Feigning Weakness

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Abstract. In typical crisis bargaining models, strong actors must convince the opponent that they are not bluffing and the only way to do so is through costly signaling. However, in a war strong actors can benefit from tactical surprise when their opponent mistakenly believes that they are weak. This creates contradictory incentives during the pre-war crisis: actors want to persuade the opponent of their strength to gain a better deal but, should war break out, they would rather have the opponent believe they are weak. I present an ultimatum crisis bargaining model that incorporates this dilemma and show that a strong actor may feign weakness during the bargaining phase. This implies that (a) absence of a costly signal is not an unambiguous revelation of weakness, and (b) the problem of uncertainty is worse because the only actor with incentives to overcome it may be unwilling to do so.

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Logic, especially when human beings are involved, is often no more than a way to go wrong with confidence.

David Weber

During the last days of September 1950, the U.S. administration faced a momentous decision about what to do in Korea: should American forces stop at the 38th parallel, as originally planned, or should they continue into North Korea, and turn the conflict from a war of liberation into a war of unification? The North Koreans could effect no organized resistance to the onslaught of the U.N. forces, and the only uncertainty clouding the issue had to do with the behavior of the Chinese Communists: would the People's Republic of China (PRC) intervene to forestall unification of Korea on American terms or not?

After some hesitation and an effort to ascertain Chinese intent, the U.S. administration concluded that the risk of Chinese intervention was negligible and therefore the gamble was worth taking. One crucial factor in that estimate was the lack of obvious military preparations that China would have to undertake had it seriously intended to wage war on the United States. In particular, the PRC had not sent troops in significant numbers south of the Yalu River, it had not prepared Beijing for possible aerial raids, it had not mobilized economic or manpower resources, and it had failed to move when it made best sense to do so from a military standpoint—right after General MacArthur's landing at Inchon. All the Chinese appeared to have done was issue propaganda statements in government-controlled media, send somewhat contradictory messages through a diplomatic channel known to be distrusted by the Americans, fail to make a direct statement to the United Nations, and move some token forces of "volunteers" into North Korea. Even in late November, the Far East Command estimated that there were no more than about 70,000 of these "volunteers" to face over 440,000 U.N. troops of "vastly superior firepower."[1] Confident of success, General MacArthur launched the "home by Christmas" offensive on November 24.

This U.N. offensive was shattered in a mass Chinese counter-attack. Unbeknownst to U.N. Command, the Chinese had managed to move over 300,000 crack troops into North Korea. As Appleman (1961, 65) documents, their armies had marched in complete secrecy "over circuitous mountain roads" with defense measures that required that during the day "every man, animal, and piece of equipment were to be concealed and camouflaged. [...] When CCF units were compelled for any reason to march by day, they were under standing orders for every man to stop in his tracks and remain motionless if aircraft appeared overhead. Officers were empowered to shoot down immediately any man who violated this order." This discipline had enabled the PRC to deploy vast numbers of troops in Korea without being discovered by aerial reconnaissance prior to actual contact.

But if the Chinese wanted to deter the Americans, why did they not make their mobilization public? When they knew the Americans doubted their resolve, why did they not choose an action that would reveal it? Whereas it is doubtless true that the Chinese benefitted from the tactical surprise once fighting began, they practically ensured that the Americans would not believe their threats. As Schelling (1966, 55, fn. 11) puts it,

> It is not easy to explain why the Chinese entered North Korea so secretly and so suddenly. Had they wanted to stop the United Nations forces at the level, say, of

[1] Appleman (1961, 763,768), Whiting (1960, 122).

> Pyongyang, to protect their own border and territory, a conspicuous early entry in force might have found the U.N. Command content with its accomplishment and in no mood to fight a second war, against Chinese armies, for the remainder of North Korea. They chose instead to launch a surprise attack, with stunning tactical advantages but no prospect of deterrence.

This behavior is indeed puzzling, especially when we consider the logic of costly signaling in crisis bargaining. When two opponents face each other with conflicting demands, the only way to extract concessions is by persuading the other that rejecting the demand would lead to highly unpleasant consequences such as war. The focus is on credible communication of one's intent to wage war should one's demands are not met. As is well known, to achieve credibility, an actor must engage in an action which he would not have taken if he were unresolved even if the act of taking it would cause the opponent to become convinced that he is resolved. In other words, the action must be sufficiently costly or risky (or both) to make bluffing unattractive. Because a weak actor would not attempt to bluff his way into concessions with such an action, the act of taking it signals strength. Conversely, the absence of such an act can be taken as *prima facie* evidence of weakness.

In this light, the American administration was justified in drawing what turned out to be a wildly incorrect assessment about Chinese intent. The Chinese had not backed up their threats with any costly or risky actions, and even their demands had been somewhat watered down. For instance, at one point they said that it would be acceptable for South Korean troops to cross the parallel as long as the American forces remained south of it. This unwillingness by the Chinese to take actions that were available to them, and that they could have expected to produce concessions from the U.S. at an acceptable cost provided they were resolved to forestall unification, eventually persuaded the Americans that the threats were not serious, causing them to embark on unification.[2]

Since the Chinese goal was to deter unification, the logic of crisis bargaining suggests that the Chinese should not have concealed their preparations, and should have made the (admittedly much riskier) public demand for U.N. forces to remain south of the parallel. The fact that concealment had significant tactical advantages cannot, by itself, explain the decision to mobilize in secret because such an argument presupposes that the Chinese preferred to fight over Korea rather than prevent unification through deterrence, which is a highly dubious assumption.

In this article, I propose a development of our crisis bargaining models that could help shed some light on the puzzling failure to signal strength. First, I show that in a war, a strong player can obtain serious tactical advantage from an opponent who mistakenly believes him to be weak. This is intuitive and unsurprising although it is not without merit to have this emerge as result of optimal behavior by both actors instead of assuming it. Second, I consider a crisis model of the type in which strong actors can obtain better negotiated outcomes when their opponent correctly infers that they are strong. I show that when bargaining in

[2] The debate about the causes of U.S. failure to understand the seriousness of Chinese threats is quite intense. The literature on the subject is intricate and it is well beyond the scope of this article to delve in details on that issue. Many studies assert that the Chinese threat *was* credible but that the U.S. administration mistakenly dismissed it (Lebow 1981). The opposite assertion is that the Chinese were spoiling for a fight (Chen 1994, 40). Slantchev (2008) counters both in detail.

a crisis can end in war, a strong actor has contradictory incentives. On one hand, he wants to obtain a better negotiated deal, which requires him to convince his opponent that he is strong. On the other hand, should persuasion fail and war break out, he wants his opponent to believe that he is weak. Somehow, this actor must simultaneously signal strength and weakness.

I show that this contradiction is resolved in equilibrium by the strong actor sometimes feigning weakness during the crisis bargaining phase itself. He pretends to be weak by mimicking the smaller demand of a weak type. Even though this puts him at a disadvantage at the negotiation table, the loss is offset by the gain of tactical surprise on the battlefield that he can achieve if war follows anyway. This explanation also provides a rationale for the Chinese decision to forego the potential benefits of deterrence in order to gain tactical advantages in case deterrence failed.

1 Signaling Strength in Crises

When two actors with conflicting interests lock horns in a crisis, the only way to secure concessions is to convince the opponent that such concessions, however painful, are preferable to the consequences of failure to comply with one's demands. In an interstate crisis, the threatened consequences are in the form of a costly and risky war. The stronger an actor is, the worse the expected war outcome for the adversary, and the more that adversary should be prepared to concede in order to avoid it. If there is one conclusion that emerges from our studies of crisis bargaining, it is that actors must signal credibly their strength if they are to obtain better deals from their opponents. Pretending to be weak does not pay.

Loosely speaking, the logic goes as follows. The minimal concessions an actor can expect to secure at the negotiation table are related to what he expects from fighting in the absence of a settlement. If an actor's expected payoff from war is high, his minimally acceptable terms would be more demanding relative to what they would have been if he were weak. Because actors are loath to concede more than is absolutely necessary, they are keenly interested in ascertaining just what the minimally acceptable terms of the opponent might be. The problem is that the opponent may have (or pretend to have) expectations that the actor considers unrealistically optimistic given what he knows about factors that affect the value of war for both. For instance, a strong actor with a qualitatively superior army may be faced with an opponent who refuses to comply with his demands because she believes that his army is not that good and that fighting him is preferable to concessions provided he is weak. The actor must then somehow disabuse the opponent of that incorrect estimate of his strength if he is ever to obtain concessions.

Clearly, a simple statement asserting that his army is good will not work. If she were to believe it and concede, then there would be no risk or cost in making the statement. The costless benefit would allow even an actor whose army is bad to make such a statement, which in turn means that the statement itself cannot be taken at face value. But if this is so, then such a statement cannot possibly cause the opponent to concede. In fact, the only thing the opponent could believe must be something that the actor would not do if his army were bad even when doing it would cause her to believe his army is good and to concede. In other words, the costs from the action must outweigh the benefit from successful persuasion for a weak actor. Only then would the action convince the opponent that the actor is strong, which would cause her to revise downward her expected payoff from war, which in turn would decrease the minimal concessions she expects at the negotiation table.

Hence, a demand can only succeed if it is accompanied by an informative signal of strength, and a signal of strength can be informative only if it is too costly for a weak actor to imitate. Because concessions are linked to costly signaling in this way, a strong actor always searches for a costly signaling mechanism that might enable him to secure his demands. At the very basic level, taking an action that increases the risk of war can be very informative. The reason is that the better an actor expects to do in the war, the larger the risks he would be willing to run. Conversely, the larger the risk generated by his action, the smaller the likelihood that the action can be profitably taken by a weak actor, and the more convincing the opponent will find it.

