HATE, FEAR AND INTERGROUP CONFLICT

Experimental Evidence from Nigeria

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Abstract

This paper studies to what extent social conflict between identity groups is driven by hate (preferences for harming the outgroup) vs. fear (subjective beliefs about the outgroup's hate towards one's ingroup), and how policy interventions can affect these drivers to increase cooperation. To this end, I develop a theory-guided experimental protocol to empirically disentangle these two motives and determine their relative importance. I deploy this protocol as a lab-in-the-field experiment in Jos, Nigeria, to study the city's ongoing conflict between Christians and Muslims. I find that fear explains 76%, and hate 24%, of the non-cooperative behavior between Christians and Muslims. Moreover, this fear is mostly unwarranted, as non-cooperators grossly exaggerate the percentage of hateful people in the outgroup. I then estimate a structural model to determine what type of policy intervention would most effectively increase cooperation. My counterfactual analysis suggests that interventions that correct unwarranted fears would be highly effective, while interventions that reduce hate would not because hateful people tend also to be very fearful. Finally, I study a real-life intervention with an RCT on a radio drama that promotes intergroup cooperation. Using my experimental protocol, I find that the radio drama decreases hate but not fear and therefore does not increase cooperation, as my model predicted.

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1. Introduction

Societies fractured into social identity groups, such as ethnicities or religions, typically fall into ingroup-outgroup dynamics characterized by hostile behavior and social conflict (Tajfel and Turner, 2004). These hostilities can take many forms, encompassing labor discrimination, the curtailment of civil rights and access to public goods, segregation, and even war in its most extreme case. Despite the prevalence of such conflicts, we still lack clarity on the motives that drive citizens to support hostile actions against the outgroup. While the literature has extensively studied material incentives for conflict, *intangible incentives* remain underexplored despite their recognized importance (Blattman, 2023).

Studying the intangible drivers of conflict is hard, because there are many potential motives, few with a clear definition that distinctly separates them from the others, and even fewer with an empirical measure. To make progress, I focus on the fundamental partition of motives for action that is preferences vs. beliefs. Support for hostilities may be rooted in preferences: individuals harbor *hate* towards the outgroup and want to harm them. Alternatively, support for hostile behavior could stem from beliefs: individuals do not hate the outgroup but *fear* that the outgroup hates them and wants to harm them, causing them to support hostile actions to protect themselves. This fundamental distinction is of high importance, as different drivers of conflict will call for different types of policy interventions. Nevertheless, hostile behavior is an equilibrium outcome, making it empirically challenging to disentangle the preferences and beliefs that might be driving it.

This paper seeks to answer two questions. (1) To what extent is intergroup conflict driven by hate vs. fear? I define hate as a *preference* for harming the outgroup, and fear as a *belief* about the outgroup's hate towards the ingroup. I conceptualize social conflict as a manifestation of non-cooperation, in the tradition of Fearon and Laitin (1996). Here, I further inquire: To the extent conflict is driven by fear, is this fear warranted? That is, are beliefs about the outgroup accurate, or are they misperceptions? After understanding what drives social conflict, I connect this diagnosis to real-life policy and ask: (2) Why interventions that are currently trusted to promote cooperation may or may not be effective? Here I focus on cultural media interventions (CMIs), a popular type of intervention in Africa that is used to tackle different social issues (Banerjee et al., 2020) and has received increased attention as a policy tool to mitigate conflict (e.g., in Rwanda (Paluck, 2009)). In particular, this paper studies radio drama series, a prime example of CMIs.

To answer question (1), I develop a theory-guided experimental protocol to empirically disentangle the preferences and beliefs that drive hostile action and assess their relative importance. Then, I deploy this protocol as a lab-in-the-field experiment in Jos, Nigeria, to study the city's ongoing conflict between Christians and Muslims. Jos is a city where Christians and Muslims have lived together for over a hundred years, but in the past 25 years, the city experienced multiple outbreaks of religious violence perpetrated by ordinary citizens from both sides. These events led to a process of religious segregation in all aspects of life. Today, there is little interaction between the groups, religion is the key political

cleavage, and politicians fuel negative narratives about the outgroup for political gain.

I start by building a model of conflict, with hate and fear as primitives. I model conflict between groups as a coordination game, where cooperation is a Nash equilibrium that offers the highest possible payoff to each player. In this game, players may prefer to not cooperate if they feel enough hate for the outgroup—that is, if a player prefers to sacrifice part of her payoff in order to reduce the payoff of the outgroup player by a greater amount. Alternatively, non-cooperation may stem also from fear—a player who is not hateful but fears the outgroup player is hateful (and therefore non-cooperative) will also want to not cooperate to reduce her losses. There are two important considerations here. (i) Although fear stems from perceived hate, it is independent from actual hate because beliefs are subjective and may not reflect reality. This means fear alone can drive conflict—when there are mutual misperceptions—making it a distinct driver from hate. (ii) Although, dynamically, past conflict may affect present hate and fear, in this static model (and the empirical exercise) conflict occurs after preferences and beliefs are formed. This static approach is appropriate as the goal here is not to explain *why* hate and fear are at their current levels, but rather to uncover *what* are the current levels and *how* they drive present conflict.

In the field, I measure cooperation between Christians and Muslims through coordination games. However, non-cooperation is an equilibrium outcome that is driven by both preferences and beliefs. To disentangle these drivers, I use the following insight when designing the experimental protocol. For each coordination game that subjects play, I can design a money allocation decision that mirrors the payoff structure of the coordination game but removes outcome uncertainty, such that beliefs do not enter the decision problem—only preferences. In this way, the money allocation decision identifies the preferences used in the coordination game. With this in mind, in the experiment I ask participants to make a series of money allocation decisions that elicit their willingness to pay to decrease or increase an outgroup member's payoff. This allows me to recover participants' level of hate in a way that is directly connected to their coordination game decision. To elicit fear, I ask participants to guess the money allocation decisions of other participants to identify their beliefs about the outgroup members' level of hate. I then use the information collected to estimate a structural model to recover social preferences at the individual level. Using the estimated preferences and elicited beliefs, I can determine the extent to which non-cooperation is driven by hate vs. fear. I then use the estimated model to conduct counterfactual analysis and study how policy interventions that shift hate or fear would affect cooperation levels in this context.

The first result is that in a game where mutual cooperation is an equilibrium and yields the maximum payoff (which represents half a day of salary in this context), people fail to cooperate in 31% of the interactions between groups—compared to only 6% of interactions within groups. This leads to a loss of 9.6% of attainable payoffs in intergroup interactions. I estimate the model and find that it performs well in terms of sample fit: the hate and fear elicited from participants explain over 90% of the decisions to cooperate or not. The estimated model leads to three main findings. First, 24% of non-cooperation decisions are motivated by hate, while 76% are motivated by fear. Second, fear is mostly unwarranted,

as non-cooperators vastly exaggerate the percentage of hateful people in the outgroup. Third, while altruistic individuals show a wide range of beliefs, from fearful to trusting, hateful individuals tend to also be very fearful of the outgroup. The counterfactual analysis reveals that if a policy solved unwarranted fears by correcting inaccurate beliefs about the outgroup, 94% of the people not cooperating out of fear would switch to cooperation. This result underlines how misperceptions leading to unwarranted fears are the most important barrier to intergroup cooperation. In contrast, if a policy completely eradicated intergroup hate, none of the people not cooperating out of hate would switch to cooperation. The effect on cooperation is null in this case because hateful individuals are also very fearful and therefore, even without hate, all of them will still want to not cooperate out of fear.

Importantly, I validate my measures of hate and fear by showing how they correlate with support for a real-life hostile action against the outgroup—religious segregation. What is more, my measure of hate correlates more strongly with support for segregation for hateful reasons, while my measure of fear correlates more strongly with support for segregation for fearful reasons. In addition, I show that my measures of hate and fear correlate with Social Dominance Orientation—a well-established personality trait in psychology and one of the strongest predictors of outgroup dehumanization and support for violence against them (Kteily et al., 2015; Thomsen et al., 2008). Furthermore, I find important differences in the way Christians and Muslims behave. Specifically, 84% of the decisions to not cooperate come from Christians and 16% come from Muslims. Additionally, Christians are more hateful towards Muslims and have more biased beliefs about them than the other way around. These results are in line with what was predicted in the pre-analysis plan, as I expected heterogeneity in this direction based on extensive fieldwork.

Having understood what drives intergroup conflict, I turn to question (2) and use my protocol to study why cultural media interventions may or may not be effective at increasing cooperation. To this end, I conduct an RCT where I randomly give participants access to a radio drama series that promotes intergroup cooperation, and evaluate its effects on hate, fear and cooperation. Radio dramas are both a popular form of entertainment in Sub-Saharan Africa and a common intervention used by NGOs in the region. Recently, they have received increased attention as a policy to mitigate conflict due to their perceived advantages: (i) fictional stories make it easier to address sensitive topics of conflict (Slater and Rouner, 2002); (ii) stories increase attention and retention of the message (Kromka and Goodboy, 2019); (iii) they are inexpensive to produce and require minor logistics to implement, relative to other popular interventions to mitigate conflict.

To study this policy, I partnered with the production company hired by the largest NGOs in Nigeria, and we produced a new radio show following the exact same steps NGOs take to produce their shows. The new radio drama aimed to reduce both hate and fear: the story is about two communities that, driven by hate and unfounded fears, miss out on mutually beneficial interactions, and its resolution has a message on letting go of hate and reevaluating fear. The treatment consisted of 24 episodes, each lasting between 10-15 minutes. The show was not broadcasted, but instead episodes were sent to

participants through WhatsApp, four times a week over a six-week period. To promote and monitor engagement, participants were incentivized to answer weekly quizzes on the show's content. The control group listened to a placebo radio drama with a message on health. At endline, participants went through the lab-in-the-field experiment again, which allowed me to study the effects of the intervention on hate, fear and cooperation.

I find that the radio show treatment is effective at reducing hate (by 0.45 SD), but ineffective at reducing unwarranted fears. Furthermore, the treatment proves ineffective at increasing cooperation. The previous diagnosis on the drivers of conflict allows to rationalize what could have otherwise been a puzzling result. The radio show is an effective policy because it reduces hate, but it is inefficient at achieving its main goal (increasing cooperation), because of the structure of the drivers of conflict in this setting. In a place where fear is the main problem and in addition hateful people tend also to be very fearful, an intervention that is only effective at reducing hate will struggle to increase cooperation. This result also highlights how unwarranted fears is not only a bigger problem than hate, but also one that seems harder to solve.

Beyond this, I find that the effect on hate is strongest in the most hateful subsample—a result that was not obvious *a priori*, as the most hateful individuals could have had also more rigid preferences. On the fear side, however, I do not find any treatment effects on any subsample. Importantly, I show the main result is not likely driven by social desirability bias, following the methodology in Dhar et al. (2022).

This paper makes three main contributions. First, it presents a theory-guided experimental protocol to empirically disentangle hate and fear in a way that proves useful at explaining conflict behavior and policy efficacy. The literature has provided evidence of how group membership affects preferences and beliefs (for reviews see Shayo (2020) and Charness and Chen (2020)). Concerning preferences, group membership has been shown to affect social preferences positively and negatively (Akerlof and Kranton, 2000; Chen and Li, 2009; Fershtman and Gneezy, 2001; Kranton et al., 2020; Enke et al., 2023). Concerning beliefs, group membership has been shown to affect trust, stereotypes and prejudice (Bénabou and Tirole, 2011; Falk and Zehnder, 2013; Bonomi et al., 2021). This paper builds upon the findings and tools of this literature to develop a theory of intergroup conflict and an experimental protocol to estimate the parameters of the theory.

Second, this paper provides well-identified evidence on how unwarranted fears can be an essential driver of conflict (even more than hate)—and how policies may struggle to correct these fears. This evidence directly contributes to the theoretical literature on fear and conflict (Chassang and Padró i Miquel, 2007; Padró i Miquel, 2007; Acemoglu and Wolitzky, 2023). In addition, this finding provides evidence on the moral foundations of conflict, something well established in social psychology (Fiske and Rai, 2014) but scant in the economic study of conflict (Rohner, 2024; Blattman, 2023; Esteban et al., 2012; Choi and Bowles, 2007). Furthermore, because I use a general framework of cooperation, these findings could help explain what drives conflict behavior in multiple other spheres of intergroup

interaction, like trade (Korovkin and Makarin, 2023; Anderson, 2011; Jha, 2013), labor selection (Oh, 2023; Giuliano et al., 2009), public spending (Luttmer, 2001; Franck and Rainer, 2012; Hodler and Raschky, 2014; Kramon and Posner, 2016), and economic performance (Hjort, 2014; Ghosh, 2022; Marx et al., 2021; Alesina and La Ferrara, 2005).

Third, this paper provides experimental evidence on the effectiveness of using cultural media as an intervention to foster intergroup cooperation. This evidence contributes to the literature on policies to improve cooperation between groups in conflict (for a review see Paluck et al. (2021)). Some of the interventions that have attracted academic attention lately are intergroup contact (Lowe, 2021; Rao, 2019; Mousa, 2020; Scacco and Warren, 2018; Paluck et al., 2019), perspective taking (Alan et al., 2021; Adida et al., 2018) and the use of narratives (Broockman and Kalla, 2016). The existing literature, however, lacks clarity regarding the mechanisms through which these interventions operate (Paluck et al., 2021). This paper sheds light on these mechanisms. In addition, my finding relate to the research on media and its effects on social and economic outcomes (for reviews see DellaVigna and La Ferrara (2015) and La Ferrara (2016)). More specifically, it contributes to the work studying how media influences attitudes of people in conflict situations (Yanagizawa-Drott, 2014; Adena et al., 2015; DellaVigna et al., 2014; Paluck, 2009).

The rest of the paper proceeds as follows. Section 2 presents the theory that guides the design of the experimental protocol. Section 3 presents the experimental protocol. Section 4 presents the setting where I deploy the experimental protocol. Section 5 describes the data collection process. Section 6 presents the results of the calibrated estimates (which will also motivate the need for a structural model). Section 7 presents the structural model and estimation strategy. Section 8 presents the results of the structural estimates and the counterfactual analysis. Section 9 turns to real-life policy analysis and presents the RCT on the radio show. Section 10 presents the results of the RCT. Section 11 concludes.

2. Theory

This section presents the theory that guides the design of the experimental protocol.

Consider a society with two groups, I (the ingroup) and O (the outgroup). Let i be a member of group I, and j a member of group O. When interacting with j, i has the the following utility function:

$$u_i = x_i + \beta_i \cdot x_j \tag{1}$$

Where x_i is i's payoff, x_j is j's payoff, and $\beta_i \in [-1, 1]$ is i's parameter of social preferences towards members of group O. If $\beta_i < 0$, i is hateful towards members of group O; if $\beta_i > 0$, i is altruistic towards members of group O; if $\beta_i = 0$, i is selfish when interacting with members of group B. The bounds assumed on β_i signify that i can not care about j more that she cares about herself. In this version of the model, β_i is exogenously determined—but later in this section I discuss the possibility of an endogenous

β_i and its implications.

I model social conflict as a coordination game (a.k.a. stag-hunt game) (as in Chassang and Padró i Miquel (2007); Acemoglu and Wolitzky (2023); Rohner et al. (2013)) where players can *Cooperate* (C) or *Not Cooperate* (N), and failure to cooperate represents the conflict state (in the tradition of Fearon and Laitin (1996)). Coordination games can allow for a richer study of the reasons behind conflict because in it cooperating represents the maximum attainable payoff for each player and is an equilibrium—so failure to cooperate is not driven by own-payoff maximization, as in the prisoner's dilemma. For directness, I illustrate the theory with the following coordination game, which is the one subjects play in the experiment (where payoff units are in Nigerian naira). Payoffs in the matrix represent x_i and x_j in the utility function.

Example 1

	C	N
C	1000 , 1000	500 , 900
N	900 , 500	750 , 750

Players i and j face each other in a coordination game like the one in Example 1. In the case where there are no social preferences, β_i=0, the game has two equilibria: (C, C) and (N, N). The equilibrium (C, C) gives each player the highest possible payoff in the game, but carries some risk: if j decides to play N, then i would get the lowest possible payoff in the game.

There are two reasons why a player would choose N as her strategy: out of preferences or out of beliefs. Before delving into them, notice that all types of players, regardless of their social preferences, prefer to not cooperate when the other player does not cooperate. That is, for all β_i, $u_i(N, N) > u_i(C, N)$.[1] Intuitively, even if i is fully altruistic and has β_i=1, she would still prefer to play N if j plays N, because doing so increases her payoff more than it reduces j's payoff (i.e., she increases the sum of both payoffs).

The first reason to not cooperate is out of preferences: player i will choose N if she has sufficiently hateful preferences towards the outgroup. To see this, we need to characterize the condition under which a person will want to not cooperate, even if the other player is going to cooperate. In other words, we characterize the condition under which $u_i(N, C) > u_i(C, C)$. In our example,

$$u_i(N, C) > u_i(C, C)$$
$$900 + \beta_i 500 > 1000 + \beta_i 1000$$
$$\beta_i < -0.2$$

[1] Proof: $u_i(N, N) > u_i(C, N) \Rightarrow 750 + \beta_i 750 > 500 + \beta_i 900 \Rightarrow \beta_i > 5/3$. Because $\beta_i \in [-1, 1]$, it is always the case that $\beta_i < 5/3$.

Define the threshold $T \equiv -0.2$. If i is hateful beyond the threshold, she will prefer to not cooperate regardless of what j might do. That is, if $\beta_i < T$, N is a dominant strategy for i. In the case of Example 1, $\beta_i < T$ means that i is hateful enough to prefer to lose 100 and reduce j's payoff by 500. When $\beta_i < T$, we say that i chooses to not cooperate out of hate.

The second reason to not cooperate is out of beliefs: player i will choose N if she believes that the probability of j not cooperating is sufficiently high. To see this, consider i's expected utility function in the game. Let s_i be i's strategy, and $\tilde{P}_i(s_j = N)$ be i's subjective belief about $P(s_j = N)$, the probability that j will not cooperate.

$$W_i(s_i) = \tilde{P}_i(s_j = N) \cdot u_i(s_i, N) \; + \; \tilde{P}_i(s_j = C) \cdot u_i(s_i, C) \tag{2}$$

Player i will chose to not cooperate if $W_i(N) \geq W_i(C)$. In the case of Example 1, solving for $\tilde{P}_i(s_j = N)$ yields the following.

$$\tilde{P}_i(s_j = N) \geq \frac{u_i(C,C) - u_i(N,C)}{u_i(C,C) - u_i(N,C) \; + \; u_i(N,N) - u_i(C,N)}$$

$$\tilde{P}_i(s_j = N) \geq \frac{100 + \beta_i \cdot 500}{350 + \beta_i \cdot 350} \tag{3}$$

The condition above determines the beliefs required for i to want to not cooperate. Importantly, the cutoff depends on i's social preferences: the less altruistic a person is, the more optimistic her beliefs need to be to want to cooperate.

Now, i's beliefs about j can be broken into two: first-order beliefs and higher-order beliefs. First-order beliefs are i's beliefs about j's level of hate towards her, β_j. I define *fear* as these first-order beliefs. Fear can lead to non-cooperation if i believes that j is hateful beyond the threshold ($\beta_j < T$) and therefore non-cooperative—in which case i will want to not cooperate as well. Therefore, fear will be captured by $\tilde{P}_i(\beta_j < T)$, which is i's beliefs about $P(\beta_j < T)$.

Higher-order beliefs are i's beliefs on j's beliefs about i, and so on. Higher-order beliefs will be captured by $\tilde{P}_i(s_j = N | \beta_j \geq T)$. We can therefore divide the beliefs on $P(s_j = N)$ in the following way:

$$\tilde{P}_i(s_j = N) = \tilde{P}_i(\beta_j < T) + \tilde{P}_i(s_j = N | \beta_j \geq T)$$

If $\tilde{P}_i(\beta_j < T)$ drives the decision to not cooperate, we say that i chooses to not cooperate out of fear. This occurs when i chooses not to cooperate despite having $\beta_i > T$, and higher-order beliefs are negligible (which will be the case empirically, as I will show in Section 7).

Important considerations about the model:

Given that this model will guide the empirical analysis, there are some elements of it that warrant some discussion.

Are fear and hate independent drivers of conflict? Theoretically, they can be, and empirically, they appear to be. Regarding fear: although fear is based on *perceived* hate, fear is independent from hate because beliefs are subjective and do not need to correspond to actual levels of hate. Importantly, this implies that fear alone can drive conflict: even in the absence of any real hate, conflict can still happen if both sides *believe* that the outgroup is hateful (as shown in Chassang and Padró i Miquel (2007)). Empirically this is what I find: substantial misperceptions about the true level of hate generate unwarranted fears that drive non-cooperation (Section 6). Moreover, the intervention analyzed in Section 10 exogenously shifts fear but not hate, providing further evidence that fear can operate independently of hate when there are misperceptions.

Regarding hate: Hate could depend on fear if social preferences include an element of reciprocity—that is, if believing that the outgroup hates the ingroup leads individuals to hate the outgroup in return. However, empirically the correlation between preferences and beliefs appears weak: for instance, 70% of participants in the upper quartile of fear are fully altruistic towards the outgroup (see Figure A4.1). Regardless, I explore the implications of an alternative model with reciprocal social preferences in the counterfactual analysis of Section 8.2 and more thoroughly in Appendix C2.

Could conflict affect hate and fear (i.e. reverse causality)? In a dynamic model, yes: conflict today could affect future levels of hate and fear. In a static model, however, conflict cannot affect hate and fear because preferences and beliefs are formed *prior* to the decision to engage in conflict. That is, in the static model, only conflict is determined in equilibrium, while hate and fear are exogenously determined. Importantly, my empirical exercise mirrors the static model: I elicit participants' preferences and beliefs *before* they make cooperation decisions, and participants never learn about the outcomes of the games. This static approach is appropriate for this paper because the goal here is not to explain *why* hate and fear are at their current levels, but rather to uncover *what* are their current levels and *how* they drive present conflict.

Could conflict be caused not by hate and fear, but by another variable that incidentally also affects hate and fear? The decision to cooperate or not (as any other) must be fully explained by preferences and beliefs. By construction, preferences and beliefs exhaust all motives for action. Therefore, any external event or variable that influences cooperation must operate through changes in either preferences or beliefs. That said, two questions arise. (i) Is the preference structure I assume the correct one? In Section 7, I use a structural model to test more general models and let the data guide the model selection process. Moreover, as I will show in the next section, my method for disentangling preferences and beliefs does not rely on any assumptions about the form of the utility function. (ii) Do my empirical measures correctly identify the preferences and beliefs that drive the decision? I discuss identification in the next

section.

3. Lab experiment design

This section presents the experimental protocol that identifies the drivers of non-cooperation. Following the theory, three pieces of information are needed from each person in the experiment: (i) the decision to cooperate (s_i); (ii) the social preferences towards the outgroup (β_i); and (iii) the beliefs on the probability that an outgroup member has social preferences below the threshold ($\tilde{P}_i(\beta_j<T)$). The key is to collect these pieces of information in a way that directly connects them to each other.

3.1. Identification strategy to disentangle the motives for non-cooperation

To disentangle the primitives that play a role in the equilibrium outcome, I use the following insight when designing the experimental protocol. For each coordination game that participants in the experiment could play, it is possible to design a money allocation decision that mirrors the payoff structure of the coordination game but removes the uncertainty in outcomes, such that beliefs do not enter the decision problem, only preferences. In this way, the money allocation decision isolates the preferences that play a role in the decision of the coordination game. To clarify the intuition for identification of preferences vs. beliefs, consider the following example.

Example 2

	C	N
C	1000 , 1000	500 , 900
N	900 , 500	750 , 750

Coordination Game

	You	Other
Opt 1	1000	1000
Opt 2	900	500

Money Allocation Decision

↑ preferences + beliefs ⟵ ↑ preferences

In the money allocation decisions, one participant is the decision-maker and gets to pick between the payoffs in Option 1 or Option 2, while her match is a receiver. Without imposing any structure on the utility function, we can categorize people into two groups by examining together their decisions in the two situations above. If a participant prefers Option 2 to Option 1, she reveals her preferences are hateful enough to want to sacrifice 100 to lower the payoff of her match in 500. This in turn reveals that in the coordination game she would want to not cooperate out of hate—that is, she would want to not cooperate even if she knew her match was going to cooperate. We can infer this because the money allocation decision presents to the participant exactly that scenario. If, instead, the participant prefers Option 1 to Option 2 in the money allocation decision, she reveals that she does *not* have preferences

that are hateful enough to want to not cooperate out of hate in the coordination game. Therefore, if a participant prefers Option 1 to Option 2, but in the coordination game decides to not cooperate, it must be that believes are driving her non-cooperative decision.

The identifying assumption behind this strategy is that participants use the same preference structure when facing the money allocation decision as when playing the coordination game. I find two main challenges to this assumption. (i) The preference structure in the money allocation decision could include social desirability concerns that may be absent in the coordination game, where participants can plausibly deny they chose to not cooperate out of hate. To address this concern, in Section 6.4 I use a survey module that measures participants' propensity to give socially desirable answers to debias the social preference parameters and assess the robustness of the results. (ii) Preferences used in the coordination game could include psychological costs and benefits such as a taste for cooperation or loss aversion. To address this concern, the structural model in Section 7 has a general utility function that captures any potential payoff shifter.

If this assumption holds, one can distinguish between those not cooperating due to preferences versus beliefs without imposing any functional form on the utility[2]. Moreover, if the assumption holds, no exogenous variation is required to prove that the observed non-cooperation is driven by the elicited preferences and beliefs—as established earlier, this must necessarily be the case.

