RESEARCH ARTICLE

Prosociality and Pentecostalism in the D.R. Congo

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ABSTRACT
This paper explores an empirical puzzle: individuals in urban D.R. Congo who were unsure if they would be able to provide sufficient food for their families gave more of their money away to anonymous receivers in behavioral games. They were especially likely to share money evenly. We argue that this surprising prosocial behavior reflects sharing norms associated with informal insurance, for which more materially insecure individuals presumably have higher demand. We further argue that such sharing norms are sustained in urban Congo by Pentecostal churches, a nexus of risk-spreading in this context. The same group of highly insecure individuals is more likely to participate in public religious ceremonies — but not private ones — and to share money evenly in behavioral games. Moreover, the gap in money sharing between individuals facing high and low insecurity is largest when participants are primed with Christian images.

People are much less selfish than rational-choice models expect them to be. They are influenced by fairness considerations and many behavioral and cognitive biases.[1] Recent studies in small-scale societies around the globe have noted the importance of market integration and religions with moral high gods in sustaining norms of prosociality and cooperation.[2] This paper explores the role of church-based insurance networks in sustaining norms of prosociality in the city of Kananga in the D.R. Congo.

First, we document an empirical puzzle: individuals facing acute material insecurity are *more prosocial* in the dictator game — giving more of their cash endowment away to an anonymous other person — compared to less insecure individuals. The average increase in prosociality is driven by highly insecure individuals dividing money evenly between themselves and the receiver. This correlation is robust to controlling

[1]For an overview, see Rabin (1998), Thaler (2000), and Kahneman (2011).

[2]See for example: Henrich, Ensminger, McElreath, Barr, Barrett, Bolyanatz, Cardenas, Gurven, Gwako, Henrich et al. (2010); Henrich, Boyd, Bowles, Camerer, Fehr, Gintis and McElreath (2001); Lang, Purzycki, Apicella, Atkinson, Bolyanatz, Cohen, Handley, Kundtová Klocová, Lesorogol, Mathew et al. (2019); Purzycki, Apicella, Atkinson, Cohen, McNamara, Willard, Xygalatas, Norenzayan and Henrich (2016).

for a number of possible omitted variables, including annual income, wealth, migrant status, years spent in urban settings, family size, and religious beliefs. It also does not appear to be explained by problems understanding the game.[3] These empirical results are puzzling because materially insecure individuals have a compelling reason to be selfish: game winnings could help ensure their family will have enough food, at least for a time. Why do those in greatest need of cash give more of their cash away?

One explanation is that the high rate of 50-50 allocations reflects sharing norms associated with informal insurance networks in Kananga.[4] Informal risk-sharing arrangements have been documented in many developing countries, especially in rural settings such as Nigeria (Udry, 1990), India (Townsend, 1994), and the Philippines (Fafchamps and Lund, 2003). Although participants are anonymous in the experimental games examined here — and thus they are not literally participating in risk-sharing — informal insurance practices likely coevolve with strong norms of sharing that may sustain prosocial behavior. More materially insecure individuals ought to have greater demand for informal insurance and thus stronger sharing norms.

Much of the literature on risk-sharing in developing countries focuses on rural settings, in which the standard threats to insurance, moral hazard and adverse selection, are less severe. In urban settings, scholars have noted a number of organizations that counter adverse selection by imposing high participation costs and counter moral hazard by enabling peer-to-peer monitoring (Iannaccone, 1992). Examples include trade unions (Roth, 2001), burial societies (Dercon, Hoddinott, Krishnan and Woldehanna, 2008), and religious communities (Barr, Dekker and Fafchamps, 2008; Berman, 2000; Cassar, Crowley and Wydick, 2007; Dehejia, DeLeire and Luttmer, 2007; Dekker, 2004; Erlbeck, 2017; Iannaccone, 1992; Karlan, 2005; Ruffle and Sosis, 2007; Wydick, Hayes and Kempf, 2011).[5] Consistent with evidence from other contexts, churches appear to serve as a nexus of informal insurance in Kananga.

Church communities appear to deal with adverse selection and moral hazard in two principal ways. First, high participation costs — e.g. attending church multiple times per day — screen out unreliable individuals who are less committed to the group. In addition to screening, high participation costs also create ample opportunities for monitoring. Second, Pentecostal churches also put a premium on financial contributions to the church, which are made publicly during services. In short, displays of public generosity and religious participation both appear to be ways to signal one's type and establish a reputation as a 'good Christian.'[6] Among other things, such a reputation may help ensure access to informal insurance networks in the church community. In both cases, materially insecure individuals, who are in greater need for insurance, will be more sensitive to the pressure to establish a good reputation and thus should be more likely to exhibit high degrees of public ritual participation and prosocial behavior.

To explore if sharing norms associated with church-based informal insurance networks might explain why materially insecure individuals are more likely to choose

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[3]We also show suggestive evidence of a positive relationship between material insecurity and prosociality in a separate small sample of individuals who played the random-allocation game.

[4]An alternative explanation centers on exposure to violent conflict, which is associated with greater prosociality (Bauer, Blattman, Chytilová, Henrich, Miguel and Mitts, 2016) and religiosity (Henrich, Bauer, Cassar, Chytilová and Purzycki, 2019). As discussed on p. 11, however, this explanation is less plausible in the current context given the lack of violent conflict in the Kasaï region since the mid 1960s.

