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# Motivated Errors

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## Abstract

In three sets of experiments involving 5,432 subjects, we show that agents make more errors when doing so allows them to justify selfish behavior. We show that errors relating to addition arise when they can help to justify selfishness but are eliminated when selfish motives are removed. In addition, we show that selfish motives can either exacerbate or mitigate errors relating to correlation neglect and anchoring. Our results are consistent with individuals acting confused as a justification for selfish behavior.



## Keywords

decision making, rationalization, motivated reasoning


## Disciplines

Economics

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**Abstract**

In three sets of experiments involving 5,432 subjects, we show that agents make more errors when doing so allows them to justify selfish behavior. We show that errors relating to addition arise when they can help to justify selfishness but are eliminated when selfish motives are removed. In addition, we show that selfish motives can either exacerbate or mitigate errors relating to correlation neglect and anchoring. Our results are consistent with individuals acting confused as a justification for selfish behavior.

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# 1 Introduction

Most people would like to believe that they are good.[1] Yet, many of their decisions are not good—they are selfish, lazy, impatient, indulgent, or worse. How do people resolve this tension? Previous research has highlighted the role of motivated reasoning, which allows agents to rationalize their decisions to themselves or to others in a more favorable light.[2] In particular, the prior literature has demonstrated two broad ways in which agents rationalize decisions that could be viewed as undesirable.

The first way involves appealing to uncertainty in how decisions map to outcomes. The intuition is as follows. Choosing to benefit oneself to the detriment of others is undesirable, but choosing to benefit oneself when the action may not harm others—say because of uncertainty in how decisions map to outcomes—may be less undesirable. Engaging in this type of motivated reasoning is often facilitated by information avoidance. In the canonical example of Dana, Weber and Kuang (2007), agents choose to stay uninformed about the state of the world in order to maintain uncertainty about whether a selfish action harms another subject.[3] Evidence for this type of motivated reasoning is also evident when an individual acts more selfishly when observers are uncertain about the mapping between the individual's decision and outcomes (Dana, Cain and Dawes, 2006; Broberg, Ellingsen and Johannesson, 2007; Andreoni and Bernheim, 2009; Linardi and McConnell, 2011; Shaw et al., 2014).

The second way involves appealing to uncertainty about whether undesirable decisions are attributable to more innocuous preferences or beliefs. The intuition is as follows. It is bad to be selfish, but there is nothing wrong with holding particular preferences (over, say, risk) or holding particular beliefs (over, say, what payoffs are likely to arise), even if those preferences or beliefs lead you to make selfish decisions. In one of the earliest examples, Snyder et al. (1979) shows that subjects, when deciding whether or not to watch a movie with an individual who has a disability, are more likely to avoid this individual when their avoidance "could masquerade as a movie preference" rather than a dislike for an individual who has a disability. More recently, empirical work documents that individuals appear to use their fairness preferences (Konow, 2000), ambiguity preferences (Haisley and Weber, 2010), risk preferences (Exley, 2016), and beliefs about factors that influence payoffs—such as how others behave (Di Tella et al., 2015)—to rationalize decisions that could otherwise be attributed to selfishness.[4]

[1] When 1,536 individuals were are asked (via a Google Consumer Survey in 2018) to indicate the extent of agreement with the following statement "Overall, I am a good person," the vast majority indicated agreement.

[2] Such rationalization may be desired by agents with self-image concerns or social image concerns (Rabin, 1995; Bodner and Prelec, 2003; Bénabou and Tirole, 2004, 2006; Mijović-Prelec and Prelec, 2010; Bénabou and Tirole, 2011; Grossman, 2015; Grossman and van der Weele, 2017; Bénabou, Falk and Tirole, 2018; Foerster and van der Weele, 2018*a*).

[3] See Section 2.5 for an additional discussion of the literature on information avoidance.

[4] Other examples include cases where decisions may be rationalized by: condo preferences (Hsee, 1996), dispute-related fairness preferences (Babcock et al., 1995), honesty preferences (Danilov and Saccardo, 2016), preferences about charity metrics (Gneezy, Keenan and Gneezy, 2014; Exley, 2020; Palma and Xu, 2019), and beliefs about competence (Liu and Lin, 2018). In addition to early work (Kunda, 1990; Batson et al., 1997) and review articles

In this paper, we investigate whether individuals can appeal to the possibility that they are confused—or that they have made some sort of honest mistake—to justify selfish decisions.[5] Since the possibility of being confused can arise in nearly all decision environments, participants in prior work could have also exploited the possibility of confusion as an excuse. However, prior work focused instead on uncertainty arising form aforementioned sources such as risk, ambiguity, or incomplete information and so did not directly investigate this channel. Consequently, the main contribution of this paper is to show that individuals can indeed exploit uncertainty about the possibility of being confused as an excuse for selfish behavior.

We show this both in a simple decision environment (see Study 1) and in environments where individuals may also be subject to well-established behavioral biases (see Studies 2, 3A, and 3B). In the first case, we find that individuals are more likely to make errors—of the kind one might make if they are confused—when doing so can help justify selfishness. Because these additional errors arise in the presence of selfish motives, we call them *motivated errors*. In the second case, in the presence of cognitive limitations and behavioral biases that induce errors of their own, we show that selfish motives can either exacerbate or mitigate such errors. We thus demonstrate that such cognitive limitations and behavioral biases can look more or less pronounced depending on whether selfish motives are aligned with them or against them.

By first investigating a simple decision environment, Study 1 documents evidence for motivated errors in response to even minor uncertainty about whether individuals are confused. In particular, we document that subjects make errors—acting as if they are unable to compute simple addition problems—when such errors are helpful to justify selfish behavior, but that they make *few to no errors* when selfish motives are removed. In the experiment, subjects make a series of decisions in which they choose between receiving money for themselves and a charity receiving the sum of four or five payoffs. We show that when we add a zero to the sum of payoffs going to charity, subjects are more likely to choose the money for themselves. For example, subjects are less likely to choose the payoffs for charity—and thus more likely to keep money for themselves—when told that $55 + 55 + 55 + 55 + 0$ cents will be donated to charity than when told that $55 + 55 + 55 + 55$ cents will be donated. The payoff-irrelevant addition of a zero makes subjects behave more selfishly. One possibility is that the addition of a zero actually confused subjects and made subjects think the

(Chance and Norton, 2015; Gino, Norton and Weber, 2016) that stress how ambiguity and uncertainty contribute to motivated reasoning, ambiguity and risk preferences may also be relevant when payoffs explicitly depend on ambiguity or risk (Dana, Weber and Kuang, 2007; Oberholzer-Gee and Eichenberger, 2008; Gneezy et al., 2020; Garcia, Massoni and Villeval, 2018; Regner, 2018; Olschewski et al., 2019) or when payoffs are influenced by the (unknown) behavior of others (Falk and Szech, 2013; Bartling and Özdemir, 2017; Falk and Szech, 2017; Gneezy, Saccardo and van Veldhuizen, 2018).

[5]To fix ideas about what we mean by agents appealing to the possibility that they are confused, akin to the model in Bénabou and Tirole (2006), imagine agents in a decision environment have some small probability of taking a selfish action because they are confused and make a mistake. This implies that choosing the selfish action cannot be viewed as a definitive desire to be selfish, since there is always some probability mass on the selfish action being chosen due to confusion. An agent that wants to avoid image costs of being selfish can then mimic "confused" types when doing so serves as a convenient excuse for selfish behavior. This dynamic will result in more evidence of supposed confusion when acting confused can facilitate selfish behavior.

sum was lower. We find, however, that when selfish motives are removed—when subjects instead choose between two payoffs that both benefit charity—decisions are no longer influenced by the addition of a zero. In addition, we find that when participants are directly asked to calculate these sums, they do so correctly in 98% of cases and their ability to do so does not depend on whether a 0 is added to the sum. Agents only act as if they cannot add a zero when doing so can rationalize selfish decisions.

Additional versions of Study 1 document that the extent of motivated errors depends on the extent to which the environment allows for the possibility of confusion. In particular, we find that decreasing the scope for confusion—by providing participants with more information on the sum of the payoffs going to charity (i.e., the total amount donated)—proves effective at reducing motivated errors. When subjects have the opportunity to click a box to reveal the sum of payoffs going to charity or when they are shown this sum by default, motivated errors are cut in half, although we still document motivated errors being made. Only when information about the sum is shown by default *and* is unavoidable—because subjects must correctly report it back before making their choice—can we no longer find evidence of motivated errors.

In another set of versions of Study 1, we document that our results persist even when subjects could have exploited information avoidance as an excuse to behave selfishly. In all of the versions discussed so far, participants have all of the information required to calculate the sum—even if they do not observe the sum directly. In our last set of study versions, participants may avoid information such that they do not have all of the information required to calculate the sum. Thus, participants motivated to exploit information avoidance as an excuse—as subjects do in Dana, Weber and Kuang (2007)—could choose to avoid information and exploit the lack of information as an excuse to behave selfishly. While we find that participants do indeed exploit information avoidance as an excuse, evidence for motivated errors persists among the subjects who do not exploit information avoidance as an excuse and instead choose to reveal all of the information needed to calculate the sum.

To show the robustness of motivated errors to well-documented behavioral biases—and to document that they can arise in settings where agents actually make errors absent selfish motives to do so—we run additional studies. Building off of prior work that documents beliefs being biased by correlation neglect (Enke and Zimmermann, 2019) and by anchoring (Enke et al., Forthcoming) in settings absent any selfish motives, we explore whether selfish motives can influence the extent to which individuals' beliefs appear to suffer from these biases.[6] In Study 2, subjects are asked to calculate the true state of the world when provided with correlated signals. Even under incentives

[6]By documenting evidence for motivated reasoning by eliciting beliefs about unknown states of the world, these studies are also related to prior work on motivated beliefs about ability (Eil and Rao, 2011; Ertac, 2011; Grossman and Owens, 2012; Mobius et al., 2014; Buser, Gerhards and Van der Weele, 2018; Coutts, 2018; Heger and Papageorge, 2018; Schwardmann and van der Weele, 2017; Chew, Huang and Zhao, 2018; Zimmermann, 2018), politics (Thaler, 2019), beauty (Eil and Rao, 2011), financial decisions (Kuhnen, 2015), and non-ego relevant but desirable events (Gotthard-Real, 2017). See Bénabou and Tirole (2016) for a review, Bénabou and Tirole (2002) and Köszegi (2006) for related theoretical work, and Schwardmann, Tripodi and van der Weele (2019) for evidence from the field.

for accuracy, subjects display correlation neglect: they provide answers that are too high when a high signal is correlated with the other signals they receive, and they provide answers that are too low when the correlated signal is low. In this setting, we show that we can exacerbate or mitigate the extent of correlation neglect that subjects display by giving them a self-serving motive to display more correlation neglect or to display less correlation neglect. When subjects are motivated to make errors in the direction of correlation neglect, they appear to suffer more extensively from correlation neglect; when subjects are motivated to make errors in the opposite direction of correlation neglect, they look more rational. In Studies 3A and 3B, we show that motivated errors can generate the same pattern in contexts where subjects are incentivized to provide correct answers to knowledge-based questions but display an anchoring bias that generates an assimilation effect, such that beliefs gravitate towards the anchor. When subjects are motivated to make errors in the direction of the anchoring bias, they appear to suffer more from an anchoring bias; when subjects are motivated to make errors that work against an anchoring bias, they look more rational.

That subjects can make motivated errors—including in settings where errors are uncommon in the absence of selfish motives—suggests that individuals may be able to attribute their selfishness to confusion across a wide variety of contexts, both in settings where mistakes are rarely made in practice and in settings where mistakes are common. This finding suggests the importance of more research on motivated reasoning and whether it drives self-serving behavior in contexts beyond those that have previously been explored.

Our results also suggest particular value in further exploring the role of motivated reasoning in settings where subjects are believed to suffer from cognitive limitations or behavioral biases. Had we not identified the role of selfish motives, the motivated errors that we observed in Study 1 could have been mistaken for a cognitive limitation or a behavioral bias.[7] In addition, that we document that motivated errors can exacerbate—or mitigate—the prevalence of well-documented cognitive limitations and behavioral biases suggests the importance of exploring how motivated reasoning interacts with these types of errors. Along with other recent work inspired by Bénabou and Tirole (2002) on false or selective memory (Chew, Huang and Zhao, 2018; Zimmermann, 2018; Saucet and Villeval, 2019), these results support the call put forth in Bénabou and Tirole (2016) for more work on how behavior that may appear to be indicative of "wired-in cognitive mistakes" could instead be indicative of motivated reasoning.

The rest of the paper proceeds as follows. Section 2 describes the design and results of Study 1. Section 3 describes the design and results of Study 2. Section 4 describes the design and results of Study 3. Section 5 concludes.

# 2 Study 1: Adding a Zero

In our first set of experiments (Study 1), payoff-irrelevant information influences agents' decisions over payoffs only when selfish motives are relevant. When choosing between a payoff for themselves

[7] Absent identifying the role of selfish motives, our findings from Study 1 could reflect the affect heuristic (Gilovich, Griffin and Kahneman, 2002) or errors arising from irrelevant attributes (Chadd, Filiz-Ozbay and Ozbay, 2019).

and a payoff for charity, participants are more likely to favor a payoff for themselves when a zero is added to the payoff for charity. By contrast, when choosing between two payoffs for charity, participants no longer respond to the addition of the zero. Because subjects only make errors—allowing the addition of the zero to impact choices—in the presence of selfish motives, we say they make *motivated errors*.

In this section, we present the design and results from this set of experiments. We also show when motivated errors persist and when they are mitigated. Motivated errors persist even as participants gain experience (e.g., in the latter half of decisions they make). Motivated errors persist, albeit less so, when there is less scope for confusion about the total amount in the charity payoff because they can click to see the sum going to charity or because it is displayed on the decision screen by default. We only eliminate motivated errors by making participants correctly enter the total amount in the charity payoff before making a decision, which gives insight into the underlying mechanisms for motivated errors (see Section 2.4).

## 2.1 Adding a Zero Experimental Design

Study 1 included 1,745 subjects from Amazon Mechanical Turk ("MTurk") who participated in one of eight study versions.[8] In all study versions, each participant received $4 for completing the 25-minute study. In addition, one randomly selected decision for each participant was implemented for bonus payment and resulted in an additional payment for the participant or a donation to charity. The online nature of the experiment allows participants to be anonymous (i.e., they never directly interact with the experimenter), but we still observe their choices. Consequently, participants who want to justify selfish decisions may do so for self-image reasons (justifying selfishness to themselves) or for social image reasons (justifying selfishness to the experimenter).

In all versions, participants make 48 binary choices in which they choose between a "bundle," which changes from decision to decision, and an "outside option," which is fixed for all 48 decisions. In each decision, the value of the bundle is equal to the sum of 4 or 5 summands. For simplicity, each summand in a bundle is either 0 or a single positive number that (usually) appears multiple times. Consequently, the sum of a bundle can always be calculated as $n \times d$ (where $n$ is the number of times the positive number $d$ appears in the bundle, with all remaining summands being 0).

The eight versions of Study 1—*Self/Charity, Charity/Charity, Self/Self, Self/Charity (sum optional), Self/Charity (sum shown), Self/Charity (sum unavoidable), Charity/Charity (summands optional), and Self/Charity (summands optional)*—vary along four dimensions shown in Table 1: (1) the recipient of the outside option, (2) the recipient of the bundle, (3) information about the summands in the bundle, and (4) information about the sum in the bundle (beyond the implied information from the summands). The naming of the versions follows two rules. First, the name indicates the recipient of the outside option followed by the recipient of the bundle. For example, in the *Self/Charity* version, the outside option benefits the participant (thus *Self/*) and the bundle

[8] See the note of Table 1 for recruitment details. Full instructions and additional details for Study 1 can be found in Appendix B.1.

benefits a charity (thus *Charity*). Second, the text in parentheses relates to the information about the bundle participants may receive before making each choice. No parentheses implies that participants must learn information about all the summands but that no additional information about the sum is available.

Table 1: Study 1 Versions

| | Outside Option Recipient | Bundle Recipient | Information on the Summands | Information on the Sum |
|---|---|---|---|---|
| Self/Charity | Self | Charity | Required | None |
| Charity/Charity | Charity | Charity | Required | None |
| Self/Self | Self | Self | Required | None |
| Self/Charity (sum optional) | Self | Charity | Required | Optional |
| Self/Charity (sum shown) | Self | Charity | Required | Shown |
| Self/Charity (sum unavoidable) | Self | Charity | Required | Unavoidable |
| Self/Charity (summands optional) | Self | Charity | Optional | None |
| Charity/Charity (summands optional) | Charity | Charity | Optional | None |

We recruited approximately 200 participants from Amazon Mechanical Turk (MTurk) per study version for a total of 1,745 participants. Our initial five study versions—involving 198 participants in *Self/Charity*, 199 participants in *Charity/Charity*, 202 participants in *Self/Self*, 195 participants in *Self/Charity (summands optional)*, and 206 participants in *Self/Charity (sum shown)*—were run in January 2018. In response to helpful comments from reviewers, additional versions were run later. In December 2019, we recruited 168 participants (after excluding 31 prior participants who participated due to a recruitment error) in *Self/Charity (sum unavoidable)*. In September 2021, we recruited 201 participants in *Self/Charity (sum optional)*, 202 participants in *Charity/Charity (summands optional)*, and 198 participants in a second run of *Self/Charity (summands optional)*. To be eligible for any of our study versions in 2018 or 2019 (in 2021), workers must have previously completed at least 100 (1000) HITs with a 95% (99%) or better approval rating and must have been working from a United States IP address. Recruitment criteria were more stringent in 2021 due to changes in the MTurk subject pool that seemed to be correlated with the COVID-19 pandemic.

We begin by describing the *Self/Charity* version in depth, since the other seven versions are easily explained as slight variations off of this version. In the *Self/Charity* version, the recipient of the outside option is the participant and the level of the outside option is calibrated on the participant level (as described below); the recipient of the bundle is the national chapter of the Make-A-Wish Foundation, a charity; and participants must learn about each summand in the bundle before making their choice. In the remainder of this section, we explain how the bundles are constructed, we explain how and why we calibrated the outside option at the participant level, and we describe how the other seven versions differ from the *Self/Charity* version.

**Bundles in the *Self/Charity* version**

Each bundle in the *Self/Charity* version of Study 1 includes four or five summands (called "amounts" to participants) that are either zero or the same non-zero number. Participants are informed that if the bundle is chosen, the sum of these four or five amounts will be donated to the Make-A-Wish Foundation national chapter. The first amount in a bundle is always revealed by default (see Figure 1 for an example). Participants are then required to reveal the remaining

three or four amounts in a bundle by clicking on the header above each amount. We present the bundles to participants in this interactive manner so that we could require them to view all of the amounts in a bundle.[9] To ensure participants comprehend this structure, we require participants to correctly answer questions about how much money would be given to charity in several example bundles before they make choices in the study (see Appendix Figure B.5).

Figure 1: Example of how a bundle initially appears in Study 1


Clicking on each header reveals the number of cents associated with that amount.

To facilitate comparisons across each participant's decisions, we carefully structured the 48 bundles (importantly, however, participants are not informed of this structure). In particular, we started with 12 "baseline" bundles, which we call *n/4-bundles*, since they include four amounts of which $n$ amounts are non-zero (so, if $n < 4$, then $4 - n$ amounts are zero). Each non-zero amount within a bundle equals $d$, which is constant within a bundle but varies across bundles. Thus, the sum going to charity if a baseline *n/4-bundle* is chosen is $n \times d$ cents. The $n$ and $d$ parameters for the baseline bundles are chosen such that $n \times d$ varies systematically around 150 cents. We have four baseline bundles with $n = 2$, four baseline bundles with $n = 3$, and four baseline bundles with $n = 4$. We randomly select $d \in \{51, 52, 53, 54, 55, 56, 57, 58, 59\}$ at the bundle level, so that $n \times d$ is substantially below 150 cents for the bundles with $n = 2$, slightly above 150 cents for bundles with $n = 3$, and substantially above 150 cents for the bundles with $n = 4$. We vary the order of the zeros in the baseline bundles as shown in Appendix Table A.1. For example, while columns 5–8 of Appendix Table A.1 reveal all 3/4-bundles contain one amount worth 0 cents and three amounts worth $d$ cents (for a total sum of $3d$ cents), note that the placement of the 0 cents varies across these bundles. The first amount equals 0 cents in the 3/4-bundle described in column 5, the second amount equals 0 cents in the 3/4-bundle described in column 6, the third amount equals 0 cents in the 3/4-bundle described in column 7, and the fourth amount equals 0 cents in the 3/4-bundle described in column 8.

From each of the 12 baseline bundles, we construct an *n/5-bundle* by "adding a zero" to it. Each *n/5-bundle* mirrors the payoff structure of an *n/4-bundle* except for the addition of a fifth amount

[9]This interface also allows us to observe which summands participants choose not to view in the *Self/Charity (summands optional)* and *Charity/Charity (summands optional)* versions, as detailed later in this section.

that is zero. From each of these 12 baseline bundles, we additionally construct a *(n+1)/5-bundle* by "improving" it. Each *(n+1)/5-bundle* mirrors the payoffs structure of an *n/4-bundle* except for the addition of a fifth amount that is $d$. We call the 12 baseline bundles and the 24 bundles constructed from them our "main bundles."

In addition to our main bundles, we have 12 non-main bundles with four amounts each. We included these bundles both to balance the number of bundles of each size (i.e., to have 24 bundles with four amounts along with the 24 bundles with five amounts) and to provide additional data to perform secondary analyses conducted in Section 2.3. Until then, decisions involving these non-main bundles are excluded from our analysis (see Appendix Table A.2 for details on these bundles).

The order in which participants make their 48 binary decisions varies. Half of participants make their 24 decisions involving bundles with four amounts first and the other half make their 24 decisions involving bundles with five amounts first. In addition, within each block of 24 decisions, the order in which each bundle is shown randomly varies for each participant.

**Outside options in the *Self/Charity* version**

We systematically varied the sum in the bundle around 150 cents because we also set the outside option to be equivalent to a donation of 150 cents. Of course, each participant may have a different private value for a 150-cent donation to charity, and we expect most participants to value money for themselves more than money for charity. Consequently, we calibrate the outside option for each participant in the *Self/Charity* version to a value of money for themselves that is equivalent to 150 cents for charity. This calibration allows us to keep the value of the outside option similar across study versions with and without selfish motives; as described below, we directly set the outside option in the *Charity/Charity* version to be 150 cents for charity. This is a methodological contribution that we have also used in our other work (Exley, 2016, 2020; Exley and Kessler, 2019).[10] We discuss the calibration procedure further in Section 2.3, but we highlight its features here as well.

By calibrating the outside option in the *Self/Charity* version to be equivalent to 150 cents for charity, we can ensure that each participant is close to indifferent between the outside option and the bundle for the $n = 3$ decisions (and further from indifferent for the $n = 2$ and $n = 4$ decisions), so we have a well-controlled measure of how likely the participant is to select the bundle. If we had not calibrated the outside option and instead set it directly, we might have ended up in an environment where participants found the outside option in the *Self/Charity* version to be much more (or much less) appealing than all of the bundles. If that had happened, we might have seen subjects always choosing (or never choosing) the outside option in the *Self/Charity* version. A bad calibration—that sets the outside option too high or too low relative to the bundles—could therefore prevent us from observing that adding a zero affects behavior. Moreover, we stress that a bad calibration *cannot explain* why we find that adding a zero affects behavior. The identification strategy in our study relies on comparing the rates at which the bundles are chosen with and without

[10] See a discussion of the advantages of this procedure in Gauriot, Heger and Slonim (2019).

an additional zero. Participants should never respond to the addition of the zero, regardless of the level of the outside option.