As I explain in detail below, although the experimental design is based on the logic showcased in Example 2, what participants do in the experiment is somewhat more complex: they play a couple of coordination games; they face a series of money allocation decisions, which allows me to determine not only if they are above or below a certain threshold of hate but also how hateful or altruistic are they exactly; and they make incentivized guesses on other participants' money allocation decisions, which elicits how hateful or altruistic they believe the outgroup to be.

3.2. The experimental protocol

Experiment set up

With the insight from above in mind, the lab experiment proceeds as follows. First, participants are told there are two groups, the Blue Group and the Green Group, and that they will play with one group first and then the other. Before playing with each group, they are shown the list of names of all the members of the group, and are told that they will be randomly matched and play with one of the members of the group but won't know which one. Each group consists of ten individuals who made their decisions in advance. Crucially, the names in the Blue Group are all Christian names, while the names in the Green Group are all Muslim names. In Nigeria, names are a clear signal of religious affiliation, so participants can easily identify that the common characteristic of the members of each group is religion (full details

[2]If no structure is imposed on the utility function, an underlying assumption in this analysis is that if a person knows the other player will not cooperate, she will prefer to not cooperate as well.

on the setting are presented in Section 4). After playing a set of games with the group that was first revealed, participants are then shown the list of names of the second group and proceed to play with that group. By the end of the experiment, participants have played the same set of games with each group.

This design has two advantages. First, using names to signal religion allows me to not mention religion explicitly, which helps reduce experimenter demand effects. Second, by not knowing exactly who their match is within the group, participants are forced to think about the average behavior of the members of the group, of which the only discernible shared characteristic is religion. In this way, one can control for any other characteristic a name could signal, like gender, age cohort, etc.

Importantly, there was no deception in this experiment. The names in the Blue and Green groups belonged to real people who were sampled from the pilot of the experiment and made their decisions in advance. In addition, the payoffs of one of the games played was implemented, and participants were informed that that game would be picked at random at the end of the lab experiment. Lastly, the names of participants (that were not from the pilot) were never recorded, to lower demand bias.

Eliciting social preferences

After participants are matched with an anonymous person from the first group shown to them, they start the activities of the experiment with a series of money allocation decisions. There are 20 money allocation decisions a participant could potentially face. In half of the 20 money allocation decisions a participant could face, Option 2 represents the hateful option of reducing the match's payoff in ₦500 naira[3], at a cost to the decision-maker. In the other half of the 20 money allocation decisions, Option 2 represents the altruistic option of increasing the match's payoff in ₦500 naira, at a cost to the decision-maker. Within each half, each possible decision varies the amount of money a person has to sacrifice to pick Option 2 (i.e., each decision presents a different price for Option 2). In the end, this series of decisions elicits the participant's willingness to pay to either increase or decrease in a fixed amount the payoff of their match.

However, it is not necessary for participants to face all 20 money allocation decisions. Using an algorithm that selects the next money allocation decision based on participants' prior choices, participants need to make only 7 or 8 decisions for the experimenter to calibrate their social preference parameters. Out of these, the payoffs of only one decision is implemented, picked at random.

To calibrate a person's social preference parameter, I use a her choices in the money allocations decisions in the following way. If a person picks Option 2 in a certain money allocation decision, she reveal that for her $u_i(Opt2) \geq u_i(Opt1)$. Assuming that her utility function has the form $u_i{=}x_i{+}\beta_i{\cdot}x_j$, then $u_i(Opt2) \geq u_i(Opt1)$ implies that $\beta_i{\leq}(x_{i2} - x_{i1})/(x_{j1} - x_{j2})$—where x_{i1} is the payoff for participant i if she picks Option 1. This way, each money allocation decision puts a bound on the social preference

[3] ₦500 naira represent twice the hourly wage in this context.

parameter, and with enough decisions of this sort one can calibrate and pin down a person's parameter. With this calibration method, I can use each participant's choices to place their social preference parameter in one of the following intervals: $\hat{\beta}_i \in \{(-1, -0.9), ..., (0.9, 1)\}$. I call these the calibrated estimates. A table clarifying the correspondence between the money allocation decisions made by a participant and the β_i assigned to her can be found in Appendix B1.

This calibration approach to recovering social preferences has the advantage of being simple and transparent. However, there are two potential concerns one could have with this approach. First, it ignores sampling variability, so I cannot calculate standard errors for the individual-level parameters I have calibrated. Second, it does not allow me to test with the data if alternative models could better explain behavior. In Section 7, I present a structural estimation approach that addresses these concerns at the cost of being less direct.

Eliciting beliefs about others' social preferences

After the money allocation decisions phase, the next module elicits beliefs about the probability of j not cooperating out of hate. That is, it elicits beliefs on the probability that j is hateful beyond the threshold, $\tilde{P}_i(\beta_j < T)$. To do this, I ask participants to guess the choices that other participants made in the money allocation decisions. If they guess correctly, participants earn money.

Notice, first, that beliefs on $P(\beta_j < T)$ are determined by the beliefs on the distribution of social preferences of the group j belongs to. In particular, $P(\beta_j < T)$ is the percentage of the distribution of social preferences of the group j belongs to that lies to the left of T. To elicit beliefs on $P(\beta_j < T)$, I do the following. First, I show participants a money allocation decision where picking Option 2 means having $\beta_j < T$. And I tell them, for example, that in this case the decision-maker was from the Green Group and the receiver was from the Blue Group. Then, I ask them to guess how many people (out of the 10) from the Green Group picked Option 2 when playing with someone from the Blue Group. This guess ultimately reveals what percentage of Muslims the participant thinks are hateful enough towards Christians to want to pick Option 2 in this money allocation decision—and, consequently, to want to not cooperate out of hate in an upcoming coordination game.

In addition to eliciting beliefs about the tail of the distribution of social preferences of the group j belongs to, I also elicit beliefs about the mean of this distribution, which I label as $\tilde{E}_i[\beta_j]$. To do this, I ask participants to face the same 20 money allocation decisions they faced before, but this time trying to guess what their match from the Green/Blue group picked. Because they do not know exactly who their match is but just their religion, this exercise elicits their beliefs on the average behavior of a person from that religion.

Measuring cooperation

Lastly, participants play coordination games with their anonymous matches from the Green and Blue groups. With each match, they play two coordination games, where each game has a variation in payoffs that changes the threshold of how hateful a person needs to be to want to not cooperate out of hate (which also changes the fear threshold). The first game, showcased in Examples 1 and 2, has a threshold of $T=-0.2$, and the second game, whose payoff matrix can be found in Appendix A3, has a threshold of $T=-0.6$.

After these games, the lab activities conclude. A key feature of the design is that participants are never informed about the choices their matches made in the games or money allocation decisions, ensuring that these do not influence any subsequent responses. Importantly, participants also cannot infer these choices, as the only feedback they receive is their final survey payment—which is determined by multiple factors. Full details on the experimental protocol can be found in the Appendix E.

4. Setting: Jos, Nigeria

Nigeria is divided between a Muslim-dominated North and a Christian-dominated South. The Middle Belt is the region where these two religious communities intersect. Plateau State is one of the states located in the Middle Belt and stands out as the most ethnically diverse state in the country. The experiments of this project took place in Jos, the capital of Plateau State.

The city of Jos has historically had a balanced population of both Christians and Muslims, who have lived together for over a hundred years. Throughout much of Jos' history, the relation between these two groups was characterized by peaceful and harmonious interactions. For instance, just 25 years ago both religious groups lived on the same street and used to celebrate religious festivals together. However, with the onset of democratization in the 1990s, political leaders competing for power began to emphasize religious distinctions, leading to heightened tensions and a looming threat of violence. In 2001 occurred what came to be known as the First Crisis. This was a spontaneous outbreak of inter-religious violence perpetrated by ordinary citizens, that spread throughout the city. The crisis lasted for several days and resulted in over a thousand fatalities, with both groups being both victims and perpetrators.

After the First Crisis, tensions between the religious groups increased even more. This led to several similar spontaneous outbreaks of inter-religious violence in 2004, 2008 and 2011, each resulting in hundreds of fatalities. This sequence of crises deeply scarred the city and broke what was left of the once-harmonious relationship between Christians and Muslims. Since the First Crisis, and reinforced by the ones that followed, a process of religious segregation was set in motion, permeating all aspects of life, like the composition of residential areas, schools, jobs and political groups.

Figure 1 showcases the religious segregation that took place in Jos between 2000 and 2022. The figure shows a diagram for the map of Jos at three key points in time: 2000, just before the First Crisis;

Figure 1: Religious Segregation in Jos, 2000-2022

Notes: The figure shows a diagram for the map of Jos at three points in time. In each diagram, each cell represents one of Jos' communities (or neighborhoods) in its approximate geographical location. Green quadrants have a majority Muslim population, with darker greens representing a higher share of Muslims, and blue quadrants have a majority Christian population, with darker blues representing a higher share of Christians. Due to the absence of census data containing this information, the data for this figure was gathered using the following method: Within the group of participants of this project that were 40 or older and had lived in their community for at least 25 years, I picked 3 per community and asked them about the religious composition of the population in their neighborhood in these three years. For each neighborhood-year, I averaged the three answers and use that average as the data point.

2010, just before the 2011 crisis; and 2022, when the baseline data of this study was collected. In each diagram, each cell represents one of Jos' communities (or neighborhoods) in its approximate geographical location. Green quadrants have a majority Muslim population, with darker greens representing a higher share of Muslims, and blue quadrants have a majority Christian population, with darker blues representing a higher share of Christians.

Today, due to the segregation that took place, there is minimal interaction between the religious groups in the city. Although the city has regained some stability and safety over the past decade, the traumatic experiences of the past have made people reluctant to venture outside the areas of their religious group. This lack of contact has exacerbated mistrust and animosity between the groups. Additionally, religion has become the key political cleavage, with political parties using religious banners to mobilize voters in the quest for control over the city. At the time of this writing, both sides fear that if the other religious group gains too much power, they may force them out of the city or block their growth in it. Many politicians exploit these fears for political gains, further exacerbating tensions. This context closely resembles the theoretical characterization of "the politics of fear", described by Padró i Miquel (2007).

Currently, power over the city is relatively balanced between the two religious groups, which may explain the fragile peace the city has experienced in recent years. Yet, this equilibrium is constantly under threat and is hard to predict if and when a new crisis may break out.

5. Data collection

The data collection for each lab-in-the-field experiment (baseline and endline) lasted for two weeks. The treatment, which was listening to the radio show (see Section 9), took place for six weeks, in between lab experiments. At baseline, the team in the field surveyed 997 people from 41 Jos communities (out of 44 communities). The sample was 50% Muslim and 50% Christian, 47% female and 53% male, with ages between 18 and 60 and a mean of 33. Participants were required to have access to a phone with WhatsApp and be available to participate in a second lab experiment two months later.

The recruiting process was the following. Every morning a pair of enumerators of the same religion visited a community of their religion. When in the community, enumerators picked a random starting point (like a school or water source) and started walking in opposite directions. To select a house to survey, they followed a 3/4 pattern, knocking on the 3rd house away from the starting point, then the 4th house from there, then the 3rd house from there, and so on. If someone answered the door, enumerators would briefly explain the survey and ask if someone in the household was interested in participating. If someone accepted, the lab-in-the-field experiment was carried out immediately at the person's home. Enumerators were instructed to maintain a balanced sample in age and gender. On average, the lab experiment took around 50 minutes to complete.

At the end of the survey, enumerators asked participants if they wanted to participate in the radio show project. Because this implied no extra effort, everyone agreed to be contacted for this. Some days after the baseline was completed, we created two WhatsApp groups, one for the treatment group and another one for the control group. In them, we welcomed everyone to the radio show project and explained the logistics of it. Through the WhatsApp groups we sent the episodes of the radio drama. Only administrators could send messages in these WhatsApp groups.

After the radio show ended, enumerators visited the communities again. Using the registered phones, enumerators contacted the participants and scheduled appointments to carry out the endline lab experiment. 947 participants from baseline participated in the endline lab experiment—that is, 95% of the original sample.

For each survey, participants received a compensation between ₦700 and ₦1,700 naira, depending on the results of the different lab games. In Jos, ₦1,000 naira was at the time approximately the payment for four hours of work. These payments were made in cash immediately after the survey ended. Importantly, the final payment did not reveal any information about the participant's or their match's decisions. This was because only some questions, picked at random, got their payoffs implemented, and which question got selected was not revealed.

6. Results of the Calibrated Estimates

6.1. Cooperation rates

Table 1 reports cooperation rates by match type and game. The results show that even in a game where mutual cooperation is an equilibrium and yields the highest possible payoff to each player (equivalent to half a day's wage), individuals fail to cooperate in 28%-31% of interactions between groups. In contrast, cooperation rates with the ingroup are much higher, with only 6%-7% of interactions within group failing to cooperate. The table also shows a strong heterogeneity by religious identity: 26%-28% of Christians chose not to cooperate with the outgroup, compared to just 2%-5% of Muslims. This religious heterogeneity is explored further in Section 6.3.

Table 1: Cooperation Rates

Match	Game	% of interactions that failed to coop.	% that chose NC	
			Christians	Muslims
Outgroup	$T=-0.2$	31.5%	28.0%	5.0%
	$T=-0.6$	28.0%	26.3%	2.4%
Ingroup	$T=-0.2$	6.5%	5.4%	1.2%
	$T=-0.6$	7.6%	6.6%	1.2%

Notes: This tables shows cooperation rates with the ingroup and the outgroup and for the games with threshold $T=-0.2$ and $T=-0.6$. The column labeled "% of interactions that failed to cooperate" reports the expected percentage of interaction where at least one player chose to not cooperate. The last two columns report the % of participants from each religion that chose to not cooperate.

I also find considerable heterogeneity in cooperation rates across neighborhoods. In the five least cooperative neighborhoods, between 55% and 77% of participants chose to not cooperate. Cooperation rates (and preferences and beliefs) by neighborhood are reported in Appendix B7. Notably, some of the neighborhoods with the highest rates of non-cooperation correspond to those known to have been at the epicenter of the conflict in Jos (ICG, 2012).

In addition,Table B2.1 examines the explanatory power of hateful preferences and fearful beliefs in predicting non-cooperation, as measured by the R^2 across different regressions. Regressing s_i on β_i alone yields an R^2 of 29.2%, which increases to 35.2% when controls are added (age, gender, religion, education, and marital status). In contrast, regressing s_i on $\tilde{P}_i(\beta_j<T)$ produces an R^2 of 48.7%, rising to 52.1% with controls. Finally, a model including both hate and fear achieves an R^2 of 55.7%, which increases to 58.1% when controls are added. Three conclusions follow: (i) fear has greater explanatory power than hate; (ii) the two measures jointly explain non-cooperation better than either one alone; and (iii) the measures of hate and fear demonstrate strong explanatory power, accounting for over 55% of the variation—a high figure by empirical economics standards.

6.2. Disentangling of hate and fear

Table 2 reports average social preferences for the outgroup (β_i) and average beliefs about the percentage of the outgroup that is hateful beyond the threshold ($\tilde{P}_i(\beta_j<T)$), disaggregated by whether individuals chose to cooperate or not. Several key patterns emerge. Regarding preferences, Columns 1 and 2 show a large gap in social preferences between cooperators and non-cooperators. In both games, the average β_i among cooperators is above 0.9, while for non-cooperators it is around 0.31–0.35. However, Column 3 reveals that only a minority of non-cooperators have a hateful reason not to cooperate (i.e., $\beta_i<T$): only 30% in the $T=-.2$ game and 21% in the $T=-.6$ game. This means that the great majority—70% and 79%, respectively—of non-cooperators did not have a hateful reason to not cooperate, which implies that their decision must have been driven by beliefs.

Table 2: Preferences and Beliefs for the Outgroup

Game	Avg. β_i		% of Non-Coop.	Avg. $\tilde{P}_i(\beta_j<T)$		Accurate
	Coop. (1)	Non-Coop. (2)	with $\beta_i<T$ (3)	Coop. (4)	Non-Coop. (5)	$P(\beta_j<T)$ (6)
$T=-0.2$	0.92	0.35	30%	0.14	0.59	0.05
	(0.14)	(0.75)		(0.16)	(0.21)	
$T=-0.6$	0.91	0.31	21%	0.08	0.47	0.03
	(0.17)	(0.76)		(0.12)	(0.22)	

Notes: This tables shows preferences and beliefs for the outgroup, disaggregated by whether individuals chose to cooperate or not in the games with threshold $T=-0.2$ and $T=-0.6$. Column 1 and 2 show the average social preferences for the outgroup (β_i). Column 3 shows the percentage of non-cooperators that had hateful preferences beyond the threshold. Column 4 and 5 show that the average beliefs about the percentage of the outgroup that is hateful beyond the threshold ($\tilde{P}_i(\beta_j<T)$). Column 6 shows the accurate percentage of individuals that are hateful beyond the threshold.

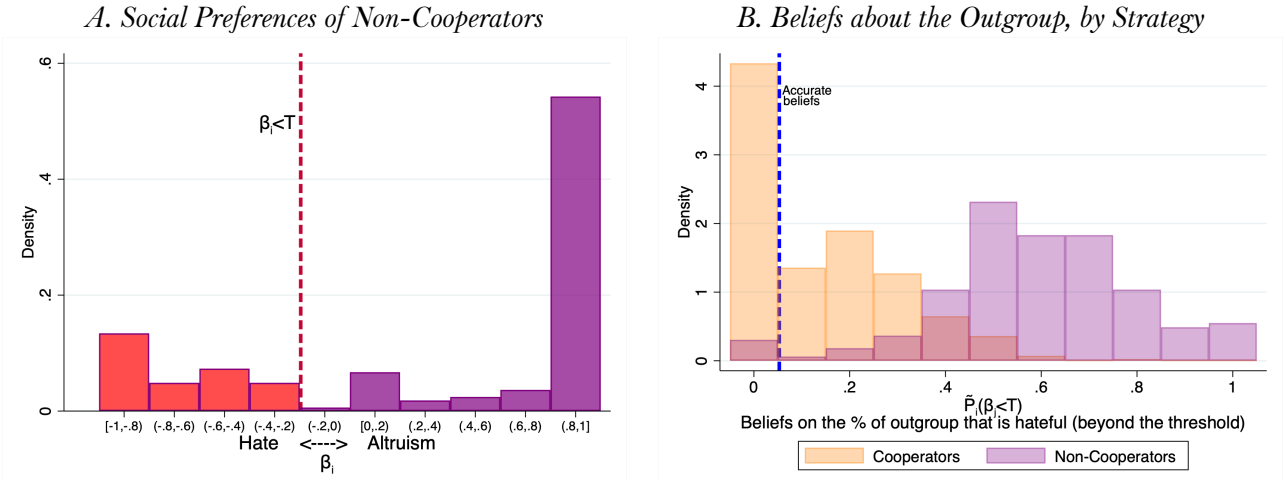
Regarding beliefs, Columns 4 and 5 show that non-cooperators believe there is a much higher proportion of hateful people in the outgroup than cooperators. More importantly, Columns 5 and 6 show that non-cooperators hold large misperceptions about the outgroup, vastly overestimating the share of hateful individuals: they believe that 59% and 47% of the outgroup have $\beta_j<T$, whereas the actual shares are only 5% and 3% for the respective thresholds. Cooperators, in contrast, hold much more accurate beliefs about the outgroup.

Overall, these results show that non-cooperation is primarily driven by fear, and that this fear is unfounded, as it is based on misperceptions. (An analogous table of preferences and beliefs for the ingroup is found in Appendix B3.

I now turn to a graphical analysis to illustrate the underlying distributions. Here, I focus on the $T=-.2$ game with the outgroup, but equivalent graphs for cooperators and non-cooperators in both games and group types are provided in Appendix B4, B5 and B6.

Figure 2A shows the distribution of social preferences (β_i) among participants who chose not to cooperate in the $T=-.2$ game. The dashed red line marks the threshold below which a person becomes

Figure 2: Distribution of Preferences and Beliefs in Game with $T=-.2$



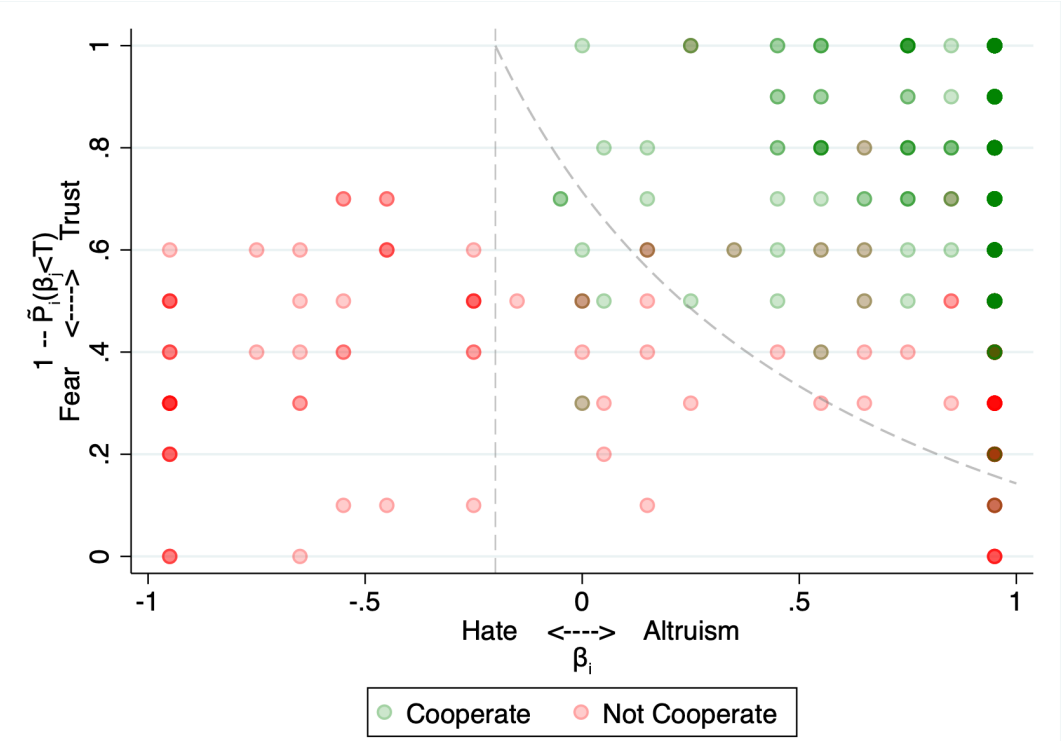
Notes: Figure 2A presents the social preferences (β_i) of non-cooperators. The red line represents the threshold point where a person becomes hateful enough to want to not cooperate out of hate. Figure 2B displays the beliefs about probability that an outgroup member has a level of hate beyond the threshold, $P(\beta_j<T)$, and therefore want to not cooperate out of hate. The blue line represents the actual probability of this event happening.

hateful enough to want to not cooperate out of hate. Only 30% of non-cooperators fall below this line, while the remaining 70% must have chosen to not cooperate out of fearful beliefs. Notably, 52% of non-cooperators are fully altruistic toward the outgroup. Figure 2B presents the distribution of beliefs about the percentage of the outgroup that is hateful beyond the threshold ($\tilde{P}_i(\beta_j<T)$). The dashed blue line marks the true share of hateful outgroup members (6%). While cooperators slightly overestimate this (mean belief: 14%), non-cooperators vastly overestimate it (mean belief: 59%).

Figure 3 shows the relationship between preferences, beliefs and cooperation for the entire sample. The x-axis shows participants' social preferences towards the outgroup, β_i, and the y-axis shows participants' beliefs about the outgroup's social preferences towards the ingroup (more specifically, beliefs on the percentage of outgroup members that are not hateful beyond the threshold, $1-\tilde{P}_i(\beta_j<T)$). Each participant is represented by a dot. The dot is green if the participant cooperated and red if they did not. The dots are translucent and can overlap. This creates different grades of opacity, with darker dots indicating a higher density of people at that preference-belief level. In addition, the greener a dot is, the more cooperation there is at that preference-belief level, and the redder it is, the more non-cooperation there is. (Brown dots are the result of translucent green and red dots overlapping.) The vertical dashed line represent the threshold, $T=-0.2$, at which an individual becomes hateful enough to want to not cooperate out of hate. To the right of this line, when an individual does not have a hateful reason to not cooperate, the curved dashed line represent the threshold below which an individual beliefs the $P(s_j=N)$ is sufficiently high to want to not cooperate (which depends on β_i, as described by Equation (3)).

Figure 3 reveals several facts worth noticing. First, all participants with $\beta_i<T$ choose not to cooperate, as predicted by the model. Second, among those with $\beta_i>T$, the rate of non-cooperation increases

Figure 3: Preferences, Beliefs and Cooperation in Game with $T=-.2$



Notes: This figure shows the relationship between preferences, beliefs and cooperation for the entire sample. The x-axis shows participants' social preferences towards the outgroup, β_i, and the y-axis shows participants' beliefs about the outgroup's social preferences towards the ingroup (more specifically, beliefs on the percentage of outgroup members that are not hateful beyond the threshold, $1-\tilde{P}_i(\beta_j<T)$). Each participant is represented by a dot. The dot is green if the participant cooperated and red if they did not. The dots are translucent and can overlap. This creates different grades of opacity, with darker dots indicating a higher density of people at that preference-belief level. In addition, the greener a dot is, the more cooperation there is at that preference-belief level, and the redder it is, the more non-cooperation there is. (Brown dots are the result of translucent green and red dots overlapping.) The vertical dashed line represent the threshold, $T=-0.2$, at which an individual becomes hateful enough to want to not cooperate out of hate. To the right of this line, when an individual does not have a hateful reason to not cooperate, the curved dashed line represent the threshold below which an individual beliefs the $P(s_j=N)$ is sufficiently high to want to not cooperate (which depends on β_i, as described by Equation (3)).

as the level of fear increases. In particular, most participants below the dashed curved line do not cooperate. Just above this line, some non-cooperation persists, possibly aided by additional factors such as higher-order beliefs or psychological costs—topics explored in depth in the structural model (Section 7). Third, while altruistic individuals display a broad range of beliefs, from complete trust to extreme fear, hateful individuals tend to also have fearful beliefs.

