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# Timely Negotiations

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Deadlines often disrupt negotiations and lead to unwanted impasses, yet how to mitigate these effects is still an open question. We conduct a laboratory experiment to identify mechanisms that reduce bargaining impasses. Theoretical predictions suggest that uncertain deadlines—where the timing of the deadline is not fixed but follows a probabilistic process—should improve negotiation outcomes by limiting strategic posturing. Empirically, we find a non-monotonic relationship: small amounts of deadline uncertainty increase impasse rates, while both fixed deadlines and high uncertainty perform better. Next, allowing for range offers—proposals that specify a range of acceptable prices—reduces negotiation breakdowns by softening the aggressive anchoring typical in bargaining. These effects persist under both complete and private information conditions. In contrast, informational nudges, aimed at promoting equal-sharing norms or emphasizing risks associated with delaying agreements, fail to improve negotiation outcomes. Our results suggest that structural design choices, such as deadline certainty and flexible offer formats, have a stronger impact on negotiation success than informational interventions.

*Keywords*: bargaining, negotiations, deadlines, anchoring, brinkmanship, range offers
*JEL Classification*: C78, C91, D74, D82

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# Timely Negotiations*

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Deadlines often disrupt negotiations and lead to unwanted impasses, yet how to mitigate these effects is still an open question. We conduct a laboratory experiment to identify mechanisms that reduce bargaining impasses. Theoretical predictions suggest that *uncertain deadlines*—where the timing of the deadline is not fixed but follows a probabilistic process—should improve negotiation outcomes by limiting strategic posturing. Empirically, we find a non-monotonic relationship: small amounts of deadline uncertainty increase impasse rates, while both fixed deadlines and high uncertainty perform better. Next, allowing for *range offers*—proposals that specify a range of acceptable prices—reduces negotiation breakdowns by softening the aggressive anchoring typical in bargaining. These effects persist under both complete and private information conditions. In contrast, *informational nudges*, aimed at promoting equal-sharing norms or emphasizing risks associated with delaying agreements, fail to improve negotiation outcomes. Our results suggest that structural design choices, such as deadline certainty and flexible offer formats, have a stronger impact on negotiation success than informational interventions.

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# 1 Introduction

Negotiation underpins many forms of economic interaction, from contract design and hiring to routine decision-making within firms and families. Unsurprisingly, the World Economic Forum ranks negotiation among the top ten skills for a successful career. Crucially, successful negotiations depend not only on individual skill but also on the bargaining protocol—the process governing interactions between negotiating parties—which can profoundly impact outcomes. Among the most critical elements influencing negotiation outcomes are deadlines (e.g., Raiffa, 1982; Dunlop, 1984; Kennan and Wilson, 1993; Madsen, 2022). In organizational contexts, deadlines are essential for meeting project milestones; in labor negotiations, deadlines heighten bargaining urgency, often prompting concessions to avoid costly disruptions like strikes. Legislative deadlines similarly compel lawmakers to prioritize and finalize policy decisions. Yet deadlines, while driving efficiency, also present risks. The same pressure that encourages resolution can also lead parties to delay agreements until the final moment—a phenomenon known as the *deadline effect* (e.g., Roth et al., 1988)—sometimes resulting in unwanted negotiation impasses despite opportunities for mutual gain (e.g., Cramton and Tracy, 1992; Roth and Ockenfels, 2002).

One of the main drivers of deadline effects in negotiations is *brinkmanship*: the strategic delay of agreements to signal commitment to one's position rather than a response to genuine constraints like insufficient information or low gains from trade.[1] For example, consider a merger negotiation between two tech companies facing a looming deadline imposed by antitrust regulators. One company anchors the discussion with an aggressively high valuation of its assets. The other responds with an equally inflated counteroffer, resisting the initial anchor and creating a standoff. As the deadline nears, neither side makes meaningful concessions, despite both knowing that reaching a deal is preferable to letting it collapse. Instead, they engage in strategic posturing, hoping the other will concede first. This negotiation behavior is not necessarily driven by psychological biases or fairness views but can emerge from rational, payoff-maximizing decision-making (Abreu and Gul, 2000; Fanning, 2016). Ultimately, the negotiation deadline may pass without the (rational) parties reaching an agreement.[2]

In this paper, we explore how negotiation institutions can be designed to reduce impasses caused by deadlines and brinkmanship. Drawing on the negotiation literature in economics and management (see Section 2), we focus on the *nature of deadlines*—i.e., how the source

[1]Brinkmanship is reinforced by various factors discussed in the literature, including optimism (Shavell, 1982; Yildiz, 2011), exploitation of proposer power (Ma and Manove, 1993; Fershtman and Seidmann, 1993; Gneezy et al., 2003), and differences in risk preferences and fairness views (Gächter and Riedl, 2005; Bochet et al., 2024).

[2]Empirical examples of negotiation inefficiencies under deadline pressure abound. In the 2023 United Auto Workers (UAW) strikes, negotiations escalated as the union initiated targeted work stoppages despite the mutual benefits of avoiding $5 billion in production losses. Similarly, in the 2019 U.S.-China trade talks, impending tariff deadlines heightened stakes, and negotiations collapsed in May 2019 amid mutual accusations of bad faith and strategic posturing.

of time constraints influences bargaining—and the *structure of offers*—i.e., how negotiators present terms, such as fixed prices versus flexible ranges.

Regarding the nature of deadlines, they can be either *fixed* or *uncertain* (e.g., Ross Jr et al., 1990; Damiano et al., 2012; Simsek and Yildiz, 2016). Fixed deadlines, such as those in legislative bargaining where a budget must be passed by a specific date to avoid a government shutdown, impose a clear and predictable endpoint for negotiations. In contrast, uncertain deadlines are tied to exogenous events or decisions by third parties, making the timeline stochastic. For example, in mergers and acquisitions, the deadline may depend on the timing of regulatory approval, while in job negotiations, it might hinge on the availability of a key decision-maker. The theoretical literature suggests that fixed deadlines exacerbate brinkmanship by encouraging parties to delay concessions until the last possible moment, while uncertain deadlines positively disrupt this negotiation strategy by removing the focus on a predictable endpoint. In sum, deadlines vary in their degree of stochasticity, and we aim to analyze how uncertainty regarding the timing of deadlines affects negotiation outcomes.

Regarding the structure of offers, we are interested in offers that go beyond the standard single-point price offer. Negotiation and bargaining studies often implicitly or explicitly restrict offers to a single price (e.g., Gächter and Riedl, 2005; Camerer et al., 2019; Karagözoğlu and Kocher, 2019; Bochet and Siegenthaler, 2018, 2021). While this approach is simple and intuitive, it certainly limits the information conveyed through offers. Backus et al. (2023) provide evidence for the importance of richer offer structures, showing that a small communication enhancement on eBay—allowing offers to be accompanied by a short message—reduced bargaining breakdowns by 14%. Analyzing the communication content, the authors conclude (pp. 3, 31) that "cost-based rationales are effective, and overly effusive communication strategies can be counterproductive," and that the messages "most correlated with experience are restrained, polite, and precise." Building on these insights, we focus on the effects of minimally expanding the types of offers negotiators can make rather than examining the role of free communication, which is known to increase the role of social preferences.

One type of offer structure we allow is a so-called *range offer*—a proposal that specifies an acceptable price range rather than a single point. For example, a seller might say, "I'm looking for a price offer between $400 and $500," or a job candidate might state, "I'm expecting something in the range of $90,000 to $105,000." Range offers are commonly used in real-world negotiations (Ames and Wazlawek, 2014), but range offers as an institution have not yet been discussed in the economics literature. The management literature shows that range offers can influence bargaining dynamics (Ames and Mason, 2015): by presenting both an aspiration price and an acceptable lower bound, range offers appear more cooperative and naturally encourage negotiators to consider their counterpart's priorities. Such perspective-taking can foster effective negotiations. Specifically, it reduces the pull of anchoring, a phenomenon in negotiations where initial offers influence expectations and outcomes (e.g., Galinsky and

Mussweiler, 2001; Leider and Lovejoy, 2016). However, as will be seen, our framework extends beyond range offers to allow for other offer strategies.

Establishing causal relationships around bargaining behavior using observational data is challenging, as negotiation institutions tend to be stable within a given context, while factors such as the nature of deadlines, offer structures, information availability, and bargaining norms vary widely across contexts. For instance, labor union and business-to-business negotiations may differ in their degree of deadline stochasticity. Still they also vary in many other ways, making it impossible to isolate the specific role of deadline uncertainty. Additionally, real-world negotiation data are scarce and often lack the detail needed to analyze negotiation processes, with some important exceptions (e.g., Backus et al., 2020; Larsen, 2021; Backus et al., 2023; Keniston et al., 2024; Freyberger and Larsen, 2025). To overcome these challenges, we use laboratory experiments, which have a long tradition in experimental economics due to their strong parallels with real-world negotiations.[3] Key strategic dynamics—such as self-interest, fairness concerns, and expectation management—function similarly in both settings, as negotiators must decide when to stand firm, when to concede, and how to influence the other party's behavior.

In our study, 768 participants were paired to negotiate the price of an object across 8 experimental conditions. Participants interacted via computer terminals, enabling them to make, revise, and accept price offers continously. The experiment varied the nature of the deadline. Under *fixed* deadlines, negotiations conclude at a commonly known point in time. In contrast, under stochastic or *uncertain* deadlines, negotiations end randomly within a known time interval. The length of this interval determines the degree of uncertainty.

The experiment also varied the offer structure. In the *one-dimensional* conditions, participants make a single price offer, which they can revise over time. In the *two-dimensional* conditions, negotiators can state both a "price offer" and an "acceptable price," which are functionally equivalent but can coexist. The richer offer space enables but does not force participants to make range offers. Additionally, we include an intermediate condition, where negotiators make one-dimensional offers but can also communicate a secondary, non-binding offer (*cheap talk*).

We examine these negotiation conditions both under *complete* information, where parties know each other's valuation for the object, and under *private* information, where parties remain unaware of each other's potential gains from trade. Finally, we implement treatments to influence negotiators' expectations about the returns to strategic posturing. Specifically, we provide pre-bargaining information about the outcomes of past sessions, highlighting either that a large majority of prior negotiations concluded with 50-50 splits or that waiting until

[3] See Roth et al. (1995) and Karagözoğlu and Hyndman (2022) for reviews. Closely related research includes Bolton (1991); Karagözoğlu and Riedl (2015); Embrey et al. (2015); Bolton and Karagözoğlu (2016); Bochet and Siegenthaler (2018, 2021); Karagözoğlu and Kocher (2019); Fanning and Kloosterman (2022); Ding and Lehrer (2022); Calford and Cason (2024); Bochet et al. (2024).

the deadline often results in costly breakdowns. We want to see if these *informational nudges* discourage brinkmanship.

Our experimental findings reveal the following patterns:

1. The impact of deadline uncertainty on negotiation impasses is non-monotonic (Result 1). First, across all conditions, the average impasse rate rises from 18% with a fixed deadline to 26% under small deadline uncertainty. This increase happens because even minor deadline uncertainty weakens the surge of concessions typically seen near fixed deadlines, while at the same time failing to curb brinkmanship significantly.[4] Second, however, as the uncertainty interval widens, impasse rates do decline, though they never return to the level observed under fixed deadlines. This beneficial effect of greater deadline uncertainty supports the theoretical prediction that uncertainty erodes brinkmanship as a negotiation strategy. Result 1 highlights the importance of designing negotiation institutions that minimize incentives for brinkmanship without undermining the coordinating function of deadlines.

2. Participants utilize the two-dimensional offer space to formulate range offers, which help mitigate conflict compared to one-dimensional offers by establishing more accommodating anchors from the outset (Result 2). Crucially, negotiators do not simply propose ranges with immediately acceptable lower bounds. Instead, they employ a sophisticated *range-offer strategy*, using the initial range to signal flexibility while maintaining terms that are often too demanding for early agreement. Final terms are then settled through standard price offers, with the initial flexibility signal facilitating mutual concessions. Our findings indicate that this signaling function of range offers operates similarly to cheap talk, allowing negotiators to communicate intentions (e.g., Farrell and Gibbons, 1989). However, unlike cheap talk, range offers are binding and embedded directly into the negotiation process.

3. Informational nudges, whether highlighting the risks of deadlines or the prevalence of the equal-sharing norm, show no discernible effect on impasse rates (Result 3). This suggests that negotiators do not merely miscalculate the risks of brinkmanship or misperceive norms but actively persist in strategic posturing. These findings highlight the critical role of negotiation design over informational guidance in mitigating breakdowns.

4. The effects of deadline uncertainty and range offers are consistent across both complete

[4] One mechanism underlying this result is that fixed deadlines impose a beneficial all-or-nothing risk: negotiators who hold out until the fixed deadline know they risk losing everything, which encourages concessions. Small deadline uncertainty removes this strict constraint, making risk-taking more viable: proposers can delay fair offers, hoping the other side will concede, without the pressure of an imminent, known endpoint. This expectation that the other side will concede is often ill-founded. From the perspective of prospect theory (Kahneman and Tversky, 1979), when negotiators view a 50-50 split as a reference point, accepting an unequal offer feels like a loss, making them more risk-seeking.

and private information negotiations. However, information availability independently affects bargaining outcomes: more information promotes trade when the trade surplus is small but can backfire when the surplus is large, as information triggers fairness concerns that impede agreement (Result 4).

Our results help address a crucial question in the negotiation literature (e.g., Karagözoğlu and Kocher, 2019; Madsen, 2022): *Do deadlines improve negotiation outcomes, and if so, how should they be designed?*[5] To illustrate how we contribute to this question, consider a merger negotiation influenced by the timing of an upcoming regulatory decision. There are two scenarios: In the first, the decision is expected within a narrow window of 11 to 12 days. In the second, it could occur anytime within a broader window of 6 to 17 days. In which scenario is an agreement more likely? Our findings suggest that agreements are more likely in the broader window scenario. Larger uncertainty about the deadline reduces brinkmanship, encouraging steady negotiations and decreasing the likelihood of an impasse. Conversely, the narrower window increases the risk of brinkmanship tactics, making agreements harder to achieve, even though the deadline is guaranteed not to occur before day 11.[6]

From a practical viewpoint, one may wonder if the companies should agree to self-impose a fixed deadline to eliminate deadline uncertainty. In the narrow window scenario, our results indicate that a self-imposed deadline is beneficial. A clear, fixed deadline creates a coordination point, fostering rapid negotiation progress—an advantage that uncertain deadlines, even with minimal uncertainty, fail to achieve. However, in the broad window scenario, the benefits and costs of a self-imposed deadline largely offset each other: while it can accelerate progress near the deadline, it would also create incentives for brinkmanship, potentially undermining its advantages.

Another long-standing question in the negotiation literature is (Fisher et al., 1981): *Which features of a negotiation institution promote cooperative bargaining?* While prior research highlights the role of richer communication channels, such as face-to-face interactions, in fostering prosocial behavior and reducing misunderstandings (e.g., Schweinsberg et al., 2022; Boothby et al., 2023), our findings demonstrate that enhancing the offer space can achieve similar benefits without altering the communication medium. Our experimental results show that participants naturally adopt range offers, which reduce anchoring effects and promote cooperation. This underscores that even modest improvements in how offers are structured can significantly improve outcomes. These findings support Ames and Mason (2015)'s conclu-

[5] Karagözoğlu and Kocher (2019) vary time pressure by adjusting the time available until the negotiation deadline across conditions. They find that greater time pressure significantly increases the likelihood of disagreements and last-minute agreements, highlighting the risks associated with tight deadlines. We explore whether deadline stochasticity can mitigate these inefficiencies.

[6] While theoretical models adeptly predict brinkmanship and the surge of agreements near deadlines (e.g., Yildiz, 2011; Fuchs and Skrzypacz, 2013; Fanning, 2016), it remains crucial to investigate models that can account for the non-monotonicity in deadline uncertainty documented in this study. Empirically, fixed and stochastic deadlines appear to function in fundamentally different ways.

sion that range offers are perceived as more polite and lead to fewer aggressive counteroffers. However, while Ames and Mason (2015) frame range offers primarily as a unilateral, strategic tool to secure favorable outcomes, our results emphasize their broader potential to reduce bargaining impasses. We also demonstrate that a lack of information about valuations can enhance cooperative bargaining compared to scenarios with complete information, especially when surpluses are substantial. Although this may seem counterintuitive, the negative effects of complete information are driven by the activation of fairness concerns, which in turn lowers agreement rates (Babcock et al., 1995; Huang et al., 2020; Bochet et al., 2024). These insights suggest that negotiators should be cautious about disclosing information, even if it is mutual, and that retaining some of information asymmetry can foster cooperation.

The next section outlines the theoretical background and presents behavioral hypotheses. Section 3 describes the experimental design. Section 4 presents the main results. Section 5 concludes.