How do we implement the participant-level calibration? Before facing the 48 binary decisions, each participant completes a multiple price list that aims to elicit an $X$ value that makes the participant indifferent between $X$ cents for themselves and 150 cents for the national chapter of the Make-A-Wish Foundation. Once we identify this $X$ value, we set each individual participant's outside option to $X$ cents for themselves. In particular, the multiple price list generates an indifference range for $X$. We assign participants an $X$ value equal to the lower bound of their indifference range, unless the lower bound of the indifference range is 0, in which case we assign $X = 5$ cents.[11] The distribution of $X$ values are displayed in Panel A of Appendix Figure A.1 and, as will be shown throughout this section, our results are robust to a restricted sample that excludes the 12% of participants whose lower bound implies $X = 0$ and for whom we assign $X = 5$ cents.

**Additional versions of Study 1**

Each of the seven other versions of Study 1 have a slight variation off of the *Self/Charity* version, and they are each described here. Additional details are shown in the corresponding sections where we discuss the results from these versions.

The *Charity/Charity* version is like the *Self/Charity* version, except that the outside option for all the decisions is 150 cents going to the national chapter of the Make-A-Wish Foundation. Since the national chapter of the Make-A-Wish Foundation is the recipient of both the bundle and the outside option, participants who want to maximize donations to the charity should choose the bundle whenever its sum is greater than 150 cents. This allows us to examine decisions in a setting where stakes are comparable to the *Self/Charity* version (due to the calibration procedure) but where selfish motives are absent.

The *Self/Self* version is like the *Self/Charity* version, except that the recipient of the bundle is the participant and the outside option for all the decisions is 150 cents going to the participant. Since the participant is the recipient of both the bundle and the outside option, participants who want to maximize earnings in the experiment should choose the bundle whenever its sum is greater than 150 cents. This allows us to consider how the absence of selfish motives influences decisions in a setting where participants' own money is still at stake. As evident from our extensive discussion of the calibration procedure, however, we view the *Charity/Charity* version—and not the *Self/Self* version—as the appropriate "control" for the *Self/Charity* version.

[11] In particular, as shown in Appendix Figure B.3, the price list contains 31 rows. On each row, the participant must decide between 150 cents being given to the Make-A-Wish Foundation national chapter and an amount of money for themselves that varies from 0 cents to 150 cents in five-cent increments (i.e., the price list gives $5 \times (r-1)$ cents to the participant on the $r^{th}$ row). If a participant switches from choosing the first payment option on the $r^{th}$ to the second payment option on the $(r+1)^{th}$ row, then that participant is indifferent between 150 cents for the national chapter and $X$ cents for themselves, where $5 \times (r-1) \leq X \leq 5 \times r$. Setting $X$ to the lower bound ensures that, if anything, participants should prefer bundles over their outside option more when the outside option is $X$ cents for themselves than when it is 150 cents for the national chapter of the Make-A-Wish Foundation. To obtain more precise estimates of $X$ cents, one could employ a version of the DOSE approach in Wang, Filiba and Camerer (2010).

The *Self/Charity (sum optional)*, *Self/Charity (sum shown)*, and *Self/Charity (sum unavoidable)* versions are like the *Self/Charity* version, except that participants may learn the sum of money going to charity in the bundle without doing the calculation themselves. These versions allow us to examine whether our results persist even when the scope for acting confused may be reduced. In the *Self/Charity (sum optional)* version, participants have the option to click a button to reveal the sum of the amounts in the bundle on the decision screen. In the *Self/Charity (sum shown)* version, participants are shown the sum on the decision screen without having to click to reveal it. In the *Self/Charity (sum unavoidable)* version, participants are shown the sum in a way that ensures they cannot avoid it. In particular, prior to facing each decision screen, participants are shown the sum for the upcoming decision and are required to correctly enter this amount into a text box before proceeding to the decision screen. In addition, the sum is made more salient on the decision screen.

The final two versions—the *Self/Charity (summands optional)* and *Charity/Charity (summands optional)* versions—are like the *Self/Charity* and *Charity/Charity* versions, respectively, except participants may acquire *less* information on the bundle. In particular, while participants are still shown the first amount in each bundle by default, they do not need to reveal the other three or four amounts before making a choice about the bundle. This allows us to examine whether our results persist even when participants can exploit a different excuse for selfish behavior (i.e., lacking the information necessary to determine the payoff consequences of their choices).

## 2.2 Documenting errors in decisions

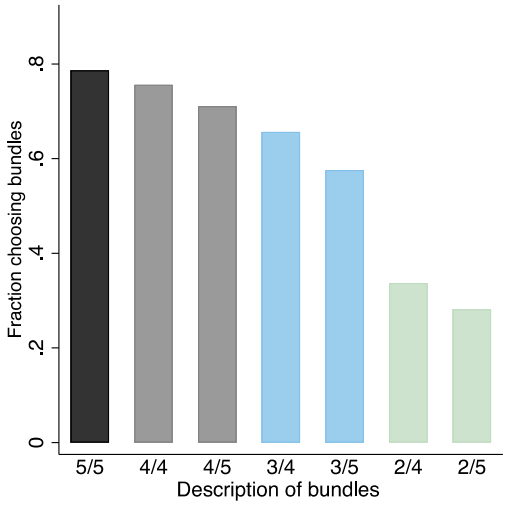
In the *Self/Charity* version, we find clear evidence that participants make systematic errors. In particular, participants are less likely to choose a bundle when a zero is added to it, even though the donation made by the bundle (i.e., the sum of the amounts in the bundle) has not changed.

Figure 2 shows our results graphically, collapsing across all our main bundles. The shading of the bars indicates the number of non-zero amounts in the bundle, which determines the sum of the bundle and whether the sum is above or below 150 cents.[12] It is clear that participants' willingness to choose a bundle is not solely driven by the number of non-zero amounts. For each of the four-amount bundles (i.e., the *4/4-bundles*, the *3/4-bundles*, and the *2/4-bundles*), there are corresponding five-amount bundles that involve the same number of non-zero donation amounts (i.e., the *4/5-bundles*, the *3/5-bundles*, and the *2/5-bundles*). The fact that these five-amount bundles contain an additional zero is payoff irrelevant, but adding a zero causes a substantial drop in willingness to choose a bundle.

Table 2 presents the results from the main bundles in a regression framework that includes additional controls and carefully isolates the impact of adding a zero and the impact of adding a non-zero amount to a baseline *n/4-bundle*. In particular, we report results from the following linear

[12] In the *5/5-bundles*, 5 of the donation amounts are non-zero, so the sum is 255 to 295 cents. In the *4/4-* and *4/5-bundles*, 4 of the donation amounts are non-zero, so the sum is 204 to 236 cents. In the *3/4-* and *3/5-bundles*, 3 of the donation amounts are non-zero, so the sum is 153 to 177 cents. In the *2/4-* and *2/5-bundles*, 2 of the donation amounts are non-zero, so the sum is 102 to 118 cents.

Figure 2: In the *Self/Charity* version of Study 1, fraction choosing a main bundle




Data include all participants' decisions in all main bundles in the *Self/Charity* version of Study 1.

probability model:

$$P(choose\ bundle) = \beta_1(^{+}0) + \beta_2(^{+}1) + \sum_{n=2}^{4}\sum_{d=51}^{59} k_n \times l_d + \epsilon \quad (1)$$

where $(^{+}0)$ is an indicator for an *n/5-bundle* that is constructed by adding a fifth amount that is equal to zero to a baseline *n/4-bundle*, $(^{+}1)$ is an indicator for an *(n+1)/5-bundle* that is constructed by adding a fifth amount that is non-zero to a baseline *n/4-bundle*, $k_n$ are dummies for the number of non-zero amounts within the underlying baseline *n/4-bundle* (see Table A.1), and $l_d$ are dummies for the value of the non-zero amounts in the bundle, which range from 51 to 59 cents.

The coefficient estimate on $(^{+}0)$ in Column 1 of Table 2 shows that adding a zero significantly decreases participants' willingness to choose a bundle by 6 percentage points. This effect is large. It is 10% of the likelihood of choosing a baseline bundle, which is 0.58. It is more than half the magnitude of the 10 percentage point increase observed from adding a non-zero amount to a bundle (see the coefficient estimate on $(^{+}1)$), which on average increases the total amount donated in a main bundle by 33%. In addition, the 6 percentage point average effect reflects a large fraction of participants responding to the addition of the zero in this biased way: 50% of our participants make errors at least once by choosing an *n/4-bundle* but not the *n/5-bundle* constructed by adding a zero to it.

What can we say about why participants respond to the addition of the zero? First, participants do not solely interpret five-amount bundles more negatively than four-amount bundles, since adding a non-zero amount to a bundle increases participants' willingness to choose it.[13] Our effect is instead

[13]Put differently, more is not less. This is not surprising, since the donation from choosing a bundle in our

Table 2: In the *Self/Charity* version of Study 1, regression of choosing a main bundle

| Sample: | full | | | choice varies | $X$ is lower bound |
|---|---|---|---|---|---|
| | main bundles (1) | if 4/4 baseline (2) | if 2/4 or 3/4 baseline (3) | main bundles (4) | main bundles (5) |
| $(^{+}0)$ | -0.06*** | -0.04*** | -0.07*** | -0.08*** | -0.07*** |
| | (0.01) | (0.02) | (0.01) | (0.01) | (0.01) |
| $(^{+}1)$ | 0.11*** | 0.03** | 0.15*** | 0.14*** | 0.12*** |
| | (0.01) | (0.02) | (0.02) | (0.02) | (0.01) |
| N | 7128 | 2376 | 4752 | 5616 | 6048 |
| $k_n * l_d$ FEs | yes | yes | yes | yes | yes |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the participant level and shown in parentheses. The results are from a linear probability model of whether a participant chose a main bundle in the *Self/Charity* version of Study 1. $(^{+}0)$ is an indicator for an *n/5-bundle* that is constructed by adding a fifth amount that is equal to zero to a baseline *n/4-bundle*, $(^{+}1)$ is an indicator for an *(n+1)/5-bundle* that is constructed by adding a fifth amount that is non-zero to a baseline *n/4-bundle*, $k_n * l_d$ FEs include all possible interactions of dummies for the number of non-zero amounts within the baseline *n/4-bundle* (see Table A.1) and dummies for the value of the non-zero amount $d$ in the bundle to fully control for the sum of the amounts in the baseline bundle. Columns 1–3 analyze all participants' decisions: in all main bundles in Column 1, involving the baseline *4/4-bundles* in Column 2, and involving the baseline *2/4-* and *3/4-bundles*, which already have at least one zero, in Column 3. Column 4 analyzes all main bundles but among a restricted sample of participants who choose the bundle at least once and choose their outside option at least once. Column 5 analyzes all main bundles but among a restricted sample of participants with outside option $X$ set to the lower bound of their indifference range (thus excluding participants with a zero lower bound).

driven by participants responding to the addition of a zero to a bundle. Adding a zero decreases participants' willingness to choose a bundle, even though it does not change the sum of donations to charity.

Second, our results are not solely about the presence of a zero in a bundle.[14] Column 2 of Table 2 examines the impact of adding a zero to a baseline bundle absent any zeros (i.e., to *4/4-bundles*) while Column 3 of Table 2 examines the impact of adding a zero to a baseline bundle with one or two zeros (i.e., to *2/4-bundles* or *3/4-bundles*). The negative effect of adding a zero persists in both cases: adding a zero decreases participants' willingness to choose a bundle by 4 percentage points when a zero is not already present and by 7 percentage points when a zero is already present.

Our findings are also robust to different restrictions on the set of participants we consider. Column 4 and Column 5 of Table 2 examine whether our effect persists with more restricted samples of participants. Column 4 only includes participants who choose the bundle at least once and choose

experiment can be known with certainty, and so our setting differs from prior literature that has documented a "more is less" phenomenon in environments where underlying uncertainty about the value of a bundle allows agents to update about the bundle's overall quality when something is added to it (Hsee, 1998; List, 2002; Leszczyc, Pracejus and Shen, 2008).

[14]This result helps us to differentiate from effects related to the presence of a zero, such as those observed in Magen, Dweck and Gross (2008) and Read, Olivola and Hardisty (2016), which show that decision-makers choosing between money now and money later can be made more patient by reminding them that taking money now means receiving $0 later.

their outside option at least once.[15] Not surprisingly, the impact of adding a zero is even larger (i.e., it is 8 percentage points) for this sample. Column 5 shows that our results are robust to excluding participants for whom we assigned an outside option of 5 cents because the lower bound of their indifference range was 0 cents.

Our findings are also robust to the order in which participants make decisions. In particular, we can examine whether experience with the decisions mitigates motivated errors in two ways. First, we exploit that participants either make all 24 decisions involving four-amount bundles and then make all 24 decisions involving five-amount bundles or vice versa. Second, we exploit that the order of bundles randomly varies within the set of 24 four-amount bundles and within the set of 24 five-amount bundles. Appendix Table A.3 presents the corresponding results. Columns 1 and 2 split participants based on whether they faced the four-amount bundles first (and so the zeros were added in the second half of the study, Column 1) or the five-amount bundles first (so the zeros were added in the first half of the study, Column 2). Columns 3 and 4 show the results from decisions involving main bundles that occur "early" in each set (from the first half of each set, decisions 1–12 and 25–36, Column 3) or "late" in each set (from the second half of each set, decisions 13–24 and 37–48, Column 4). Rather than mitigating motivated errors, experience, if anything, exacerbates them (i.e., the estimated magnitude is larger in Column 4 than in Column 3).

That participants' decisions are influenced by an additional zero to the same degree when they first make decisions involving bundles that contain an additional zero (Column 1) as when they first make decisions involving bundles that do not contain an additional zero (Column 2) also provides evidence against cognitive dissonance or consistency influencing participants' decisions to a substantial degree (Cialdini, 1984; Bazerman, Loewenstein and White, 1992; Babcock et al., 1995; Konow, 2000; Haisley and Weber, 2010; Gneezy et al., 2012; Bohnet and Bazerman, 2016; Falk and Zimmermann, 2016; Golman et al., 2016; Gneezy et al., 2020; Gneezy, Saccardo and van Veldhuizen, 2018; Falk and Zimmermann, Forthcoming). Of course, the number of decisions that participants make in our study may minimize the role of these mechanisms, since participants may be less constrained by prior decisions if they cannot fully remember those prior decisions (Bénabou and Tirole, 2002; Zimmermann, 2018).

## 2.3 Documenting motivated errors

In the previous subsection, we document systematic errors in decisions. When a zero is added to a bundle, participants are less likely to choose that bundle, even though the additional zero does not change the donation made by the bundle. Participants act as if $(n \times d) + 0 < (n \times d)$. A natural inclination for behaviorally minded researchers is to attempt to identify a cognitive limitation, behavioral bias, or heuristic that might explain these errors. For example, one might hypothesize that participants systematically miscalculate the amount in the bundle when a zero is added because they think in terms of the average amount (which is mechanically lower when there are more zeros)

[15] Across all 48 decisions, 10% of participants never choose the outside option, and 11% of participants always choose the outside option.

or because they overweight the last amount in the bundle (which is zero when a zero is added).[16]

We instead examine whether selfish motives might cause agents to make these errors. Thus, we consider two additional versions of Study 1 that eliminate selfish motives. As described above, participants in the *Self/Charity* version made binary decisions between a bundle of money for a charity and an outside option of money for themselves and so had a selfish reason to choose the outside option. In the *Charity/Charity* version, we eliminate selfish motives by having participants choose between the bundle for charity and an outside option of 150 cents for the same charity. Similarly, participants in the *Self/Self* version chose between the bundle for themselves and an outside option of 150 cents for themselves.

Panel A of Figure 3 reproduces Figure 2 for the *Charity/Charity* version. As expected, whether there are 3 or more non-zero amounts in a bundle (and thus whether the sum of the bundle is more than 150 cents) is the key determinant in whether the bundle is selected. Notably however, adding a zero to a bundle does not influence whether the bundle is selected. Panel B of Figure 3 reproduces the figure for the *Self/Self* version, and shows similar findings as those seen in Panel A.

Table 3 confirms that participants are unresponsive to the addition of a zero in both of these versions. In both the *Charity/Charity* version (Panel A) and *Self/Self* version (Panel B), we estimate near-zero coefficients on ($^{+}0$). That participants do not respond to the addition of a zero in the absence of selfish motives means that participants are capable of accurately ignoring the addition of a zero when making their decisions. Absent selfish motives, the addition of a zero does not cause participants to make errors. The addition of a zero only causes errors when there are selfish motives to make them (i.e., in the *Self/Charity* version). Thus, we say participants make motivated errors.

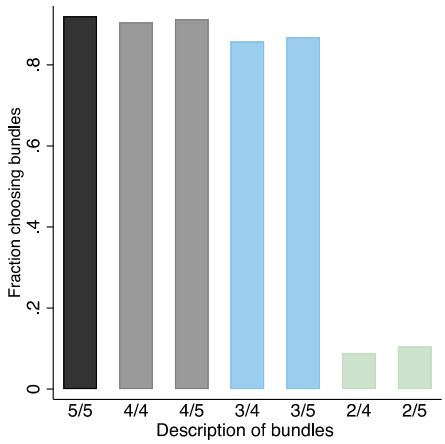
To statistically confirm that the effect of adding a zero is different when selfish motives are present and absent, we next compare results from the *Self/Charity* and *Charity/Charity* versions. In both versions, participants face the same bundles going to the Make-A-Wish Foundation. The only difference is the outside option, which is $X$ cents for participants in *Self/Charity* and 150 cents for the Make-A-Wish Foundation in *Charity/Charity*. Since we estimate each participant's $X$ value to make them indifferent between $X$ cents for themselves and 150 cents for the Make-A-Wish Foundation, the comparison between these versions isolates the impact of removing selfish motives without changing stakes.[17] Panel C of Table 2 presents the corresponding results. The coefficients on ($^{+}0$) and ($^{+}1$) show the effects in *Self/Charity* version (which are mechanically the same as in Table 2). The coefficient on *Charity/Charity* and the associated interactions show how these effects differ in the *Charity/Charity* version. In particular, the coefficient on *Charity/Charity**($^{+}0$) shows that the effect of adding a zero is fully eliminated when selfish motives are removed.

[16] Counter to this latter possibility, we do not find evidence that the location of zeros matters. In addition, results from some of our other study versions, discussed in Section 2.4, show that there is little scope for miscalculations or for inattention to produce these errors.

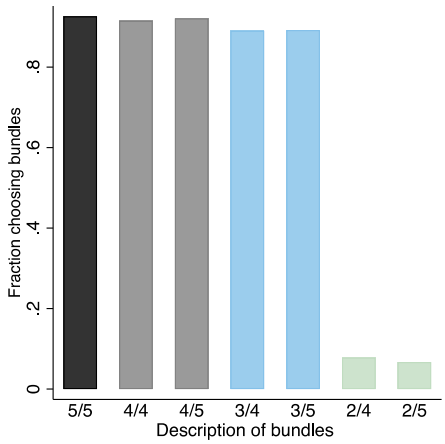
[17] Note that a comparison between the *Self/Charity* and *Self/Self* versions would allow stakes to change. While we do not analyze this comparison, our conclusions would be the same if we did.

Figure 3: In the *Charity/Charity* and *Self/Self (baseline)* versions of Study 1, fraction choosing a main bundle

Panel A: *Charity/Charity* version




Panel B: *Self/Self (baseline)* version




Data include all participants' decisions in all main bundles: in the *Charity/Charity* version of Study 1 in Panel A and in the *Self/Self (baseline)* version of Study 1 in Panel B.

Evidence for motivated errors is also readily apparent at the individual level. First, the fraction of participants who make at least one error—choosing an *n/4-bundle* but not the *n/5-bundle* constructed from it—is 50% in the *Self/Charity* version but only 26% in the *Charity/Charity* version ($p < 0.01$). Second, the fraction of participants who make at least two errors of this form, with the second error arising in response to a bundle that has a different sum than the bundles in the first error, is 29% in the *Self/Charity* version but only 14% in the *Charity/Charity* version ($p < 0.01$). This latter result shows that participants' decisions do not simply reflect the use of an additional zero as a way to break indifference between the bundle and the outside option, since they could not be indifferent between their outside option and two bundles with different total amounts. Third, we find that the fraction of participants who display non-monotonic behavior (with regard to the sum of donations made by a bundle) is 37% in the *Self/Charity* version but is only 25% in the *Charity/Charity* version ($p < 0.01$).[18] As expected, this non-monotonic classification is significantly correlated with whether participants respond to the addition of a zero.

Finally, we highlight that participants are able to correctly sum the amounts in the bundle—and that their ability to correctly sum the numbers does not depend on adding a zero—lending

[18]Our measure of non-monotonicity uses decisions from four non-main bundles that are denoted as $4^L$*/4-bundles* because all four amounts are non-zero, but each amount is smaller than the amounts in the main bundles. The non-zero amounts in these bundles are randomly selected to be $d^L$ cents, where $d^L \in \{30, 31, 32, 33, 34, 35, 36, 37, 38\}$ (for more details about these bundles, see Appendix Table A.2). These bundles were constructed so that the sum of each bundle was close to, but lower than, the sum of each *3/4-bundle* and each *3/5-bundle* (i.e., $3 \times d > 4 \times d^L$ for all $d$ and $d^L$). Thus, we call a participant non-monotonic if the participant chooses one or more $4^L$*/4-bundles* and fails to choose all of the *3/4-bundles* and *3/5-bundles*. While we could construct other measures of non-monotonic behavior, even among this set of 16 bundles, this measure seems particularly natural since it utilizes bundles designed to be close in sum to our main bundles but with significantly lower individual donation amounts.

Table 3: In the *Charity/Charity* and *Self/Self* versions of Study 1, regression of choosing a main bundle

| Sample: | full | | | choice varies | $X$ is lower bound |
|---|---|---|---|---|---|
| | main bundles (1) | if 4/4 baseline (2) | if 2/4 or 3/4 baseline (3) | main bundles (4) | main bundles (5) |
| **Panel A: *Charity/Charity* version** | | | | | |
| ($^{+}0$) | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| ($^{+}1$) | 0.28*** | 0.02 | 0.42*** | 0.29*** | 0.28*** |
| | (0.01) | (0.01) | (0.02) | (0.01) | (0.01) |
| N | 7164 | 2388 | 4776 | 7092 | 5832 |
| **Panel B: *Self/Self* version** | | | | | |
| ($^{+}0$) | -0.00 | 0.01 | -0.01 | -0.00 | -0.01 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| ($^{+}1$) | 0.29*** | 0.01 | 0.42*** | 0.29*** | 0.28*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| N | 7272 | 2424 | 4848 | 7128 | 5940 |
| **Panel C: *Self/Charity* version and *Charity/Charity* version** | | | | | |
| ($^{+}0$) | -0.06*** | -0.04*** | -0.07*** | -0.08*** | -0.07*** |
| | (0.01) | (0.02) | (0.01) | (0.01) | (0.01) |
| ($^{+}1$) | 0.11*** | 0.03** | 0.15*** | 0.14*** | 0.12*** |
| | (0.01) | (0.02) | (0.02) | (0.02) | (0.01) |
| *Charity/Charity**($^{+}0$) | 0.07*** | 0.06*** | 0.08*** | 0.09*** | 0.08*** |
| | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) |
| *Charity/Charity**($^{+}1$) | 0.17*** | -0.02 | 0.27*** | 0.15*** | 0.16*** |
| | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) |
| *Charity/Charity* | 0.03 | 0.15*** | -0.03 | 0.00 | 0.01 |
| | (0.03) | (0.03) | (0.03) | (0.02) | (0.03) |
| N | 14292 | 4764 | 9528 | 12708 | 11880 |
| $k_n * l_d$ FEs | yes | yes | yes | yes | yes |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the participant level and shown in parentheses. The results are from a linear probability model of whether a participant chose a main bundle in the *Charity/Charity* version of Study 1 (Panel A), in the *Self/Self (baseline)* version of Study 1 (Panel B), and in the *Charity/Self* version and *Charity/Charity* version of Study 1 (Panel C), following the specifications from Table 2. In Panel C, the specifications include an indicator labeled *Charity/Charity* for being in the *Charity/Charity* version as well as an interaction of this indicator with the other variables.

additional credence to the notion that they are using the additional zero as an excuse to be selfish. In a supplemental study, the *Calculation* study, participants are shown 12 of our main bundles (six *n/4-bundles* and the six *n/5-bundles* constructed from them) and are asked to report the sum of each bundle.[19] To incentivize accuracy, participants are told that one bundle will be randomly

[19]In October 2019, we recruited 100 participants from Amazon's Mechanical Turk to complete the *Calculation* study. Each participant received $3 for completing the 20-minute study as well as any additional bonus payments from one randomly selected decision. As with our other studies run in 2019, workers must have previously completed

selected and the participant will receive a 25-cent bonus if they correctly sum the amounts in that bundle. Nearly all calculations are accurate: 98% and 99% of the calculations involving the *n/4-bundles* and the *n/5-bundles*, respectively, are accurate (the one percentage point difference is not statistically significant). Participants are able to sum the bundles regardless of whether the bundle includes an additional 0.