6.3. Heterogeneity by religion

Do the two religious groups under study act in a similar way? Or if there is heterogeneity in behavior, in which direction does it go? In terms of cooperation, the difference is stark. Out of all the people who decided to not cooperate with the outgroup, 84% were Christians, while only 16% were Muslims. Table 3 reports heterogeneity by religion in social preferences and beliefs for the outgroup.

Tables 3 reports the following mean and s.d. of the following variables for each religious group: β_i, the social preferences for the outgroup; $\tilde{\mathrm{E}}_i[\beta_j]$, the beliefs on the mean social preferences outgroup

members have for the ingroup; $\tilde{P}_i(\beta_j<T)$, the beliefs about the probability that a member of the outgroup is hateful beyond the threshold. The table also shows $P(\beta_i<T)$, the actual probability that someone from i's group is hateful beyond the threshold. Diagonal comparisons are the comparisons between beliefs and facts.

Table 3: Heterogeneity by Religion

	Christians	Muslims
β_i	0.74	0.90
	(0.50)	(0.20)
$\tilde{E}_i[\beta_j]$	0.41	0.83
	(0.76)	(0.30)
$P(\beta_i<T)$	0.09	0.01
$\tilde{P}_i(\beta_j<T)$	0.27	0.16
	(0.28)	(0.18)

Notes: β_i is the social preferences for the outgroup. $\tilde{\mathrm{E}}_i[\beta_j]$ is the beliefs on the mean social preferences outgroup members have for the ingroup. $P(\beta_i<T)$ is the actual probability that someone from i's group is hateful beyond the threshold. $\tilde{P}_i(\beta_j<T)$ is the beliefs about the probability that a member of the outgroup is hateful beyond the threshold. The standard deviation of each estimate is reported in parenthesis.

Row 1 shows that Christians have lower social preferences towards Muslims than Muslims have towards Christians. Row 2 shows that Christians have worse beliefs about Muslims than Muslims have about Christians. Comparing Row 1 and 2 (diagonally) reveals that Christians have very inaccurate and negatively biased beliefs about Muslims, while Muslims have somewhat overoptimistic beliefs about Christians on this statistic. Row 3 and 4 shows that 9% of Christians are hateful towards Muslims, while Muslims exaggerate this percentage by 7 p.p.—they believe 16% of Christians are hateful towards them. On the other hand, 1% of Muslims are hateful toward Christians, while Christians exaggerate this percentage by 26 p.p.—they believe 27% of Muslims are hateful towards them. (An analogous table for the ingroup can be found in Appendix B8.)

In sum, in this context, Christians are less cooperative than Muslims, have worse social preferences towards Muslims and have more biased beliefs about Muslims than the other way around. Importantly, in the pre-analysis plan I pre-registered that heterogeneity in these outcomes would go in this direction, based on the focus groups done in the exploratory phase of this project. The main reason why this is the case is probably the salience of Boko Haram, the major armed group in the country, which distorts the beliefs of only one group and generates negative feelings towards only one group. However, it is important to keep in mind that religious violence in this area has come from both sides. Another feature of this context that probably helps drive the difference in behavior is the location of Jos. Although the city has a very similar number of Christians and Muslims, most of the nearby cities outside of Plateau State are part of the Muslim north. This creates the feeling in some Christians in Jos that they are surrounded by Muslim communities and that therefore their presence in the area is threatened. Importantly, Christians and Muslims have very similar levels of income in this setting, so this is unlikely

to be driving the different willingness to pay.

6.4. Robustness: Social Desirability in the Money Allocation Decisions

As mentioned in Section 3, the identifying assumption behind the identification strategy is that participants use the same preference structure when facing the money allocation decision as when playing the coordination game. One potential concern with this assumption is that the preference structure in the money allocation decision could include social desirability concerns that may be absent in the coordination game, where participants can plausibly deny they chose to not cooperate out of hate.

To address this concern, in this section I control for social desirability bias in the parameters calibrated with the money allocation decisions. I do this in the following way. In the baseline survey, I include a module (developed by psychologists) that measures a person's propensity to give socially desirable answers (as in Dhar et al. (2022)). The module asks respondents if they have several too-good-to-be-true traits such as never being jealous, lazy or resentful. Those who report having more of these traits are scored as having a higher propensity to give socially desirable answers. I then use these individual-level social desirability scores to correct the biased social preferences in the following way.

Let the social preference parameter biased by social desirability concerns be:

$$\beta_{i,\text{biased}} = \beta_{i,\text{true}} + \phi \text{SDS}_i$$

Where SDS_i stands for social desirability score and is a variable from 1 to 10 indicating how many socially desirable answers i gave in that survey module. This variables has a mean of 6.5 and s.d. of 2.

To get $\beta_{i,\text{true}}$, I first I estimate ϕ by regressing $\beta_{i,\text{biased}}$ on SDS_i. Then I compute $\beta_{i,\text{true}} = \beta_{i,\text{biased}} - \phi \text{SDS}_i$ for each person. I then replace $\beta_{i,\text{biased}}$ for $\beta_{i,\text{true}}$ and reassess how many of the people that decided to not cooperate had a hateful reason to do so.

The estimated ϕ is 0.04, significant at the 1% level. After replacing $\beta_{i,\text{biased}}$ for $\beta_{i,\text{true}}$, I find a slightly different decomposition of motives. In the game with $T=-.2$, the percentage of people not cooperating out of hate is 34%, and the percentage not cooperating out of fear is 66% (compared to the original breakdown of 30% and 70%, respectively). In the game with $T=-.6$, I find that the percentage of people not cooperating out of hate is 25%, and the percentage not cooperating out of fear is 75% (compared to the original breakdown of 21% and 79%).

Now that the social preference parameters have been adjusted, participants' belief accuracy also changes. The share of participants with hate beyond the threshold is now 6% in the game with $T=-0.2$ (up from the original estimate of 5%), and 4% in the game with $T=-.6$ (up from 3%). However, non-cooperators continue to significantly overestimate these figures: recall that they believe that 59% of the outgroup is hateful beyond the threshold in the game with $T=-.2$, and 47% in the game with $T=-.6$.

In sum, correcting parameters for social desirability bias reveals a higher proportion of non-cooperation driven by hate and slightly more accurate beliefs about the level of hate. Despite these changes, the main conclusions of the analysis remain unchanged: it is still the case that the majority of non-cooperators

choose to not cooperate out of fear, and that this fear is unfounded given that non-cooperators vastly overestimate the percentage of hateful people in the outgroup.

6.5. Validation: Hate and fear measures and hostile attitudes

The present validation exercises that aim to provide evidence that my measures of hate and fear capture real-life motivators of hostile behavior. In the first exercise, I test whether my measures correlate with support for a specific hostile action against the outgroup—religious segregation—highly relevant in the context of Jos. Furthermore, as a hostile action, segregation can be supported out of hate or fear, and I use this to examine whether my measures not only predict *if* people support hostile behavior but also *why*. This is done in the following way.

In a survey module, I asked participants about real integration policies that were being discussed by the city and state governments at the time. Specifically, I inquired about a policy promoting integration in settlements and another promoting integration in schools. For each policy, my approach to elicit attitudes was structured as follows. I first introduced the policy to the participants and stated that "the policy may have some possible downsides." I then presented two potential downsides and asked participants to express the extent to which they agreed that each downside was indeed associated with the policy. Importantly, one downside was meant to capture a hateful reason against the policy, while the other was meant to capture a fearful reason against the policy. Participants expressed their level of agreement on a 1 to 4 scale (1=completely disagree, 2=somewhat disagree, 3=somewhat agree, 4=completely agree). The policies and associated downside in this survey module are detailed in the table below.

Policy	**Hateful reason against**	**Fearful reason against**
New settlements in Jos should mix Christians and Muslims	Christians and Muslims have different ways of living that simply cannot coexist together	Some families would not be able to trust their neighbors in these mixed settlements
Schools in Jos should have a mix of Christian and Muslim children and teachers	Muslims and Christians have different ways of educating their children that simply cannot be integrated	The safety of our children would be at risk in these mixed schools

Table 4 reports the results of regressions where the dependent variable is the level of agreement with a reason against an integration policy, and the independent variables are the lab measures of hate and fear. The first thing to note is that the lab measures of hate and fear show a positive and statistically significant correlation with attitudes against religious integration. The second thing to note is the strength of the correlation between my hate and fear measures and the reasons for opposing integration. Specifically, my measure of hate shows a stronger correlation with reasons rooted in hatred, whereas my measure of fear shows a stronger correlation with reasons rooted in fear. To see this, notice that the coefficient of *Hate* is notably greater in column (1) vs. column (2) (p-*value*=0.00), and significant in column (3) but not in column (4). On the other hand, the coefficients of *Fear* show the opposite pattern: the coefficient of Fear is notably greater in column (2) vs. column (1) (p-*value*=0.00), and in column

(4) vs. column (3) (*p-value*=0.03). These results suggest that the lab measures used in this paper do not merely capture generic negative feelings but rather appear to effectively capture the specific feelings they were designed to measure.

Table 4: Attitudes on Segregation Policies

	Do you agree the following is a downside of integration in...			
	Settlements		Schools	
	Hateful reason	Fearful reason	Hateful reason	Fearful reason
	(1)	(2)	(3)	(4)
Hate ($-\beta_i$)	0.496***	0.197**	0.209**	0.147
	(0.085)	(0.079)	(0.103)	(0.092)
Fear ($\tilde{P}_i(\beta_j<T)$)	0.928***	1.447***	0.675***	1.021***
	(0.168)	(0.144)	(0.171)	(0.144)
Controls	Y	Y	Y	Y
Mean Dep.Var.	1.957	2.397	1.929	1.642
Observations	997	995	996	995

Notes: This table reports the result of regressions where the dependent variable is the level of agreement with a reason against an integration policy, and the independent variables are the lab measures of hate and fear. The outcome variable is a variable from 1 to 4 that expresses how much a person agrees that the stated potential downside of a policy is in fact associated with that policy. Columns 1 and 2 are about downsides regarding a policy for integration in settlements, while the ones in Columns 3 and 4 are about downsides regarding integration in schools. Columns 1 and 3 are about hateful reasons to oppose the policy, while 2 and 4 are about fearful reasons to oppose the policy. The variable *Hate* is the negative of the social preferences, $-\beta_i$, and the variable *Fear* is the beliefs on the proportion of the outgroup that is hateful beyond the threshold, $\tilde{P}_i(\beta_j<T)$. Controls are religion, sex, age, education and marital status. *Mean Dep.Var.* is the mean of the dependent variable for the whole sample at baseline. Standard errors are clustered at the individual level.

In an additional exercise, while I am cautious about claiming that my measures directly predict violent behavior, I provide one piece of suggestive evidence in that direction. I include in the survey a standard module measuring Social Dominance Orientation (SDO) (Ho et al., 2015; Pratto et al., 1994), which is widely used concept in psychology that captures an individual's support for group-based hierarchies and the dominance of "inferior" outgroups by the "superior" ingroup. SDO is a well-established personality trait that is well documented to be one of the strongest psychological correlates of having low empathy for the outgroup, dehumanizing the outgroup, and supporting the use of violence against them (Sidanius and Pratto, 1999; Kteily et al., 2015; Thomsen et al., 2008; Kteily et al., 2012). In Appendix B9, I examine how my measures of hate and fear correlate with SDO. I find that both measures are strongly associated with SDO, with correlations with and without controls being statistically significant at the 1% or 5% level. Interestingly, fear appears to have a stronger correlation than hate, suggesting that fear of the outgroup may play a particularly important role in supporting group-based hierarchies and the dehumanization of out-groups.

Overall, the results presented in this section suggest that the measures of hate and fear used in this paper capture support for hostile behavior, and its reasons, beyond the lab setting.

7. Structural Model

Section 3 presented a calibration approach to recovering social preferences that has the advantage of being simple and transparent. However, the directness of that approach comes at a cost, as the calibration exercise also presents two drawbacks. First, individual-level parameters are being calibrated using 7 or 8 decisions per person. This procedure ignores sampling variability and the asymptotics of estimation, and therefore does not allow to compute standard errors of the recovered parameters. Second, the calibration approach does not allow me to test alternative models that could potentially better explain behavior. One could, instead, want to consider more general models that include additional parameters that capture other elements (like loss aversion, psychological costs/benefits or higher-order beliefs), and let the data drive the model selection process. This section presents a structural estimation approach that overcomes these drawbacks and still allows to recover parameters at the individual level to determine the extent to which non-cooperation is driven by hate vs. fear.

In what follows, I introduce an empirical model with random coefficients to recover $\beta_i \ \forall i$. In short, this procedure (i) uses everyone's full set of decisions to estimate the distribution (mean and variance) from which all β_i's are drawn; (ii) for each person, it uses her decisions to get a conditional distribution from which the β_i of people with her set of decisions are drawn; (iii) uses the mean of that conditional distribution as an estimator of her β_i.

7.1. A general expected utility function

The more general expected utility function I use in this section is the following:

$$W(s_i) = \tilde{P}_i(s_j{=}N)\big[u(s_i, s_j{=}N) + \psi_i{\cdot}\mathbb{1}(s_i{=}C)\big] + \tilde{P}_i(s_j{=}C)\big[u(s_i, s_j{=}C) + \gamma_i{\cdot}\mathbb{1}(s_i{=}N)\big]$$

$$\text{with} \ \ \tilde{P}_i(s_j{=}N) = \tilde{P}_i(\beta_j{<}T) + \tilde{P}_i(s_j{=}N|\beta_j{\geq}T)$$

Compared to the expected utility function presented in Section 2 (Equation (2)), this general utility function includes two payoff shifters, ψ_i and γ_i, to add full flexibility to the utility a player might get from each scenario of the game[4]. The following table shows the utility player i would get in each scenario of the game with this general utility function.

	C	N
C	$1000 + \beta_i{\cdot}1000$	$500 + \beta_i{\cdot}900 + \psi_i$
N	$900 + \beta_i{\cdot}500 + \gamma_i$	$750 + \beta_i{\cdot}750$

These payoff shifters can capture different psychological costs and benefits that a player might receive, beyond the monetary payoffs of the game.

In particular, a $\psi_i < 0$ could capture the psychological cost of getting what is usually described as the "sucker's payoff" (the payoff i gets when she cooperates and j does not). Ultimately, a negative ψ_i raises

[4] Adding payoff shifters to the (C, C) and/or (N, N) scenario would be redundant, it would not add more flexibility to the model. This can be seen in Appendix A2.

the cost of cooperating when the other player does not, and therefore lowers the level of fear needed to prefer to not cooperate. On the other hand, a $\gamma_i > 0$ could capture a psychological benefit of giving the "sucker's payoff" to the other player. Ultimately, a positive γ_i raises the benefit of not cooperating when the other player cooperates, and therefore lowers the level of hate needed to want to not cooperate. In addition, a negative ψ_i and/or a negative γ_i could capture loss aversion, where the reference point is the payoff the player would have received if she had chosen the other strategy.[5]

Of course, if ψ_i and γ_i should be included in the model—and if so, their sign and magnitude—will be determined empirically by estimating the model. In the same way, the effect of higher-order beliefs captured by $\tilde{P}_i(s_j{=}N|\beta_j{\geq}T)$ will also be estimated.

7.2. Empirical model (with random coefficients) and estimation procedure

In the experiment, participants are matched with an unspecified $j{\in}O$. First, they make M_i money allocation decisions, where M_i can be 7 or 8 depending on the participant's decisions. Then, their beliefs on the money allocation decisions j made are elicited to get $\tilde{P}_i(\beta_j{<}T)$. And then they play G coordination games, with $G{=}2$.

In each money allocation decision m, participant i makes decision d_{im} between two options with sure payoffs for herself and her match j. Participant i's utility from picking $d_{im}{\in}\{Opt1, Opt2\}$ is her base utility function (as defined by equation (1)), plus an idiosyncratic error, $\varepsilon_{d_{im}}$, that has an extreme value distribution with mean zero. This error can be thought of as the result of limited attention in the experiment. The utility function is:

$$u(d_{im}) = x_i(d_{im}) + \beta_i \cdot x_j(d_{im}) + \varepsilon_{d_{im}}$$

Where $x_i(d_{im})$ is the payoff i gets when she chooses d_{im} in money allocation decision m.

The data consists of is d_{im} and the payoffs for i and j in each option of each money allocation decision. The unknown parameter is β_i. Because ε_{id} is distributed extreme value, the probability of participant i's sequence of choices $d_i = \langle d_{i1}, ..., d_{iM_i} \rangle$ is:

$$\Lambda_{im} = \frac{\exp\Big(u_{im}(Opt2) - u_{im}(Opt1)\Big)}{1 + \exp\Big(u_{im}(Opt2) - u_{im}(Opt1)\Big)}$$

$$P(d_i|\beta_i) = \prod_{m=1}^{M_i} \Lambda_{im}^{\mathbb{1}(d_{im}=Opt2)} \left(1 - \Lambda_{im}\right)^{\mathbb{1}(d_{im}=Opt1)}$$

Participants also play G coordination games. In each game g, participant i picks strategy $s_{ig}{\in}\{C, N\}$.

[5] A potential model with risk aversion is discussed in Appendix C1. In the end, I discard it for multiple reasons. First, theoretically, at this level of prices individuals should not exhibit risk aversion. Second, empirically, this is what I find in the field. Using a canonical survey module to measure risk aversion, I find that over 90% of individuals are risk-neutral at this level of prices. Third, the behavioral literature suggests that at low prices, behavior is better explained by loss aversion than risk aversion (Rabin, 2000; DellaVigna, 2018).

Participant i has risk-neutral preferences and her expected utility function includes an error, $\varepsilon_{s_{ig}}$, that has an extreme value distribution with mean zero, and that is independent from $\varepsilon_{d_{im}}$. The expected utility function is:

$$W(s_{ig}) = \tilde{P}_i(s_{jg}{=}N)\big[u(s_{ig}, s_{jg}{=}N){+}\psi_i{\cdot}\mathbb{1}(s_{ig}{=}C)\big]{+}\tilde{P}_i(s_{jg}{=}C)\big[u(s_{ig}, s_{jg}{=}C){+}\gamma_i{\cdot}\mathbb{1}(s_{ig}{=}N)\big]{+}\varepsilon_{s_{ig}}$$

$$\text{with } \tilde{P}_i(s_{jg}{=}N) = \tilde{P}_i(\beta_j{<}T_g) + \tilde{P}_i(s_{jg}{=}N|\beta_j{\geq}T_g)$$

$$\text{and } u(s_{ig}, s_{jg}) = x_i(s_{ig}, s_{jg}) + \beta_i \cdot x_j(s_{ig}, s_{jg})$$

Where $\tilde{P}_i(s_{jg}{=}s)$ is i's subjective beliefs on $P(s_{jg}{=}s)$, given that $j{\in}O$. Recall that $\tilde{P}_i(\beta_{jg}{<}T_g)$ captures the effect of first-order beliefs and is elicited directly in the experiment, and $\tilde{P}_i(s_{jg}{=}N|\beta_j{\geq}T_g)$ captures the effect of higher-order belies and is to be estimated. $x_i(s_{ig}, s_{jg})$ is the payoff i gets when she chooses s_i and j chooses s_j in game g. ψ_i and β_i are payoff shifters that can capture different psychological costs or benefits.

The data consists of s_{ig}, $\tilde{P}_i(\beta_{jg}{<}T_g)$, and the payoffs for i and j in all four scenarios of each game. The unknown parameters are β_i, ψ_i, γ_i and $\tilde{P}_i(s_{jg}{=}N|\beta_j{\geq}T_g)$. Because $\varepsilon_{s_{ig}}$ is distributed extreme value, the probability of participant i's sequence of choices $s_i = \langle s_{i1}, s_{i2}\rangle$ is:

$$\Lambda_{ig} = \frac{\exp\Big(W_{ig}(N) - W_{ig}(C)\Big)}{1 + \exp\Big(W_{ig}(N) - W_{ig}(C)\Big)}$$

$$P(s_i|\beta_i, \psi_i, \gamma_i) = \prod_{g=1}^{G} \Lambda_{ig}^{\mathbb{1}(s_{ig}=N)} \left(1 - \Lambda_{ig}\right)^{\mathbb{1}(s_{ig}=C)}$$

Combining both probabilities, I can define the probability of i's sequence of choices in all the lab activities, $y_i = \langle d_{i1}, ..., d_{iM_i}, s_{i1}, s_{i2}\rangle$:

$$P(y_i|\beta_i, \psi_i, \gamma_i) = P(d_i|\beta_i) \times P(s_i|\beta_i, \psi_i, \gamma_i)$$

Let $\theta_i \equiv (\beta_i, \psi_i, \gamma_i)$, a vector of our parameters of interest. The individual-level parameter θ_i is unknown, but I assume that $\theta_i \sim \mathcal{N}(\mu, \Sigma)$ and has a probability density function $f(\cdot)$. So the probability of i's sequence of choices y_i is:

$$P(y_i|\mu, \Sigma) = \int P(y_i|\theta_i) \cdot f(\theta_i|\mu, \Sigma)\ \ d\theta$$

A mixed logit likelihood function represents the probability of observing all the decisions of all individuals:

$$L = \prod_{i=1}^{N} P(y_i|\mu, \Sigma)$$

Because the integrals in the likelihood function are hard to calculate, they are approximated through

numerical simulations. The parameters μ and Σ are estimated through simulated maximum likelihood, following Train (2009).

After estimating μ and Σ, I can use them to subsequently estimate θ_i $\forall i$ in the following way. Using Bayes rule, I can derive a distribution of θ_i conditional on i's sequence of choices y_i:

$$g(\theta_i|y_i,\mu,\Sigma) = \frac{P(y_i|\theta_i)\cdot f(\theta_i|\mu,\Sigma)}{P(y_i|\mu,\Sigma)}$$

This conditional distribution represents a shift of the unconditional distribution, and it is a distribution from which the β_i of someone with the set of decisions y_i is more likely to be drawn. Using $g(\cdot)$, I can calculate the mean of the distribution conditional on the choice sequence y_i, and use it as an estimator of θ_i:

$$\bar{\theta_i} = \int \theta_i \cdot g(\theta_i|y_i,\mu,\Sigma)$$

This integral is also approximated through simulations, following Train (2009).

It is worth noticing that this estimation procedure manages to use all the information in one single stage while keeping the essence of the identification strategy of the experimental design, which is to estimate social preferences based on the money allocation decisions, and separately from the coordination games. In this estimation, 80% of the observations used to estimate μ_β come from the money allocation decisions. Intuitively, what the estimation will tend to do is to pick a μ_β to fit the money allocation decisions, and pick a μ_ψ and μ_γ to fit the coordination game decisions that remain unexplained, given the elicited individual beliefs, $\tilde{P}_i(s_{jg}{=}N)$.

7.3. Result of the model selection process

Appendix C1 reports the model selection process, where I test from the most to the least general model to identify the right level of generality that best describes behavior. As it turns out, the model selection process concludes that γ_i and $\tilde{P}_i(s_j{=}N|\beta_j{\geq}T)$ are not a parameters that help the model to better describe the data, while ψ_i is (with a $\psi_i{<}0$). In that sense, the model that best describes behavior is the one with the following expected utility function:

$$W(s_i) = \tilde{P}_i(s_j{=}N)\big[u(s_i,s_j{=}N) + \psi_i{\cdot}\mathbb{1}(s_i{=}C)\big] \;+\; \tilde{P}_i(s_j{=}C){\cdot}u(s_i,s_j{=}C) + \varepsilon_{s_i}$$
$$\text{with}\;\; \tilde{P}_i(s_j{=}N) = \tilde{P}_i(\beta_j{<}T)$$

This implies two things. First, that participants in the experiment do not form higher-order beliefs while playing the game. This is in line with ample evidence in the experimental literature (Rubinstein, 1989; Kneeland, 2015) and anecdotal evidence from the fieldwork. Second, psychological costs/benefits do not seem to change the level of hate needed to want to not cooperate, but they do reduce the level of fear needed to want to do so. Taking into account these results, the threshold at which a person becomes hateful enough to want to not cooperate remains at $T{=}{-}0.2$, while the level of fear needed for a person

to want to not cooperate (described by Equation (3)) now becomes:

$$\tilde{P}_i(s_j{=}N) = \tilde{P}_i(\beta_j{<}T) \geq \frac{100 + \beta_i{\cdot}500}{350 + \beta_i{\cdot}350 - \psi_i}$$

The estimated parameters of the model can be found in the following section.

8. Results of the Structural Estimates and Counterfactual Analysis

8.1. Structural estimates and decomposition of motives for non-cooperation

Table 5 reports the results of the simulated maximum likelihood estimation of the random coefficients model presented in Section 7. The parameters of interest are β_i, the social preferences for the outgroup, and ψ_i, a psychological cost of cooperating when the other player does not, both for all i. I estimate the mean and variance of the distribution from which these parameters are drawn.

