Journal of Economic Behavior & Organization 92 (2013) 104–115

Contents lists available at SciVerse ScienceDirect

Journal of Economic Behavior & Organization

journal homepage: www.elsevier.com/locate/jebo

# Strategic ignorance in ultimatum bargaining☆

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ARTICLE INFO

*Article history:*
Received 5 July 2012
Received in revised form 16 May 2013
Accepted 19 May 2013
Available online 2 June 2013

*JEL classification:*
C72
C78
C91
D63
D82
D83

*Keywords:*
Strategic ignorance
Bargaining
Intentions
Experiment

ABSTRACT

In his classic article "An Essay on Bargaining" Schelling (1956) argues that ignorance might actually be strength rather than weakness. We test and confirm Schelling's conjecture in a simple take-it-or-leave-it bargaining experiment where the proposer can choose between two possible offers. Option *A* always gives the proposer a higher payoff than option *B*. The payoff of the responder depends on the (randomly determined) state of nature. In one state payoffs of the two players are aligned whereas they are not aligned in the other state. The responder is always informed about the actual state. The proposer knows the actual state in our first treatment but not in the second. We find that proposers indeed benefit from ignorance because the responders accept almost all offers (even the unfavorable ones) if the payoffs are not transparent for the proposer. In additional treatments we investigate bargaining situations where the proposer can deliberately remain ignorant.



## 1. Introduction

The availability of information on an opponent's bargaining position plays an important role in negotiations and not only affects one's own bargaining behavior but also the behavior of an opponent. Generally, it is assumed that the more information that is available in a bargaining situation, the better the bargaining position is (e.g., Fischer and Ury, 1981, p. 45). Schelling (1960) challenged this view by arguing that a bargainer who is incompletely informed about his opponent's payoffs might have an advantage because the opponent would be forced to make concessions to avoid a bargaining breakdown. In his chapter on "*Strategic Moves*", Schelling notes, "*(. . .) ignorance can be an advantage to a player if it is recognized and taken into account by an opponent*" (Schelling, 1960, p. 161). As the informed bargainer is aware that the uninformed one does not know what a reasonable solution is, the burden of avoiding a stalemate is on the side of the informed bargainer. Early experimental studies seem to support this view (Siegel and Fouraker, 1960; Hamner and Harnett, 1975). The following example illustrates the basic intuition: two persons walking on a crowded main street are going to collide. One person

☆ We thank two anonymous referees, Rainer Michael Rilke, Dirk Sliwka and Gari Walkowitz for valuable comments. We also thank Caroline Martens, Frauke Meyer and Katrin Recktenwald for excellent research assistance. Financial support from the Deutsche Forschungsgemeinschaft through Grant 'TP3 Design of Incentive Schemes within Firms: Bonus Systems and Performance Evaluations' (sub-project of the DFG-Forschergruppe 'Design and Behavior') and through the Leibniz-Award to Axel Ockenfels is gratefully acknowledged.

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http://dx.doi.org/10.1016/j.jebo.2013.05.010

anticipates the upcoming event but the other does not, for example, due to a distraction. The person aware of the possible collision clears the way, accepting the "cost" of leaving his ideal route. The other (unintentionally) ignorant person continues along his intended way: being uninformed pays off. Ignorance might also be used strategically. A person who anticipates the possibility of a collision might simply walk down the street while looking at the ground and pretending to be ignorant. The other informed person has to bear the costs of avoiding the collision, although he might have the feeling that the ignorant person is intentionally avoiding looking up. Thus, remaining *strategically ignorant* might also pay off. Putting this in an organizational context, one might consider a business partnership. One day an urgent request comes in, but only one of the two partners is in the office. Subtasks have to be allocated quickly between the two partners, and the nature of the tasks prohibits subsequent re-allocation. By deliberately remaining ignorant and not asking her partner about his preferences, the partner in the office can pick her preferred subtasks and leave the other subtasks to her partner. Should the partner turn out to dislike the subtasks allocated to him, she can come up with the excuse: "Oh sorry, I didn't know". The excuse might still have some force despite the fact that, in principle, she could have informed herself – or at least attempted to do so – for example, by giving her partner a call.[2]

The aim of this study is to experimentally test Schelling's conjecture in a simple two-person take-it-or-leave-it bargaining game. As it is particularly difficult to observe (strategic) ignorance in bargaining in the field, we chose an experimental approach that allows actions to be perfectly monitored, including those in which one attempts to avoid acquiring information. Control is the most important advantage of an experimental study (see Roth, 1995; Falk and Fehr, 2003), which is essential for our purpose, i.e., drawing conclusions regarding how strategic ignorance causally affects behavior. Moreover, in contrast to questionnaire studies, it is possible to provide participants with incentives that are likely to have a crucial influence on strategic ignorance in bargaining. Our basic experimental framework comprises a simple situation that is reduced to the essential features of strategic ignorance. One of two states of nature is determined by a 50:50 draw. While the interests of a proposer and a responder are aligned in state $s_a$, they are not in state $s_n$. The proposer has to offer one of two options, option *A* or option *B*. In state $s_n$, the proposer profits from option *A* more than the responder. Option *B* in state $s_n$ would make both players' payoffs nearly equal, but this option is slightly inferior for the proposer in comparison to option *A*. In state $s_a$, option *A* provides both players with higher payoffs than option *B*. The responder can accept or reject the offer. Accepting an offer always leads to positive payoffs for both players, while rejection leaves them with zero payoffs.

In treatment *Transparency*, both players are fully informed about the true state, and we observe that proposers are not always able to implement their most preferred option. Offers of option *A* are frequently rejected in state $s_n$. In the *Non-Transparency* treatment, the proposer is ignorant about the true state, but the responder knows it. This information is known to both players. We hypothesize that the proposer will benefit from being ignorant, as the responder will accept nearly all offers. As the experimental results show, an ignorant proposer can almost always implement her most preferred option, i.e., option *A*. A possible explanation for this result is differences in causal attributions of how the outcomes emerged. If an unfavorable offer is attributable to bad luck (i.e., the random choice of one of the two states of nature), responders might accept these offers because negative intentions are not involved (see, e.g., Blount, 1995; Falk et al., 2008).