## 2.4 Exploring Mechanisms: Decreasing the scope for confusion

In this section, we investigate whether we can reduce the prevalence of motivated errors by reducing the plausible scope for confusion or for calculation errors in the decision environment.[20] We specifically consider three changes to the decision environment in three additional study versions—the *Self/Charity (sum optional)*, *Self/Charity (sum shown)*, and *Self/Charity (sum unavoidable)* versions—that involve providing participants with information on the sum of the amounts in the bundle when making their choice, thus reducing the possibility of calculation errors or confusion. Table 4 presents the corresponding results; Column 1 reproduces results from the *Self/Charity* version for reference.

In the *Self/Charity (sum optional)* version, participants have the option to click a button to reveal the sum of the amounts in the bundle on the decision screen (see Panel B of Figure 4). As shown in Column 2 of Table 4, adding a zero to a bundle still statistically significantly decreases participants' willingness to choose a bundle by 3 percentage points in the *Self/Charity (sum optional)* version. However, this change to the decision environment proves somewhat effective at mitigating motivated errors: this 3 percentage point effect is significantly smaller ($p < 0.1$) than the 6 percentage point effect observed in the *Self/Charity* version.

Motivated errors may not be fully eliminated in the *Self/Charity (sum optional)* version because participants simply do not choose to click to reveal the sum and so can still appeal to the possibility of being confused about the sum. Indeed, participants in that version only clicked to reveal the sum 58% of the time. Thus, in an attempt to further reduce the scope for confusion about the sum, the *Self/Charity (sum shown)* version displays the sum on each decision screen (see Panel C of Figure 4). This change proves just as effective—but not more effective—at reducing motivated errors as the option to reveal the sum in the *Self/Charity (sum optional)* version. As shown in Column 3 of Table 4, adding a zero to a bundle still significantly decreases participants' willingness to choose a bundle by 3 percentage points. But, again, this 3 percentage point effect is significantly smaller ($p < 0.1$) than the 6 percentage point effect observed in the *Self/Charity* version.

It is possible that motivated errors are not eliminated in the *Self/Charity (sum shown)* version because participants can still appeal to the possibility of being confused or unaware of the sum, even though it is displayed on each decision screen (e.g., there is no guarantee the subject saw or

at least 100 HITs with a 95% or better approval rating and must have been working from a United States IP address.

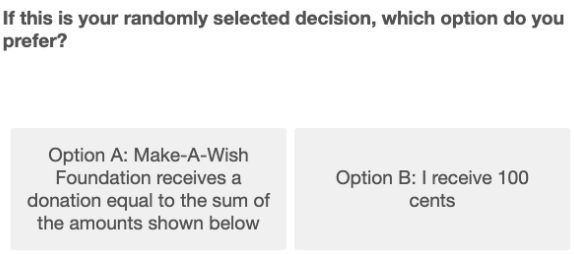
[20] We consider adjustments to the decision environment that are common debriasing strategies. For reviews, see Conlisk (1996); Rabin (1998); DellaVigna (2009); Madrian (2014); Gabaix (2017). For related examples, see List (2003); Chetty, Looney and Kroft (2009); Finkelstein (2009); Brocas et al. (2014); Hanna, Mullainathan and Schwartzstein (2014); Schwartzstein (2014); Taubinsky and Rees-Jones (Forthcoming); Enke (2017).

attended to the sum, even though it was shown). Thus, in the *Self/Charity (sum unavoidable)* version, we take steps to ensure that participants cannot appeal to the possibility of being unaware of, or confused about, the sum. In particular, we make the sum salient on the decision screen (see Panel D of Figure 4) and participants are required to correctly report the sum of the charity payoff before making the associated decision (see Appendix Figure B.9). This combination proves successful at eliminating motivated errors. In particular, as shown in Column 4 of Table 4, adding a zero to a bundle no longer statistically significantly influences participants' willingness to choose a bundle. The impact of adding a zero is 4 percentage points smaller ($p < 0.05$) in the *Self/Charity (sum unavoidable)* version than the 6 percentage point effect observed in the *Self/Charity* version.

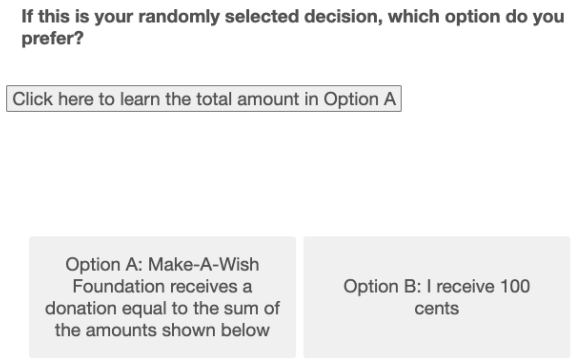
That only the *Self/Charity (sum unavoidable)* version succeeds at eliminating motivated errors indicates that individuals' ability to appeal to the possibility of being confused is rather difficult to constrain. We can only eliminate motivated errors when it is unambiguous to participants—and to the experimenter—that they know the sum (e.g., because they are required to accurately report it back as part of the study).

Figure 4: Example question faced by participants in the *Self/Charity*, *Self/Charity (sum optional)*, *Self/Charity (sum shown)*, and *Self/Charity (sum unavoidable)* versions, assuming $X = 100$

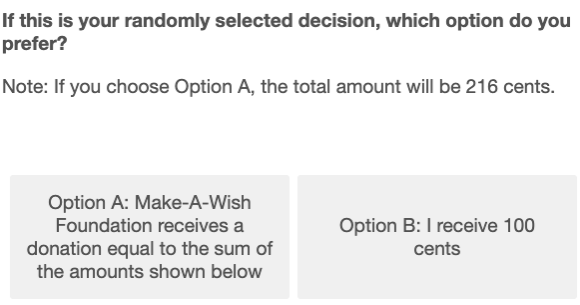
(a) *Self/Charity* version




(b) *Self/Charity (sum optional)* version




(c) *Self/Charity (sum shown)* version




(d) *Self/Charity (sum unavoidable)* version

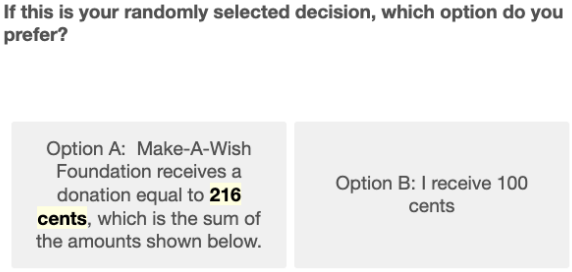


Table 4: In additional *Charity/Self* versions of Study 1, regression of choosing a main bundle

| Version: | Baseline | Sum Optional | Sum Shown | Sum Unavoidable |
|---|---|---|---|---|
| ($^{+}0$) | -0.06*** | -0.03** | -0.03*** | -0.02 |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| ($^{+}1$) | 0.11*** | 0.10*** | 0.11*** | 0.10*** |
| | (0.01) | (0.02) | (0.01) | (0.01) |
| N | 7128 | 7231 | 7416 | 6048 |
| $k_n * l_d$ FEs | yes | yes | yes | yes |

$^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$. Standard errors are clustered at the participant level and shown in parentheses. The results are from a linear probability model of whether a participant chose a main bundle in the noted version of Study 1, following the specification in Column (1) of Table 2 .

## 2.5 Exploring Mechanisms: Additional results on information avoidance

In all of the study versions discussed so far, participants had to reveal all of the amounts in a bundle before making a decision. Thus, while participants could appeal to not knowing the sum (i.e., due to inattention or confusion), participants could *not* appeal to lacking the information necessary to determine the sum. In this way, while conceptually similar, the evidence for motivated errors that we observe is different than work on information avoidance in which—as in Dana, Weber and Kuang (2007) and the rich literature that followed it (Larson and Capra, 2009; Matthey and Regner, 2011; Conrads and Irlenbusch, 2013; Feiler, 2014; Grossman, 2014; van der Weele et al., 2014; Exley and Petrie, 2018; Serra-Garcia and Szech, 2019)—participants can avoid information and then appeal to not having the necessary information to determine the payoff consequences of their decisions.[21]

So that we can directly investigate excuses relating to information avoidance—and so that we can observe whether motivated errors arise when participants can also engage in information avoidance—we next turn to the results from the *Self/Charity (summands optional)* version. As described above, in the *Self/Charity (summands optional)* version, the first amount in a bundle is revealed by default but participants do not need to reveal the other three or four amounts before making a choice about the bundle.

When given the option, participants frequently engage in information avoidance. Across all 48 bundles, participants only choose to reveal any additional information 56% of the time, and they only fully reveal all the amounts in a bundle 45% of the time. Interestingly, there is no evidence that participants are more likely to avoid information when the first amount in a bundle (which is

[21]There is also related theoretical work (Nyborg, 2011; Grossman and van der Weele, 2017; Golman, Hagmann and Loewenstein, 2017) and similar findings involving other contexts (Bartoš et al., 2016; Freddi, 2018). See also the closely-related literature on motivated avoidance of prosocial asks (Jacobsen et al., 2011; DellaVigna, List and Malmendier, 2012; Lazear, Malmendier and Weber, 2012; Kamdar et al., 2015; Trachtman et al., 2015; Andreoni, Rao and Trachtman, 2016; Lin, Schaumberg and Reich, 2016).

always revealed by default) is zero.[22]

That said, consistent with individuals exploiting information avoidance as an excuse—and consistent with evidence on information avoidance from prior literature—we find evidence of information avoidance facilitating more selfish decisions.[23] When we consider "high donation" bundles (i.e., bundles with a sum of more than 150 cents, so information is likely to encourage giving), participants who can avoid information are 10 percentage points less likely to choose the bundle ($p < 0.05$) than participants who are forced to fully reveal information (in the *Self/Charity* version). However, information avoidance does not always facilitate more selfish behavior. When we instead consider "low donation" bundles (i.e., bundles with a sum of less than 150 cents, so information is likely to discourage giving), the ability to avoid information directionally reduces giving by only 2 percentage points and this reduction is not statistically significant ($p = 0.57$).[24] This finding suggests that in settings where there is uncertainty about whether revealing information will encourage or discourage giving, information avoidance may backfire as a strategy to behave selfishly.

Regardless of whether information avoidance induces more selfish behavior, it could be that individuals looking for an excuse to be selfish will do so by avoiding information when that is an option. This would imply that individuals who fully revealed all the amounts in a bundle—when they could have instead avoided them—would not be seeking excuses. If this were the case, then we would no longer expect evidence for motivated errors among individuals who fully reveal information. The results in Table 5 show that this is not the case. The table replicates the structure of Table 2 but restricts to the decisions from the *Self/Charity (summands optional)* version in which participants choose to fully reveal information on all amounts in a bundle—and thus decisions in which individuals do not exploit information avoidance as an excuse. Among this group of decisions, the evidence for motivated errors proves very robust.

Consequently, while one could have thought that motivated errors only arise among participants who would have exploited information avoidance as an excuse if given the opportunity to do so, our results show that while individuals often appear to avoid information as an excuse, individuals also appear keen to acquire full information on the payoff consequence of their actions and then to act

[22] Among the one-quarter of bundles in which the first amount is a zero, subjects reveal at least one additional amount in the bundle 62% of the time and all amounts in the bundle 47% of the time. Among the three-quarter of bundles in which the first amount is *not* a zero, these rates are even lower: subjects reveal at least one additional amount 54% of the time and all amounts 44% of the time. In contrast, one could have imagined that participants would use the first summand being zero as an excuse not to reveal the remaining amounts and as an excuse not to choose the bundle.

[23] To further test motivated information avoidance, we also did a second run of the *Self/Charity (summands optional)* version alongside a run of the *Charity/Charity (summands optional)* version. In doing so, we find that participants are significantly more likely to avoid information when there are selfish motives to do so. Across all 48 bundles, participants reveal all amounts in a bundle only 37% of the bundles in the *Self/Charity (summands optional)* version but instead 54% of the time in *Charity/Charity (summands optional)* version ($p < 0.01$). This comparison is related to the exploration of the role of image concerns in the classic moral wiggle room experiment conducted in Exley and Kessler (2021).

[24] While these findings are in similar in spirit to Spiekermann and Weiss (2016), since they also examine information that may encourage or discourage giving, our findings differ in that participants cannot ex-ante know whether information is likely to encourage or discourage giving.

as if they are confused about that information as an excuse to be selfish.

Table 5: In the *Self/Charity (summands optional)* version of Study 1, regression of choosing a main bundle when full information on payoffs is acquired

| | main bundles (1) | if 4/4 baseline (2) | if 2/4 or 3/4 baseline (3) | main bundles (4) | main bundles (5) |
|---|---|---|---|---|---|
| $(^{+}0)$ | -0.11*** | -0.06** | -0.13*** | -0.12*** | -0.11*** |
| | (0.02) | (0.03) | (0.03) | (0.02) | (0.02) |
| $(^{+}1)$ | 0.13*** | -0.02 | 0.19*** | 0.13*** | 0.12*** |
| | (0.02) | (0.02) | (0.03) | (0.02) | (0.02) |
| Constant | 0.86*** | 0.90*** | 0.76*** | 0.74*** | 0.84*** |
| | (0.04) | (0.04) | (0.05) | (0.08) | (0.10) |
| N | 3081 | 973 | 2108 | 2902 | 2945 |
| $k_n * l_d$ FEs | yes | yes | yes | yes | yes |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the participant level and shown in parentheses. The results are from a linear probability model of whether a participant chose a main bundle—conditional on fully revealing all information on the payoffs in the bundle—in the *Self/Charity (summands optional)* version of Study 1, following the specifications from Table 2.

# 3 Study 2: Correlation Neglect

In Study 2, participants make motivated errors in response to correlated information. First, we show that when providing beliefs about an unknown state of the world, participants display correlation neglect; they fail to account for signals about the state being correlated. When a high signal is correlated with the other signals participants see, their estimate of the state is too high; when a low signal is correlated with the other signals participants see, their estimate of the state is too low. Second, we introduce a selfish motive for individuals to display more correlation neglect—or to display less correlation neglect—as an excuse to be selfish. We find that the introduction of these selfish motives can exacerbate—or mitigate—the amount of correlation neglect that subjects appear to display.

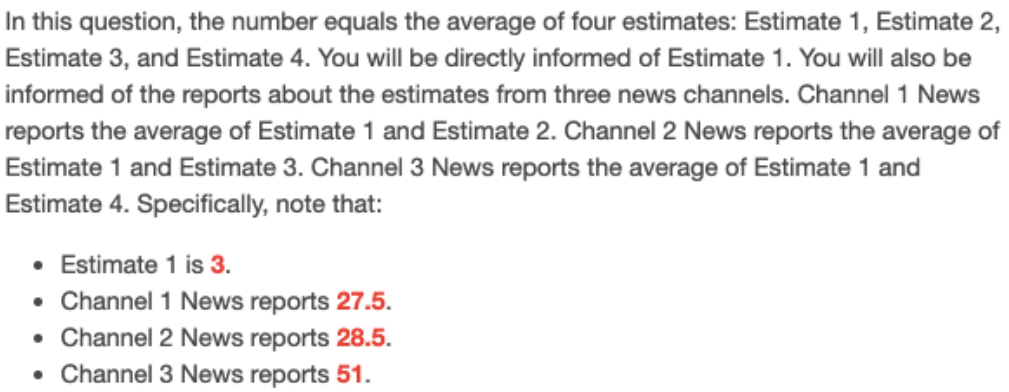
## 3.1 Correlation Neglect Experimental Design

A total of 1,200 individuals participated in one of three versions of Study 2.[25] Each participant received $3.50 for completing the 20-minute study. In addition, one randomly selected decision for each participant was implemented for bonus payment and resulted in an additional payment for the participant and/or a donation to charity. As with Study 1, while social image concerns are likely muted given the degree of anonymity in this online setting, participants may desire to justify selfish behavior to themselves or to the experimenter.

[25]In July 2021, we recruited and randomized 1,200 participants from MTurk into one of three study versions. See the note of Table 1 for details on eligibility conditions, which also applied to Study 2. Full instructions for Study 2 can be found in Appendix B.2.

The Correlation Neglect study involves two parts. In Part 1, all subjects complete the same calibration procedure as in Study 1 to elicit a value $X$ such that each participant is indifferent between $X$ cents for themselves and 150 cents for charity. In Part 2, building off of the design in Enke and Zimmermann (2019), after receiving instructions and correctly completing understanding questions, participants answer 10 questions in which they are asked to predict a number when information on the number is presented in a correlated way. In particular, subjects are asked to predict a number that equals the average of four estimates: Estimate 1, Estimate 2, Estimate 3, and Estimate 4. They are asked about their prediction using a slider that selects a range of answers on the support of 0 to 100. Prior to making this prediction, subjects are directly informed of Estimate 1 and are informed of the average of Estimates 1 and 2 (as the output of "Channel 1 News"), the average of Estimates 1 and 3 (as the output of "Channel 2 News"), and the average of the Estimates 1 and 3 (as the output of "Channel 3 News"). Figure 5 shows an example of how the correlated information is presented to subjects.

Figure 5: Example of How Correlated Information is Presented




For five of the 10 questions (i.e., the odd-numbered questions in Table 6), Estimate 1 is the smallest of the four estimates; we call these the *Low Estimate 1* questions. For the other five questions (i.e., the even-numbered questions in Table 6), Estimate 1 is the largest of the four estimates; we call these the *High Estimate 1* questions. To cleanly test for the impact of a Low Estimate 1 versus a High Estimate 1, the questions were formulated as pairs. Both questions in a pair (e.g., Q1 & Q2) have the same set of four estimates, and thus the same correct answer, but they either use the lowest estimate as Estimate 1 (as in Q1), so correlation neglect would pull responses down, or the highest estimate as Estimate 1 (as in Q2), so correlation neglect would pull responses up. To identify correlation neglect we can assess whether subjects underestimate the number in the *Low Estimate 1* questions and whether they overestimate the number in the *High Estimate 1* questions. We can also identify the extent of correlation neglect by comparing responses in the *Low*

*Estimate 1* questions to responses in the corresponding *High Estimate 1* questions, which allows us to measure the difference in subjects' responses when the (same) information is presented such that correlation neglect pulls the estimate down rather than up.

Table 6: Questions in the Correlation Neglect study

| Q# | Correct Answer | Correlated Answer | Estimate: 1 | 2 | 3 | 4 | News Channel: 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 50 | 29 | 8 | 40 | 59 | 93 | 24 | 33.5 | 50.5 |
| 2 | 50 | 71.5 | 93 | 8 | 40 | 59 | 50.5 | 66.5 | 76 |
| 3 | 47 | 24.5 | 2 | 43 | 50 | 93 | 22.5 | 26 | 47.5 |
| 4 | 47 | 70 | 93 | 2 | 43 | 50 | 47.5 | 68 | 71.5 |
| 5 | 54 | 29 | 4 | 59 | 55 | 98 | 31.5 | 29.5 | 51 |
| 6 | 54 | 76 | 98 | 4 | 59 | 55 | 51 | 78.5 | 76.5 |
| 7 | 49 | 27 | 5 | 51 | 48 | 92 | 28 | 26.5 | 48.5 |
| 8 | 49 | 70.5 | 92 | 5 | 51 | 48 | 48.5 | 71.5 | 70 |
| 9 | 52 | 27.5 | 3 | 52 | 54 | 99 | 27.5 | 28.5 | 51 |
| 10 | 52 | 75.5 | 99 | 3 | 52 | 54 | 51 | 75.5 | 76.5 |

Table shows the estimates and the reports of the news channels for each of the 10 questions in Study 2. The questions are constructed in pairs with the same correct answer but a different Estimate 1, which is then averaged with the other estimates to generate the news channel reports. The "Correlated Answer" column shows the average of Estimate 1 and the reports of the three news channels (i.e., what an agent would guess if they fully ignored the correlated nature of the information and treated each signal as fully independent). Each participant sees these 10 questions in a randomized order.

Subjects answer these 10 questions in one of three treatments: the *Control* condition, the *Underestimate* treatment, or the *Overestimate* treatment. In the *Control* condition, the charity always receives 150 cents, regardless of whether the participant provides an underestimate (i.e., selects a range that is too low), provides an overestimate (i.e., selects a range that is too high), or provides a correct answer (i.e., selects a range that includes the true number). In addition, the participant receives $X$ cents if they provide a correct answer, giving them a private incentive to provide a correct answer. In the *Underestimate* treatment, we replace the payment associated with underestimating to be a bonus of $X$ cents for the subject, rather than 150 cents for charity. Equivalently, in the *Overestimate* treatment, we replace the payment associated with overestimating to be a bonus of $X$ cents for the subject, rather than 150 cents for charity. Since the $X$ is calibrated to be equivalently valued to the charity receiving 150 cents, the *Underestimate* and *Overestimate* treatments hold stakes constant but each provides a self-serving incentive to make an error in a certain direction.

Combining this treatment variation with variation in whether Estimate 1 is high or low allows us to explore cases where selfish motives should exacerbate correlation neglect (e.g., *Low Estimate 1* questions in the *Underestimate* treatment and *High Estimate 1* questions in the *Overestimate* treatment) and cases where selfish motives should mitigate correlation neglect (e.g., *Low Estimate 1* questions in the *Overestimate* treatment and *High Estimate 1* questions in the *Underestimate*

treatment). This design allows us to compare the extent of correlation neglect in the *Control* condition to the extent of correlation neglect in these other cases.

## 3.2 Correlation Neglect Results

Table 7 presents regression results about the size of the errors participants make (where error is defined as the midpoint of the participant's range on the slider minus the correct answer for that question, which allows us to analyze data from questions with different correct answers in the same regression). The regressions include fixed effects for each pair of questions and estimate the impact of being a *Low Estimate 1* question. Since *High Estimate 1* is the excluded group, the regression estimates the extent to which participants respond to correlation neglect by comparing how they answer when correlation neglect pulls their answer down versus when correlation neglect pulls their answer up.

Column 1 presents results from the *Control* condition. The suppressed fixed effects indicate that participants significantly overestimate the answer when the question involves a High Estimate 1. The coefficient estimates on the indicator for it being a *Low Estimate 1* question shows that participants provide significantly lower answers—by an average of 19.50—when the question involves a Low Estimate 1 rather than a High Estimate 1. Consistent with correlation neglect, participants provide answers that are substantially lower (nearly 20 points lower on a 0–100 support) when Estimate 1 is low rather than high. This pattern is also evident in Panel A of Figure 6, which shows the distributions of the errors in the *Control* condition.[26]

Column 2 presents results from the same specification as Column 1 but looking at cases when selfish motives are expected to *exacerbate* correlation neglect. This arises when participants in the *Overestimate* treatment answer a *High Estimate 1* question and when participants in the *Underestimate* treatment answer a *Low Estimate 1* question. In these cases, selfish motives and correlation neglect push answers in the same direction. The coefficient estimate on the indicator for *Low Estimate 1* shows that in these cases, participants provide significantly lower answers—by an average of 24.81—when the question involves a Low Estimate 1. A t-test shows that this difference is statistically significantly larger ($p < 0.01$) than the 19.50 difference observed in the *Control* condition. This comparison reveals that selfish motives can exacerbate the impact of correlation neglect, which is also evident by comparing Panel B to Panel A in Figure 6.