We have studied many mechanisms that allow a strong actor to distinguish himself from a weak one by taking some costly or risky action. For instance, an actor could make public statements that increase the domestic political costs of backing down (Fearon 1994), allow his domestic political opponents to contradict him for political gain (Schultz 1998), put his international reputation on the line (Sartori 2005), engage both domestic and international audiences (Guisinger and Smith 2002), or generate an autonomous risk of inadvertent war (Schelling 1966). As Banks (1990) has proven for a general class of models, strong types can expect to obtain better negotiated deals but only at the cost of taking actions that are too risky for the weak types to imitate.

The crisis bargaining models that are central to these studies rely on a conceptualization of war as a costly lottery. Both actors must pay to participate in it but only one can win it. A strong type is one who has a high expected payoff from war (relative to another possible type, not relative to the opponent), either because the objective probability of winning favors him, or because his costs of fighting are low, or because of some combination of the two. The expected payoff from war is a fundamental primitive in these models and is usually referred to as the *distribution of power* (Powell 1996). Regardless of the precise source of uncertainty, the distribution of power is assumed to be exogenous. This assumption is carried over to the crisis bargaining models that treat war as a process rather than a costly lottery (Wagner 2000).[3]

Why does it matter that the distribution of power is assumed to be exogenous? For one, if we maintain this assumption, we cannot study military investment decisions because these presumably change the distribution of capabilities, and as such influence the distribution of power. Powell (1993) shows that when the expected payoff from war depends on strategic decisions about how to allocate resources between consumption and arming, the necessity to spend on mutual deterrence creates a commitment problem which may lead to war when peace becomes too expensive to maintain.

More directly related to crisis bargaining, this assumption excludes any actions that might alter the distribution of power. Slantchev (2005) argues that military moves—mobilization and deployment of troops, for instance—must necessarily affect it, and as such their use as instruments of coercion may have effects that do not obtain in models that do not take that into account. He shows that strong types do not, in fact, have to run higher risks in order

[3]Powell (2004) argues that the dynamics of the interaction are similar whether we assume uncertainty arises from asymmetric information about the costs of fighting or about the distribution of power.

to obtain better deals: the costliness of increasing military capability discourages bluffing while the concomitant improvement in the distribution of power reduces the opponent's expected war payoff and makes her more likely to concede.

These are theoretical reasons for treating the distribution of power as endogenous. The puzzle of Chinese intervention in the Korean War suggests at least one substantive reason to do so. As the admittedly cursory sketch of that episode illustrates, the PRC concealed its military preparations so thoroughly to gain tactical surprise. It was well known at the time that the superior air power of the U.N. forces put the Chinese at a serious disadvantage, which is why they tried to hard to obtain Soviet air cover for their land action (Stueck 2002, 89). If they were to expose their preparations, they risked having their forces annihilated before getting a change to engage the enemy. If the U.S. administration had made up its mind on unification, the revelation of the extent of Chinese mobilization could have also caused the United States to increase its effort in the war, which would similarly have jeopardized the chances of success of the PRC offensive.[4] The upshot is that for both actors, the expected payoff from war depended on the behavior they thought their opponent might engage in. If the Chinese revealed their mobilization, they might have succeeded in deterring the U.S. but they might have also considerably reduced their payoff from war if deterrence failed. If, on the other hand, they concealed their mobilization, they might not have been able to deter the U.S. but they would have increased their payoff from war. In other words, the expected distribution of power depended on the actions taken during the crisis.

This episode not only provides a rationale for treating the distribution of power as endogenous, it also suggests a particular *timing* of decisions if one is interested in investigating analogous cases. In Powell's (1993) and Slantchev's (2005) models, actors make their military allocation decisions that fix the distribution of power for the duration of the war *before* the actual choice to attack. The decision to fight is then taken after they observe each other's military preparations in light of the distribution of power that results from their actions. The Chinese tactic in the Korean War intervention, on the other hand, was to conceal the actual distribution of power until *after* the battle was joined. That is, they managed to lull the Americans into a false sense of security which was designed to prevent them from formulating an even more formidable offensive plan that would have attacked whatever vulnerability the Chinese revealed. In that sense, the episode suggests that we might want to think about war fighting decisions made *after* bargaining breaks down but in the light of information revealed *during* the bargaining phase.

In his classic statement of how mutually incompatible expectations might cause war, Blainey (1988, 53–54) essentially makes an argument that these optimistic expectations are about wartime behavior, and are "influenced by relative assessments of each other's ability to attract allies, their ability to finance a war, their internal stability and national morale, their qualities of civilian leadership and their performance in recent wars." In other words, the power distribution is at least partially endogenous to what the opponents do once fighting breaks out. To make matters more complicated, tactical imperatives of the

[4]The vulnerability to aerial attacks and inferiority of equipment and (supposedly) morale led MacArthur to assure President Truman at the Wake Island Conference that should the Chinese attempt to intervene, "there would be the greatest slaughter" (United States Department of State 1976, 953).

type the Chinese faced may lead an actor to engage in behavior that *feeds* the optimism of his opponent and makes him more intransigent. In these situations, a peaceful settlement on mutually acceptable terms becomes difficult because there is no way to reconcile the conflicting expectations without an action that would negate the tactical advantage, and in turn make the signaling actor weaker.

One simple model with a structure that could address this situation would be an ultimatum crisis bargaining game in which the distribution of power is endogenously determined by actions taken after the ultimatum is rejected. This means that the expected payoff from war will depend on what the actors do when they go to war but that these decisions will be based on the information they obtain during the crisis. This structure allows us to investigate the contradictory incentives the Chinese faced in November: on one hand they wanted to signal that they are serious and the Americans should not advance to the Yalu River, but on the other hand they wanted to keep the Americans in the dark about their actual military preparations. As we shall see, this dilemma appears in the model in the following terms: should the strong actor choose a demanding ultimatum that would reveal his strength which would put him at a disadvantage if the demand is rejected, or should he choose a middling demand that is not very attractive and will cause the opponent to think he might be weak but which would give him a tactical advantage if it is rejected?

The contradictory incentives get resolved with a strategy that leads the strong actor to behavior that induces strategic uncertainty in the opponent. Sometimes he reveals his strength through the usual costly signaling mechanism but sometimes he pretends to be weak by adopting the strategy of a weak type in order to induce falsely optimistic beliefs in the opponent and then take advantage of them on the battlefield.

It is worth noting that feigning weakness is not something one sees in signaling games in general because the incentives required to induce such behavior are quite specific. However, results similar in spirit can be obtained in other settings such as jump-bidding in auctions (Hörner and Sahuguet 2007) or repeated contests (Münster 2007). This provides some comfort that the finding is a more general phenomenon and not merely an artifact of the particular modeling choices I have made.

2 The Model

As explained in the previous section, the model is designed as a simple setting that captures the contradictory incentives of strong players during crisis when they can benefit from misleading opponents in war. It is essentially the same as the classic ultimatum game in Fearon (1995) (to allow for crisis bargaining) except that the war payoffs depend on military effort the actors invest in fighting (to endogenize the distribution of power). These efforts may be contingent on the information obtained in the bargaining phase (to allow for signaling).

Two risk-neutral players, $i \in \{1, 2\}$ are disputing the two-way partition of a continuously divisible benefit represented by the interval $[0, 1]$. An agreement is a pair $(x, 1 - x)$, where x is player 1's share and $1 - x$ is player 2's share. The set of possible agreements is $\mathcal{X} = \{(x, 1 - x) \in \mathcal{R}^2 : x \in [0, 1]\}$. The players have strictly opposed preferences with $u_1(x) = x$ and $u_2(x) = 1 - x$ for all $x \in \mathcal{X}$.[5] Player 1 begins by making a take-it-

[5]For ease of exposition, I will refer to player 1 as "he" and player 2 as "she."

or-leave-it offer $x \in \mathcal{X}$ that player 2 can either accept or reject. If she accepts, the game ends with the agreement $(x, 1-x)$. If she rejects, the players engage in a costly contest (war). The contest is a simultaneous-move game in which each player chooses a level of effort $m_i \geq 0$ at cost $c_i > 0$. The probability of winning is determined probabilistically by the ratio contest-success function $\pi_i(m_1, m_2) = m_i/(m_1 + m_2)$ if $m_1 + m_2 > 0$ and $\pi_i = 1/2$ otherwise.[6] The winner obtains the entire benefit, so player i's expected payoff from a contest is $\pi_i(m_1, m_2) - m_i/c_i$.

The game has two-sided incomplete information. Each player knows his own cost of effort, c_i, but is unsure about the opponent's cost. Specifically, player 1 believes that player 2 is strong, $\overline{c}_2$, with probability p and weak, $\underline{c}_2 < \overline{c}_2$ with probability $1-p$. Player 2 believes that player 1 is strong, $\overline{c}_1$ with probability q and weak, $\underline{c}_1 < \overline{c}_1$, with probability $1-q$. These beliefs are common knowledge. If the costs of effort are too high even for the strong type (that is, if $\overline{c}_i$ is too small), then war is prohibitively costly and the game will carry no risk of bargaining breakdown. Therefore, assume that the strong type's costs are at least somewhat lower than the costs of his weak opponent.

ASSUMPTION 1. The strong type's costs are not too high: $\overline{c}_j > \sqrt{\underline{c}_i \overline{c}_i}$.

Since the strategies for the crisis bargaining game would have to form an equilibrium in the contest continuation game, I analyze that first.

3 The Contest Endgame

In the feint equilibria, the weak player 1 makes a low-value low-risk demand that is accepted by the weak player 2 and rejected by the strong player 2 with positive probability. The strong player 1, on the other hand, randomizes between this low-value demand and a high-value high-risk demand that is accepted only by the weak player 2. This means that whenever a contest occurs in a feint equilibrium, it is either with complete information (after the high-value demand is rejected, the strong types of both players face each other) or one-sided asymmetric information (after the low-value demand is rejected, the strong player 2 is unsure if she is fighting the weak or strong player 1). To avoid clutter, I will present here the contest results relevant to this analysis.

