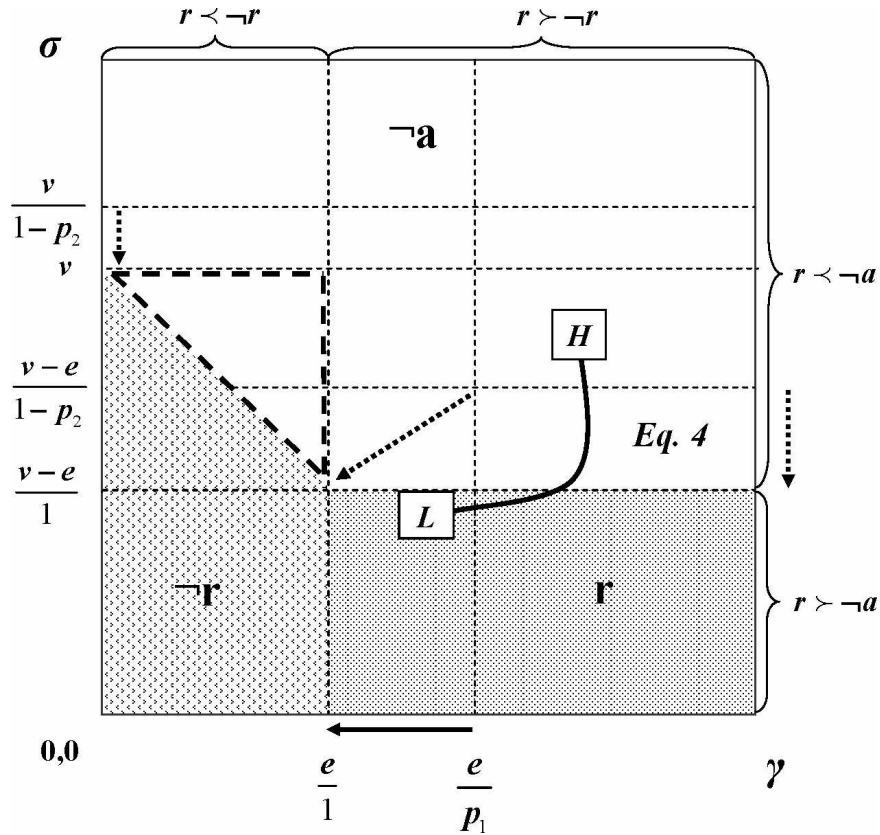
Figure 3: Insinuation. Only L reciprocates.

Eq. $3H$ was maintained by the Proposer's belief that, should there be an insinuation, the Responder will infer he is facing the h Proposer and hence accept and not reciprocate. Proposition 7 establishes that if the L type is great enough of the proportion of the Responder population, the non-insinuation equilibria Eq. $3H$ will fail the Intuitive Criterion. Upon observing insinuation, Responders can infer that they are facing the l Proposer, since insinuate is dominated for h. When L is a greater proportion of Responders, the L Responder's best response of reciprocate would be sufficient to make the l Proposer deviate to reciprocate. The prediction for this set of parameters would then be, the Proposer will insinuate. She will lose the prescriptions of the highly shame averse type but gain the prescriptions of the not highly shame averse type. This is what the Proposer in the Yale incident could have been trying to achieve with her insinuation.

When there is negative correlation between guilt and shame, as in Eq. $3L$, insinuation can cause the non-reciprocating type H to not accept, as in Eq. $5L$ of figure 4. When there is positive correlation, as in Eq. $3H$, insinuation can cause the non-reciprocating type to reciprocate, as in Eq. 6 of figure 4.
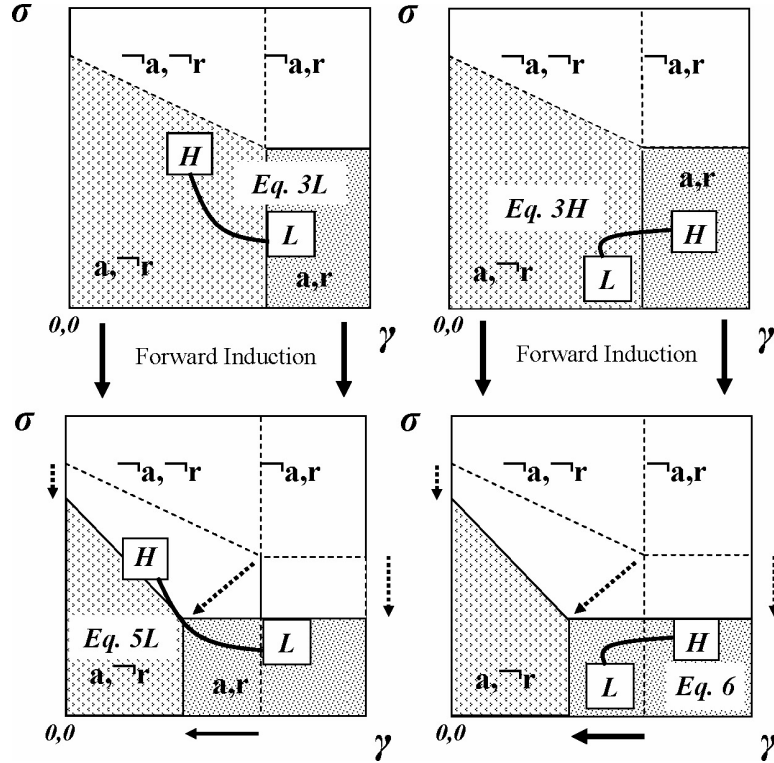
Figure 4: Free-rider rejects (left) or reciprocates (right).

4 Discussion

4.1 Policy Implications

4.1.1 Bans

At first, it may seem surprising that only a handful of medical schools out of thousands use the most obvious solution: ban drug rep to doctor gift giving[21]. However, the rational for the reluctance to ban can be seen in my model by. We can convert the drug firm's revenues from bribing:

$$R\left(p_2\left(\mathbf{r}_L\right) + (1 - p_2)\left(\mathbf{r}_H\right)\right) > 0$$

into a social utility constraint that must also be met for the gift giving to be permitted by some social planner,

$$u - S\left(p_2\left(\mathbf{r}_L\right) + (1 - p_2)\left(\mathbf{r}_H\right)\right) \geq 0$$

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[21] Harris, Gardiner, "Group Urges Ban on Medical Giveaways." New York Times, April 28, 2008, describes a recent effort to increase bans in medical schools.

in which u is the social utility achieved by permitting gifts and S is the sensitivity to distorted prescribing. Suppose that the regulator bans. Given a ban, doctors could infer that the regulator believed that the rate of reciprocation *would have* made the ban worthwhile:

$$u - S\bar{\rho} < 0$$

where

$$\bar{\rho}(I) = \rho_L(I) \cdot \mu_2 + \rho_H(I) \cdot (1 - \mu_2) \tag{31}$$

In other words, the regulator must have believed that the aggregate rate of reciprocation would have been too high, if it had not banned. But, unlike Eq. 2 where shame could be avoided by rejecting, when the regulator bans, all doctors suffer shame through the implied $\bar{\rho}$; all doctors would have suffered from the belief that they would have reciprocated enough to warrant a ban. A persistent and unavoidable insult[22] to the integrity of their profession might deter entry of qualified people into a specific hospital, or in the health care industry in general [23].

4.1.2 Gift Ceilings

A gift ceiling would work like a ban above the gift ceiling, with the same shaming off-equilibrium belief implications. Instead of feeling completely untrusted, as with bans, doctors would feel untrusted above the gift ceiling $\bar{v}$. It would work like a buying a cheaper gift below the gift ceiling, and thus could shift the situation away from Eq. 1 to Eq. 2 or 4, thus reducing reciprocation by reducing acceptance.

4.1.3 Gift Registries

Gift registries, which record all gifts over a certain amount (e.g., \$50), have been legislated in a number of states[24] [Ross et. al., 2007]. If preferences over beliefs are monotonic on the number of people who have them, then gift registries amount to increasing σ, the sensitivity to shame. Increasing σ amounts to decreasing v via a gift ceiling.

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[22]$\sigma\bar{\rho}$ can also include the effects of pencuniary punishments for acceptance contingent upon beliefs about subsequent intended actions, if $\hat{\rho} = \bar{\rho} + fines$ or if fines are a function of $\bar{\rho}$, $\hat{\sigma} = (\sigma + fines)$. Both $\hat{\sigma} > \sigma$ and $\frac{v-e}{\bar{\rho}} > \frac{v-e}{\hat{\rho}}$ implies that the acceptance regions in all figures would shrink, reducing the effectiveness of gifts.