Column 3 presents results from the same specification as Column 1 when selfish motives are expected to *mitigate* correlation neglect. This arises when participants in the *Overestimate* treatment answer a *Low Estimate 1* question and when participants in the *Underestimate* treatment answer a *High Estimate 1* question. In these cases, selfish motives and correlation neglect push in opposite directions, so selfish motives should lead participants to be less responsive to correlation neglect. The coefficient estimate on the indicator for *Low Estimate 1* shows that participants still provide

[26] Appendix Table A.6 provides an alternative specification that reports the extent to which subjects overestimate the truth in *High Estimate 1* questions, reported as the coefficient on *High Bias* in Column 1, and how much they underestimate the truth in *Low Estimate 1* questions, reported as the coefficient on *Low Bias* in Column 1.

Table 7: Regression of errors in the Correlation Neglect study

| Sample: | Control | When Selfish Motives Should Exacerbate Bias | When Selfish Motives Should Mitigate Bias | All |
|---|---|---|---|---|
| | (1) | (2) | (3) | |
| *Low Estimate 1* | -19.50*** | -24.81*** | -7.70*** | -19.50*** |
| | (1.03) | (1.37) | (1.43) | (1.03) |
| *Low Estimate 1*Exacerbate Bias* | | | | -5.30*** |
| | | | | (1.71) |
| *Low Estimate 1*Mitigate Bias* | | | | 11.80*** |
| | | | | (1.76) |
| N | 4080 | 3960 | 3960 | 12000 |
| Question Pair FEs | yes | yes | yes | yes |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the participant level and shown in parentheses. The results are from an OLS regression of the true answer to a question minus the answer provided by a participant in that question (i.e., the "error") in the Correlation Neglect study. *Low Estimate 1* is an indicator for questions with a Low Estimate 1 (i.e., the odd-numbered questions in Table 6). *Exacerbate Bias* is an indicator for questions in which selfish motives are expected to exacerbate correlation neglect (i.e., the questions with a Low Estimate 1 in the *Underestimate* treatment and questions with a High Estimate 1 in the *Overestimate* treatment). *Mitigate Bias* is an indicator for questions in which selfish motives are expected to mitigate correlation neglect (i.e., the questions with a High Estimate 1 in the *Underestimate* treatment and questions with a Low Estimate 1 in the *Overestimate* treatment). Column 1 analyzes answers from the Control condition, Column 2 analyzes when *Exacerbate Bias* = 1, Column 3 analyzes when *Mitigate Bias* = 1, and Column 4 analyzes all answers. In Columns 1–3, there are five fixed effects, one for each pair of questions in Table 6. In Column 4, there are 15 fixed effects resulting from those five question-pair fixed effects crossed by whether the answer was elicited (i) in the Control condition, (ii) when *Exacerbate Bias* = 1, and (iii) when *Mitigate Bias* = 1.

significantly lower answers—by an average of 7.70—when the question involves a Low Estimate 1. But a t-test shows that this difference is statistically significantly smaller ($p < 0.01$) than the 19.50 difference observed in the *Control* condition. This comparison reveals that selfish motives can mitigate the impact of correlation neglect, which is also evident by comparing Panel C to Panel A in Figure 6.

Column 4 presents results when pooling across all data reported in Columns 1–3 and confirms the statistical significance of the impact of selfish motives exacerbating or mitigating errors. Appendix Table A.4 reproduces the results from Column 4 in Table 7 as Column 1 and then presents a series of robustness checks that build off of that specification. Our findings prove robust. In each of the Columns 2–9 of Appendix Table A.4, the coefficient on *Low Estimate 1* is negative and significant, demonstrating evidence of correlation neglect in the *Control* condition. In addition, in each of the columns, the coefficient on *Low Estimate 1*Exacerbate Bias* is negative and significant, showing that selfish motives can exacerbate correlation neglect, and the coefficient on *Low Estimate 1*Mitigate Bias* is positive and significant, showing that selfish motives can mitigate correlation neglect. Columns 2–6 show that the results are robust to separately considering each pair of questions. Column 7 shows that the results are robust to excluding participants with an outside

Figure 6: CDFs of Errors in Correlation Neglect Study

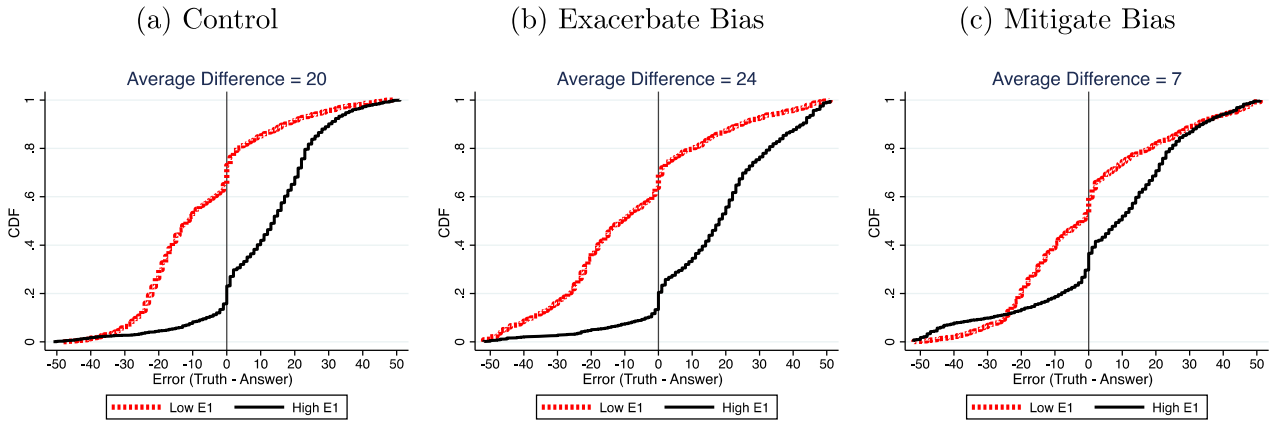



Figure shows CDFs of errors (the true answer to a question minus the answer provided by a participant in that question) in the Correlation Neglect Study. *Low E1* refers to questions with a Low Estimate 1 (i.e., the odd-numbered questions in Table 6). *High E1* refers to questions with a High Estimate 1 (i.e., the even-numbered questions in Table 6).

option that could be less than 5 cents or could be more than 150 cents.[27] Columns 8 and 9 show the results are robust to considering only the first five, or only the last five, questions participants answer, respectively.

# 4 Study 3A and 3B: Anchoring

In Studies 3A and 3B, subjects make motivated errors in response to anchoring manipulations (for seminal examples of anchoring, see Tversky and Kahneman (1974) and Ariely, Loewenstein and Prelec (2003); for a recent meta-study, see Ioannidis, Offerman and Sloof (2020)). First, we show that when guessing answers to difficult knowledge-based question, participants' answers are influenced by whether a random anchor is high or low. When the random anchor is high, responses are pulled up; when the random anchor is low, responses are pulled down (i.e., evidence of an assimilation effect). Second, we introduce a selfish motive for individuals to display more of an anchoring bias—or to display less of an anchoring bias—as an excuse to be selfish. We find that the introduction of these selfish motives can exacerbate—or mitigate—the amount of anchoring bias that subjects appear to display.

## 4.1 Anchoring Experimental Designs

A total of 1,195 individuals participated in one of three versions of Study 3A and another 1,192 individuals participated in one of the three versions of Study 3B.[28] Each participant received $2 for

[27] This is a stricter exclusion criteria than the robustness check in Column 5 of Table 2, since the direction of the bias that results from overestimating or underestimating $X$ is less clear in the Correlation Neglect study.

[28] Participants were recruited and randomized into one of the three study versions for Study 3A in December 2021 and for Study 3B in January 2022. See the notes of Table 1 for details on eligibility conditions, which also applied to Studies 3A and 3B. Full instructions for Study 3A and Study 3B can be found in Appendices B.3 and B.4, respectively.

completing the 10-minute study. In addition, one randomly selected decision for each participant was implemented for bonus payment and resulted in an additional payment for the participant and/or a donation to charity. As with the prior studies, while social image concerns are likely muted given the degree of anonymity in this online setting, participants may desire to justify selfish behavior to themselves or to the experimenter.

The anchoring studies followed the same structure as Study 2 in a very similar paradigm. In Part 1, all subjects complete the same calibration procedure as is used in Study 1 and Study 2 to elicit a value $X$ such that the participant is indifferent between $X$ cents for themselves and 150 cents for charity. In Part 2, building off of the design in Enke et al. (Forthcoming), after receiving instructions and correctly completing understanding questions, participants respond to four questions in which they are asked to guess an answer after being provided with a random, uninformative low or high anchor.[29] As shown in Appendices B.3 and B.4, we use the same four questions as Enke et al. (Forthcoming), which asks trivia questions about (1) how many minutes it takes for light to travel from the sun to Jupiter, (2) how many days it took to complete the first airplane trip across the continental US, (3) the number of millions of people living in Uzbekistan, and (4) the weight (in hundred of tons) of the Eiffel tower. Participants are able to select answers from the support of 0 to 100 using a slider that selects a range of answers.

We use two different anchoring manipulations in Studies 3A and 3B. In Study 3A, participants are first asked to consider whether the answer is above or below a number. Participants are told that this number (i.e., the anchor) is randomly selected to be either 20 or 80. Then, participants are asked to select their precise answer to the question on a slider from 0 to 100, and the default answer on the slider is set to the anchor. Participants have 15 seconds to answer each question and are told that the default answer will be implemented if they do not select a different answer themselves.

In Study 3B, participants are first asked whether the answer is above or below a number. As in Study 3A, participants are told that this number (i.e., the anchor) is randomly selected to be either 20 or 80. In Study 3B, however, participants must provide an answer (i.e., they must guess whether the answer to the question is above or below the anchor). Then, participants are asked to select the answer on a slider from 0 to 100 with the default position of the slider set to the midpoint of the support (i.e., to 50 out of 100). Participants are given as much time as they would like to answer the question, and they are required to answer this question to continue with the study.

To summarize, the main difference between the two anchoring manipulations is as follows. Study 3A provides a visual anchor (since the slider is set to the anchor) and the anchor is an explicit default (since the anchor is implemented in the event that a participant does not answer the question within

[29]Since the meta-study in Ioannidis, Offerman and Sloof (2020) reveals that uninformative anchors do not always result in an anchoring bias, we closely followed the decision context of Enke et al. (Forthcoming) in which an anchoring bias is known to induce an assimilation effect (rather than a contrast effect). For a discussion of the differences between assimilation and contrast effects, see Herr, Sherman and Fazio (1983) and Bordalo, Gennaioli and Shleifer (2017).

the designated time). By contrast, Study 3B does not provide a visual anchor or use a default and instead requires participants to answer the anchoring question before providing a precise answer to the main question that determines payoffs. We provided a time limit in Study 3A to discourage participants from trying to search online for the correct answer to the question. The time limit required us to have a default answer to implement if the participant did not make a choice within the designated time. We ran Study 3B to more closely follow the procedures in Enke et al. (Forthcoming) and to investigate a setting in which the anchor was not the default answer. Despite some mild cause for concern that subjects might search for correct answers online in Study 3B (answers are correct only 5% of the time in the Study 3A but are correct 13% of the time in Study 3B), results are very similar and are quite robust across both studies.

Following the design of Study 2, participants in Study 3A and Study 3B are randomly assigned to a *Control* treatment, an *Underestimate* treatment, or an *Overestimate* treatment. Following Enke et al. (Forthcoming), answers are considered right if they are no more than 2 different from the truth. The payoffs from providing an answer that is correct, is too low, or is too high depend on treatment in exactly the same way as detailed in Study 2 (see Section 3.1).

## 4.2 Anchoring Results

Table 8 presents regression results about the size of the errors participants make (where error is defined as the midpoint of the participant's range on the slider minus the correct answer for that question, which allows us to analyze data from questions with different correct answers in the same regression). Panel A shows the results from Study 3A and Panel B shows the results from Study 3B. The regressions include fixed effects for each question and estimate the impact of having a *Low Anchor* for that question. Since *High Anchor* is the excluded group, the regression estimates the extent of anchoring bias participants display by comparing how they answer when the anchor pulls their answer down versus when the anchor pulls it up.

Column 1 presents results from the *Control* condition. The negative coefficient estimates on *Low Anchor* reveal that participants provide significantly lower answers—by an average of 19.93 in Study 3A and an average of 14.35 in Study 3B—when the question involves a low anchor rather than a high anchor, clear evidence of an anchoring bias. This pattern is also evident in Panel A of Figures 7 and 8, which show the distributions of the errors in the *Control* condition for each study.[30]

Following the structure of Table 7, Column 2 of Table 8 presents results from the same specification as Column 1 but looking at cases when selfish motives are expected to *exacerbate* anchoring bias. This arises when participants in the *Overestimate* treatment face a high anchor and when participants in the *Underestimate* treatment face a low anchor. In these cases, selfish motives and

[30] Appendix Table A.6 provides an alternative specification that reports the extent to which subjects overestimate the truth when facing a high anchor, reported as the coefficient on *High Bias* in Columns 2 and 3 (for Study 3A and 3B, respectively). In these studies, subjects still overestimate the truth on average when facing a low anchor (as can be seen from the positive coefficient on *Low Bias* in Columns 2 and 3), although as shown in Table 8, the extent of the overestimate is dramatically reduced when the anchor is low.

anchoring bias push answers in the same direction. The coefficient estimate on the indicator for *Low Anchor* shows that in these cases, participants provide significantly lower answers—by an average of 27.91 in Study 3A and 21.36 in Study 3B—when they face a low anchor rather than a high anchor. T-tests show that these differences are statistically significantly larger ($p < 0.01$) than the corresponding differences observed in the *Control* condition. These comparisons reveal that selfish motives can exacerbate the impact of anchoring bias, which is also evident by comparing Panel B to Panel A in Figures 7 and 8.

Column 3 presents results from the same specification as Column 1 when selfish motives are expected to *mitigate* anchoring bias. This arises when participants in the *Overestimate* treatment face a low anchor and when participants in the *Underestimate* treatment face a high anchor. In these cases, selfish motives and anchoring bias push in opposite directions, so selfish motives should lead participants to be less responsive to the anchor. The coefficient estimate on the indicator for *Low Anchor* shows that participants still provide significantly lower answers—by an average of 9.11 in Study 3A and 5.01 in Study 3B—when the question involves a low anchor rather than a high anchor. T-tests show that these differences are statistically significantly smaller ($p < 0.01$) than the corresponding differences observed in the *Control* condition. These comparisons reveal that selfish motives can mitigate the impact of anchoring bias, which is also evident by comparing Panel C to Panel A in Figures 7 and 8.

Column 4 presents results when pooling across all data reported in Columns 1–3 and confirms the statistical significance of the impact of selfish motives exacerbating or mitigating anchoring bias. Appendix Table A.5 presents the same set of robustness checks as those shown in Appendix Table A.4. Results from Study 3A are shown in Panel A and results from Study 3B are shown in Panel B. Our findings prove robust. In each of the Columns 2–8 of Appendix Table A.4, the coefficient on *Low Anchor* is negative and significant, demonstrating evidence of anchoring in the *Control* condition. In addition, in nearly all of the regressions, the coefficient on *Low Anchor*Exacerbate Bias* is negative and significant, showing that selfish motives can exacerbate the anchoring bias.[31] In addition, in all of the regressions, the coefficient on *Low Anchor*Mitigate Bias* is positive and significant, showing that selfish motives can mitigate correlation neglect. Columns 2–5 show that the results are robust to separately considering each question. Column 6 shows that the results are robust to excluding participants with an outside option that could be less than 5 cents or could be more than 150 cents. Columns 7 and 8 show that the results are robust to considering only the first two, or only the last two, questions participants answer, respectively.

[31]The three coefficient estimates that are not statistically significant are directionally negative and arise in cases where we are investigating a subset of our data.

Table 8: Regression of errors in the Anchoring studies

| Sample: | Control | When Selfish Motives Should | | All |
|---|---|---|---|---|
| | | Exacerbate Bias | Mitigate Bias | |
| | (1) | (2) | (3) | |
| **Panel A: Anchoring Study 3A** | | | | |
| *Low Anchor* | -19.93*** | -27.91*** | -9.11*** | -19.93*** |
| | (1.47) | (1.61) | (1.79) | (1.47) |
| *Low Anchor*Exacerbate Bias* | | | | -7.98*** |
| | | | | (2.18) |
| *Low Anchor*Mitigate Bias* | | | | 10.82*** |
| | | | | (2.32) |
| N | 1592 | 1588 | 1600 | 4780 |
| **Panel B: Anchoring Study 3B** | | | | |
| *Low Anchor* | -14.35*** | -21.36*** | -5.01*** | -14.35*** |
| | (1.52) | (1.96) | (1.94) | (1.52) |
| *Low Anchor*Exacerbate Bias* | | | | -7.01*** |
| | | | | (2.48) |
| *Low Anchor*Mitigate Bias* | | | | 9.34*** |
| | | | | (2.46) |
| N | 1584 | 1618 | 1562 | 4764 |
| Question FEs | yes | yes | yes | yes |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the participant level and shown in parentheses. The results are from OLS regressions of the true answer to a question minus the answer provided by a participant in that question (i.e., the "error") in Anchoring Study 3A in Panel A and in Anchoring Study 3B in Panel B. *Low Anchor* is an indicator for questions with a low anchor. *Exacerbate Bias* is an indicator for questions in which selfish motives are expected to exacerbate the anchoring bias (i.e., for the questions with low anchors in the *Underestimate* treatment and questions with high anchors in the *Overestimate* treatment). *Mitigate Bias* is an indicator for questions in which selfish motives are expected to mitigate the anchoring bias (i.e., for the questions with high anchors in the *Underestimate* treatment and questions with low anchors in the *Overestimate* treatment). Column 1 analyzes answers from the Control condition, Column 2 analyzes when *Exacerbate Bias* = 1, Column 3 analyzes when *Mitigate Bias* = 1, and Column 4 analyzes all answers. In Columns 1–3, there are four fixed effects, one for each of the four questions. In Column 4, there are 12 fixed effects resulting from those four question fixed effects crossed by whether the answer was elicited (i) in the Control condition, (ii) when *Exacerbate Bias* = 1, and (iii) when *Mitigate Bias* = 1.

Figure 7: CDFs of Errors in Anchoring Study 3A

(a) Control (b) Exacerbate Bias (c) Mitigate Bias

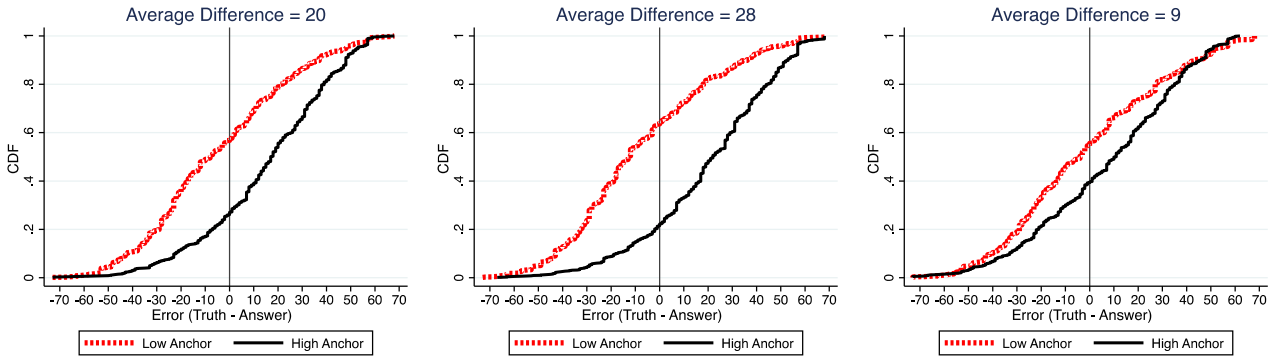



Figure shows CDFs of errors (the true answer to a question minus the answer provided by a participant in that question) in the Anchoring Study 3A. *Low Anchor* refers to questions with a Low Anchor. *High Anchor* refers to questions with a High Anchor.

Figure 8: CDFs of Errors in Anchoring Study 3B

(a) Control (b) Exacerbate Bias (c) Mitigate Bias

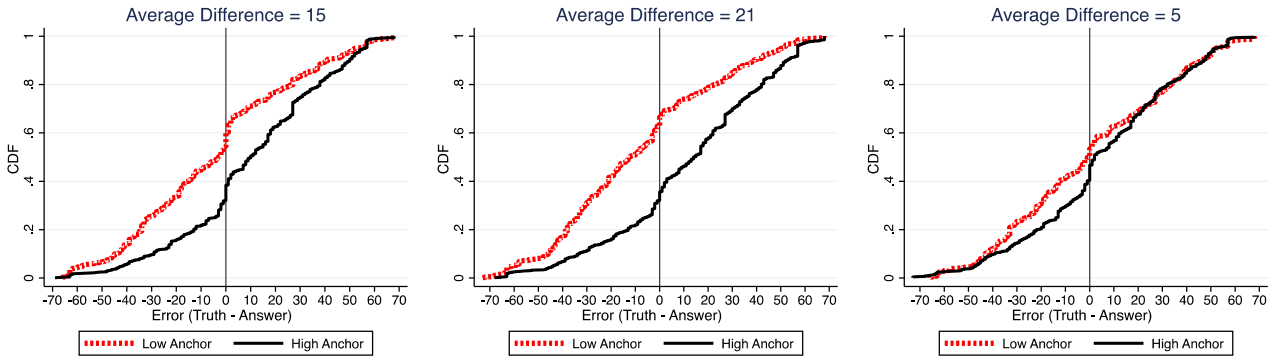



Figure shows CDFs of errors (the true answer to a question minus the answer provided by a participant in that question) in the Anchoring Study 3B. *Low Anchor* refers to questions with a Low Anchor. *High Anchor* refers to questions with a High Anchor.

# 5 Conclusion

Across three studies involving over 5,000 participants, we provide evidence consistent with individuals making motivated errors: they make errors when doing so can serve as an excuse for more selfish behavior. We show that selfish motives can generate behavior that looks like it is driven by cognitive limitations or a behavioral bias, such as subjects behaving as if adding a zero reduces a sum when doing so gives them an excuse to keep money for themselves rather than giving it to charity (as in Study 1). An exploration of this behavior suggests it is driven by the ability to act confused; it is eliminated when the environment dramatically mitigates the possibility of confusion about the amount of money in the sum. In addition, we show that in the presence of actual cognitive limitations or behavioral biases, selfish motives can exacerbate or mitigate correlation neglect (as in Study 2) and anchoring biases (as in Studies 3A and 3B), depending on whether the selfish motive is aligned or unaligned with the underlying limitation or bias.

In light of our results, we make several observations that may be informative for future work. First, since social image concerns are rather muted in our studies (i.e., participants are anonymous and do not interact with the experimenter in person), an interesting open question is how motivated errors operate in environments with heightened observability. On one hand, observability may mitigate some types of motivated errors if, for example, it is harder for individuals to rationalize decisions by acting confused when they are observed directly (e.g., if they have to act as is they are confused rather than just making choices consistent with confusion).[32] In simple environments, individuals may be concerned about observers pointing out the implausibility of confusion as an excuse. On the other hand, however, observability may exacerbate motivated errors since individuals may have an increased desire to rationalize their decisions to others and so may make motivated errors rather than engaging in obvious selfishness.[33]

Second, since motivated errors prove difficult to eliminate in even simple decision environments (e.g., they persist even when individuals are told the sum in Study 1), there is a clear need for more work on techniques aimed at reducing motivated errors. Related to work on the role of cognitive dissonance (Babcock et al., 1995; Haisley and Weber, 2010; Gneezy et al., 2020; Gneezy, Saccardo and van Veldhuizen, 2018), one approach may be to make motivated errors more salient to individuals by juxtaposing them with the lack of errors when agents are not motivated.