Table 5: Random Coefficients Estimation

	Coefficient	Stand. Err.	
μ_β	0.922	0.072	***
σ_β	0.420	0.059	***
μ_ψ	-532.7	108.6	***
σ_ψ	469.2	163.7	***
Observations			9,006
Clusters			997
Likelihood			-3,267

Notes: This table reports the results of the simulated maximum likelihood estimation of the random coefficients model presented in Section 7. Each observation is one decision of one participant in either a money allocation decision or a coordination game. μ_β and σ_β are the mean and variance of the distribution of the parameter of social preferences, β_i. μ_ψ and σ_ψ are the mean and variance of the distribution of the payoff shifter parameter, ψ_i. Standard errors are clustered at the individual level.

The first thing to note is that all parameters are precisely estimated—all four parameters in Table 5 are significant at the 1% level. The estimated μ_β shows that, on average, people are highly altruistic towards the outgroup. In addition, σ_β indicates the level of dispersion of social preferences around the mean. The estimated μ_ψ shows that there is indeed a psychological cost of getting the "sucker's payoff" that matters in the decision and is of considerable size, being half the amount of the maximum payoff in the game. Nevertheless, the size of σ_ψ highlights how this psychological penalty varies considerably in the population.

The fact that $\psi_i{<}0$ warrants some discussion. The reason why this is the case is that the level of fear needed to want to not cooperate appears to be lower than the one described by Equation (3), when the utility function only considers monetary costs. To see this, consider the case of fully altruistic non-cooperators (who are half of all non-cooperators). If $\psi_i{=}0$ and the only potential costs of cooperating are monetary, a fully altruistic person would want to not cooperate only if she believes that at least 86%

of the outgroup will not cooperate ($\tilde{P}_i(s_j{=}N){>}0.86$). However, fully altruistic non-cooperators believe, on average, that 60% of the outgroup will not cooperate ($\tilde{P}_i(s_j{=}N){=}0.6$). This suggests that the fear threshold for non-cooperation is lower than the one described by Equation (3), and that, therefore, the potential costs of cooperating go beyond the monetary one. Consequently, a model that includes psychological costs through the ψ parameter will describe better the data.

Using the estimated distributions, I estimate individual-level parameters to assign a β_i and ψ_i to each participant, following the procedure explained in Section 7. I use these parameters and the elicited beliefs in the analysis that follows. The first important thing to note is that the model performs well in terms of sample fit: using the structurally estimated individual-level parameters and the elicited beliefs, I correctly predict 94% of the decisions in the coordination game. This indicates that the core drivers of non-cooperation are captured by my model and measurements.

The quantitative decomposition of motives for non-cooperation is done as follows. To determine to what extent non-cooperation is driven by hate vs. fear, I shut down the fear motive in participants' expected utility and observe how many non-cooperators would still prefer to not cooperate in this scenario. By doing this I determine what percentage of people do not cooperate purely out of hate and what percentage require fear to decide to not cooperate. More specifically, to shut down the fear channel I set to zero participants' beliefs on the probability that j will not cooperate—that is, I set $\tilde{P}_i(s_j{=}N){=}0$ for all i. Doing so reduces i's expected utility to i's utility when j cooperates, $W(s_i){=}u(s_i, C)$. Because I have estimated β_i for all i, I can calculate $u(s_i, C)$ and determine for each i if $u(N, C){>}u(C, C)$. As shown before, $u(N, C){>}u(C, C)$ means that $\beta_i{<}T$, which allows me to conclude that i chooses to not cooperate out of hate (and regardless of beliefs). From this I can also conclude that non-cooperators for whom $u(N, C){<}u(C, C)$ required fear to want to not cooperate.

I find that, for the game with $T{=}{-}.2$, 24% of the people who do not cooperate do so out of hate, while 76% do so out of fear. And for the game with $T{=}{-}.6$, 15% of the people who do not cooperate do so out of hate, while 85% do so out of fear. Comparing these numbers to those found using the calibration approach from Section 6 (30% hate-70% fear for $T{=}{-}.2$, and 21% hate-79% fear for $T{=}{-}.6$) provides a good cross-validation exercise. It is reassuring to find that the proportions of people not cooperating out of hate and fear estimated by these two approaches are fairly similar[6]. Notice it was not clear *a priori* this was going to be the case, as one approach calibrates individual-level parameters out of 8 money allocation decisions, while the other uses everyone's full set of decisions to estimate the distribution of parameters, and then uses an individual's decisions to determine where in the estimated distribution the individual's parameter is likely to be. The fact that the resulting decompositions from both approaches are so similar suggests that the results are not the artifact of a particular specification or estimation method.

[6] I also find that the correlation between the β_i from both approaches is 0.84. For a scatter plot, see Figure B3.1.

8.2. Counterfactual analysis

I now turn to the counterfactual analysis to study how hypothetical policy interventions that shift the drivers of conflict would affect cooperation. For simplicity, here I focus on the game with $T{=}{-}.2$, but in Appendix C4 I do the same analysis for the game with $T{=}{-}.6$ and find very similar results.

First, I investigate how would cooperation change if a policy solved unwarranted fears by correcting misperceptions about the outgroup. In other words, I investigate how would cooperation change if people had accurate beliefs about the percentage of people in the outgroup that is hateful. To do this, I replace everyone's subjective beliefs on the probability that an outgroup member does not cooperate out of hate with the empirical probability of this event happening—that is, I replace $\tilde{P}_i(\beta_j{<}T)$ with $P(\beta_j{<}T)$ for all i. Notice that I can calculate $P(\beta_j{<}T)$ because I have estimated the social preferences of all individuals in each groups. Then, I calculate the expected utilities with the newly imputed beliefs and observe in this scenario how many people prefer to not cooperate, $W(N){>}W(C)$. I find that if a policy solved unwarranted fears by correcting inaccurate beliefs about the outgroup, the number of people not cooperating would drop by 72%. This means that 94% of the people who do not cooperate out of fear do so due to misperceptions (recall that 76% of people do not cooperate out of fear, so 72%/76%=94%). This result underlines how misperceptions leading to unwarranted fears are the single most important barrier to intergroup cooperation.

However, expecting a policy to completely eliminate misperceptions may be unrealistic. In an additional exercise, I analyze a potentially more realistic policy—one that reduces each individual's misperceptions by half. More specifically, I replace $\tilde{P}_i(\beta_j{<}T)$ with $min\Big\{\frac{\tilde{P}_i(\beta_j<T)}{2}, P(\beta_j{<}T)\Big\}$. I find that such an intervention would decrease the number of people not cooperating by 52%. This means that the number of people not cooperating out of fear would drop by 68% (52%/76% = 68%). This shows that even if a policy does not fully correct misperceptions, it can still be highly effective at increasing cooperation.

I then investigate how would cooperation change if a policy were to reduce hate. I first simulate a policy that completely eradicates intergroup hate, such that nobody wants to not cooperate out of hate. To do this, I replace the social preferences of all hateful people (those with $\beta_i{<}0$) with selfish social preferences ($\beta_i{=}0$). Then, I calculate the expected utilities with the newly imputed preferences and observe in this scenario how many people prefer to not cooperate, i.e., for how many $W(N){>}W(C)$. I find that if a policy completely eradicated intergroup hate, the number of people not cooperating *would not decrease*. The reason why this is the case is because hateful individuals tend to also be very fearful, so even without hate, all of them would still want to not cooperate out of fear.

In light of this, I simulate a policy with more extreme (and unrealistic) effects on social preferences. I study what would be the effect of a policy that could turn all people not cooperating out of hate into fully altruistic individuals. To see this, I replace the social preferences of those with $\beta_i{<}T$ for $\beta_i{=}1$. I find that in this case the number of people not cooperating would fall by 4.5%. This means that if the

people not cooperating out of hate became fully altruistic, only 19% of them would switch to cooperation (recall that 24% of people do not cooperate out of hate, so 4.5%/24%=19%)—while 81% of them would still want to not cooperate, now out of fear. This result highlights how tackling hate is an inefficient way of increasing cooperation.

I now analyze how the effects of policy would change under an alternative model in which social preferences partly depend on beliefs—that is, a model with reciprocity in social preferences. In this framework, individuals' social preferences are adjusted by a reciprocity parameter that reflects their beliefs about the social preferences the outgroup has for the ingroup. As a result, if someone believes the outgroup is hateful, she may respond by being hateful in return. I develop this model and explore its implications in detail in Appendix C2, where I empirically estimate the reciprocity parameter that partially determines the social preferences. With this alternative model in hand, I re-run the counterfactual analysis. Under the scenario in which individuals hold accurate beliefs, 100% of those who previously did not cooperate out of fear switch to cooperation, and 42% of those who previously did not cooperate out of hate also switch. In other words, if social preferences are reciprocal, then correcting misperceptions about the outgroup would have an even stronger effect on cooperation than in the baseline model—since it would increase cooperation both by updating beliefs and by shifting preferences through reciprocity. This raises the potential value of interventions that target unwarranted fears.

Considering all these counterfactual scenarios together, the main policy recommendation that can be drawn is that policies that reduce fear would be significantly more effective at increasing cooperation than policies that reduce hate. This is not only because policies to reduce hate affect a smaller percentage of non-cooperators (24% vs 76%), but also because they manage to switch to cooperation a smaller percentage of the population they target (19% vs 94%).

9. Real-Life Policy Analysis: RCT on a Cultural Media Intervention

After understanding how hate and fear drive conflict, I now connect this diagnosis to real-life policy and study why policies currently trusted to reduce conflict in this setting may or may not be effective at doing so. I focus one type of intervention, which is cultural media interventions, in particular radio drama series. I do an RCT on this intervention and evaluate it in the context of the model: I use the experimental protocol again to measure how the intervention changed the levels of hate, fear and cooperation.

9.1. Radio dramas as a policy tool in Africa

In Nigeria, NGOs are constantly creating new radio dramas to promote messages on different social issues. For example, the main production company in the Jos region creates around 4 radio dramas per year, and recently created shows on topics such as women empowerment and Covid-19. Moreover, radio dramas have been used to promote messages on conflict-related issues. For instance, radio dramas

have tackled topics such as how fake news fuel conflict and the reintegration of former Boko-Haram members into society.

In Nigeria, policymakers see radio dramas as a highly valuable strategy for addressing conflict, citing three primary reasons (which happen to have scientific support). First, fictional stories make it easier to discuss sensitive topics (Slater and Rouner, 2002). Delving into historical and contemporary conflict tends to evoke strong emotions and opinions in the listeners, which can make them less receptive to the intended message. A fictional story overcomes this challenge. Second, dramatized narratives help to increase attention and retention of the intended message (Kromka and Goodboy, 2019). In an environment saturated with numerous NGOs constantly employing different campaigns to promote cooperation, most initiatives struggle to capture people's attention. Instead, radio dramas stand out due to their engaging nature, which in turn increases message retention. Third, radio dramas are a type of intervention that is inexpensive to produce and require minor logistics to implement, relative to other popular interventions to mitigate conflict. This versatility allows them to be implemented in a wide range of contexts.

These three reasons help explain why radio dramas have become a popular policy tool in Africa and make them an interesting policy to study. In addition, research in social psychology on whether radio dramas can improve relationships between groups after conflict has found mixed results (Paluck, 2009), indicating the need for further investigation.

9.2. A new radio drama: *The Convergence*

I partnered with Podbeta, a radio drama production company from Nigeria, to create a *new* radio drama. This company has been hired to create the radio shows of some of the most important NGOs in Nigeria, including Search for Common Ground and UN Women. Creating a new radio show has important advantages. First, it ensures that the participants of the experiment have not previously heard the treatment radio show. Using an existing radio show would pose a problem because these are widely broadcasted, which means that the subjects of the experiment could have already been treated. Alternatively, one could use a radio show that was broadcasted in an area that does not cover Jos. However, importing a radio drama would not have the same effect since the messages of this type of radio dramas are tailored to the specific situation of the place in which they are broadcasted. Moreover, creating a new radio show allowed me to have a story that directly addressed the motives I explore in this paper—that is, a story that spoke about hate and fear between communities in conflict.

A possible concern about creating a new radio show is that one might not be evaluating the exact same policy implemented by policymakers. On this, it is important to note that even though the NGOs pay for the shows, the creative process relies on the production company. To emulate the policy creation process as closely as possible, I follow the exact same steps Nigerian NGOs take to create their radio shows. These steps are straightforward. (i) The NGO hires the production company to create a new

radio show. (ii) The NGO provides one page of pointers stating the main message they want the show to convey. (iii) The production company gets back to the NGO with an outline of the story and how it conveys the message, and the NGO approves or makes comments. (iv) The production company writes the scripts for the episodes and sends them to the NGO for approval. (v) The production company records the show and delivers the final product to the NGO.

The objective of the treatment was to reduce both hate and fear, as the treatment was to be designed before knowing which driver of conflict was best to focus on (emulating a real-life policy design). With this in mind, the pointers I gave to the production company were the following. I wanted a story that promoted interfaith peace and cooperation. The story should showcase two communities in conflict where hate and unwarranted fears lead both communities to miss out on mutually beneficial interactions. The resolution of the story should convey a message on how reevaluating fear and letting go of hate can lead to both communities being better off.

The production company then proceeded to create the radio drama *The Convergence*. It consisted of 24 episodes lasting between 10 to 15 minutes, was available in both English and Hausa and participants could listen to it in whichever language they preferred. The plot unfolds as follows: A corrupt politician offers contracts to a businessman in exchange for ensuring his victory in the election. To achieve this, the businessman assembles a team to disseminate fake news about the outgroup on social media: they burn a car and post images on online reporting that it was a deliberate attack from the other tribe that killed people. This leads to rising tensions before elections and unfair judgments about the outgroup, which result in important losses for the communities, including the unjust firing of an outstanding schoolteacher due to her tribal affiliation and the rejection of a beneficial NGO program solely because its leader came from a different tribe. Moreover, one key character harbors deep hatred toward the other tribe because of past family tragedies caused by the ongoing conflict. As the story reaches its resolution, the communities uncover the politician's manipulation scheme and vote him out of office; the businessman flees the country, while his collaborators face imprisonment; and the character with hatred has a character arc where she heals her resentments, enabling her to form meaningful friendships with members of the other tribe. The story ends with a message of unity.

9.3. RCT design

The RCT for the radio show was conducted in the following manner. At first, the surveying company recruited subjects to participate in two lab-in-the-field experiments, which were held two months apart, for a project of the University of California. To minimize experimenter demand effects, enumerators only asked participants if they were interested in taking part in "a different project the surveying company was carrying out" at the conclusion of the initial lab experiment. This second project was for a media production company, and participants were told that it involved listening to a new radio drama that was being released and providing feedback on it. Participants were also informed that they could

listen to it during some period before the second lab experiment, which they had already agreed to participate in. Those who were interested were invited to sign up right away and were told that they would receive additional information through WhatsApp in the following days. Because all participants had already given their phone numbers to schedule the second lab experiment, signing up for "the radio show project" took no time and all participants agreed to be contacted for it too. Importantly, participants were also told that participation on the radio show project was being offered to all those participating in the lab experiment.

Participants were randomly assigned to either the treatment or control groups. The show was not broadcasted, but instead episodes were sent to participants through WhatsApp four times a week (on Mondays, Wednesdays, Fridays and Saturdays) over a six-week period. To promote and monitor engagement, every Saturday participants received a quiz on the content of that week's episodes. Answering the quiz correctly put people in a weekly lottery for two prizes of ₦2,000 naira, and gave them one entry to the two grand prizes of ₦50,000 naira, which were awarded at the end of the sixth week. The control group was sent a placebo radio show with a message on health. They also received weekly quizzes with the same scheme of prizes.

A week after the radio show ended, the endline lab-in-the-field experiment started. Participants in the treatment and control groups went through the lab experiment again, which allowed me to re-measure their levels of hate, fear and cooperation to estimate the effects of the radio drama on each margin. Half of the participants were assigned to the treatment group and the other half to the control group. These groups were balanced on baseline levels of cooperation, social preferences, beliefs, religion, sex, age and other characteristics. A balance table can be found in Appendix D1. The attrition rate at the endline lab experiment was 5%, which excludes self-selection on this dimension as an issue of the analysis.

10. Results of the RCT

10.1. Average treatment effect (ATE)

The main specification to study the effects of the radio show is the following.

$$Y_i = \gamma_0 + \gamma_1 Treated_i + \gamma_2 X_i + \varepsilon_i$$

Where Y_i is an outcome variable; $Treated_i$ is a dummy variable equal to 1 if i belonged to the treatment group; and X_i is a vector of pre-registered controls that includes the outcome variable at baseline, plus other characteristics like religion, sex, age, education and marital status.

Table 6 reports the average treatment effects of the radio show on hate, fear and cooperation. Columns 1 and 2 report the effects on hate. The outcome variable in these columns is the negative of the social preferences for the outgroup, $-\beta_i$, such that a negative coefficient represents a reduction in

Table 6: Average Treatment Effects of the Radio Show

A. Full sample

	Hate $-\beta_i$		Fear $\tilde{P}_i(\beta_j<T)$		Non-Cooperation $s_i=N$	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated	0.026**	0.027**	-0.012	-0.012	-0.012	-0.013
	(0.013)	(0.012)	(0.011)	(0.010)	(0.015)	(0.014)
Controls	N	Y	N	Y	N	Y
Mean Dep.Var.	-.823	-.823	.218	.218	.169	.169
Observations	947	947	947	947	947	947

B. Removing subjects who are mechanically unresponsive to treatment

	Hate $-\beta_i$		Fear $\tilde{P}_i(\beta_j<T)$		Non-Cooperation $s_i=N$	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated	0.172**	0.185***	-0.021	-0.021	-0.086	-0.090
	(0.067)	(0.066)	(0.015)	(0.014)	(0.067)	(0.068)
Controls	N	Y	N	Y	N	Y
Mean Dep.Var.	-.079	-.079	.343	.343	1	1
Observations	138	138	600	600	160	160

Notes: This table reports the treatment effect of the radio show. $-\beta_i$ is negative of the social preferences for the outgroup, estimated following the approach presented in Section 3. $\tilde{P}_i(\beta_j<T)$ is the beliefs on the percentage of the outgroup that will not cooperate out of hate. $s_i=N$ is the decision to not cooperate in the coordination game. The controls are the outcome variable at baseline, religion, sex, age, education and marital status. Table 6A report results for the full sample. Table 6B restricts the sample to individuals who were not mechanically unresponsive to the treatment in the outcome variable of the respective column. *Mean Dep.Var.* is the mean of the dependent variable for the whole sample at baseline. Standard errors are clustered at the individual level.

hate. Columns 3 and 4 report the effects on fear, or the beliefs about the percentage of the outgroup that would want to not cooperate out of hate, $\tilde{P}_i(\beta_j<T)$. Columns 5 and 6 report the effect on the decision to not cooperate in the coordination game.

Table 6A reports the results for the full sample. Columns 1 and 2 show that the radio show reduced hate, although the effect is small in magnitude. Columns 3 and 4 indicate that the radio show had no effect on fear. However, it is worth noting that the point estimates have the right sign, towards reducing negative beliefs. Columns 5 and 6 show that the radio drama had no effects on cooperation either, although again the point estimate has the expected sign.

It is important to note that this first specification might be underestimating the effects of the radio show because it estimates the effects over the full sample, where there are many subjects who are mechanically unresponsive to the treatment because their outcome variable cannot improve from baseline. In other words, many subjects were fully altruistic ($\beta_i=1$) or had fully optimistic beliefs ($\tilde{P}_i(\beta_j<T)=0$) at baseline, and therefore they would always show an effect equal to zero, at best. These zeros are not in-

formative of the effectiveness of the intervention. Because of this, I run the same regressions restricting the sample to individuals who had margin for improvement in the outcome variable of the respective column. Results are reported in Table 6B. Columns 1 and 2, show there was a reduction in hate that is considerably greater than the one previously estimated. In particular, Column 2 indicates that listening to the radio show reduced hate by 0.18 for this groups, which is 0.45 of a standard deviation. Columns 3 and 4 still show there were no effects on fear, and the point estimates still remain small in magnitude. And Columns 5 and 6 show that there is still no effect on cooperation, although the point estimates increases considerably.[7]

Finding that the radio show reduces hate but does not increase cooperation could have been a puzzling result that would make it difficult to conclude if the policy was ultimately effective or not. However, this result becomes easy to rationalize under the light of study of drivers presented in this paper. The radio show is an effective policy because it reduces hate, but it is the wrong policy for this context because it does not affect the key motive for conflict, which is fear. By only affecting hate, this policy not only fails to affect the majority of non-cooperators, but also targets a group of people that even without hate will still want to not cooperate out of fear. Because of this, the policy is ultimately ineffective at achieving its main goal, which is increasing cooperation.

Figure 3 can help illustrate this result. Consider the case of individuals with preferences β_i=−.25, who have hateful preferences just beyond the threshold. Among those with a hateful motive to not cooperate, these are the individuals most likely to be swayed toward cooperation by the intervention. And notice that these participants believe that at least 40% of the outgroup is hateful. The radio show moves the dots of these individuals to the right, leaving them close to β_i=−.05, and effectively removing their hateful motive to not cooperate. However, the radio show does not affect beliefs, so these dots do not move vertically. Importantly, the theory presented in Section 2 states that with β_i=−.05, it is enough to believe that 23% of the outgroup is hateful to want to not cooperate. Therefore, these participants will still want to not cooperate out of fear, based on this simple graphical counterfactual.

Ultimately, while these results highlight the problems of designing policy interventions without understanding the drivers of conflict, they also showcase how my experimental protocol proves useful to deepen our understanding of policy solutions.

10.2. Heterogeneous effects by baseline levels of hate and fear

I now explore how treatment effects varied depending on how hateful or fearful participants were at baseline. To do this, I estimate the treatment effect by quartile of baseline levels of hate and fear. The

[7] In Appendix D2 I estimate, under some assumptions, the average treatment effect on the treated (ATT), using participants' answers of the weekly quizzes as a proxy for them actually listening to the radio show. I find that the ATT on hate is 3.1 times the ATE, significant at the 5% level. Still, I find no effects on fear or cooperation.

estimating equation is the following:

$$Y_i = \gamma_0 + \sum_{n=1}^{4} \gamma_n \left(\textit{Treated}_i \times \textit{Quartile}_i^n \right) + \sum_{n=1}^{4} \phi_n \textit{Quartile}_i^n + \eta X_i + \varepsilon_i$$

Where Y_i is an outcome variable at endline; $\textit{Treated}_i$ is a dummy variable equal to 1 if i belongs to the treatment group; $\textit{Quartile}_i^n$ is dummy variable equal to 1 if i falls in quartile n of hate/fear at baseline; and X_i is a vector of controls that include religion, sex, age, education and marital status. As in Table 6, Panel B, I restrict the sample to only participants who where not mechanically unresponsive to treatment.

Table 7: Heterogeneous Effects of the Radio Show

	$\text{Hate}_{t=0}$ Quartiles				$\text{Fear}_{t=0}$ Quartiles			
	Hate $-\beta_i$		No-Coop. $s_i{=}N$		Fear $\tilde{P}_i(\beta_j{<}T)$		No-Coop. $s_i{=}N$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated x Q4	0.375*	0.380*	0.071	0.048	-0.012	-0.014	0.042	0.040
	(0.209)	(0.215)	(0.173)	(0.177)	(0.025)	(0.025)	(0.029)	(0.030)
Treated x Q3	0.355***	0.317**	-0.183	-0.161	0.000	0.008	-0.013	0.008
	(0.134)	(0.123)	(0.120)	(0.119)	(0.023)	(0.024)	(0.033)	(0.034)
Treated x Q2	0.014	0.091	-0.059	-0.111	-0.033	-0.037	-0.047	-0.052
	(0.033)	(0.057)	(0.059)	(0.075)	(0.028)	(0.028)	(0.035)	(0.035)
Treated x Q1	0.027	0.019	-0.111	-0.110	-0.048	-0.047	-0.014	-0.011
	(0.054)	(0.062)	(0.076)	(0.081)	(0.036)	(0.036)	(0.060)	(0.060)
Controls	N	Y	N	Y	N	Y	N	Y
Observations	138	138	138	138	600	600	600	600

Notes: This table reports the heterogenous treatment effect of the radio show by quartiles of baseline level of hate and fear. $-\beta_i$ is negative of the social preferences for the outgroup, estimated following the approach presented in Section 3. $\tilde{P}_i(\beta_j{<}T)$ is the beliefs on the percentage of the outgroup that will not cooperate out of hate. $s_i{=}N$ is the decision to not cooperate in the coordination game. Column (1) looks at treatment effects on hate by baseline level of hate. Column (2) looks at treatment effects on cooperation by baseline level of hate. Column (3) looks at treatment effects on fear by baseline level of fear. Column (4) looks at treatment effects on cooperation by baseline level of fear. All regressions include the dummies for each quartile. The controls are religion, sex, age, education and marital status. Standard errors are clustered at the individual level.

Table 7 reports the results. Column 1 and 2 look at treatment effects on hate by baseline level of hate. Column 3 and 4 look at treatment effects on cooperation by baseline level of hate. Column 5 and 6 look at treatment effects on fear by baseline level of fear. Column 7 and 8 look at treatment effects on cooperation by baseline level of fear. Column 2 shows that the treatment effect on hate was only present in quartiles 4 and 3 (where the mean β_i was -0.8 and -0.1, respectively), while there was no effect on quartiles 2 and 1 (with mean β_i of 0.5 and 0.8). In other words, the radio show was effective at changing social preferences in hateful individuals but not in altruistic ones. It was not obvious *a priori* that this would be the case, as it was plausible that hateful individuals would have more rigid social

preferences. However, Column 4 shows once more that the reduction in hate failed to translate into increased cooperation. On the fear side, Column 6 shows that the radio show failed to change beliefs about the outgroup in any quartile of baseline level of fear. Consequently, Column 8 shows there was no change in cooperation by quartiles of fear.