# 2 Theoretical Background

## 2.1 Negotiation Setting

Two agents, a buyer and a seller, negotiate the price of a good. The buyer has a valuation, $v$, for the good, drawn from distribution $F_v$. The seller has a production cost, $c$, drawn from distribution $F_c$. The available surplus is $s = \max\{0, v - c\}$. For now, we assume valuations and production costs are common knowledge.

The negotiation has a nominal deadline $T$, but the actual termination time is uncertain and varies within the interval $[T - u, T + u]$. Here, $u \geq 0$ determines the realized size of the deadline uncertainty interval and is known to the bargainers. The actual deadline is unknown and determined according to a cumulative distribution function $G(t)$, where $G(t)$ gives the probability that the deadline arrives at or before time $t$ within the interval $[T - u, T + u]$.

The buyer and seller may submit price offers at any time before the deadline. If and when an offer, $p$, is accepted, the buyer's payoff is $v - p$, and the seller's payoff is $p - c$. There is no discounting. If no agreement is reached by the deadline, the pair forfeits any potential gains from the trade.

## 2.2 A Model of Deadline Effects

This section presents a formal model of bargaining with a deadline. We use the seminal framework of Abreu and Gul (2000), which captures how individuals negotiate while maintaining a reputation for toughness. Specifically, we draw on Fanning (2016), who examines reputational bargaining in the presence of a deadline. Our goal is not to provide a direct experimental test of the model (see Embrey et al., 2015) but rather to use it as a tool for developing intuition about the bargaining environment described in Section 2.1. This analysis will lead to our first behavioral hypothesis.

**Behavioral Hypothesis 1** (Deadline Uncertainty)**.** *Larger deadline uncertainty, $u$, will lead to less delay and fewer trade failures.*

The model is as follows. At the start of the negotiation ($t = 0$), agents announce demand schedules $\alpha_i(t)$ for $t \in [0, T + u]$, specifying the share of the surplus they demand over time, where the surplus is normalized to $s = 1$. Hence, for each agent $i$, $\alpha_i \in [0, 1]^{[0,T+u]}$. After laying out their demands at $t = 0$, agents choose at each point in time $t > 0$ whether to concede by accepting the opponent's current demand. When agent $i$ concedes at time $t$ to agent $j$'s demand $\alpha_j(t)$, agent $i$ gets a payoff of $1 - \alpha_j(t)$, while agent $j$ obtains $\alpha_j(t)$.

Agents can be either rational or behavioral. A rational agent behaves optimally, given what they know about the opponent. A behavioral agent commits to a predetermined demand schedule and never accepts lower offers. Agent $i$ is behavioral with probability $z_i > 0$. For simplicity in our exposition, we focus on "simple" behavioral types, which are described by a time-invariant demand $\alpha_i(t) = \bar{\alpha}_i$ for all $t$. Thus, if $i$ is behavioral, she demands a share $\bar{\alpha}_i$ throughout the negotiation. In contrast, a "complex" behavioral type would submit a demand schedule, without the time invariance restriction imposed for the "simple" behavioral types. To guarantee that the problem is interesting, behavioral demands are incompatible across agents, specifically, $\bar{\alpha}_i + \bar{\alpha}_j > 1$.[7]

We use this model to construct two key examples—Examples 1 and 2—that illustrate the deadline effect and the anchoring effect arising from reputation building in the presence of behavioral types. The model assumes that negotiators announce demand schedules at $t = 0$ and later decide whether to concede. However, the conclusions of the model apply to a much more general class of bargaining protocols. Indeed, a key strength of the reputational bargaining model is its *independence* from the details of the bargaining protocol. As shown by Abreu and Gul (2000), Proposition 4, the equilibrium of this game emerges as the unique limit of equilibria in bargaining games where offers can be made frequently, regardless of the specific bargaining structure. This equivalence also holds in bargaining with a deadline (Fanning, 2016, Proposition 6). The core logic of reputational bargaining models thus captures a fundamental dynamic in bargaining: even when offers can be made continuously, a rational player who lowers their demand below that of a behavioral type reveals that they are not truly committed, weakening their bargaining position. This will ensure that the predicted equilibrium outcomes apply to the experimental setting.

[7]Behavioral agents may be driven by psychological factors, leading to firm commitments. Alternatively, if negotiators can commit to their demands with positive probability—e.g., through public statements that make reversal costly—then behavioral agents can be viewed as rational actors who have successfully committed (Crawford, 1982; Fershtman and Seidmann, 1993; Ellingsen and Miettinen, 2008; Chen et al., 2024; Miettinen and Vanberg, 2025).

Equilibrium is defined by sequential rationality, specifying demand schedules and concession strategies that maximize rational agents' expected payoff given their beliefs about the opponent's type and strategy. The following proposition is adapted from Fanning (2016).[8]

**Proposition 1.** *There exists a unique equilibrium. Rational agents start the negotiation by mimicking the behavioral types' demands, $\bar{\alpha}_i$ and $\bar{\alpha}_j$. There are no agreements on $(0, T-u)$ but a strictly positive probability of concession in the interval $[T-u, T+u]$. If deadline uncertainty diminishes, i.e., $u$ converges to $0$, all agreements happen close to the deadline (deadline effect). When deadline uncertainty $u$ is larger with a more spread out deadline distribution, $G(t)$, agreements occur more gradually over time. Moreover, rational agents miss the deadline with a positive probability.*

The proposition shows how negotiators attempt to build a reputation for being tough by mimicking behavioral demands. Deadline effects arise as rational agents engage in brinkmanship and delay concessions until close to the deadline in an attempt to extract bigger shares. These incentives for strategic posturing are significant, as rational bargainers experience bargaining breakdowns despite the commonly known surplus. Our first example below illustrates these points.

**Example 1** (Deadline Effect)**.** *Consider a bargaining game with a deadline distributed uniformly on $[T-u, T+u]$, where $T = 90$ seconds and $u \in \{1, 30\}$. There is a single behavioral type characterized by $\alpha(t) = \bar{\alpha} = 0.6$ for all $t \in [0, T+u]$.*[9] *The probability that an agent is behavioral is $z_i = z_j = 0.1$.*

***(i) Tight Deadlines—Brinkmanship:*** *If $u = 1$, the deadline is tightly distributed around 90 seconds. At equilibrium, both agents mimic the behavioral demand of 0.6 with probability 1 up until $t = 89$. Agents concede with positive probability on the interval $[89, 90.36]$, having conceded for sure after $90.36$ seconds. The expected agreement time is $89.28$ seconds. The probability of trade failure is 22.95%. Thus, with the deadline distributed tightly around 90 seconds, agreements occur in the final moments or fail to occur as rational agents attempt to extract the behavioral demand.*

***(ii) Uncertain Deadlines—No Brinkmanship:*** *If $u = 30$ such that there is significant uncertainty around the deadline's arrival time, agents concede with positive probability on the interval $[60, 101.02]$, with an expected agreement time of 73.16 seconds. The greater*

[8] Uniqueness follows from Proposition 1 in Fanning (2016) and the equilibrium description is based on Proposition 3. In general, a positive probability of agreement can occur at $t = 0$, resulting in a U-shaped agreement distribution. However, given the symmetry of our experimental setting, the behavioral types are best understood as symmetric as well, implying that no agreement occurs at time zero.

[9] A more general model allows for multiple behavioral types and time-varying demands (Fanning, 2016). The constant behavioral demand is chosen for simplicity. Empirically, bargaining often involves gradual concession (e.g., Bochet et al., 2024; Keniston et al., 2024). The comparative statics presented in Example 1 continue to be true for gradual concessions, e.g., a linearly decreasing behavioral demand schedule between $\alpha(0) = a$ and $\alpha(120) = b$ with $a > b$.

*deadline uncertainty reduces brinkmanship, concession probability is spread over a larger interval, and the expected agreement time is shifted forward, despite expanding the deadline interval symmetrically. The probability of trade failure remains at 22.95%.*

Example 1's key point is that a tight deadline forces all actions and concessions into a narrow 1.36-second window (the deadline effect), whereas greater deadline uncertainty allows for more gradual and less risky concession behavior over time. The equilibrium with tight deadlines places particularly high demands on the rationality of bargainers, as they must process information and execute their strategies within an extremely short time frame. Thus, while the theoretical breakdown probability remains the same in cases (i) and (ii), empirically we not only expect an intensified deadline effect in the tight-deadline scenario but also more impasses.

## 2.3 Anchoring and Range Offers

Section 2.2 focused on the effect of deadline uncertainty. In this section, we provide the theoretical background for range offers. The discussion will support the following behavioral hypothesis.

**Behavioral Hypothesis 2** (Range Offers)**.** *The availability of range offers will weaken anchoring effects and reduce negotiation impasses.*

Tversky and Kahneman (1974) pioneered the concept of anchoring, demonstrating that initially presented values disproportionately influence decision-makers. Negotiation studies on anchoring highlight the power of first offers in affecting surplus distribution, which creates an incentive for negotiators to lead with aggressive demands (Galinsky and Mussweiler, 2001).[10] However, anchoring can become a source of inefficiency if it leads to negotiation breakdowns. Anchoring strategies are particularly problematic in the presence of deadlines, where limited time dramatically constrains adjustments toward agreement. Indeed, there may not be enough time to overcome initial differences in bargaining positions resulting from aggressive anchors.

To demonstrate the effect of anchoring more formally, we return to the model and expand on the example.

**Example 2** (Anchoring)**.** *Consider a bargaining game with a deadline distributed uniformly on* $[T-u, T+u]$*, where* $T = 90$ *seconds and* $u = 15$*. The behavioral type characterized by* $\alpha(t) = \bar{\alpha}$ *for all* $t \in [0, T+u]$*. The probability that an agent is behavioral is* $z_i = z_j = 0.1$*.*

***(i) Weak Anchors:*** *If* $\bar{\alpha} = 0.51$*, the negotiation environment is one where the benefits of anchoring are limited. Even if a rational agent succeeds in obtaining the behavioral demand, it*

[10] Anchoring effects are remarkably robust across domains (Furnham and Boo, 2011), cultures and power dynamics (Gunia et al., 2013), and for different types of anchors (Mussweiler and Strack, 2001; Janiszewski and Uy, 2008).

*is just 51% of the pie. Still, both agents start out by demanding* $\bar{\alpha} = 0.51$*. They concede with positive probability on the interval* $[75, 77.69]$*. The expected agreement time is 75.54 seconds. The trade failure probability is 3.24%. Thus, rational agents quickly concede when the deadline arrives with positive probability, never negotiating beyond 2.69 seconds into the 30-second interval during which the deadline can occur, resulting in a small probability of trade failure.*

***(ii) Aggressive Anchors:*** *If* $\bar{\alpha} = 0.9$*, agents start by demanding 90% of the pie. They concede with positive probability on the entire time interval,* $[75, 105]$*, with an expected agreement time of 99.3 seconds. The trade failure probability increases to 81.8%. Thus, when rational agents perceive behavioral types as aggressive—as can occur in contexts of one-off bargaining, limited communication, or ambiguous environments—they not only set aggressive anchors but also tolerate significant delays in reaching agreements, well past the expected arrival time of the deadline. This leads to trade failures, as each party rationalizes their stance by the potential high rewards of successfully extracting the aggressive behavioral demand.*

Example 2 shows that the presence of behavioral types prompts rational agents to use anchoring strategies. Importantly, more aggressive anchoring significantly increases the probability of trade failure, with the aggressiveness of anchors shaped by expectations about behavioral types. Even a moderate probability of encountering a behavioral type has a striking impact on negotiations. In (ii), the aggressive anchor attached to the behavioral type almost eliminates the scope for trade, despite it being common knowledge that behavioral types are rare.[11]

We argue that a restricted offer space, such as single-price offers, exacerbates anchoring. When negotiators are limited to stating a single number, they have no choice but to use that number strategically, making extreme opening offers more tempting—particularly if anchoring is an expected bargaining strategy (Friedenberg, 2019; Schweinsberg et al., 2023). In contrast, a richer offer space alleviates these issues by allowing negotiators to communicate more nuancedly. When proposals can convey not just a single number but a range of acceptable terms, negotiators can better signal aspirations and flexibility. We will refer to such offers as *range offers*.

An economist's immediate reaction to range offers might be that only the more accommodating bound of the range offer should matter. However, empirical evidence suggests that negotiators take both endpoints into account and range offers are perceived as more polite, which discourages extreme counteroffers and escalation (Ames and Mason, 2015). Moreover, the literature on the role of cheap talk in bargaining suggests a more theoretical reason for why range offers might be effective in mitigating anchoring, as we explain next.

Negotiations are characterized by mixed motives. While both parties prefer to secure a larger share of the surplus, they also share an interest in striking a deal. The common interest

[11]To emphasize the point that even a low probability of a behavioral type can cause significant inefficiencies, let $\bar{\alpha} = 0.6$, $u = 15$, and consider two values of $z = \{0.01, 0.3\}$. The expected time of agreement is 75.54 seconds if $z = 0.01$ and 78.46 seconds if $z = 0.3$. The breakdown probability is 20.27% if $z = 0.01$ and 30.01% if $z = 0.3$.

in reaching an agreement can diffuse distributional tension. Indeed, Farrell and Gibbons (1989) show that cheap talk can influence bargaining outcomes by allowing agents to signal their keenness to trade before negotiating prices (see also Crawford, 1982; Farrell and Rabbin, 1996). In their model, parties send a costless message—either "keen" or "not keen"—before entering a sealed-bid double auction, where trade occurs only if bids overlap. The message shapes expectations, creating equilibria with increased agreement probability that would not exist in the normal-form version of the game.[12]

This dynamic closely mirrors our framework: if both parties could mutually agree to lower their anchors, they would (Example 2). The challenge, however, is that in a setting with single-price offers, adopting a less aggressive stance is not a rational strategy. In contrast, a range offer introduces an additional communication channel that negotiators can, in principle, use to signal their willingness to settle. Our hypothesis is that range offers reduce reliance on aggressive anchoring and foster a more cooperative bargaining process. We view the introduction and analysis of the range offer institution as a key contribution of this paper, as it embeds signaling into bargaining without requiring pre-bargaining communication—achieving this by allowing for a seemingly redundant offer. To separate the effect of binding range offers from their cheap talk function, we also implement treatments where range offers are non-binding. If results are similar under these conditions, it suggests that range offers primarily operate through their signaling value.

## 2.4 Informational Nudges

It is well-established that aggressive demands in bargaining can arise due to biased or heterogeneous expectations. Specifically, negotiators may exhibit self-serving fairness biases (e.g., Babcock and Loewenstein, 1997; Gächter and Riedl, 2005; Karagözoğlu and Riedl, 2015) or be overly optimistic about their bargaining power (e.g., Yildiz, 2011). Correcting and aligning these expectations may facilitate agreement.

**Behavioral Hypothesis 3** (Informational Nudges)**.** *Informational nudges designed to promote equal-sharing norms or highlight the risks associated with strategic posturing weaken anchoring effects and facilitate agreements.*

In one condition of our experiment, we will establish a 50-50 profit-sharing norm by providing participants with information about past bargaining outcomes, which predominantly resulted in equal splits. In another condition, we will provide information about the risks of brinkmanship. We hypothesize that these *informational nudges* can help recenter beliefs around less extreme behavioral demands, thereby reducing the aggressiveness of anchoring.

[12] Without cheap talk, agents set bids and asks based only on independent priors, leading to aggressive price-setting and frequent trade failures. With cheap talk, parties frequently signal "keen" and reveal, in equilibrium, that the trade surplus is large. This fosters confidence that the other side will not risk a breakdown, facilitating more cooperative offer strategies.

### 2.5 Private Information

Private information about valuations and costs is perhaps the most commonly studied cause of bargaining delays. It thus represents a natural focus of our final behavioral hypothesis.

**Behavioral Hypothesis 4** (Private Information)**.** *Negotiations with public or complete information about valuations and costs will be characterized by more accommodating opening offers, less delay, and fewer trade failures compared to negotiations with private information about valuations and costs.*

When parties do not know each other's true willingness to pay or accept, they have incentives to strategically prolong negotiations as a way to signal patience or screen their counterpart (e.g., Ausubel et al., 2002; Bochet and Siegenthaler, 2018). Consumer negotiations on eBay's Best Offer platform illustrate how informational frictions can lead to inefficient impasses, with approximately 37% of negotiations failing despite the availability of mutually beneficial trades (Freyberger and Larsen, 2025). Moreover, the theoretical literature predicts that most information will be revealed only as the deadline nears, therefore heightening the risk of impasses (e.g., Kennan and Wilson, 1993; Fuchs and Skrzypacz, 2013).