3.1 Complete Information

In this case, the costs of effort are common knowledge. Players optimize $\max_{m_i} \left\{\frac{m_i}{m_i + m_j} - \frac{m_i}{c_i}\right\}$, which yield the best responses $m_1^*(m_2) = \sqrt{c_1 m_2} - m_2$ and $m_2^*(m_1) = \sqrt{c_2 m_1} - m_1$ in an interior equilibrium. Solving the system of equations then gives us the equilibrium effort levels: $m_1^* = c_2 \left(\frac{c_1}{c_1 + c_2}\right)^2$ and $m_2^* = c_1 \left(\frac{c_2}{c_1 + c_2}\right)^2$. The equilibrium expected payoffs are:

$$W_1 = \left(\frac{c_1}{c_1 + c_2}\right)^2 \quad \text{and} \quad W_2 = \left(\frac{c_2}{c_1 + c_2}\right)^2. \tag{1}$$

[6]This one is the classic contest success function from economics (Hirshleifer 1989). In the economics literature, surveyed by Garfinkel and Skaperdas (2007), the interest in the rent dissipation and the inability to create a contract that would avoid it, not so much in the signaling properties of arming or taking advantage of informational asymmetries.

Observe now that fighting is still inefficient: $W_1 + W_2 < 1 \Leftrightarrow 0 < 2c_1c_2$. Hence, players always have an incentive to negotiate a division of the good instead of fighting to win it all. Moreover, a mutually-acceptable peaceful division always exists. The rationalist puzzle that arises from war's inefficiency remains intact (Fearon 1995).

3.2 One-Sided Asymmetric Information

Suppose now that player 2's cost of effort, $\overline{c}_2$, is common knowledge but only player 1 knows his cost (the other case is symmetric). Player 2 believes that player 1 is strong with probability $\hat{q}$ and weak with probability $1 - \hat{q}$, where $\hat{q}$ is the posterior belief that player 2 would form after seeing the player 1's ultimatum. In equilibrium, $\hat{q}$ is common knowledge as well.

Since he knows his own cost, player 1 solves $\max_{m_1} \left\{ \frac{m_1}{m_1+m_2} - \frac{m_1}{c_1} \right\}$, which yields:

$$m_1(m_2; c_1) = \max\left(\sqrt{c_1 m_2} - m_2, 0\right). \tag{2}$$

This best response function is sufficient to eliminate some possible contests from consideration as equilibria.

LEMMA 1. *In equilibrium, either both types of the informed player participate in the contest, or only the strong type does.*

This result (all proofs are in the appendix) means that there are only two possibilities to consider: either both types of player 1 spend strictly positive effort (skirmish), or only the strong type does (war). The fanciful names are meant as reminders that contests in which the weak type participates are lower in intensity than conflicts in which only the strong type participates.

3.2.1 The Skirmish Equilibrium

Let $m_1(\underline{c}_1)$ denote the weak type's effort, and $m_1(\overline{c}_1)$ denote the strong type's. Because player 2 is unsure about player 1's type, her optimization problem is $\max_{m_2} \left\{ \frac{\hat{q}m_2}{m_1(\overline{c}_1)+m_2} + \frac{(1-\hat{q})m_2}{m_1(\underline{c}_1)+m_2} - \frac{m_2}{c_2} \right\}$. Let $\underline{m}_1 = m_1^*(m_2^*; \underline{c}_1)$ denote the equilibrium effort level of the weak type, and $\overline{m}_1 = m_1^*(m_2^*; \overline{c}_1)$ denote the equilibrium effort levels of the strong type from (2). Solving player 2's program yields:

$$m_2^* = \underline{c}_1 \overline{c}_1 \left[\frac{f(\hat{q})}{g(\hat{q}; c_2)} \right]^2, \tag{3}$$

where $f(\hat{q}) = \hat{q}\sqrt{\underline{c}_1} + (1-\hat{q})\sqrt{\overline{c}_1} > 0$ and $g(\hat{q}; c_2) = \underline{c}_1\overline{c}_1/c_2 + \hat{q}\underline{c}_1 + (1-\hat{q})\overline{c}_1 > 0$. We can then write the type-contingent expected payoff for player 1 as $W_1(\hat{q}; c_1) = \left(1 - \frac{f(\hat{q})}{g(\hat{q};c_2)}\sqrt{\frac{\underline{c}_1\overline{c}_1}{c_1}}\right)^2$, and the expected payoff for player 2 as $W_2(\hat{q}) = \left(\hat{q}\underline{c}_1 + (1 - \hat{q})\overline{c}_1\right)\left[\frac{f(\hat{q})}{g(\hat{q};c_2)}\right]^2$. In the skirmishing equilibrium, $\underline{m}_1 > 0$, which means that $m_2^* < \underline{c}_1$ is necessary for this equilibrium to exist. Using (3) then yields the necessary condition for the skirmish equilibrium in terms of the posterior beliefs:

$$\hat{q} < \frac{\overline{c}_1\sqrt{\underline{c}_1}}{c_2\left(\sqrt{\overline{c}_1} - \sqrt{\underline{c}_1}\right)} \equiv q_s(c_2). \tag{4}$$

3.2.2 The War Equilibrium

In this case, the weak type does not exert any effort in equilibrium, so $\underline{m}_1 = 0$. The strong type's optimal effort is still defined by (2). Player 2's maximization problem, $\max_{m_2} \left\{ \frac{\hat{q} m_2}{m_1(\overline{c}_1) + m_2} + (1 - \hat{q}) - \frac{m_2}{c_2} \right\}$, is simpler because whatever positive effort she expends, she will win outright if her opponent happens to be the weak type. The solution is:

$$m_2^* = \overline{c}_1 \left(\frac{\hat{q} c_2}{\overline{c}_1 + \hat{q} c_2} \right)^2. \tag{5}$$

Since the weak type must be willing to exert no effort, it follows that a necessary condition for this equilibrium is $m_2^* \geq \underline{c}_1$, which we obtain by setting $\underline{m}_1 \leq 0$ in (2). Solving this yields $\hat{q} \geq q_s(c_2)$, the converse of (4). This means that these two cases characterize the complete solution to the one-sided incomplete information problem for all values of $\hat{q}$: if $\hat{q} < q_s(c_2)$, then the skirmish equilibrium obtains; otherwise, the war equilibrium does.

We can now write the expected payoff for the strong type of player 1 (the weak type does not participate, so his payoff is 0) as:

$$W_1(\hat{q}; \overline{c}_1) = \left(\frac{\overline{c}_1}{\overline{c}_1 + \hat{q} c_2} \right)^2, \tag{6}$$

and the expected payoff for player 2 as $W_2(\hat{q}) = 1 - \hat{q} + \hat{q} \left(\frac{\hat{q} c_2}{\overline{c}_1 + \hat{q} c_2} \right)^2$.

3.3 The Sun Tzu Principle of Feigning Weakness

As we shall see in the next section, in equilibrium, the uninformed player in the one-sided asymmetric information contests will always be the strong type. Therefore, the comparative statics will be established for that case. The first result is that a player who is unsure about the type of opponent she is fighting will fight harder if she believes her opponent is more likely to be strong.

LEMMA 2. *The uninformed player's equilibrium effort is increasing in her belief that her opponent is strong provided her costs of effort satisfy Assumption 1.*

This now implies that this player's *opponent* would do better in the contest when she thinks he is weak. This parallels Sun Tzu's principle of feigning weakness which he stated as follows: "If your opponent is of choleric temper, seek to irritate him. Pretend to be weak, that he may grow arrogant" (6). It is worth noting that Sun Tzu's principle is here derived as the result of optimal rational behavior in a contest under uncertainty.

LEMMA 3 (Sun Tzu). *The expected equilibrium payoff of an informed player who participates in the contest decreases in his opponent's belief that he is strong.*

The logic behind the principle is straightforward. Player 2's equilibrium effort level is increasing in $\hat{q}$: the more pessimistic she is, the higher the effort she will exert. This leads player 1 to compensate by increasing his own effort, leading to an overall decrease in his expected payoff because of the higher costs he incurs in the process. This is not surprising, of course, but it does put player 1 in an interesting situation because he would strictly prefer player 2 to believe he is weak: she will invest less effort, and his expected payoff will increase.

4 The Crisis Ultimatum

I now establish the existence of equilibria in which the weak type makes a low-risk low-value demand and the strong type mixes between pooling on that demand with the weak type and separating to a high-risk high-value demand. In other words, in equilibrium the strong type pretends to be weak with positive probability. The weak type of player 2 accepts both demands, the strong type rejects the low-value demand with positive probability and the high-value demand with certainty. (This is why the low-value demand carries a lower risk of war from player 1's *ex ante* perspective.) The construction of these "feint equilibria" will also serve as a proof of the main result for this article.

4.1 The Equilibrium Demands

The demands that player 1 makes in any feint equilibrium must satisfy certain properties that rationalize player 2's responses. Let us begin with the low demand, $\underline{x}$. The strong type of player 2 is willing to mix, so she must be indifferent between accepting $\underline{x}$ and the contest that would follow if she rejects. Since only the strong type rejects with positive probability, it follows that in this contest player 1 would know for sure that his opponent is strong. This means that the contest will be between a strong player 2 who is uncertain whether player 1 is weak or strong, and player 1 who knows that his opponent is strong. The strong player 2's optimal effort is then given by (3) if the contest admits the skirmish equilibrium and by (5) otherwise. I shall use $W_2(\hat{q};\overline{c}_2)$ to denote the expected payoff with the understanding that this notation refers to the appropriate equilibrium payoff.[7]

Because the strong type of player 2 is willing to accept the low-value demand with positive probability, it follows that $1-\underline{x} \geq W_2(\hat{q}(x);\overline{c}_2)$. Because player 1 has no incentive to offer more than the absolute minimum necessary to obtain acceptance, it follows that in equilibrium,

$$\underline{x} = 1 - W_2(\hat{q}(\underline{x});\overline{c}_2). \tag{7}$$

If the strong type of player 2 accepts $\underline{x}$ with positive probability, then the weak type will accept it for sure.