[5]This is part of a broader research agenda about how religion enables societies to solve collective action problems and prove more resilient in the long run (Sosis and Ruffle, 2003; Sosis and Bressler, 2003).

[6]These are effective signals because they are individually costly. Participation has a high time cost, while sharing scarce resources with others (prosociality) has a direct monetary cost.

the 50-50 allocation in the dictator game, we explore several types of evidence. First, we show that highly materially insecure individuals are more likely to participate in *public* Christian ceremonies, but they do not report greater *private* devotion. Moreover, high-insecurity individuals are less likely to believe that god will intervene on their behalf. Individuals appear to seek human, not divine, insurance.[7] This empirical pattern suggests that, in this setting, insurance stems more from *belonging* than believing. Importantly, materially insecure individuals who gave more in the dictator game are, in large part, the same as those who frequently attend public religious ceremonies. In other words, there is a positive interaction between economic insecurity and public devotion, as one would predict if equal allocations in the dictator game reflect church-based risk-sharing norms.

We next exploit a priming experiment embedded in the administration of the behavioral games. Specifically, each participant was exposed to an image printed on a towel that was used by enumerators as a surface on which to demonstrate the rules of the behavioral games. The different images, or priming treatments, were associated with Christianity (the bible), local ancestor worship (customary masks), secular authorities (the logo of the Congolese police), and a control (flowers). One might hypothesize that if a church-based social norm of fairness explains more prosocial behavior among highly materially insecure individuals, then this behavior would be more pronounced when primed with Christian imagery. The difference in prosociality between high- and low-insecurity individuals is indeed largest when individuals are primed with a Christian image. This finding is consistent with social norms of fairness becoming more salient in the presence of Christian iconography.[8]

Finally, we examine participants' responses to exit questions just after playing the dictator game and completing the interview. We investigate if materially insecure individuals were more likely to invoke Christian teachings about charity or 'loving one's neighbor.' However, we find no such differences in this source of text as data. That said, materially insecure individuals are much more likely to use the word "money," indicating that the economic implications of their decisions in the game are highly salient to this subgroup. This finding corroborates the idea that social norms of fairness linked to risk sharing in part explain high prosociality among the materially insecure, though it says nothing about the role of churches in mediating such norms.

Altogether, the empirical evidence examined in this paper is consistent with the idea that materially insecure individuals give more in behavioral games due to sharing norms associated with informal insurance. Churches are a nexus for such insurance in Kananga, and there is suggestive evidence that religious symbols mediate the more pronounced prosociality among individuals facing material insecurity. That said, these findings should be interpreted with caution. We are working with a small sample, and we did not preregister hypotheses about the relationship between material insecurity and fairness norms. We view the results as preliminary and suggestive, primarily a source of hypotheses that might be tested systematically in future work.[9]

Although the correlates of prosociality have been studied in a wide range of soci-

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[7] This finding runs in contrast to Auriol, Lassebie, Panin, Raiber and Seabright (2017), who find that individuals view Pentecostal churches in Ghana as a source of insurance through an interventionist Christian god. Relatedly, Bryan, Choi and Karlan (2018) find that an anti-poverty program focused on Protestant teachings in the Philippines helps reduce poverty through more of a psychological channel by reducing existential stress and increasing grit.

[8] This priming experiment shares features with Auriol, Diego, Fourati, Miquel-Florensa and Seabright (2019), which examines how the presence of religious symbols affects risk taking.

[9] That said, preliminary evidence from the other field sites associated with this project "The Evolution of Religion and Morality" appears to recover this same relationship, suggesting it may have external validity.

eties, there has been relatively less work on the relationship between prosocial behavior in economic experiments and material insecurity in developing countries.[10] The most closely related paper is Auriol et al. (2017), which examines whether enrollment in a formal funeral insurance policy affects how Pentecostal churchgoers in Ghana contribute to their church in dictator games. Their findings also suggest that insurance motives animate Pentecostal congregants' behavior, though they focus on insurance through divine intervention rather than income-sharing among participants.

1. Context

The data were collected in the city of Kananga, the 4th largest city in the Democratic Republic of Congo and the capital of the Kasaï Central Province. Kananga has a moderate climate, situated at the transition from the equatorial forest to the savannah. Dry seasons in January and in June-August punctuate the rainy seasons.

Although Kananga has a population of nearly 1 million, it and the rest of the province are particularly underdeveloped relative to other parts of the country. According to a random sample, unemployment is 42%, and self-reported median monthly household income is approximately $70, or $111 at PPP. Most individuals with jobs work for the provincial government or engage in petty commerce. Three-quarters of the population has completed the six mandatory years of primary school. Despite the high rate of poverty, Kananga is an urban environment and so no individuals in the sample are subsistence farmers. All households buy food in the market. Table 1 contains additional descriptive statistics about the population in Kananga and the sample analyzed in this paper.

The population of Kananga is overwhelmingly Christian, though individuals often hold traditional religious beliefs regarding ancestor worship alongside their beliefs in the Christian god. In a random sample of over 3,000 individuals across Kananga, 94% self-identified as Christian. The remaining 6% is made up mainly of individuals who subscribe to traditional religions, no religion, or one of the other major world traditions. Church attendance is high: 64.5% of the sample report attending every day; another 24% report attending multiple times per week. Separate from church, 88.5% of individuals in the sample report praying 'all day' or 'several times per day.' Although the Catholic church has long been dominant in Congo[11] — most estimate that roughly half of the population is Catholic — its adherents make up only 22% of Kananga's population. Protestants account for another 12.4% of the population. Most Christians (56%) today belong to Pentecostal churches, the focus of this paper.