Third, since we observe that motivated errors can both exacerbate and mitigate correlation neglect and anchoring biases, future work may examine whether motivated errors influence other well-established behavioral biases and cognitive limitations, such as those relating to base-rate neglect, confirmation bias, and the gambler's fallacy. Future work may also investigate the extent

[32]That said, just as individuals often deceive others to achieve more self-serving outcomes (Gneezy, 2005; Shalvi et al., 2011; Shalvi, Eldar and Bereby-Meyer, 2012; Gino and Ariely, 2012; Gino, Ayal and Ariely, 2013; Pittarello et al., 2015; Bicchieri and Dimant, 2018), individuals may succeed at deceiving others about the drivers of their behavior.

[33]For related work, see Foerster and van der Weele (2018*b*).

to which the level of complexity influences the scope for motivated errors.[34] Indeed, we view such work as important because, as hypothesized in Bénabou and Tirole (2016), self-serving motives may contribute to behavior and beliefs that seem to be indicative of agents "displaying limited cognitive abilities due to some [of] the biases discussed in the large behavioral-economics and bounded-rationality literatures." In addition, this contribution to such behavior could be widely relevant since the possibility of making honest mistakes—whether it be from confusion, inattention, behavioral biases, or cognitive limitations—may allow agents to justify selfish or other undesirable behavior in a broad array of decision environments.

[34] One may naturally speculate that increased levels of complexity increase the scope for motivated errors. That said, it is also possible that individuals who are keen to exploit confusion as an excuse are just as capable of exploiting minor complexity (as in Study 1) as heightened complexity (as in Studies 2, 3A, and 3B).

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# Appendices (For Online Publication Only)

# A Additional Tables and Results Mentioned in Main Text

Table A.1: The 36 main bundles

| | **n = 4** | | | | **n = 3** | | | | **n = 2** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***n/4-bundles*** **("Baseline Bundles")** | | | | | | | | | | | | |
| 1st amount | $d$ | $d$ | $d$ | $d$ | 0 | $d$ | $d$ | $d$ | 0 | $d$ | $d$ | 0 |
| 2nd amount | $d$ | $d$ | $d$ | $d$ | $d$ | 0 | $d$ | $d$ | 0 | 0 | $d$ | $d$ |
| 3rd amount | $d$ | $d$ | $d$ | $d$ | $d$ | $d$ | 0 | $d$ | $d$ | 0 | 0 | $d$ |
| 4th amount | $d$ | $d$ | $d$ | $d$ | $d$ | $d$ | $d$ | 0 | $d$ | $d$ | 0 | 0 |
| Total amount | $4d$ | $4d$ | $4d$ | $4d$ | $3d$ | $3d$ | $3d$ | $3d$ | $2d$ | $2d$ | $2d$ | $2d$ |
| ***n/5-bundles*** | | | | | | | | | | | | |
| 1st-4th amount | same as in *n/4-bundles* | | | | | | | | | | | |
| 5th amount | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total amount | $4d$ | $4d$ | $4d$ | $4d$ | $3d$ | $3d$ | $3d$ | $3d$ | $2d$ | $2d$ | $2d$ | $2d$ |
| ***(n+1)/5-bundles*** | | | | | | | | | | | | |
| 1st-4th amount | same as in *n/4-bundles* | | | | | | | | | | | |
| 5th amount | $d$ | $d$ | $d$ | $d$ | $d$ | $d$ | $d$ | $d$ | $d$ | $d$ | $d$ | $d$ |
| Total amount | $5d$ | $5d$ | $5d$ | $5d$ | $4d$ | $4d$ | $4d$ | $4d$ | $3d$ | $3d$ | $3d$ | $3d$ |

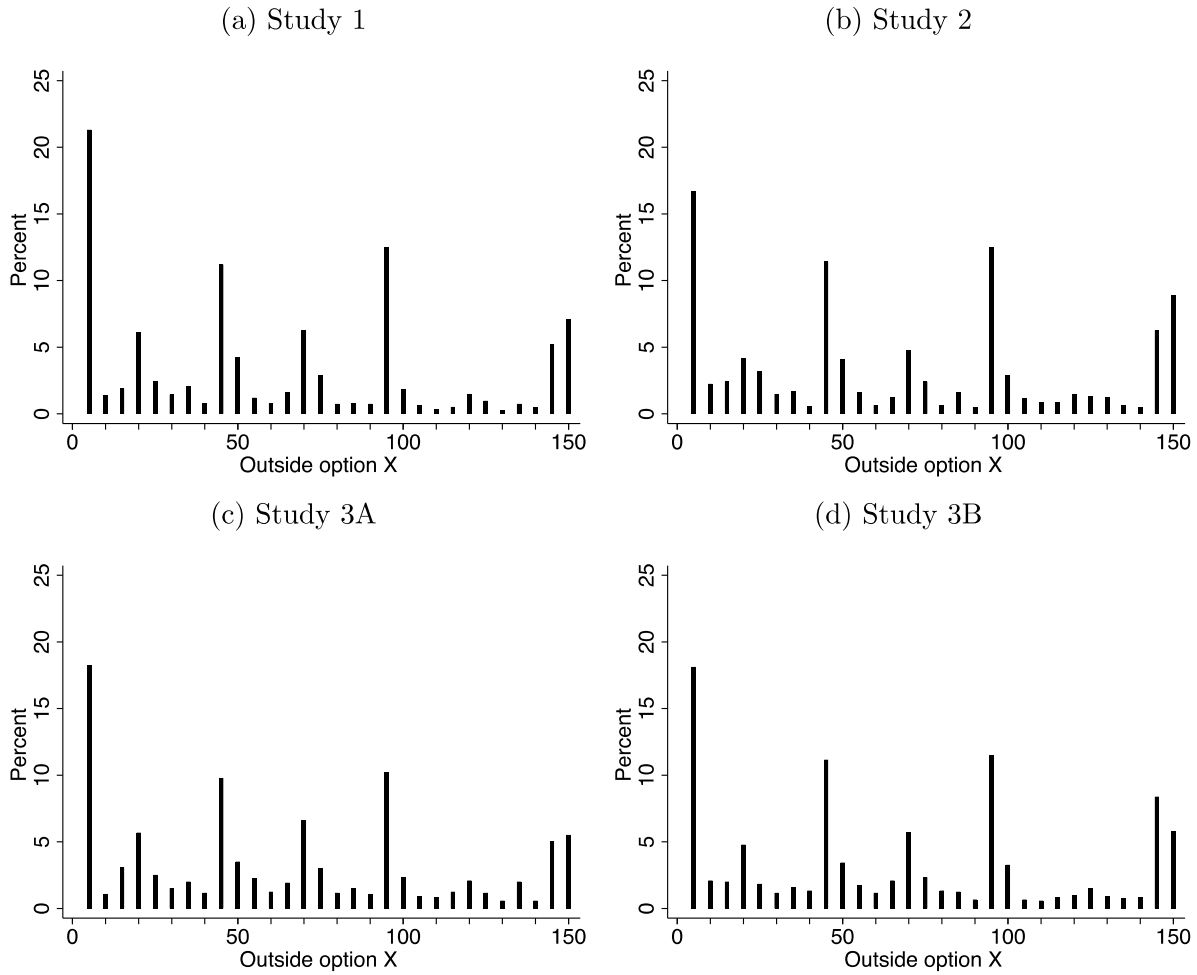
Each column indicates the amounts associated with each bundle. Note that while the four-amount bundles with $n = 4$ only vary in terms of which value for $d$ is randomly selected (since there are no zeros in those bundles), the four bundles with $n = 2$ and the four bundles with $n = 3$ also vary in terms of which amounts (i.e., the 1st, 2nd, 3rd, and/or 4th amount shown on the decision screen) are zero. In the *n/5-bundles* and *(n+1)/5-bundles*, the payoff structure for the first four amounts is the same as in the corresponding *n/4-bundle*. 0 indicates a zero-amount, and $d$ indicates a non-zero of $d$ that is randomly selected on the participant-bundle level such that $d \in \{51, 52, 53, 54, 55, 56, 57, 58, 59\}$.

Table A.2: The 12 non-main bundles

| | **n = $4^L$** | | | | **n = $3^L$** | | | | **n = 1** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***n/4-bundles*** | | | | | | | | | | | | |
| 1st amount | $d^L$ | $d^L$ | $d^L$ | $d^L$ | 0 | $d^L$ | $d^L$ | $d^L$ | $d$ | 0 | 0 | 0 |
| 2nd amount | $d^L$ | $d^L$ | $d^L$ | $d^L$ | $d^L$ | 0 | $d^L$ | $d^L$ | 0 | $d$ | 0 | 0 |
| 3rd amount | $d^L$ | $d^L$ | $d^L$ | $d^L$ | $d^L$ | $d^L$ | 0 | $d^L$ | 0 | 0 | $d$ | 0 |
| 4th amount | $d^L$ | $d^L$ | $d^L$ | $d^L$ | $d^L$ | $d^L$ | $d^L$ | 0 | 0 | 0 | 0 | $d$ |
| Total amount | $4d^L$ | $4d^L$ | $4d^L$ | $4d^L$ | $3d^L$ | $3d^L$ | $3d^L$ | $3d^L$ | $d$ | $d$ | $d$ | $d$ |

Each column indicates the amounts associated with each bundle. 0 indicates a zero-amount, $d^L$ indicates a non-zero of $d^L$ that is randomly selected on the participant-bundle level such that $d^L \in \{30, 31, 32, 33, 34, 35, 36, 37, 38\}$ and $d$ indicates a non-zero of $d$ that is randomly selected on the participant-bundle level such that $d \in \{51, 52, 53, 54, 55, 56, 57, 58, 59\}$.

Figure A.1: Distribution of $X$ values




Data include all participants' decisions in the calibration procedure across all versions of Study 1 in Panel A, across all versions of Study 2 in Panel B, and across all versions of Study 3A in Panel C, and across all versions of Study 3D in Panel D. $X$ is set to the lower bound of participants' implied indifference range from the calibration procedure except for when there is a zero lower bound and so $X$ is set to 5 cents.

Table A.3: Considering the role of experience in the *Self/Charity* version of Study 1, regression of choosing a main bundle

| | 5-bundles first | 4-bundles first | early bundles | late bundles |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| ($^{+}0$) | -0.06*** | -0.06*** | -0.04** | -0.08*** |
| | (0.02) | (0.02) | (0.02) | (0.02) |
| N | 3744 | 3384 | 3568 | 3560 |
| ($^{+}1$) controls | yes | yes | yes | yes |
| $k_n * l_d$ FEs | yes | yes | yes | yes |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the participant level and shown in parentheses. The results are from a linear probability model of whether a participant chose a main bundle in the *Self/Charity* version of Study 1. ($^{+}0$) is an indicator for an *n/5-bundle* that is constructed by adding a fifth amount that is equal to zero to a baseline *n/4-bundle*, ($^{+}1$) is an indicator for an *(n+1)/5-bundle* that is constructed by adding a fifth amount that is non-zero to a baseline *n/4-bundle*, $k_n * l_d$ FEs include all possible interactions of dummies for the number of non-zero amounts within the baseline *n/4-bundle* (see Table A.1) and dummies for the value of the non-zero amount $d$ in the bundle to fully control for the sum of the amounts in the baseline bundle. Columns 1–2 analyze decisions in all main bundles by participants who first view the set of five-amount bundles then the set of four-amount bundles in Column 1 and instead by participants who first view the set of four-amount bundles then the set of five-amount in Column 2. Columns 3–4 analyze all participants' decisions in main bundles that occur "early" within each set of bundles (i.e., decisions 1–12 and 25–36) in Column 3 and that instead occur "late" within the set of bundles (i.e., decisions 13–24 and 37–48) in Column 4.

Table A.4: Regression of errors in the Correlation Neglect study

| Sample: | All | Restricted to Questions | | | | | $5 \leq X < 150$ | early questions | late questions |
|---|---|---|---|---|---|---|---|---|---|
| | | 1&2 | 3&4 | 5&6 | 7&8 | 9&10 | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| *Low Estimate 1* | -19.50*** | -17.69*** | -20.22*** | -19.29*** | -18.85*** | -20.74*** | -19.16*** | -18.97*** | -20.07*** |
| | (1.03) | (1.13) | (1.19) | (1.23) | (1.14) | (1.28) | (1.15) | (1.13) | (1.17) |
| *Low Estimate 1*Exacerbate Bias* | -5.30*** | -6.16*** | -5.38*** | -4.89** | -4.86** | -5.23*** | -5.12*** | -5.33*** | -5.29*** |
| | (1.71) | (1.88) | (1.94) | (1.96) | (1.90) | (2.00) | (1.90) | (1.85) | (1.92) |
| *Low Estimate 1*Mitigate Bias* | 11.80*** | 12.05*** | 12.00*** | 10.77*** | 12.92*** | 11.28*** | 10.97*** | 12.01*** | 11.70*** |
| | (1.76) | (1.95) | (2.02) | (2.03) | (1.95) | (2.06) | (1.96) | (1.89) | (1.97) |
| N | 12000 | 2400 | 2400 | 2400 | 2400 | 2400 | 9660 | 6000 | 6000 |
| Question FEs | yes | yes | yes | yes | yes | yes | yes | yes | yes |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the participant level and shown in parentheses. The results are from OLS regressions of the true answer to a question minus the answer provided by a participant in that question (i.e., the "error") in the Correlation Neglect study. See the table notes of Table 7 for specification details and variable definitions. In Columns 1 and 7–9, there are 15 fixed effects resulting from those five question-pair fixed effects crossed by whether the answer was elicited (ii) when *Exacerbate Bias* = 1, and (iii) when *Mitigate Bias* = 1. In Columns 2–6, there are 3 relevant fixed effects out of the 15 fixed effects in Columns 1 and 7–9.

Table A.5: Regression of errors in the Anchoring studies

| Sample: | All | Restricted to Question | | | | $5 \leq X < 150$ | early questions | late questions |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| **Panel A: Anchoring Study 3A** | | | | | | | | |
| *Low Anchor* | -19.93*** | -18.27*** | -20.95*** | -16.99*** | -23.50*** | -19.37*** | -20.42*** | -19.23*** |
| | (1.47) | (2.67) | (2.56) | (2.48) | (2.26) | (1.57) | (1.87) | (1.86) |
| *Low Anchor*Exacerbate Bias* | -7.98*** | -8.54** | -8.59** | -10.52*** | -4.28 | -8.81*** | -7.22*** | -8.78*** |
| | (2.18) | (3.83) | (3.65) | (3.58) | (3.17) | (2.33) | (2.67) | (2.74) |
| *Low Anchor*Mitigate Bias* | 10.82*** | 8.55** | 9.46** | 11.22*** | 14.01*** | 10.05*** | 11.27*** | 10.35*** |
| | (2.32) | (3.86) | (3.83) | (3.67) | (3.49) | (2.48) | (2.80) | (2.87) |
| N | 4780 | 1195 | 1195 | 1195 | 1195 | 4012 | 2390 | 2388 |
| **Panel B: Anchoring Study 3B** | | | | | | | | |
| *Low Anchor* | -14.35*** | -11.96*** | -13.24*** | -8.79*** | -23.41*** | -12.91*** | -13.39*** | -15.45*** |
| | (1.52) | (2.81) | (2.97) | (2.75) | (2.83) | (1.66) | (2.15) | (1.98) |
| *Low Anchor*Exacerbate Bias* | -7.01*** | -9.63** | -4.60 | -10.33*** | -3.72 | -9.75*** | -9.90*** | -3.97 |
| | (2.48) | (4.09) | (4.19) | (3.85) | (4.14) | (2.64) | (3.11) | (3.15) |
| *Low Anchor*Mitigate Bias* | 9.34*** | 8.24** | 9.44** | 7.77* | 12.30*** | 7.89*** | 8.32*** | 10.92*** |
| | (2.46) | (4.00) | (4.35) | (4.01) | (4.06) | (2.68) | (3.21) | (3.01) |
| N | 4764 | 1191 | 1191 | 1191 | 1191 | 3948 | 2380 | 2382 |
| Question FEs | yes | yes | yes | yes | yes | yes | yes | yes |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the participant level and shown in parentheses. The results are from OLS regressions of the true answer to a question minus the answer provided by a participant in that question (i.e., the "error") in the Anchoring studies. See the table notes of Table 8 for specification details and variable definitions. In Columns 1 and 6–8, there are 12 fixed effects resulting from those four question fixed effects crossed by whether the answer was elicited (i) in the Control condition, (ii) when *Exacerbate Bias* = 1, and (iii) when *Mitigate Bias* = 1. In Columns 2–5, there are the 3 relevant fixed effects out of the 12 fixed effects in Columns 1 and 6–8.

Table A.6: Alternative regressions of errors

| Study: | Correlation Neglect | Anchoring 3A | Anchoring 3B |
|---|---|---|---|
| | (1) | (2) | (3) |
| *Low Bias* | -8.35*** | 7.11*** | 6.48*** |
| | (0.78) | (1.31) | (1.47) |
| *High Bias* | 11.16*** | 26.99*** | 20.80*** |
| | (0.70) | (1.10) | (1.25) |
| *Low Bias* Underestimate* | -0.65 | -3.09* | -4.93** |
| | (1.30) | (1.74) | (2.02) |
| *High Bias* Underestimate* | -5.28*** | -7.88*** | -4.68*** |
| | (1.25) | (1.55) | (1.72) |
| *Low Bias* Overestimate* | 6.52*** | 2.92 | 4.58** |
| | (1.23) | (1.78) | (1.99) |
| *High Bias* Overestimate* | 4.65*** | 4.94*** | 2.06 |
| | (1.11) | (1.39) | (1.71) |
| N | 12000 | 4780 | 4764 |
| Question FEs | yes | yes | yes |

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the participant level and shown in parentheses. The results are from OLS regressions of the true answer to a question minus the answer provided by a participant in that question (i.e., the "error") in the study noted in the column. *Low Bias 1* is an indicator for questions with a Low Estimate 1 in the Correlation Neglect study (i.e., the odd-numbered questions in Table 6) and for questions with a Low Anchor in the Anchoring studies. *Overestimate* is an indicator for questions in which selfish motives should increase answers (i.e., when questions are answered in the *Overestimate* treatment). *Underestimate* is an indicator for questions in which selfish motives are expected to decrease answers (i.e., when questions are answered in the *Underestimate* treatment). Column 1 analyzes answers in the Correlation Neglect study, Column 2 analyzes answers in Anchoring Study 3A, and Column 3 analyzes answers in Anchoring Study 3B. In Columns 1, there are five fixed effects, one for each pair of questions in Table 6. In Columns 2 and 3, there are four fixed effects, one for each of the anchoring questions.

# B Experimental Instructions

## B.1 Full instructions for Study 1

### B.1.1 Instructions for *Self/Charity* version of Study 1

After consenting to participate in the study, each participant is informed of the $4 study completion fee and of the opportunity to earn additional payment for themselves or the Make-A-Wish Foundation. Figure B.1 shows how this payment information is explained and the corresponding understanding question that must be answered correctly in order for the participant to proceed.

Figure B.1: Payment Information

**Your Payment:** This study involves two Parts -- Part 1 and Part 2 -- followed by a short survey. For completing this study, you will receive a minimum payment of $4 dollars within 24 hours. Also, Part 1 or Part 2 will be randomly selected as the part-that-counts. According to the instructions in the part-that-counts, you may also have the chance to earn additional payments.

Any additional payment you earn for yourself will be distributed via a bonus payment within one week.

Any additional payments you earn not for yourself will be distributed to the national chapter of Make-A-Wish Foundation as a donation. Make-A-Wish Foundation is a 501(c)(3) charitable organization that organizes and funds "wishes" for children with life-threatening medical conditions. On their website (http://wish.org), Make-A-Wish Foundation describes their activities as follows: "We grant the wishes of children with life-threatening medical conditions to enrich the human experience with hope, strength and joy [… ] Most wish requests fall into four major categories:

- **I wish to go:**
  Some wish kids want to travel to their favorite theme park, while others want to visit an exotic beach, go on a cruise, see snow for the first time, or attend a major sporting event or concert.
- **I wish to be:**
  Children search the depths of their imagination when they wish to be someone for a day— a firefighter, a police officer or a model.
- **I wish to meet:**
  Many want to meet their favorite athlete, recording artist, television personality, movie star, politician or public figure.
- **I wish to have:**
  Children often wish for a special gift, such as a computer, a tree house, a shopping spree or something that they have coveted for a long time."

**Understanding Question**: Which of the following statements is true?

All of my decisions will influence the resulting payments from this study.

None of my decisions will influence the resulting payments from this study.

My decisions in the part-that-counts can only result in me receiving a bonus payment within one week.

My decisions in the part-that-counts will result in me receiving a bonus payment within one week and/or Make-A-Wish Foundation receiving a donation.

In Part 1, each participant completes a multiple price list that allows us to calibrate the outside option used for the decisions in Part 2. In particular, the outside option equals $X$ cents for participants, where we calibrate $X$ to make the participant indifferent between $X$ cents for themselves and 150 cents for the Make-A-Wish Foundation. Figure B.2 presents the instructions for the multiple price list and corresponding understanding questions that the participant must answer correctly to proceed. Figure B.3 shows how the multiple price list appears.

Figure B.2: Part 1 Instructions

**Part 1 Instructions**

In Part 1, you will have to make several decisions by completing one list. Each row of the list will present two payment options.

- The payment option on the left will always involve the Make-A-Wish Foundation receiving 150 cents as a donation.

- The payment option on the right will involve you receiving some amount of money as a bonus payment. The amount of money will increase from 0 to 150 cents as you proceed down the rows of the list.

Your task is to decide which payment option you prefer on each row by clicking on the row at which you prefer to switch from choosing the option on the left to the option on the right.

If Part 1 is randomly selected as the part-that-counts, one row from this list will be randomly selected. The payment option you select on that row would then be distributed.

**Understanding Question**: If Part 1 is randomly selected as the part-that-counts and you chose the option on the left in the randomly selected row, what would happen?

Make-A-Wish Foundation would receive 150 cents as a donation.

I would receive some amount of money as a bonus payment.

**Understanding Question:** If Part 1 is randomly selected as the part-that-counts and you chose the option on the right in the randomly selected row, what would happen?

Make-A-Wish Foundation would receive 150 cents as a donation.

I would receive some amount of money as a bonus payment.

Figure B.3: Part 1 Decisions: Multiple Price List

Before decisions are indicated

Please indicate which payment option you prefer on each row by clicking on the row where you would like to switch from choosing the option on the left to choosing the option on the right.

(Note that you cannot click on the submit button until you have selected an answer.)

| DONATION FOR MAKE-A-WISH FOUNDATION | | BONUS PAYMENT FOR YOU |
|---|---|---|
| 150 CENTS | OR | 0 CENTS |
| 150 CENTS | OR | 5 CENTS |
| 150 CENTS | OR | 10 CENTS |
| 150 CENTS | OR | 15 CENTS |
| 150 CENTS | OR | 20 CENTS |
| 150 CENTS | OR | 25 CENTS |
| 150 CENTS | OR | 30 CENTS |
| 150 CENTS | OR | 35 CENTS |
| 150 CENTS | OR | 40 CENTS |
| 150 CENTS | OR | 45 CENTS |
| 150 CENTS | OR | 50 CENTS |
| 150 CENTS | OR | 55 CENTS |
| 150 CENTS | OR | 60 CENTS |
| 150 CENTS | OR | 65 CENTS |
| 150 CENTS | OR | 70 CENTS |
| 150 CENTS | OR | 75 CENTS |
| 150 CENTS | OR | 80 CENTS |
| 150 CENTS | OR | 85 CENTS |
| 150 CENTS | OR | 90 CENTS |
| 150 CENTS | OR | 95 CENTS |
| 150 CENTS | OR | 100 CENTS |
| 150 CENTS | OR | 105 CENTS |
| 150 CENTS | OR | 110 CENTS |
| 150 CENTS | OR | 115 CENTS |
| 150 CENTS | OR | 120 CENTS |
| 150 CENTS | OR | 125 CENTS |
| 150 CENTS | OR | 130 CENTS |
| 150 CENTS | OR | 135 CENTS |
| 150 CENTS | OR | 140 CENTS |
| 150 CENTS | OR | 145 CENTS |
| 150 CENTS | OR | 150 CENTS |

After decisions are indicated if $X = 100$

Please indicate which payment option you prefer on each row by clicking on the row where you would like to switch from choosing the option on the left to choosing the option on the right.