It is worth noting that prior bargaining experiments have shown that public information does not necessarily increase efficiency. While it clarifies the range of mutually beneficial prices, it can also trigger strategic brinkmanship and fairness disputes that delay or even derail high-surplus negotiations (Bochet et al., 2024). Whether this effect persists under time pressure from deadlines is an open question.

## 3 The Experiment

### 3.1 Environment

A buyer and a seller negotiate the price of a (virtual) item. At the beginning of the negotiation, the buyer's valuation for the item, $v$, is independently and randomly drawn from a discrete uniform distribution $u\{31, 100\}$. The seller's cost of producing the item, $c$, is drawn from $u\{1, 70\}$. The trade surplus, $s$, thus ranges from 0 (when $v \leq c$) to 99 (when $v = 100$ and $c = 1$). The expected surplus is 32.2. The probability that the surplus is positive is 83.3%. Valuation and costs can be private or public information.

Each negotiation has a deadline. In the case of trade before the deadline is reached, the buyer's payoff is $v - p$, and the seller's payoff is $p - c$, where $p$ is the agreed-upon price. If no agreement is reached by the deadline, the pair forfeits any potential gains from the trade. There is no discounting. Deadlines can be fixed or uncertain.

Buyers and sellers can continuously make and revise price offers. They may also cancel unaccepted offers or accept/reject their opponent's price offers. Price offers have to be integer

Table 1: Experimental Design

| Treatment | Subjects | Matching Groups | Information Structure | Nature of Deadline | Offer Structure | Informational Nudges |
|---|---|---|---|---|---|---|
| 1. CI | 96 | 6 | Complete | Fixed/Uncertain | One-Dimensional | × |
| 2. CI-2Dim | 96 | 6 | Complete | Fixed/Uncertain | Two-Dimessional | × |
| 3. CI-Cheap | 96 | 6 | Complete | Fixed/Uncertain | Cheap-Talk | × |
| 4. PI | 96 | 6 | Private | Fixed/Uncertain | One-Dimensional | × |
| 5. PI-2Dim | 96 | 6 | Private | Fixed/Uncertain | Two-Dimessional | × |
| 6. PI-Cheap | 96 | 6 | Private | Fixed/Uncertain | Cheap-Talk | × |
| 7. CI-Risk | 96 | 6 | Complete | Fixed/Uncertain | One-Dimensional | Deadl. effect |
| 8. CI-Equal | 96 | 6 | Complete | Fixed/Uncertain | One-Dimensional | 50-50 norm |

*Notes:* A total of 768 subjects participated in the experiment. Each participant was assigned to a single treatment and took part in 20 bilateral negotiation rounds. Each treatment consisted of six independent matching groups, each comprising 16 participants.

numbers between 1 and 100. No structure is imposed on the timing of offers. Offers can be either limited to a single-point price (one-dimensional) or can follow a richer structure (two-dimensional).[13]

## 3.2 Treatments

Table 1 summarizes the experimental treatments. The following sections describe the different treatment dimensions.

### 3.2.1 Information Structure

We examine negotiation behavior across both complete (or public) information and private information conditions. Under public information, both negotiation parties are informed about the buyer's valuation ($v$) and the seller's cost ($c$). Under private information, the buyer knows their valuation but remains uninformed about the seller's cost; and vice versa for the seller. All study participants are assigned to either a complete or the private information condition.

### 3.2.2 Deadline Uncertainty

Negotiations differ in whether there is a fixed or uncertain deadline. With a fixed deadline, the negotiation always ends after 90 seconds. When deadlines are uncertain, the deadline is

[13] Recall that while our experiment allows continuous revision of offers, the theoretical insights of reputational bargaining remain applicable, as shown in Abreu and Gul (2000), Proposition 4. Moreover, Fanning (2016) extends this insight to deadline settings, demonstrating that frequent-offer bargaining games converge to the same strategic structure as the concession game, provided that demand changes are not too abrupt.

known to occur at a random point in the interval $[90-u, 90+u]$, with $u \in \{1, 2, ..., 30\}$. The deadline uncertainty parameter $u$ is announced at the beginning of each negotiation. That is, participants know the interval's duration but remain unaware of the exact timing of the deadline within the interval.

All study participants experience both certain and uncertain deadlines. We varied the deadline within subjects because it is a simple change that requires minimal explanation and allows for efficient use of the sample. For half of the participants, the first ten negotiations have a fixed deadline, followed by ten negotiations with uncertain deadlines. The other half of the participants experienced ten negotiations with an uncertain deadline, followed by ten negotiations with certain deadlines. This allows us to control for order effects. Within the uncertain-deadline negotiations, the degree of uncertainty changes across rounds according to the randomly drawn interval lengths.[14]

#### 3.2.3 Offer Structure

We examine three different offer structures.

The point price offer structure (one-dimensional offers) is the standard way of structuring negotiations in experiments. Here, negotiators can propose a single price for the item, which they can revise upward or downward as negotiations progress. For example, a buyer with a value of 79 might initially offer to trade at a price of 41 and increase the offer over time.

The two-dimensional offer structure allows negotiators to make two simultaneous offers: a 'price offer (PO)' and an 'acceptable price (AP)'. For example, a buyer might propose a price offer of 41 while also stating an acceptable price. Both types of offers function like a regular price offer but enable negotiators to indicate a willingness to accept a range of outcomes. Negotiators are free to use only one type of offer or set the same price for both.

The cheap-talk offer structure also allows negotiators to state an acceptable price complementing the standard price offer, but unlike in the two-dimensional offer structure, the acceptable price is nonbinding. The opponent can see it but cannot accept it directly. This setup allows us to examine how the ability to communicate an acceptable price without commitment influences negotiation dynamics, isolating the effect of signaling flexibility without enforcing contractual obligations. In theory, cheap talk allows negotiators to trade off bargaining position against the likelihood of continued negotiation, leading to equilibrium behaviors that would not arise without non-binding communication (Farrell and Gibbons, 1989; Siegenthaler,

[14]The formal model in section 2 allows for arbitrarily small deadline uncertainty, $u$, but does not explicitly cover a fully fixed deadline like the 90-second limit in the experiment. We view the fixed deadline as the case where $u$ approaches zero. Alternatively, the model can incorporate a fixed deadline, $T$, by introducing uncertainty about the implementation of late-stage agreements, capturing factors like communication delays or limited attention. Such delays are natural both in the field and in experimental settings. This adjustment preserves the model's core intuition while aligning it with the experiment, and both approaches are formally equivalent (see Fanning, 2016, footnote 13).

2017; Backus et al., 2019).

#### 3.2.4 Informational Nudges

As discussed above, informational nudges may shape negotiation behavior by influencing expectations. Focusing on the complete information environment with one-dimensional offers, conditions CI-Risk and CI-Equal examine how expectations impact negotiation outcomes.

In the CI-Risk condition, participants receive information about past sessions, highlighting the costs associated with the deadline effect. Before negotiations begin, they are shown data on the prevalence of delays and the consequences of bargaining breakdowns observed in previous sessions of this experiment. This awareness is intended to discourage brinkmanship strategies.

In the CI-Equal condition, instead of emphasizing the costs of deadline effects, participants are informed about the final shares agreed upon in previous sessions. Specifically, they are shown that the most common outcome is an almost equal split of the bargaining "pie." Awareness of the prevalence of 50-50 sharing may facilitate agreements by reinforcing the fairness norm and highlighting the difficulty of securing larger shares.

### 3.3 Sample and Procedures

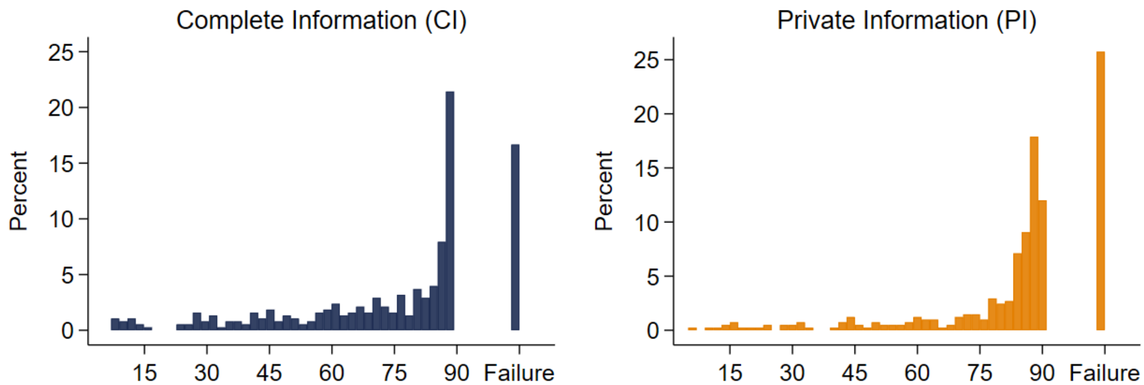
We conducted the negotiation study at the University of Valencia's laboratory between 2017 and 2023. A total of 768 students from various fields participated, with an average age of 21.67 years and 54% identifying as female. Each session lasted no more than two hours. Participants earned an average of EUR 27.50, which included a fixed EUR 5 participation reward. The variable payment was based on negotiation outcomes. All payoffs were distributed in cash at the end of each session.

Upon arrival at the lab, participants were assigned a seat and a computer terminal before receiving the experimental instructions. Written instructions were distributed so participants could follow along as the experimenters read them aloud. The instructions outlined that each participant would engage in 20 bilateral negotiations. Each participant remained in the same role—either a buyer or a seller—throughout all rounds. In each round, buyers and sellers were randomly paired. Participants were organized into groups of 16 and were randomly rematched within these groups across rounds. All interactions were conducted anonymously via computer software. Participants had no identifiers, ensuring they remained unaware if and when they negotiated with the same individual more than once.

## 4 Results

Before examining the impact of the deadline's nature and the two-dimensional offer protocol, we first establish that the deadline effect replicates well in our data. Figure 1 illustrates the

Figure 1: Deadline Effect in Baseline Treatments




Notes: The figure shows the distribution of agreement times, including trade failures, to illustrate the deadline effect in the baseline negotiation treatments (point-price offers and fixed deadlines) under complete information (CI) and private information (PI). Only negotiations with positive surpluses ($s > 0$) are included.

deadline effect and its potential to cause trade failures by depicting the distribution of agreement times in the CI and PI treatments. These treatments serve as the baseline conditions, where deadlines are fixed and offers are limited to point-price proposals (excluding range offers). Throughout the results section, the analysis focuses exclusively on negotiations where the buyer's valuation exceeds the seller's cost ($s > 0$), ensuring a positive trade surplus is possible and trade failures are inefficient.

To get an overview of how the different experimental conditions affect negotiations, table 2 presents the averages of three key variables. The opening offer gap—the difference between the buyer's and seller's initial offers—reflects the level of initial conflict, which increases with more aggressive anchoring. Agreement time refers to the moment an offer is accepted, conditional on the negotiation resulting in a trade. The impasse rate reflects the percentage of negotiations where the deadline passes without an agreement.[15] The 'Certain Deadline' columns include cases where $u = 0$, while the 'Uncertain Deadlines' columns average all negotiations where $u > 0$.

## 4.1 Deadline Uncertainty

This section examines Behavioral Hypothesis 1, which suggests that uncertainty about the timing of a deadline reduces negotiation delays and impasse rates. We begin by presenting the main result, followed by the empirical evidence supporting it.

**Result 1** (Deadline Uncertainty). *The effect of deadline uncertainty on impasse rates is non-monotonic. With a fixed deadline ($u = 0$), the average impasse rate is 18%. Even slight uncer-*

[15]The patterns observed in impasse rates are reflected in efficiency outcomes as well, measured by the ratio of realized to available surplus, as shown in section 4.5.

Table 2: Summary of Key Negotiation Variables

| | Opening Offer Gap | | Agreement Time | | Impasse Rate | |
|---|---|---|---|---|---|---|
| | Certain Deadline | Uncertain Deadline | Certain Deadline | Uncertain Deadline | Certain Deadline | Uncertain Deadline |
| CI | 23.37 | 20.52 | 68.96 | 59.34 | 16.67% | 18.13% |
| CI-2Dim | 13.53 | 14.06 | 63.73 | 54.02 | 9.74% | 13.07% |
| CI-Cheap | 14.36 | 12.82 | 67.50 | 57.81 | 12.31% | 14.93% |
| PI | 56.01 | 53.57 | 76.19 | 67.92 | 25.74% | 33.92% |
| PI-2Dim | 47.92 | 43.54 | 76.67 | 64.99 | 22.81% | 28.87% |
| PI-Cheap | 45.49 | 42.57 | 73.22 | 63.04 | 23.08% | 30.85% |
| CI-Risk | 20.91 | 18.53 | 72.06 | 63.18 | 17.22% | 21.98% |
| CI-Equal | 17.55 | 16.14 | 62.31 | 53.46 | 19.20% | 16.97% |

*Notes:* The table shows the mean values of the opening offer gap (the difference between the first offers the buyer and seller in a negotiation), agreement time (the time of acceptance in seconds conditional on agreement), and impasse rate (percentage of negotiations without trade) for each treatment. 'Certain Deadline' covers half the data where $u = 0$, while 'Uncertain Deadline' averages over the remaining half with $u \in \{1, ...30\}$. The data includes only negotiations where a strictly positive trade surplus was possible.

*tainty ($u = 1$) disrupts last-minute agreements, causing impasses to spike to 26%. However, as deadline uncertainty increases, impasse rates decline because greater uncertainty undermines brinkmanship as a strategy.*

Table 2 compares the averages of key negotiation variables between certain deadlines ($u = 0$) and uncertain deadlines, where all cases with $u > 0$ are aggregated. For all conditions (except CI-2Dim), we observe a smaller opening offer gap for uncertain deadlines compared to certain ones. For all conditions, we observe a shorter agreement time for uncertain deadlines compared to certain ones. However, contrary to our hypothesis, uncertain deadlines increase impasse rates in all conditions (except CI-Equal).

Table 3 presents regressions confirming the statistical significance of these effects. Models 1-3 are linear random effects regressions. Model 4 is a logistic random effects regression with effects shown as odds ratios. Standard errors are clustered by matching groups. The baseline category is CI with certain deadlines. Coefficient '2Dim' is a dummy if binding two-dimensional offers are allowed. Coefficient 'Cheap' is a dummy if non-binding two-dimensional offers are allowed. Coefficient 'PI' is a dummy for the private information conditions. Uncertain deadlines are classified into three categories: small ($0 < u \leq 10$), intermediate ($10 < u \leq 20$), and large ($20 < u \leq 30$).

With deadline uncertainty, the opening offer gap narrows and agreements occur faster compared to fixed deadlines (Wald test, $p < .001$ for all $u$-categories). However, the effect of

Table 3: Treatment Effects Regressions

| | (1)<br>Opening Offer Gap | (2)<br>Demand | (3)<br>Agreement Time | (4)<br>Impasse Rate |
|---|---|---|---|---|
| 2Dim | -8.616*** | -2.497*** | -8.132*** | 0.698*** |
| | (1.661) | (0.565) | (1.904) | (0.055) |
| Cheap | -9.438*** | -2.837*** | -7.047*** | 0.793** |
| | (1.839) | (0.650) | (1.559) | (0.079) |
| $u \in \{1, 10\}$ | -2.965** | -1.098*** | -6.615*** | 1.588*** |
| | (1.359) | (0.338) | (1.516) | (0.152) |
| $u \in \{11, 20\}$ | -1.280 | -0.259 | -8.769*** | 1.426*** |
| | (1.282) | (0.353) | (1.418) | (0.155) |
| $u \in \{21, 30\}$ | -2.564* | -0.541 | -13.504*** | 1.219* |
| | (1.393) | (0.352) | (1.314) | (0.126) |
| PI | 31.749*** | 10.607*** | 9.037*** | 2.436*** |
| | (1.371) | (0.463) | (1.421) | (0.221) |
| Surplus | 0.012 | 0.486*** | -0.026 | 0.964*** |
| | (0.044) | (0.014) | (0.034) | (0.006) |
| Constant | 10.665*** | 3.433*** | 63.674*** | 0.647** |
| | (1.835) | (0.777) | (2.704) | (0.124) |
| Observations | 4,566 | 58,375 | 3,795 | 4,774 |

*Notes:* Standard errors in parentheses are cluster by matching group, $^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$. Models 1-3 are linear random effects regressions; model 4 is a logistic random effects regression with effects shown as odds ratios. All regressions include period dummies. The baseline condition is CI (public information, point-price offers) with certain deadlines. Coefficient 2Dim is a dummy if binding two-dimensional offers are allowed. Coefficient Cheap is a dummy if non-binding two-dimensional offers are allowed. Coefficient PI is a dummy for the private information conditions.