Pentecostal churches are somewhat heterogeneous in their beliefs and practices, driven by the particular emphases of their charismatic founders.[12] But they are also united in their emphasis on conversion, deliverance, and a fresh start. Consistent with evidence from Kenya, Pentecostal churches also frequently place value on the nuclear family (over the extended family), on self-control, and on the possibility of achieving material success from hard work (McClendon and Riedl, 2015). That said, there is no

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[10]An important exception is Hruschka, Efferson, Jiang, Falletta-Cowden, Sigurdsson, McNamara, Sands, Munira, Slingerland and Henrich (2014), which documents a similar pattern *across* societies. Higher food insecurity in a society is associated with more generous average behavior in economic experiments. The focus of this paper, by contrast, is variation in insecurity *within* a particular society.

[11]Catholic and Protestant missionaries established sites in the region, dating back to the late 19th Century when the first Catholic missionaries established a presence 30 kilometers from Kananga.

[12]Roughly half of Pentecostal churches in Kananga belong to networks that have more harmonized dogma, while the rest are autonomous upstarts.

evidence that Pentecostal Christians in Kananga are wealthier or happier from those who pray at other churches.[13]

Although few individuals identify as non-Christian, traditional religious beliefs persist alongside Christian beliefs. Ancestor worship remains common: 46% of individuals in Kananga report that ancestral spirits punish individuals 'often' or 'sometimes.' Witchcraft beliefs are also widespread. Although few individuals report visiting witch doctors, 'feticheurs,' or the 'thunderman' — a sorcerer who can, for a price, make lightning strike specific individuals with unpaid debts or other offensive qualities — 40% say they personally know someone who has been affected by witchcraft.[14] Although generally those who profess stronger Christian beliefs put less stock in traditional beliefs, these cosmologies are not perfectly negatively correlated. Many individuals simultaneously hold both types of beliefs.

The largest ethnic group in Kananga is the Luluwa, who comprise about 70% of the population. The Luluwa did not have a centralized precolonial state, as did the Kuba and the Luba, two minority ethnic groups in Kananga. The notion of the Luluwa as a distinct ethnic group in fact is thought to stem from Belgian colonial accounts referring to the heterogeneous peoples living in the region surrounding the Luluwa river (Vansina, 1968). Most Luluwa individuals feel a stronger tie to their *groupement* (or sub-tribe) — typically a set of villages in a similar location — than to the Luluwa as a whole. Uniting the Luluwa is the Tshiluba language, one of the four national languages of the D.R. Congo. Ethnicity is salient as a marker of social identity in Kananga, and co-ethnic bias has been documented in past work (Lowes, Nunn, Robinson and Weigel, 2015).

2. Research design

2.1. Data collection

The authors directly oversaw data collection in Kananga. We recruited five Congolese enumerators among current and former students from Kananga's best universities based on their performance in interviews and a short math and typing quiz. We also trained and supervised these enumerators directly during each stage of data collection (sampling, surveys, behavioral games). Finally, we also cleaned and managed all incoming data for the project on a daily basis in Kananga.

2.2. Sampling

The sample for this study consists of individuals living in Kananga who are both (i) Pentecostal Christians, and (ii) ethnically Luluwa. To identify participants, we selected a sub-sample of an existing random sample of 3,097 households participating in a 'screening survey,' run in conjunction with another study in Kananga (Lowes et al., 2017). Random sampling was achieved in two steps. First, we randomly sampled neighborhoods (polygons) partitioning a satellite map of Kananga (Figure 4). Second, enumerators visited selected neighborhoods and randomly sampled residents by count-

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[13]Specifically, in data from another survey conducted in 2014 (Lowes, Nunn, Robinson and Weigel, 2017), there is no statistically significant correlation between Pentecostalism and income, wealth (proxied by house quality), or self-reported happiness (results available upon request).

[14]In fact, we suspect this figure may be deflated due to experimenter demand effects because in conversations with individuals we know well, the corresponding figure would be close to 100%.

ing every X^{th} house, where X is determined by dividing the estimated population of each neighborhood by a constant.

Using this random sample, we first excluded participants in the other study and then randomly selected 200 individuals who fit the sampling criteria (Pentecostal Christian and Luluwa) as possible participants. We restricted the sample in this way to identify common social categories salient in this population in accordance with the broader experimental protocol for the Cultural Evolution of Religion Consortium (CERC) study on "The Evolution of Religion and Morality" (Lang et al., 2019). At times, enumerators could not find an available respondent at sampled households; we then randomly sampled additional households from the 3,097 sample until we reached the target of 200 participants. However, as we discuss in Section 2.6, data quality checks found anomalies in the data of two enumerators, whose observations were subsequently dropped to be conservative. The sample examined here thus consists of only 111 individuals.

Table 1 provides summary statistics for the full random sample as well as the subsample for this project. Because of the focus on the majority ethnic group and religion (Pentecostalism), the subsample for this paper is not a random sample of the full screening sample, and participants vary along several dimensions, such as gender and migrant status. The Table also provides several socioeconomic indicators regarding the subsample given the focus of the paper on material insecurity.