[23]Nearly 60 percent of doctors had considered getting out of medicine because of low morale (Williams, Alex, "The Falling-Down Professions," New York Times, January 6, 2008).

[24]Medina, Jennifer, "Drug Lobbying Kills Gift Disclosure Bill," New York Times, June 29, 2006.

4.1.4 Educational Interventions: Disambiguating The Meaning of the Gift

An initial study demonstrated that education as to the 'true' motives of firms and the social costs of accepting gifts can indeed cut acceptance [Randall et. al., 2005]. If an educational interventions did this by increasing σ for all guilt sensitivity types, it would have the same effect as a ceiling on gift value. If on the other hand an educational intervention increased doctors' belief of facing the bribing Drug Rep, that would have the same effect as the Drug Rep always insinuating and hence, increasing $\mu_1(g_1) = p_1$ to $\mu_1(g_2) = 1$, with the difference that it could save the firm representative from having to reveal her motive, and risking the imposition of restricted access to doctors. As shown in Proposition 10 and 11, that could result in *more* influenced prescriptions by making it more profitable. Counterintutively, regulators could try to decrease the prior belief on the l type of Proposer $\mu_1 = p_1 \to 0$, e.g., by promoting the idea that all firms are actually non-bribing. If that worked, guilt in non-reciprocation would go down, which would eventually result in less giving with a bribing intention.

Veiled offers suggest that the firm believes that ambiguity is essential for a profit maximizing trade-off between acceptance and reciprocation. If so, policy makers may be able to disrupt the illicit exchange by disambiguating the beliefs of receivers. If Doctors uniformly believed that nothing was expected of their type, i.e., $\rho_{\theta_2} \to 0, \forall \theta_2 \in \{H, L\}$, then the region for acceptance will expand as it's upper bound $\frac{v-e}{\bar{\rho}} \to \infty$, at the same time that the region for not reciprocating r, whose lower bound is defined by $\frac{e}{\mu_1 \rho_{\theta_2}} \to \infty$. Contrariwise, should the situation be described by Eq. $\bar{3}H$, in which $\bar{\rho} = 1 - p_2$ and both types of doctors accept, but only $\neg H$ type reciprocates, it could be best for policy makers to try to convince everyone that all types of doctors are in fact reciprocating so as to increase $\bar{\rho} \to 1$ to prompt rejection from a majority of doctors.

5   Conclusion

Doctors are experts. Expertise opens the client to expert relationship to exploitation by third parties. The client cannot tell if the expert is acting in their best interest for the same reason that the client needs the expert's help. Hence, clients need to trust the experts they go to. Hence also, experts must be averse to the appearance of betraying their client's trust and therefore, anything approaching explicit contracting to betray that trust. Gifts are a way for third parties to camouflage such contracting. However, third parties face an incentive problem similar to that which they may try to exploit; Expertise also makes the experts actions unobservable to the third party. Contracts on those actions are therefore

unenforceable – by the usual means. Third parties need to trust their experts even to betray the trust of others.

6   Appendix A

Partial tree for case where Proposer chooses g_1 and Responder chooses a.
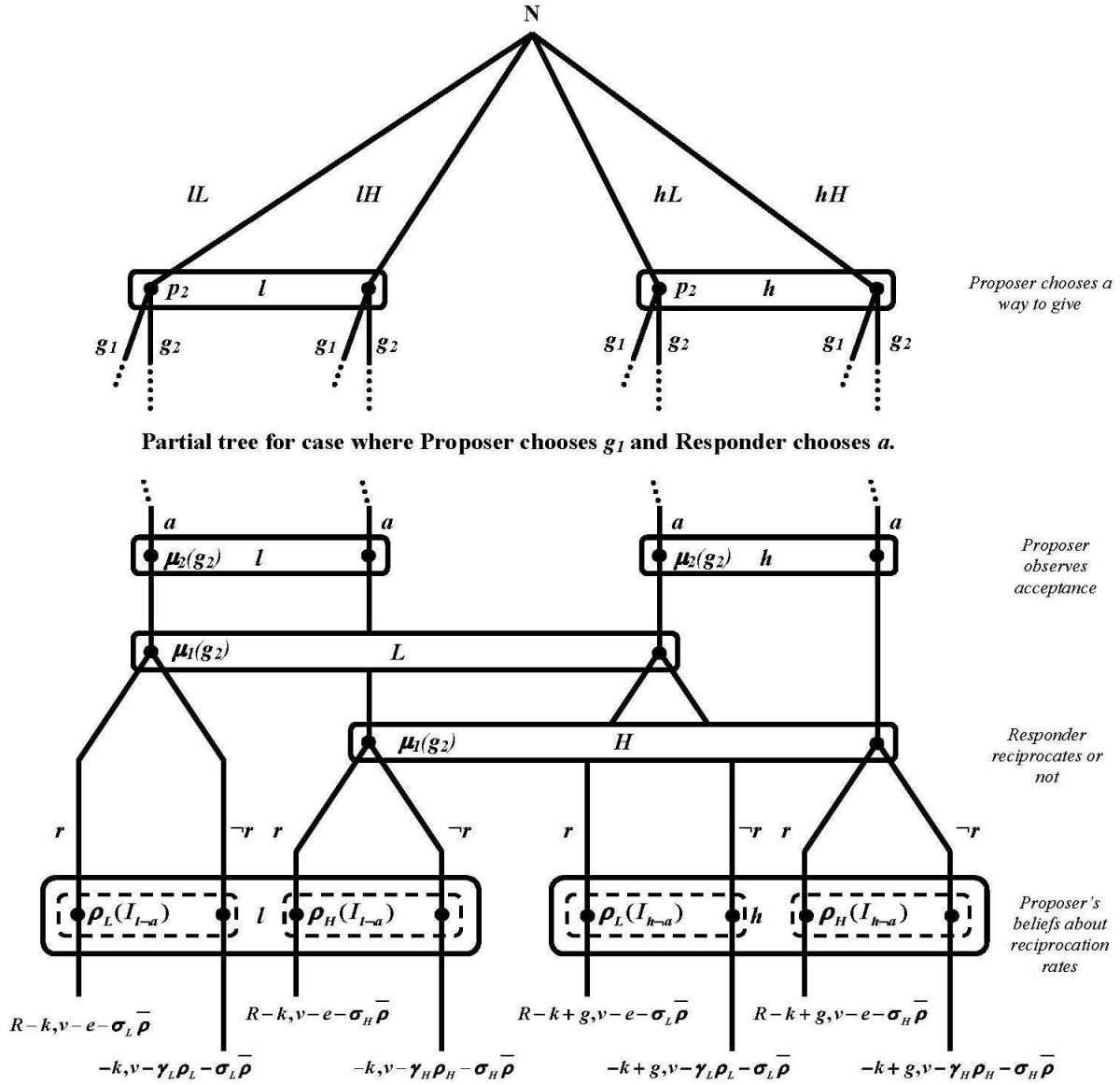
7 Appendix B: Background on Pharmaceutical Industry Gift Giving

Medical professionals, health policy makers, and the general public have become increasingly concerned about the effects of pharmaceutical company gifts to doctors in the face of costs that have risen disproportionately to measures of efficacy. These gifts range from free drug samples to items unrelated to the products manufactured by the company, such as expensive dinners, exotic vacation packages only tangentially related to short conferences or even large payments for very undemanding "consulting work". Gifts constitute a significant part of the $19 billion[Brennan et. al., 2006][25] spent on marketing to 650,000 prescribing US doctors – including the salaries of 85,000 pharmaceutical firm representatives who visit an average of 10 doctors per day. At the same time, patient spending on prescription medications has more than doubled between 1995-2001 from $64 billion to $154.5 billion in 2001, with an estimated one-quarter of this increase resulting from a shift among medical professionals to the prescribing of more expensive drugs [Dana and Loewenstein, 2003]. This figure is on its way to double again and totaled $252 billion in 2006 [Herper and Kang, 2006].