In a third treatment, *Choice*, the proposer can *choose* between remaining ignorant about the state of nature or inform herself about it. None of the alternatives incur any direct monetary costs. The notion of introducing the possibility of remaining strategically ignorant of the opponent's payoff is adapted from Dana et al. (2007), who analyze the strategic use of ignorance in a dictator game. The dictator can remain ignorant to justify a selfish action to herself. In our setting, not to inform herself about the state also allows the proposer to select the self-interested offer (i.e., option *A*) without knowing the actual payoff consequences for the responder. Knowing the state would potentially place some (internal) pressure on the proposer to select the more equalizing option *B* in state $s_n$. Additionally, by remaining ignorant, the proposer might wish to influence the responder's inclination to accept option *A* in state $s_n$. The responder is always informed about the actual state and learns whether the proposer chose to remain ignorant. We hypothesize that proposers will not benefit from strategic ignorance, as responders will perceive the act of remaining ignorant as hostile. Our results suggest that responders tend to reject option *A* in state $s_n$ less frequently when the proposers remain ignorant. To push the notion of the perception of hostile intentions a bit further, we designed a modified version of the *Choice* treatment, *Choice Uncertain Information Acquisition*, where a proposer's attempt to inform herself about the state is only successful in 50 percent of the cases. As a consequence, if the proposer remains ignorant, the responder does not know whether this ignorance was purposeful. We find that responders accept option *A* offers from ignorant proposers significantly more frequently in state $s_n$ than from proposers who successfully informed themselves about the state. In a fifth treatment, *Choice Hidden*, the responder is not informed of whether the proposer informed herself about the state. Here, few proposers remain ignorant, and responders frequently accept option *A* offers in state $s_n$.

The paper is organized as follows: we begin by discussing the literature related to strategic ignorance. Second, we state our hypotheses and elaborate our experimental design. In Section 5, we report the experimental results. Finally, Section 6 discusses the results in light of previous findings and concludes.

[2] Fischbacher and Utikal (2010) analyze the effectiveness of apologies in preventing punishments after harmful offenses. They find that excuses are not accepted if the harmdoer commits offenses intentionally. If the intention of an offense is not clear, i.e., if the situation is ambiguous, apologies seem to be an effective instrument to reduce the likelihood of being punished. In our context, remaining ignorant blurs the intentionality of the proposer and therefore might reduce the likelihood of being punished with a rejected offer.

## 2. Related literature

Proctor (2008, p. 3) emphasize the omnipresence of ignorance and differentiate – from an epistemic perspective – between "*ignorance as native state (or resource), ignorance as lost realm (or selective choice), and ignorance as a deliberately engineered and strategic play (or active construct)*". In our study, we particularly focus on the third category of ignorance. Although they assess the considerable relevance of strategic ignorance in human interactions, the literature on strategic ignorance in bargaining is relatively small. Some experimental studies have indicated that negotiators might *not* profit from being uninformed. For example, Roth and Murnighan (1982) showed that varying information asymmetries between negotiators has an impact on how a pie is divided, i.e., uninformed negotiators tend to be exploited by their informed opponents. Negotiators made lower offers if they knew that their opponent was unaware of the actual size of the pie. Being ignorant turned out to be a disadvantage (see also Kagel et al., 1996).

Other experimental investigations have shown that ignorance might be an advantage. Siegel and Fouraker (1960) conducted a seminal study on the role of ignorance in bargaining. In their bilateral bargaining experiment, the buyer knew the payoff tables of both sides, but the seller only knew his own payoff table. The buyer and seller then had to come up with a price-quantity agreement. Although their results were not statistically significant, the authors found that the incompletely informed participant tended to be better off than the informed opponent. Siegel and Fouraker argued that the incompletely informed bargainer established a higher aspiration level, as he was unable to form realistic expectations and therefore made larger demands, smaller concessions and accepted longer durations to reach an agreement. A follow up study by Hamner and Harnett (1975) showed a similar effect. Beisecker et al. (1989) examined a complete–incomplete information situation with a fictitious bargaining task. Their results show that an uninformed bargainer can profit from ignorance when the counterpart perceives the own advantage as a violation of procedural equity. To restore relational equity, the completely informed bargainer may accept less favorable agreements. Overall, this strand of literature suggests that ignorance in bargaining can be an advantage. None of these studies, however, examines the possibility of strategically electing to remain ignorant.

More recently, Poulsen and Roos (2010) examined the effect of strategic information avoidance in a Nash demand game where two players had to negotiate over the distribution of a sum of money. At the beginning, the responder had to decide whether he wished to learn about a demand made by a proposer. The proposer was informed about the responder's decision before stating his demand. In a repeated setting, responders learned that more information may be harmful, i.e., over time, information-avoidance increased and the distribution of the surplus became more balanced. In an ultimatum game setup, Poulsen and Tan (2007) allowed the responder to choose a Minimum Acceptable Offer (MAO). The proposer could then costlessly acquire the information about the responder's MAO before making his proposal. The offer was accepted or rejected according to the previously stated MAO. One third of the proposers remained uninformed and offered half of the pie. Information-acquiring proposers made offers equal to the responders' MAOs. In a treatment without information-acquisition, the MAOs stated by the responders were smaller than those in the information-acquisition treatment, demonstrating that the opportunity to gather information about the MAOs may backfire for the informed party. Thus, in these two studies, one player had the opportunity to remain ignorant of the other player's strategic choice. In our study, proposers are able to remain ignorant of the payoffs resulting from the offer. In a similar vein, Gehrig et al. (2003, 2006) examined a situation in which a proposer could purchase information about a responder's outside option in an ultimatum game. Under transparent information acquisition, where the responder knew whether the proposer was informed, acceptance rates were higher than in non-transparent situations.

As mentioned above, our experimental design is also influenced by the dictator game setup of Dana et al. (2007). The aim of their study was to analyze whether generosity in dictator game giving is truly evidence of a concern for desirable social outcomes. They showed that when the dictator had the opportunity to not know whether his action hurt the receiver, many dictators chose a "moral wiggle room" and made self-interested choices. Dana et al. concluded that dictators were more concerned with seeming fair to themselves than actually being fair (see also Dana et al., 2006; Broberg et al., 2007).

## 3. Hypotheses

Assuming that it is common knowledge that both bargainers are purely interested in maximizing their own payoffs, a responder should accept any offer that gives him positive payoffs. Thus, a proposer could safely offer a tiny positive amount to the responder while leaving the larger share for herself. However, as we know from numerous experiments on the ultimatum game and other bargaining games, proposers offer more than the smallest positive amount (see, for example, Güth et al., 1982; Camerer, 2003). This seems to be partly driven by the proposer's concerns for (distributive) fairness.[3] Partly, this behavior results from proposers anticipating that responders are willing to reject unfair offers and/or offers that signal bad intentions of the proposer (see Blount, 1995; Falk et al., 2008).