2.3. Survey and game administration

Congolese enumerators conducted surveys and behavioral games at respondents' homes in French or Tshiluba, according to participants' preferences, in July and August of 2014. Surveys and experimental protocols (available upon request) were translated, back translated, and rectified by a team of highly educated Congolese living in Kinshasa and Kananga.

Participants answered questionnaires about demographic and socioeconomic characteristics and then played either the dictator game (DG) or random-allocation game (RAG). Among the 111 participants in the final analysis, 88 played the DG, and 23 played the RAG. For these games, there were several iterations of behavioral games each of which involved two players, consistent with the common CERC protocol (Lang et al., 2019):

(1) *Self versus distant*: these games involved the participant and an 'ethnic co-religionist,' i.e. a non-Luluwa individual who belonged to a Pentecostal church.
(2) *Local versus distant*: these games involved one Luluwa and one non-Luluwa, both of whom belonged to Pentecostal churches.
(3) *Self versus outgroup*: these games involved the participant and a non-Luluwa individual who did not belong to a Pentecostal church.
(4) *Distant versus outgroup*: these games involved two non-Luluwa, one of whom belonged to a Pentecostal church, while the other did not.

In all of these games, the other players were fully anonymous and randomly sampled from the population of Kananga. Importantly, this paper will only examine data from the games where 'self' is one of the options, i.e. iterations (1) and (3) above. Only these versions of the games offer measures of prosociality and are thus relevant for the current topic.

In the DG, the participant and enumerator sat on a mat in the participant's yard and set up a pop-up tent in which they would play the behavioral games. Figure 5

shows the experimental lab-in-the-field setup. The enumerator read out a common protocol explaining rules: the participant would receive 1,000 Congolese Francs (CF) — about \$1.10 and more than a day's wage for the median household in the sample — in ten 100 CF bills, one envelope labeled *Meme* ('me,' in Tshiluba) and a second envelope labeled *Munayi mukuabu* ('other player').[15] The participant would enter into the tent, divide the money into the two envelopes, keeping the *Meme* envelope and putting the *Munayi mukuabu* envelope into a zipped bag just outside the tent. Participants were informed that all allocations they made would be delivered to anonymous individuals ('receivers') in Kananga. Before actually making the allocation, the enumerator demonstrated a series of example allocations and asked the individual a number of test questions seeking to validate their understanding of the rules of the game.[16]

The enumerator specified the ethnicity and church of the receiver verbally when explaining each round of the game. In the *Self versus distant* game, the receiver was a non-Luluwa who belonged to a Pentecostal church.[17] In the *Self versus outgroup* game, the receiver was a non-Luluwa who did not belong to a Pentecostal church. The 'other' church and ethnicity of the receivers were not specified. These receivers were selected randomly using the same 3,097 sampling frame. They were therefore fully anonymous from the perspective of the 'player one' participant. The receivers received the payoffs allocated to them.

The enumerators conducted the RAG according to a similar overall protocol, though the specific instructions for this game are quite different. Participants received a die with three sides colored white and three sides colored black. Once in the tent, they rolled the die thirty times. Before each role, they were told to pick white or black in their mind. Then, if the die landed on the same color as that which they chose in their mind, they were told to put a 100 CF bill into the *Meme* envelope; if the die landed on the opposite color, they were told to put a 100 CF bill into the *Munayi mukuabu* envelope. The participants repeated this procedure thirty times until they had allocated all thirty of the 100 CF bills (and 3,000 CF had been split between the two envelopes). The distribution of the die rolls should be binomial; the expected value in each envelope is 1,500 CF. However, no one intervened if the participant simply allocated the bills non-randomly. The step of 'choosing in one's mind' adds an additional level of privacy: even if someone were watching — which they were not, because all games occurred inside the tent — they could not have detected if the participant followed the rules. The game thus offers a measure of willingness to break the rules for personal gain. Comparing versions of the game measures differences in prosociality toward the recipient groups.[18]

The analysis here does not exploit the different iterations of the dictator game and random-allocation game administered to respondents. Instead, we pool these data together and examine correlations between material insecurity and behavior in these games. Estimations include game round fixed effects, so that all of the empirical patterns concern within-game variation, rather than across-game variation, and we cluster standard errors at the individual level.

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[15] As noted, in other iterations of these games, participants divided money between two different players, but these games will not be analyzed here.

[16] The test questions took the form of asking how much the other player would receive if the first player made various allocations. In all the examples and test questions, the expected value of the player one allocations was 50% to avoid biasing the respondent toward low or high allocations.

[17] The exact wording was as follows: "In this game, the other player is an anonymous individual randomly selected from the population of Kananga who is a Pentecostal Christian and not Luluwa."

[18] The die-rolling protocol is unique to the RAG. In the DG, participants simply allocate the money according to their preferences.

2.4. Measuring material insecurity

To measure insecurity, in the main survey enumerators asked participants a series of questions about the extent to which they worry about being able to provide sufficient food for their families over different time intervals (one month, six months, one year, five years). Appendix Section 5 contains detailed variable descriptions. The level of perceived insecurity is high: 80% of individuals admit to being worried about consistently providing sufficient food for their family in the next month.[19] Moreover, perceived insecurity over these different time periods is highly correlated within individuals: those who anticipate having problems putting food on the table in the next month are also more likely to worry about putting food on the table in the next six months, next year, and next five years.