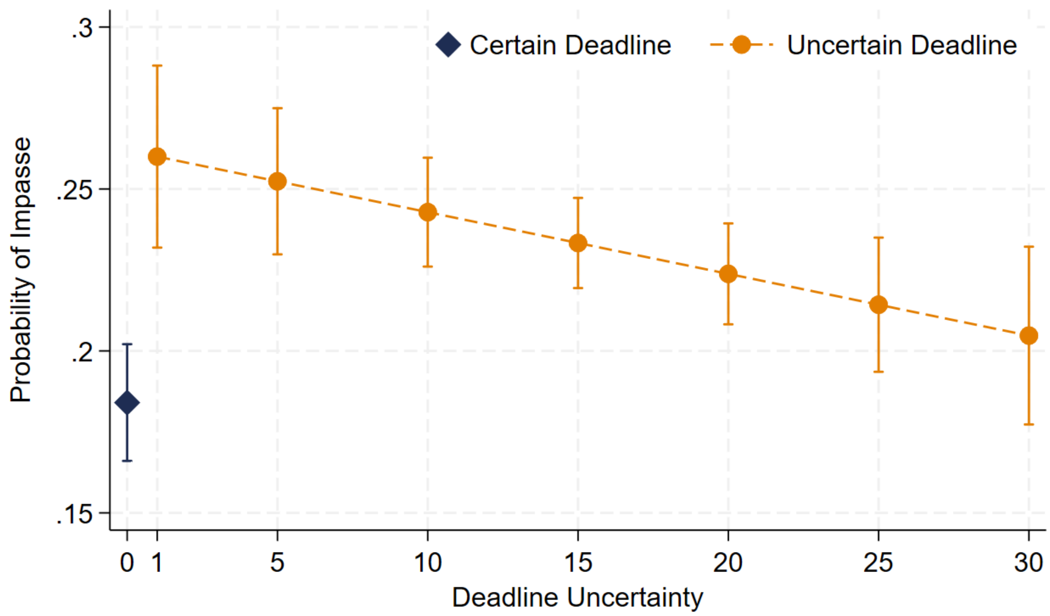
deadline uncertainty on impasse rates is reversed and non-linear: impasses *rise* most sharply under small deadline uncertainty compared to fixed deadlines (Wald test, $p < .001$), while this effect remains but diminishes as uncertainty increases further. In an analogous regression with a single dummy for uncertain deadlines (a dummy equal to 1 when $u > 0$), the impact of uncertain deadlines on opening offer gaps, demand, agreement time, and impasse rates remain and are highly significant (Wald test, $p < .001$).[16]

The non-monotonic effect of deadline uncertainty on impasse rates is explored further in figure 2A. It illustrates the size and robustness of the finding by showing the estimated probability of an impasse, treating $u \geq 1$ as a continuous variable while still maintaining a separate category for $u = 0$ to allow for the non-monotonicity. Notably, impasse rates are lowest at $u = 0$, peak at $u = 1$, and decrease with larger deadline uncertainty. While the

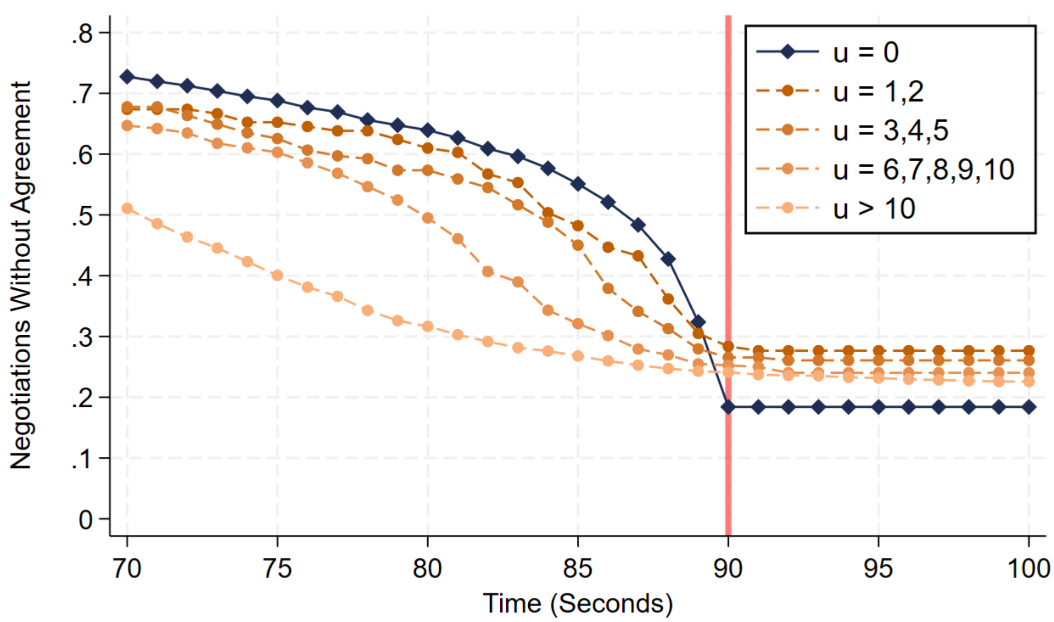
[16]Correcting for multiple hypothesis testing due to the multiple negotiation outcome variables (opening offer gap, agreement time, and impasse rate) following List et al. (2019), all reported p-values in this paragraph remain $p < .001$. The effect of '$u \in \{21, 30\}$' on impasse rates (tab. 3) is no longer significant ($p = .109$), confirming that large deadline uncertainty performs similarly to fixed deadlines.

Figure 2: Deadline Uncertainty and Impasse Rate

A. Discontinuity Between $u = 0$ and $u = 1$




B. No Surge of Agreement Near Deadline When $u > 0$




Notes: **Figure A.** depicts the estimated probability of an impasse for different deadline uncertainty with 95% confidence intervals derived from a random-effects logistic regression model with standard errors clustered by matching group. The estimates are evaluated at the mean surplus and pooled across the information conditions. **Figure B.** illustrates the fraction of negotiations without an agreement over time.

figure pools conditions for simplicity, the same pattern is evident separately under the public information (fig. 8A) and private information (fig. 9A) conditions. We also observe the same pattern when focusing separately on the first ten negotiations (fig. 10A) and the last ten negotiations (fig. 11A) in a session, indicating that the effect of deadline uncertainty remains robust regardless of whether fixed or uncertain deadlines are implemented first. It is crucial to consider how little the negotiation environments differ between $u = 0$ and $u = 1$: in the former, participants are informed that the negotiation will end after exactly 90 seconds, while in the latter, they are told the negotiation will end between 89 and 91 seconds. All other features of the negotiation remain identical.

Why are negotiations with minimal but positive deadline uncertainty the least efficient? Figure 2B provides insight. It depicts the fraction of negotiations that have not yet reached an agreement over time, categorized by different levels of deadline uncertainty. The figure shows that uncertainty can sometimes be beneficial: up to second 89, it raises the cumulative probability of reaching an agreement, and up to second 80, it also increases the marginal likelihood of agreement per second (steeper slope). These patterns suggest that greater uncertainty weakens brinkmanship, making it a less viable strategy—in line with the key mechanism highlighted in the theoretical predictions.

However, the downside is that uncertain deadlines fail to provide clear coordination points. Specifically, under $u = 0$, there is a pronounced surge in agreements during the last two seconds, with the fraction of negotiations without an agreement falling from 44% at second 88 to 19% by second 90. In contrast, with $u = \{1, 2\}$, the fraction of negotiations without an agreement decreases much more modestly, from 36% at second 88 to 28% by second 92. While theory predicts that there should be a surge of agreements within a small deadline uncertainty interval when $u = \{1, 2\}$, our results suggest that, in practice, negotiators may struggle to adjust their strategies effectively. The expected urgency does not materialize even for small uncertainty windows. In sum, while deadline uncertainty reduces brinkmanship, it fails to compensate for the loss of fixed deadlines as a coordination mechanism. This trade-off is especially problematic when uncertainty is small.

A potential behavioral mechanism for the rise in impasses under small uncertainty is that negotiators adjust their risk-taking strategies in response to deadline uncertainty. Negotiators who are more risk-tolerant are now enabled to take moderate risks—waiting a few seconds into the interval where the deadline could arrive—rather than risking the entire pie by holding out until a fixed deadline. This gradual form of risk-taking allows them to push for larger shares while anticipating that their counterpart may give in quickly. However, this expectation is often ill-founded and leads to a negotiation breakdown. From the perspective of prospect theory (Kahneman and Tversky, 1979), acceptors may view a 50-50 split as a reference point and perceive sub-50% offers as losses, making them more risk-seeking and less likely to concede even late in the game. Our data are consistent with this interpretation, though we acknowledge that alternative mechanisms, such as strategic uncertainty, may also contribute.

## 4.2 Range Offers

We next turn to Behavioral Hypothesis 2, which posits that bargainers will utilize two-dimensional offers to make range offers that facilitate trade. As before, we state the main result first, followed by supporting evidence.

**Result 2** (Range Offers)**.** *Negotiators use the two-dimensional offer space to make range offers. This behavior results in shorter delays in agreement and reduced impasse rates. Range offers facilitate agreement by reducing the aggressiveness of offers at the outset of negotiations (anchoring).*

As seen in table 2, CI-2Dim features smaller gaps in opening offers, quicker agreements, and fewer impasses compared to CI. Some results are particularly large in magnitude; for example, with certain deadlines, the impasse rate drops from 16.67% in CI to 9.74% in CI-2Dim. Similarly, PI-2Dim shows smaller opening offer gaps and fewer impasses than PI. The differences in agreement time between PI and PI-2Dim are minimal. The ability of the two-dimensional offer space to reduce opening offer gaps and impasse rates is evident under both certain and uncertain deadlines.

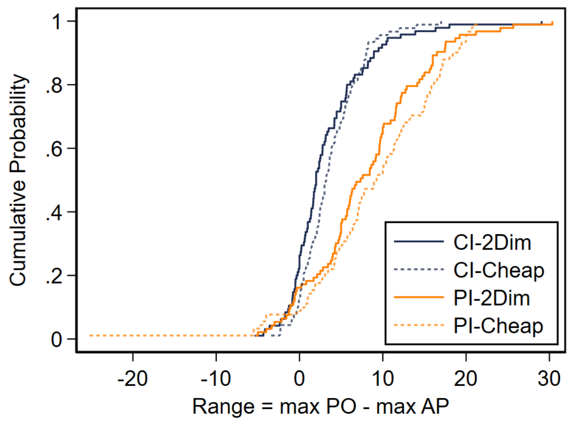
To evaluate the statistical significance of the impact of two-dimensional offers, we look again at the random effects regressions in table 3. The 2Dim dummy equals 1 for CI-2Dim and PI-2Dim; it is a dummy indicating that a condition allowed for range offers. As can be seen, across conditions, the ability to make range offers leads to a lower opening gap (Wald test, $p < .001$), a shorter agreement time ($p = 0.002$), and a reduced impasse rate ($p < 0.001$). Recall that the effects on the impasse rate reported in column (4) are odds ratios from random effects logistic regressions. The p-values remain unaffected when correcting for multiple hypotheses testing, following the same method as in footnote 16. In the online appendix, we confirm that these results hold separately for the public information (tab. 8) and private information (tab. 9) conditions. Additionally, column (2) of table 3 focuses on 'Demand', which is calculated as the proposer's potential profit if the offer were accepted and includes all offers (not just opening offers). The availability of two-dimensional offers also reduces average demands.

Negotiators overwhelmingly use the two-dimensional offer space to formulate range offers. This behavior is illustrated in figure 3A, which shows the cumulative distribution of the difference between a negotiator's maximum PO and maximum AP in a negotiation. This difference is positive for more than 80% of the negotiators, implying that their POs are higher than their APs.[17] Figure 3B further characterizes negotiators' behavior by showing how much they reduce their demands for each offer type. The difference between the most demanding and

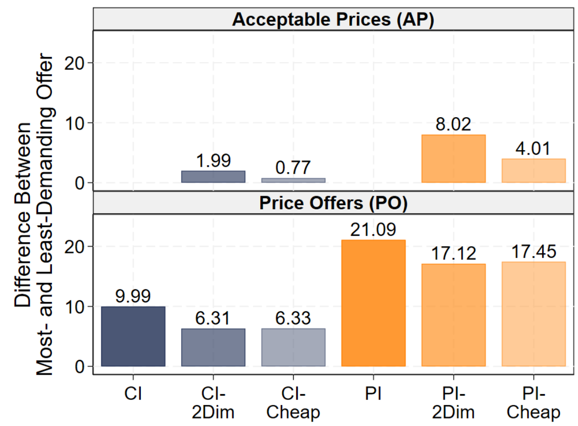
[17] Calculating the range as the difference between the *first* PO and the *first* AP results in an almost identical empirical cumulative distribution.

Figure 3: Two-Dimensional Offers

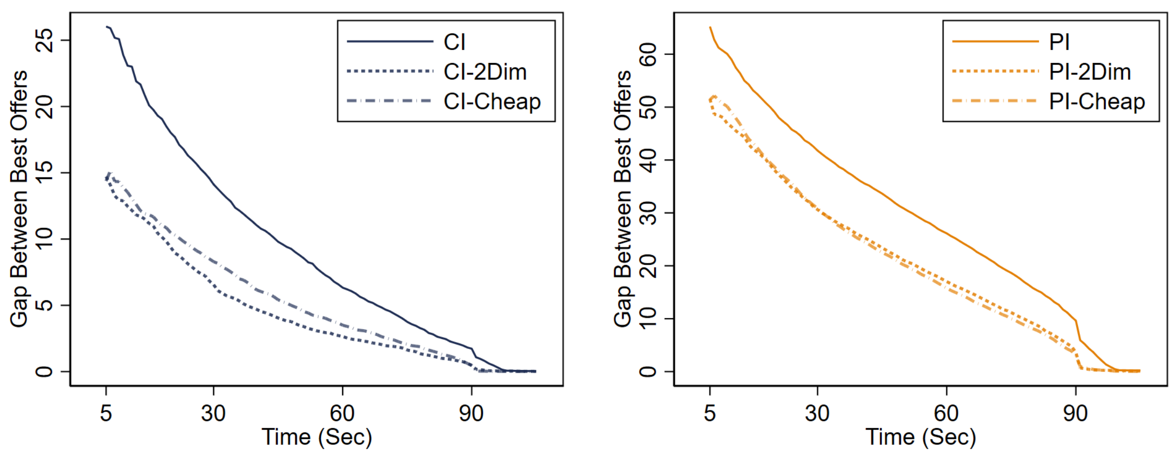
A. Range Offers




B. Compromise




C. Gap Between Best Offers Over Time




*Notes:* **Figure A.** shows cumulative distribution functions of range offers, computed as the difference between the maximum PO and maximum AP offered by a subject in a negotiation. **Figure B.** shows the compromise over time for each type of offer. It computes for each subject the average difference between the maximum PO and minimum PO; and analogously for AP. **Figure C.** shows the average gap between the two negotiators' best offers (PO or AP) over time; the price gap is 0 if and when a pair reaches an agreement.

Table 4: Usage of Price Offers (PO) and Acceptable Prices (AP)

| | Number of Offers per Negotiation | | Average Timing (Seconds) | | Percentage of Agreements by Offer Type | | |
|---|---|---|---|---|---|---|---|
| | PO | AP | PO | AP | PO | AP | Impasse |
| CI | 12.05 | | 38.36 | | 82.77% | | 17.33% |
| CI-2Dim | 6.52 | 2.21 | 32.46 | 24.79 | 59.82% | 28.91% | 11.27% |
| CI-Cheap | 8.71 | 1.43 | 35.97 | 25.42 | 86.53% | | 13.47% |
| PI | 16.06 | | 42.71 | | 70.75% | | 29.25% |
| PI-2Dim | 10.12 | 3.74 | 38.17 | 36.21 | 47.89% | 26.82% | 25.29% |
| PI-Cheap | 10.23 | 2.26 | 39.36 | 29.07 | 73.55% | | 26.45% |

*Notes:* The number of offers per negotiation represents the average number of price offers and acceptable offers made per negotiation. Average timing indicates the mean proposal time for each offer type. The percentage of agreements by offer type shows how often negotiations resulted in an acceptance of a PO, AP, or disagreement.