Increased costs could be due to better medicine. In 2000, the average price of these "new" drugs was nearly twice the average price of existing drugs prescribed for the same symptoms. But, according to [Dana and Loewenstein, 2003], the US Food and Drug Administration judged 76% of all approved new drugs between 1989 to 2000 to be only moderately more efficacious than existing treatments, many being a modification of an older product with the same ingredients. Not surprisingly, pharmaceutical firms are among the most profitable[26] [Fortune 500, 2001-2005]. PhRMA, the drug industry trade group, claims that this extraordinary profitability is due to extraordinary risks taken, as indicated by their posted R&D expenditures. Drug firms have been highly secretive about the specifics of their R&D spending data. One study argued that marketing dwarfs R&D spending by three fold [Public Citizen, 2001].

Doctors rarely acknowledge the influence of promotions on their prescribing. A number of studies, however, have established a positive relationship between prescription drug promotion and sales. There is also a consensus in the literature that doctors who report re-

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[25]Half is spent on free samples, which according to [Adair and Holmgren, 2005] shift doctor prescriptions habit by 10%. Doctors are also less critical of the appropriateness of a drug when giving out free samples [Morgan et. al., 2006]. As pointed out by a psychiatry blogger, firms may be feeding doctors' desire to be heroes in the eyes of their patients with free samples [Carlat, 2007]. Other initial evidence that free samples do have a significant impact on prescribing are in [Chew et. al., 2000].

[26]"From 1995 to 2002, pharmaceutical manufacturers were the nation's most profitable industry. They ranked 3rd in 2003 and 2004, 5th in 2005, and in 2006 they ranked 2nd, with profits (return on revenues) of 19.6% compared to 6.3% for all Fortune 500 firms."[Kaiser Foundation, 2007]

lying more on advertisements prescribe more heavily, more expensively, less generically, less appropriately and often adopt new drugs more quickly, leading to more side effects [Norris et. al., 2005]. The bias in self assessment as to the effects of promotion is illustrated dramatically in one study in which, after returning from all-expenses paid trips to educational symposia in resort locations, doctors reported that their prescribing would not be increased. Their tracked subsequent prescribing, however, attested to a significant increase [Orlowski and Wateska, 1992].

What exactly these gifts do is a topic of much debate. Drug firms have been monitoring physician prescribing imperfectly since 1950 through various sampling techniques[Greene, 2007]. Beginning in the 1990s, they were able to purchase physician level data. One major data provider to pharmaceutical firms, IMS Health, collects information on 70% of all prescriptions filled in community pharmacies [Steinbrook, 2006] and had revenues over $2.7 billion in 2007. Since 2005, the AMA has received $44 million/year from licensing physician data (the AMA Masterfile) which contains physician profiles for 900,000 physicians that can be used with pharmacy prescriptions data to construct physician prescribing profiles [Greene, 2007]. However, even as late as 2001, four in 10 physicians did not realize that drug industry representatives had information about their prescribing practices[Kaiser Foundation Survey, 2001].

Drug firms claim that gifts are incidental to their motive to persuade and are used merely to improve doctor attitude towards information presented to them[27]. Doctors themselves admit that gifts increase the likelihood of their attendance at drug firm presentations. In one survey however, 67% of faculty and 77% of residents believed accepting gifts could influence prescribing, especially if gifts greater than $100 were involved [Madhavan et. al., 1997]. In another, 61% of physicians thought that their prescribing would be unaffected by expensive gifts like textbooks, but only 16% thought their colleagues would be similarly unaffected [Steinman et. al., 2001] [28]. (From now on, this will be referred to as the "61/16 survey.") Furthermore, doctors' assessment as to whether they are affected by gifts negatively correlates with the amount and frequency of gifts they accept [Wazana, 2000].

There has been little or no state or federal sanctions of the amount or type of gifts that a doctor can accept. The American Medical Association and PhRMA have both formally *recommended* that doctors not accept gifts outside of textbooks with retail value greater than $100 and no more than *eight* at a time[29]. Most doctors are not aware of even these

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[27] A record $875 million fine against one firm for kickbacks and lavish gifts to get doctors to prescribe more of its drugs shows that what drug firms provide is not always just information [Raw, 2002]. Note, that crucially, the advertising and bribing motives for gifts are not mutually exclusive.

[28] The discrepancy between influence on self and influence on most other physicians is corroborated by [Madhavan et. al., 1997].

[29] The AMA has been criticized for conflict of interest for accepting $600,000 from drug firms to formulate

guidelines and enforcement is unheard of. Perhaps under the pressure of public uproar and the threat of regulation, many pharmaceutical firms adopted a similar code for themselves in 2002, and apparently to some effect. A new code going into effect in January 2009 prohibits distribution of noneducational items to health care professionals including small gifts, such as pens, note pads, mugs, and similar "reminder items" with company or product logos on them, even if they are practice-related[Hosansky (2008)].

8 Appendix C

8.1 The Screening Effect of Non-Credible Shame

In my model, unobservable reciprocation occurs *after* observable acceptance. This dynamic structure allows a Responder to reject based upon the shame attending on *beliefs* (about others beliefs) about what he *would have done, had he accepted.* The difference between his beliefs and what he actually would have done can capture non-acceptance from an overestimation of shame. For some range of shame sensitivities in Eq. 2 and 4b, only the belief 'whoever accepts reciprocates' would have been sufficient to deter acceptance. But in those equilibria, had the highly shame averse type of Responder accepted, he would not have reciprocated. His guilt would not have been sufficient. In rejecting, the Responder would not have taken into account the diminution of the aggregate reciprocation rate of all who accept from his own non-reciprocating acceptance. This outcome models the possibility that those who rejected in the Yale incident may not have taken into account the diminution of the shame of acceptance, *as a result of their own acceptance.* In contrast, those who accepted may have foreseen the possibility, as they themselves suggested.

More formally, recall that in dynamic games, off-equilibrium beliefs need not be consistent with histories after an actual deviation. Such beliefs allow for the possibility of incredible threats. In signaling games, the off-equilibrium beliefs themselves that an observer best responds to need not be credible. These beliefs can be eliminated by forward induction arguments like the Intuitive Criterion of [Cho and Kreps, 1987]. The key difference in psychological games is that the signallers' own preferences depend directly upon the observer's beliefs (or his beliefs about them). These beliefs and their effect upon the signallers preferences can also be credible or not. They too may not withstand a forward induction argument. In the separating equilibria of this game, the off-equilibrium beliefs of the player who not accepted allow for non-credible shame and guilt.

In Eq. 2a and 2b, type H's guilt sensitivity is not sufficient to induce reciprocation since

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and promote this policy.

$\gamma_H < \frac{e}{p_1}$. The non-acceptance condition $\neg(a \succeq \neg a)$ is defined as $\min\{e, p_1\gamma_H\rho_H\} > v - \sigma_H\bar{\rho}$.
In order for H to reject in Eq. 2a, he must believe

1. 'If I accept, I will be expected to reciprocate.' $\rho_H = 1$ and that others believe,

2. 'whoever accepts reciprocates' $\bar{\rho} = 1$.