The key independent variable in the following analysis is an index of all the questions about material insecurity. We first standardize each variable, then sum the full set of variables, and finally standardize the resulting index again. Magnitudes of coefficients can be interpreted in relation to a 1 standard deviation increase in perceived material insecurity. Appendix Section 5 provides information about other covariates that will be examined in the subsequent analysis, all of which also come from this household questionnaire administered to participants before the games.

2.5. Primes

As with other projects in the multi-site CERC study, the 160 dictator game participants were randomly assigned to priming treatments: 'moralistic,' 'local god', 'secular', and control. To prime individuals, enumerators laid out custom-made towels with printed images on them on top of the mats on which they sat with the participant to explain the rules of each game. They placed the towel between themselves and the participant, and demonstrated how to divide the money into the two envelopes on top of the towel.

In this setting, the primes were as follows.

(1) *Christianity.* The 'moralistic' prime towel showed a photograph of a bible printed on it.
(2) *Ancestral spirits.* The 'local god' prime showed customary masks, used in ceremonies to represent ancestral spirits.
(3) *Police.* The 'secular' prime showed the emblem of the national police of Congo.
(4) *Flowers.* The control prime showed a field of orange flowers.

In Kananga, the Christian god is thought to possess the principal attributes of a 'moral high god' (Norenzayan, 2013). Indeed, 79.5% of the sample say that the Christian god punishes people for their behavior; 98.5% say that he can see inside people's hearts and minds. When asked what the Christian god likes, respondents answer: (1) love / love of one's neighbor, (2) adoration, (3) glory. When asks what he dislikes, they answer: (1) theft, (2) wrath, (3) adultery. Alongside strong professed beliefs in the Christian god, 46% of individuals say they think ancestral spirits punish people 'often' or 'sometimes.' When asked what ancestral spirits like, respondents are most likely to answer: (1) sacrifice, (2) truth, and (3) candles. When asked what they dislike, respondents answer: (1) disobedience, (2) anger, (3) the Bible.

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[19]The distribution of perceived insecurity is bimodal (Figure 2): about 16% of the sample appear considerably less worried about their family's ability to have sufficient food relative to the main mass of individuals for whom there is uncertainty around this fact.

Figure 6 shows the photographs used for each prime. We selected each of these images after conducting focus groups and asking individuals what various images meant to them. These four most consistently generated responses in line with the prime category. Primes were not used in the random-allocation game.

2.6. Research anomalies

There were two perturbations to the research protocol worth noting. First, following the initial 'religious landscape interview,' we defined 'local god' as Kadima, the most widely recognized god other than the Christian god. However, after administering the main survey for several days, it became clear that very few individuals believe in Kadima. (Believers are concentrated in one small part of the city.) A more general definition of 'local god' as ancestral spirits captured many more adherents. As such, after six days of survey enumeration, we changed the 'local god' category in the survey to ancestral spirits. The dataset thus contains data on both ancestral spirits and Kadima for 111 individuals, and only for Kadima for 89 individuals.

Second, we learned the following year (2015) that two of the enumerators had faked data. We detected anomalies in their data, and then conducted a number of 'back check' surveys in which other enumerators sought out their old respondents and asked questions about what activities they conducted with the enumerators in 2014. These surveys revealed considerable anomalies for one enumerator, suggesting that he had filled in many of the surveys himself and may have allocated money in the behavioral games himself as well. They revealed weaker evidence of anomalies for the other enumerator, and no such evidence for the other three enumerators on the project (for whom data forensic techniques also detected nothing out of the ordinary). Although we do not believe these two enumerators faked *all* of their data, to be conservative we discard all data from them, reducing the sample size from 200 to 111.[20]

3. Results

3.1. Material insecurity and prosociality

This section demonstrates that materially insecure individuals are more likely to exhibit prosocial behavior in the experimental games played. In the dictator game, participants allocated an average of 389 CF to the receiver (keeping the rest of their endowment for themselves); 48% of individuals chose the 50-50 split, allocating 500 CF to the receiver.

Although participants worried about their ability to put food on the table for their families might be thought most likely to make a 'selfish' allocation in the dictator game, these individuals kept less of their cash endowment than their more materially secure peers. This result appears most clearly in Figure 1. The distribution of allocations to the receiver is shifted to the right among individuals with above-median insecurity. Insecure individuals are considerably more likely to make the 50-50 split.

To test this pattern systematically, we estimate ordinary least squares (OLS) models, whose results are summarized in Table 2. The regressions in this table use data from both dictator game rounds in which the participant made a choice about how

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[20]This sample size of 111 individuals does not reflect the 'local god' definition in the previous paragraph. Data from all individuals is included in the analysis, regardless of which type of 'local god(s)' were included in the survey.

much of his own endowment to share with another player. In both games, the other player is from a different ethnic group; in one game, the other player is a Pentecostal Christian, and in the other game, they are not. Table 2 does not exploit this variation in the identity of the receiver, but rather pools data from both games to examine average giving behavior to others. We include a dummy variable for the second game (with a Pentecostal receiver) and cluster standard errors at the individual level. The relationship between dictator game giving and the perceived insecurity — the principal topic of this paper — does not appear to vary systematically by the identity of the receiver (see Figure 10 in the Appendix).