(Note that you cannot click on the submit button until you have selected an answer.)

| DONATION FOR MAKE-A-WISH FOUNDATION | | BONUS PAYMENT FOR YOU |
|---|---|---|
| 150 CENTS | OR | 0 CENTS |
| 150 CENTS | OR | 5 CENTS |
| 150 CENTS | OR | 10 CENTS |
| 150 CENTS | OR | 15 CENTS |
| 150 CENTS | OR | 20 CENTS |
| 150 CENTS | OR | 25 CENTS |
| 150 CENTS | OR | 30 CENTS |
| 150 CENTS | OR | 35 CENTS |
| 150 CENTS | OR | 40 CENTS |
| 150 CENTS | OR | 45 CENTS |
| 150 CENTS | OR | 50 CENTS |
| 150 CENTS | OR | 55 CENTS |
| 150 CENTS | OR | 60 CENTS |
| 150 CENTS | OR | 65 CENTS |
| 150 CENTS | OR | 70 CENTS |
| 150 CENTS | OR | 75 CENTS |
| 150 CENTS | OR | 80 CENTS |
| 150 CENTS | OR | 85 CENTS |
| 150 CENTS | OR | 90 CENTS |
| 150 CENTS | OR | 95 CENTS |
| 150 CENTS | OR | 100 CENTS |
| 150 CENTS | OR | 105 CENTS |
| 150 CENTS | OR | 110 CENTS |
| 150 CENTS | OR | 115 CENTS |
| 150 CENTS | OR | 120 CENTS |
| 150 CENTS | OR | 125 CENTS |
| 150 CENTS | OR | 130 CENTS |
| 150 CENTS | OR | 135 CENTS |
| 150 CENTS | OR | 140 CENTS |
| 150 CENTS | OR | 145 CENTS |
| 150 CENTS | OR | 150 CENTS |

In Part 2, each participant makes 48 binary decisions between a bundle that changes from decision to decision and an outside option that is fixed for all 48 decisions. Choosing the outside option results in the participants receiving $X$ cents for themselves, where $X$ is calibrated from Part 1 as previously explained. Choosing a bundle results in Make-A-Wish Foundation receiving the sum of the 4 or 5 amounts in the bundle. Appendix Tables A.1 and A.2 detail the amounts that comprise each bundle. The first amount in a bundle is always revealed by default, and a participant is required to reveal all of the remaining amounts in a bundle by clicking on the header above each amount before proceeding onto the next decision screen. Also, the order of these decision screens varies. It is randomly determined whether a participant first makes the 24 decisions involving bundles with four amounts or instead first makes the 24 decisions involving bundles with five amounts. Within each block of 24 decisions, the order of those decisions is also randomly determined.

Prior to making these 48 decisions, participants face extensive instructions and understanding questions. Figure B.4 shows the first and second pages of the instructions for Part 2 along with the corresponding understanding questions that the participant must answer correctly to proceed. These understanding questions ensure that participants understand the payoffs that result from choosing a bundle versus the outside option and that they must reveal all amounts in a bundle before making a decision. Figure B.5 shows the subsequent three example bundles and corresponding understanding questions that the participant must answer correctly to proceed. These understanding questions ensure that participants know how to determine the total donation amount made by a bundle.

Figure B.4: Part 2 Instructions

First Page (if $X = 100$)

**Part 2 Instructions**

In Part 2, you will face 48 decisions. In each decision, you may choose between two payment options, Option A and Option B, which are as follows:

- **Option A:** Make-A-Wish Foundation receives a donation equal to the sum of several amounts. The exact amount of this sum may vary across the decisions.

- **Option B:** You receive a bonus payment of 100 cents.

If Part 2 is randomly selected as the part-that-counts, one decision will be randomly selected. The payment option you select in that decision would then be distributed.

**Understanding Question:** If Part 2 is randomly selected as the part-that-counts and you chose Option A in the randomly selected decision, what would happen?

Make-A-Wish Foundation would receive a donation of 150 cents.

How much Make-A-Wish Foundation would receive as a donation would depend on the sum of the amounts in that decision.

**Understanding Question:** If Part 2 is randomly selected as the part-that-counts and you chose Option B in the randomly selected decision, what would happen?

I would receive 100 cents as a bonus payment.

I would receive an amount that may be more than or less than 100 cents as a bonus payment.

Second Page

**Part 2 Instructions Continued . . .**

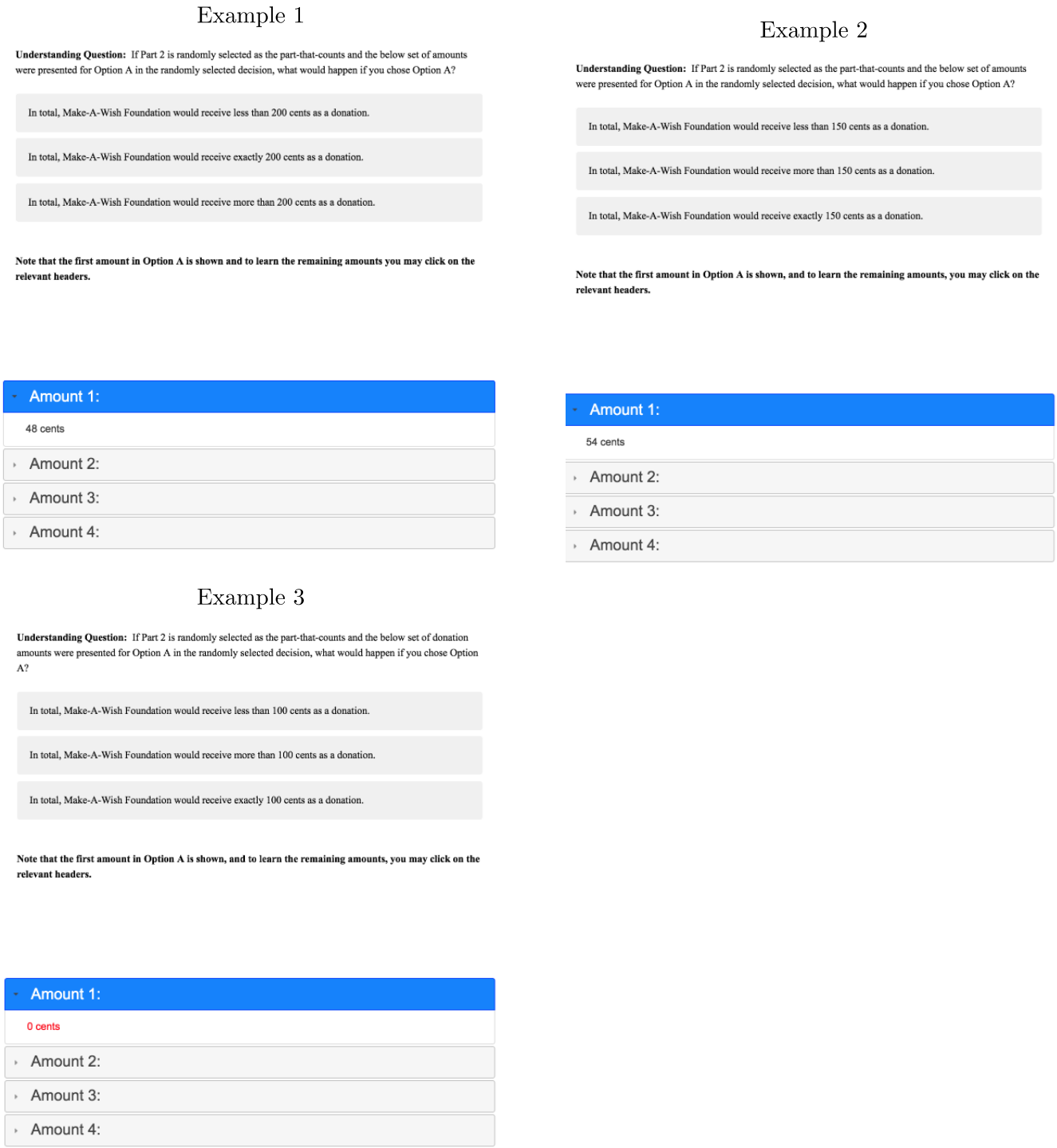
In each decision in Part 2, choosing Option A will result in Make-A-Wish Foundation receiving the sum of the donation amounts shown in Option A. Across decisions, this sum may vary.

Prior to making each decision in Part 2, you will always have the opportunity to learn all of the amounts in Option A. While you will have the opportunity to learn this information, you may choose to make decisions with or without learning this information.

**Understanding Question:** Prior to making each decision in Part 2, do you have to learn all of the amounts in Option A?

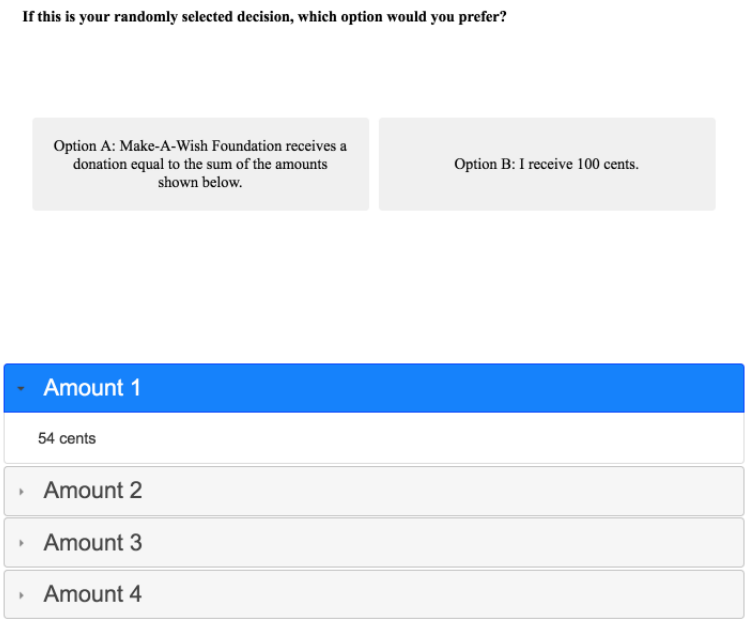
No | Yes

Figure B.5: Part 2 Examples



Only after completing all of these understanding questions successfully do participants proceed to make their 48 decisions. Each decision appears on a separate screen, and Figure B.6 shows an example of one such decision.

Figure B.6: Part 2: Example Decision Screen




After completing all 48 decisions in Part 2, participants answer follow-up questions about their decisions in the study and provide demographic information. We distributed the relevant payments after the study was completed.

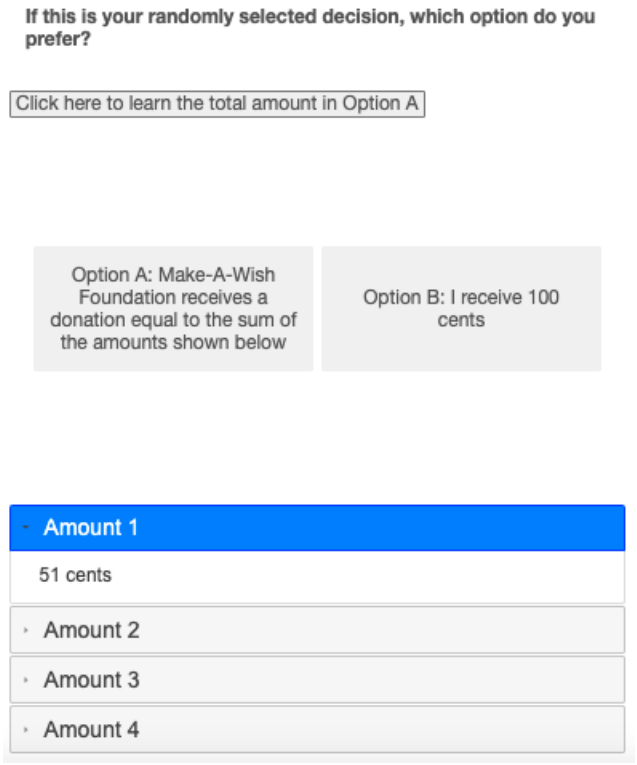
### B.1.2 Instructions for other versions of Study 1

The previous section details the instructions for the *Self/Charity* version of Study 1. In this section, we describe how these instructions differ for the remaining seven versions of Study 1.

In the *Self/Charity (summands optional)* version, all that differs is that—aside from the first amount in a bundle still being revealed by default—participants can choose whether or not to reveal the other amounts in a bundle. Thus, how decision screens appear in Part 2 is still as shown in Figure B.6, but the participant can make a decision without clicking on all the headers.

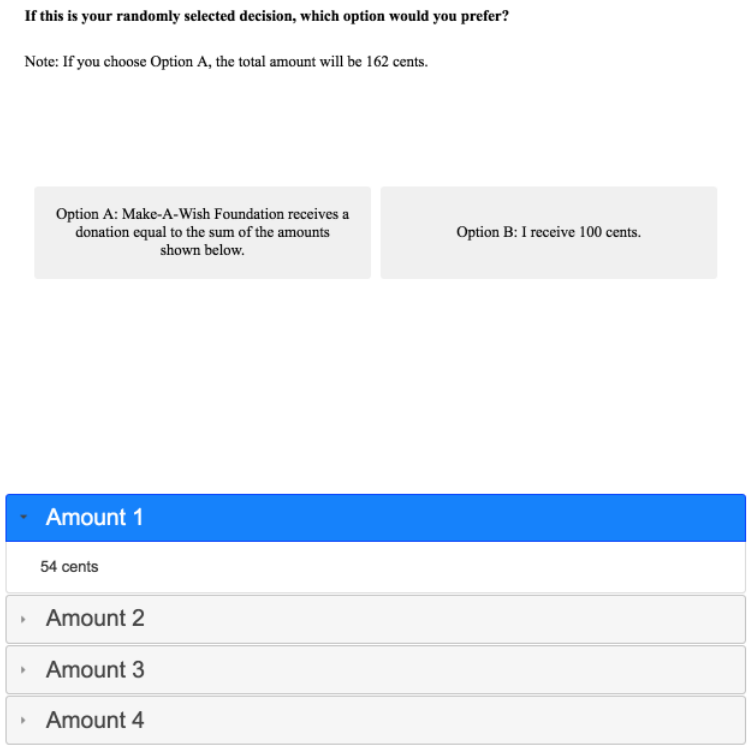
In the *Self/Charity (sum optional)* version, all that differs is that participants can click to reveal the sum of amounts in the bundle on the decision screen, as shown in Figure B.7.

Figure B.7: Part 2: Example Decision Screen for *Self/Charity (sum optional)* version of Study 1



In the *Self/Charity (sum shown)* version, all that differs is that participants are shown the sum of amounts in the bundle on the decision screen, as shown in Figure B.8.

Figure B.8: Part 2: Example Decision Screen for *Self/Charity (sum shown)* version of Study 1



In the *Self/Charity (sum unavoidable)* version, there are two main differences. First, prior to each decision screen, participants face a screen where they are informed of, and must accurately report, the sum of the amounts in the bundle that will be on the decision screen, as shown in Figure B.9. Second, participants are shown the sum of amounts in the bundle on the decision screen in a manner that is arguably more salient than in the *Self/Charity (sum shown)* version, as shown in Figure B.10.

Figure B.9: Part 2: Example of Screen before the Decision Screen for *Self/Charity (sum unavoidable)* version of Study 1

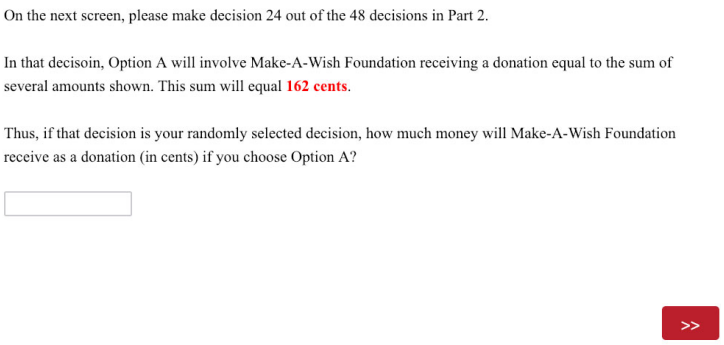
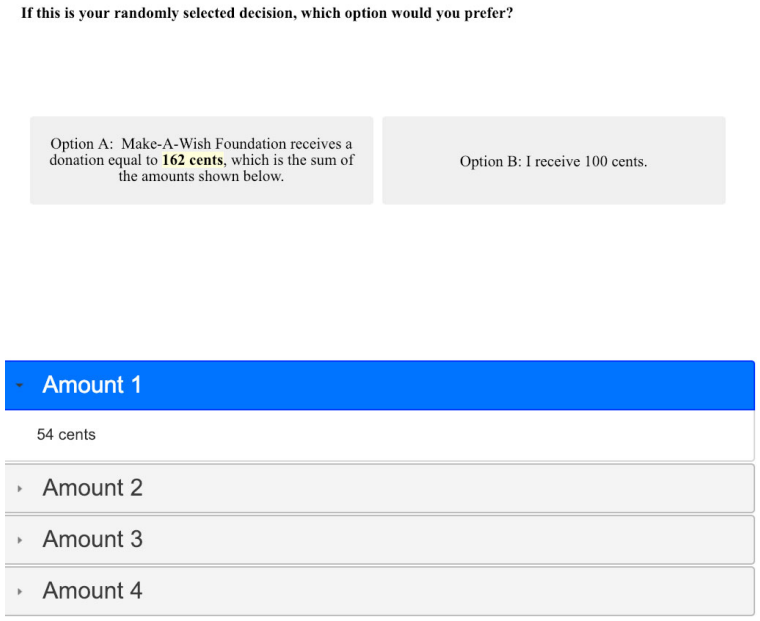


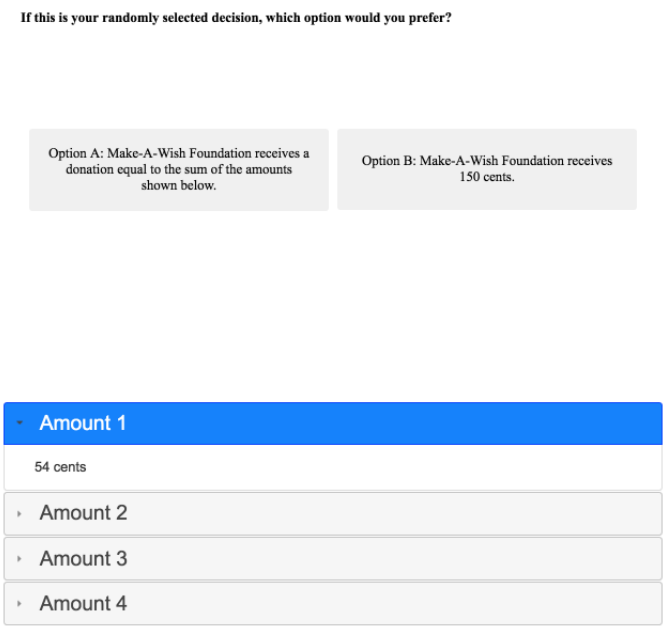

Figure B.10: Part 2: Example Decision Screen for *Self/Charity (sum unavoidable)* version of Study 1



In the *Charity/Charity* version, choosing the outside option now results in 150 cents being given to Make-A-Wish Foundation (regardless of the decisions in Part 1), as shown in Figure B.11.

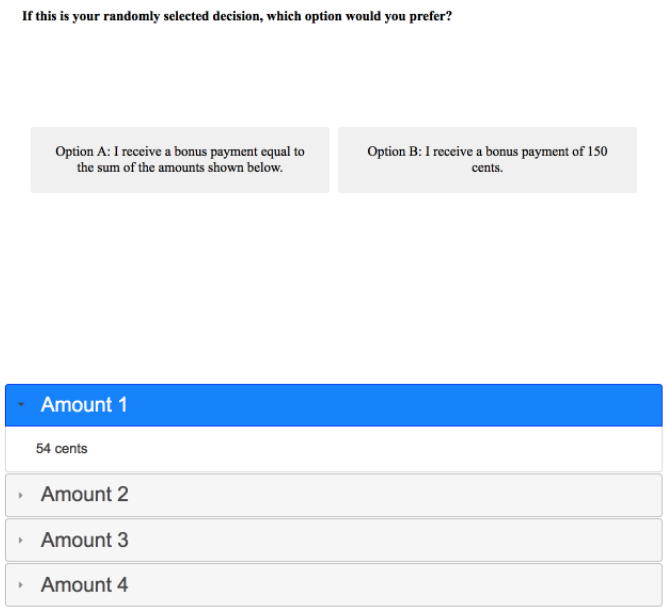
In the *Charity/Charity (summands optional)* version, participants can choose whether or not to reveal the other amounts in a bundle as in the *Self/Charity (summands optional)* version. Thus, how decision screens appear in Part 2 is still as shown in Figure B.11, but the participant can make a decision without clicking on all the headers.

Figure B.11: Part 2: Example Decision Screen for *Charity/Charity* version of Study 1



In the *Self/Self* version, choosing the outside option now results in 150 cents being given to the participant (regardless of the participant's decisions in Part 1) and choosing a bundle now results in the amount of money in the bundle being given to the participant, as shown in Figure B.12.

Figure B.12: Part 2: Example Decision Screen for *Self/Self* version of Study 1



## B.2 Full instructions for Study 2 (Correlation Neglect)

### B.2.1 Instructions for *Underestimate* treatment of Study 2 (Correlation Neglect)

After consenting to participate in the study, each participant is informed of the $3.50 study completion fee and of the opportunity to earn additional payment for themselves or the Make-A-Wish Foundation. They were otherwise shown a figure identical to Figure B.1 in Study 1 which explains the payment information and shows the corresponding understanding question that must be answered correctly in order for the participant to proceed.

Part 1 was identical to Study 1. Figure B.2 presents the instructions for the multiple price list and corresponding understanding questions that the participant must answer correctly to proceed. Figure B.3 shows how the multiple price list appears.

In Part 2 of the study, participants answer ten main decisions. Prior to answering these ten main decisions, participants face extensive instructions and understanding questions. Figures B.13–B.14 show the two pages of instructions for Part 2 along with the corresponding understanding questions that the participant must answer correctly to proceed. These understanding questions ensure that participants understand the payoffs that result from how they answer the Part 2 questions.

Figure B.13: Part 2 Instructions, Page 1

**Instructions for Part 2 (Page 1 out of 2):**

In Part 2, you will be asked 10 questions. In each of these questions, you will be asked to guess a number. This number will be some number between 0 and 100. Information on this number will be provided to you on the decision screen. You will be asked to report your guess by selecting a range of numbers on a slider from 0 to 100.

In each question, the following additional payments will be allocated according to your guess:

> If **your guess is right** because one of the numbers in the range you select is the right number, you will be allocated **a bonus payment of 100 cents** and Make-A-Wish Foundation will be allocated **a donation of 150 cents**.
>
> If **your guess is too high** because all of the numbers in the range you select are larger than the right number, Make-A-Wish Foundation will be allocated **a donation of 150 cents**.
>
> If **your guess is too low** because all of the numbers in the range you select are smaller than the right number, you will be allocated **a bonus payment of 100 cents**.

If Part 2 is randomly selected as the part-that-counts, one question from this part will be randomly selected. Then, the payment that is allocated in that question will be distributed.

**Understanding Question:** If my guess is right, what additional payment will be allocated?

- a bonus payment of 100 cents for me and a donation of 150 cents for Make-A-Wish Foundation
- a donation of 150 cents for Make-A-Wish Foundation only
- a bonus payment of 100 cents for me only

**Understanding Question:** If my guess is too high, what additional payment will be allocated?

- a donation of 150 cents for Make-A-Wish Foundation
- a bonus payment of 100 cents for me

**Understanding Question:** If my guess is too low, what additional payment will be allocated?

- a donation of 150 cents for Make-A-Wish Foundation
- a bonus payment of 100 cents for me

>>

Figure B.14: Part 2 Instructions, Page 2

**Instructions for Part 2 (Page 2 out of 2):**

When you are asked to report the number in a question, you will be provided with the following information:

In this question, the number equals the average of four estimates: Estimate 1, Estimate 2, Estimate 3, and Estimate 4. You will be directly informed of Estimate 1. You will also be informed of reports about the estimates from three news channels. Channel 1 News reports the average of Estimate 1 and Estimate 2. Channel 2 News reports the average of Estimate 1 and Estimate 3. Channel 3 News reports the average of Estimate 1 and Estimate 4.