Turning now to the high demand $\overline{x}$, observe that only the strong type of player 2 is willing to reject this offer and only the strong type of player 1 is supposed to make it in equilibrium. Therefore, the contest that follows rejection is one of complete information between the two strong types. Since the weak type of player 2 must be willing to accept $\overline{x}$, it follows that she should not have incentives to deviate into this contest. Player 1, thinking that he is facing the strong type of player 2, will exert the complete information effort $\overline{m}_1$. The weak type of player 2's optimal deviation is argmax $\left\{\frac{m_2}{\overline{m}_1+m_2} - \frac{m_2}{\underline{c}_2}\right\}$, whose solution is $m_2' = \max\left(0, \sqrt{\underline{c}_2\overline{m}_1} - \overline{m}_1\right)$. The optimal deviation payoff for the weak type is $W_2' =$

[7] When it is necessary to be explicit about which equilibrium I am referring to, I shall use $W_2^s(\hat{q};\overline{c}_2)$ for the skirmish equilibrium, and $W_2^w(\hat{q};\overline{c}_2)$ for the war equilibrium.

$\left(1-\sqrt{\frac{\overline{m}_1}{\underline{c}_2}}\right)^2\left[1-\left(\frac{\overline{c}_1}{\overline{c}_1+\overline{c}_2}\right)\sqrt{\frac{\overline{c}_2}{\underline{c}_2}}\right]^2$ if $m_2' > 0$ and 0 otherwise. This payoff is strictly worse than what the weak type would have obtained in the full information contest against a strong opponent because player 1 fights much harder than he does when he knows that his opponent is weak. Since the weak player 2 accepts $\overline{x}$, it follows that $1-\overline{x} \geq W_2'$. Because player 1 has no incentive to offer anything more than that, it follows that in equilibrium:

$$\overline{x} = 1 - W_2'. \tag{8}$$

The strong type of player 2 will reject this offer with certainty because her expected payoff from the contest is strictly better than the weak type's. Whereas $\overline{x}$ is entirely determined by the exogenous parameters, $\underline{x}$ is endogenous because it depends on the posterior belief $\hat{q}$ that player 2 would have following player 1's demand.

4.2 The Range of Possible Low-Value Low-Risk Demands

We know that in equilibrium, the low-value demand $\underline{x}$ must satisfy (7), which means that it depends on how player 2 is going to revise her beliefs after seeing the demand player 1 makes. Although only two demands are made with positive probability in the class of feint equilibria I am characterizing, we must specify what beliefs player 2 would have after any possible demand, including ones player 1 is not supposed to be making. The reason is that her reaction to any demand depends on what she believes the consequences of rejection would be, and it has to be the case that her behavior is such that player 1 would not want to deviate from the equilibrium proposals.

Generally speaking, perfect Bayesian equilibrium places very weak restrictions on beliefs following actions that are not supposed to occur in equilibrium. Usually this permits a great variety of actions to be supported in equilibrium provided we assign appropriate beliefs to zero-probability events, no matter how odd such beliefs might appear. It is actually not difficult to construct feint equilibria by assuming that any zero-probability demand leads player 2 to believe that her opponent is weak. However, such beliefs seem to me to have a highly artificial flavor. For instance, as we have seen $\underline{x}$ would require player 2 to believe that her opponent is strong with probability $\hat{q}(\underline{x}) > 0$ because the strong player does make this demand with positive probability. But if this is so, then why would she suddenly believe that he would not demand some x greater than, but arbitrarily close to $\underline{x}$, with positive probability either? The feint equilibria would be more persuasive if they did not depend on such inexplicable and drastic changes in beliefs resulting from arbitrarily small changes in demands unless, of course, player 1's strategy warrants them.

The specification of reasonable beliefs begins with the observation that the strong type of player 2's response to some demands may not depend on her beliefs at all. If player 1 demands very little, then she will accept for sure even if she is certain that he is weak. Conversely, if player 1 demands a lot, then she will reject for sure even if she is certain that he is strong. Any belief-contingent responses (and therefore the low-value demand) will necessarily lie between these two extremes. The following lemma establishes the demands that limit the unconditional responses.

LEMMA 4. *Let* $x_1 = 1 - \overline{W}_2$ *and* $x_2 = 1 - \underline{W}_2$, *where* $\underline{W}_2 = W_2(\overline{c}_1, \overline{c}_2)$ *is the strong player 2's expected payoff from a full information contest against a strong opponent and*

$\overline{W}_2 = W_2(\underline{c}_1, \overline{c}_2)$ *is her analogous payoff against a weak opponent. In any equilibrium, the strong player 2 will accept any* $x \leq x_1$ *and reject any* $x \geq x_2$ *regardless of her beliefs.*

Because the only possible demands that involve belief-contingent responses will be in the interval $[x_1, x_2]$, this result immediately leads to a pair of necessary conditions that must be satisfied for the feint equilibria to exist. The strong player 1's expected payoff from making the high-value high-risk demand is $U_1(\overline{x}; \overline{c}_1) = p\underline{W}_1 + (1-p)\overline{x}$, where $\underline{W}_1 = W_1(\overline{c}_1, \overline{c}_2)$ is his full information contest payoff against a strong player 2. It must be the case that $U_1(\overline{x}; \overline{c}_1) \geq x_1$, or else the strong player 1 would deviate to an offer that player 2 is sure to accept. This requirement yields $p \leq \frac{\overline{W}_2 - W_2'}{1-\underline{W}_1 - W_2'} \equiv p_{\max}$. Furthermore, it is also necessary that $U_1(\overline{x}; \overline{c}_1) \leq x_2$. If this were not the case, then even if a smaller offer carries no risk whatsoever the strong player 1 would still strictly prefer to demand $\overline{x}$ to any $x < x_2$, which means that he would not be willing to mix between the high-value and the low-value demands. This requirement yields $p \geq \frac{\underline{W}_2 - W_2'}{1-\underline{W}_1 - W_2'} \equiv p_{\min}$. When these conditions are satisfied, $\underline{x} \in [x_1, x_2]$ and the posterior belief $\hat{q}(\underline{x})$ must be such that the equality in (7) holds.[8] The following lemma proves that it is always possible to find such a belief.

LEMMA 5. *For any* $x \in [x_1, x_2]$*, there always exists a unique* $\hat{q}(x) \in [0, 1]$ *that satisfies* (7)*. Moreover,* $\hat{q}(x)$ *is strictly increasing in* x*.*

We conclude that in any equilibrium, the strong player 2 will accept any $x \leq x_1$, will reject any $x \geq x_2$, and will be indifferent for between accepting and rejecting any $x \in [x_1, x_2]$ provided her posterior beliefs are $\hat{q}(x)$ as defined by (7). Let $r_2(x)$ denote the probability with which the strong player 2 rejects a demand $x \in [x_1, x_2]$. The expected payoff of the strong player 1 from making such a demand is $U_1(x; \overline{c}_1) = pr_2(x)W_1(\hat{q}(x); \overline{c}_1) + (1 - pr_2(x))x$.

We now establish the conditions that must be satisfied for player 1 to be willing to make such a demand. Because $\overline{x}$ is fixed by the exogenous parameters, in any feint equilibrium the low-value demand can be no worse than what the strong player 1 expects to get from making the high-value demand, $\hat{x}_1 = U_1(\overline{x}; \overline{c}_1)$. If player 2 is certain to accept the low-value demand x, then the strong player 1 will never demand any such $x < \hat{x}_1$ in equilibrium. Hence, the only reasonable posterior belief is $\hat{q}(x) = 0$ for all $x \leq \hat{x}_1$.

However, with such a belief, the strong player 2 will certainly reject any offers $x \in [x_1, \hat{x}_1]$. (This interval exists because $p \leq p_{\max}$ implies that $x_1 \leq \hat{x}_1$.) The strong player 1 could try to take advantage of this combination of belief and rejection. If he chooses some $x \in [x_1, \hat{x}_1]$, then he can exploit the fact that the strong opponent would erroneously believe that he is weak in the war that follows when she rejects that demand. He should not be able to find such a profitable deviation in equilibrium, which would rationalize player 2's belief that he never chooses such demands.

We now establish the condition that prevents such tricks. Since $\hat{q}(x) = 0$ and $r_2(x) = 1$, the deviation payoff for the strong player 1 is $U_1(x) = pW_1(0; \overline{c}_1) + (1-p)x$ for any

[8] Since $p_{\max} - p_{\min} = \frac{\overline{W}_2 - \underline{W}_2}{1-\underline{W}_1 - W_2'} > 0$, it is always possible to satisfy the two necessary conditions simultaneously.