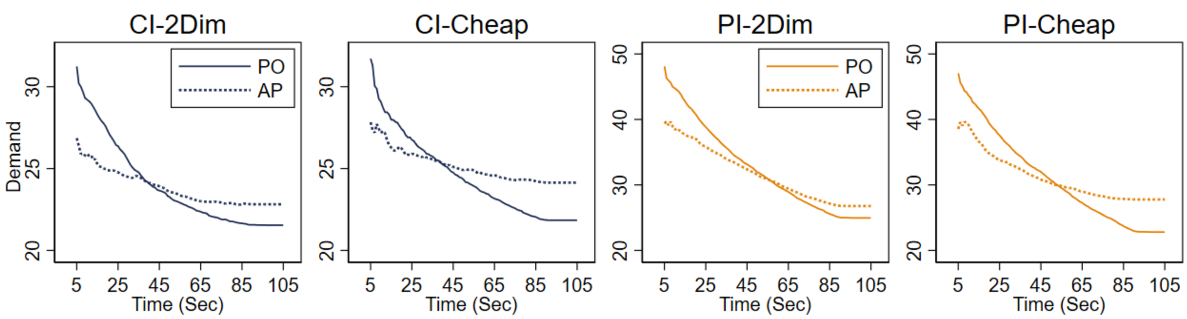
least demanding PO (compromise on PO) substantially exceeds the one for APs. Table 4 completes the description by listing the usage of POs and APs. POs are used more frequently and are made later in the negotiation than APs. However, both are common and among all agreements in the 2Dim conditions, two-thirds are reached through POs, while one-third are reached through APs.

This crucial point bears repeating: negotiators do not merely make highly accommodating APs that are immediately accepted. Rather, APs are deliberately set below POs to signal flexibility while remaining too high for immediate agreement. These APs are then held constant over time to reinforce the credibility of what is acceptable to a negotiator. Instead of adjustments to APs, compromise emerges through decreasing demands in POs, with the initial signal of flexibility facilitating mutual concessions. Figure 4 visually illustrates this *range-offer strategy* and demonstrates its robustness across experimental conditions.

The range-offer strategy effectively reduces conflict. To demonstrate, figure 3C tracks the gap between each party's most accommodating offers (PO or AP) up to a given point. The price gap is 0 if and when a pair reaches an agreement. As can be seen, this gap is much smaller in CI-2Dim (PI-2Dim) than in CI (PI) already at the start, indicating less aggressive anchoring and reduced conflict throughout the negotiation.

A more detailed analysis of anchoring is provided in the appendix, where we confirm that demands are significantly lower in APs than in POs and that POs serve as the primary tool for making concessions (tab. 10, Column 1). Moreover, the effect of two-dimensional offers on impasse rates disappears entirely once we control for the gap or conflict in the opening offers (tab. 10, Column 2). The advantage of the two-dimensional offer space thus stems from its influence on opening behavior and anchoring. The analysis also confirms that anchoring, on

Figure 4: Range-Offer Strategy




Notes: The figures illustrate the range-offer strategy, where a negotiator starts out with a range offer ($PO > AP$) and then compromises by lowering the price offer (PO), typically undercutting the acceptable price (AP) halfway through the negotiation. Demand (y-axis) corresponds to the average PO or AP over all subjects and negotiations where the subject used at least one PO and at least one AP.

average, is an effective negotiation strategy: after controlling for other factors such as trade surplus, each unit increase in the opening demand leads to a 0.172 increase in expected payoff (tab. 10, Column 3).

Throughout the discussion, the reader may have noticed that the findings for CI-2Dim and PI-2Dim closely mirror those for CI-Cheap and PI-Cheap. In our main regressions, the effects of the 'Cheap' and '2Dim' dummies on the key negotiation variables are similar (tab. 3); though for agreement time and impasse rates, the effect of cheap-talk APs decreases slightly. The results of the cheap-talk conditions demonstrate that the richer offer space does not merely provide more opportunities to accept others' prices. The fact that cheap-talk APs lead to similar negotiation behavior and outcomes as binding APs suggests that APs serve as a meaningful signal of flexibility. Our results thus support the idea that cheap talk creates new negotiation equilibria that could not be reached with a single price offer (Farrell and Gibbons, 1989). A single PO alone cannot simultaneously convey both an aggressive anchor and a willingness to compromise, but introducing another dimension to the offer makes this balance possible. Negotiators use range offers in the way cheap-talk models would predict.

Range offers provide a natural bargaining institution that embeds the signaling effects of cheap talk directly into the negotiation process. This suggests that the strategic insights of cheap talk models apply more broadly than previously recognized, as signaling can be embedded within structured offer formats rather than relying on separate (pre-bargaining) communication channels. Although our data show no large difference between binding and non-binding APs, binding range offers may play a more critical role in environments characterized by mistrust, where cheap talk may be disregarded but structured offers retain credibility. While this credibility could, in principle, discourage bargainers from stating low demands, in dynamic negotiations it instead allows initial offers to leave room for movement. Because agreements are rarely immediate, negotiators can use range offers to signal flexibility without undermining

Table 5: Informational Nudges Regressions

| | (1)<br>Gap in First Offers | (2)<br>Demand | (3)<br>Agreement Time | (4)<br>Trade Failure |
|---|---|---|---|---|
| CI-Risk | -2.009 | -0.791 | 0.116 | 1.170 |
| | (1.665) | (0.589) | (2.064) | (0.152) |
| CI-Equal | -5.077** | -1.240** | -9.824*** | 1.058 |
| | (1.828) | (0.578) | (2.903) | (0.151) |
| $u \in \{1, 10\}$ | -1.891** | -0.421 | -7.482*** | 1.791*** |
| | (0.659) | (0.339) | (2.012) | (0.246) |
| $u \in \{11, 20\}$ | -1.538* | -0.038 | -12.665*** | 1.346* |
| | (0.826) | (0.274) | (1.877) | (0.227) |
| $u \in \{21, 30\}$ | -2.095** | 0.062 | -13.903*** | 0.776* |
| | (0.763) | (0.386) | (1.735) | (0.108) |
| Surplus | 0.378*** | 0.614*** | 0.156*** | 1.004 |
| | (0.028) | (0.007) | (0.015) | (0.003) |
| Constant | 6.672** | 2.073** | 56.229*** | 0.189*** |
| | (2.736) | (0.947) | (2.710) | (0.050) |
| Observations | 2,250 | 27,005 | 1,938 | 2,371 |

*Notes:* Random effects regressions with standard errors in parentheses cluster by matching group, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Data includes conditions CI, CI-Equal, and CI-Risk; the informational nudges were not implemented for the private information condition. Impasse rate effects expressed in odds ratios from logistic random effects regressions. All regressions include period dummies. The baseline treatment is CI.

their position, allowing concessions to unfold as part of the negotiation process rather than as a sign of weakness.

Other strategies and conventions also play a crucial role in facilitating successful bargaining. Alternating offers involve a process in which buyers and sellers take turns proposing offers, with each counteroffer directly responding to the previous one (Bochet et al., 2024; Keniston et al., 2024). The proportion of counteroffers in a negotiation sequence, denoted as $A \in [0, 1]$, ranges from $A = 0$ (only one negotiator makes offers) to $A = 0.5$ (random proposer) to $A = 1$ (fully alternating proposals). A specific type of counteroffer, split-the-difference offers, divides the gap between the two most recent offers in half. Regression analysis (see tab. 7) shows that alternating and split-the-difference offers significantly reduce the opening offer gap. Moreover, both conventions also lower the impasse rate. Importantly, range offers have an independent effect: their estimated coefficients remain significant and quantitatively similar even when controlling for alternating and split-the-difference offers. This suggests that range offers contribute uniquely to negotiation dynamics beyond the effects of other bargaining conventions.

## 4.3 Informational Nudges

Addressing Behavioral Hypothesis 3, this section investigates whether informational nudges that create awareness of common bargaining outcomes can mitigate deadline effects and reduce negotiation impasses. Recall that in the CI-Risk treatment, participants were informed at the start of the session about the deadline effect observed in previous sessions, emphasizing that delays are frequent and result in costly breakdowns. In the CI-Equal treatment, participants also received pre-bargaining information, but this time it focused on the high occurrence of 50-50 agreements in prior sessions, establishing a descriptive norm of equal sharing.

**Result 3** (Informational Nudges)**.** *Informational nudges—whether emphasizing the risks of deadlines or the prevalence of the equal-sharing norm—do not significantly affect impasse rates. However, providing information about equal-sharing norms reduces opening demands as well as agreement times conditional on trade occuring.*

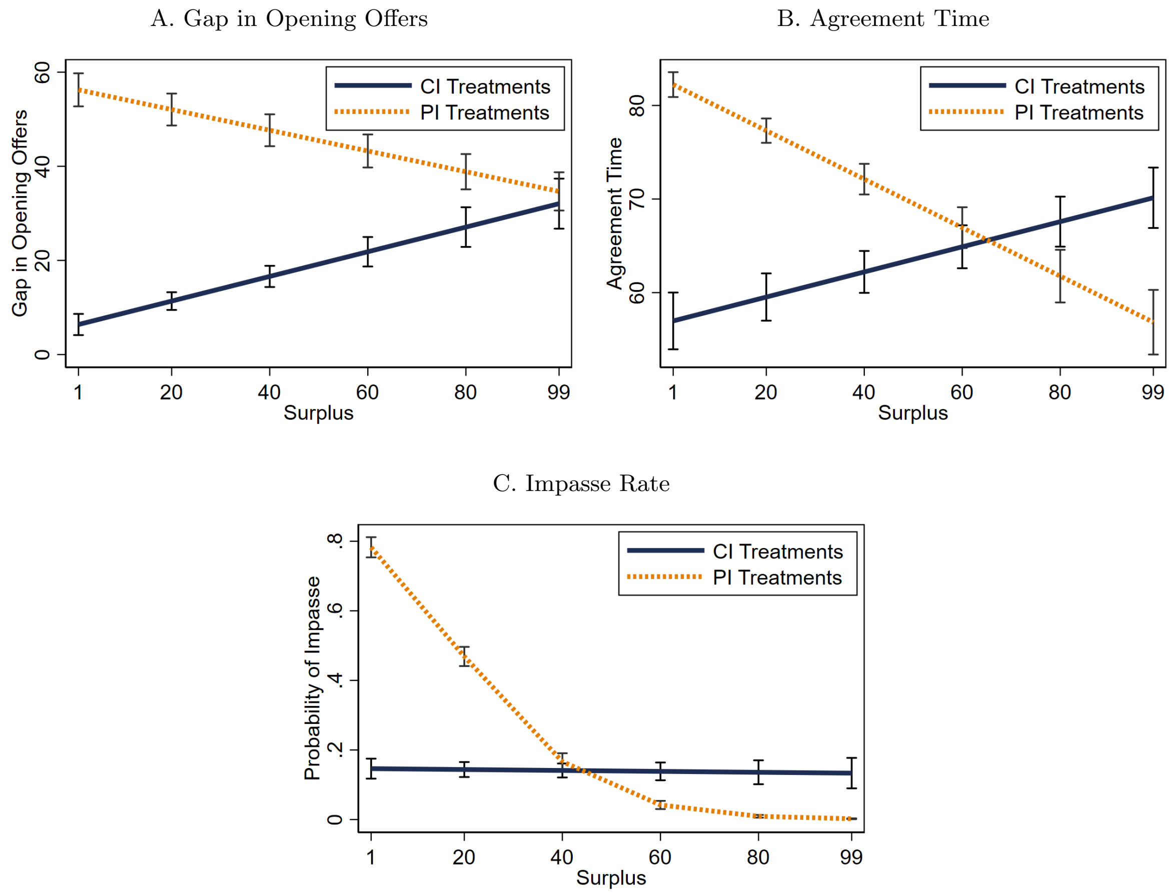
Result 3 is supported by the regression analysis in table 5. The information provided in CI-Risk about the costs of the deadline effect did not significantly impact bargaining outcomes. The results for treatment CI-Equal give a somewhat more optimistic view of informational nudges designed to improve negotiations. Opening offer gaps and demands in CI-Equal are reduced relative to CI, likely due to the stronger equal sharing norm. However, similar to CI-Risk, bargaining impasses in CI-Equal remain unchanged compared to CI. Even when the negotiation is framed as one where the most common outcome is a 50-50 split, impasses are not significantly reduced.

The failure of informational nudges to reduce impasses suggests that deliberate negotiation strategies rather than miscalculated risks or misperceived norms drive deadline effects. Even when participants are made aware of past bargaining failures or the prevalence of equal-sharing norms, they do not adjust their behavior in a way that facilitates agreements. One plausible reason is second-order skepticism: while an individual negotiator might recognize the value of avoiding brinkmanship, they may still believe that their counterpart will act strategically, making it too risky to deviate from an aggressive stance.

These results align with the fact that there are limited learning effects in our setting—deadline effects do not diminish in later negotiation rounds. If anything, learning appears to intensify the deadline effect over time as agreement times are shifted backward over time (see figs. 12 and 13).

Against this backdrop, the role of range offers in reducing negotiation impasses becomes particularly significant, as it fundamentally reshapes negotiation behavior rather than merely responding to informational cues or experimenter demand effects. The latter would be strongest in the informational nudge conditions. The success of range offers relative to informational nudges suggests that effective negotiation design requires institutional adjustments rather than purely cognitive interventions.

Figure 5: Information and Surplus Size




*Notes:* Predicted probabilities and 95% confidence intervals from random effects linear (figures A. and B.) and logistic (figure C.) regressions. Period dummies included. Standard errors clustered by matching groups.

## 4.4 Complete versus Private Information

This section examines Behavioral Hypothesis 4, which posits that negotiations with complete information about valuations and costs differ from those conducted under conditions of incomplete information. We first state the results aligning with our hypothesis and then provide the supporting empirical evidence.

**Result 4** (Complete versus Private Information)**.** *Negotiations with complete information result in less demanding opening offers, reduced delays, and fewer trade impasses compared to those involving private information. However, these effects are observed on average; for negotiations with large surpluses, the pattern reverses, with private information leading to less delay and fewer impasses.*

The summary of key negotiation variables presented in table 2 provides evidence supporting

Table 6: Elicited Fairness and Risk Tolerance Measures

| | Opening Offer Gap | | Demand | | Agreement Time | | Impasse Rate | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Risk Tolerance | 1.469*** | 1.556*** | 2.700** | 2.752*** | -0.015 | 0.081 | 1.168*** | 1.175*** |
| | (0.512) | (0.524) | (1.123) | (1.040) | (0.587) | (0.590) | (0.050) | (0.051) |
| Violates 50-50 | 2.230*** | 2.305*** | 0.806* | 1.011** | 3.885*** | 3.561*** | 1.202** | 1.178** |
| | (0.750) | (0.753) | (0.469) | (0.441) | (1.050) | (1.060) | (0.095) | (0.092) |
| Constant | 13.900*** | -1.276 | 22.615*** | -0.403 | 55.232*** | 45.538*** | 0.164*** | 0.395*** |
| | (2.047) | (2.081) | (1.056) | (0.699) | (2.850) | (3.272) | (0.031) | (0.093) |
| Controls | No | Yes | No | Yes | No | Yes | No | Yes |
| Observations | 6,070 | 6,070 | 76,078 | 76,078 | 5,010 | 5,010 | 6,289 | 6,289 |

Notes: Controls in even-numbered models include the treatments (dummies for 2Dim, Cheap, PI, Deadline Certainty) and surplus. Period dummies have been included. Standard errors in parentheses clustered by matching group, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Models (3) and (4) use participants' elicited fairness measures. In the other models, the dependent variable is measured at the negotiation level. Thus, we average the behavioral measures over the two participants in a negotiation.

of Result 4. Opening offer gaps are considerably larger under private information, which is expected, as negotiators are uncertain about the size of the surplus and must uncover mutually beneficial prices. Deadline pressure compounds this challenge by limiting the time available for price discovery, leading to significantly later agreement times and higher impasse rates. The statistical significance of these effects is confirmed by the regressions presented in table 3, particularly through the coefficient for private information (PI).

Interestingly, while previous research by Huang et al. (2020) and Bochet et al. (2024) suggests that private information can facilitate negotiations by diminishing the role of fairness considerations, the presence of a deadline amplifies the need for timely access to information. As a result, environments with complete information tend to perform better on average.

However, our data aligns with these previous findings when we break the results down by the size of the trade surplus. Figures 5A through 5C illustrate the estimated opening offer gaps, agreement times, and impasse rates, respectively.[18] Information becomes particularly valuable when surpluses are small. In contrast, for trade surpluses exceeding 40, negotiation impasses become less frequent with private information than with complete information. This is a common occurrence, as 37% of the negotiations have surpluses greater than 40.

The intuition behind the detrimental role of public information is that in high-stakes negotiations, information can backfire, as fairness considerations can become a greater obstacle

[18] The dependency of the impasse rate on the surplus in private information settings aligns with Myerson and Satterthwaite (1983), whose seminal work identifies how a lack of information about counterparties' valuations can hinder mutually beneficial agreements. In the appendix, we delve deeper into this relationship, showing that trade failures are significantly more frequent for combinations of buyer values and seller costs associated with smaller expected and actual surpluses, respectively (figs. 6 and 7).

than the price discovery process. To examine the influence of behavioral preferences, participants completed two additional, incentivized tasks after the negotiation experiment. The tasks elicited fairness and risk preferences.[19,20]

The regressions in table 6 provide direct evidence of the influence of risk and fairness preferences on negotiation outcomes. The variable 'Risk Tolerance' ranges from 1-6, with higher numbers indicating a higher elicited risk tolerance. We find that higher elicited risk tolerance is associated with larger opening offer gaps, greater individual demands, and an increased likelihood of impasse. The variable 'Violates 50-50' is a dummy indicating whether an individual deviated from offering 50% to their opponent in the fairness task. This variable captures a lower inclination to adhere to the 50-50 norm. The findings suggest that the presence of a 50-50 norm violator complicates a negotiation significantly.