[3] Models of social preferences can explain such behavior to some extent. For prominent models of inequity-aversion, see Levine (1998), Fehr and Schmidt (1999) and Bolton and Ockenfels (2000). The influence of intentions is modeled in Falk and Fischbacher (2006). Concerns for efficiency might also play a role in our setting (Charness and Rabin, 2002). See also the findings on mini-ultimatum games that employ a reduced strategy set – often two strategies – for the proposer (see, for example, Bolton and Zwick, 1995, Güth et al., 2001, and Falk et al., 2003).

As mentioned in the introduction (and will be explained in detail in the next section), two states of nature are possible in our experimental game: a state $s_n$ where interests of a proposer and a responder are in conflict, and a state $s_a$ where interests are aligned. The actual state of nature is randomly determined. The proposer has to offer one of two options to the responder, option *A* or option *B*. Option *A* gives greater payoffs to the proposer than option *B*, independent of the actual state. Thus, a self-regarding proposer should always offer option *A*. In state $s_a$, option *A* leads to a higher payoff for the responder compared to option *B*. In state $s_n$, the opposite is the case. Additionally, in state $s_a$, option *A* is the more efficient (in terms of total payoffs) and payoff equalizing option, and in state $s_n$, option *B* is the more efficient and payoff equalizing option. The responder has to decide whether to accept or reject the offer. If he rejects the offer, both players receive zero payoffs.

In our experimental design, we vary what a proposer knows about the state of nature. In one setting, she is informed about the actual state. In another, the proposer is kept ignorant of this. In additional settings, the proposer can deliberately decide whether she wants to inform herself about the state, i.e., she can also remain ignorant. The responder always knows the actual state and whether the proposer is informed about the state.[4]

In our hypotheses, we concentrate on behavior in state $s_n$, which is the more interesting state for the purposes of our research. In state $s_a$, payoffs are aligned and it can generally be assumed that option *A* will be proposed and accepted.

In three treatments of our experimental setup, the proposer can decide whether she wants to inform herself about the state. When unaware of the state, the proposer naturally chooses option *A* because this gives her a higher payoff, it maximizes expected total surplus, and she does not know the payoff consequences for the responder. If the proposer, however, has efficiency concerns, it would be desirable to know the actual state because option *A* is only efficient in state $s_a$ and option *B* is efficient in state $s_n$. Additionally, if the actual state is $s_n$, option *A* could be perceived as being unfair, and the proposer therefore runs the risk that the offer might be rejected. Deliberately not informing oneself might also be perceived as showing of bad intentions. However, based on the results of Dana et al. (2007), some proposers might prefer to exploit the *moral wiggle room* by remaining ignorant and proposing option *A* without knowing whether this has adverse consequences for the responder. Additionally, she might believe that it is easier for the responder to accept option *A* if he knows that the proposer was ignorant of the consequences of her choice for the responder's payoff. Thus, in line with previous experimental findings, the following hypothesis can be derived:

***Hypothesis "Information Acquisition of Proposers"**: The majority of proposers inform themselves about the actual state.*

Our second hypothesis concerns the proposer's offer. Let us assume that the proposer knows the actual state. Based on previous findings, we hypothesize that she might be concerned about efficiency and/or equity and therefore chooses option *B* in state $s_n$. Additionally, in state $s_n$, the proposer might fear that the responder will reject option *A* because this is the less equitable option. This consideration leads to our second hypothesis:

***Hypothesis "Proposers' Offers"**: Proposers who know the actual state tend to offer option* B *in state* $s_n$. *Proposers who do not know the actual state offer option* A.

Our third hypothesis focuses on the responder's acceptance decision. A responder who is primarily concerned with efficiency is not very likely to reject any offer because a rejection would reduce efficiency. Based on previous findings on inequity aversion, we hypothesize that the responder might prefer zero payoffs for both players to the considerably unequal payoff allocation that would result from accepting option *A* in state $s_n$. This is true, at least if the proposer knows the actual state. If the proposer remained ignorant, it is unclear how the responder would react to an offer of option *A* in state $s_n$. On the one hand, the responder might be upset that the proposer did not inform herself and therefore reject the offer. On the other hand, the responder might acknowledge that the proposer was ignorant of the consequences of offering option *A* and therefore accept the offer (this is particularly true if the proposer might have unsuccessfully attempted to inform herself, as could be the case in our treatment *Choice-UI*; see below). If the proposer were unable to inform herself about the true state of nature, ignorance might serve as an excuse, and we therefore hypothesize that in this case the responder is inclined to accept option *A* in state $s_n$. Recall that the responder always knows the actual state of nature. Thus, we arrive at the following hypothesis:

***Hypothesis "Responders' Acceptance Decision"**: Option* A *offers by proposers who know the actual state tend to be rejected in state* $s_n$. *Responders' reactions to option* A *in state* $s_n$ *offered by deliberately ignorant proposers are ambiguous. Option* A *offers in state* $s_n$ *by proposers who were unable to acquire information about the actual state tend to be accepted.*

## 4. Experimental design and procedures

### *4.1. A simple framework of strategic ignorance in bargaining*

We consider a non-constant-sum bargaining situation in which a random move selects one of two possible states of nature that occur with equal probability. This is known to all players. A proposer (*P*) makes a take-it-or-leave-it-offer to a responder (*R*) by choosing between two possible options, option *A* and option *B*. The responder has to decide whether to accept or

[4] Except in treatment *Choice Hidden*, where the responder does not know whether the proposer informed herself about the state (see details below).

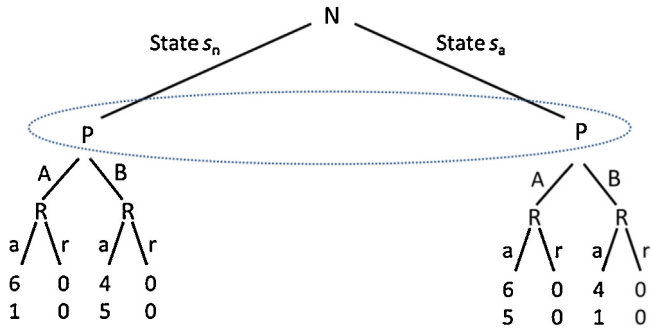


**Fig. 1.** The figure presents the game trees employed in the *Transparency* treatment (when disregarding the dotted-line information set of *P*) and in the *Non-Transparency* treatment (when including the dotted-line information set of *P*). As usual, payoffs are denoted at the end of the tree. The number at the top denotes the payoff of the proposer, while the number at the bottom is the payoff of the responder.

reject the offer. Rejection leaves both players with zero payoffs. Accepted options provide both players with strictly positive payoffs. We focus on take-it-or-leave-it bargaining to keep the interaction simple. A take-it-or-leave-it bargaining structure places the proposer in a position of relative strength and places the burden of avoiding a stalemate on the responder. In a sense investigating strategic ignorance on the proposer's side in a situation where she has already relative strength is conservative because one could assume that she would see a stronger need to improve her strength by remaining ignorant even more in a position of less relative strength.