The results in Table 2 show that the relationship between material insecurity and prosociality is highly statistically significant when controlling for basic individual level covariates (age, age squared, and gender). The dependent variable in columns 1-3 is the allocation (in Congolese Francs) to the receiver; in columns 4-6, it is an indicator variable for 50-50 allocations. All else equal, a one standard-deviation increase in material insecurity is associated with a 60 CF increase in allocations to the receiver (column 1), or a 13.7 percentage-point increase in the probability that a participant chooses the 50-50 allocation (column 4). The positive relationship between dictator game giving and perceived insecurity is consistent across time periods used to gauge individuals' concern about access to food in the future (Figure 8 in the Appendix).

To explore where in the distribution of perceived insecurity the effect on dictator-game giving derives, Figure 2 estimates a quadratic fit between the two variables. The positive slope appears at all values of the insecurity index. Although the bimodality of the insecurity index could imply a less general relationship, the average allocation to the receiver does consistently increase by quantiles of the insecurity index (Figure 9 in the Appendix).

This relationship could be explained by omitted variables, such as income and wealth. However, the results are unchanged when controlling for measures of annual income and wealth (columns 2 and 5), which is consistent with past work similarly documenting no clear relationship between socioeconomic status and prosociality (Henrich et al., 2010). This result is unsurprising when we note that individuals' sense of material insecurity is only weakly correlated with annual income ($\rho = 0.10, p = 0.13$) and uncorrelated with wealth. Indeed, daily income flows are highly unpredictable in Kananga; even individuals with steady annual income might face the threat of insufficient food during bad weeks.[21] Although there is a weakly upward-sloping relationship between dictator game giving and income, it is imprecisely measured because of the limited variation in income in the sample (see Figure 7). By far the stronger predictor of relatively larger allocations — and of equal allocations — in the dictator game is perceived material insecurity.

Another possible omitted variable — one motivated by the larger cross-country project to which this paper belongs — is religious belief and religiosity. If people reporting higher levels of material insecurity are also those with stronger beliefs in and devotion to a moral high god, then the observed relationship in Table 2 could be spurious. Controlling for measures of respondents' beliefs about the Christian god (*Christian belief*) and the frequency of their participation in ceremonies dedicated to that god (*Christian participation*), in columns 3 and 6, does not much change the coefficient on *Insecurity index*. Holding constant Christian belief and participation, individuals who are more concerned about their material security in the future are

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[21]Even individuals with government jobs are often subject to such uncertainty. Although the provincial government in theory pays at the end of every month, salary disbursements are often late — sometimes several months late.

still much more likely to make equal allocations in the dictator game.

Still another possible omitted variable that could be associated with both material insecurity and dictator game allocations is migrant status. Many people in Kananga recently moved there from a village in the surrounding area, and it is possible that recent migrants are less materially secure and also have stronger norms of fairness stemming from the village equilibrium they recently left. To test this, we include an indicator for individuals who were born in Kananga, as well as a count of the number of total years spent in Kananga, as controls (Table 8 columns 2 and 5). The estimated coefficient on *Insecurity index* remains large and highly significant. Finally, it could be that larger families have a harder time obtaining sufficient food for everyone and also have stronger sharing norms. Including measures of the number of children and the overall household size as controls, however, also does not meaningfully alter the results (Table 8 columns 3 and 6).

Material insecurity also appears positively associated with allocations to the receiver in the random-allocation game (RAG), though this relationship is less robust. Analysis of RAG outcomes is extremely suggestive because (a) there are only 23 participants once we drop data from the two problematic enumerators, and (b) the RAG captures not just a participant's prosociality but also his willingness to follow the rules when unobserved.[22] However, it is reassuring to see the same broad pattern reflected in RAG results, summarized in Figure 13 and Table 3. Although the coefficients on *Insecurity index* are not statistically significant, they are consistently positive across the analogous specifications examined in Table 2, suggesting a similar relationship between perceived material insecurity and allocations to the receiver.[23]

Given the setting of this study in a fragile state, a natural question is whether the relationship between material insecurity and prosociality is explained by exposure to conflict. A large literature finds a robust link between exposure to violence and prosociality (Bauer et al., 2016) and religiosity (Henrich et al., 2019). Although we cannot definitively rule out this possibility, given a lack of reliable data on individual exposure to conflict in the setting, it is unlikely to be the driver of the findings because Kananga and the wider Kasaï region has not experienced violent conflict since the mid 1960s. Unlike the war-torn East or the high-crime capital, Kananga has in fact been known as the 'oasis of peace' in the DRC because it has been spared by most of the conflicts that have destabilized the region. Sadly, this peace streak came to an end in 2017 with the Kamuina Nsapu insurgency in Kasaï. But the data for this project were collected in 2014, several years before this insurgency coalesced.

Another potential concern is experimenter demand effects. If materially insecure individuals sought to please the researchers more, in order to increase the probability of future interviews, then the observed behavior could reflect this form of differential demand effects. This explanation is difficult to sustain in the present context because it would require highly materially insecure individuals to exhibit less present bias — i.e. to prioritize future payoffs over payoffs today — than less insecure individuals, which runs counter to a large body of experimental research on scarcity (Mullainathan and Shafir, 2013). Nonetheless, one test of this possibility is to examine if words like

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[22]One possible omitted variable in the analysis of RAG data is cognitive ability, which is negatively correlated with material insecurity ($\rho = -0.06$). Because the RAG protocol requires participants to realize that they are able to 'cheat' and no one could possibly find out, those with higher cognitive ability may allocate more to themselves. Because of the correlation with material insecurity, cognitive bias could be a source of omitted variable bias. However, when controlling for years of education, the estimated coefficient on *Insecurity Index* increases in magnitude, thereby mitigating this concern.