10.3. Social desirability bias

One potential threat to the results in this section is that they are driven by social desirability bias. Despite the choices made on the experimental design to reduce demand effects, one could still be concerned that listening to a radio show that aimed to promote intergroup cooperation might increase demand effects for socially desirable answers. If this is the case, the treatment group could be more prone than the control group to disingenuously express more positive attitudes towards the outgroup to present themselves in a good light to the surveyors—and this could be driving the treatment effect. I now present evidence that this was not the case. Following Dhar et al. (2022), I included in the baseline survey a module (developed by psychologists) that measures a person's propensity to give socially desirable answers. The module asks respondents if they have several too-good-to-be-true traits such as never being jealous, lazy or resentful. Those who report having more of these traits are scored as having a higher propensity to give socially desirable answers. I use these individual-level scores to see if subjects with a higher propensity to have social desirability bias seem to be more positively affected by the radio show (which could drive the results). To test for this I run the following regression.

$$Y_i = \eta_0 + \eta_1 Treated_i + \eta_2 SDS_i + \eta_3 Treated_i \times SDS_i + \eta_4 X_i + \varepsilon_i$$

Where Y_i is an outcome variable; $Treated_i$ is a dummy variable equal to 1 if i belongs to the treatment group; SDS_i stands for social desirability score and is a variable from 1 to 10 indicating how many socially desirable answers i gave in that survey module; and X_i is a vector of controls that includes the outcome variable at baseline, plus other characteristics like religion, sex and age. Table 8 reports the results.

First, Row 3 indicates that participants with a higher tendency to give socially desirable answers indeed expressed less hate and less fear towards the outgroup in the lab measure. This result is important because it validates that the survey module was indeed effective at capturing people's tendency to give socially desirable answers. Crucially, Row 1 shows that the tendency to give more socially desirable answers was not higher in the treatment group vs. the control group, which indicates that listening to the radio show did not increase demand effects. In addition, Column 1, Row 2, shows that the treatment effect on hate is robust to controlling for social desirability, and what is more, this effect is of the exact same magnitude as that reported in the main specification (Table 6A). Taken together, these results provide evidence that the effects of the radio show do not appear to be driven by social desirability bias.

Table 8: Social Desirability Bias

	Hate $-\beta_i$		Fear $\tilde{P}_i(\beta_j<T)$		Non-Coop. $s_i=N$	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated x SDS	-0.008	-0.007	0.006	0.007	0.001	0.003
	(0.007)	(0.006)	(0.006)	(0.005)	(0.009)	(0.008)
Treated	0.024*	0.026**	-0.010	-0.011	-0.009	-0.012
	(0.013)	(0.012)	(0.011)	(0.010)	(0.015)	(0.014)
Soc.Des.Score	0.019***	0.007*	-0.017***	-0.007*	-0.020***	-0.009
	(0.006)	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)
Controls	N	Y	N	Y	N	Y
Mean Dep.Var.	.823	.823	.218	.218	.169	.169
Observations	947	947	947	947	947	947

Notes: This table reports the treatment effect of the radio show controling for social desirability bias. $-\beta_i$ is negative of the social preferences for the outgroup, estimated following the approach presented in Section 3. $\tilde{P}_i(\beta_j<T)$ is the beliefs on the percentage of the outgroup that will not cooperate out of hate. $s_i=N$ is the decision to not cooperate in the coordination game. *SDS* refers to the individual-level social desirability bias score. The controls are the outcome variable at baseline, religion, sex and age. *Mean Dep.Var.* is the mean of the dependent variable for the whole sample at baseline. Standard errors are clustered at the individual level.

11. Discussion

In this paper I develop a theory-guided experimental protocol to disentangle hate and fear. I then use this protocol to understand, first, what drives conflict in a particular setting, and, second, which drivers a particular policy intervention shifts. I find that the main driver of conflict is not hate but unwarranted fears, and that interventions should focus on solving misperceptions about the outgroup to maximize the impact on cooperation. However, I also find that unwarranted fears prove hard to change with policy (even more than hate). In what remains, I discuss some questions that arise from this study.

Why do unwarranted fears exist in the first place? One plausible explanation for the existence of unwarranted fears towards the outgroup, which may point at a broader pattern, is that "bad type" individuals are more salient because their actions receive more media coverage and are more talked about. In line with well-studied psychological biases (like availability bias or 'what you see is all there is' bias (Kahneman, 2011; Enke, 2020)), people will not realize that the information they receive exaggerates the percentage of "bad type" individuals in the outgroup, which would lead to widespread misperceptions. In the US, for example, after the 2021 Capitol attack, Democrats greatly exaggerated the percentage of Republicans supporting political violence (Mernyk et al., 2022).

Why did the radio show fail to reduce unwarranted fears? Could a different radio show, or another type of intervention, succeed? I am skeptical that a radio show focused solely on reducing fear could achieve this goal, particularly because the production company believed they had no limitations in effectively delivering their message about fear. In fact, within the story of this radio show, the fear

channel seemed to receive more attention than the hate channel. Could a different type of intervention have been effective at reducing fear? That is hard to know, of course. However, other interventions, like intergroup contact, have had effects on positive actions but not on trust (Lowe, 2021; Mousa, 2020). It might be the case that, in general, it is easier to convince people to treat the outgroup in a better way than to convince them that what they think about the outgroup is not correct. Moreover, the findings of this paper suggest that even when individuals recognize that a treatment influences their own behavior, they might still think such treatment will be ineffective in changing the behavior of the outgroup.

Are the results of this paper the description of one particular setting, or a more general description of intergroup relations? This is, of course, a question that cannot be answered with this one paper. However, a nice feature of this paper is that the experimental protocol I develop is portable, and can be used to study other settings of conflict and other policies for conflict, and hopefully further our understanding on the differential role that preferences and beliefs play in conflict and its resolution.

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Appendix

Appendix A. Theoretical Model

A1. Extensions of the theoretical model

Utility function with different social preferences parameters for the ingroup and the outgroup

In the model presented in Section 2 of the paper it is always the case that j belongs to the outgroup, $j{\in}O$. One simple extension allows for j to belong to the outgroup or the ingroup, $j{\in}\{I, O\}$, and for i to have different social preferences for j depending on which group j belongs to. In this case, i has one social preference parameter for people from the in group, β_{iI}, and one different social preference parameter for people from the outgroup, β_{iO}. The utility function is the following:

$$u_i(x_i, x_j) = x_i + \big(\beta_{iI} \cdot \mathbb{1}(j{\in}I) + \beta_{iO} \cdot \mathbb{1}(j{\in}O)\big)x_j$$

With this formulation, depending on which group j belongs to, i uses a different social preference parameter in the interaction. Additionally, the distance $|\beta_{iI}{-}\beta_{iO}|$ captures i's level of ingroup bias (or moral universalism), where $|\beta_{iI}{-}\beta_{iO}|{=}0$ means i has no ingroup bias (or full moral universalism), and a higher $|\beta_{iI}{-}\beta_{iO}|$ means a higher level of ingroup bias.

A2. Derivations of the theoretical model

Derivation of Equation (3)

The following is the derivation of the threshold to not cooperate out of fear described by equation (3). The condition determines how fearful a person must be, given her level of social preferences, to prefer to not cooperate.

	C	N
C	1000 , 1000	500 , 900
N	900 , 500	750 , 750

$$W_i(s_i) = \tilde{P}_i(s_j{=}N) \cdot u_i(s_i, N) \;+\; \tilde{P}_i(s_j{=}C) \cdot u_i(s_i, C)$$

Given this, i chooses to not cooperate if $W_i(N) \geq W_i(C)$. Solving for $\tilde{P}_i(s_j{=}N)$ yields the following.

$$W_i(N) \geq W_i(C)$$
$$\tilde{P}_i(s_j{=}N) \cdot u_i(N, N) \;+\; \tilde{P}_i(s_j{=}C) \cdot u_i(N, C) \geq \tilde{P}_i(s_j{=}N) \cdot u_i(C, N) \;+\; \tilde{P}_i(s_j{=}C) \cdot u_i(C, C)$$

Replace $\tilde{P}_i(s_j{=}C) = 1 - \tilde{P}_i(s_j{=}N)$ and let $\tilde{P}_i(s_j{=}N) = \tilde{p}$

$$\begin{aligned}
\tilde{p}\cdot u_i(N,N) \;+\; (1{-}\tilde{p})\cdot u_i(N,C) \;&\geq\; \tilde{p}\cdot u_i(C,N) \;+\; (1{-}\tilde{p})\cdot u_i(C,C)\\
\tilde{p}\cdot u_i(N,N) \;+\; u_i(N,C) \;-\; \tilde{p}\cdot u_i(N,C) \;&\geq\; \tilde{p}\cdot u_i(C,N) \;+\; u_i(C,C) \;-\; \tilde{p}\cdot u_i(C,C)\\
\tilde{p}\cdot u_i(N,N) \;-\; \tilde{p}\cdot u_i(N,C) \;+\; \tilde{p}\cdot u_i(C,C) \;-\; \tilde{p}\cdot u_i(C,N) \;&\geq\; u_i(C,C) \;-\; u_i(N,C)\\
\tilde{p}\Big(u_i(C,C) - u_i(N,C) \;+\; u_i(N,N) - u_i(C,N)\Big) \;&\geq\; u_i(C,C) - u_i(N,C)\\
\tilde{p} \;&\geq\; \frac{u_i(C,C) - u_i(N,C)}{u_i(C,C) - u_i(N,C) \;+\; u_i(N,N) - u_i(C,N)}
\end{aligned}$$

Replacing the utilities for the game with $T = -0.2$:

$$\begin{aligned}
\tilde{p} &\geq \frac{(1000 + \beta_i 1000) - (900 + \beta_i 500)}{(1000 + \beta_i 1000) - (900 + \beta_i 500) \;+\; (750 + \beta_i 750) - (500 + \beta_i 900)}\\
\tilde{p} &\geq \frac{100 + \beta_i 500}{350 + \beta_i 350}
\end{aligned}$$

Alternatively, replacing the utilities for the game with $T = -0.6$:

$$\begin{aligned}
\tilde{p} &\geq \frac{(1000 + \beta_i 1000) - (700 + \beta_i 500)}{(1000 + \beta_i 1000) - (700 + \beta_i 500) \;+\; (600 + \beta_i 600) - (500 + \beta_i 700)}\\
\tilde{p} &\geq \frac{300 + \beta_i 500}{400 + \beta_i 400}
\end{aligned}$$

Derivation of Equation (3) with payoff shifters

Now consider the case with payoff shifters. The following table shows the utilities i would get in each scenario in of the game.

	C	N
C	$1000{+}\beta_i 1000{+}\eta$	$500{+}\beta_i 900{+}\psi$
N	$900{+}\beta_i 500{+}\gamma$	$750{+}\beta_i 750{+}\rho$

The player chooses to not cooperate if:

$$\begin{aligned}
\tilde{p}\cdot u_i(N,N) \;+\; (1{-}\tilde{p})\cdot u_i(N,C) \;&\geq\; \tilde{p}\cdot u_i(C,N) \;+\; (1{-}\tilde{p})\cdot u_i(C,C)\\
\tilde{p}\cdot (750 + \beta_i 750 + \rho) \;+\; (1{-}\tilde{p})\cdot (900 + \beta_i 500 + \gamma) \;&\geq\; \tilde{p}\cdot (500 + \beta_i 900 + \psi) \;+\; (1{-}\tilde{p})\cdot (1000 + \beta_i 1000 + \eta)
\end{aligned}$$

Taking into account the process above we know:

$$\tilde{p} \geq \frac{u_i(C,C) - u_i(N,C)}{u_i(C,C) - u_i(N,C) \;+\; u_i(N,N) - u_i(C,N)}$$

Replacing the utilities:

$$\tilde{p} \geq \frac{(1000 + \beta_i 1000 + \eta) - (900 + \beta_i 500 + \gamma)}{(1000 + \beta_i 1000 + \eta) - (900 + \beta_i 500 + \gamma) \; + \; (750 + \beta_i 750 + \rho) - (500 + \beta_i 900 + \psi)}$$

$$\tilde{p} \geq \frac{100 + \beta_i 500 + \eta - \gamma}{350 + \beta_i 350 + \eta - \gamma + \rho - \psi}$$

Empirically, only $(\eta - \gamma)$ and $(\rho - \psi)$ are identified. This is why in the empirical model (and abusing notation) I only estimate a γ, that is actually capturing $(\eta - \gamma)$, and a ψ, that is actually capturing $(\rho - \psi)$.

A3. Game matrix of the game with $T = -0.6$

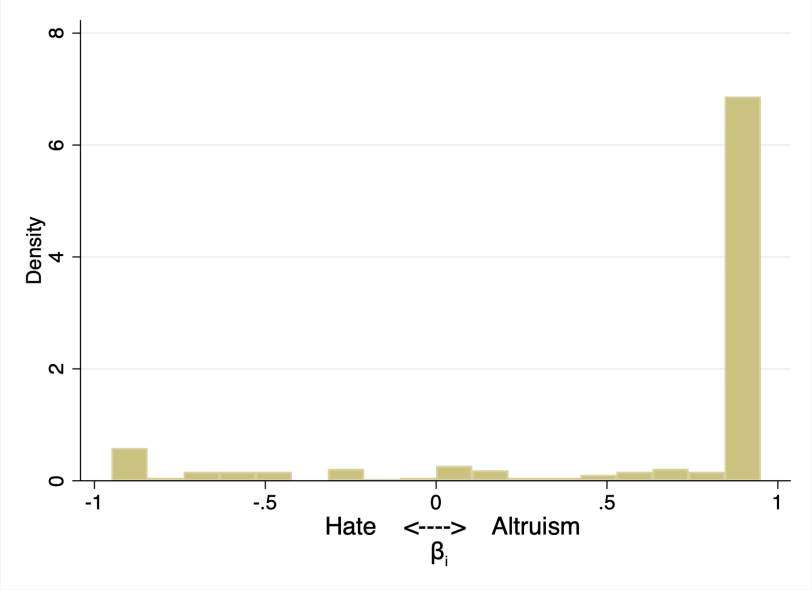
The game matrix of the game with $T = -0.6$ is the following:

	C	N
C	1000 , 1000	500 , 700
N	700 , 500	600 , 600

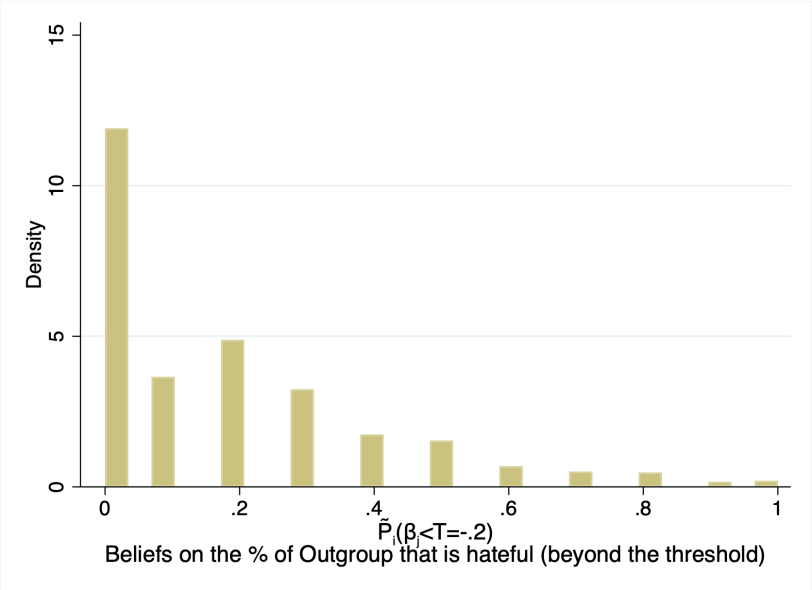
A4. Evidence against hate being reciprocal to beliefs on outgroup's hate

Figure A4.1: Is Hate Reciprocal to Beliefs on Outgroup's Hate (i.e. Fear)?

A. Preferences of Participants with Fear in the Upper Quartile



B. Beliefs of Participants with $\beta_i \in (0.9, 1)$



Notes:

Appendix B. Additional Results of the Calibrated Parameters

B1. Correspondence between money allocation decisions and assigned β_i

To calibrate a person's social preference parameter, I use a her choices in the money allocations decisions in the following way. If a person picks Option 2 in a certain money allocation decision, she reveal that for her $u_i(Opt2) \geq u_i(Opt1)$. Assuming that her utility function has the form $u_i{=}x_i{+}\beta_i{\cdot}x_j$, then $u_i(Opt2) \geq u_i(Opt1)$ implies that $\beta_i{\leq}(x_{i2} - x_{i1})/(x_{j1} - x_{j2})$—where x_{i1} is the payoff for participant i if she picks Option 1. This way, each money allocation decision puts a bound on the social preference parameter, and with enough decisions of this sort one can calibrate and pin down a person's parameter. With this calibration method, I can use each participant's choices to place their social preference parameter in one of the following intervals: $\hat{\beta}_i{\in}\{(-1,-0.9),...,(0.9,1)\}$. The following table shows the correspondence between costliest money allocation decision where a participant selected *Opt2* and the β_i assigned to her.

Table 9: Correspondence Between the Costliest Money Allocation Decision Where a Participant Selected *Option 2* and the β_i Assigned to Her

Money Allocation Decision						
Option 1		Option 2		Decision	Price Paid	$\beta_i \in$
x_{i1}	x_{j1}	x_{i2}	x_{j2}	Type	for Opt 2	Interval
1000	0	550	500	Altruism	450	(0.9,1.0)
1000	0	600	500	Altruism	400	(0.8,0.9)
1000	0	650	500	Altruism	350	(0.7,0.8)
1000	0	700	500	Altruism	300	(0.6,0.7)
1000	0	750	500	Altruism	250	(0.5,0.6)
1000	0	800	500	Altruism	200	(0.4,0.5)
1000	0	850	500	Altruism	150	(0.3,0.4)
1000	0	900	500	Altruism	100	(0.2,0.3)
1000	0	950	500	Altruism	50	(0.1,0.2)
1000	0	1000	500	Altruism	0	(0.0,0.1)
1000	1000	1000	500	Hate	0	(0.0,-0.1)
1000	1000	950	500	Hate	50	(-0.1,-0.2)
1000	1000	900	500	Hate	100	(-0.2,-0.3)
1000	1000	850	500	Hate	150	(-0.3,-0.4)
1000	1000	800	500	Hate	200	(-0.4,-0.5)
1000	1000	750	500	Hate	250	(-0.5,-0.6)
1000	1000	700	500	Hate	300	(-0.6,-0.7)
1000	1000	650	500	Hate	350	(-0.7,-0.8)
1000	1000	600	500	Hate	400	(-0.8,-0.9)
1000	1000	550	500	Hate	450	(-0.9,-1.0)

B2. Explanatory power of hate and fear

Table 10: Explanatory Power of Hate and Fear Measures

	Non-Cooperation (s_i)					
	(1)	(2)	(3)	(4)	(5)	(6)
Hate ($-\beta_i$)	0.516***	0.479***			0.281***	0.263***
	(0.025)	(0.025)			(0.022)	(0.022)
Fear ($\tilde{P}_i(\beta_j<T)$)			1.085***	1.032***	0.888***	0.857***
			(0.035)	(0.035)	(0.036)	(0.036)
R^2	0.292	0.336	0.487	0.516	0.557	0.576
Controls	N	Y	N	Y	N	Y
Observations	997	997	997	997	997	997

Notes: Controls are age, gender, religion, education, and marital status. Standard errors are clustered at the individual level.

B3. Table of preferences and beliefs for the ingroup

Table 11: Preferences and Beliefs for the Ingroup

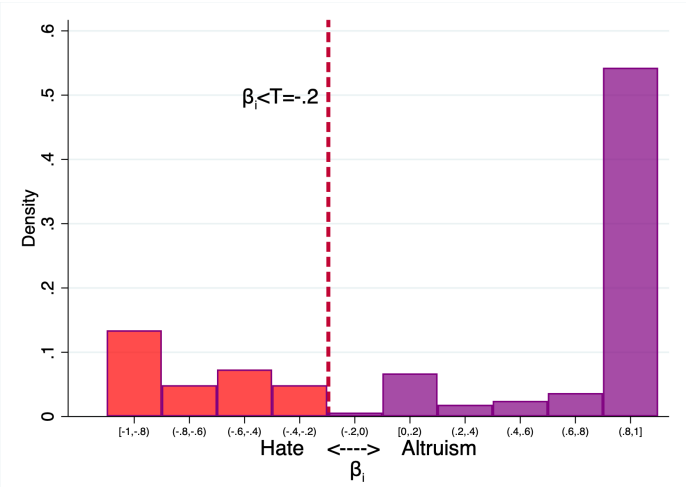
	Avg. β_i		% of Non-Coop.	Avg. $\tilde{P}_i(\beta_j<T)$		Accurate
Game	Coop.	Non-Coop.	with $\beta_i<T$	Coop.	Non-Coop.	$P(\beta_j<T)$
$T=-0.2$	0.93	0.58	12%	0.10	0.33	0.004
	(0.09)	(0.60)		(0.13)	(0.31)	
$T=-0.6$	0.93	0.72	8%	0.05	0.25	0.003
	(0.11)	(0.50)		(0.10)	(0.27)	

Notes: This tables shows preferences and beliefs for the ingroup, disaggregated by whether individuals chose to cooperate or not in the games with threshold $T=-0.2$ and $T=-0.6$. Column 1 and 2 show the average social preferences for the ingroup (β_i). Column 3 shows the percentage of non-cooperators that had hateful preferences beyond the threshold. Column 4 and 5 show that the average beliefs about the percentage of the ingroup that is hateful beyond the threshold ($\tilde{P}_i(\beta_j<T)$). Column 6 shows the accurate percentage of individuals that are hateful beyond the threshold.