But, others know that $\gamma_H < \frac{e}{p_1}$. Therefore, cannot expect him to reciprocate. Therefore, he cannot believe that they would expect him to reciprocate upon acceptance. Hence, $\rho_H = 0$. But, if they did not believe that he would reciprocate, they could only believe that 'whoever accepts *might* reciprocate' $\bar{\rho} < 1$. Thus, the difference in the shame sensitivity that *would* keep H from accepting: $\sigma_H > v - p_1\gamma_H$, and the shame sensitivity that *should* keep H from accepting: $\sigma_H \geq \frac{v}{p_2}$, is in the shame region $\frac{v}{p_2} \geq \sigma_H \geq v - p_1\gamma_H$ and $e > p_1\gamma_H$. (See dashed triangle marked (2) in figure 5.) If the Proposer insinuates, this region would be $\frac{v}{p_2} \geq \sigma_H \geq v - \gamma_H$ and $e > \gamma_H$.
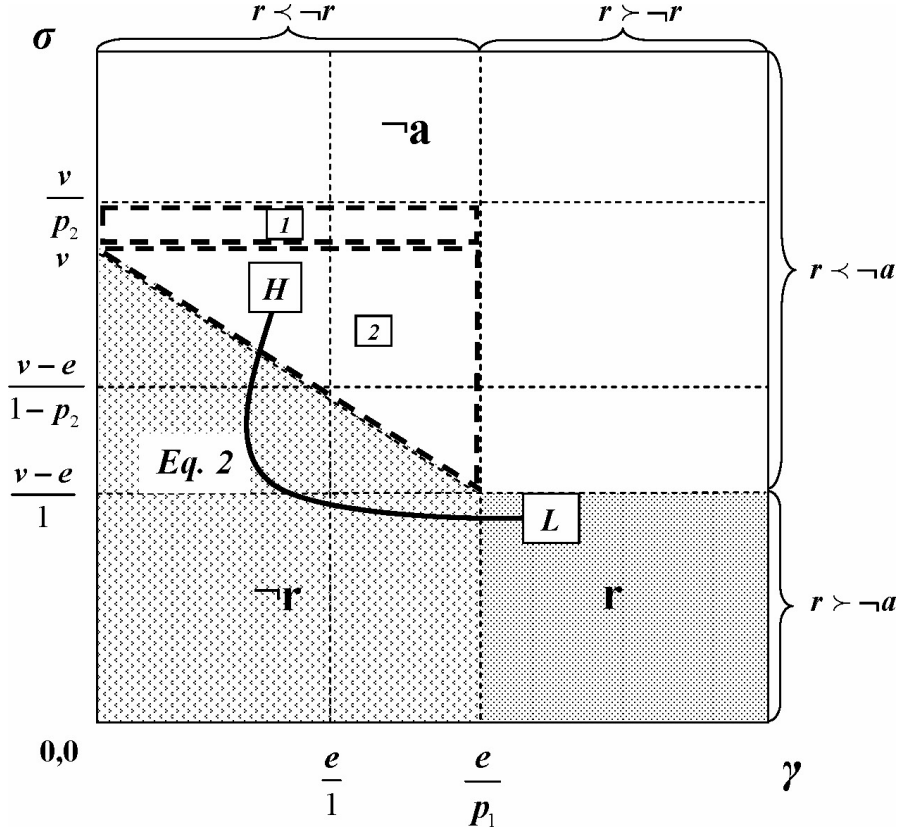

Figure 5: No Insinuation. Only L reciprocates.

In Eq. 2b, H believes that, had he accepted, he would *not have been expected* to reciprocate $\rho_H = 0$. It was only the raw shame externality of L that kept him from accepting:

$0 > v - \sigma_H$. But, then, if he did accept, he should anticipate that the shame should be diluted to $\sigma_H p_2 < \sigma_H$ by his own diminution of it, since he would not reciprocate. For him to reject then, when he anticipated this dilution, his shame sensitivity would have to be very high: $\sigma_H \geq \frac{v}{p_2}$. Then, the difference in the shame sensitivity that *would* keep H from accepting $\sigma_H > v$ and the shame sensitivity that *should* keep H from accepting $\sigma_H \geq \frac{v}{p_2}$ is in the shame region $\frac{v}{p_2} \geq \sigma_H \geq v$.(See dashed rectangle marked (1) in region $\gamma_H < \frac{e}{p_1}$ in figure 5.)

9 Appendix D: Proofs

Let $\mathbf{a}_{\theta_2}(g_2)$ be the rate of acceptance of type $\theta_2 \in \{H, L\}$ after observing giving with insinuation. Similarly, for $\mathbf{a}_{\theta_2}(g_1)$ but after observing giving only. Since g_2 is dominated for the h, in any equilibrium, $\boldsymbol{g}_{2h} = 0$. Propositions 1-3 are pooling equilibria in which Proposer l does not insinuate. Proposition 4 is a separating equilibrium in which l insinuates.

Recall the consistency condition for a PWSE from (6).

$$\rho_{\theta_2}(I) = \mathbf{r}_{\theta_2}(I), \forall I \in \mathcal{I}, \forall \theta_2 \in \{H, L\} \tag{32}$$

9.0.1 No Insinuation Equilibria

Proof of Lemma 1. For a fixed $s_1 \in \{g_2, g_1\}$, given $\rho_H(s_1) = \rho_L(s_1) = 0$, then regardless of the value of μ_2,

$$\bar{\rho} = \rho_H(s_1) \cdot \mu_2(s_1) + \rho_L(s_1) \cdot (1 - \mu_2(s_1)) = 0$$

Therefore, the acceptance condition $(a \succeq \neg a)$:

$$\min\{e, \mu_1(s_1)\gamma_{\theta_2}\rho_{\theta_2}(s_1)\} \leq v - \sigma_{\theta_2}\bar{\rho}(s_1), \forall \theta_2 \in \{H, L\}$$

will always be satisfied since it becomes,

$$\min\{e, 0\} \leq v$$

The reciprocate condition $(r \succeq \neg r)$:

$$\mu_1(s_1)\gamma_{\theta_2}\rho_{\theta_2}(s_1) \geq e, \forall \theta_2 \in \{H, L\}$$

is never satisfied since $\rho_{\theta_2}(s_1) = 0, \forall \theta_2 \in \{H, L\}$ regardless of of the value of μ_1. If both Responders accept and neither reciprocate, then the l Proposer's payoff from insinuating from (3) would be

$$\max_{s_1 \in \{g_2, g_1\}} E\left(\pi_l\left(s_1, \mathbf{r}\left(s_1\right)\right)\right) = \max_{s_1 \in \{g_2, g_1\}} \left\{\mu_2\left(s_1\right)\left(\mathbf{r}_L\left(s_1\right) \cdot R - k\right) + \left(1 - \mu_2\left(s_1\right)\right)\left(\mathbf{r}_H\left(s_1\right) \cdot R - k\right)\right\}$$

$$\tag{33}$$

$$= \max_{s_1 \in \{g_2, g_1\}} \left\{\mu_2\left(s_1\right)\left(0 \cdot R - k\right) + \left(1 - \mu_2\left(s_1\right)\right)\left(0 \cdot R - k\right)\right\} = -k \tag{34}$$

∎

Proof of Proposition 2. ($\Rightarrow$) l Proposer pools to g_1. Thus, $\boldsymbol{g}_{2l} = 0, \boldsymbol{g}_{2h} = 0$. Beliefs are not updated: $\mu_1\left(g_1\right) = p_1$. Both Responders accept and reciprocate: $\mathbf{a}_H\left(g_1\right) = \mathbf{r}_H\left(g_1\right) = \mathbf{a}_L\left(g_1\right) = \mathbf{r}_L\left(g_1\right) = 1$. Therefore, $\left(r \succeq \neg r, r \succeq \neg a\right)$:

$$v - e \geq \sigma_{\theta_2}\bar{\rho}\left(g_1\right) \text{ and } \mu_1\left(g_1\right)\gamma_{\theta_2}\rho_{\theta_2}\left(g_1\right) \geq e, \forall \theta_2 \in \{H, L\} \tag{35}$$

Consistency (32) requires $\rho_H\left(g_1\right) = \mathbf{r}_H\left(g_1\right) = 1$ and $\rho_L\left(g_1\right) = \mathbf{r}_L\left(g_1\right) = 1$. Since both types of Responders took the same action, the updated belief of the Proposer that it is facing the H type of Responder is equal to her prior: $\mu_2\left(g_1\right) = p_2$ in

$$\bar{\rho}\left(g_1\right) = \rho_L\left(g_1\right) \cdot \mu_2\left(g_1\right) + \rho_H\left(g_1\right) \cdot \left(1 - \mu_2\left(g_1\right)\right) = 1$$

from (1). Combined with (35), we get (9) and (10).

($\Leftarrow$)Now suppose that (9) and (10) hold. Since $\rho_H\left(g_1\right) = \rho_L\left(g_1\right) = 1$, then

$$\bar{\rho}\left(g_1\right) = \rho_L\left(g_1\right) \cdot \mu_2\left(g_1\right) + \rho_H\left(g_1\right) \cdot \left(1 - \mu_2\left(g_1\right)\right) = 1$$

Then the condition for both types of Responders to accept and to reciprocate $\left(r \succeq \neg r, r \succeq \neg a\right)$:

$$v - e \geq \sigma_{\theta_2}\bar{\rho}\left(g_1\right) \text{ and } \mu_1\gamma_{\theta_2}\rho_H\left(g_1\right) \geq e, \forall \theta_2 \in \{H, L\}$$

will be met. Hence, $\mathbf{a}_H\left(g_1\right) = \mathbf{r}_H\left(g_1\right) = \mathbf{a}_L\left(g_1\right) = \mathbf{r}_L\left(g_1\right) = 1$, if the l Proposers pools to g_1. $\mu_2\left(g_1\right) = p_2$ since the Responders pooled, in which case, $\mu_1\left(g_1\right) = p_1$. l will pool to g_1 because he cannot do better by deviating to g_2 since both types of Responders are reciprocating. Therefore nothing that the Responders do after g_2 will can perturb the equilibrium path. In particular, $\mathbf{a}_H\left(g_2\right) = 1, \mathbf{r}_H\left(g_2\right) = 0, \mathbf{a}_L\left(g_2\right) = 1, \mathbf{r}_L\left(g_2\right) = 0$ supports the equilibrium. Thus, $\boldsymbol{g}_{2l} = 0, \boldsymbol{g}_{2h} = 0$. ∎

Proof of Proposition 3. ($\Rightarrow$) l Proposer pools to g_1. Thus, $\boldsymbol{g}_{2l} = 0, \boldsymbol{g}_{2h} = 0$. Beliefs are not updated: $\mu_1\left(g_1\right) = p_1$. The L Responder accepts and reciprocates: $\mathbf{a}_L\left(g_1\right) = \mathbf{r}_L\left(g_1\right) = 1$.