$x \in [x_1, \hat{x}_1]$. This payoff increases strictly in x (because beliefs are invariant, the war payoff is constant). Therefore, the *best* possible deviation is to $\hat{x}_1$: if this is not profitable, no smaller demand would be. Using the definition of $\hat{x}_1$, we obtain $pW_1(0;\overline{c}_1) + (1-p)U_1(\overline{x};\overline{c}_1) \leq U_1(\overline{x};\overline{c}_1) \Leftrightarrow W_1(0;\overline{c}_1) \leq U_1(\overline{x};\overline{c}_1)$, which we can rewrite in terms of the prior as $p \leq \frac{1-W_1(0;\overline{c}_1)-W_2'}{1-\underline{W}_1-W_2'} \equiv \hat{p}_{\max}$. To find when this condition is binding, observe that $\hat{p}_{\max} < p_{\max} \Leftrightarrow W_1(0;\overline{c}_1) > 1-\overline{W}_2 = x_1$. This means that if $W_1(0;\overline{c}_1) \leq x_1$, then $p_{\max}$ binds as the upper bound on the prior. If this is not the case, we also need to ensure that $\hat{p}_{\max} \geq p_{\min}$ for the equilibrium to exist. This reduces to $W_1(0;\overline{c}_1) \leq 1-\underline{W}_2 = x_2$. To summarize, the necessary conditions are:

$$W_1(0;\overline{c}_1) \leq x_2 \quad \text{and} \quad p \in [p_{\min}, \min\{p_{\max}, \hat{p}_{\max}\}]. \tag{9}$$

When these necessary conditions are satisfied, the strong player 1 will never want to make any demands $x < \hat{x}_1$ in equilibrium, which rationalizes $\hat{q}(x) = 0$ for any such demand as well. This belief, in turn, implies that $r_2(x) = 1$ for any $x \in [x_1, \hat{x}_1)$ too. The low-risk low-value equilibrium offer must be somewhere in $[\hat{x}_1, x_2]$.

We now have to define the probability with which the strong player 2 rejects an offer in that range. Because she is indifferent between accepting and rejecting such offers (by the definition of $\hat{q}$), it follows that *any* mixing probability is admissible. Because the strong player 1 must be willing to randomize in equilibrium, it also follows that he must be indifferent between the low-risk low-value and the high-risk high-value demands, $U_1(\underline{x}(\hat{q});\overline{c}_1) = U_1(\overline{x};\overline{c}_1)$. We can specify the rejection function that satisfies the indifference condition over $[\hat{x}_1, x_2]$ as follows: $\widetilde{r}_2(x) = \frac{U_1(\overline{x};\overline{c}_1)-x}{p\left[W_1(\hat{q}(x);\overline{c}_1)-x\right]}$. The definition of $\hat{x}_1$ implies that $\widetilde{r}_2(\hat{x}_1) = 0$.

Any $x \in [\hat{x}_1, x_2]$ will be acceptable to the strong type of player 1 given the rejection probability $\widetilde{r}_2(x)$: he is indifferent between demanding x and demanding $\overline{x}$. However, the weak type of player 1 must also be willing to make the low-value demand. Player 1's payoff from the low-value demand is $U_1(\underline{x};c_1) = pr_2(\underline{x})W_1(\hat{q}(\underline{x});c_1) + \left[1-pr_2(\underline{x})\right]\underline{x}$.

Because the strong player 2 accepts all $x < x_1$, the weak type does as well. The zero risk of these demands can tempt the weak player 1. The best deviation he can make is to largest such offer: if he will not deviate to $x = x_1$ when it is accepted, then he would not deviate to any smaller acceptable demand. Therefore, it is sufficient to derive a rejection function that satisfies $U_1(x;\underline{c}_1) \geq x_1$, which holds whenever $r_2(x) \leq \frac{\overline{W}_2-W_2(\hat{q}(x);\overline{c}_2)}{p\left[1-W_1(\hat{q}(x);\underline{c}_1)-W_2(\hat{q}(x);\overline{c}_2)\right]} \equiv \overline{r}_2(x)$. (The denominator is positive by Lemma 7 in the appendix.) The probability with which the strong player 2 rejects the low-value offer must be sufficiently small (so the risk of war is low) to prevent the weak player 1 from deviating to the largest surely acceptable offer. When the weak player 1 is unwilling to go for an acceptable offer, the strong player 1 will not do so either (his equilibrium expected payoff is at least as large). For any x that might be supportable in equilibrium as a low-value demand, it must be the case that $\widetilde{r}_2(x) \leq \overline{r}_2(x)$, or else there would be no rejection probability that can simultaneously make the strong type indifferent between x and $\overline{x}$ and be at least as good as the riskless x_1 for the weak type of player 1.

With these results we can begin tracing the contours of the equilibrium set. For any potential low-value offer, $\underline{x} \in [\hat{x}_1, x_2]$, define the equilibrium posterior belief and rejection probability by the strong player 2 as:

$$q^*(x) = \begin{cases} 0 & \text{if } x < \underline{x} \\ \hat{q}(x) \text{ from (7)} & \text{if } x \in [\underline{x}, x_2] \\ 1 & \text{if } x > x_2. \end{cases} \qquad r_2^*(x) = \begin{cases} 0 & \text{if } x < x_1 \\ 1 & \text{if } x \in [x_1, \underline{x}) \\ \widetilde{r}_2(x) & \text{if } x \in [\underline{x}, x_2] \\ 1 & \text{if } x > x_2 \end{cases} \tag{BR}$$

Picking any value in this range pins down the probability with which the strong type of player 1 must make this demand (feigns weakness). This probability must be such that it makes the strong player 2 willing to mix. In other words, it induces a belief that makes the strong player 2 indifferent between accepting and rejecting the demand. Thus, the probability of the feint, $r_1^*(\underline{x})$, must be such that it induces the posterior belief $q^*(\underline{x})$. By Bayes rule, any demand x that the strong player 1 makes with probability $r_1(x)$ and the weak type certainly makes produces the posterior belief $q(x) = \frac{qr_1(x)}{qr_1(x)+1-q} < q$. If the strong player 1 wishes to induce the belief $q^*(\underline{x})$, then the strong type would have to make the low offer with probability $r_1^*(\underline{x}) = \frac{q^*(\underline{x})(1-q)}{q(1-q^*(\underline{x}))}$.

We require that $r_1^*(\underline{x}) < 1$ or else there would be no way for the strong player 1 to induce the requisite belief in player 2. This reduces to $q^*(\underline{x}) < q$, and because we know that the low-value demand will be at least $\hat{x}_1$ and that $q^*(x)$ is non-decreasing, it follows that another necessary condition for the feint equilibria to exist is $q^*(\hat{x}_1) < q$. Since by its definition $q^*(\hat{x}_1)$ must satisfy $\hat{x}_1 = 1 - W_2(q^*(\hat{x}_1); \overline{c}_2)$ and because $\hat{x}_1 = U_1(\overline{x}; \overline{c}_1)$, it follows that it must be the case that $q^*(\hat{x}_1)$ is such that $p = \frac{W_2(q^*(\hat{x}_1);\overline{c}_2)-W_2'}{1-\underline{W}_1-W_2'}$ holds. Because we require $q^*(x) < q$ and $W_2(q; \overline{c}_2)$ is decreasing in q (by Lemma 6), it follows that the necessary condition is $p > \frac{W_2(q;\overline{c}_2)-W_2'}{1-\underline{W}_1-W_2'} \equiv \hat{p}_{\min}$. Lemma 6 implies that $\hat{p}_{\min} > p_{\min}$, making $\hat{p}_{\min}$ the binding lower bound on admissible priors. Putting together the conditions from (9) with this final requirement yields the necessary conditions for the feint equilibria to exist:

$$W_1(0; \overline{c}_1) \leq x_2 \quad \text{and} \quad p \in (\hat{p}_{\min}, \min\{p_{\max}, \hat{p}_{\max}\}]. \tag{NC}$$

Finally, with the reaction function specified in (BR), we must guarantee that the weak type of player 1 would not want to use x_2: the problem is that his expected payoff could be concave in x over the interval, and it may be the case that $U_1(\underline{x}; \underline{c}_1) < U_1(x_2; \underline{c}_1)$, which clearly cannot be true in equilibrium. Let $\hat{x}_2 \in [\hat{x}_1, x_2]$ be such that:

$$U_1(x; \underline{c}_1) \geq U_1(x_2; \underline{c}_1) \quad \text{and} \quad \widetilde{r}_2(x) \leq \overline{r}_2(x) \quad \text{and} \quad q^*(x) < q \tag{10}$$

for all $x \in [\hat{x}_1, \hat{x}_2]$. Lemma 8 shows that this set exists. Our construction will admit *at least* one low-value that can be supported in equilibrium with the beliefs and rejection function we derived. It may well be the case that $\hat{x}_2 = x_2$ if the weak type's expected utility decreases in x over the interval. In that case, the condition is not binding.