### 4.5 Efficiency

Our primary outcome variable has been impasse rates, alongside negotiation variables such as opening offers and agreement times. Impasse rates capture bargaining breakdowns independently of surplus size. In this section, we compare experimental conditions based on efficiency, which we define as the sum of realized earnings. Efficiency accounts for surplus lost in a disagreement, making it a valuable complementary measure.

To examine efficiency, table 11 in the online appendix presents random effects regressions analogous to those in table 3. We find that efficiency in the private information (PI) treatment is not lower than in the complete information (CI) treatment. Specifically, efficiency in CI is 83.40%, while in PI, it is 84.13% (Wald test, $p = .877$). Thus, while incomplete information increases impasse rates, it does not lead to greater surplus losses. This finding aligns with the surplus size effects discussed in section 4.4.

Next, we find that the availability of two-dimensional offers in the 2Dim conditions significantly increases efficiency. Efficiency rises from 83.40% to 88.70% in the public information treatments and from 84.13% to 86.74% in the private information conditions (Wald test, $p < .001$). These results indicate that the reduction in impasse rates when negotiators can make range offers (section 4.2) translates into higher efficiency.

Finally, consistent with section 4.1, fixed deadlines lead to higher efficiency than uncer-

[19] In the risk elicitation task, subjects had to choose one lottery among the following six: 80% chance of winning €2, 70% chance of winning €3, 60% chance of winning €4, 50% chance of winning €5, 40% chance of winning €6, and 30% chance of winning €7. Each subject then received the selected amount with the corresponding probability. The lottery choices order subjects by risk preference, with the first lottery revealing the greatest risk aversion and the last one being the most risk-loving choice.

[20] In the fairness elicitation task, subjects had to play the following ultimatum bargaining game. Person $A$ had to distribute €5 between herself and person $B$. Person $B$ had to specify a minimum offer they are willing to accept before knowing Person $A$'s proposed split. If Person $A$'s proposed split covers Person $B$'s minimum acceptable offer, the split was implemented. Otherwise, both earned 0. Both subjects in a pair made decisions in both roles. Pairs were randomly matched in a session.

tain deadlines (88.37% vs. 83.33%, Wald test, $p < .001$). Additionally, the effect of deadline uncertainty remains non-monotonic. Negotiations with fixed deadlines exhibit the lowest inefficiency rate at 11.63%, while small deadline uncertainty increases inefficiency to 19.87%. As uncertainty rises further, inefficiency declines again, reaching 15.93% when $u > 10$. This pattern mirrors the results for impasse rates, suggesting that deadline uncertainty affects both measures similarly.

# 5 Conclusion

We investigated mechanisms to mitigate the negative impact of deadlines on negotiations, focusing on two key factors: *deadline uncertainty* and the use of *range offers*. Our findings reveal that uncertain or flexible deadlines often lead to more impasses, as they erode the coordination benefits of fixed deadlines while failing to sufficiently curb brinkmanship—the strategic delay of agreement to signal commitment. Notably, impasses peak when deadline uncertainty is small (but there is no fixed deadline) because negotiators hesitate in the absence of a clear coordination point. In contrast, range offers prove effective in reducing impasses by counteracting the anchoring effect of overly ambitious initial offers and embedding strategic flexibility into the bargaining process.

These findings have practical implications for negotiation design. Policymakers and organizations should recognize that moderate deadline uncertainty is often counterproductive and creates hesitation and inefficiencies instead of fostering flexibility. In contrast, fully fixed deadlines encourage urgency, while large uncertainty—akin to having no deadline—allows for a more adaptive negotiation process. Thus, when designing negotiation structures, it is crucial to balance deadline pressure against the risk of coordination failure. Our results also suggest that institutions can improve negotiation efficiency by incorporating structured offer mechanisms, such as range offers, which foster cooperation without requiring explicit communication.

Beyond these applied insights, our findings contribute to theoretical discussions on bargaining dynamics and strategic signaling. The experimental results suggest that range offers function as a signaling mechanism, extending the applicability of cheap talk models in bargaining research. Importantly, our results are robust across public and private information conditions, suggesting that the observed effects are not driven by belief updating or asymmetric knowledge. We interpret the rise in impasses under small deadline uncertainty as evidence of institutional-dependent risk-taking.

Similarly, while our results suggest that binding range offers effectively signal flexibility, their relative advantage over cheap talk likely depends on the negotiation environment. In settings where cheap talk lacks credibility, structured proposals may be more effective for signaling, but in other contexts, the commitment of a binding range offer could discourage negotiators from using them. Understanding when negotiators prefer binding versus non-binding range offers and how these mechanisms interact with trust and institutional constraints remains an important avenue for further study.

Ultimately, our findings demonstrate that structured negotiation mechanisms, such as range offers, can enhance bargaining efficiency without requiring explicit communication, while deadline design plays a crucial role in shaping strategic behavior. Understanding how institutional structures shape negotiations is critical not only for theory but also for real-world applications in business and policy.

## References


Abreu, D. and F. Gul (2000). Bargaining and reputation. *Econometrica 68*(1), 85–117.

Ames, D. R. and M. F. Mason (2015). Tandem anchoring: Informational and politeness effects of range offers in social exchange. *Journal of personality and social psychology 108*(2), 254.

Ames, D. R. and A. S. Wazlawek (2014). Pushing in the dark: Causes and consequences of limited self-awareness for interpersonal assertiveness. *Personality and Social Psychology Bulletin 40*(6), 775–790.

Ausubel, L., P. Cramton, and R. Deneckere (2002). Bargaining with incomplete information. *Handbook of game theory with economic applications 3*, 1897–1945.

Babcock, L. and G. Loewenstein (1997). Explaining bargaining impasse: The role of self-serving biases. *Journal of Economic perspectives 11*(1), 109–126.

Babcock, L., G. Loewenstein, and X. Wang (1995). The relationship between uncertainty, the contract zone, and efficiency in a bargaining experiment. *Journal of Economic Behavior & Organization 27*(3), 475–485.

Backus, M., T. Blake, B. Larsen, and S. Tadelis (2020). Sequential bargaining in the field: Evidence from millions of online bargaining interactions. *The Quarterly Journal of Economics 135*(3), 1319–1361.

Backus, M., T. Blake, J. Pettus, and S. Tadelis (2023). Communication and bargaining breakdown: An empirical analysis. Technical report, National Bureau of Economic Research.

Backus, M., T. Blake, and S. Tadelis (2019). On the empirical content of cheap-talk signaling: An application to bargaining. *Journal of Political Economy 127*(4), 1599–1628.

Bochet, O., M. Khanna, and S. Siegenthaler (2024). Beyond dividing the pie: Multi-issue bargaining in the laboratory. *Review of Economic Studies 91*(1), 163–191.

Bochet, O. and S. Siegenthaler (2018). Better later than never? an experiment on bargaining under adverse selection. *International Economic Review 59*(2), 947–971.

Bochet, O. and S. Siegenthaler (2021). Competition and price transparency in the market for lemons: Experimental evidence. *American Economic Journal: Microeconomics 13*(2), 113–140.

Bolton, G. (1991). A comparative model of bargaining: Theory and evidence. *The American Economic Review*, 1096–1136.

Bolton, G. E. and E. Karagözoğlu (2016). On the influence of hard leverage in a soft leverage bargaining game: The importance of credible claims. *Games and Economic Behavior 99*, 164–179.

Boothby, E. J., G. Cooney, and M. E. Schweitzer (2023). Embracing complexity: A review of negotiation research. *Annual Review of Psychology 74*(1), 299–332.

Calford, E. M. and T. N. Cason (2024). Contingent reasoning and dynamic public goods provision. *American Economic Journal: Microeconomics 16*(2), 236–266.

Camerer, C. F., G. Nave, and A. Smith (2019). Dynamic unstructured bargaining with private information: theory, experiment, and outcome prediction via machine learning. *Management Science 65*(4), 1867–1890.

Chen, Z., R. Wang, and J. Zong (2024). Pre-commitment in bargaining with endogenous credibility. *Journal of Economic Behavior & Organization 227*, 106714.

Cramton, P. C. and J. S. Tracy (1992). Strikes and holdouts in wage bargaining: Theory and data. *The American Economic Review*, 100–121.

Crawford, V. (1982). A theory of disagreement in bargaining. *Econometrica*, 607–637.

Damiano, E., H. Li, and W. Suen (2012). Optimal deadlines for agreements. *Theoretical Economics 7*(2), 357–393.

Ding, T. and S. F. Lehrer (2022). Waiting for the right offer: Laboratory evidence on how news affects bargaining. *Available at SSRN 4054835*.

Dunlop, J. T. (1984). The negotiations alternative in dispute resolution. *ViLL. L. REv. 29*, 1421.

Ellingsen, T. and T. Miettinen (2008). Commitment and conflict in bilateral bargaining. *American Economic Review 98*(4), 1629–1635.

Embrey, M., G. R. Fréchette, and S. F. Lehrer (2015). Bargaining and reputation: An experiment on bargaining in the presence of behavioural types. *The Review of Economic Studies 82*(2), 608–631.

Fanning, J. (2016). Reputational bargaining and deadlines. *Econometrica 84*(3), 1131–1179.

Fanning, J. and A. Kloosterman (2022). An experimental test of the coase conjecture: Fairness in dynamic bargaining. *The RAND Journal of Economics 53*(1), 138–165.

Farrell, J. and R. Gibbons (1989). Cheap talk can matter in bargaining. *Journal of Economic Theory 48*, 221–237.

Farrell, J. and M. Rabbin (1996). Cheap talk. *Journal of Economic Perspectives 10*(3), 103–118.

Fershtman, C. and D. J. Seidmann (1993). Deadline effects and inefficient delay in bargaining with endogenous commitment. *Journal of Economic Theory 60*(2), 306–321.

Fisher, R., W. Ury, and B. Patton (1981). *Getting to Yes: Negotiating agreement without giving in.* Penguin.

Freyberger, J. and B. J. Larsen (2025). How well does bargaining work in consumer markets? a robust bounds approach. *Econometrica 93*(1), 161–194.

Friedenberg, A. (2019). Bargaining under strategic uncertainty: The role of second-order optimism. *Econometrica 87*(6), 1835–1865.

Fuchs, W. and A. Skrzypacz (2013). Bargaining with deadlines and private information. *American Economic Journal: Microeconomics 5*(4), 219–243.

Furnham, A. and H. C. Boo (2011). A literature review of the anchoring effect. *The journal of socio-economics 40*(1), 35–42.

Gächter, S. and A. Riedl (2005). Moral property rights in bargaining with infeasible claims. *Management Science 51*(2), 249–263.

Galinsky, A. D. and T. Mussweiler (2001). First offers as anchors: The role of perspective-taking and negotiator focus. *Journal of personality and social psychology 81*(4), 657.

Gneezy, U., E. Haruvy, and A. Roth (2003). Bargaining under a deadline: Evidence from the reverse ultimatum game. *Games and Economic Behavior 45*(2), 347–368.

Gunia, B., R. Swaab, N. Sivanathan, and A. D. Galinsky (2013). The remarkable robustness of the first-offer effect: Across culture, power, and issues. *Personality and Social Psychology Bulletin 39*(12), 1547–1558.

Huang, J., J. B. Kessler, and M. Niederle (2020). Fairness concerns are less relevant when agents are less informed. *Experimental Economics*.

Janiszewski, C. and D. Uy (2008). Precision of the anchor influences the amount of adjustment. *Psychological Science 19*(2), 121–127.

Kahneman, D. and A. Tversky (1979). Prospect theory: An analysis of decision under risk. *Econometrica 47*(2), 363–391.

Karagözoğlu, E. and K. Hyndman (2022). *Bargaining: Current Research and Future Directions.* Springer Nature.

Karagözoğlu, E. and M. G. Kocher (2019). Bargaining under time pressure from deadlines. *Experimental Economics 22*, 419–440.

Karagözoğlu, E. and A. Riedl (2015). Performance information, production uncertainty, and subjective entitlements in bargaining. *Management Science 61*(11), 2611–2626.

Keniston, D., B. J. Larsen, S. Li, J. Prescott, B. S. Silveira, and C. Yu (2024). Splitting the difference in incomplete-information bargaining: Theory and widespread evidence from the field. *International Economic Review*.

Kennan, J. and R. Wilson (1993). Bargaining with private information. *Journal of Economic Literature 31*(1), 45–104.

Larsen, B. J. (2021). The efficiency of real-world bargaining: Evidence from wholesale used-auto auctions. *The Review of Economic Studies 88*(2), 851–882.

Leider, S. and W. S. Lovejoy (2016). Bargaining in supply chains. *Management Science 62*(10), 3039–3058.

List, J. A., A. M. Shaikh, and Y. Xu (2019). Multiple hypothesis testing in experimental economics. *Experimental Economics 22*, 773–793.

Ma, C.-t. A. and M. Manove (1993). Bargaining with deadlines and imperfect player control. *Econometrica: Journal of the Econometric Society*, 1313–1339.

Madsen, E. (2022). Designing deadlines. *American Economic Review 112*(3), 963–997.

Miettinen, T. and C. Vanberg (2025, February). Commitment and conflict in unanimity bargaining. *American Economic Journal: Microeconomics 17*(1), 206–37.

Mussweiler, T. and F. Strack (2001). The semantics of anchoring. *Organizational behavior and human decision processes 86*(2), 234–255.

Myerson, R. B. and M. A. Satterthwaite (1983). Efficient mechanisms for bilateral trading. *Journal of economic theory 29*(2), 265–281.

Raiffa, H. (1982). *The art and science of negotiation.* Harvard University Press.

Ross Jr, W. H., D. E. Conlon, and E. A. Lind (1990). The mediator as leader: Effects of behavioral style and deadline certainty on negotiator behavior. *Group & Organization Studies 15*(1), 105–124.

Roth, A. and A. Ockenfels (2002). Last-minute bidding and the rules for ending second-price auctions: Evidence from ebay and amazon auctions on the internet. *American Economic Review 92*(4), 1093–1103.

Roth, A. E. et al. (1995). Bargaining experiments. *Handbook of experimental economics 1*, 253–348.

Roth, A. E., J. K. Murnighan, and F. Schoumaker (1988). The deadline effect in bargaining: Some experimental evidence. *The American Economic Review 78*(4), 806–823.

Schweinsberg, M., H. Petrowsky, B. Funk, and D. Loschelder (2023). Understanding the first-offer conundrum: How buyer offers impact sale price and impasse risk in 26 millions ebay negotiations. *Proceedings of the National Academy of Sciences 120*(32).

Schweinsberg, M., S. Thau, and M. M. Pillutla (2022). Negotiation impasses: Types, causes, and resolutions. *Journal of Management 48*(1), 49–76.

Shavell, S. (1982). Suit, settlement, and trial: A theoretical analysis under alternative methods for the allocation of legal costs. *The Journal of Legal Studies 11*(1), 55–81.

Siegenthaler, S. (2017). Meet the lemons: An experiment on how cheap-talk overcomes adverse selection in decentralized markets. *Games and Economic Behavior 102*, 147–161.

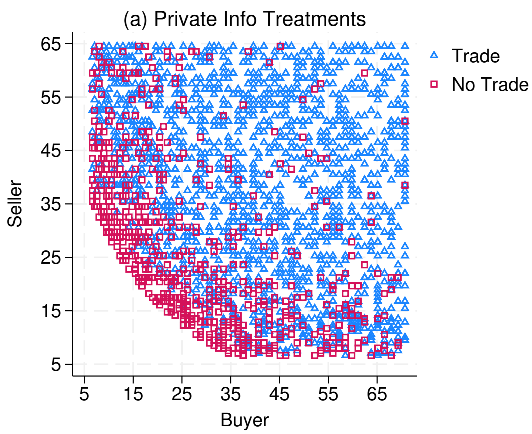
Simsek, A. and M. Yildiz (2016). Durability, deadline, and election effects in bargaining. Technical report, National Bureau of Economic Research.

Tversky, A. and D. Kahneman (1974). Judgment under uncertainty: Heuristics and biases: Biases in judgments reveal some heuristics of thinking under uncertainty. *science 185*(4157), 1124–1131.

Yildiz, M. (2011). Bargaining with optimism. *Annu. Rev. Econ. 3*(1), 451–478.