Then $(r \succeq \neg r, r \succeq \neg a):$

$$v - e \geq \sigma_L \bar{\rho}(g_1) \text{ and } \mu_1(g_1)\gamma_L\rho_L(g_1) \geq e \qquad (36)$$

Consistency (32) on the equilibrium path requires $\rho_L(g_1) = \mathbf{r}_L(g_1) = 1$. The H Responder does not accept: $\mathbf{a}_H(g_1) = 0$. The condition for rejection $\neg(a \succeq \neg a):$

$$\min\{e, \mu_1(g_1)\gamma_H\rho_H(g_1)\} > v - \sigma_H\bar{\rho}(g_1) \qquad (37)$$

is met for H. The updated belief of the Proposer that it is facing the L type would be $\mu_2(g_1) = 1$. Then from (1)

$$\bar{\rho}(g_1) = \rho_L(g_1) \cdot \mu_2(g_1) + \rho_H(g_1) \cdot (1 - \mu_2(g_1)) \qquad (38)$$

$$\bar{\rho}(g_1) = 1 \cdot 1 + \rho_H(g_1) \cdot 0 = 1 \qquad (39)$$

With (39), (36) becomes the rest of (11)

$$v - e \geq \sigma_L \text{ and } p_1\gamma_L \geq e$$

(37) becomes

$$\min\{e, p_1\gamma_H\rho_H(g_1)\} > v - \sigma_H \qquad (40)$$

After rejection beliefs are arbitrary $\rho_H(g_1) \in \{0, 1\}$.

Let the Responder believe that had he accepted, he would have been expected to reciprocate $\rho_H(g_1) = 1$. (40) becomes

$$\min\{e, p_1\gamma_H\} > v - \sigma_H$$

Again, because what happens after rejection cannot affect the equilibrium path, we can set $p_1\gamma_H < e$. Hence, $\sigma_H > v - p_1\gamma_H$. This is $(13a)$.

Alternatively, let the Responder believe that had he accepted, he would not have been expected to reciprocate then $\rho_H(g_1) = 0$. (40) becomes

$$\min\{e, 0\} > v - \sigma_H$$

Hence, $0 > v - \sigma_H$. This is $(13l)$. We can set $\rho_H(g_2) = 0$ and $\rho_L(g_2) = 0$ off the equilibrium path. Then, (12) is satisfied.

$(\Leftarrow)$Now, given that (11) and $(13a)$ hold and suppose the l Proposer pools so that

$\mu_1 (g_1) = p_1$. By (11) :

$$\rho_L (g_1) = 1, \bar{\rho} (g_1) = 1, v - e \geq \sigma_L \text{ and } p_1 \gamma_L \geq e$$

the acceptance and reciprocation are best condition $(r \succeq \neg r, r \succeq \neg a)$ is met for L

$$v - e \geq \sigma_L \bar{\rho} (g_1) \text{ and } \mu_1 (g_1) \gamma_L \rho_L (g_1) \geq e \tag{41}$$

Therefore, $\mathbf{a}_L (g_1) = \mathbf{r}_L (g_1) = 1$.

By $(13a)$: $\rho_H (g_1) = 1$, $p_1 \gamma_H < e$, then $\mu_1 (g_1) \gamma_H \rho_H (g_1) < e$. Also by $(13a)$: $v - p_1 \gamma_H < \sigma_H$ and therefore

$$\min \{e, p_1 \gamma_H \rho_H\} > v - \sigma_H$$

the reject condition $\neg (a \succeq \neg a)$ is met for H,

$$\min \{e, \mu_1 (g_1) \gamma_H \rho_H (g_1)\} > v - \sigma_H \bar{\rho} (g_1)$$

Therefore, $\mathbf{a}_H (g_1) = 0$. Off the equilibrium path, we can set $\mathbf{r}_H (g_1) = 0$. Since by (41) at least one type L reciprocated, by (4) the Proposer will make positive profits after g_2. By (12): $\rho_H (g_2) = \rho_L (g_2) = 0$. By Lemma 1, if the l Proposer were to deviate to g_2, she would earn $-k < 0$. Hence, she will not deviate. Thus, $\boldsymbol{g}_{2l} = 0, \boldsymbol{g}_{2h} = 0$.

$(\Leftarrow)$Now alternatively, given that (11) and $(13l)$ hold and suppose the l Proposer pools so that $\mu_1 (g_1) = p_1$. By (11) :

$$\rho_L (g_1) = 1, \bar{\rho} (g_1) = 1, v - e \geq \sigma_L \text{ and } p_1 \gamma_L \geq e$$

Therefore, the acceptance and reciprocation are best condition $(r \succeq \neg r, r \succeq \neg a)$ is met for L

$$v - e \geq \sigma_L \bar{\rho} (g_1) \text{ and } \mu_1 (g_1) \gamma_L \rho_L (g_1) \geq e$$

Therefore, $\mathbf{a}_L (g_1) = \mathbf{r}_L (g_1) = 1$. By $(13l)$:

$$\rho_H (g_1) = 0, \sigma_H > v \text{ and } p_1 \gamma_H < e.$$

Therefore,

$$\min \{e, 0\} > v - \sigma_H \bar{\rho} (g_1)$$

The reject condition $\neg (a \succeq \neg a)$:

$$\min \{e, \mu_1 (g_1) \gamma_H \rho_H (g_1)\} > v - \sigma_H \bar{\rho} (g_1)$$

for H is met. Therefore, $\mathbf{a}_H\left(g_1\right)=0$. Off the equilibrium path, we can set $\mathbf{r}_L\left(g_1\right)=0$.

Since at least one type reciprocated after g_1, by (4) the Proposer will make positive profits after g_1. By (12) and Lemma 1, if the l Proposer were to deviate to g_2, she would earn $-k<0$. Hence, she will not deviate. Thus, $\boldsymbol{g}_{2l}=0, \boldsymbol{g}_{2h}=0$. ∎

Proof of Proposition 4. ($\Rightarrow$) l Proposer pools to g_1. Thus, $\boldsymbol{g}_{2l}=0, \boldsymbol{g}_{2h}=0$. Beliefs are not updated: $\mu_1\left(g_1\right)=p_1$. The L Responder accepts and reciprocates: $\mathbf{a}_L\left(g_1\right)=\mathbf{r}_L\left(g_1\right)=1$. Therefore, $\left(r \succeq \neg r, r \succeq \neg a\right)$:

$$v-e \geq \sigma_L\bar{\rho}\left(g_1\right) \text{ and } \mu_1\left(g_1\right)\gamma_L\rho_L\left(g_1\right) \geq e \tag{42}$$

Consistency (32) on the equilibrium path requires $\rho_L\left(g_1\right)=\mathbf{r}_L\left(g_1\right)=1$.