Figure 1 illustrates the posterior beliefs and the probability with which the strong player 2 rejects demands when $\underline{x} = \hat{x}_1$. Because there is no equilibrium in which the strong type of player 1 demands less than $\hat{x}_1$, the posterior belief assigns probability zero to that type for any such demand. If $x < x_1$, then the strong player 2 accepts such generous offers

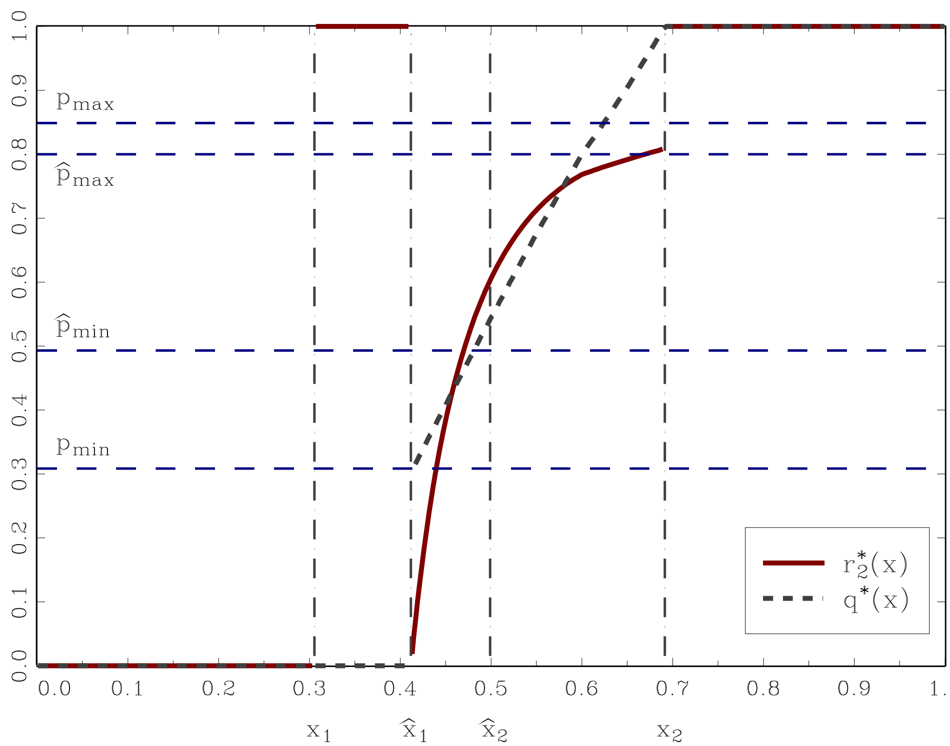

Figure 1: Posterior beliefs when $\underline{x} = \hat{x}_1$, and the probability with which the strong player 2 rejects demands.

regardless of her beliefs. If the demand is between x_1 and $\hat{x}_1$, she will reject it for sure because she expects it to have been made by the weak type, in which case fighting is better. Any $x \in [\hat{x}_1, x_2]$, on the other hand, could have been made by the strong type of player 1, so they result in a belief $q^*(x)$ that makes the strong type of player 2 indifferent between rejecting and accepting the demand. The rejection probability, $r_2^*(x)$, is such that the strong player 1 is indifferent between making any such demand and $\overline{x}$. Note, in particular, how increasing demands are more likely to be rejected. Finally, when demands exceed x_2, the strong player 2 will reject them for sure regardless of her beliefs. It is immaterial what beliefs we assign here but it seems appropriate that she would conclude that only the strong type of player 1 would dare demand so much.

One interesting result here is that although larger demands never lead player 2 to lower estimates of the probability that her opponent is strong, the probability with which she rejects demands is not monotonic. In fact, player 2 is *more* likely to reject moderately low demands than moderately high ones. This is evident when we consider some demand $x' \in (x_1, \hat{x}_1)$ and some other demand $x'' \in [\hat{x}_1, \hat{x}_2]$. By (BR), $r_2^*(x') = 1 > r_2^*(x'')$ even though $x' < x''$. That is, player 2 is more likely to reject the more generous offer. The reason for this seemingly strange behavior is in the consequences of making the generous offer for what player 2 expects to happen if she rejects it. Since a strong player 1 would never make such a puny demand, player 2 updates to believe her opponent is weak whenever she sees x'. Unfortunately, in this case, her expected payoff from war is sufficiently high to warrant rejection of what would have been a reasonable demand had it been made by a strong opponent at least with some positive probability. In contrast, the high demand causes her to become a bit more pessimistic about her expected payoff in case of rejection which warrants accepting the worse terms with higher probability. The interaction between demand and acceptance is mediated through the revision of beliefs the demand may cause.

4.3 The Feint Equilibria

We can now state the main result of this article.

THEOREM. *If condition* (NC) *is satisfied, then any* $\underline{x} \in [\hat{x}_1, \hat{x}_2]$ *can be supported in a perfect Bayesian equilibrium of the crisis bargaining game using the following strategies and beliefs:*

- *The weak player 1 demands* $\underline{x}$. *The strong player 1, demands* $\underline{x}$ *with probability* $r_1^*(\underline{x})$ *and* $\overline{x}$ *with probability* $1 - r_1^*(\underline{x})$.
- *The weak player 2 accepts* $x \leq \overline{x}$, *and rejects every other demand. The strong player 2 accepts* $x \leq x_1$, *rejects* $x \in (x_1, \underline{x})$, *accepts* $x \in [\underline{x}, x_2]$ *with probability* $1 - r_2^*(x)$, *and rejects* $x > x_2$.

On and off the path, beliefs are given by $q^*(x)$ *in* (BR). *In the contest endgame, both players choose the equilibrium strategies given their beliefs.*

Figure 2 shows a numerical example that illustrates the expectations off the equilibrium path and shows why the strong player 1 feigns weakness (all numbers rounded to two decimal points).[9] The high-value demand is fixed by the exogenous variables at $\overline{x} = 0.91$. Since $\hat{x}_1 = 0.41$ and $\hat{x}_2 = 0.50$, any value in that range can be supported as the low-value demand in equilibrium. I have chosen $\underline{x} = 0.45$ for the graphical illustration.

Player 2 accepts any $x \leq x_1$, so player 1's payoff is his demand regardless of his type. Only the strong player 2 rejects $x \in (x_1, \underline{x})$, so player 1's payoff is a weighted average between the demand and war. The strong player 1 does much better that the weak type. The discontinuous jump at x_1 shows that the strong type of player 1 (but not the weak) actually benefits from the strong opponent's rejection. This illustrates the contest advantage from inducing an incorrect belief in the opponent: in this range player 2 updates to believe that player 1 is weak with certainty, which is then reflected in how hard she fights in the contest. In equilibrium, these deviations are not profitable, of course, but the comparison of the payoff from a safe offer and a risky offer that induces a wrong belief is telling.

Only the strong player 2 rejects $x \in [\underline{x}, x_2)$ with positive probability, which is calibrated to make the strong player 1 indifferent between any such demand and the high-value demand. The weak player 1's payoff decreases until the increase in the demand outweighs the increase in the probability of rejection. The strong player 2 is certain to reject demands $x \in [x_2, \overline{x})$, and she enters the contest believing she is fighting the strong player 1. Because the probability of rejection and the expected contest payoff are both constant over

[9] The parameters are $\underline{c}_1 = 1$, $\overline{c}_1 = 4$, $\underline{c}_2 = 2$, and $\underline{c}_2 = 5$. The prior beliefs are $p = q = 0.7$. The necessary conditions are satisfied because $p \in [\hat{p}_{\min} = 0.49, \min\{p_{\max} = 0.85, \hat{p}_{\max} = 0.80\}]$, and $W_1(0; \overline{c}_1) = 0.34 < 0.69 = x_2$.

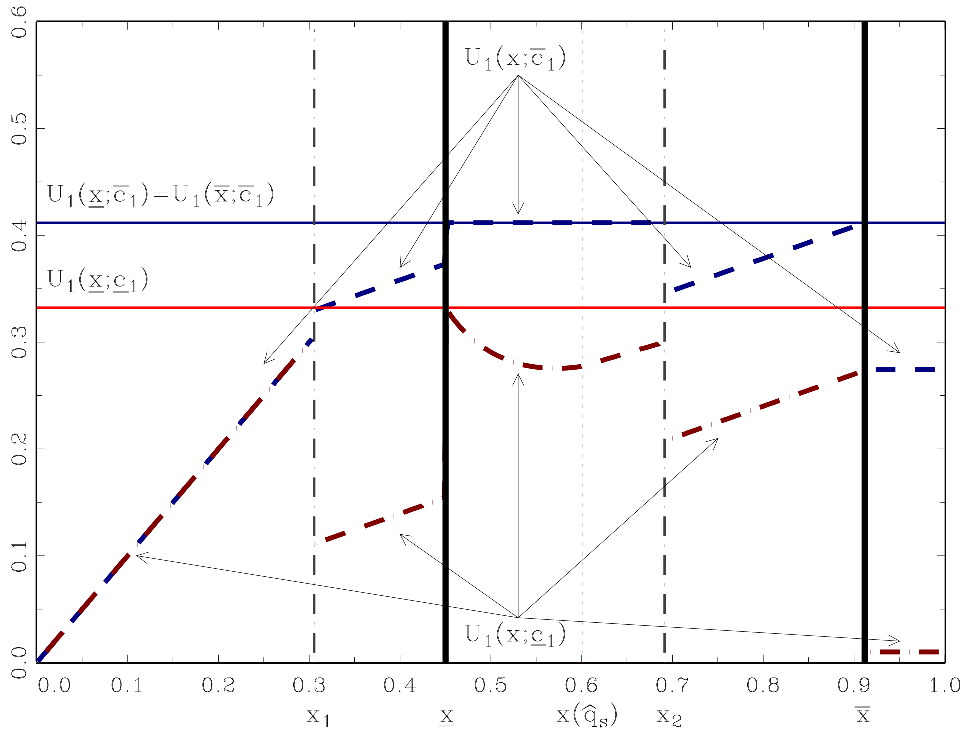

Figure 2: Expected payoffs for player 1 in a feint equilibrium.

this range, the expected payoff of making such demands increases in the demand (which the weak player 2 accepts).

Finally, player 2 rejects $x > \bar{x}$ regardless of type and beliefs. The outcome is a contest in which player 1 finds himself in a fight with player 2 whose type he is unsure of (his posterior will be the same as the prior), but who believes she is fighting the strong player 1. Both types of player 2 will expend a lot of effort in this contest, and as a result player 1's expected payoff will not be very good regardless of how strong he is.

What is the feint advantage for the strong player 1? The risk of war after the high-value demand is $p = 0.70$ because only the strong player 2 will reject it and do so with certainty. The expected payoff from a contest with this opponent who also knows, correctly, that player 1 is strong, is $\underline{W}_1 = 0.20$. The risk of war after the low-value demand, on the other hand, is only $pr_2^*(\underline{x}) = (0.70)(0.38) = 0.27$. However, the expected payoff from a contest with a strong opponent who thinks that her adversary is strong with probability $q^*(\underline{x}) = 0.41$, is $W_1(q^*(\underline{x}), \bar{c}_1) = 0.31$. The probability of a peaceful outcome is higher with a low-value demand, but this potential loss is offset by the potential gain in war should the demand be rejected anyway.