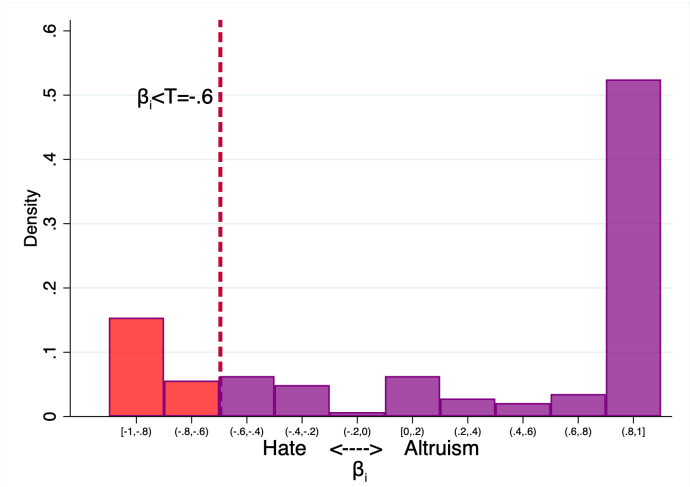
B4. Figures with distribution of social preferences

Figure 4: Distribution of Social Preferences (β_i) for the **Outgroup**, by Strategy

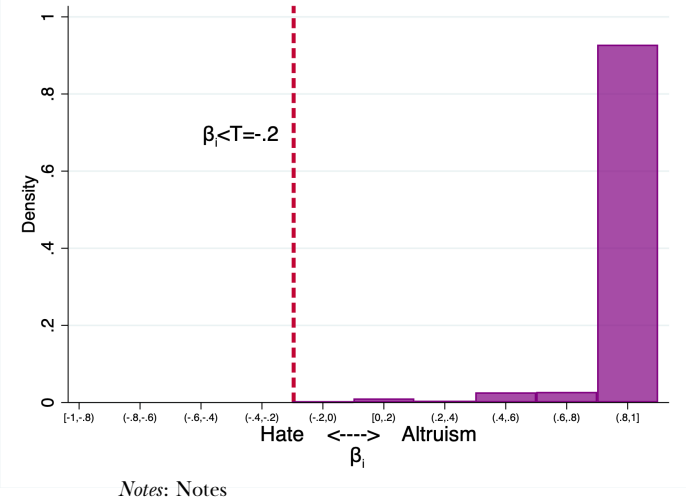
A. Strategy: NC, Game: $T=-.2$



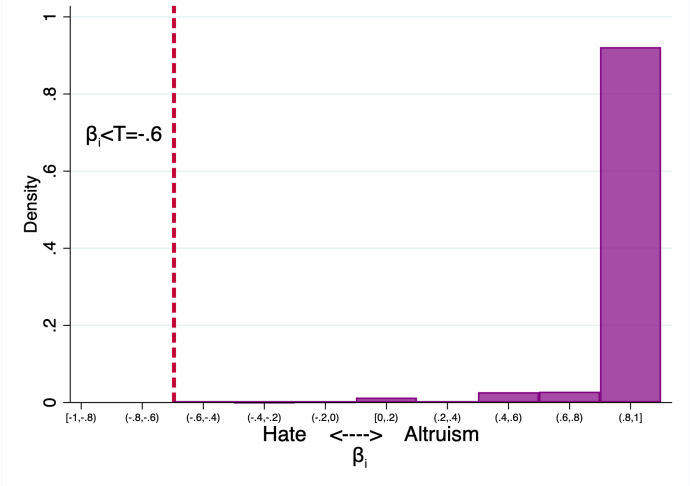
B. Strategy: NC, Game: $T=-.6$



C. Strategy: C, Game: $T=-.2$



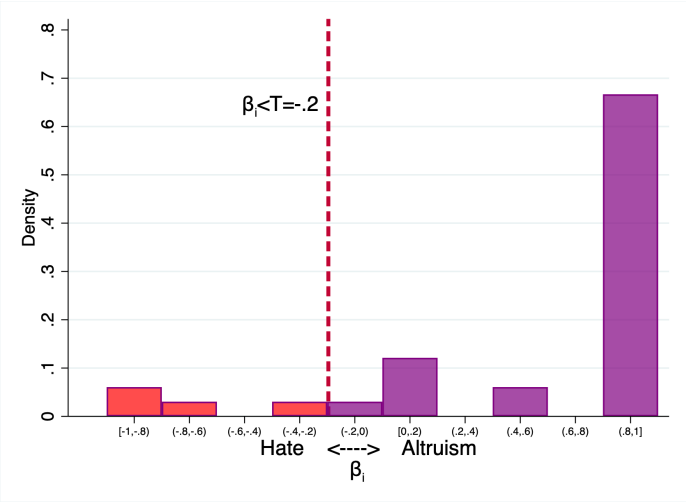
D. Strategy: C, Game: $T=-.6$



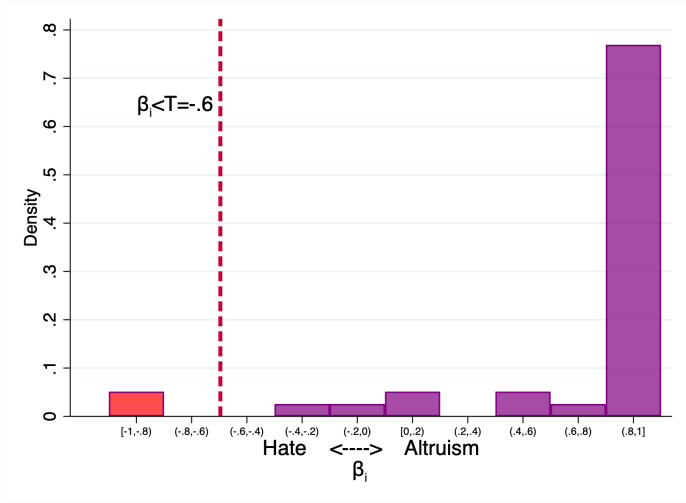
Notes: Notes

Figure 5: Distribution of Social Preferences (β_i) for the **Ingroup**, by Strategy

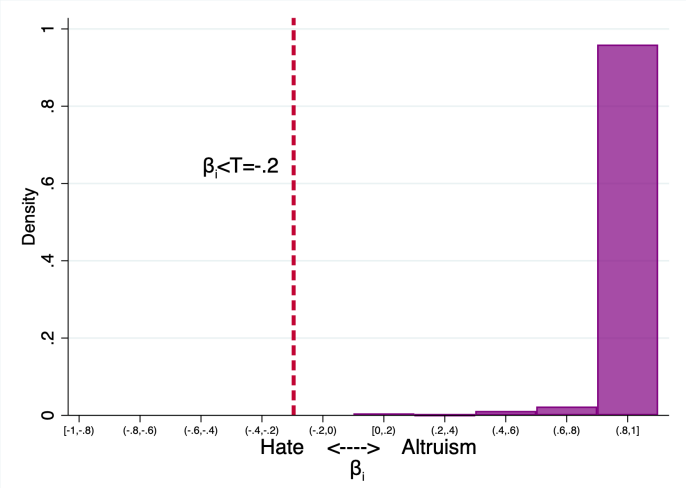
A. Strategy: NC, Game: T=−.2



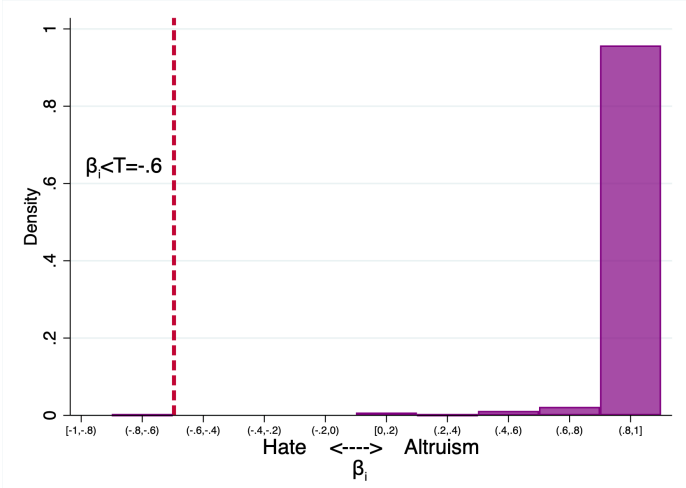
B. Strategy: NC, Game: T=−.6



C. Strategy: C, Game: T=−.2



D. Strategy: C, Game: T=−.6

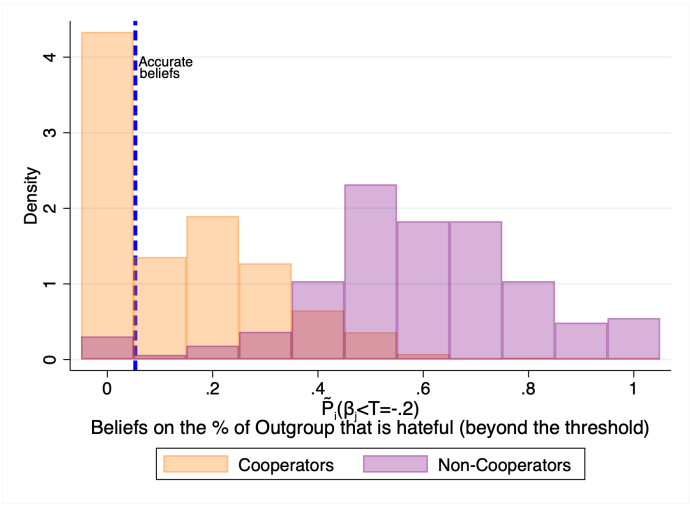


Notes: Notes

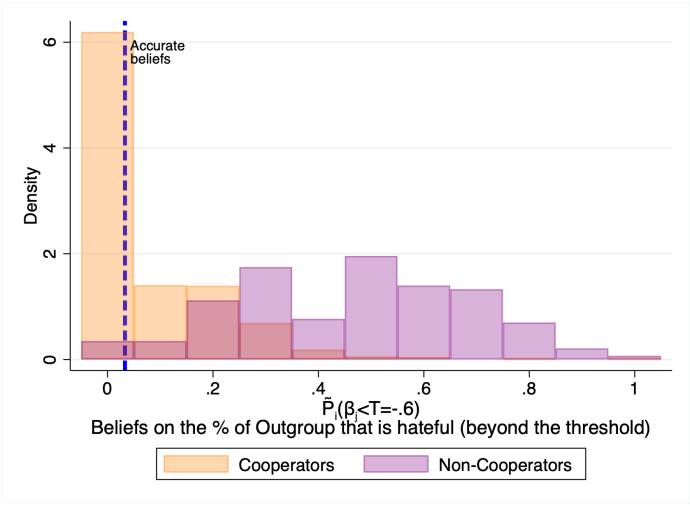
B5. Figures with distribution of beliefs

Figure 6: Distribution of Beliefs ($\tilde{P}_i(\beta_j<T)$), by Match and Game

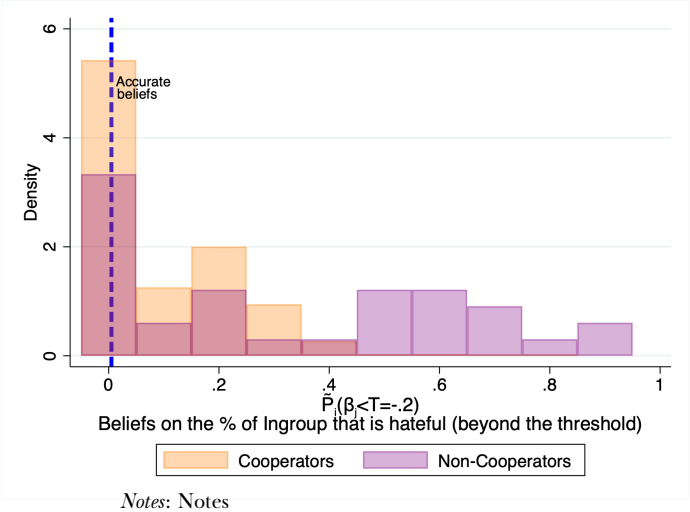
A. Match: Outgroup, Game: $T=-.2$



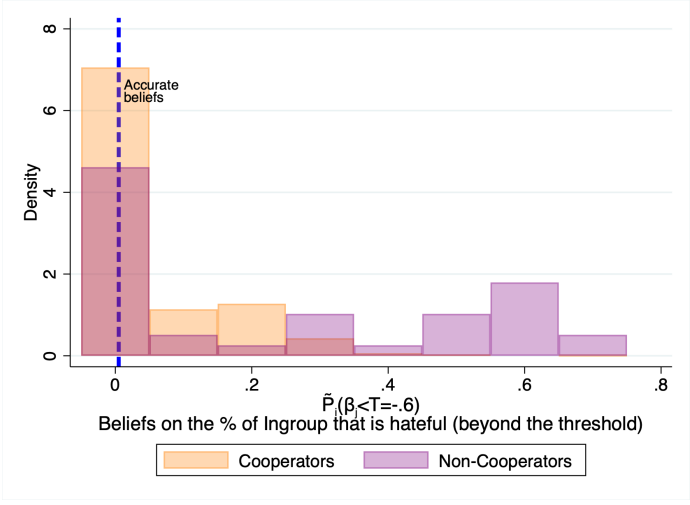
B. Match: Outgroup, Game: $T=-.6$



C. Match: Ingroup, Game: $T=-.2$



D. Match: Ingroup, Game: $T=-.6$

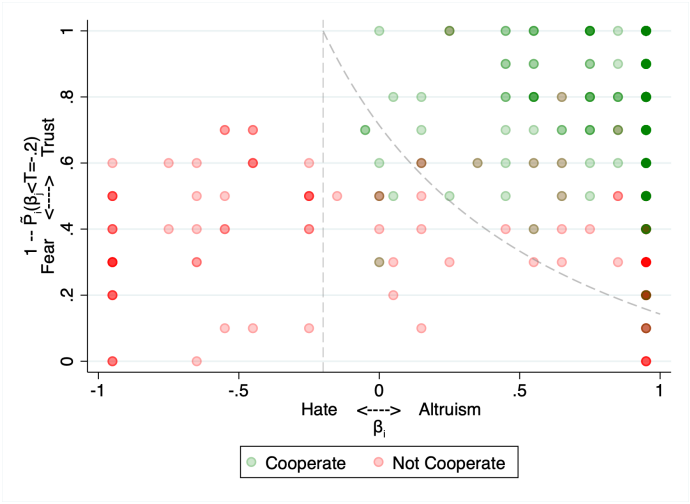


Notes: Notes

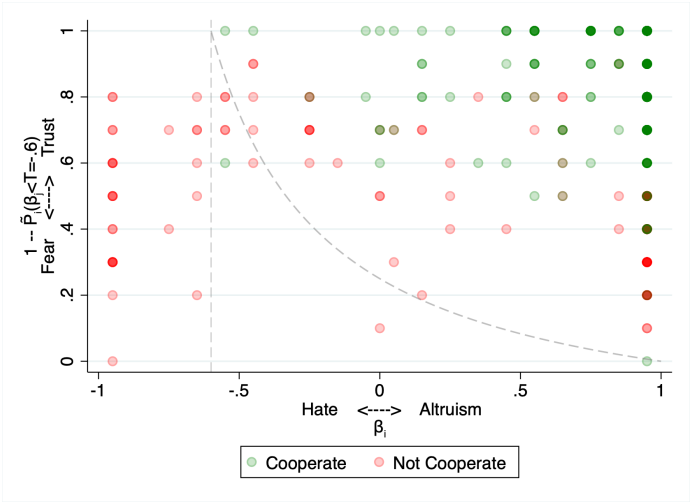
B6. Figures with preferences, beliefs and cooperation together

Figure 7: Preferences, Beliefs and Cooperation, by Match and Game

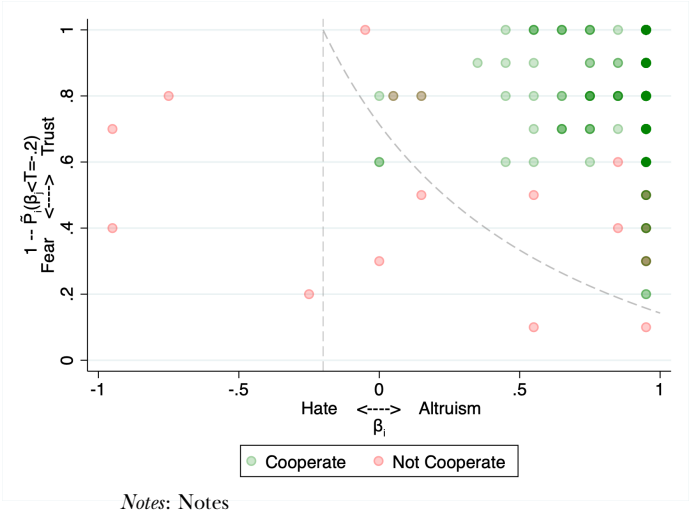
A. Match: Outgroup, Game: $T=-.2$



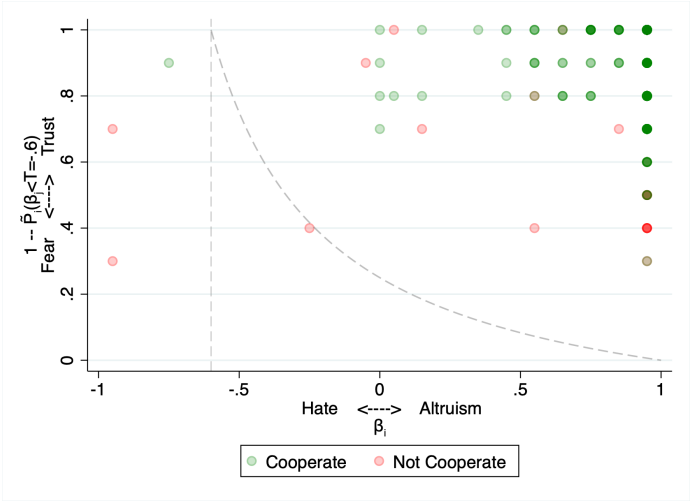
B. Match: Outgroup, Game: $T=-.6$



C. Match: Ingroup, Game: $T=-.2$



D. Match: Ingroup, Game: $T=-.6$



Notes: Notes

B7. Cooperation, preferences and beliefs by Neighborhood

Table 12: Non-Cooperation Rates by Community

Community	% Chose Not Cooperate
Ungwan Dalyop	77%
Dogon Karfe	58%
Yan Trailer	58%
Jenta Mangoro	50%
Dong Village	50%
Sabon Layi Rusau	46%
Apata	46%
Ungwan Rukuba	46%
Congo Russia	42%
Rukuba Road	38%
New Road	24%
Kunga Rigiza	19%
Tudun Fera	17%
Ungwan Jarawa	12%
Sabon Fegi	12%
Ungwan Rogo	11%
Bauchi Road	11%
Old Bukuru park	8%
Nasarawa Filin Ball	8%
Katako	8%
Ali Kazaure	8%
Jenta Makeri	8%
Tudun Faira	7%
Duala	4%
Yelwa	4%

Blue text: Christian community
Green text: Non-Christian community

Table 13: Community-Level Social Preferences (β_i)

Community	**Avg.** β_i
Ungwan Dalyop	0.20
Ungwan Rukuba	0.36
Jenta Mangoro	0.45
Dogon Karfe	0.56
Congo Russia	0.58
Sabon Layi Rusau	0.63
Yan Trailer	0.67
Dong Village	0.76
Apata	0.76
Nasarawa Filin Ball	0.78
Laranto	0.80
Jenta Makeri	0.80
Tudun Fera	0.82
Kunga Rigiza	0.84
Bauchi Road	0.84
Sabon Layi	0.85
Dutse Uku	0.85
Tina Junction	0.87
Layin Zana	0.87
Ungwan Jarawa	0.87
Tudon Wada	0.89
Ali Kazaure	0.89
Rukuba Road	0.89
Bulbula	0.89
New Road	0.90

Blue text: Christian community
Green text: Non-Christian community

Table 14: Percentage of Hateful People (β_i<0) by Community

Community	% $\beta_i < 0$
Ungwan Dalyop	38%
Ungwan Rukuba	29%
Jenta Mangoro	27%
Dogon Karfe	25%
Sabon Layi Rusau	15%
Congo Russia	15%
Yan Trailer	13%
Dong Village	12%
Tudun Fera	8%
Apata	8%
Nasarawa Filin Ball	8%
Jenta Makeri	8%
Kunga Rigiza	5%
Laranto	4%
Ungwan Jarawa	4%
Bulbula	4%
Rukuba Road	4%
Bauchi Road	4%
Yan Shanu	0%
Duala	0%
Kwanan Soja	0%
Old Bukuru park	0%
Kabong	0%
Sabon Fegi	0%
Sabon Layi	0%

Blue text: Christian community
Green text: Non-Christian community
Note: Percentage of individuals with $\beta_i < 0$ (hateful preferences) in each community.

Table 15: Average Beliefs on $P(\beta_j<T)$ by Community

Community	**Avg.** $\tilde{P}_i(\beta_j<T)$
Ungwan Dalyop	0.52
Dogon Karfe	0.47
Ungwan Rukuba	0.43
Jenta Mangoro	0.39
Apata	0.36
Dong Village	0.34
New Road	0.34
Bauchi Road	0.33
Sabon Layi Rusau	0.32
Congo Russia	0.31
Dutse Uku	0.28
Ungwan Jarawa	0.28
Kunga Rigiza	0.28
Sabon Fegi	0.25
Ali Kazaure	0.25
Rukuba Road	0.25
Yan Trailer	0.23
Old Bukuru park	0.23
Katako	0.23
Layin Zana	0.21
Laranto	0.20
Bulbula	0.20
Tudun Faira	0.17
Nasarawa Filin Ball	0.17
Tudun Fera	0.16

Blue text: Christian community
Green text: Non-Christian community
Note: Average beliefs on the probability that an outgroup member has β_i below threshold T.

B8. Preferences and beliefs for the ingroup, by Religion

Table 16: Heterogeneity by Religion, Preferences and Beliefs for the Ingroup

	Christians	Muslims
β_i	0.91	0.93
	(0.17)	(0.13)
$\tilde{E}_i[\beta_j]$	0.85	0.91
	(0.31)	(0.17)
$P(\beta_i<T)$	0.004	0.004
$\tilde{P}_i(\beta_j<T)$	0.10	0.11
	(0.15)	(0.13)

Notes: β_i is the social preferences for the ingroup. $\tilde{E}_i[\beta_j]$ is the beliefs on the mean social preferences ingroup members have for the ingroup. $P(\beta_i<T)$ is the actual probability that someone from i's group is hateful beyond the threshold towards the ingroup. $\tilde{P}_i(\beta_j<T)$ is the beliefs about the probability that a member of the ingroup is hateful beyond the threshold towards the ingroup. The standard deviation of each estimate is reported in parenthesis.

B9. Hate, Fear and Social Dominance Orientation

The following is the survey module that measures social dominance orientation. Below it is the table that shows how my measures of hate and fear correlate with SDO.

Instructions: Show how much you favor or oppose each idea below by selecting a number from 1 to 7 on the scale below. You can work quickly; your first feeling is generally best.

1 = strongly oppose, 2 = somewhat oppose, 3 = slightly oppose, 4 = neutral, 5 = slightly favor, 6 = somewhat favor, 7 = strongly favor

Protrait dominance:

1. An ideal society requires some groups to be on top and others to be on the bottom.

2. Some groups of people are simply inferior to other groups.

Contrait dominance: 3. No one group should dominate in society.

4. Groups at the bottom are just as deserving as groups at the top.

Protrait anti-egalitarianism:

5. Group equality should not be our primary goal.

6. It is unjust to try to make groups equal.

Contrait anti-egalitarianism:

7. We should do what we can to equalize conditions for different groups.

8. We should work to give all groups an equal chance to succeed.

Table 17: Hate, Fear and Social Dominance Orientation

	Social Dominance Orientation					
	(1)	(2)	(3)	(4)	(5)	(6)
Hate ($-\beta_i$)	0.216**	0.393***			0.068	0.187*
	(0.101)	(0.105)			(0.111)	(0.112)
Fear ($\tilde{P}_i(\beta_j<T)$)			0.612***	0.953***	0.564***	0.828***
			(0.156)	(0.152)	(0.169)	(0.159)
Controls	N	Y	N	Y	N	Y
Observations	997	997	997	997	997	997

Notes: Controls are age, gender, religion, education, and marital status. Standard errors are clustered at the individual level.

Appendix C. Structural Model: Model Selection Process and Additional Results

C1. Testing Alternative Empirical Models

For all the following empirical models I test, the utility function in the money allocation decisions is:

$$u(d_{im}) = x_i(d_{im}) + \beta_i \cdot x_j(d_{im}) + \varepsilon_{d_{im}}$$

Where $d_{im} \in \{Opt1, Opt2\}$, $x_i(d_{im})$ is the payoff i gets when she chooses d_{im} in money allocation decision m, and $\varepsilon_{d_{im}}$ is an idiosyncratic error that has an extreme value distribution with mean zero. The data consists of is d_{im} and the payoffs for i and j in each option of each money allocation decision. The unknown parameter is β_i.

In what follows I test different empirical models in which I vary the expected utility functions that would be used in the coordination game.

Most restricted expected utility function

The first model I test has an expected utility function as defined in theoretical model of Section 3. The expected utility function is the following.

$$W(s_i) = \tilde{P}_i(s_j{=}C) \cdot u(s_i, s_j{=}C) \; + \; \tilde{P}_i(s_j{=}N) \cdot u(s_i, s_j{=}N) + \varepsilon_{s_i}$$

$$u(s_i, s_j) = x_i(s_i, s_j) + \beta_i \cdot x_j(s_i, s_j)$$

Where $\tilde{P}_i(s_j{=}s)$ is i's subjective beliefs on $P(s_j{=}s)$, given that $j \in B$, $x_i(s_i, s_j)$ is the payoff i gets when she chooses s_i and j chooses s_j in the game, and ε_{s_i} is an idiosyncratic error that has an extreme value distribution with mean zero. For now (and until stated otherwise) I will assume that subjects do not form higher-order beliefs, and therefore $\tilde{P}_i(s_{jg}{=}N) = \tilde{P}_i(\beta_j{<}T)$. The data consists of s_{ig}, $\tilde{P}_i(s_{jg}{=}N)$, and the payoffs for i and j in all four scenarios of each game. The unknown parameter is β_i.

I use a random coefficient model to estimate the parameters of the distribution of β_i (mean μ_β, and variance σ_β), as explained in Section 7. The results are reported in Table C1.1.

The in-sample fit performance of this model is 90% for the full sample and 43% for non-cooperators. In other words, the parameters estimated correctly predict the decisions taken by 90% of participants in the experiment and 43% of participants that decided to not-cooperate in the experiment. The reason why this model does a poor job at explaining non-cooperative behavior is that half of the people who did not cooperate are fully altruistic, as shown in Figure 2. If $\psi_i{=}0$, a fully altruistic person would want to not cooperate only if she believes that $P(s_j{=}N){>}0.86$. However, fully altruistic non-cooperators believe, on average, that $P(s_j{=}N){=}0.6$. This implies that the potential costs of cooperating go beyond

Table C1.1: Most Restricted Model

	Coefficient	Stand. Err.	
μ_β	0.951	0.064	***
σ_β	0.447	0.062	***
Observations			9,006
Clusters			997
Likelihood			-3,497

Notes: This table reports the results of the simulated maximum likelihood estimation of a random coefficients model. Each observation is one decision of one participant in either a money allocation decision or a coordination game. μ_β and σ_β are the mean and variance of the distribution of the parameters of social preferences. Standard errors are clustered at the individual level.

the monetary one. To account for this and increase the model fit in non-cooperators, I test more flexible models.

Risk aversion

One first approach to relax the initial model assumptions would be to have an expected utility function that allows for risk aversion. I discard this approach because, theoretically, at this level of prices individuals should not exhibit risk aversion. Indeed, empirically this is what I find in the field. Using a canonical survey module to measure risk aversion, I find that over 90% of individuals are risk-neutral at this level of prices. In addition, the behavioral literature suggests that at low prices, behavior is better explained by loss aversion than risk aversion (Rabin, 2000; DellaVigna, 2018). Because of this, the first variation of the model I test is one with a parameter that could capture loss aversion (and other psychological costs that would vary the level of fear needed to want to not cooperate).

A payoff shifter for the case $(s_i{=}C, s_j{=}N)$

In search for a better model fit with the data, I relax the functional assumption and consider a model with a payoff shifter for the case $(s_i{=}C, s_j{=}N)$ to capture any psychological cost or benefit that might be playing a role in this case. Let ψ be the parameter which captures the psychological cost of cooperating when the other person does not. ψ could capture the psychological cost of getting what is usually described as the "sucker's payoff". Another psychological cost ψ could capture is loss aversion, where the reference point is (C, C).