For H, $\mathbf{a}_H\left(g_1\right)=1, \mathbf{r}_H\left(g_1\right)=0$. The accept $\left(a \succeq \neg a\right)$:

$$\min\left\{e, \mu_1\left(g_1\right)\gamma_H\rho_H\left(g_1\right)\right\} \leq v-\sigma_H\bar{\rho}\left(g_1\right)$$

condition holds but not the reciprocate condition $\left(r \succeq \neg r\right)$:

$$\mu_1\left(g_1\right)\gamma_H\rho_H\left(g_1\right) < e$$

Consistency (32) implies, $\rho_H\left(g_1\right)=\mathbf{r}_H\left(g_1\right)=0$ and therefore,

$$0 \leq v-\sigma_H\bar{\rho}\left(g_1\right) \text{ and } 0 < e \tag{43}$$

To find $\bar{\rho}\left(g_1\right)$, note that since both accepted, the updated belief of the Proposer that it is facing the L type is equal to her prior, $\mu_2\left(g_1\right)=p_2$ in

$$\bar{\rho}\left(g_1\right)=\rho_L\left(g_1\right) \cdot \mu_2\left(g_1\right)+\rho_H\left(g_1\right) \cdot \left(1-\mu_2\left(g_1\right)\right)$$

by (1). Hence,

$$\bar{\rho}\left(g_1\right)=1 \cdot p_2+0 \cdot \left(1-p_2\right)=p_2$$

The rest of (16) holds. Putting $\bar{\rho}\left(g_1\right)=p_2$ into (42) we have (14) :

$$v-e \geq \sigma_L p_2 \text{ and } p_1\gamma_L \geq e$$

Putting $\bar{\rho}\left(g_1\right)=p_2$ into (43) we have (15) :

$$0 \leq v-\sigma_H p_2$$

Since insinuation g_2 is off the equilibrium path, beliefs are arbitrary. We can set $\rho_L(g_2) = \rho_H(g_2) = 0$, which is (17).

$(\Leftarrow)$Now, suppose that (14) and (16) hold and the l Proposer pools so that $\mu_1(g_1) = p_1$. By (14) :

$$v - e \geq \sigma_L p_2 \text{ and } p_1 \gamma_L \geq e$$

and (16) : $\rho_L(g_1) = 1$. Therefore, $(r \succeq \neg r, r \succeq \neg a)$:

$$v - e \geq \sigma_L \bar{\rho}(g_1) \text{ and } \mu_1(g_1)\gamma_L \rho_L(g_1) \geq e$$

Thus, $\mathbf{a}_L(g_1) = 1, \mathbf{r}_L(g_1) = 1$.

By (15) : $0 \leq v - \sigma_H p_2$ and by (16) : $\rho_H(g_1) = 0$, it follows that the not reciprocate is better than not accept condition $(\neg r \succeq \neg a)$ is met for H

$$v - \mu_1(g_1)\gamma_H \rho_H(g_1) - \sigma_H \bar{\rho}(g_1) \geq 0$$

Along with $p_1 \gamma_H < e$, then $\neg(r \succeq \neg r)$ is met:

$$\mu_1(g_1)\gamma_H \rho_H(g_1) < e$$

Therefore, $\mathbf{a}_H(g_1) = 1, \mathbf{r}_H(g_1) = 0$.

Since at least one type reciprocated, by (4) the Proposer will make positive profits after g_1. By (17) and Lemma 1, if the l Proposer were to deviate to g_2, she would earn $-k < 0$. Hence, she will not deviate. Thus, $\boldsymbol{g}_{2l} = 0, \boldsymbol{g}_{2h} = 0$. ∎

Proof of Proposition 5. $(\Rightarrow)$ l Proposer pools to g_1. Thus, $\boldsymbol{g}_{2l} = 0, \boldsymbol{g}_{2h} = 0$. Beliefs are not updated: $\mu_1(g_1) = p_1$. The H Responder accepts and reciprocates: $\mathbf{a}_H(g_1) = \mathbf{r}_H(g_1) = 1$. Therefore, $(r \succeq \neg r, r \succeq \neg a)$:

$$v - e \geq \sigma_H \bar{\rho}(g_1) \text{ and } \mu_1(g_1)\gamma_H \rho_H(g_1) \geq e \tag{44}$$

Consistency (32) on the equilibrium path requires $\rho_H(g_1) = \mathbf{r}_H(g_1) = 1$.

For L, $\mathbf{a}_L(g_1) = 1, \mathbf{r}_L(g_1) = 0$. The accept $(a \succeq \neg a)$:

$$\min\{e, \mu_1(g_1)\gamma_L \rho_L(g_1)\} \leq v - \sigma_L \bar{\rho}(g_1)$$

condition holds but not the reciprocate condition $(r \succeq \neg r)$:

$$\mu_1(g_1)\gamma_L \rho_L(g_1) < e$$

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Consistency (32) implies, $\rho_L(g_1) = \mathbf{r}_L(g_1) = 0$ and therefore,

$$0 \leq v - \sigma_L \bar{\rho}(g_1) \text{ and } 0 < e \tag{45}$$

To find $\bar{\rho}(g_1)$, note that since both accepted, the updated belief of the Proposer that it is facing the L type is equal to her prior, $\mu_2(g_1) = p_2$ in

$$\bar{\rho}(g_1) = \rho_L(g_1) \cdot \mu_2(g_1) + \rho_H(g_1) \cdot (1 - \mu_2(g_1))$$

by (1). Hence,

$$\bar{\rho}(g_1) = 0 \cdot p_2 + 1 \cdot (1 - p_2) = (1 - p_2)$$

The rest of (20) holds. Putting $\bar{\rho}(g_1) = (1 - p_2)$ into (44) we have (18) :

$$v - e \geq \sigma_H(1 - p_2) \text{ and } p_1 \gamma_H \geq e$$

Putting $\bar{\rho}(g_1) = (1 - p_2)$ into (45) we have (19) :

$$0 \leq v - \sigma_L(1 - p_2)$$

Since insinuation g_2 is off the equilibrium path, beliefs are arbitrary. We can set $\rho_H(g_2) = \rho_L(g_2) = 0$, which is (21).

($\Leftarrow$)Now, suppose that (18) and (20) hold and the l Proposer pools so that $\mu_1(g_1) = p_1$. By (18) :

$$v - e \geq \sigma_H(1 - p_2) \text{ and } p_1 \gamma_H \geq e$$

and (20) : $\rho_H(g_1) = 1$, therefore, $(r \succeq \neg r, r \succeq \neg a)$:

$$v - e \geq \sigma_H \bar{\rho}(g_1) \text{ and } \mu_1(g_1) \gamma_H \rho_H(g_1) \geq e$$

Thus, $\mathbf{a}_H(g_1) = 1, \mathbf{r}_H(g_1) = 1$.

By (19) : $0 \leq v - \sigma_L(1 - p_2)$ and by (20) : $\rho_L(g_1) = 0$, it follows that the not reciprocate is better than not accept condition $(\neg r \succeq \neg a)$ is met for L

$$v - \mu_1(g_1) \gamma_L \rho_L(g_1) - \sigma_L \bar{\rho}(g_1) \geq 0$$

Along with $p_1 \gamma_L < e$, then $\neg(r \succeq \neg r)$ is met:

$$\mu_1(g_1) \gamma_L \rho_L(g_1) < e$$

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Therefore, $\mathbf{a}_L(g_1) = 1, \mathbf{r}_L(g_1) = 0$.

Since at least one type reciprocated, by (4) the Proposer will make positive profits after g_1. By (21) and Lemma 1, if the l Proposer were to deviate to g_2, she would earn $-k < 0$. Hence, she will not deviate. Thus, $\boldsymbol{g}_{2l} = 0, \boldsymbol{g}_{2h} = 0$. ∎

Proof of Corollary 6. Suppose as in Eq. $3H$ that both types of Responders accept and H reciprocates. But, suppose L also reciprocates. The $(r \succeq \neg r, r \succeq \neg a)$:

$$v - e \geq \sigma_{\theta_2}\bar{\rho}(g_1) \text{ and } \mu_1(g_1)\gamma_{\theta_2}\rho_{\theta_2}(g_1) \geq e, \forall \theta_2 \in \{L, H\}$$

condition would have to be met for both. Since both types reciprocate, consistency (32) requires $\rho_H(g_1) = \rho_L(g_1) = 1$. Therefore, by (1) : $\bar{\rho}(g_1) = 1$. That would violate $v - e < \sigma_H$.

If say only H accepts and reciprocates, then $\rho_H(g_1) = 1$ and $\rho_L(g_1) = 0$. Therefore, $\bar{\rho}(g_1) = 1$, so again, that would violate $v - e < \sigma_H$. ∎

9.0.2 Insinuation Equilibrium

Proof of Proposition 7. $(\Rightarrow)$ l Proposer separates by insinuating g_2. Thus, $\boldsymbol{g}_{2l} = 1, \boldsymbol{g}_{2h} = 0$. Beliefs are updated: $\mu_1(g_2) = 1$ and $\mu_1(g_1) = 0$.