[23]Note in defining 'fair' allocations in the RAG, we coded any allocation of 1,300 CF, 1,400 CF, 1,500 CF, 1,600 CF, or 1,700 CF as 'fair' given that there is uncertainty in the game corresponding to the die rolls.

'researcher' or 'foreigner' appear more frequently in the exit questions among highly materially insecure individuals. As Tables 10 and 11 demonstrate, this does not appear to be the case. The word 'foreigner' does indeed appear when participants are asked to describe what the games reminded them of in real life. However, it appears with equal frequency among respondents of high and low material insecurity. The available evidence thus does not suggest reason to believe that experimenter demand effects are asymmetric across respondents of low and high material insecurity.

3.2. Prosociality and insurance

Why do participants facing greater uncertainty about their ability to provide food for their families in the future exhibit *more* prosocial behavior, when they have strong reasons to be selfish?

One explanation motivated by economic theory is that the high rate of equal allocations in the dictator game among materially insecure participants reflects sharing norms derived from informal insurance mechanisms in Kananga. When individuals are uncertain if they will be able to provide food for their family due to variability in income shocks over time, a natural solution is to share income or food with neighbors whose income shocks are uncorrelated with their own.[24] Informal insurance networks have been documented in many settings, including rural Nigeria (Udry, 1990) and India (Townsend, 1994). In the present study, the identity of the receiver in the dictator game is unknown, so it is unreasonable to think participants are literally sharing their endowment equally in order to hedge against future negative income shocks. But it is plausible that informal insurance and redistribution practices have coevolved with strong norms of sharing that lead participants to split their endowment equally more often. Such norms could manifest in individuals making more prosocial decisions in these games because they receive a 'warm glow' feeling when they contribute equally. People who are more materially insecure ought to have greater demand for insurance and thus stronger sharing norms.

Problems of moral hazard and adverse selection associated with insurance are more acute in cities relative to villages. In villages, participating individuals live in close proximity; people know one another and it is easy to monitor others. Cities are filled with strangers and provide fewer monitoring opportunities. Organizations that require frequent in-person contact provide one solution to these problems, enabling their members to develop trust and eventually an urban insurance network. Scholars have noted a number of organizations that foster informal insurance, such as trade unions (Roth, 2001) and burial societies (Dercon et al., 2008). Perhaps the most commonly cited such organizations are churches and other religious communities (Barr et al., 2008; Berman, 2000; Cassar et al., 2007; Dehejia et al., 2007; Dekker, 2004; Erlbeck, 2017; Karlan, 2005; Wydick et al., 2011). A number of empirical studies have documented a positive relationship between mutual lending/insurance and church membership in experimental (Barr et al., 2008; Cassar et al., 2007; Karlan, 2005; Ruffle and Sosis, 2006) and observational data (Dehejia et al., 2007; Dekker, 2004; Wydick et al., 2011).

Churches are a pillar of social life in Kananga, with 90% participating in religious ceremonies at least once per week. Anecdotally, most people openly report their church as the most important social network to which they belong outside of their family.

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[24]Relatedly, individuals exposed to conflict and violence across a range of diverse settings have been found to exhibit greater prosociality and to participate more in civic organizations (Bauer, Cassar, Chytilová and Henrich, 2014; Bauer et al., 2016).

They also report frequently supporting, and being supported by, other adherents. Indeed, 41% of individuals in a random sample who reported providing monetary or in-kind support to non-family adults said they offered this support to members of their church; similarly, 32% of those who said they had received support in the past six months from non-family members said this support came from church members. Church-based insurance functions with and without intervention from the pastor. In emergencies, for example in the case of a death in the family, the pastor often solicits contributions on behalf of the aggrieved congregant. For smaller shocks, individuals report sharing among themselves.[25]

How do churches deal with the problems of adverse selection and moral hazard? There appear to be two principal ways. First, Pentecostal churches — those studied in this paper — require that their adherents devote considerable amounts of time, with public prayer typically at least once per day and in most cases multiple times per day. Indeed, in the current sample, 69% report attending church multiple times per day. High participation costs are a way for individuals to signal their commitment to the community and thus may facilitate informal insurance among the network of believers (Berman, 2000). Put differently, conditioning insurance on costly participation in public ceremonies may help screen out less committed individuals who might not reciprocate when it is their time to do so. Frequent public prayer also facilitates monitoring to reduce moral hazard (Dehejia et al., 2007).

Second, in all churches in Kananga, and perhaps especially in Pentecostal churches, individuals are expected to contribute via tithing and other collections. Such payments are typically made in public in Kananga's churches: individuals walk (or dance) up to the front of the church during a service to deposit their contribution. Overt displays of generosity help establish a reputation as a 'good Christian' and thus perhaps a trustworthy member of an insurance network.