Ultimately, a negative ψ raises the cost of cooperating when the other player does not, and therefore lowers the level of fear needed to want to not cooperate (see Appendix A2 for the derivation of the new fear threshold). The expected utility function is now the following:

$$W(s_i) = \tilde{P}_i(s_j{=}C){\cdot}u(s_i, s_j{=}C) \;+\; \tilde{P}_i(s_j{=}N)\big[u(s_i, s_j{=}N) + \psi{\cdot}\mathbb{1}(s_i{=}C)\big] + \varepsilon_{s_i}$$

The data consists of s_{ig}, $\tilde{P}_i(s_{jg}{=}N)$, and the payoffs for i and j in all four scenarios of each game.

The unknown parameters are β_i and ψ. Notice also that the first model is nested in this one.

I use a random coefficient model to estimate the parameters of the distribution of β_i (mean μ_β, and variance σ_β) and the parameter ψ, as explained in Section 4. The results are reported in Table C1.2.

Table C1.2: Model with ψ

	Coefficient	Stand. Err.	
μ_β	0.936	0.071	***
σ_β	0.419	0.061	***
ψ	-539.4	108.2	***
Observations			9,006
Clusters			997
Likelihood			-3,299

Notes: This table reports the results of the simulated maximum likelihood estimation of a random coefficients model. Each observation is one decision of one participant in either a money allocation decision or a coordination game. μ_β and σ_β are the mean and variance of the distribution of the parameters of social preferences. ψ is a payoff shifter for the case (s_i=C, s_j=N). Standard errors are clustered at the individual level.

The first thing to note is that the estimated parameter ψ is significant, which indicates that is seems to matter in the decision problem. The in-sample fit performance of this model is 96% for the full sample and 91% for non-cooperators. In other words, the parameters estimated correctly predict the decisions taken by 96% of participants in the experiment and 91% of participants that decided to not-cooperate in the experiment. The model fit for non cooperators increases substantially when compared to the previous model. This reveals that the potential costs of cooperating seem to go beyond a monetary loss and include psychological costs. In the end, this model is empirically superior to the one without ψ.

Fully flexible model: Adding a payoff shifter for the case (s_i=N, s_j=C)

Ultimately, the parameter ψ from the previous model is a payoff shifter that changes the way in which i perceives the payoffs from each strategy in the case where j does not cooperate. This begs the question if a symmetric payoff shifter for the case where j cooperates would also increase the explanatory power of the model. Such a payoff shifter would change the way in which i perceives the payoffs from each strategy in the case where j cooperates, and would give full flexibility to the emprical model. Call this parameter γ, which, if positive, could represent a psychological benefit of giving the "sucker's payoff" to the other player. Such a benefit would lower the threshold at which a person becomes hateful enough to want to not cooperate out of hate. If γ was instead negative, it could capture a taste for mutual cooperation, or loss aversion with (C, C) as the reference point. The expected utility function is now the following:

$$W(s_i) = \tilde{P}_i(s_j{=}C)\big[u(s_i, s_j{=}C) + \gamma{\cdot}\mathbb{1}(s_i{=}C)\big] \; + \; \tilde{P}_i(s_j{=}N)\big[u(s_i, s_j{=}N) + \psi{\cdot}\mathbb{1}(s_i{=}C)\big] + \varepsilon_{s_i}$$

The data consists of s_{ig}, $\tilde{P}_i(s_{jg}{=}N)$, and the payoffs for i and j in all four scenarios of each game.

The unknown parameters are β_i, ψ and γ. Notice also that the first two models are nested in this one.

I use a random coefficient model to estimate the parameters of the distribution of β_i (mean μ_β, and variance σ_β) and the parameters ψ and γ, as explained in Section 7. The results are reported in Table C1.3.

C1.3: Fully Flexible Model

	Coefficient	Stand. Err.	
μ_β	0.938	0.069	***
σ_β	0.420	0.059	***
ψ	565.4	177.2	***
γ	25.8	127.8	
Observations			9,006
Clusters			997
Likelihood			-3,299

Notes: This table reports the results of the simulated maximum likelihood estimation of the random coefficients model. Each observation is one decision of one participant in either a money allocation decision or a coordination game. μ_β and σ_β are the mean and variance of the distribution of the parameters of social preferences. ψ is a payoff shifter for the case $(s_i{=}C, s_j{=}N)$. γ is a payoff shifter for the case $(s_i{=}N, s_j{=}C)$. Standard errors are clustered at the individual level.

The first thing to note is that the parameter γ is not significant, and the likelihood this model reaches is not greater than the previous model that had no γ. This indicates that there does not seem to be a psychological benefit or cost that shift the perceived payoffs in the case when j cooperates.

The fact that the payoff shifter ψ is significant and γ is not can be understood by considering Figure 3. The payoff shifter γ would move the cooperation threshold represented by the vertical line. Instead, the payoff shifted ψ would move the cooperation threshold represented by the curved line. As one can see graphically, moving the vertical line would not improve the fit, because to the left of it there are only non-cooperators (as the theory predicts). Instead, moving the curved line with the payoff shifter ψ would improve the sample fit because above this curved line there are some non-cooperators that the simplest model is not able to explain.

In conclusion, there is only one psychological cost/benefit that seems to be playing a role in the decision problem. In this sense, the previous model, with ψ and no γ, is empirically superior to this one.

Adding Higher-Order Beliefs

Until now I have assumed that subjects do not form higher-order beliefs, and therefore $\tilde{P}_i(s_{jg}{=}N) = \tilde{P}_i(\beta_j{<}T)$. Having studied which payoff shifters are relevant, I now move forward to test a model with higher-order beliefs. The inclusion of higher-order means that $\tilde{P}_i(s_j{=}N) = \tilde{P}_i(\beta_j{<}T){+}\tilde{P}_i(s_j{=}N|\beta_j{\geq}T)$, where the first term of the right hand side captures the effect of first-order beliefs on $\tilde{P}_i(s_j{=}N)$ and the second term captures the effect of higher-order beliefs. The expected utility function is now the follow-

ing:

$$W(s_i) = \tilde{P}_i(s_j{=}C){\cdot}u(s_i, s_j{=}C) \;+\; \tilde{P}_i(s_j{=}N)\big[u(s_i, s_j{=}N) + \psi{\cdot}\mathbb{1}(s_i{=}C)\big] + \varepsilon_{s_i}$$

$$\text{with} \;\; \tilde{P}_i(s_j{=}N) = \tilde{P}_i(\beta_j{<}T) + \tilde{P}_i(s_j{=}N|\beta_j{\geq}T)$$

The data consists of s_{ig}, $\tilde{P}_i(\beta_j{<}T)$, and the payoffs for i and j in all four scenarios of each game. The unknown parameters are β_i, ψ and $\tilde{P}_i(s_j{=}N|\beta_j{\geq}T)$. Notice also that the previous models are nested in this one.

Estimating this model is computationally more challenging because now we have to-be-estimated-parameters multiplying each other. Because of this, I take a step back and focus on a model without random coefficients. That is, a model where there is a single β for everyone, which is computationally less challenging. I first estimate the best performing model so far, without random coefficients—which is the model with ψ and no higher-order beliefs (that is, $\tilde{P}_i(s_j{=}N) = \tilde{P}_i(\beta_j{<}T)$). The estimated parameters are shown in Table C1.4. As we should expect, the β and ψ are very similar to those estimated in the model with random coefficients.

C1.4: Without higher order beliefs

	Coefficient	Stand. Err.	
β	0.904	0.0001	***
ψ	496.3	0.80	***
Observations			9,006
Clusters			997
Likelihood			-15616.5

Notes: This table reports the results of the maximum likelihood estimation of a model without random coefficients. Each observation is one decision of one participant in either a money allocation decision or a coordination game. β is the social preferences. ψ is a payoff shifter for the case ($s_i{=}C$, $s_j{=}N$). Standard errors are clustered at the individual level.

Now I proceed to add higher order beliefs to this model. That is, I estimate the model with the expected utility function specified in this section. Table C1.5 shows the results.

C1.5: With higher order beliefs

	Coefficient	Stand. Err.	
β	0.904	0.0002	***
ψ	496.3	4.35	***
$\tilde{P}_i(s_j{=}N\|\beta_j{\geq}T)$	0.000	0.0045	
Observations			9,006
Clusters			997
Likelihood			-15616.5

Notes: This table reports the results of the maximum likelihood estimation of a model without random coefficients. Each observation is one decision of one participant in either a money allocation decision or a coordination game. β is the social preferences. ψ is a payoff shifter for the case ($s_i{=}C$, $s_j{=}N$). And $\tilde{P}_i(s_j{=}N|\beta_j{\geq}T)$ captures the effect of higher-order beliefs on $\tilde{P}_i(s_{jg}{=}N)$. Standard errors are clustered at the individual level.

The estimation of the model clearly indicates that subjects do not form higher-order beliefs in this context. As the reader can see, the estimated higher-order beliefs are a very precise zero. In addition, the likelihood function value is not greater than the value of the model without higher-order beliefs. Notice also that, despite adding higher-order beliefs, the estimated parameters of β and γ remained the same as in the model without.

This result is perhaps not surprising if one considers the ample evidence in the experimental literature that states that, on average, people do not form higher order beliefs when playing games in the lab (Rubinstein, 1989; Kneeland, 2015). And what is more, they are less likely to form higher order beliefs if their are playing a game of this sort for the first time (as was the case in my setting).

In addition, the result also falls in line with anecdotal evidence from the fieldwork. When talking to participants to understand their reasoning behind their decision in the game, no explanation that resembled higher-order beliefs ever came up. If the participant gave a justification on why they thought their match would not cooperate, it always had to do with the belief that their match wanted to lower their payoff. When asked specifically about higher order beliefs in the game, participant struggle a lot to understand (or did not understand at all) how beliefs on beliefs should be affecting their decision and that of their partner. It is worth remarking that this was the first time the participants faced a game like this, so understanding the basics of the game was already demanding enough.

Having ψ at the individual level (ψ_i)

Up until this point, the best performing model continues to be the one with ψ and no higher-order beliefs. One additional change can be tested on this model: Given that the estimation occurs in the environment of random coefficients, one can easily increase the flexibility of the model to get a better fit by taking ψ to be a random coefficient too, not just β_i. In this sense, every person has a different ψ_i that comes from a distribution with mean μ_ψ and variance σ^2_ψ. For this case, the expected utility function is the following.

$$W(s_i) = \tilde{P}_i(s_j{=}C){\cdot}u(s_i, s_j{=}C) \;+\; \tilde{P}_i(s_j{=}N)\big[u(s_i, s_j{=}N) - \psi_i{\cdot}\mathbb{1}(s_i{=}C)\big] + \varepsilon_{s_i}$$

The data consists of s_{ig}, $\tilde{P}_i(s_{jg}{=}N)$, and the payoffs for i and j in all four scenarios of each game. The unknown parameters are β_i and ψ_i.

I use a random coefficient model to estimate the parameters of the distributions of β_i (mean μ_β, and variance σ_β) and ψ_i (mean μ_ψ, and variance σ_ψ), as explained in Section 7. The results are reported in Table C1.6.

The first thing to note is that the estimated parameters of ψ's distribution are significant, which indicates that there seems to be some individual level variation in ψ_i (which is especially noticeable by the magnitude of σ_ψ). The in-sample fit performance of this model is 99% for the full sample and 95% for non-cooperators. In other words, the parameters estimated correctly predict the decisions taken

Table C1.6: Individual-Level ψ_i

	Coefficient	Stand. Err.	
μ_β	0.922	0.072	***
σ_β	0.420	0.059	***
μ_ψ	532.7	108.6	***
σ_ψ	469.2	163.7	***
Observations			9,006
Clusters			997
Likelihood			-3,267

Notes: This table reports the results of the simulated maximum likelihood estimation of the random coefficients model presented in Section 4. Each observation is one decision of one participant in either a money allocation decision or a coordination game. μ_β and σ_β are the mean and variance of the distribution of the parameters of social preferences. μ_ψ and σ_ψ are the mean and variance of the distribution of the parameters of loss aversion. Standard errors are clustered at the individual level.

by 99% of participants in the experiment and 95% of participants that decided to not-cooperate in the experiment. Compared to the other model with one ψ for everyone, this model presents a better sample fit and reaches a higher likelihood. In this sense, this model is empirically superior to the one individual-level loss aversion.

This is then the preferred model over all, as it seems to be the one to best represent the behavior observed in the lab. Because of this, this is the the model selected for the paper and the one presented in Section 8.

C2. Counterfactual Analysis in a Model Where Preferences Depend on Beliefs

As mentioned in the paper, I cannot test if the correct model is one where preferences depend on beliefs because I do not have an exogenous change in beliefs that would allow me to see if preferences change because of this. However, I can study how my empirical results would change if the correct model was one were preferences depend on beliefs.

In this mode, the individual's utility function is the following:

$$u_i = x_i + \beta_i(Z_i) \cdot x_j \tag{4}$$

In the model presented in the paper Z_i is said to be predetermined. The following extension of the model considers the case in which social preferences are endogenous to the beliefs about the social preferences of others (in the spirit of Rabin (1993) and Levine (1999)). This formulation allows people to have social preferences that depend on reciprocity. In other words, people may have higher social preferences for those who they belief have higher social preferences towards them, and lower social preferences for those who they believe have lower social preferences towards them.

Let $\tilde{E}_i[\beta_j]$ be i's beliefs about $E[\beta_j | j \in O]$ — that is, i's believe about the expected social preferences

of j given that j belongs to the outgroup O. Then β_i is a function of this argument, $\beta_i(\tilde{E}_i[\beta_j])$. In particular, β_i has the following functional form.

$$\beta_i = \frac{\alpha_i + \lambda \cdot \tilde{E}_i[\beta_j]}{1+\lambda}$$

$$u_i = x_i + \left(\frac{\alpha_i + \lambda \cdot \tilde{E}_i[\beta_j]}{1+\lambda} \right) \cdot x_j$$

Where $\alpha_i \in [-1, 1]$ is i's base social preferences. The base social preferences are adjusted by a reciprocity parameter $\lambda \in [0, 1]$. A $\lambda > 0$ means that i wants to adjust her base social preferences in order to correspond to the social preferences she believes j has towards her. Note that in this formulation it is still the case that $\beta_i \in [-1, 1]$. And note that when $\lambda = 0$ and there is no reciprocity in social preferences, $\beta_i = \alpha_i$ and the model goes back to the original presented in Section 2 of the paper.

Now, if this was the correct specification of the model, how would this affect the empirical results? The first point to note is that it would not alter the main findings: that fear is the main driver of conflict and that this fear is unwarranted. However, what it could affect is the effect of changing fear, as it would affect cooperation not only by the change in beliefs but also by a change in preferences. The relevant question therefore becomes: how would cooperation change if beliefs change in this model, compared to the model without reciprocity?

To answer this question we need to estimate λ. Using the formula of $\beta_i(\tilde{E}_i[\beta_j])$, we can get to λ by estimating the following regression and then solving for λ.

$$\beta_i = \left(\frac{\bar{\alpha}}{1+\lambda} \right) + \left(\frac{\lambda}{1+\lambda} \right) \tilde{E}_i[\beta_j] + \varepsilon_i$$

To run this regression I use the calibrated parameters for β_i and the elicited beliefs for $\tilde{E}_i[\beta_j]$. Running the regression I find that $\frac{\lambda}{1+\lambda} = 0.33$ (with *p-value* $= 0.00$), and therefore $\lambda = 0.49$. This result implies that when $\tilde{E}_i[\beta_j]$ increases by 0.1, β_i increases by 0.03.

I now incorporate this result into the structural model to examine how the reciprocity parameter influences the counterfactual analysis. I consider a counterfactual in which beliefs about the outgroup change, and analyze how this would affect non-cooperation in a model that includes reciprocity preferences. In particular, I look at the counterfactual case where people have accurate beliefs about the outgroup. That is, where $\tilde{E}_i[\beta_j] = E[\beta_j]$ and $\tilde{P}_i(\beta_j < T) = P(\beta_j < T)$.

To study this counterfactual, I first estimate α_i using λ and β_i. Once I have this, I can calculate the new β_i for each person when their $\tilde{E}_i[\beta_j]$ changes. For the case where people have accurate beliefs and reciprocity preferences, I find that 100% of the people that were not cooperating out of fear switch to cooperation, and 42% of the people that were not cooperating out of hate switch to cooperation. In the model without reciprocity, if people had accurate beliefs 94% of the people not cooperating out of hate would switch to cooperation, and (mechanically) 0% of the people not cooperating out of hate would

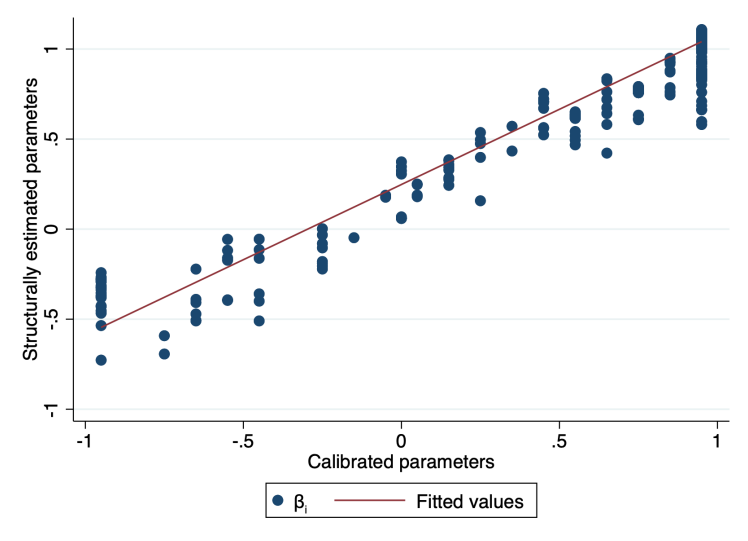
switch to cooperation.

The bottom line is therefore that if people had social preferences with reciprocity, the effect of correcting beliefs on cooperation would be even stronger. This result raises the potential value of correcting misperceptions about the outgroup.

C3. Comparing Structurally Estimated Parameters and Calibrated Parameters

The following graph is a scatter plot of the recovered β_i from the two different methods used in the paper, the calibration method and the structural estimation. The linear fit has a coefficient of 0.84.

Figure B3.1: Correlation of Recovered Parameters



C4. Counterfactual analysis for the game with $T=-.6$

Following the same procedures explained in Section 8.2, I find that if in this game people had accurate beliefs, the number of people not cooperating would drop by 78%. This means that 91% of the people not cooperating out of fear would switch to cooperation if they had accurate beliefs. On the other hand, I find that if in this game hateful people now had selfish preferences (β_i=0), the number of people not cooperating would not change. This means that all the people not cooperating out of hate would still want to not cooperate, now out of fear.

Appendix D. Additional Results of the RCT

D1. RCT Balance Table

Table D3.1: Treatment Balance on Observables

	(1) No-Coop	(2) Soc.Pref.	(3) Beliefs	(4) Religion	(5) Gender	(6) Age	(7) Educ.	(8) Married	(9) SDS
Treated	0.014	-0.004	0.004	-0.005	0.003	0.022	-0.031	-0.035	0.117
	(0.024)	(0.025)	(0.015)	(0.033)	(0.032)	(0.733)	(0.068)	(0.033)	(0.131)
Observations	947	947	947	947	947	947	947	947	947

Notes: This tables shows how the different characteristics were balanced between the treatment and the contrel group. *Treated* is the dummy that indicates treatment status. *No-Coop* is a dummy for $s_i{=}N$. *Soc.Pref.* is the parameter of social preferences β_i. *Beliefs* is the beliefs about the percentage of the outgroup that is hateful beyond the threshold, $\tilde{P}_i(\beta_j{<}T)$. *Religion* is a dummy equal to 1 if i is Christian. *Gender* is a dummy equal to 1 if i is female. *Educ.* is categorical variable that indicates the level of education. *Married* is a dummy that indicates if the person is married or single. *SDS* is the social dominance score as defined in Section 10.3.

D2. Radio Show's Average Treatment Effect on the Treated

I do not have information on how many people actually listened to the radio show. However, I know that only 33% of the participants answered at least one of the quizzes about the radio show. It is hard to know to what extent this percentage reflects the number of people who actually listened to the radio show, but the number suggests that it might have been the case that a majority of people did not listen to the radio show. If this is the case, one would like to estimate the treatment effect on the treated (ATT). Under the assumption that everyone who listened to the radio show answered at least one quiz and everyone who did not listen answered no quiz, I can use the treatment assignment as an IV for listening to the radio show, and estimate the ATT. Table D3.1 shows that the ATT on hate is 3.1 times the ATE. There are still no effects on fear or cooperation, consistent with the previous findings.

Table D3.1: Average Treatment Effect on the Treated (ATT)

	Hate $-\beta_i$		Fear $\tilde{P}_i(\beta_j<T)$		Non-Coop. $s_i=N$	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated	0.079**	0.081**	-0.036	-0.035	-0.036	-0.039
	(0.040)	(0.037)	(0.035)	(0.032)	(0.046)	(0.043)
Controls	N	Y	N	Y	N	Y
Mean Dep.Var.	.823	.823	.218	.218	.169	.169
Observations	947	947	947	947	947	947

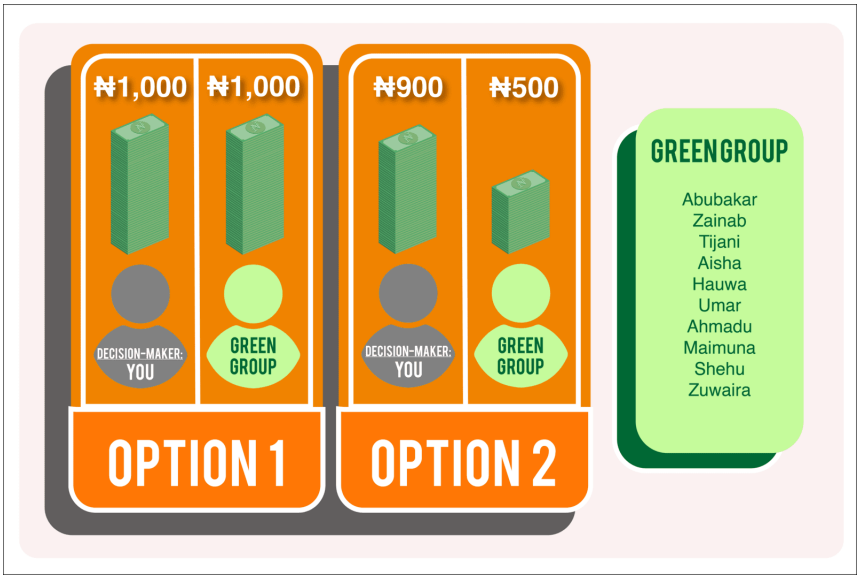
Notes: This table reports the radio show's average treatment effect on the treated. $-\beta_i$ is negative of the social preferences for the outgroup, estimated following the approach presented in Section 3. $\tilde{P}_i(\beta_j<T)$ is the beliefs on the percentage of the outgroup that will not cooperate out of hate. $s_i=N$ is the decision to not cooperate in the coordination game. The controls are the outcome variable at baseline, religion, sex, age, education and marital status. *Mean Dep.Var.* is the mean of the dependent variable for the whole sample at baseline. Controls are Standard errors are clustered at the individual level.