Fig. 1 presents the game tree with the exact payoff details. The acceptance of option *A* pays more to the proposer than the acceptance of option *B*, regardless of the state of nature. Whether, from the responder's perspective, the acceptance of option *A* is more preferable than the acceptance of option *B* depends on the actual state of nature. In state $s_n$, the responder's payoff from option *B* is higher than that from option *A*. The opposite is the case in state $s_a$. Thus, in state $s_a$, the payoffs of the two players are *aligned*, i.e., option *A* is both players' preferred option, while in state $s_n$, they are *not aligned*.

For comparability, we essentially use the same payoff parameters as Dana et al. (2007) in their dictator game.[5] When the payoffs are aligned (our state $s_a$), option *A* is more efficient in terms of maximizing total surplus, while option *B* is more efficient when the payoffs are not aligned (our state $s_n$). As in Dana et al. (2007), ex ante, i.e., before the actual state is known, option *A* maximizes total expected payoffs.

Our five treatments build on this baseline game. In all of our treatments, the responder knows the actual state of nature when he decides whether to accept or reject the proposed offer. Treatments differ with respect to what the proposer knows or can learn about the actual state of nature before making the offer. We also vary the responder's knowledge concerning what the proposer knew when making the offer. In the following, we introduce the details of our five treatments.

### 4.2. Treatments

In our first treatment, *Transparency*, we employ the game depicted in Fig. 1 when disregarding the information set of the proposer indicated by the dotted line. The proposer knows the actual state of nature when she makes the offer. Our second treatment, *Non-Transparency*, employs the game that is described by the game tree in Fig. 1 when including the dotted-line information set. The proposer is unaware of the true state of nature when making her offer. Regardless of the state of nature, however, it is beneficial for the proposer to offer option *A*, assuming that the responder accepts the offer. In the third treatment, *Choice*, we endogenize transparency, i.e., the proposer can choose between a transparent situation and a non-transparent one. The proposer can decide to inform herself about the actual state of nature or remain ignorant (both at no cost) before she decides on the offer. The responder accepts or rejects the offer after he learns whether the proposer informed herself about the actual state of nature, i.e., the responder is aware of whether an option *A* offer in state $s_n$ was made knowingly or in the dark (the game trees of the games employed in this and the other two treatments can be found in the appendix). Building on the game used in treatment *Choice*, we relax the assumption that the responder is informed of what the proposer knows when making the offer. In the fourth treatment, *Choice Uncertain Information Acquisition* (henceforth *Choice-UI*), it is uncertain whether the proposer will be successful in her attempt to inform herself about the true state of

[5] Note that the parameters used in Dana et al. (2007) put pressure on the proposer to inform herself because ignorantly choosing the selfish option *A* prevents implementing a (more) payoff-equalizing *and* efficient outcome in the case of state $s_n$. In contrast to Dana et al. (2007), we are not interested in a dictator game but in an ultimatum bargaining setting where the proposer relies on the acceptance decision of the responder. This puts additional pressure on the proposer to inform herself. To balance this pressure, we provide the proposer with a potential excuse to remain ignorant by slightly modifying the payoff structure used in their game. We reduce the option *B* payoff of the proposer by one unit. In Dana et al. (2007), in state $s_n$, both players earn 5 under option *B*, while in our setting, the proposer earns one unit less than the responder. This allows the responder to more easily accept option *A* (which an ignorant proposer will offer) in state $s_n$ because he might acknowledge that the proposer cannot be expected to offer an option where she earns less than the responder. Moreover, the sacrifice incurred by the proposer by proposing option *B* instead of option *A* is higher under our parameterization than in Dana et al.'s (2007) game.

nature. If she chooses to remain ignorant, she remains ignorant for certain. If she chooses to inform herself, information acquisition is not certain, but there is a 50 percent chance that it will be successful. Otherwise, she remains ignorant. The responder is informed of whether the proposer knew the actual state of nature when she made the offer. If the proposer knew the state, it is clear to the responder that the proposer chose to inform herself and that her attempt was successful. If the responder learns that the proposer was not informed, it might be due to two different reasons. First, the proposer did not want to know. Or, second, she actually wanted to know but was not successful in informing herself. Thus, in the latter case, the responder cannot be sure about the actual intentions of the proposer, i.e., whether she tried to inform herself about the state. In our fifth treatment, *Choice Hidden* (henceforth *Choice-H*), the responder is kept uninformed about whether the proposer informed herself about the actual state of nature. This treatment enables us to disentangle two motives for remaining ignorant. One motive concerns self-image, i.e., wanting to be ignorant oneself (e.g., Bénabou and Tirole, 2006). The other motive is to signal to the responder that one is ignorant. In the treatments *Choice* and *Choice-UI*, these two motives cannot be separated.

In all treatments, the proposer knows what the responder will or will not learn about her chosen actions from the beginning.

### 4.3. Procedures

The experimental sessions took place at the Cologne Laboratory for Economic Research from August 2010 to April 2011. Subjects were recruited through the online recruiting system ORSEE programmed by Greiner (2004). We had a total of 592 participants (289 female) who were randomly drawn from a pool of over 3000 students. Each session involved 16–32 participants who were not allowed to participate in more than one session. Approximately half of the participants were economics or business administration majors; the other half were enrolled in different fields such as law and sciences. On average, participants were in their fourth year of study. We conducted two sessions of the *Transparency* ($n = 64$), the *Non-Transparency* ($n = 64$) and the *Choice-H* ($n = 64$) treatments. As there are more potential variations of plays in the other two treatments, we ran six sessions of the *Choice* ($n = 190$) and eight sessions of the *Choice-UI* ($n = 210$) treatments.