# A Supplementary Analysis: Tables and Figures

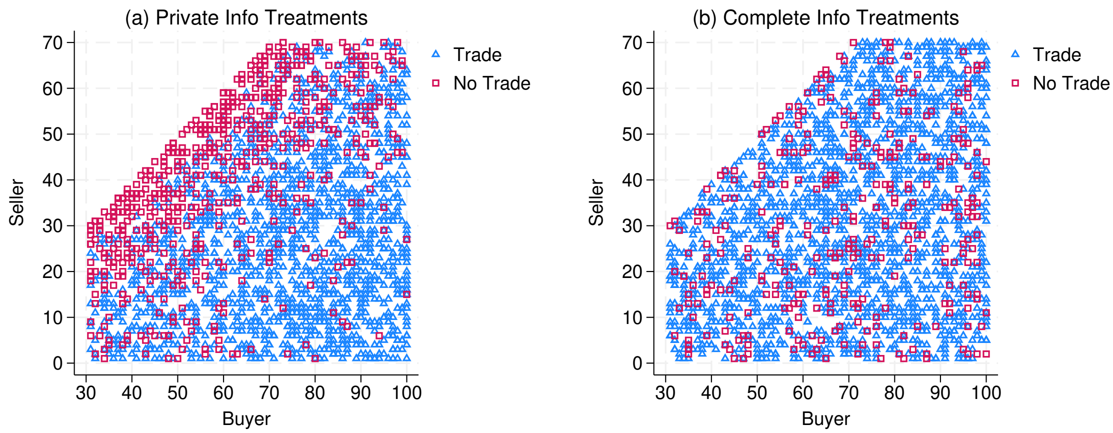
Figure 6: Expected Surplus




*Note:* Private Information (PI) treatments include treatments such as PI, PI-TwoDim, and PI-TwoDimCheap. Complete Information (CI) treatments encompass CI, CI-TwoDim, and CI-TwoDimCheap.

Figure 6 and Figure 7 illustrate that in our data trade failures are considerably more common for combinations of buyer values and seller costs that correspond to smaller expected surpluses and smaller actual surpluses, respectively. Particularly, in each figure, Panel (a) shows that under private information treatments, many combinations of buyer values and seller costs that correspond to smaller surpluses also resulted in impasses. In contrast, we do not observe the concentration of impasses on such combinations under complete information, as depicted in Panel (b). This is likely because the lack of information about counterparties' valuations hampers the ability to reach mutually beneficial agreements, particularly for small surpluses (Myerson and Satterthwaite, 1983).

Figure 7: Real Quality




*Note:* Private Information (PI) treatments include treatments such as PI, PI-TwoDim, and PI-TwoDimCheap. Complete Information (CI) treatments encompass CI, CI-TwoDim, and CI-TwoDimCheap.

In bargaining scenarios, **alternating offers** refer to a process where the buyer and seller take turns making offers. This iterative exchange involves the buyer proposing a price, the seller responding with a counteroffer, and so forth. An **offer sequence** captures the series of proposals exchanged over an item or bundle. A **counteroffer** is defined as a response directly tied to the preceding offer by the other party. The proportion of counteroffers in a sequence, denoted $A$, provides insight into the bargaining dynamics: $A = 0$ implies only one side makes offers, $A = 1$ indicates fully alternating offers, and $A \in (0, 1)$ suggests a mix. A **split-the-difference offer** is a specific type of counteroffer where the new proposal falls midway between the previous offers of both parties. For instance, if the buyer's offer is \$20 and the seller's is \$28, a split-the-difference offer would be \$24. In Table 7, the proportion of counteroffers $A$ and the frequency of split-the-difference offers is measured at the pair level.

Table 7: Treatment Effects Regressions

| | (1) Opening Offer Gap | (2) Agreement Time | (3) Impasse Rate |
|---|---|---|---|
| 2Dim | -9.496*** | -7.786*** | 0.649*** |
| | (1.628) | (1.731) | (0.055) |
| Cheap | -8.900*** | -8.321*** | 0.759*** |
| | (1.753) | (1.613) | (0.077) |
| Split-the-Diff. | -3.381*** | 6.152*** | 0.396*** |
| | (0.688) | (1.204) | (0.069) |
| Alternating ($A$) | -5.341*** | -12.415*** | 0.682** |
| | (1.834) | (1.802) | (0.107) |
| $u \in \{1, 10\}$ | -3.035** | -6.519*** | 1.651*** |
| | (1.353) | (1.413) | (0.166) |
| $u \in \{11, 20\}$ | -1.068 | -8.365*** | 1.473*** |
| | (1.274) | (1.058) | (0.166) |
| $u \in \{21, 30\}$ | -2.274 | -13.782*** | 1.249* |
| | (1.423) | (1.136) | (0.146) |
| PI | 31.560*** | 7.154*** | 2.046*** |
| | (1.342) | (1.304) | (0.187) |
| Surplus | 0.020 | -0.041 | 0.964*** |
| | (0.044) | (0.030) | (0.006) |
| Constant | 16.017*** | 79.023*** | 1.306 |
| | (2.729) | (3.274) | (0.314) |
| Observations | 4309 | 3596 | 4570 |

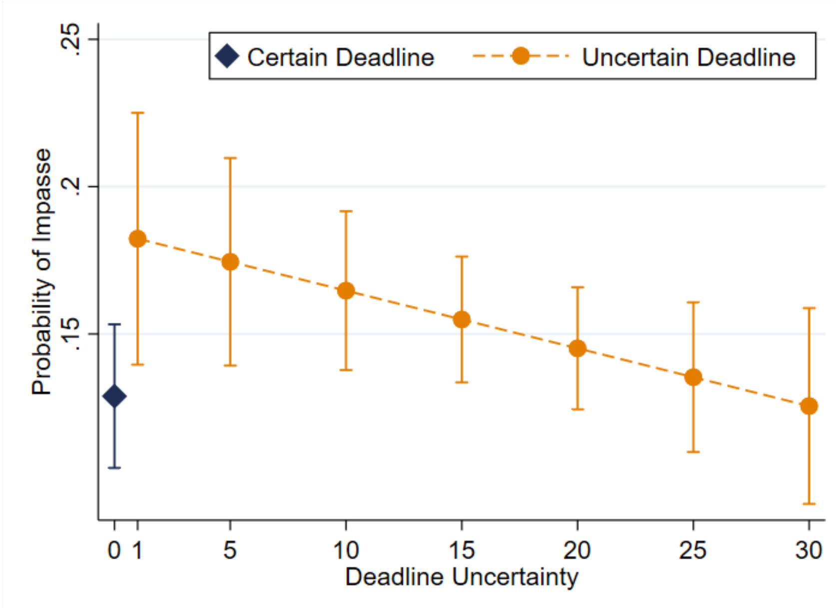
Notes: Random effects regressions. Standard errors in parentheses cluster by matching group, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Impasse rate effects expressed in odds ratios from logistic random effects regressions. All regressions include period dummies. The baseline treatment is CI.

Regression (1) in Table 10 supports the description of how negotiations progress. The dependent variable is 'Demand', representing the potential profit if the offer were accepted. The reference category is POs in the CI treatment. In the two-dimensional treatments, demands made through POs are 2.869 points lower compared to negotiations with only point price offers. This result is particularly noteworthy as it indicates that negotiations become more cooperative when the offer space is two-dimensional—even POs reflect lower demands. AP demands are further reduced by 4.548 points compared to PO demands (conditional on the two-dimensional treatment). When controlling for the timing of proposals, APs are significantly less demanding. Additionally, PO demands decrease over time by 0.179 points per second, indicating ongoing compromise. However, this reduction in demand over time is less pronounced for APs.

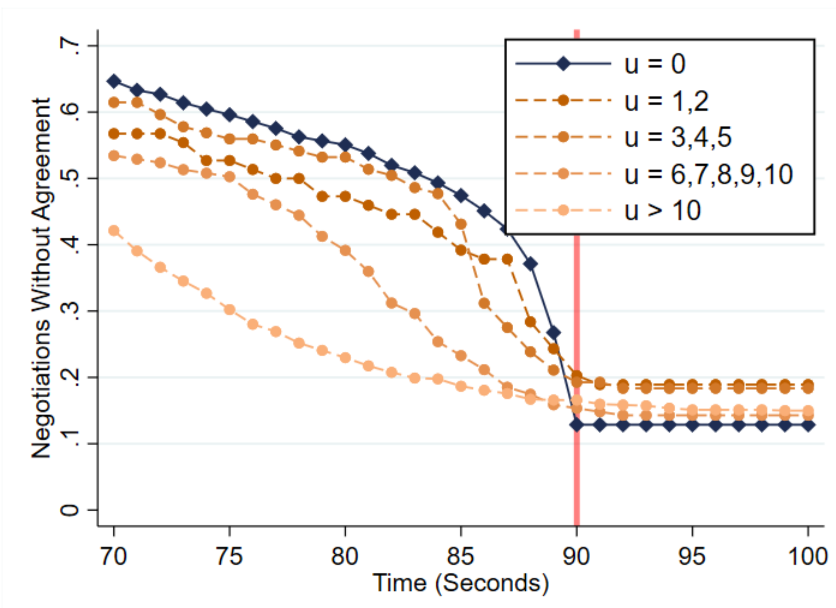
Regression (2) in Table 10 demonstrates that the superior performance of the 2Dim treatments stems from their ability to reduce anchoring. Specifically, this regression includes the gap—or conflict—between the two negotiators' initial demands as an independent variable. As shown, greater conflict in opening offers is strongly predictive of an eventual impasse (the

Figure 8: Deadline Uncertainty and Impasse Rate – Public Information Treatments

(a) Discontinuity Between $u = 0$ and $u = 1$



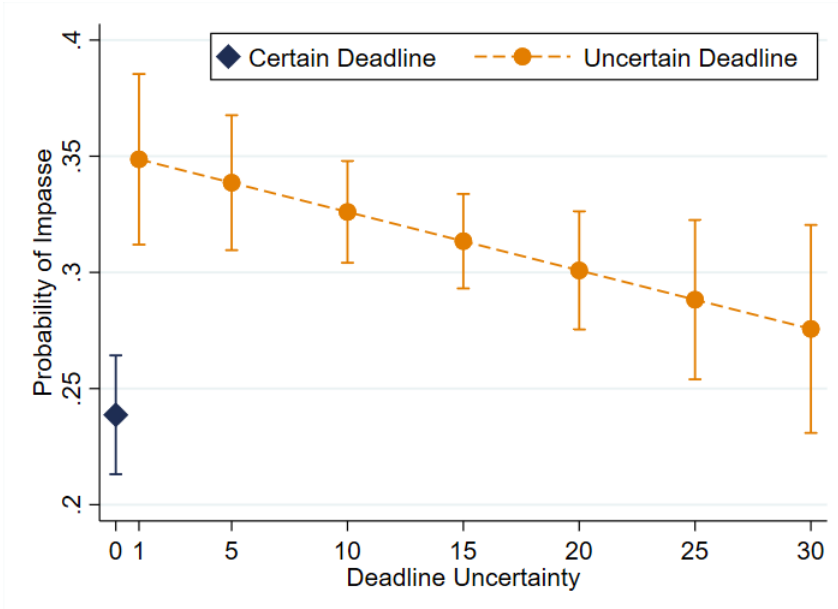

(b) No Surge of Agreement Near Deadline When $u > 0$



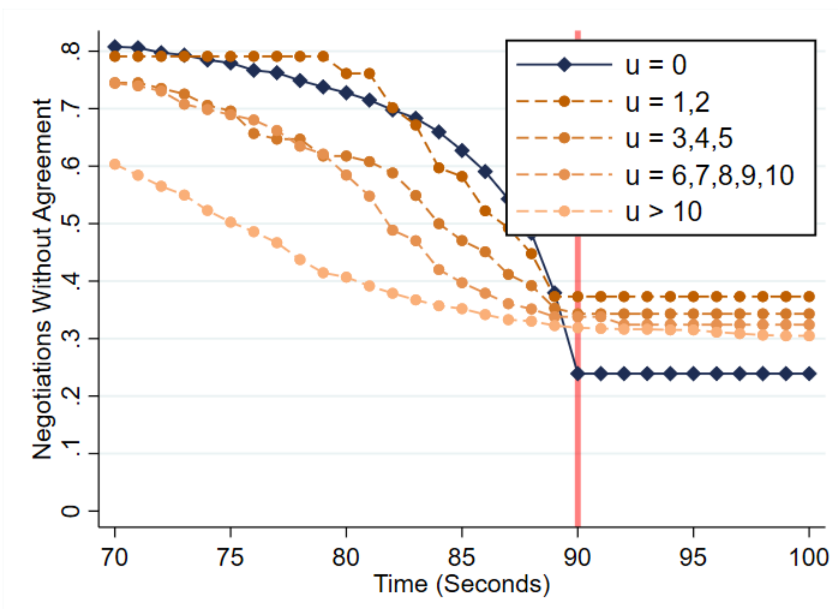

Notes: Data from complete information treatments. Figure (a) depicts the estimated probability of an impasse, with 95% confidence intervals, derived from a mixed-effects logistic regression model with standard errors clustered by matching group. The estimates are presented for varying levels of deadline uncertainty, evaluated at the mean surplus, and pooled across the information conditions. Figure (b) illustrates the cumulative fraction of negotiations that have concluded at each point in time, stratified by different levels of deadline uncertainty.

Figure 9: Deadline Uncertainty and Impasse Rate – Private Information Treatments

(a) Discontinuity Between $u = 0$ and $u = 1$



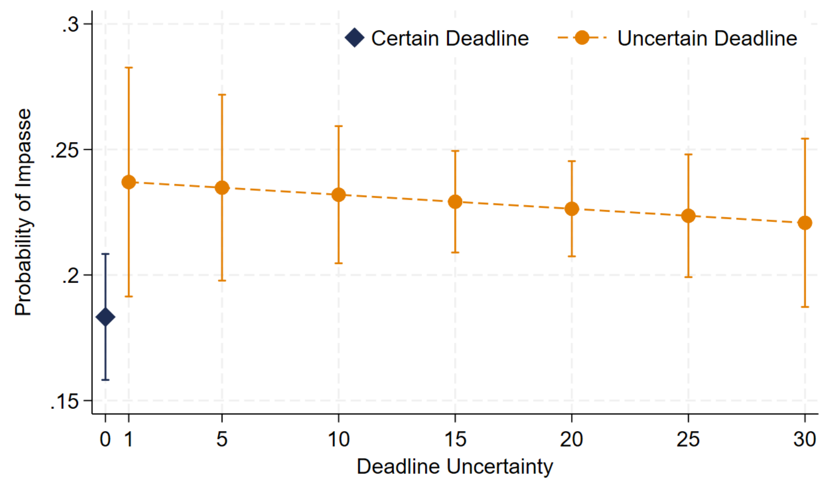

(b) No Surge of Agreement Near Deadline When $u > 0$



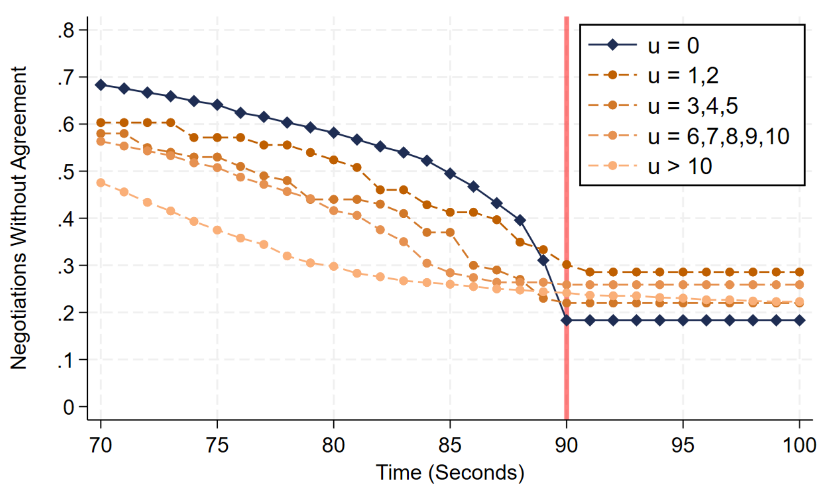

Notes: Data from private information treatments. Figure (a) depicts the estimated probability of an impasse, with 95% confidence intervals, derived from a mixed-effects logistic regression model with standard errors clustered by matching group. The estimates are presented for varying levels of deadline uncertainty, evaluated at the mean surplus, and pooled across the information conditions. Figure (b) illustrates the cumulative fraction of negotiations that have concluded at each point in time, stratified by different levels of deadline uncertainty.