The theorem identifies a class of feint equilibria which share the same structure of beliefs and strategies up to the specification of the low-value demand. Proposition 1 (in the appendix) shows that this class always has a unique Pareto-dominant equilibrium.

5 Shows of Strength and the Fostering of False Optimism

The feint equilibria exhibit the costly signaling dynamics common to crisis bargaining behavior. The strong player 1 can only obtain the high-value demand $\overline{x}$ at the cost of a high risk of a costly war with a fully prepared strong player 2. This discourages the weak type from attempting to bluff with the same demand. Endogenizing the war contest does not alter the basic logic of costly signaling. The only way a strong player can obtain a better deal is by revealing credibly that he is strong, which requires him to engage in behavior that the weak type would not want to mimic.

The interesting new feature of the feint equilibria is that the strong type of player 1 might mimic the behavior of the weak instead. One reason for this comes from the incentives the strong player 1 has to keep private his information about his own strength in the event of war. In the exogenous specification of the distribution of power, a player's expected war payoff may depend on his opponent's private information but not on her *beliefs* about the information that he knows but she does not. This means that with exogenous war payoffs, it does not matter to the player whether he fights an adversary that is fully informed or one that is uncertain about his strength. There is no reason for the player to manipulate the belief with which his opponent would enter the war, only the belief she has when deciding what to do about his demands. In these cases, the strong player is better off whenever his opponent knows that he is strong.

With endogenous war payoffs, the player does care about the beliefs with which his opponent begins the war. The informed strong type's expected payoff under uncertainty is strictly better than his payoff when his opponent is fully informed. (As $\hat{q} \rightarrow 1$ the payoff under uncertainty converges to the complete-information payoff but by Lemma 3, it is strictly decreasing in $\hat{q}$.)

This gives the strong type a potent reason not to reveal his strength during the crisis itself. He may deliberately leave his opponent in a state of *false optimism* in order to exploit the advantages of surprise in case war breaks out. Unlike the usual scenario in which strong types always attempt to overcome the optimism of the opponent with costly or risky shows of strength, the feint equilibrium dynamic suggests that they may not be willing to do so even if such actions are potentially available to them. This creates a serious problem for peaceful crisis resolution because mutual optimism is regularly blamed as a major cause of war (Blainey 1988, 53).[10]

In the classic formulation of the mutual optimism argument, "war is usually the outcome of a diplomatic crisis which cannot be solved because both sides have conflicting estimates of their bargaining power" (Blainey 1988, 114). One problem is overconfidence about the likely development of the war: its duration (short), outcome (victory), and costs (low). In the model with endogenous war effort, the expected outcome depends on how hard the actors fight. Their joint efforts determine the probability of victory, and their uncertainty about the behavior of the opponent induces uncertainty in these estimates.

The resulting expectations about the war may well be incompatible. In the skirmish

[10]Wittman (1979) offers the first rationalist account. Fey and Ramsay (2007) attempt to show that the mutual optimism explanation cannot be sustained as a result of rational behavior. Slantchev and Tarar (2007) rebut their argument.

equilibrium, the strong player 1 expects to win with probability $\pi_1(\hat{q};\overline{c}_1) = 1 - \frac{f(\hat{q})\sqrt{\underline{c}_1}}{g(\hat{q};c_2)}$, and player 2 expects to win with probability $\pi_2(\hat{q}) = \frac{f(\hat{q})^2}{g(\hat{q};c_2)}$. These players are too optimistic because $\pi_1(\hat{q};\overline{c}_1) + \pi_2(\hat{q}) > 1 \Leftrightarrow f(\hat{q}) > \sqrt{\underline{c}_1}$. Similarly, in the war equilibrium the strong player 1 expects to win with probability $\pi_1(\hat{q};\overline{c}_1) = \frac{\overline{c}_1}{\overline{c}_1+\hat{q}c_2}$, whereas player 2 expects to win with probability $\pi_2(\hat{q}) = \frac{(1-\hat{q})\overline{c}_1+\hat{q}c_2}{\overline{c}_1+\hat{q}c_2}$. As in the skirmish equilibrium, these expectations are incompatible: it is easily verified that $\pi_1(\hat{q};\overline{c}_1) + \pi_2(\hat{q}) > 1$ for any $\hat{q} < 1$. It is not difficult to see how these optimistic expectations also translate into optimistic estimates about the payoffs from war.

It is crucial to understand that these disagreements are not about some fundamental underlying "true" probability of winning. Instead, they are disagreements about how war will "play out," and this, of course, depends to a large extent on the opponent's likely behavior. That behavior in turn depends on what the opponent expects the player to do, and these expectations are profoundly influenced by the opponent's belief about some aspect that is privately known by the player. This is where deliberate falsification enters the picture.

When mutual optimism is a possible cause of war, credible signaling might be some sort of imperfect cure. When players have exaggeratedly optimistic expectations about their chances in war because they are not aware of private information the opponents posses, the only way to arrive at a peaceful settlement is to reduce this mutual optimism. As we know from our crisis bargaining studies, the only way to do so is through costly signaling. The cure is imperfect because the attempt to impart credibility to one's message forces the actor to behave in ways that increase the probability of war. Scholars are well aware of this paradox inherent in crisis bargaining, and it is perhaps best summarized by Schelling (1966, 238–39): "Flexing of muscles is probably unimpressive unless it is costly or risky. [...] Impressive demonstrations are probably the dangerous ones. We cannot have it both ways."

The results here suggest that the difficulty with settling peacefully may go beyond the risk generated by signaling efforts. When unwarranted optimism arises from lack of information to which the opponent has access, it can be dispelled only when the opponent chooses to reveal it. Unfortunately, the logic of feigning weakness suggests that an actor may choose instead of obfuscate inferences in order to gain advantage in the war that follows. In other words, the actor *may deliberately foster false optimism* even though this may make it very unlikely that his opponent would concede enough to make that actor willing to forego fighting.[11]

Private information can remain private not for lack of means to reveal it but because the only type who can afford to send the credible signal may have no incentive to do so. It is

[11] Misleading the opponent is not the only reason a strong type might not wish to separate himself from the weak type. Kurizaki (2007) analyzes a model in which player 1 can decide whether to make his threat public (so whoever backs down incurs audience costs) or keep it private (so backing down is costless). In the private threat equilibrium, the strong player 1 is indifferent between going public and staying private, whereas the weak type always threatens in private. The strong type is indifferent because he always fights when resisted and player 2 resists with the same probability after private and public threats. She does so because capitulation is costlier after a public threat, in which case she needs to be fairly certain her opponent is strong. In private, the costs of capitulation are much lower, so she can concede even if she thinks player 1 might be bluffing. There is no benefit to the strong player 1 in getting player 2 to think that he is weak.

this intentional and strategic concealment of information that is so troubling for resolving crises peacefully. To see how matters can come to a head, consider a crisis in which side A has deliberately fostered optimism in side B. Because side B (incorrectly) believes itself strong, it engages in very risky actions designed to cause side A to revise its war expectation downward. Unfortunately, side A cannot use side B's willingness to run risks as evidence that side B is strong, not when it misled B into believing that it is strong. In other words, when you have gone to great lengths to convince the opponent to be optimistic, you cannot very well use that optimism as evidence that your own assessment is faulty. Side B's signaling behavior then will be extremely likely to cause war because A is essentially dismissing it, because B is unwilling to offer the necessary concessions, and because B's exaggerated optimism is prompting him to take very large risks. In this situation, mutually incompatible crisis expectations cannot be reconciled without the actual resort to arms. As Blainey (1988, 56) puts it, "The start of war is... marked by conflicting expectations of what that war will be like. War itself then provides the stinging ice of reality."

6 Conclusion

Consider the Chinese options in the fall of 1950. On one hand, they could openly threaten with intervention and demand that the U.N. forces remain south of the 38th parallel. If this works, the outcome is excellent. However, making this high demand is also very risky: if the U.S. happens to be resolved to unify Korea, this demand would simply alert it to prepare better for fighting the PRC. The resulting war would be of very high intensity and the Chinese would certainly lose the tactical advantage that would secure a first morale-boosting victory. On the other hand, the Chinese could demur and ask that only U.S. troops desist from crossing the parallel. Although permitting the occupation of North Korea by South Korean troops is not as good as keeping it free of U.N. forces, there is some chance that the U.S. would agree to this and war would be averted. Should the U.S. prove to be bent on unification, the absence of a credible signal can be expected to increase American confidence and possibly cause the U.S. to march into a war without the type of preparation it would have engaged in knowing the Chinese were going to intervene in strength. These are unpalatable choices, certainly, and no wonder Mao vacillated for so long before making up his mind on the strategy to pursue.

This stylized description of the situation seriously abstracts from the complex domestic dynamics in both countries, and it may well have been the case that by the time Mao resolved to intervene, the United States had become undeterrable by the Chinese without open Soviet support. In November, war may have been already unavoidable (Slantchev 2008). However, the logic of feigning weakness developed in this article can help explain why the Chinese did not pursue more vigorous signaling actions when they were resolved not to permit unification.

The crisis bargaining literature quite appropriately focuses on how strong actors can signal their strength and reduce the possibility of bluffing. When weak types can mimic their actions, messages will not be believed, and when threats are not credible, they are unlikely to influence the behavior of the opponent. This basic mechanism also obtains in the model presented here. This article, however, also points out some perverse incentives that strong types may face that may make them unwilling to send costly signals even when they could have done so.