At the beginning of a session, participants were randomly allocated to cubicles. After they had taken their seats, written instructions were distributed. Within a session, all subjects received the same instructions. The instructions for the different treatments were identical, with the exception of well-defined passages that described the treatment variations (see appendix).[6] Each participant learned that he would play a simple one-shot game by interacting with one other person in the room who would be randomly and anonymously matched to him. We decided to employ a one-shot setting to focus on behavior that is not shaped by any type of endogenous social norm building, which could occur in a repeated setting. Additionally, by focusing on a one-shot setting, we attempted to avoid strategic considerations, e.g., to punish intentionally ignorant proposers in the early rounds by rejecting their offers to convince them not to remain ignorant in subsequent rounds. Before a session began, subjects had to complete a pen and paper quiz to confirm that they had understood the game (see appendix for the quiz).

The experiment was computerized using Fischbacher's zTree software (2007). Participants were informed of their randomly assigned roles on the first screen. We neutrally labeled a proposer as "participant X" and a responder as "participant Y". The two states of nature were denoted "Case 1" and "Case 2". In the treatments *Transparency* and *Non-Transparency*, a proposer simply had to choose between option *A* or option *B*. In addition, in the other three treatments, a proposer had to decide whether to inform herself about the true state of nature. As mentioned above, a responder always learned about the true state of nature before deciding whether to accept or reject the offer. To collect additional data on the responders' behavior, we solicited their decisions using a reduced version of the strategy method (Selten, 1967)[7], i.e., the responder was not asked for a complete strategy but had to decide whether – given the actual state of nature – he would be willing to accept or reject option *A* and option *B*.

To gain deeper insights into subjects' preferences and motivations, we asked them about their beliefs regarding the behavior of the other player and their decisions in hypothetical situations after the subjects had completed their decisions (and before they learned those of the other player). The hypothetical questions concerned a situation from a different treatment or a different state of nature. In the *Transparency* and *Non-Transparency* treatments, we asked the proposer and the responder to imagine that they had to decide while playing the same role but in the other treatment. In the *Choice* treatments, we asked subjects to imagine that the opposite decision had been made regarding the revelation of the true state of nature. For example, we asked a proposer who actually decided to remain ignorant which option, *A* or *B*, she would have offered, had she informed herself about the actual state. The responses to the hypothetical questions were not incentivized.

At the end of each session, the subjects were informed of the decisions of the other player they were matched with and their payoffs. They were then were asked to complete a questionnaire on the motivations for their decisions. Finally,

[6] The original instructions are written in German. The instructions provided in the appendix are translated from German into English. The original instructions are available upon request.

[7] There is no clear evidence on whether employing the strategy method leads to differences in behavior. On this "hot-or-cold" debate, see for example Brandts and Charness (2011). They find some differences in behavior in games where the second mover has a punishment or rejection choice.

**Table 1**
Results from *Transparency* and *Non-Transparency*; note that in the treatment *Non-Transparency*, the 32 proposers are unaware of the actual state.

| | Option *A* | | Option *B* | |
|---|---|---|---|---|
| | State $s_n$ | State $s_a$ | State $s_n$ | State $s_a$ |
| *Transparency* ($n = 64$) | | | | |
| Proposals | 9/16 (56%) | 16/16 (100%) | 7/16 (44%) | 0/16 (0%) |
| Acceptance rates | 11/16 (69%) | 16/16 (100%) | 16/16 (100%) | 10/16 (63%) |
| *Non-Transparency* ($n = 64$) | | | | |
| Proposals | 30/32 (94%) | | 2/32 (6%) | |
| Acceptance rates | 15/16 (94%) | 16/16 (100%) | 16/16 (100%) | 14/16 (88%) |

the participants privately received their payoffs from the game in addition to an individual participation fee of €2.50. On average, participants earned €7.04 (including the participation fee), and the sessions lasted for approximately 35 min.

## 5. Results

In the first step, we will discuss the results from the treatments *Transparency* and *Non-Transparency*. Then, we will present our findings from the three *Choice* treatments in which subjects can deliberately remain ignorant.

### 5.1. Results Transparency and Non-Transparency

Table 1 summarizes the behavior in the *Transparency* and *Non-Transparency* treatments. In *Transparency*, 9 of 16 proposers (56 percent) offered option *A* in state $s_n$.

In state $s_a$, all 16 proposers offered option *A*. In response to these proposals, 11 of 16 responders (69 percent) accepted option *A* in state $s_n$. As expected, the option *B* offers were always accepted (16/16, 100 percent) in state $s_n$. In state $s_a$, option *A* offers were always accepted (16/16, 100 percent), and option *B* offers were accepted by 10 of 16 proposers (63 percent).[8]

In *Non-Transparency*, all but two of the 32 proposers offered option *A*. A total of 15 of 16 responders (94 percent) accepted option *A* offers in state $s_n$, and 14 of 16 (88 percent) agreed to option *B* in state $s_a$. The option *B* offers in state $s_n$ were always accepted. The same is true for option *A* offers in state $s_a$. In *Non-Transparency*, significantly more proposers offered option *A* in state $s_n$ than proposers in *Transparency*.[9]

As hypothesized, responders reacted differently to option *A* offers in state $s_n$ in the two treatments. In state $s_n$, responders accepted option *A* offers more frequently in *Non-Transparency* (94 percent) than in *Transparency* (69 percent). This difference is modestly significant.[10]

In the treatments *Transparency* and *Non-Transparency*, whether the proposer was informed about the actual state was exogenously determined, i.e., intentions about remaining ignorant or not did not play a role. We now turn to the treatments where ignorance was endogenous, i.e., could be chosen by the proposer.

### 5.2. Results choice treatments

A non-trivial number of proposers decided to remain ignorant in the treatments *Choice* and *Choice-UI*. In both treatments, 24 percent of the proposers chose not to inform themselves of the actual state of nature. In *Choice-UI*, 53 percent of the proposers who attempted to inform themselves of the actual state were successful in acquiring this information, while the others remained ignorant. In *Choice-H*, 88 percent of the proposers informed themselves of the state.

> ***Observation "Information Choices of Proposers"****: In* Choice *and in* Choice-UI*, a considerable number of proposers chose to remain ignorant. In* Choice-H*, few proposers did not inform themselves of the state of nature.*

Fig. 2 displays the percentage of proposers who offered option *A* in state $s_n$. The behavior in state $s_a$ – not shown in Fig. 2 – was very similar to the behavior in *Transparency* and *Non-Transparency*: proposers nearly always offered option *A*, and responders nearly always accepted these offers (see the summary table in the appendix).