Since $\mathbf{a}_H(g_1) = \mathbf{a}_L(g_1) = 1$ and $\mathbf{r}_H(g_1) = \mathbf{r}_L(g_1) = 0$, the condition for reciprocating, given acceptance $(r \succeq \neg r)$:

$$\mu_1(g_1)\gamma_{\theta_2}\rho_{\theta_2}(g_1) \geq e$$

must not be met. By consistency (32), $\rho_H(g_1) = \rho_L(g_1) = 0$. Therefore (23) follows.

Since $\mathbf{a}_L(g_2) = 1$ and $\mathbf{r}_L(g_2) = 1$, then the condition for accepting and reciprocating for L $(r \succeq \neg r, r \succeq \neg a)$:

$$v - e \geq \sigma_L\bar{\rho}(g_2) \text{ and } \mu_1(g_2)\gamma_L\rho_L(g_2) \geq e \tag{46}$$

will be met. Consistency (32) on the equilibrium path requires $\rho_L(g_2) = \mathbf{r}_L(g_2) = 1$.

$\mathbf{a}_H(g_1) = 0$ and therefore, the updated belief of the Proposer that it is facing the L type given acceptance $\mu_2(g_2) = 1$. Then from (1)

$$\bar{\rho}(g_2) = \rho_L(g_2) \cdot \mu_2(g_2) + \rho_H(g_2) \cdot (1 - \mu_2(g_2)) = 1 \tag{47}$$

Substituting into (46) completes (22)

$$v - e \geq \sigma_L \text{ and } \gamma_L \geq e$$

H does not accept: $\mathbf{a}_H(g_2) = 0$. Therefore, for H the condition for rejecting must be met

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$\neg (a \succeq \neg a):$

$$\min\{e, \mu_1(g_2)\gamma_H\rho_H(g_2)\} > v - \sigma_H\bar{\rho}(g_2) \tag{48}$$

Since, after rejection, what would have happened after acceptance is off-equilibrium, beliefs are arbitrary: $\rho_H(g_2) \in \{0, 1\}$.

Let the Responder believe that had he accepted, he would have been expected to reciprocate then $\rho_H(g_2) = 1$. (48) with (47) becomes

$$\min\{e, \gamma_H\} > v - \sigma_H$$

Again, because what happens after rejection cannot affect the equilibrium path, we can set $p_1\gamma_H \geq e$. Therefore, (24a)

$$\sigma_H > v - e$$

Let the Responder believe that had he accepted, he would have been expected to reciprocate then $\rho_H(g_2) = 0$. (48) with (47) becomes

$$\min\{e, 0\} > v - \sigma_H$$

Therefore, (24l).

($\Leftarrow$)Now, given that $(22), (23)$ and $(24a)$ are true and suppose the l Proposer separates so that $\mu_1(g_2) = 1$. By $(22):$

$$\rho_L(g_2) = 1, \bar{\rho}(g_2) = 1, v - e \geq \sigma_L \text{ and } \gamma_L \geq e$$

The acceptance and reciprocation are best condition $(r \succeq \neg r, r \succeq \neg a):$

$$v - e \geq \sigma_L\bar{\rho}(g_2) \text{ and } \mu_1(g_2)\gamma_L\rho_L(g_2) \geq e \tag{49}$$

is met for L. Therefore, $\mathbf{a}_L(g_2) = 1$ and $\mathbf{r}_L(g_2) = 1$.

By $(24a):$

$$\rho_H(g_2) = 1, \sigma_H > v - e \text{ and } \gamma_H \geq e$$

Therefore

$$\min\{e, \gamma_H\} > v - \sigma_H$$

satisfying the reject condition $\neg(a \succeq \neg a)$ for H

$$\min\{e, \mu_1(g_2)\gamma_H\rho_H(g_2)\} > v - \sigma_H\bar{\rho}(g_2)$$

Thus, $\mathbf{a}_H(g_2) = 0$ and we can set $\mathbf{r}_H(g_2) = 1$.

Since by (49) at least one type L reciprocated, by (4) the Proposer will make positive profits after g_2. By (23) and Lemma 1, if the l Proposer were to deviate to g_1, she would earn $-k < 0$. Hence, she will not deviate. Thus, $\boldsymbol{g}_{2l} = 1, \boldsymbol{g}_{2h} = 0$.

Now alternatively, suppose that $(22), (23)$ and $(24b)$ are true and the l Proposer separates so that $\mu_1(g_2) = 1$. Just as before in (49), the acceptance and reciprocation are best condition $(r \succeq \neg r, r \succeq \neg a)$ is met for $L : \mathbf{a}_L(g_2) = 1$ and $\mathbf{r}_L(g_2) = 1$.

By $(24b)$:

$$\rho_H(g_2) = 0, \sigma_H > v \text{ and } \gamma_H \geq e$$

Thus,

$$\min\{e, 0\} > v - \sigma_H$$

which implies that reject condition $\neg(a \succeq \neg a)$ is met for H

$$\min\{e, \mu_1(g_2) \gamma_H \rho_H(g_2)\} > v - \sigma_H \bar{\rho}(g_2)$$

Therefore, $\mathbf{a}_H(g_2) = 0$. We can then choose $\mathbf{r}_H(g_2) = 0$ or 1. Since by at least one type L reciprocated, by (4) the Proposer will make positive profits after g_2. By (23) and Lemma 1, if the l Proposer were to deviate to g_1, she would earn $-k < 0$. Hence, she will not deviate. Thus, $\boldsymbol{g}_{2l} = 1, \boldsymbol{g}_{2h} = 0$. ∎

Proof of Proposition 8. $(\Rightarrow)$ l Proposer separates by insinuating. Thus, $\boldsymbol{g}_{2l} = 1, \boldsymbol{g}_{2h} = 0$. Beliefs are updated: $\mu_1(g_2) = 1$ and $\mu_1(g_1) = 0$. The L Responder accepts and reciprocates: $\mathbf{a}_L(g_2) = \mathbf{r}_L(g_2) = 1$. Then $(r \succeq \neg r, r \succeq \neg a)$:

$$v - e \geq \sigma_L \bar{\rho}(g_2) \text{ and } \mu_1(g_2) \gamma_L \rho_L(g_2) \geq e \tag{50}$$

Consistency (32) on the equilibrium path requires $\rho_L(g_2) = \mathbf{r}_L(g_2) = 1$. The H Responder does not accept: $\mathbf{a}_H(g_2) = 0$. The condition for rejection $\neg(a \succeq \neg a)$:

$$\min\{e, \mu_1(g_2) \gamma_H \rho_H(g_2)\} > v - \sigma_H \bar{\rho}(g_2) \tag{51}$$

is met for H. The updated belief of the Proposer that it is facing the L type would be $\mu_2(g_2) = 1$. Then from (1)

$$\bar{\rho}(g_2) = \rho_L(g_2) \cdot \mu_2(g_2) + \rho_H(g_2) \cdot (1 - \mu_2(g_2)) \tag{52}$$

$$\bar{\rho}(g_2) = 1 \cdot 1 + \rho_H(g_2) \cdot 0 = 1 \tag{53}$$

With (53), (50) becomes the rest of (25)

$$v - e \geq \sigma_L \text{ and } \gamma_L \geq e$$

(51) becomes

$$\min\{e, \gamma_H \rho_H(g_2)\} > v - \sigma_H \tag{54}$$

After rejection beliefs are arbitrary $\rho_H(g_2) \in \{0, 1\}$.

Let the Responder believe that had he accepted, he would have been expected to reciprocate $\rho_H(g_2) = 1$. (54) becomes

$$\min\{e, \gamma_H\} > v - \sigma_H$$

Again, because what happens after rejection cannot affect the equilibrium path, we can set $\gamma_H < e$.Hence, $\sigma_H > v - \gamma_H$. This is $(27a)$.

Alternatively, let the Responder believe that had he accepted, he would not have been expected to reciprocate then $\rho_H(g_2) = 0$. (54) becomes

$$\min\{e, 0\} > v - \sigma_H$$

Hence, $0 > v - \sigma_H$. This is $(27l)$. We can set $\rho_H(g_1) = 0$ and $\rho_L(g_1) = 0$ off the equilibrium path. Then, (26) is satisfied.