For example, suppose that Estimate 1 is 81, Estimate 2 is 13, Estimate 3 is 100, and Estimate 4 is 94. Then, you would be provided with the following information:

- Estimate 1 is 81.
- Channel 1 News reports 47.
- Channel 2 News reports 90.5.
- Channel 3 News reports 87.5.

**Understanding Question**: Suppose that Estimate 1 is 6, Estimate 2 is 12, and Estimate 3 is 16. What would Channel 1 News report?

| 6 | 9 | 11 | 12 |
|---|---|---|---|

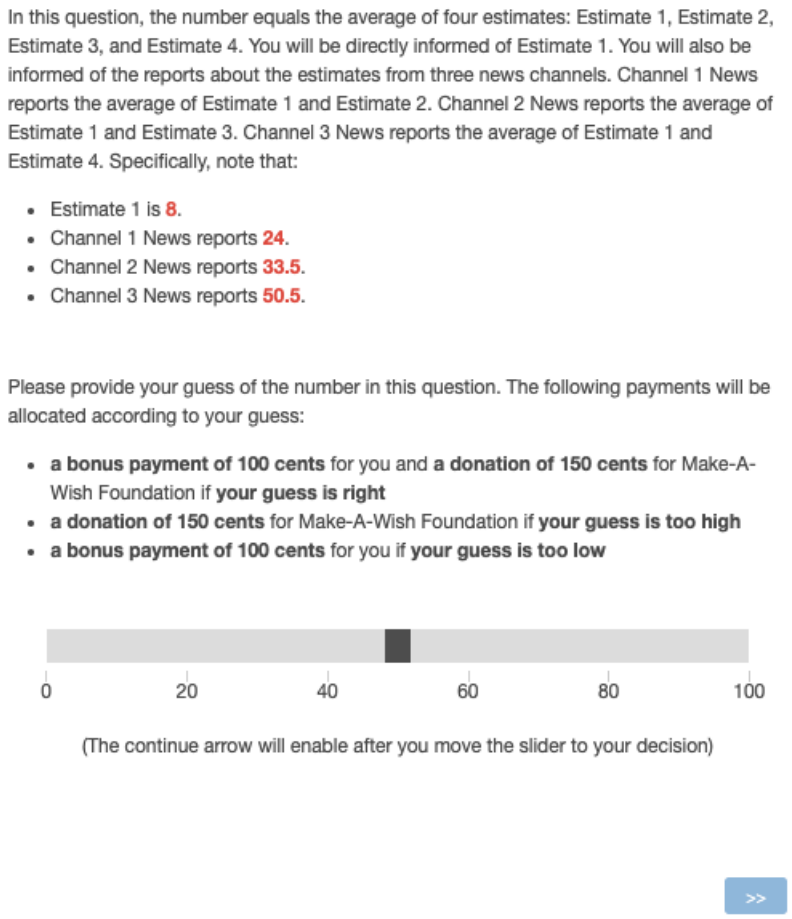
**Understanding Question**: Suppose that Estimate 1 is 6, Estimate 2 is 12, and Estimate 3 is 16. What would Channel 2 News report?

| 6 | 9 | 11 | 12 |
|---|---|---|---|

>>

In Part 2 of the study, each participant provides estimates to ten main decisions where the correct answer is the average of four estimates. The decisions are presented in a randomized order. Figure B.15 shows an example of one of the ten *Underestimate* treatment main decisions. Estimating the question answer as too low results in the participant receiving X cents for themselves, where X is calibrated from Part 1 as previously explained. Estimating the answer to the question as too high results in the Make-A-Wish Foundation receiving 150 cents.

Figure B.15: Part 2: Example Main Decision if X = 100



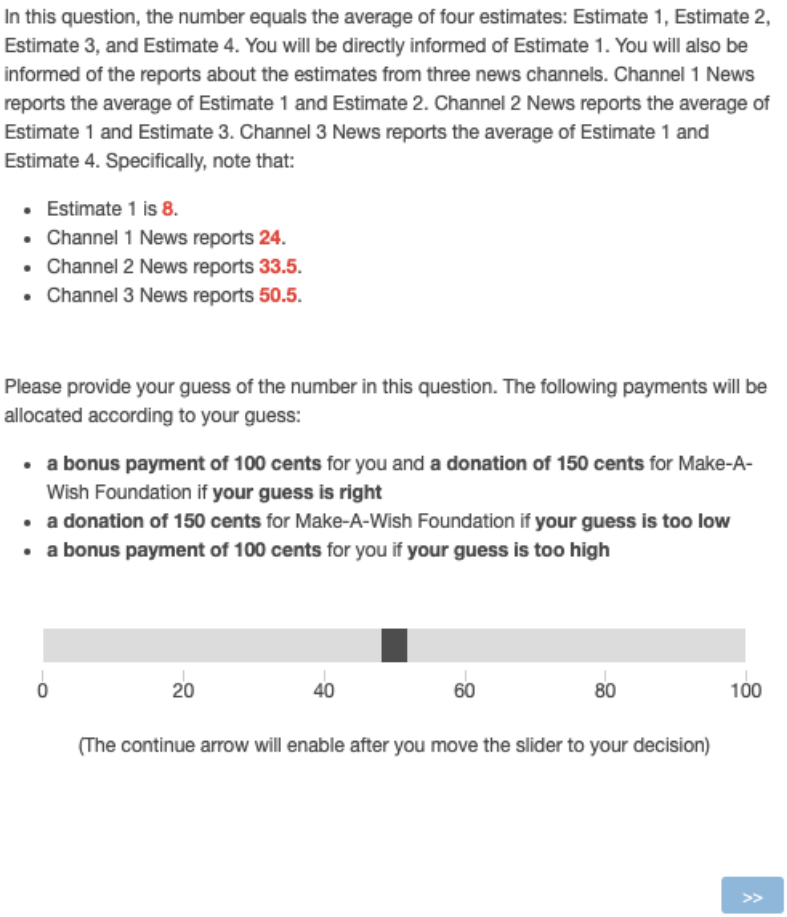

After completing the experiment, participants answer a short follow-up questionnaire.

### B.2.2 Instructions for other versions of Study 2 (Correlation Neglect)

The previous section details the instructions for the *Underestimate* treatment of Study 2 (Correlation Neglect). In this section, we describe how these instructions differ for the remaining two versions of Study 2 (Correlation Neglect).

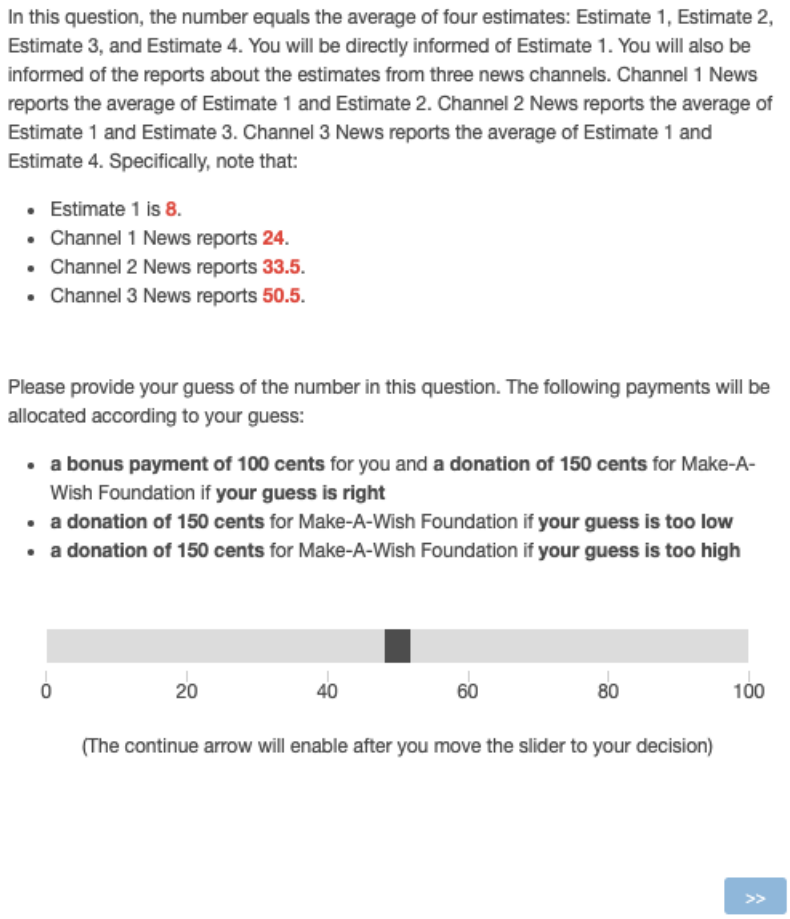
The *Overestimate* treatment is identical to the previous version of the study with the exception that the rewards in Part 2 for estimating the question answer as too high or too low are swapped. Figure B.16 shows an example of a Part 2 Question used in the *Overestimate* treatment. Estimating the answer as too high results in the participant receiving X cents for themselves. Estimating the answer as too low results in the Make-A-Wish Foundation receiving 150 cents.

Figure B.16: Part 2: Example Main Decision if X = 100 for *Overestimate* treatment of Correlation Neglect Study



In the *Control* condition, Part 2 estimates that are either too low or too high both result in the Make-A-Wish Foundation receiving 150 cents. Figure B.17 shows an example of a Part 2 Question used in the *Control* condition.

Figure B.17: Part 2: Example Main Decision if X = 100 for *Control* condition of Correlation Neglect Study



## B.3 Full instructions for Study 3A (Anchoring)

### B.3.1 Instructions for *Underestimate* treatment of Study 3A (Anchoring)

After consenting to participate in the study, each participant is informed of the $2 study completion fee and of the opportunity to earn additional payment for themselves or the Make-A-Wish Foundation. They were otherwise shown a figure identical to Figure B.1 in Study 1 which explains the payment information and shows the corresponding understanding question that must be answered correctly in order for the participant to proceed.

Part 1 was identical to Study 1. Figure B.2 presents the instructions for the multiple price list and corresponding understanding questions that the participant must answer correctly to proceed. Figure B.3 shows how the multiple price list appears.

In Part 2 of the study, each participant answers four main questions in a randomized order. Prior to answering these 4 main questions, participants face extensive instructions and understanding questions. Figures B.18–B.19 show the instructions for Part 2 along with the corresponding understanding questions that the participant must answer correctly to proceed. These understanding questions ensure that participants understand the payoffs that result from how they answer the Part 2 questions.

Figure B.18: Part 2 Instructions

**Instructions for Part 2:**

In Part 2, you will be asked to guess the answer to 4 main questions. Prior to answering each main question, you will first be asked to consider a related question about whether the answer to the main question is greater than or less than a number. This number will be randomly selected to be 20 or 80, each with a 50% chance. This number will be recorded as your guess if you do not guess a different number within 15 seconds of the main question being displayed.

The answer to each main question will be some number between 0 and 100. Your answer will be counted as right if it is no more than 2 away from the actual number.

After you make your guess in each main question, the following additional payments will be allocated:

> If **your guess is right** because it is no more than 2 away from the actual number, you will be allocated **a bonus payment of 100 cents** and Make-A-Wish Foundation will be allocated **a donation of 150 cents**.
>
> If **your guess is too high** because it is 3 or more above the actual number, Make-A-Wish Foundation will be allocated **a donation of 150 cents**.
>
> If **your guess is too low** because it is 3 or more below the actual number, you will be allocated **a bonus payment of 100 cents**.

If Part 2 is randomly selected as the part-that-counts, one main question from this part will be randomly selected. Then, the payment that is allocated in that question will be distributed.

**Understanding Question:** If my guess is right in a main question, what additional payment will be allocated in that question?

- a bonus payment of 100 cents for me and a donation of 150 cents for Make-A-Wish Foundation
- a donation of 150 cents for Make-A-Wish Foundation only
- a bonus payment of 100 cents for me only

**Understanding Question:** If my guess is too high in a main question, what additional payment will be allocated in that question?

- a donation of 150 cents for Make-A-Wish Foundation
- a bonus payment of 100 cents for me

Figure B.19: Part 2 Instructions Continued

**Understanding Question:** If my guess is too low in a main question, what additional payment will be allocated in that question?

a donation of 150 cents for Make-A-Wish Foundation

a bonus payment of 100 cents for me

**Understanding Question**: How many seconds will you be given to answer each main question?

15 seconds

30 seconds

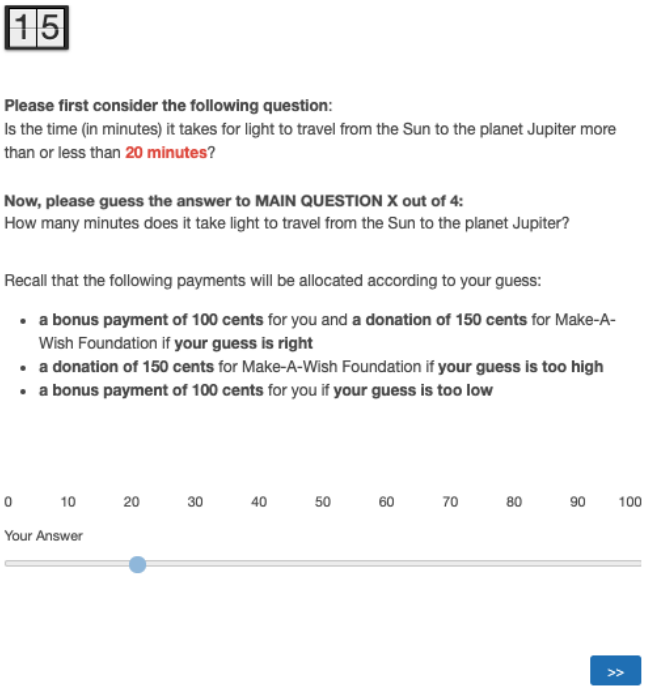
As many as you need

>>

Each question in Part 2 has an anchor randomly assigned to be either high or low. Participants have only 15 seconds to input their answer. Estimating the question answer as too low results in the participants receiving X cents for themselves, where X is calibrated from Part 1 as previously explained. Estimating the answer to the question as too high results in the Make-A-Wish Foundation receiving 150 cents. Figures B.20–B.23 show the four *Underestimate* treatment main questions with low and high anchors.

Figure B.20: Part 2: Main Question 1

Anchored Low if $X = 100$




Anchored High if $X = 100$

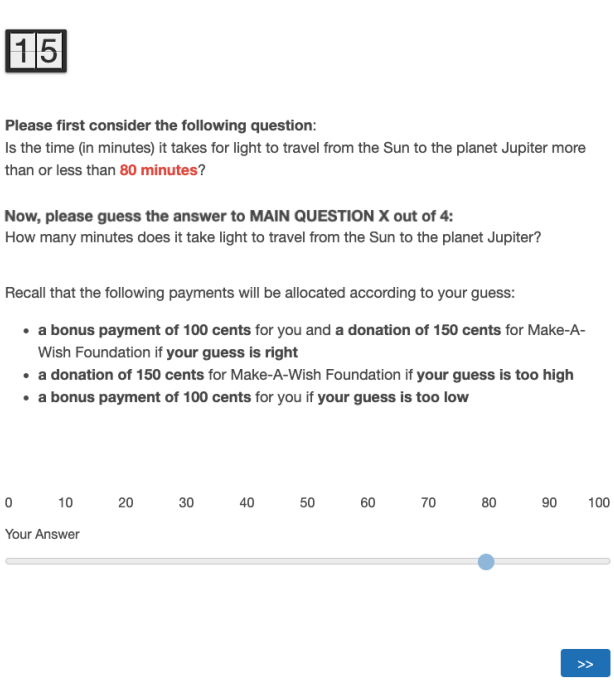
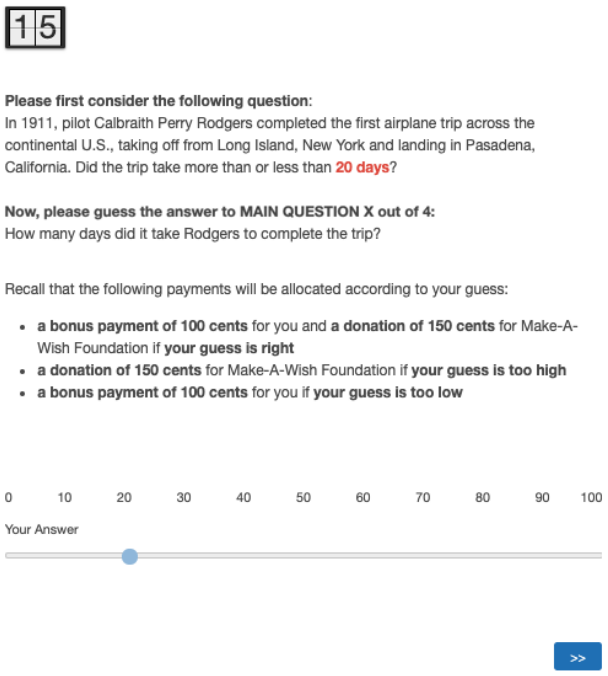


Figure B.21: Part 2: Main Question 2

Anchored Low if $X = 100$




Anchored High if $X = 100$

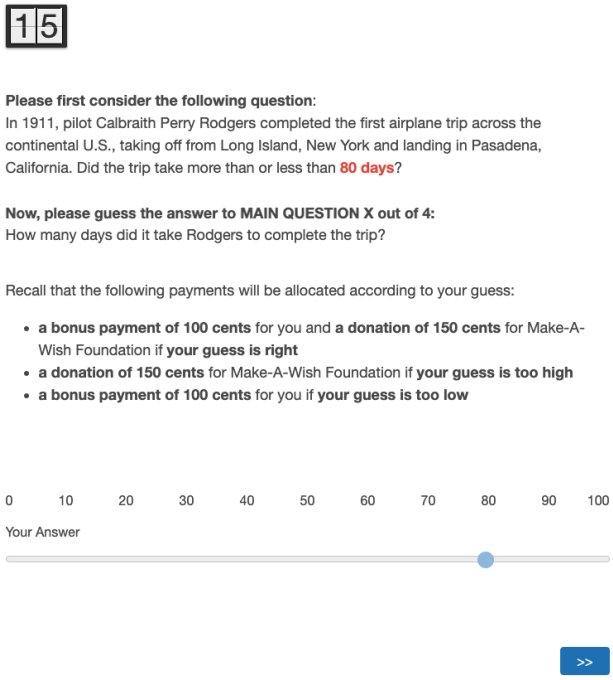
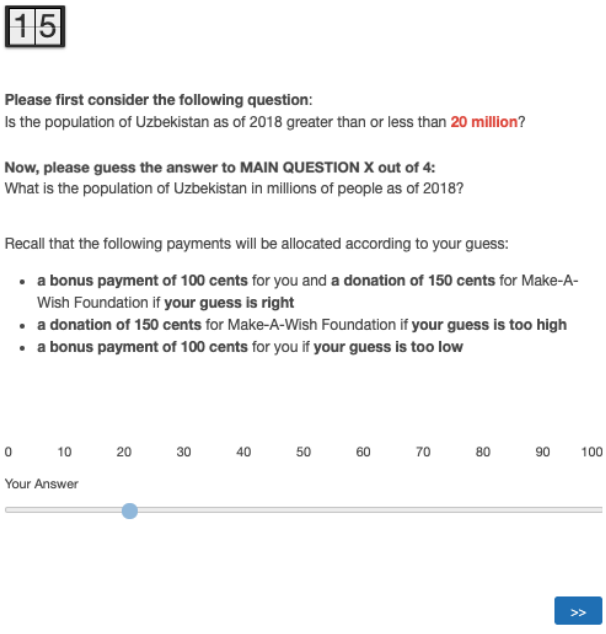



Figure B.22: Part 2: Main Question 3

Anchored Low if $X = 100$




Anchored High if $X = 100$

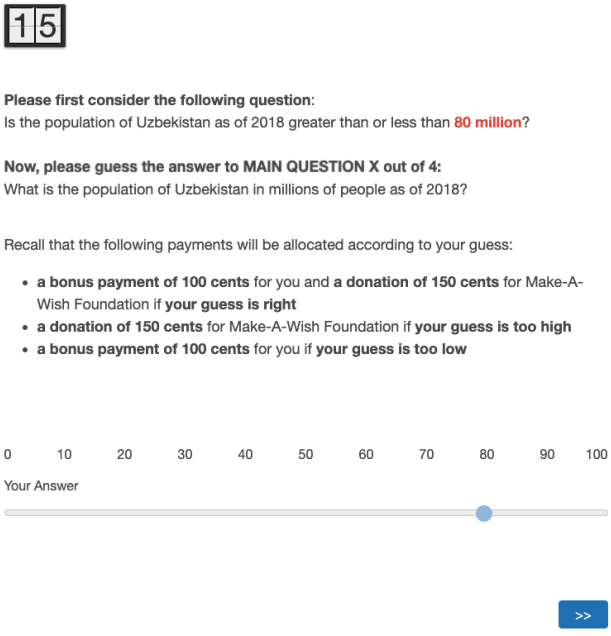
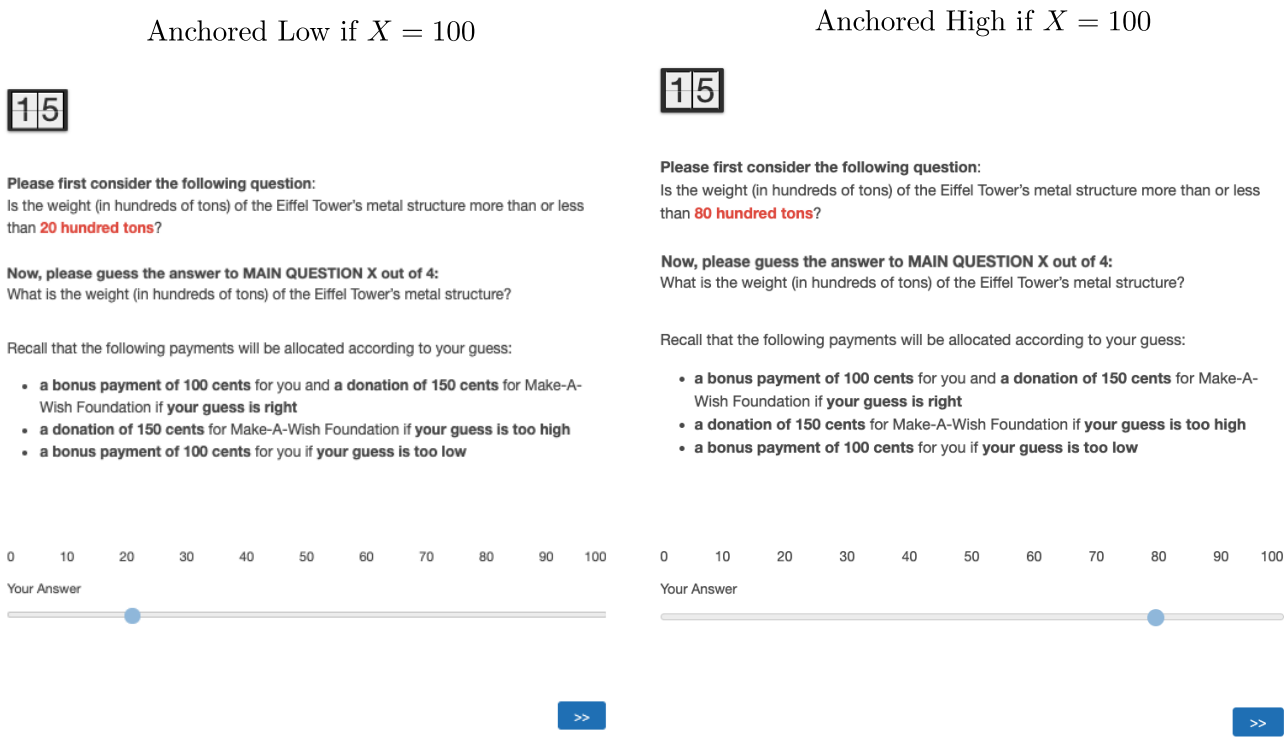


Figure B.23: Part 2: Main Question 4




After completing the experiment, participants answer a short follow-up questionnaire.