In accordance with our hypotheses, in each of the treatments, *Choice*, *Choice-UI* and *Choice-H*, very few proposers (in *Choice*, 3 of 35 proposers, in *Choice-UI*, 3 of 20 proposers and in *Choice-H*, 3 of 14 proposers) who (successfully) informed themselves of the actual state to be $s_n$, offered option *A*. The vast majority of proposers who informed themselves offered option *B* in this state. Proposers who remained ignorant almost always proposed option *A*.

[8] Note that none of the proposers actually offered option *B* in state $s_a$, but because we employed a reduced version of the strategy method, responders were asked to provide their responses to both possible offers.

[9] With $p = 0.019$ (Fisher-Test, one-sided). This finding is also supported by OLS and probit regressions (see Table A2 in the appendix).

[10] With $p = 0.086$ (Fischer-Test, one-sided).

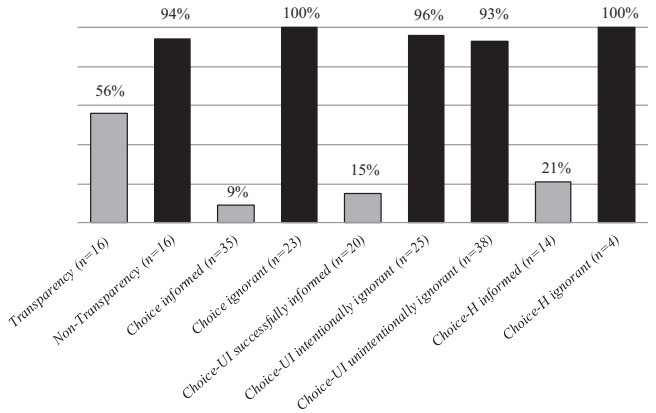


**Fig. 2.** Percentages of proposers offering option *A* in state $s_n$ where the interests of the two players are not aligned; note that in *Non-Transparency*, *Choice ignorant*, *Choice-UI ignorant* and *Choice-H ignorant* proposers are unaware that they are actually in state $s_n$; the light gray shaded bars indicate the settings in which proposers knew the state, while the dark gray shaded ones indicate the settings in which they did not. For reasons of completeness, we included the *Choice-H* ignorant, although only four observations exist.

> ***Observation "Proposers' Offers":*** *In all three* Choice *treatments, ignorant proposers proposed option* A *significantly more frequently than proposers who informed themselves of state* $s_n$.[11] *A clear majority of proposers who learned that the state was* $s_n$ *offered option* B.

Proposers in the *Choice* treatments who chose to inform themselves of the state of nature were in a similar situation as proposers in the *Transparency* treatment when they made their offers. We found that proposers in *Choice* and *Choice-UI* who informed themselves that the state was $s_n$ offered option *B* significantly more frequently than proposers who happened to be in state $s_n$ in *Transparency*.[12]

Fig. 3 depicts the responders' rates of accepting option *A* in state $s_n$. In state $s_a$ – not shown in Fig. 3 – proposers always offered option *A*, which was nearly always accepted by the responders. In *Choice*, responders knew whether they received an offer from a proposer who informed herself of the state (*Choice informed*) or a proposer who chose to remain ignorant (*Choice ignorant*). In state $s_n$, 14 of 35 responders (40 percent) accepted option *A* when it was offered by a proposer who informed herself. In comparison, if option *A* was offered by ignorant proposers, these offers were accepted more frequently, i.e., by 7 of 12 responders (58 percent). Therefore, option *A* offers in state $s_n$ from ignorant proposers seemed to be regarded as more acceptable than those from proposers who informed themselves of the state.

Responders in *Choice-UI* knew when a proposer successfully informed herself of the state of nature. In *Choice-UI*, 8 of 20 responders (40 percent) accepted option *A* when it was offered by proposers who successfully informed themselves that the state was $s_n$. If proposers in *Choice-UI* remained ignorant, responders did not know whether the proposers' ignorance was intentional or whether they unsuccessfully attempted to inform themselves of the state. We found that 21 of 31 responders (68 percent) accepted option *A* when it was offered by ignorant proposers. The difference in the acceptance rates for option *A* between proposers who informed themselves about the state and proposers who remained ignorant is significant.[13]

Thus, option *A* offers in state $s_n$ offered by ignorant proposers were accepted slightly more frequently in *Choice-UI* than in *Choice* (the difference is not significant). Option *A* offers in *Choice* and *Choice-UI* after deliberately informing oneself about the state $s_n$ were disliked more by the responders than offering the option *A* in state $s_n$ in *Transparency*.[14]

In *Choice-H*, the responder was not informed whether the proposer informed herself of the state of nature. In this treatment, the acceptance rate for option *A* in state $s_n$ was between those of *Choice informed* and *Choice ignorant*, as 8 of 16 responders (50 percent) accepted this offer. The same is true when comparing the acceptance rates of *Choice-H* and *Choice-UI*.

> ***Observation "Responders' Acceptance Decisions":*** *In* Choice *in state* $s_n$, *option* A *offers were accepted with a slightly higher frequency (although the difference is not significant) when they were offered by ignorant proposers than by proposers who informed themselves of the state. The corresponding comparison is significant in* Choice-UI. *In* Choice-H, *the acceptance rate of option* A *offers in* $s_n$ *was between those of* Choice *informed and* Choice *ignorant*.

[11] In *Choice* with $p < 0.001$, in *Choice-UR* with $p < 0.001$ and in *Choice-H* with $p = 0.011$ (all two-sided Fisher-Tests). See also the OLS and probit regressions in the appendix. There, the *p*-values show that compared to *Transparency*, a significantly smaller proportion of proposers who informed themselves offered option *A*. Proposers who remained ignorant offered option *A* significantly more often.

[12] With $p < 0.001$ comparing *Transparency* and *Choice*, and $p = 0.014$ comparing *Transparency* and *Choice-UR* (Fisher-Tests, two-sided).

[13] With $p = 0.051$ ($Chi^2$-Test, two-sided).

[14] With $p = 0.042$ ($Chi^2$-Test, two-sided, pooled data from *Choice* and *Choice-UR*). See also the OLS and probit regressions in the appendix. The *p*-values show that compared to *Transparency*, a significantly smaller share of responders accepted option *A* offers by proposers who informed themselves that the state was $s_n$.