Figure 10: Deadline Uncertainty and Impasse Rate – Period 1 to 10

(a) Discontinuity Between $u = 0$ and $u = 1$




(b) No Surge of Agreement Near Deadline When $u > 0$



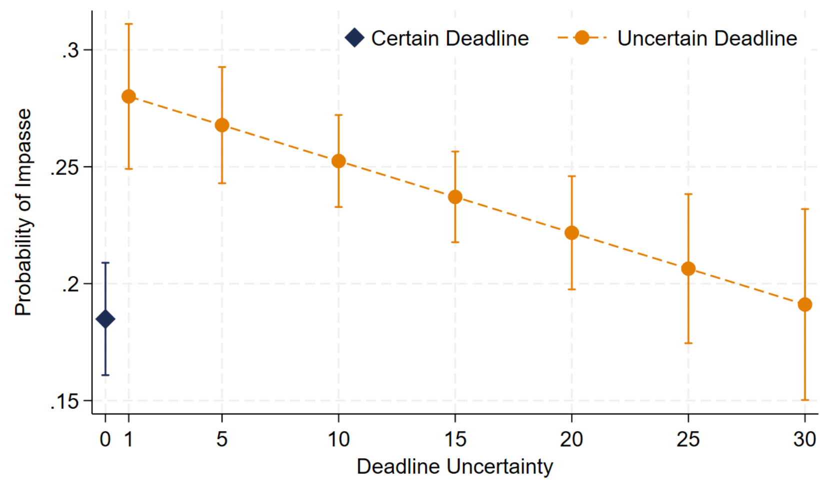

Notes: Data includes periods 1 to 10 only. Figure (a) depicts the estimated probability of an impasse, with 95% confidence intervals, derived from a mixed-effects logistic regression model with standard errors clustered by matching group. The estimates are presented for varying levels of deadline uncertainty, evaluated at the mean surplus, and pooled across the information conditions. Figure (b) illustrates the cumulative fraction of negotiations that have concluded at each point in time, stratified by different levels of deadline uncertainty.

reported effect reflects the odds ratio per point increase in demand).[21] Crucially, when controlling for the effect of opening gaps, the treatment dummies for 2Dim and Cheap are no longer significant, indicating that the advantage of the two-dimensional offer space is entirely

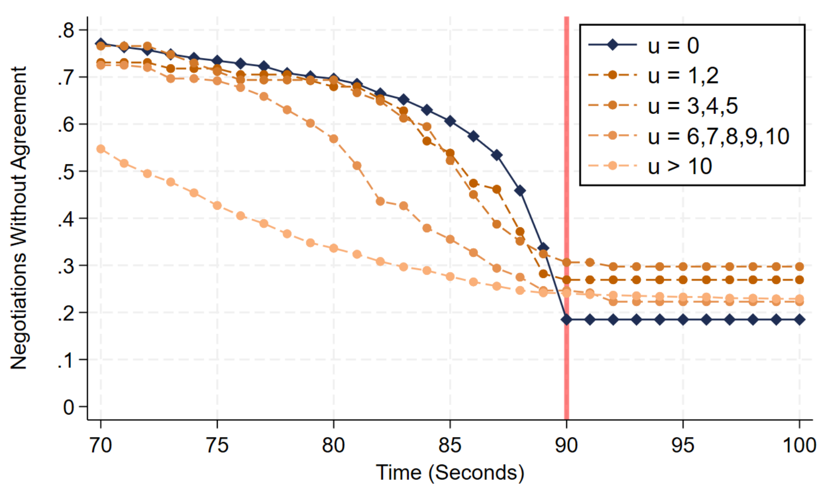
[21]This finding is remarkably robust across a variety of negotiation and bargaining experiments; see, e.g., Galinsky and Mussweiler (2001), Karagözoğlu and Kocher (2019), Bochet et al. (2024), among others.

Figure 11: Deadline Uncertainty and Impasse Rate – Period 11 to 20

(a) Discontinuity Between $u = 0$ and $u = 1$




(b) No Surge of Agreement Near Deadline When $u > 0$




Notes: Data includes periods 11 to 20 only. Figure (a) depicts the estimated probability of an impasse, with 95% confidence intervals, derived from a mixed-effects logistic regression model with standard errors clustered by matching group. The estimates are presented for varying levels of deadline uncertainty, evaluated at the mean surplus, and pooled across the information conditions. Figure (b) illustrates the cumulative fraction of negotiations that have concluded at each point in time, stratified by different levels of deadline uncertainty.

due to less aggressive anchoring at the beginning of negotiations.[22]

[22] Regression (3) in Table 10 shows that anchoring is, on average, a beneficial strategy, as increasing one's initial demand by one point results in a 0.172-point increase in payoff such that the gains from anchoring outweigh the risks of an impasse.

Table 8: Treatment Effects Regressions – Public Information Treatments

| | (1) Opening Offer Gap | (2) Demand | (3) Agreement Time | (4) Impasse Rate |
|---|---|---|---|---|
| 2Dim | -8.095*** | -1.724*** | -9.459*** | 0.599*** |
| | (1.590) | (0.489) | (3.110) | (0.094) |
| Cheap | -8.498*** | -2.086*** | -5.305** | 0.746* |
| | (1.624) | (0.583) | (2.220) | (0.130) |
| $u \in \{1, 10\}$ | -1.099 | -0.514* | -5.266** | 1.342** |
| | (0.808) | (0.277) | (1.975) | (0.176) |
| $u \in \{11, 20\}$ | -0.514 | 0.023 | -9.332*** | 1.436** |
| | (0.766) | (0.257) | (2.038) | (0.208) |
| $u \in \{21, 30\}$ | -2.645*** | -0.274 | -14.046*** | 0.960 |
| | (0.816) | (0.292) | (1.559) | (0.131) |
| Surplus | 0.257*** | 0.577*** | 0.134*** | 1.000 |
| | (0.035) | (0.010) | (0.023) | (0.003) |
| Constant | 11.579*** | 3.417*** | 58.607*** | 0.358*** |
| | (2.644) | (0.961) | (3.364) | (0.086) |
| Observations | 2257 | 24485 | 2048 | 2380 |

Notes: Random effects regressions. Standard errors in parentheses cluster by matching group, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Impasse rate effects expressed in odds ratios from logistic random effects regressions. All regressions include period dummies. The baseline treatment is CI.

Table 9: Treatment Effects Regressions – Private Information Treatments

| | (1) Opening Offer Gap | (2) Demand | (3) Agreement Time | (4) Impasse Rate |
|---|---|---|---|---|
| 2Dim | -9.265*** | -3.073*** | -6.715*** | 0.737*** |
| | (2.929) | (0.881) | (1.872) | (0.061) |
| Cheap | -10.933*** | -3.578*** | -9.707*** | 0.773* |
| | (3.413) | (1.028) | (1.970) | (0.115) |
| $u \in \{1, 10\}$ | -4.513*** | -1.394*** | -7.707*** | 2.120*** |
| | (1.287) | (0.369) | (1.443) | (0.340) |
| $u \in \{11, 20\}$ | -2.182* | -0.503 | -8.452*** | 1.530** |
| | (1.125) | (0.410) | (1.208) | (0.266) |
| $u \in \{21, 30\}$ | -2.804* | -0.952 | -13.010*** | 1.398** |
| | (1.561) | (0.550) | (1.500) | (0.219) |
| Surplus | -0.212*** | 0.422*** | -0.237*** | 0.928*** |
| | (0.019) | (0.006) | (0.017) | (0.003) |
| Constant | 41.293*** | 13.177*** | 80.904*** | 2.751*** |
| | (2.717) | (1.159) | (2.266) | (0.785) |
| Observations | 2309 | 33890 | 1747 | 2394 |

Notes: Random effects regressions. Standard errors in parentheses cluster by matching group, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Impasse rate effects expressed in odds ratios from logistic random effects regressions. All regressions include period dummies. The baseline treatment is PI.

Figure 12: Learning over Rounds – CI Treatments

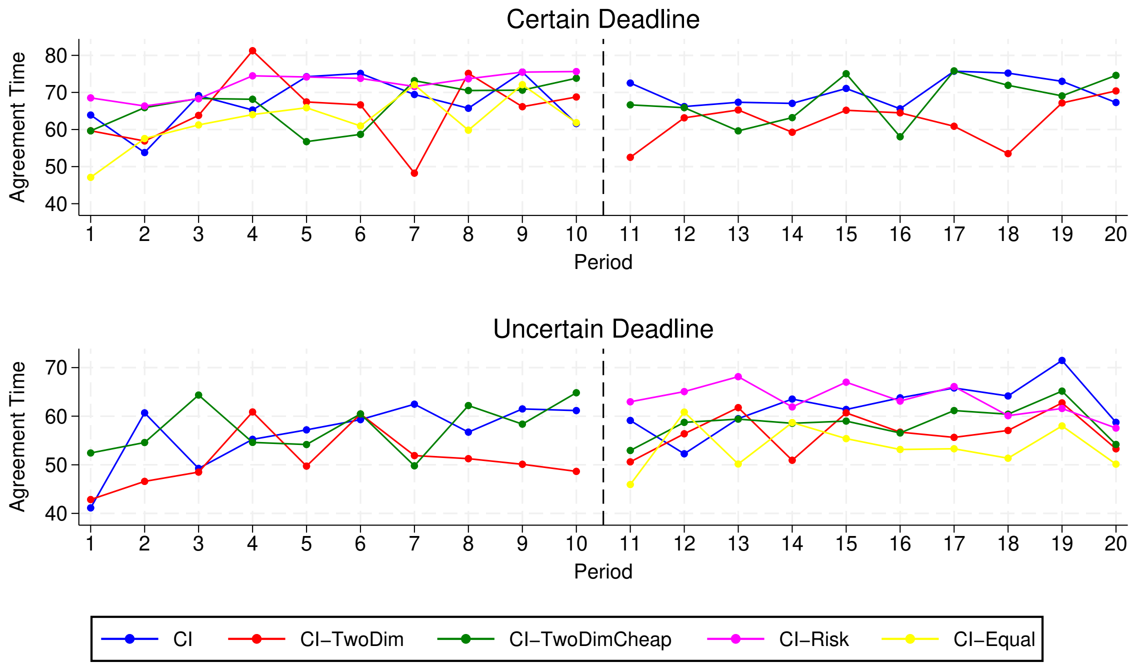



Figure 13: Learning over Rounds – PI Treatments

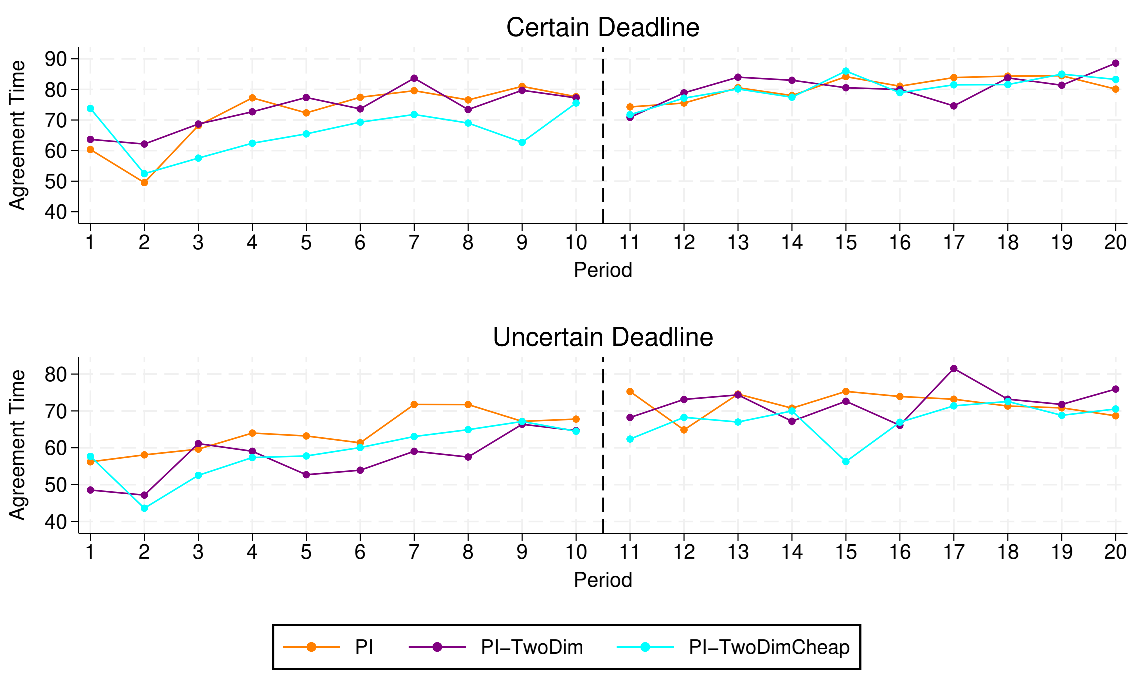


Table 10: Negotiation Process Regressions

| | (1) Demand | (2) Impasse Rate | (3) Payoff |
|---|---|---|---|
| 2Dim | -2.869*** | 0.958 | 1.455*** |
| | (0.594) | (0.094) | (0.324) |
| Cheap | -3.159*** | 1.107 | 1.192*** |
| | (0.688) | (0.131) | (0.386) |
| AP | -4.548*** | | |
| | (0.811) | | |
| Time (sec) | -0.179*** | | |
| | (0.015) | | |
| AP * Time | 0.058*** | | |
| | (0.015) | | |
| Gap in First Offers | | 1.036*** | |
| | | (0.003) | |
| First Demand | | | 0.172*** |
| | | | (0.016) |
| $u \in \{1, 10\}$ | -1.418*** | 1.902*** | -1.213*** |
| | (0.363) | (0.203) | (0.304) |
| $u \in \{11, 20\}$ | -0.807* | 1.614*** | -0.802** |
| | (0.398) | (0.166) | (0.356) |
| $u \in \{21, 30\}$ | -1.556*** | 1.411*** | -0.511 |
| | (0.428) | (0.145) | (0.342) |
| PI | 10.961*** | 0.636*** | -2.710*** |
| | (0.484) | (0.095) | (0.414) |
| Surplus | 0.474*** | 0.962*** | 0.391*** |
| | (0.017) | (0.005) | (0.010) |
| Constant | 12.214*** | 0.547*** | -3.008*** |
| | (1.164) | (0.109) | (0.680) |
| $N$ | 58375 | 4566 | 9340 |

Note: Period dummies included.

Table 11: Treatment Effects Regressions: Efficiency

| | Realized Surplus | | | Realized Surplus (Surplus $\leq$ 40) | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| 2Dim | 1.612*** | 1.582*** | 1.570*** | 1.523*** | 1.479*** | 1.522*** |
| | (0.476) | (0.469) | (0.471) | (0.282) | (0.288) | (0.296) |
| Cheap | 0.858 | 0.856 | 0.853 | 1.294*** | 1.291*** | 1.337*** |
| | (0.607) | (0.606) | (0.607) | (0.402) | (0.408) | (0.404) |
| $u \in \{1, ..., 10\}$ | -2.797*** | | | -2.419*** | | |
| | (0.540) | | | (0.539) | | |
| $u \in \{11, ..., 20\}$ | -1.771*** | | | -1.730*** | | |
| | (0.623) | | | (0.597) | | |
| $u \in \{21, ..., 30\}$ | -1.308** | | | -0.604 | | |
| | (0.578) | | | (0.574) | | |
| Uncertain Deadline | | 1.951*** | | | 1.594*** | |
| | | (0.381) | | | (0.421) | |
| PI | -0.073 | -0.093 | -0.084 | -3.651*** | -3.660*** | -3.658*** |
| | (0.470) | (0.466) | (0.467) | (0.295) | (0.300) | (0.300) |
| Surplus | 0.954*** | 0.954*** | 0.953*** | 0.905*** | 0.905*** | 0.905*** |
| | (0.021) | (0.021) | (0.021) | (0.017) | (0.017) | (0.017) |
| Constant | -4.997*** | -6.910*** | -5.940*** | -0.432 | -1.987** | -1.124 |
| | (1.184) | (1.108) | (1.108) | (0.970) | (0.954) | (0.931) |
| Observations | 4774 | 4774 | 4774 | 2714 | 2714 | 2714 |

*Notes:* Standard errors in parentheses are cluster by matching group, $^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$. Linear random effects regressions. All regressions include period dummies. The baseline condition is CI (complete information, point-price offers), with certain deadlines in Models (1) and (4), and with uncertain deadlines in Model (2)s and (5). 'Realized Surplus' is the sum of buyer and seller profit in a negotiation. Coefficient '2Dim' is a dummy indicating if binding two-dimensional offers are allowed. Coefficient 'Cheap' is a dummy indicating if non-binding two-dimensional offers are allowed. Coefficient 'PI' is a dummy for the private information conditions. The data includes only negotiations where a strictly positive trade surplus was possible.