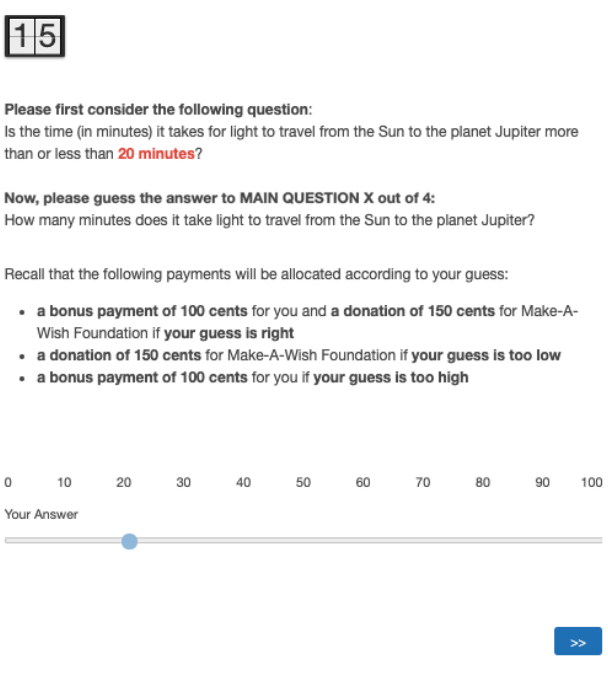
### B.3.2 Instructions for other treatments of Study 3A (Anchoring)

The previous section details the instructions for the *Underestimate* treatment version of Study 3A (Anchoring). In this section, we describe how these instructions differ for the remaining two versions of Study 3A (Anchoring).

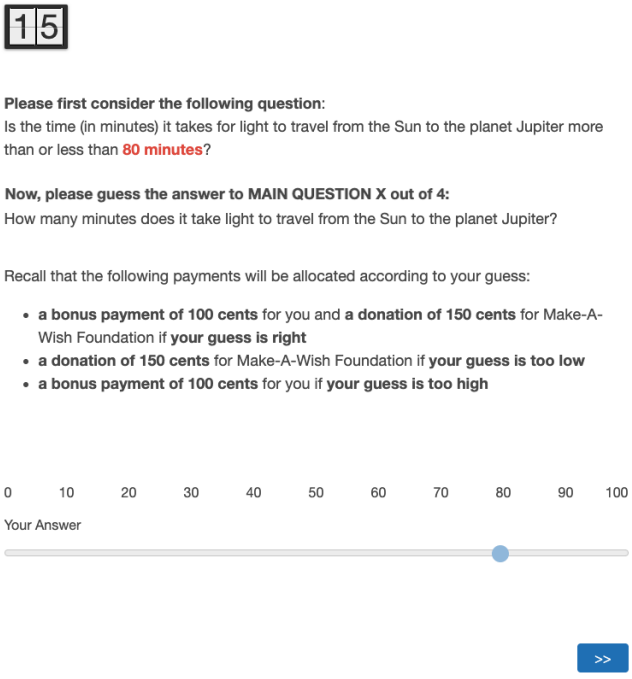
The *Overestimate* treatment is identical to the previous version of the study with the exception that the rewards in Part 2 for estimating too high or too low are swapped. If a participant estimates the answer to the questions in Part 2 as too high, that results in the participant receiving X cents for themselves. If a participant estimates the answer to the question as too low, that results in the Make-A-Wish Foundation receiving 150 cents. Figure B.24 shows an example of a Part 2 Question used in the *Overestimate* treatment.

Figure B.24: Part 2: Main Question 1 for *Overestimate* treatment of Anchoring Study 3A

Anchored Low if $X = 100$



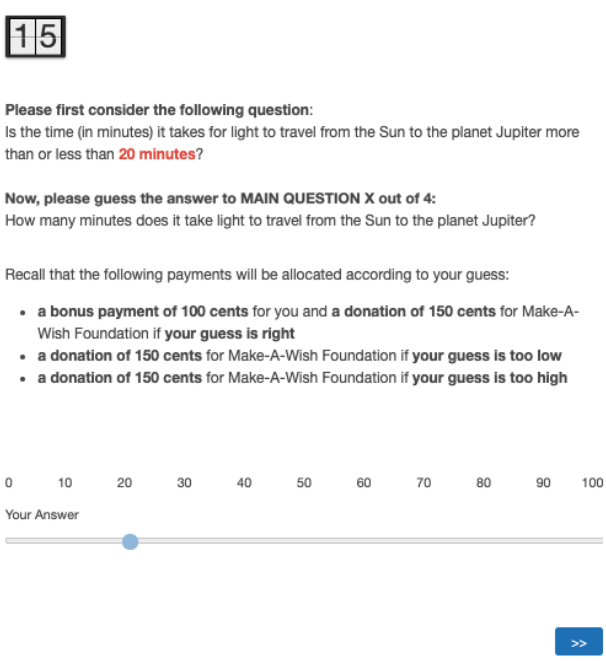

Anchored High if $X = 100$



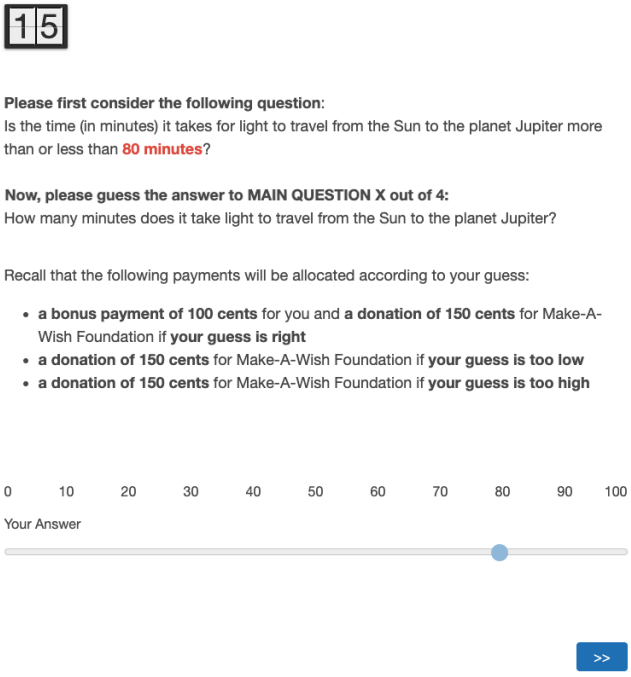
In the *Control Treatment*, Part 2 estimates that are either too low or too high both result in the Make-A-Wish Foundation receiving 150 cents. Figure B.25 shows an example of a Part 2 Question used in the *Control* condition.

Figure B.25: Part 2: Main Question 1 for *Control* condition of Anchoring Study 3A

Anchored Low if $X = 100$




Anchored High if $X = 100$



## B.4 Full instructions for Study 3B (Anchoring)

### B.4.1 Instructions for *Underestimate* treatment of Study 3B (Anchoring)

After consenting to participate in the study, each participant is informed of the $2 study completion fee and of the opportunity to earn additional payment for themselves or the Make-A-Wish Foundation. They were otherwise shown a figure identical to Figure B.1 in Study 1 which explains the payment information and shows the corresponding understanding question that must be answered correctly in order for the participant to proceed.

Part 1 was identical to Study 1. Figure B.2 presents the instructions for the multiple price list and corresponding understanding questions that the participant must answer correctly to proceed. Figure B.3 shows how the multiple price list appears.

In Part 2 of the study, each participant answers four main questions in a randomized order. Prior to answering these 4 main questions, participants face extensive instructions and understanding questions. Figures B.18–B.19 show the instructions for Part 2 along with the corresponding understanding questions that the participant must answer correctly to proceed. These understanding questions ensure that participants understand the payoffs that result from how they answer the Part 2 questions.

Each main question in Part 2 has a first question which is anchored either high or low. Estimating the main question answer as too low results in the participants receiving X cents for themselves, where X is calibrated from Part 1 as previously explained. Estimating the answer to the main question as too high results in the Make-A-Wish Foundation receiving 150 cents. Figures B.26–B.29 show the four *Underestimate* treatment main questions with low and high anchors.

Figure B.26: Part 2: Main Question 1

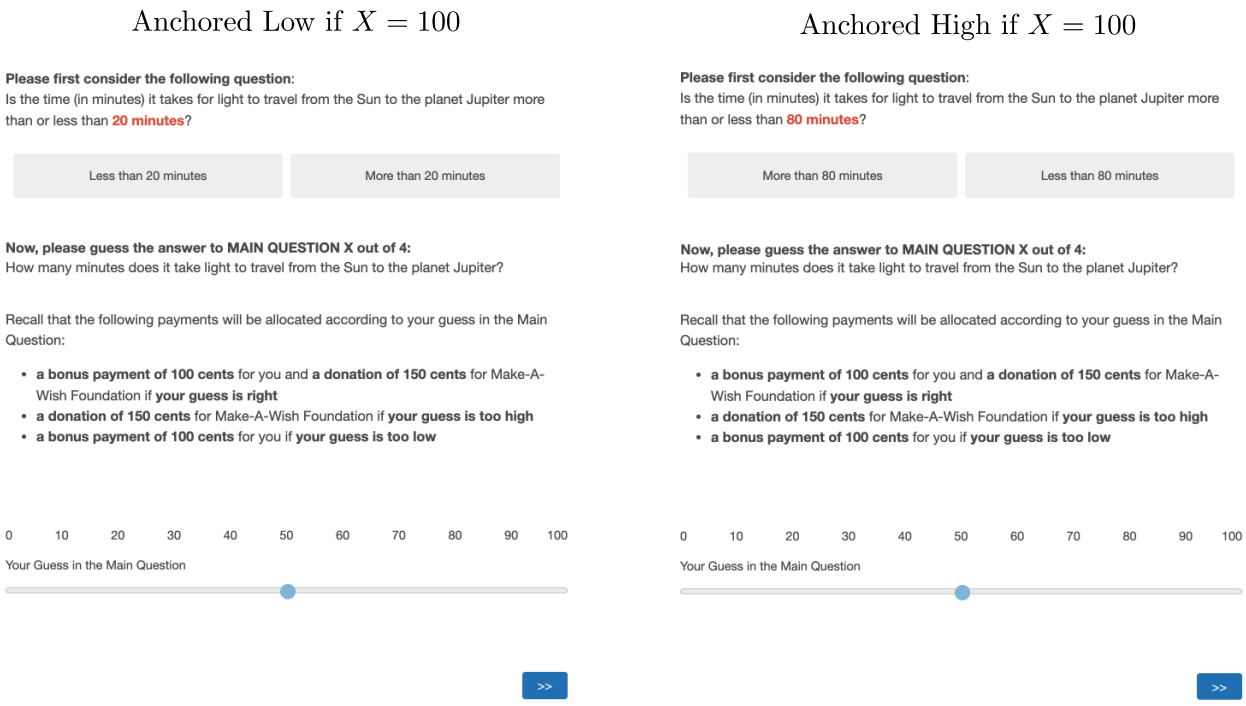



Figure B.27: Part 2: Main Question 2

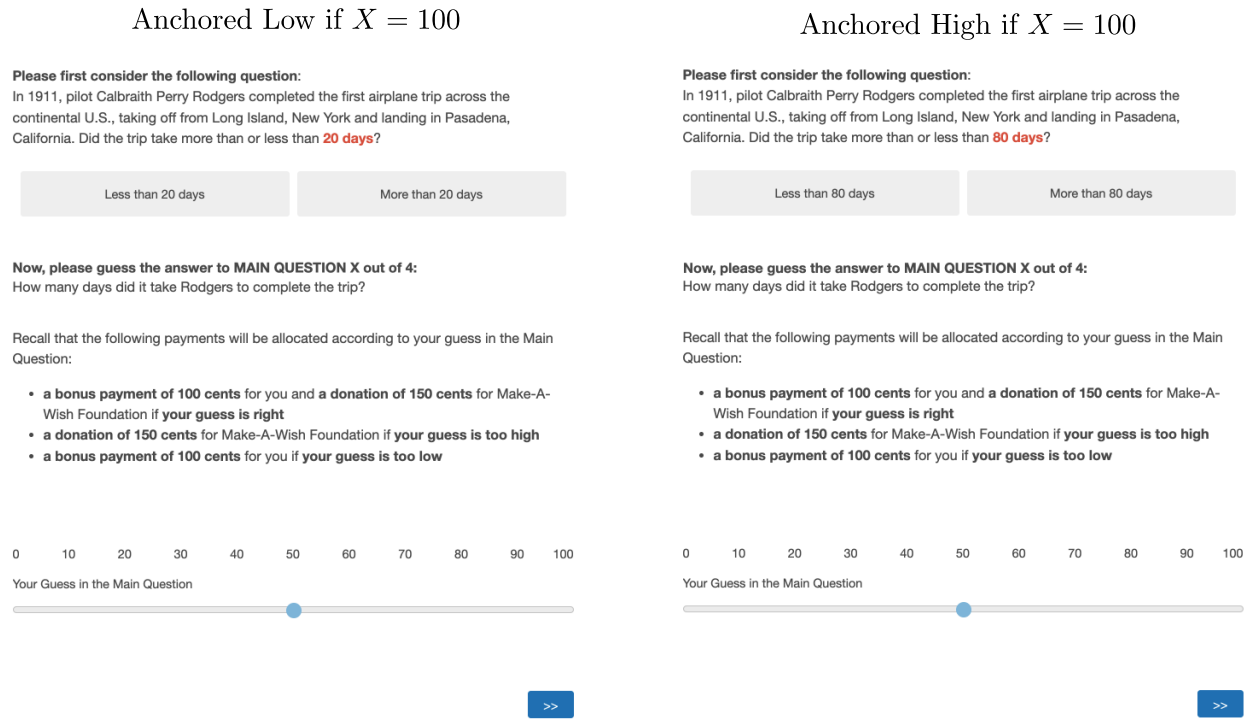
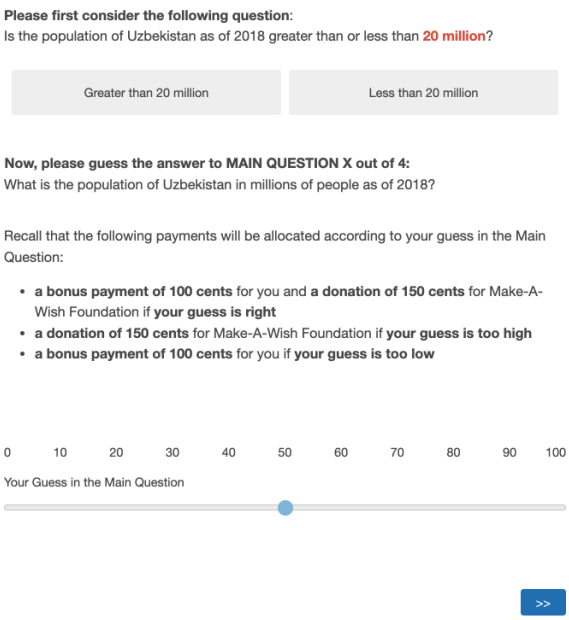


Figure B.28: Part 2: Main Question 3

Anchored Low if $X = 100$




Anchored High if $X = 100$

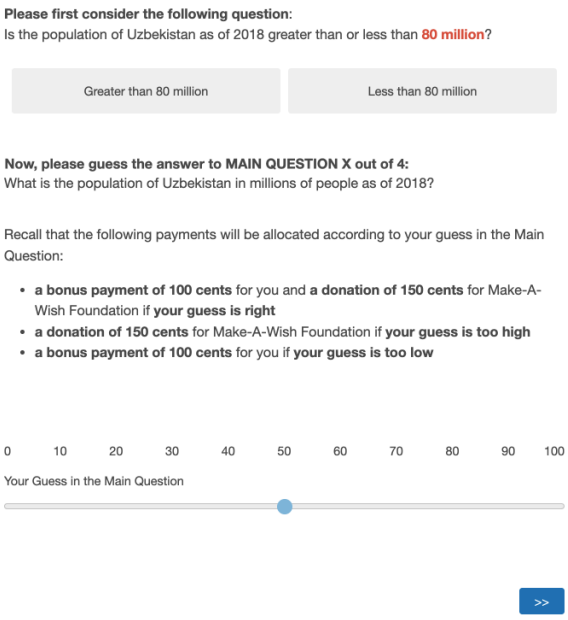
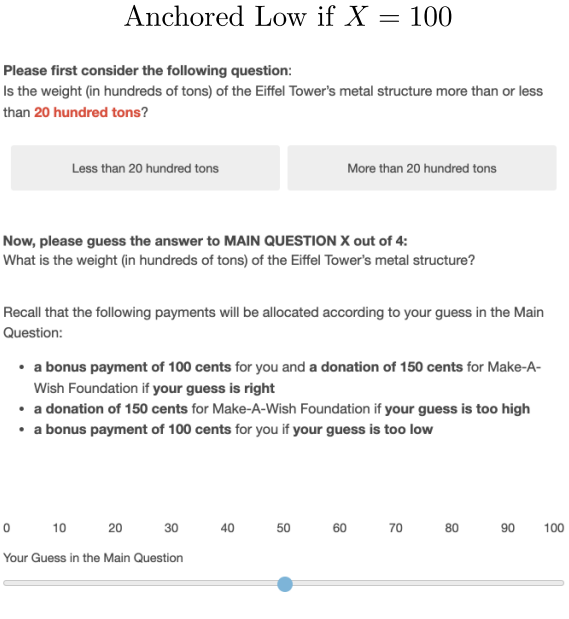
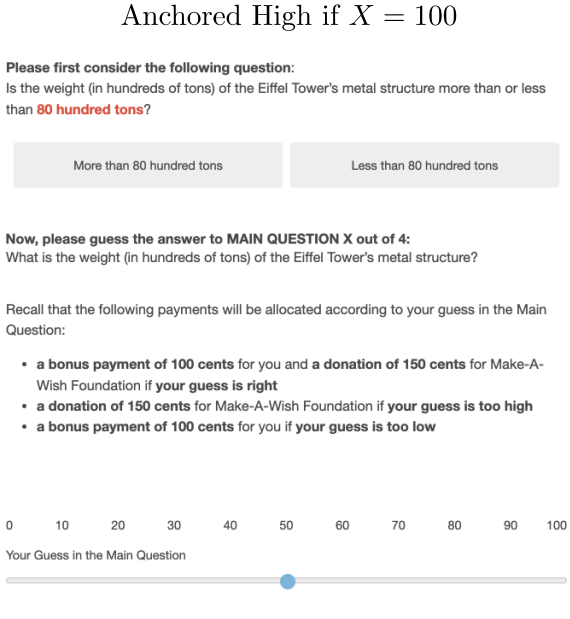



Figure B.29: Part 2: Main Question 4

Anchored Low if $X = 100$




Anchored High if $X = 100$



After completing the experiment, participants answer a short follow-up questionnaire.

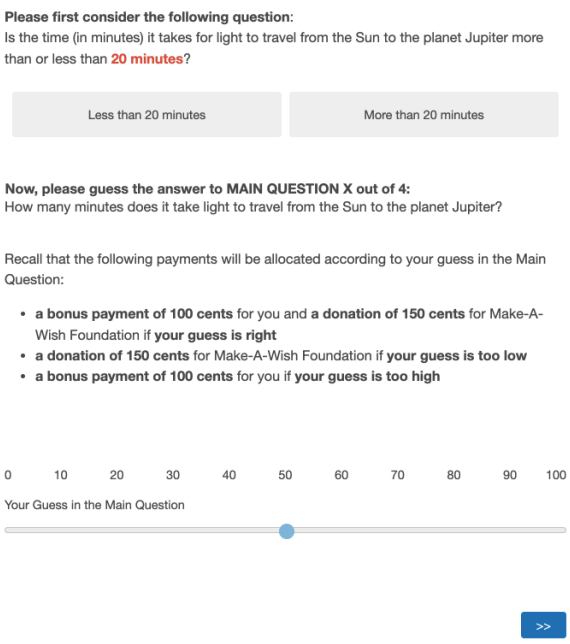
### B.4.2 Instructions for other treatments of Study 3B (Anchoring)

The previous section details the instructions for the *Underestimate* treatment version of Study 3B (Anchoring). In this section, we describe how these instructions differ for the remaining two versions of Study 3B (Anchoring).

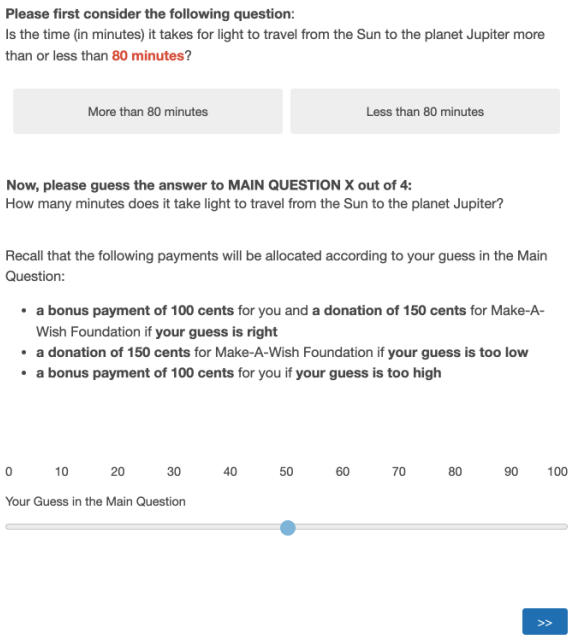
The *Overestimate* treatment is identical to the previous version of the study with the exception that the rewards in Part 2 for estimating the question answer as too high or too low are swapped. If a participant estimates the answer to the main questions in Part 2 as too high, that results in the participant receiving X cents for themselves. If a participant estimates the answer to the main question as too low, that results in the Make-A-Wish Foundation receiving 150 cents. Figure B.30 shows an example of a Part 2 Question used in the *Overestimate Treatment*.

Figure B.30: Part 2: Main Question 1 for *Overestimate* treatment of Anchoring Study 3B

Anchored Low if $X = 100$



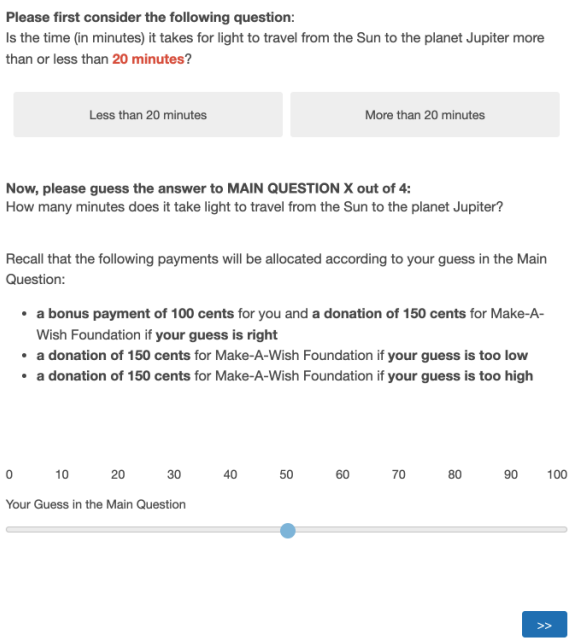

Anchored High if $X = 100$



In the *Control* condition, Part 2 estimates which are either too low or too high both result in the Make-A-Wish Foundation receiving 150 cents. Figure B.31 shows an example of a Part 2 Question used in the *Control* condition.

Figure B.31: Part 2: Main Question 1 for *Control Treatment* of Anchoring Study 3B

Anchored Low if $X = 100$




Anchored High if $X = 100$