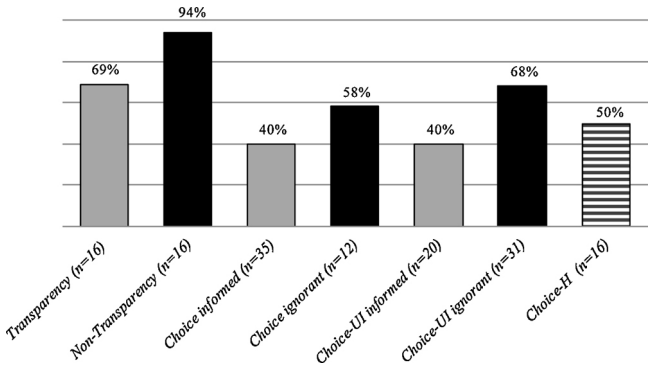


**Fig. 3.** Percentages of responders accepting option *A* in state $s_n$ where the interests of the two players are not aligned; the light gray shaded bars indicate the settings in which proposers knew the state, the dark gray shaded ones indicate the settings in which they did not (except for *Choice-H*, where most proposers informed themselves of the state but responders were not informed of the proposers' decision of whether to inform themselves).

### 5.3. Proposer payoffs

A crucial question is whether it pays for the proposer to be (strategically) ignorant. As we elicited responders' acceptance behavior for both possible options in the actual experiment, the expected payoffs (henceforth *EP*) of different proposers' strategies can be calculated.[15] Table 2 summarizes these *EP* for all possible proposer actions. Thus, in treatment *Transparency* under state $s_n$, it is beneficial for the proposer – in expected payoff terms – to offer option *B*, and in the case of state $s_a$, proposing option *A* is beneficial. In treatment *Non-Transparency*, where the proposer does not know the actual state, the expected payoff from offering option *A* is higher than that of offering option *B*. The best strategy for a self-regarding proposer who informs herself of the state in the three *Choice* treatments is to propose option *B* in the case of state $s_n$ and option *A* in the case of state $s_a$. For a proposer who remains ignorant, the *EP* are always higher when offering option *A* than when offering option *B*. The *EP* of a proposer who informs herself in the treatment *Choice* and *Choice-H* are higher compared to a proposer who remains ignorant.[16]

In treatment *Choice-UI*, however, the expected payoff of a proposer who remains ignorant is slightly higher than that of a proposer who informs herself of the state.

In addition, Table 2 also provides the actually observed total surplus for each treatment and information acquisition decision. In the treatments *Transparency* and *Non-Transparency*, the total surplus is nearly identical. In the three *Choice* treatments, however, the total surplus is always higher in situations where the proposers decided to inform themselves of the state than in situations where the proposer remained ignorant. Thus, more efficient outcomes are achieved when proposers inform themselves of the state.

### 5.4. Hypothetical decisions and beliefs in choice

We asked ignorant proposers in *Choice* what they would hypothetically have done had they informed themselves of the state of nature. A total of 12 of the 23 ignorant proposers (52 percent) would have offered option *A* in state $s_n$. However, only 3 of the 35 proposers (9 percent) who actually informed themselves that the state was $s_n$ offered option *A*. A potential explanation might be that proposers who informed themselves of the state of nature were more fairness-oriented than proposers who chose ignorance. It might be that the more fair-minded participants sorted into informing themselves (for a theoretical analysis related to this observation, see for example Grossman and van der Weele, 2013).

We also asked proposers who informed themselves of the state of nature whether they believed that option *A* in state $s_n$ would have been accepted if offered by a proposer who informed herself. A total of 14 of the 71 proposers (20 percent) believed that such offers would have been accepted. The same proposers were also asked about their beliefs concerning the acceptance of an option *A* offer in state $s_n$ if a proposer had chosen ignorance. Here, 26 of the 71 proposers (37 percent) who informed themselves believed that these offers would have been accepted. Posing the same questions to proposers who did not inform themselves of the state indicates that 10 of 23 (43 percent) believed that an option *A* offer in state $s_n$ would have

[15] Under the matching strategy in our experiment, proposers who are kept ignorant in the *Non-Transparency* treatment earn significantly more than in the *Transparency* treatment, independent of the actual state ($p = 0.016$, Mann–Whitney *U*-Test, henceforth: *MWU*, two-sided). In *Transparency*, proposers earn €5.19 on average compared to €5.69 in *Non-Transparency*. In the *Choice* treatment, there is no significant difference between the payoffs earned by informed and ignorant proposers ($p = 0.158$, *MWU*, two-sided). However, with ambiguity about the proposer's intentions in *Choice-UI*, ignorant proposers earn significantly more than proposers who successfully informed themselves that the state was $s_n$ or $s_a$ ($p = 0.045$, *MWU*, two-sided). Remaining strategically ignorant in this treatment pays off, as proposers who inform themselves of the state earn €4.83 on average and ignorant proposers on average make €5.20.

[16] E.g., in treatment *Choice*, the ex ante expected payoff of a proposer who informs herself and optimally reacts to the observed responders' strategies would be €5 (in state $s_n$, she would choose option B, and in state $s_a$, she would choose option A), and the payoff would be €4.74 for a proposer who remains ignorant.

**Table 2**
Expected payoffs in Euros for the proposers and observed total surplus for proposers and responders. Note that the expected payoffs for the proposers are based on the observed responders' acceptance rates.

| | *EP* (option *A*) | | *EP* (option *B*) | | Observed total surplus |
|---|---|---|---|---|---|
| | State $s_n$ | State $s_a$ | State $s_n$ | State $s_a$ | |
| *Transparency* | 3.36 | 6 | 4 | 2.52 | 8.37 |
| *Non-Transparency* | 5.82 | | 3.76 | | 8.66 |
| *Choice informed* | 2.4 | 6 | 4 | 1.9 | 9.65 |
| *Choice ignorant* | 4.74 | | 2.98 | | 7.38 |
| *Choice-UI informed* | 2.4 | 5.7 | 4 | 2.52 | 8.65 |
| *Choice-UI ignorant* | 5.04 | | 3.26 | | 8 |
| *Choice-H informed* | 3 | 6 | 4 | 3 | 9.53 |
| *Choice-H ignorant* | 4.5 | | 3.5 | | 9 |

been accepted if the proposer had informed herself of the state of nature. Without informing themselves, 19 out of 23 (82 percent) ignorant proposers believed that such an offer would have been accepted.[17] Thus, the proposers' beliefs seemed to reflect their different perceptions of the effectiveness of ignorance as a potential strategic advantage.[18]