($\Leftarrow$)Now, given that (25) and $(27a)$ hold and suppose the l Proposer pools so that $\mu_1(g_2) = 1$ and $\mu_1(g_1) = 0$. By (25) :

$$\rho_L(g_2) = 1, \bar{\rho}(g_2) = 1, v - e \geq \sigma_L \text{ and } \gamma_L \geq e$$

the acceptance and reciprocation are best condition $(r \succeq \neg r, r \succeq \neg a)$ is met for L

$$v - e \geq \sigma_L \bar{\rho}(g_2) \text{ and } \mu_1(g_2) \gamma_L \rho_L(g_2) \geq e \tag{55}$$

Therefore, $\mathbf{a}_L(g_2) = \mathbf{r}_L(g_2) = 1$.

By $(27a)$: $\rho_H(g_2) = 1$, $\gamma_H < e$, then $\mu_1(g_2)\gamma_H\rho_H(g_2) < e$. Also by $(27a)$: $v - \gamma_H < \sigma_H$ and

$$\min\{e, \gamma_H \rho_H\} > v - \sigma_H$$

the reject condition $\neg(a \succeq \neg a)$ is met for H,

$$\min\{e, \mu_1(g_2) \gamma_H \rho_H(g_2)\} > v - \sigma_H \bar{\rho}(g_2)$$

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Therefore, $\mathbf{a}_H(g_2) = 0$. Off the equilibrium path, we can set $\mathbf{r}_H(g_2) = 0$. Since by (55) at least one type L reciprocated, by (4) the Proposer will make positive profits after g_2. By $(26): \rho_H(g_1) = \rho_L(g_1) = 0$ and Lemma 1, if the l Proposer were to deviate to g_1, she would earn $-k < 0$. Hence, she will not deviate. Thus, $\boldsymbol{g}_{2l} = 1, \boldsymbol{g}_{2h} = 0$.

($\Leftarrow$)Now alternatively, given that (25) and (27b) hold and suppose the l Proposer separate so that $\mu_1(g_2) = 1$ and $\mu_1(g_2) = 0$. By (25) :

$$\rho_L(g_2) = 1, \bar{\rho}(g_2) = 1, v - e \geq \sigma_L \text{ and } \gamma_L < e$$

Therefore, the acceptance and reciprocation are best condition $(r \succeq \neg r, r \succeq \neg a)$ is met for L

$$v - e \geq \sigma_L \bar{\rho}(g_2) \text{ and } \mu_1(g_2)\gamma_L\rho_L(g_2) < e \tag{56}$$

Therefore, $\mathbf{a}_L(g_2) = \mathbf{r}_L(g_2) = 1$. By (27$b$) :

$$\rho_H(g_2) = 0, \sigma_H > v \text{ and } \gamma_H < e.$$

Therefore,

$$\min\{e, 0\} > v - \sigma_H \bar{\rho}(g_2)$$

The reject condition $\neg(a \succeq \neg a)$:

$$\min\{e, \mu_1(g_2)\gamma_H\rho_H(g_2)\} > v - \sigma_H \bar{\rho}(g_2)$$

for H is met. Therefore, $\mathbf{a}_H(g_2) = 0$. Off the equilibrium path, we can set $\mathbf{r}_L(g_2) = 0$.

Since by (56) at least one type reciprocated after g_2, by (4) the Proposer will make positive profits after g_2. By (26) and Lemma 1, if the l Proposer were to deviate to g_1, she would earn $-k < 0$. Hence, she will not deviate. Thus, $\boldsymbol{g}_{2l} = 1, \boldsymbol{g}_{2h} = 0$. ∎

Proof of Proposition 9. ($\Rightarrow$) Proposer separates by insinuating g_2. Thus, $\boldsymbol{g}_{2l} = 1, \boldsymbol{g}_{2h} = 0$. Beliefs are updated: $\mu_1(g_2) = 1$ and $\mu_1(g_1) = 0$. Both Responders accept and reciprocate: $\mathbf{a}_H(g_2) = \mathbf{r}_H(g_2) = \mathbf{a}_L(g_2) = \mathbf{r}_L(g_2) = 1$. Therefore, $(r \succeq \neg r, r \succeq \neg a)$:

$$v - e \geq \sigma_{\theta_2}\bar{\rho}(g_2) \text{ and } \mu_1(g_2)\gamma_{\theta_2}\rho_{\theta_2}(g_2) \geq e, \forall \theta_2 \in \{H, L\} \tag{57}$$

Consistency (32) requires $\rho_H(g_2) = \mathbf{r}_H(g_2) = 1$ and $\rho_L(g_2) = \mathbf{r}_L(g_2) = 1$. Since both types of Responders took the same action, the updated belief of the Proposer that it is facing the H type of Responder is equal to her prior: $\mu_2(g_2) = p_2$ in

$$\bar{\rho}(g_2) = \rho_L(g_2) \cdot \mu_2(g_2) + \rho_H(g_2) \cdot (1 - \mu_2(g_2)) = 1$$

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from (1). Combined with (57), we get (28) and (29).

$(\Leftarrow)$Now suppose that (28) and (29) hold. Since $\rho_H(g_2) = \rho_L(g_2) = 1$, then

$$\bar{\rho}(g_2) = \rho_L(g_2) \cdot \mu_2(g_2) + \rho_H(g_2) \cdot (1 - \mu_2(g_2)) = 1$$

Then the condition for both types of Responders to accept and to reciprocate $(r \succeq \neg r, r \succeq \neg a):$

$$v - e \geq \sigma_{\theta_2} \bar{\rho}(g_2) \text{ and } \mu_1 \gamma_{\theta_2} \rho_H(g_2) \geq e, \forall \theta_2 \in \{H, L\}$$

will be met. Hence, $\mathbf{a}_H(g_2) = \mathbf{r}_H(g_2) = \mathbf{a}_L(g_2) = \mathbf{r}_L(g_2) = 1$, if the l separates to g_2, In which case, $\mu_1(g_2) = 1$ and $\mu_1(g_1) = 0$. l will separate to g_2 because he cannot do better by deviating to g_1 since both types of Responders are reciprocating. Therefore nothing that the Responders do after g_1 will can perturb the equilibrium path. In particular, $\mathbf{a}_H(g_1) = 1, \mathbf{r}_H(g_1) = 0, \mathbf{a}_L(g_1) = 1, \mathbf{r}_L(g_1) = 0$ supports the equilibrium. Thus, $\boldsymbol{g}_{2l} = 1, \boldsymbol{g}_{2h} = 0$. ∎

Proof of Proposition 10. Recall that the Proposer maximizes the following profit function.

$$\max_{s_1 \in \{g_2, g_1\}} E(\pi_l(s_1, \mathbf{r}(s_1))) = \max_{s_1 \in \{g_2, g_1\}} \{\mu_2(\mathbf{r}_L(s_1)R - k) + (1 - \mu_2)(\mathbf{r}_H(s_1)R - k)\}$$

If she preferred Eq. $4L$ in which she insinuated and only L accepted, $\mu_2(g_2) = 1$ and reciprocated $\mathbf{r}_{L1} = 1$ to Eq. $3H$ in which both accepted $\mu_2(g_1) = p_2$ but only H reciprocated $\mathbf{r}_H(g_1) = 1$ then,

$$R - k > R(1 - p_2) - p_2 k$$

The proportion of L must be above this threshold.

$$p_2 > \frac{k}{(R + k)}$$

Since insinuate is dominated for the h Proposer, upon hearing the insinuating remark, a rational L Responder will infer that he is facing the l Proposer. As required by Eq. $4L$ in (24), if the L Responder believed that he was facing the l Proposer $\mu_1(g_2) = 1$, he reciprocates. If L were numerous enough as specified by (30), the l Proposer's profit would increase with such a response from the Responder. Therefore, if the Responder would best respond only to those types of Proposer that could make the insinuating remark, that type of Proposer's profits would increase by insinuating. Thus, the equilibrium in which the l Proposer does not insinuate Eq. $3H$ fails the Intuitive Criterion. ∎

Proof of Proposition 11. Since insinuate is dominated for the h Proposer, upon hearing

the insinuating remark, a rational L Responder will infer that he is facing the l Proposer. As required by Eq. $5L$ in (27), if the H Responder believed that he was facing the l Proposer $\mu_1(g_2) = 1$, he reciprocates. If the b Proposer were to insinuate with such a response from the Responder, it's profits would increase, since the free rider H would not accept, given that $v - \gamma_H < \sigma_H$. Therefore, if the Responder would best respond only to those types of Proposer that could make the insinuating remark, that type of Proposer's profits would increase by insinuating. Thus, the equilibrium in which the l Proposer does not insinuate Eq. $3\neg H$ fails the Intuitive Criterion. ∎

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