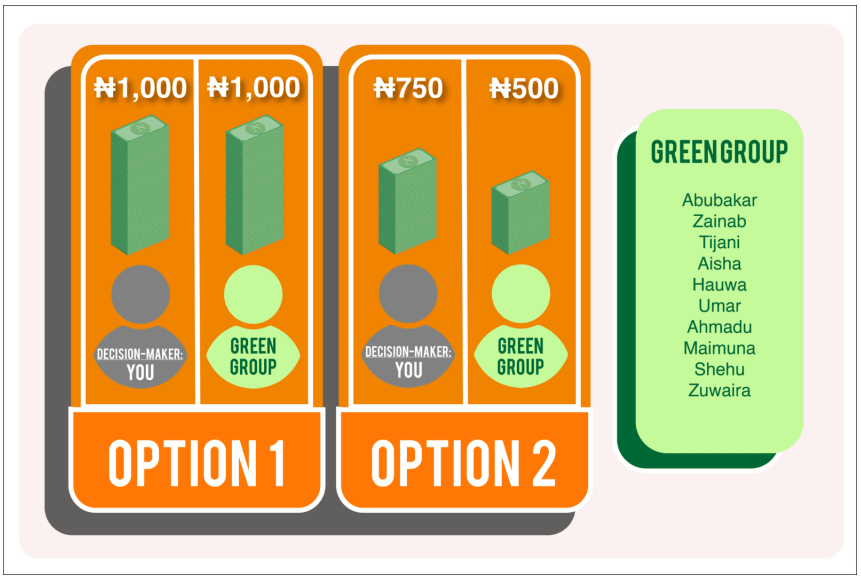
Appendix E. Lab Experiment Protocol

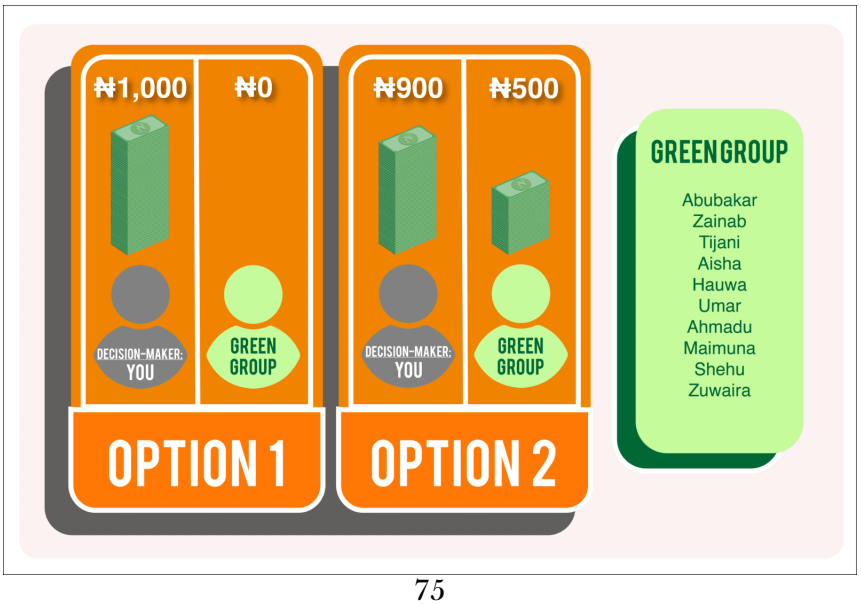
E1. Screenshots and Pictures

Green and Blue groups in the Lab Game

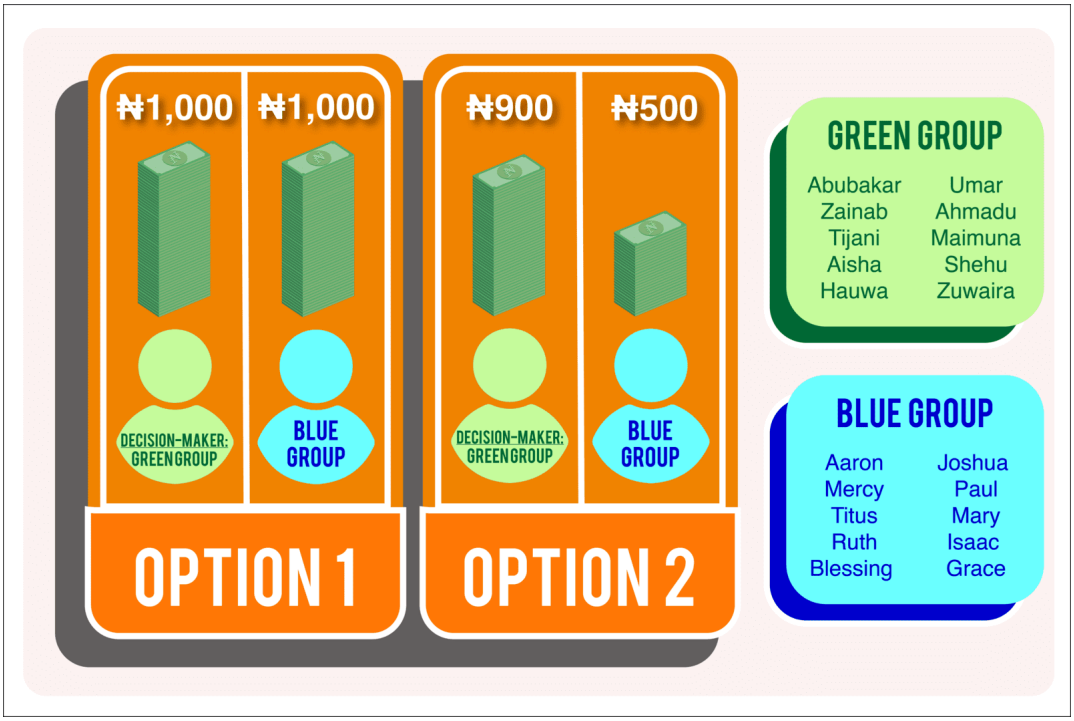
Examples of Money Allocation Decisions







Eliciting Beliefs About the Outgroup, Example



How many people from the Green Group do you think picked Option 2? (1—10)

Coordination Game Example

GREEN GROUP

Abubakar	Umar
Zainab	Ahmadu
Tijani	Maimuna
Aisha	Shehu
Hauwa	Zuwaira

YOUR choice	*Match's choice*	**YOUR earnings**	*Match's earnings*
Cooperate	Cooperate	₦1,000	₦1,000
Cooperate	Not Cooperate	₦500	₦900
Not Cooperate	Cooperate	₦900	₦500
Not Cooperate	Not Cooperate	₦750	₦750

Lab in the Field

Jos, Nigeria

E2. Experimental Protocol

The following is a sketch of experimental protocol that is best for illustration purposes. The protocol used in the field had multiple intermediate steps to guarantee participants got a good understanding of the games.

Introduction

The survey you are going to take today is anonymous. We won't record your name at any point, so no one will be able to link your choices to you. We will never share individual answers, only aggregate statistics, so you should feel free to answer whatever you want.

The results from this survey will be analyzed and shared only in the United States, never in Nigeria. No Nigerian organization, agency or researcher is involved.

Do you have any questions or concerns about the anonymity or confidentiality of your answers?

In this survey, there are no wrong or right answers, there is no objective to achieve. Different people prefer different things, and that is absolutely fine.

Today we will go through several activities that will together take about 50 minutes to complete. For today's survey you will receive between ₦700 and ₦1700, depending on the decision you and other participants in this study make. It is in your best interest to pay close attention to each question.

Your earnings will be paid to you in cash right after we finish the survey.

Module 1: Demographics

Religion, Gender, Age, Education, Migration, etc.

Module 2: Social Preferences (Money Allocation Decisions) with the First Group

Now we will proceed with the activities.

One month ago we gathered a group of people from different parts of Jos, and ages from 18 to 60. We chose twenty of them and divided them into two groups, the Blue Group and the Green Group. They participated in multiple activities, similar to the ones you are about to go through.

In these activities, you will make decisions that can make you, and them, earn extra money. Participants from the Blue Group and the Green Group that receive extra money from your decisions will never know your identity, or what your decisions were. They will only find out what their total extra earnings was, which will be affected by multiple things in addition to your decisions. Their extra earnings will be paid to them in the following days.

From all the decisions you make that could earn you extra money, we will randomly pick only one and implement its payments. So you should consider each decision on its own, and not think of them as accumulating.

If you don't have any question we will now procede with the activities.

[The first group the participant plays with is picked at random. In this example, the participant will play first with the Blue group]

In this first activity you will be randomly matched with a member from the Blue Group. To keep his/her anonymity, you will exactly know who he/she is. All you will know is that he/she is a person from the Blue Group, which consists of the following ten people:

BLUE GROUP

ChristianName1	ChristianName2	ChristianName3
ChristianName4	ChristianName5	ChristianName6
ChristianName7	ChristianName8	ChristianName9
	ChristianName10	

In this task you will make a series of decisions that will make both of you earn money. However, how much money you and your match get depends only on a decision you will make. We want to understand how much of your earnings you are willing to give up in order to increase or decrease in ₦500 the earnings of your match.

Remember, we will implement the payments of at most one of these decisions (picked randomly), so you should not think of them as accumulating or compensating one another. The best thing for you to do is to consider each of these decisions on its own.

[Participant go through 7 or 8 of the following decisions, following the algorithm detailed in this Appendix]

(Altruism, p=0)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦0
Option 2 — You get ₦1,000, and your match from the Blue Group gets ₦500

(Altruism, p=50)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦0
Option 2 — You get ₦950, and your match from the Blue Group gets ₦500

(Altruism, p=100)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦0

Option 2 — You get ₦900, and your match from the Blue Group gets ₦500

(Altruism, p=150)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦0
Option 2 — You get ₦850, and your match from the Blue Group gets ₦500

(Altruism, p=200)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦0
Option 2 — You get ₦800, and your match from the Blue Group gets ₦500

(Altruism, p=250)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦0
Option 2 — You get ₦750, and your match from the Blue Group gets ₦500

(Altruism, p=300)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦0
Option 2 — You get ₦700, and your match from the Blue Group gets ₦500

(Altruism, p=350)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦0
Option 2 — You get ₦650, and participant from the Blue Group gets ₦500

(Altruism, p=400)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦0
Option 2 — You get ₦600, and your match from the Blue Group gets ₦500

(Altruism, p=450)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦0
Option 2 — You get ₦550, and your match from the Blue Group gets ₦500

(Hate, p=0)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦1,000
Option 2 — You get ₦1,000, and your match from the Blue Group gets ₦500

(Hate, p=50)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦1,000
Option 2 — You get ₦950, and your match from the Blue Group gets ₦500

(Hate, p=100)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦1,000
Option 2 — You get ₦900, and your match from the Blue Group gets ₦500

(Hate, p=150)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦1,000
Option 2 — You get ₦850, and your match from the Blue Group gets ₦500

(Hate, p=200)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦1,000
Option 2 — You get ₦800, and your match from the Blue Group gets ₦500

(Hate, p=250)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦1,000
Option 2 — You get ₦750, and your match from the Blue Group gets ₦500

(Hate, p=300)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦1,000
Option 2 — You get ₦700, and your match from the Blue Group gets ₦500

(Hate, p=350)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦1,000
Option 2 — You get ₦650, and your match from the Blue Group gets ₦500

(Hate, p=400)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦1,000
Option 2 — You get ₦600, and your match from the Blue Group gets ₦500

(Hate, p=450)
Option 1 — You get ₦1,000, and your match from the Blue Group gets ₦1,000
Option 2 — You get ₦550, and your match from the Blue Group gets ₦500

Module 3: Social Preferences (Money Allocation Decisions) with the Second Group

Now you are going to be matched at random with a different person, this time a member from the Green Group. Again, to keep his/her anonymity, you won't exactly know who he/she is. All we will tell you is that he/she is a member of the Green Group, which consists of the following ten people:

GREEN GROUP

MuslimName1	MuslimName2	MuslimName3
MuslimName4	MuslimName5	MuslimName6
MuslimName7	MuslimName8	MuslimName9
	MuslimName10	

As before, your task is to pick if you and your match from the Green Group get the money in Option

1 or Option 2. We want to understand how much of your earnings you are willing to give up in order to increase or decrease in ₦500 the earnings of your match.

Remember, we will implement the payments of at most one of these decisions (picked randomly), so you should not think of them as accumulating or compensating one another. The best thing for you to do is to consider each of these decisions on its own.

[Participants then go again through the money allocation decisions, now with their match from the group they haven't played with (in this example, the Green Group)]

Module 4: Beliefs on the Social Preferences of the Outgroup

[In this example, the outgroup is the Green Group]

This next task is about guessing what other participants in this survey did. If you guess correctly in all questions, we will add ₦500 to your earnings.

A month ago, people from the Green Group and the Blue Group went through the same activity you just went through. To each member of the Green Group we told them that we had matched them at random with someone from the Blue Group, and showed them the list of names of the Blue Group. Then, they proceeded to make the same series of decisions you just made: picking between the money in Option 1 or Option 2.

In this task, you have to guess what a member of the Green Group picked when playing with his/her match from the Blue Group.

What do you think the member of the Green Group picked when matched with a member of the Blue Group?

[Participants made guesses for at most eight of the following money allocation decision, following the same algorithm as before]

(Altruism, p=0)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦0
Option 2 — Participant from the Green Group decided for him to get ₦1000, and his match from the Blue Group to get ₦500

(Altruism, p=50)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦0
Option 2 — Participant from the Green Group decided for him to get ₦950, and his match from the

Blue Group to get ₦500

(Altruism, p=100)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦0
Option 2 — Participant from the Green Group decided for him to get ₦900, and his match from the Blue Group to get ₦500

(Altruism, p=150)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦0
Option 2 — Participant from the Green Group decided for him to get ₦850, and his match from the Blue Group to get ₦500

(Altruism, p=200)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦0
Option 2 — Participant from the Green Group decided for him to get ₦800, and his match from the Blue Group to get ₦500

(Altruism, p=250)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦0
Option 2 — Participant from the Green Group decided for him to get ₦750, and his match from the Blue Group to get ₦500

(Altruism, p=300)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦0
Option 2 — Participant from the Green Group decided for him to get ₦700, and his match from the Blue Group to get ₦500

(Altruism, p=350)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦0
Option 2 — Participant from the Green Group decided for him to get ₦650, and his match from the Blue Group to get ₦500

(Altruism, p=400)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match

from the Blue Group to get ₦0
Option 2 — Participant from the Green Group decided for him to get ₦600, and his match from the Blue Group to get ₦500

(Altruism, p=450)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦0
Option 2 — Participant from the Green Group decided for him to get ₦550, and his match from the Blue Group to get ₦500

(Hate, p=0)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦1,000
Option 2 — Participant from the Green Group decided for him to get ₦1000, and his match from the Blue Group to get ₦500

(Hate, p=50)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦1,000
Option 2 — Participant from the Green Group decided for him to get ₦950, and his match from the Blue Group to get ₦500

(Hate, p=100)
Option 1 — Participant from Group B decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦1,000
Option 2 — Participant from Group B decided for him to get ₦900, and his match from the Blue Group to get ₦500

(Hate, p=150)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦1,000
Option 2 — Participant from the Green Group decided for him to get ₦850, and his match from the Blue Group to get ₦500

(Hate, p=200)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦1,000
Option 2 — Participant from the Green Group decided for him to get ₦800, and his match from the Blue Group to get ₦500

(Hate, p=250)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦1,000
Option 2 — Participant from the Green Group decided for him to get ₦750, and his match from the Blue Group to get ₦500

(Hate, p=300)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦1,000
Option 2 — Participant from the Green Group decided for him to get ₦700, and his match from the Blue Group to get ₦500

(Hate, p=350)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦1,000
Option 2 — Participant from the Green Group decided for him to get ₦650, and his match from the Blue Group to get ₦500

(Hate, p=400)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦1,000
Option 2 — Participant from the Green Group decided for him to get ₦600, and his match from the Blue Group to get ₦500

(Hate, p=450)
Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦1,000
Option 2 — Participant from the Green Group decided for him to get ₦550, and his match from the Blue Group to get ₦500

[The next questions asked about their beliefs on the tail of the distribution of social preferences and the dispersion]

Now I will ask you to make a couple more guesses:

(Tail, p=100)
In the following decision, how many people from the Green Group do you think picked Option 2 when deciding how much money they and their match from the Blue Group would get? [0—10]

Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her

match from the Blue Group to get ₦1,000
Option 2 — Participant from the Green Group decided for him to get ₦900, and his match from the Blue Group to get ₦500

(Tail, p=300)
In the following decision, how many people from the Green Group do you think picked Option 2 when deciding how much money they and their match from the Blue Group would get? [0—10]

Option 1 — Participant from the Green Group decided for him/her to get ₦1,000, and his/her match from the Blue Group to get ₦1,000
Option 2 — Participant from the Green Group decided for him to get ₦700, and his match from the Blue Group to get ₦500

(Dispersion 1)
How sure do you feel that your guesses in the past module are correct? 1—5
1 – Not sure at all; 5 – Absolutely sure.

(Dispersion 2)
How similarly do you think the choices of people from the Green Group were in this type of decisions? 1—5
1 – They all answered in the same way; 5 – They answered in all sorts of ways.

Module 5: Beliefs on the Social Preferences of the Ingroup

As in the previous task, this next task is about guessing what other participants in this survey did. If you guess correctly in all questions, we will add ₦500 to your earnings.

At some point in last month session, we told the members from the Blue Group that we had matched them at random with someone from inside the Blue Group, and showed them the list of names. Then, they proceeded to make the same series of decisions you just made: picking between the money in Option 1 or Option 2.

In this task, you have to guess what a member of the Blue Group picked when playing with his/her match from inside the Blue Group.
[Here they proceed to guess the money allocation decisions of an ingroup member]

Now I will ask you to make a couple more guesses:

(Tail, p=100)

In the following decision, how many people from the Blue Group do you think picked Option 2 when deciding how much money they and their match from inside the Blue Group would get? [0—10]

Option 1 — Participant from the Blue Group decided for him/her to get ₦1,000, and his/her match from inside the Blue Group to get ₦1,000
Option 2 — Participant from Blue Group decided for him to get ₦900, and his match from the inside the Blue Group to get ₦500

(Tail, p=300)
In the following decision, how many people from the Blue Group do you think picked Option 2 when deciding how much money they and their match from inside the Blue Group would get? [0—10]

Option 1 — Participant from the Blue Group decided for him/her to get ₦1,000, and his/her match from inside the Blue Group to get ₦1,000
Option 2 — Participant from Group B decided for him to get ₦700, and his match from inside the Blue Group to get ₦500

(Dispersion 1)
How sure do you feel that your guesses in the past module are correct? 1—5
1 – Not sure at all; 5 – Absolutely sure.

(Dispersion 2)
How similarly do you think the choices of people from the Blue Group were in this type of decisions? 1—5
1 – They all answered in the same way; 5 – They answered in all sorts of ways.

Module 6: Coordination Games with the Ingroup and Outgroup

In this example, the Blue Group is the ingroup and the Green Group is the outgroup]

In the next activity you and your match have to make a decision, and the monetary outcome depends on the combination of both of your decisions. I will first explain the activity to you. Then, we will go through a couple of practice rounds to make sure everything is clear. *[Give the earnings table to the participant]*

In this activity each person can choose between two actions: to Cooperate or Not Cooperate. And each person must choose their action without knowing what the other person chose.

Your Choice	Match's Choice	Your Earnings	Match's Earnings
Cooperate	Cooperate	₦1,000	₦1,000
Cooperate	Not Cooperate	₦500	₦900
Not Cooperate	Cooperate	₦900	₦500
Not Cooperate	Not Cooperate	₦750	₦750

[Enumerators played multiple test games with participants to guarantee comprehension]

You are first going to go through this activity with your match from the Blue Group. We will use the answer the person from the Blue Group gave in this activity when they were matched with another member of the Blue Group.

What do you choose? [Cooperate/Not Cooperate]

Now you are going to go through this activity again, but this time your match will be from the Green Group. We will use the answer the person from the Green Group gave in this activity when they were matched with a person from the Blue Group.

What do you choose? [Cooperate/Not Cooperate]

Now you are going to go through the same activity, but this time the possible earnings for you and your match are going to be a little different. *[Give participants the new table of possible earnings]*

Your Choice	Match's Choice	Your Earnings	Match's Earnings
Cooperate	Cooperate	₦1,000	₦1,000
Cooperate	Not Cooperate	₦500	₦700
Not Cooperate	Cooperate	₦700	₦500
Not Cooperate	Not Cooperate	₦600	₦600

You are first going to go through this new version of the activity with your match from the Blue Group. We will use the answer the person from the Blue Group gave in this activity when they were matched with another member of the Blue Group.

What do you choose? [Cooperate/Not Cooperate]

Now you are going to go through this activity again, but this time your match will be from the Green Group. We will use the answer the person from the Green Group gave in this activity when they were matched with a person from the Blue Group.

What do you choose? [Cooperate/Not Cooperate]

Module 7: Attitudes on Policy

The following questions are about some policy proposals for the city of Jos. Our objective is just to get a sense of the possible support and downsides these policies may have. We don't necessarily think they are good or bad, we just want to get an assessment, so please feel free to answer whatever you feel. Remember, your answers are completely anonymous and will never be analyzed individually.

• Policy 1: New settlements in Jos should mix Christians and Muslims

This policy may have some possible downsides. Tell me if you agree or disagree that the following is a downside of this policy:

Christians and Muslims have different ways of living that simply cannot coexist together .[Completely Disagree / Somewhat Disagree / Somewhat Agree / Completely Agree]

Some families would not be able to trust their neighbors in these mixed settlements .[Completely Disagree / Somewhat Disagree / Somewhat Agree / Completely Agree]

• Policy 2: Schools in Jos should have a mix of Christian and Muslim children and teachers

This policy may have some possible downsides. Tell me if you agree or disagree that the following is a downside of this policy.

Christians and Muslims have different ways of educating their children that simply cannot be integrated
.[Completely Disagree / Somewhat Disagree / Somewhat Agree / Completely Agree]

The safety of our children would be at risk in these mixed schools .[Completely Disagree / Somewhat Disagree / Somewhat Agree / Completely Agree]

Module 8: Social Desirability Bias

In the following questions of the survey you will be presented situations that reflect possible perceptions about yourself. In each situation tell us if you agree or disagree with the statement.

• I sometimes feel resentful when I don't get my way [Agree/Disagree]

• On a few occasions, I have given up doing something because I thought too little of my ability [Agree/Disagree]

• I am always courteous, even to disagreeable people [Agree/Disagree]

• There have been times when I felt like rebelling against people in authority even though I knew they were right [Agree/Disagree]

• There have been occasions when I took advantage of someone [Agree/Disagree]

• I sometimes try to get even rather than forgive and forget [Agree/Disagree]

• I have never been irked when people expressed ideas very different from my own [Agree/Disagree]

• There have been times when I have been quite jealous of the good fortune of others [Agree/Disagree]

• I am sometimes irritated by people who ask favors of me [Agree/Disagree]

• I have deliberately said something that hurt someone's feelings [Agree/Disagree]

[End of the survey]

E3. Money Allocation Decisions Algorithm

To recover the social preferences I use a series of money allocation decisions. This ultimately identifies the willingness to pay a person has to either help or hurt their match in a fixed amount. To identify the parameter of interest in the least amount of questions possible, I use an algorithm that picks the next money allocation decision a participant will face depending on the previous decision the participants has made. The algorithm works as follows.

There are 20 money allocation decisions. In 10 of them, picking Option 2 implies increasing the match's payoff in 500 (altruism side). In the other 10, picking Option 2 implies decreasing the match's payoff in 500 (hate side). Within each side, each money allocation decision varies the price for Option 2 from 0 to 450, by jumps of 50.

First, all participants face the same four money allocation decisions. These are the m.a.d. of price 0 and price 50 on the altruism side and the hate side. Using these four answers I used the following rule to put people into an altruistic path or a hateful path. Within each path, the next m.a.d. participant faced was that of price 250. From this point onward, depending on the decision, the next m.a.d. presented to participant depended on the decision tree showcased below.

Rule to assign people to hate or altruism side:

Rational altruistic
A0: 2 / A50: 1 / H0: 1 / H50: 1
A0: 2 / A50: 2 / H0: 1 / H50: 1

Leans altruistic
A0: 2 / A50: 2 / H0: 1 / H50: 2
A0: 2 / A50: 2 / H0: 2 / H50: 1
A0: 1 / A50: 2 / H0: 1 / H50: 1
A0: 1 / A50: 2 / H0: 2 / H50: 1

Rational hateful
A0: 1 / A50: 1 / H0: 2 / H50: 1
A0: 1 / A50: 1 / H0: 2 / H50: 2

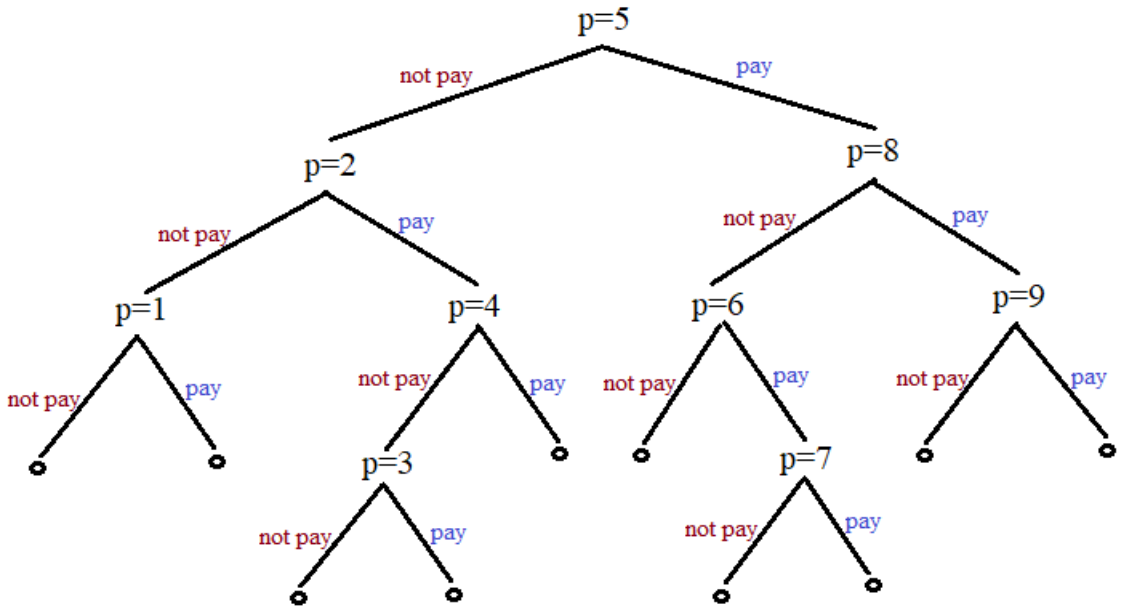
Leans hateful
A0: 2 / A50: 1 / H0: 2 / H50: 2
A0: 1 / A50: 2 / H0: 2 / H50: 2
A0: 1 / A50: 1 / H0: 1 / H50: 2

A0: 2 / A50: 1 / H0: 1 / H50: 2

Rational neutral (assign randomly)
A0: 1 / A50: 1 / H0: 1 / H50: 1

(Assign randomly)
A0: 2 / A50: 2 / H0: 2 / H50: 2
A0: 2 / A50: 1 / H0: 2 / H50: 1
A0: 1 / A50: 2 / H0: 1 / H50: 2

Prices in the graph below:
price=100 → p=2
price=150 → p=3
price=200 → p=4
price=250 → p=5
price=300 → p=6
price=350 → p=7
price=400 → p=8
price=450 → p=9


p=5
not pay
pay
p=2
p=8
not pay
pay
not pay
pay
p=1
p=4
p=6
p=9
not pay
pay
not pay
pay
not pay
pay
not pay
pay
p=3
p=7
not pay
pay
not pay
pay