Examining the responders' hypothetical decisions in the *Choice* treatment in greater detail sheds some light on the role of the proposers' intentions. Only 14 of the 35 responders (40 percent) actually accepted option *A* offers in state $s_n$ offered by a proposer who informed herself. However, 21 of these 35 responders (60 percent) would have hypothetically accepted such offers if the proposers had remained ignorant.[19] Moreover, 7 of 12 responders (58 percent) accepted option *A* offers in state $s_n$ when they were offered by *ignorant* proposers. Only 4 of these 12 responders (33 percent), however, would have accepted such offers if they had been made by a proposer who informed herself of the state and found the state to be $s_n$.[20]

## 6. Concluding remarks

The results from the *Transparency* and *Non-Transparency* treatments provide support for Schelling's conjecture: ignorance can indeed be an advantage for proposers. Nearly all uninformed proposers in *Non-Transparency* obtain their maximum payoff, i.e., €6. Responders seem to acknowledge that their opponents do not know the responders' payoff structure. The high rate of acceptance may be due to the responders' tendency to attribute the negative consequences of option *A* offers in state $s_n$ to the randomly occurring state of nature. Thus, a selfish intention on the part of the proposer might be diluted.

In the three *Choice* treatments, there are at least two possible reasons for a proposer to remain ignorant. The first is that a proposer wants to remain ignorant to herself, i.e., she does not want to know what a given offer means for a responder. A proposer who wants to offer option *A* may feel more morally consistent when ignorant compared to knowing the state, as the random draw could be blamed for an outcome that is potentially unfavorable for the responder (see also Dana et al., 2007). However, our observations from treatment *Choice-H* indicate that this explanation seems to have limited force: when responders are not informed of the proposer's decision of whether to acquire information, very few proposers remain ignorant (to themselves). A second reason for remaining ignorant might be that a proposer *strategically* uses ignorance. Such a proposer may believe that ignorance increases the responder's inclination to accept option *A* offers in state $s_n$. This second explanation is supported by the observed proposers' beliefs and responses to our open questions: proposers who deliberately remained ignorant believed that option *A* in state $s_n$ would be less frequently accepted if they had informed themselves of the state.

There are, however, at least two reasons for the proposers to inform themselves of the state of nature. The first is that a proposer might propose option *A* in state $s_n$ when she remains ignorant, which could lead to the responder's rejection. Second, if a proposer has genuine pro-social preferences, she wants to acquire information about the true state of nature to offer option *B* in state $s_n$ that gives the responder a higher payoff and is also more equal and efficient. This second explanation is supported by the finding that proposers who inform themselves of the state in the *Choice* treatments more frequently

[17] The differences in the beliefs of ignorant proposers and proposers who informed themselves concerning the effect of ignorance is significant ($p = 0.027$, *MWU*).

[18] Asking participants to briefly explain the motivations behind their decisions generated interesting insights. A proposer who decided to inform herself of the state, for example, wrote (translated from German): *"I informed myself of the state because I wanted to offer option B in the case of state $s_n$. If I really wanted to offer option A in this state, I would not have informed myself of the state to positively influence the responder to accept option A."* Another proposer, who did not inform herself of the state of nature, commented: *"I did not inform myself of the state to have an excuse for offering option A in state $s_n$. In my opinion, the responder then does not think that I am intentionally mean."* A responder who received an offer from a proposer who learned the state wrote: *"I accepted option B in state $s_n$, as it is the fair solution for both players. But I did not accept option A because I don't want to accept €6 for him and only €1 for me. I decided this way because I knew that the proposer informed herself of the state. In case the proposer would not have informed herself, I would have accepted all offers because then chance would have decided and the proposer would not have known what state actually occurred."*

[19] Asking this question to all responders who received an offer from a proposer who informed herself regardless of whether they were in state $s_n$ or state $s_a$ showed that 38 of 71 responders (53%) would have accepted option *A* in state $s_n$ from an ignorant proposer.

[20] Asking this question of all responders who received an offer from an ignorant proposer regardless of whether they were in state $s_n$ or state $s_a$ showed that only 8 of 23 responders (35%) would have accepted option *A* from a proposer who was aware that the state was $s_n$.

offer option *B* in state $s_n$ than proposers in *Transparency*. Additionally, the hypothetical decisions also indicate that genuine pro-social proposers sort into informing themselves, whereas ignorant proposers attempt to strategically exploit the *moral wiggle room*.

At first sight, one might imagine that an option *A* offer in state $s_n$ is evaluated similarly by a responder regardless of whether a proposer informed herself or deliberately remained ignorant. As it is costless to inform oneself of the state, it could, however, be argued that remaining intentionally ignorant is a more ruthless behavior on the part of the proposer. The acceptance rates show that responders tend to accept option *A* offers in state $s_n$ more frequently when they come from ignorant proposers than from proposers who informed themselves. This difference is even significant in *Choice-UI*, where responders could not be certain whether this ignorance was intended by the proposer. Therefore, Schelling's conjecture (1960) that informational weakness can be a strength is supported (by the comparison of *Transparency* and *Non-Transparency*) but might also be extended: ignorance can even be used strategically if the opponent is aware of the ignorance but is uncertain whether the ignorance was intentional (shown in *Choice-UI*). Moreover, option *A* offers in state $s_n$ from proposers who inform themselves of the state are more frequently rejected in each of the *Choice* treatments than in the *Transparency* treatment. Responders seem to perceive option *A* offers by proposers who deliberately informed themselves that the state was $s_n$ (in the *Choice* treatments) as having worse intentions than proposers who offered option *A* and were immediately provided with the information that the state was $s_n$ (in the *Transparency* treatment).

In light of our results, insufficient attention has been devoted to research on the strategic use of ignorance in bargaining. We are aware that our experiment uses a specific bargaining format and a specific payoff structure. Further research is needed to verify whether our findings extend to richer bargaining formats that go beyond take-it-or-leave-it bargaining, for example, sequential offer bargaining. In such a situation, the bargaining power is more equally divided between the two players, and therefore one could expect that a proposer has a greater need to strengthen her position, for example, by exploiting strategic ignorance. As we have a situation characterized by asymmetric information where the responder knows the state of nature but the proposer does not, sequential offer bargaining could involve signaling on the side of the responder, which makes the strategic interaction more complex. Bargaining settings are often of a repeated nature, and one might wonder whether parties adapt their behavior over time. Thus, it would also be interesting to study learning and endogenous social norm building in repeated settings. Because remaining ignorant might be perceived as rude behavior, it is an open question as to whether strategic ignorance will be used less frequently in a face-to-face environment.

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