One implication of this result is that it is not safe to infer that one's opponent is weak when he fails to engage in some costly action that is available to him and that could persuade one that he is strong. One should carefully consider the incentive to feign weakness for tactical purposes. This, of course, may be harder than it sounds because, after all, it could be the case that the opponent is not signaling because he really is weak.

The logic of the feint also suggests that overcoming mutual optimism in crises may be very difficult for two reasons. First, when a strong opponent who could reveal his strength to reduce an actor's optimism decides to feign weakness, then that actor may persist in her incorrect beliefs and blunder into disaster. Second, the possibilities for peaceful resolution of the crisis may diminish because the feigning opponent himself may be unable to correct his optimistic beliefs. Because he has purposefully misled the other actor, he cannot take her costly signals as evidence that he should revise his expectations: after all, she is signaling precisely because she believes that she is strong, which is the false belief he has taken great care to induce. In this rather unfortunate scenario, war may be the only way to inject a dose of reality into these beliefs.

A Proofs

Proof of Lemma 1. Suppose player 1 is informed. Let $m_2^* \geq 0$ denote player 2's equilibrium effort, and $m_1^*(c_1) = m_1(m_2^*; c_1)$ player 1's effort. There can be no equilibrium in which player 1 makes no effort regardless of type. Suppose, to the contrary, that $m_1^*(\overline{c}_1) = m_1^*(\underline{c}_1) = 0$ in some equilibrium. Since $m_1(c_1) > 0$ whenever $c_1 > m_2^*$, this implies that $m_2^* \geq \overline{c}_1 > 0$. This cannot be optimal because she can deviate to a lower effort and still win for sure. Therefore, in any equilibrium at least one type of player 1 must be exerting a strictly positive effort. This cannot be the weak type by himself. Suppose, to the contrary, that $m_1^*(\underline{c}_1) > 0$ and $m_1^*(\overline{c}_1) = 0$ in some equilibrium. Since $m_1^*(\underline{c}_1) > 0$ implies that $m_2^* < \underline{c}_1$, it follows from $\underline{c}_1 < \overline{c}_1$ that $m_2^* < \overline{c}_1$, and so $m_1^*(\overline{c}_1) > 0$ as well, a contradiction. □

Proof of Lemma 2. Assume that player 2 is strong. In the skirmish equilibrium, sign $\frac{\partial m_2^*}{\partial \hat{q}} =$ sign $\left(\overline{c}_2 - \sqrt{\underline{c}_1 \overline{c}_1}\right) > 0$, where the inequality follows from Assumption 1. In the war equilibrium, $\frac{\partial m_2^*}{\partial \hat{q}} = \frac{2\hat{q}\overline{c}_1^2\overline{c}_2^2}{(\overline{c}_1 + \hat{q}\overline{c}_2)^3} > 0$. □

Proof of Lemma 3. In the skirmish equilibrium, $\frac{\partial W_1(c_1)}{\partial q} = -\left(\frac{\sqrt{c_1} - \sqrt{m_2^*}}{c_1\sqrt{m_2^*}}\right)\frac{\partial m_2^*}{\partial \hat{q}} < 0.$ because the bracketed term is positive by (4) and because m_2^* is increasing in $\hat{q}$ by Lemma 2. Since only the strong type participates in the war equilibrium, inspection of his payoff in (6) is sufficient to establish the claim. □

LEMMA 6. *$W_2(\hat{q}; \overline{c}_2)$ is continuous and strictly decreasing in $\hat{q}$.*

Proof. (Continuity.) Since $W_2(\hat{q}; \overline{c}_2)$ is continuous for each equilibrium, it is enough to show that it is continuous at q_s where the equilibrium switch occurs: $W_2^s(q_s(\overline{c}_2); \overline{c}_2) =$

$1 - \frac{\underline{c}_1 + \sqrt{\underline{c}_1 \overline{c}_1}}{\overline{c}_2} = W_2^w(q_s(\overline{c}_2); \overline{c}_2)$. (Monotonicity.) In the war equilibrium, $\frac{dW_2^w(\hat{q};\overline{c}_2)}{d\hat{q}} = -\frac{\overline{c}_1^2(\overline{c}_1 + 3\hat{q}c_2)}{(\overline{c}_1 + \hat{q}c_2)^3} < 0$. In the skirmish equilibrium, $\frac{dW_2^s(\hat{q};\overline{c}_2)}{d\hat{q}} = \frac{g'f^2}{g^2} + \frac{2f(\hat{q}\underline{c}_1 + (1-\hat{q})\overline{c}_1)}{g^3}\Big(f'g - g'f\Big) < 0$. To see this, note that $f > 0$, $g > 0$, $f' < 0$, $g' < 0$, and $f'g - g'f = \sqrt{\underline{c}_1 \overline{c}_1}\left(\sqrt{\overline{c}_1} - \sqrt{\underline{c}_1}\right)\left(1 - \frac{\sqrt{\underline{c}_1 \overline{c}_1}}{\overline{c}_2}\right) > 0$ by Assumption 1. The last requirement is that $gg'f + 2(\hat{q}\underline{c}_1 + (1-\hat{q})\overline{c}_1)(f'g - g'f) < 0$, which can be shown but it takes three pages of algebra. □

Proof of Lemma 4. Lemma 6 implies that to get the best and worst payoffs for the strong player 2, we only need to consider $\hat{q} = 0$ and $\hat{q} = 1$. So, $\lim_{\hat{q}\to 0} W_2^s(\hat{q};\overline{c}_2) = \left(\frac{\overline{c}_2}{\underline{c}_1 + \overline{c}_2}\right)^2 = \overline{W}_2$, and $\lim_{\hat{q}\to 1} W_2^s(\hat{q};\overline{c}_2) = \lim_{\hat{q}\to 1} W_2^w(\hat{q};\overline{c}_2) = \left(\frac{\overline{c}_2}{\overline{c}_1 + \overline{c}_2}\right)^2 = \underline{W}_2$, with $\underline{W}_2 < \overline{W}_2$. □

Proof of Lemma 5. By Lemma 6, $W_2(\hat{q};\overline{c}_2)$ is continuous, and the intermediate value theorem implies that for any $y \in [\underline{W}_2, \overline{W}_2]$, there exists $\hat{q}$ such that $W_2(\hat{q};\overline{c}_2) = y$. By Lemma 6, $W_2(\hat{q};\overline{c}_2)$ is strictly decreasing, so $\hat{q}(y) = W_2^{-1}(y)$ is unique and strictly decreasing in y. Letting $x = 1 - y$ establishes the claim. □

LEMMA 7. $W_1(\hat{q};\underline{c}_1) + W_2(\hat{q};\overline{c}_2) < 1$.

Proof. By Lemma 6, $W_2(\hat{q};\overline{c}_2)$ attains a maximum at $W_2(0;\overline{c}_2) = \overline{W}_2$. In the war equilibrium, $W_1(\hat{q};\underline{c}_1) = 0$, and since $\overline{W}_2 < 1$, the claim holds. In the skirmish equilibrium, $W_1(\hat{q};\underline{c}_1)$ is strictly decreasing in $\hat{q}$: $\frac{dW_1(\hat{q};\underline{c}_1)}{d\hat{q}} = -2\sqrt{\overline{c}_1}\left(1 - \frac{f\sqrt{\overline{c}_1}}{g}\right)\left(\frac{f'g - g'f}{g^2}\right) < 0$, where the inequality follows from $f'g - g'f > 0$, as established in the proof of Lemma 6 and the first bracketed term being positive. Hence, it attains a maximum at $\hat{q} = 0$, and $\lim_{\hat{q}\to 0} W_1(\hat{q};\underline{c}_1) = \left(\frac{\overline{c}_1}{\overline{c}_1 + \overline{c}_2}\right)^2 = \overline{W}_1$. Since $\overline{W}_1 + \overline{W}_2 < 1$, the claim holds. □

LEMMA 8. *The set* $[\hat{x}_1, \hat{x}_2]$ *exists.*

Proof. Take $\hat{x}_2 = \hat{x}_1$. Then, $\widetilde{r}_2(\hat{x}_1) = 0 \leq \overline{r}_2(\hat{x}_1)$, so the first condition in (10) is satisfied. Since $r_2^*(\hat{x}_1) = 0$, the weak type's payoff is just $\hat{x}_1$. But we also know that $\hat{x}_1 = U_1(\hat{x}_1;\overline{c}_1) = U_1(x_2;\overline{c}_1)$, where the second equality follows from the definition of r_2^*, which makes the strong type indifferent. All else equal, the weak type's expected payoff from any demand with a positive risk of rejection is strictly worse than the strong type's payoff, which implies that $U_1(x_2;\underline{c}_1) < U_1(x_2;\overline{c}_1)$, so the second condition is satisfied. By (NC), we know that $p > \hat{p}_{\min}$, so the third condition is satisfied at $\hat{x}_1$. □

Proof of the Theorem. Follows from the text, and only requires to show that deviations to certainly unacceptable offers are not profitable. □

PROPOSITION 1. *The feint equilibrium with* $\underline{x} = \hat{x}_1$ *Pareto-dominates all other feint equilibria in its class.*

Proof (Sketch). Consider $[\hat{x}_1, \hat{x}_2]$. The weak type of player 2 always prefers lower demands because she accepts them with certainty. The strong player is indifferent between accepting and rejecting but higher demands imply lower payoff from rejection, so she prefers lower demands as well. The lowest possible demand is $\hat{x}_1$. The strong player 1 is indifferent among any two low-value demands because the high-value demand is uniquely determined by the exogenous parameters. The weak type can do no better than the strong type in any equilibrium, and at $\hat{x}_1$ he gets exactly the same payoff. □

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