If indeed these forms of religious participation help individuals establish reputations as 'good Christians' and thus gain access to church-based insurance networks, then more materially insecure individuals, who have higher demand for insurance, should be the most likely to participate. To examine this, we consider an index (*Public devotion*) of two survey questions asking respondents, respectively, how often they pray at church and how often they participate in other public rituals. Figure 11 demonstrates that highly insecure individuals do appear to participate more in public religious ceremonies. Although participation in public rituals is flat over most of the insecurity index, at high levels of insecurity, it increases sharply. Table 4 summarizes regressions testing these relationships formally. The linear relationship between the insecurity index and participation in public rituals is positive in slope but not statistically significant. This relationship becomes larger in magnitude and marginally significant when you include a quadratic term to model the nonlinearity seen in Figure 11. Moreover, regressing *Public devotion* on an indicator for highly insecure individuals picks up the sharp uptick at the right tail of the distribution: above-median insecurity individuals are 0.53 standard deviations more engaged in public Christian ceremonies.

Are materially insecure individuals participating more in public rituals because they seek access to church redistributive networks, as suggested above, or because they actually have stronger faith? Indeed, churches could provide insurance from other humans (Berman, 2000) as well as insurance from divine intervention (Auriol et al., 2017). One source of evidence comes from comparing individuals' public and *private* devo-

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[25]These observations are based on a series of focus groups and interviews conducted with pastors and other members of Pentecostal churches in Kananga.

tion. Specifically, we examine an index of two survey questions that ask respondents how often they think of the Christian god, and how often they worry what the Christian god thinks about them. There is no corresponding relationship between material insecurity and private devotion (also shown in Figure 11 and Table 4). The divergent relationships for public and private devotion are consistent with materially insecure individuals participating in public ceremonies to signal their type and thus gain access to insurance provided by church networks.

Survey evidence about the content of respondents' religious beliefs reinforces this interpretation. Specifically, in Table 5, we examine three indices capturing the strength of respondents' beliefs in a moral high god: *God cares about what I do* is composed of questions concerning whether the Christian god cares about various aspects of individual behavior; *God intervenes in our world*, of questions about the Christian god's ability and engagement in human affairs; and *God punishes those who sin*, of questions about how likely it is the Christian god will punish people for various 'bad' behaviors.[26] Consistent with the results in examining private Christian devotion, materially insecure individuals do not appear to hold stronger beliefs on any of these three dimensions. Interestingly, they are substantially *less* likely to report that the Christian god actively intervenes in human affairs. This observation contrasts with evidence from Ghana suggesting that Pentecostal churchgoers primarily seek the latter (divine) form of insurance (Auriol et al., 2017). In Kananga, instead of hoping for divine intervention, insecure individuals appear to take matters into their own hands by showing up in person and building a network of friends and fellow adherents in Kananga who might be able to assist them in difficult times.

Materially insecure individuals are thus more likely to exhibit prosocial behavior in behavioral games, and they are more likely to attend public Christian rituals. But are these two observations related? In other words, do churches help sustain sharing norms that manifest in more materially insecure individuals exhibiting more prosocial behavior?

A first form of evidence comes from simply binning material insecurity and public Christian devotion into above- and below-median groups and analyzing dictator giving across these four cells. If fairness norms associated with church-based informal insurance networks help explain the higher levels of prosociality observed among materially insecure individuals in Kananga, then above-median individuals in insecurity *and* in public devotion ought to be giving the most in the dictator game. In other words, we would expect a positive interaction between material insecurity and public devotion. Figure 3 demonstrates this positive interaction: giving is highest among high-insecurity individuals who frequently engage in public religious ceremonies. The same relationship holds if we consider only equal allocations in the dictator game (Figure 12).

Another source of evidence on this question exploits the different priming conditions in the dictator game. As noted above, individuals played with primes about Christianity, ancestral spirits, secular authority, or flowers (neutral). If prosociality reflects sharing norms sustained by church insurance networks, one would expect materially insecure participants to give differentially more than more secure participants when primed with Christianity relative to the other primes.[27] Table 6 corroborates this supposition. The largest gap in giving among above- and below-median insecurity

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[26]Detailed variable descriptions are contained in the appendix.

[27]This analysis is fairly heroic given the small sample size and should be interpreted with caution. Fortunately, the breakdown of above-median materially insecure types among the four primes is balanced: 50% for Christianity, 35% for Ancestors, 45% for Police, and 55% for control.

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individual occurs under the Christianity prime. Above-median insecurity individuals give 44% more than below-median individuals in the dictator game (significant at the 10% level). They are also 2.5 times more likely to make an equal allocation under this prime condition (significant at the 1% level). Although high-insecurity individuals tend to give more than low-insecurity individuals under the other prime conditions, the difference is only statistically significant (marginally) in one case, the police prime.[28] The Christianity prime condition may differentially activate a sharing norm among the materially insecure, leading them to contribute more money in the dictator game.

Another form of evidence comes from examining participants' responses to an 'exit question' posed to participants just after playing the dictator game. Enumerators asked respondents "What did the game remind you of in real life?" If norms of sharing are stronger among those with less security about future consumption, then they should be more likely to use sharing language in answers to this question. Figure 10 shows the ten most frequent words used to answer this question for below- and above-median insecurity individuals. The word 'share' is used by 16% of low-insecurity respondents and 11% of high-insecurity respondents. To test if this difference is statistically significant, we define an indicator, *Sharing words mentioned*, for respondents who use any of the following words in response to the dictator game exit question: 'sharing,' 'share,' 'generosity,' 'greed,' 'social,' 'help,' 'mutual,' or 'support.' Second, we define a stricter indicator that equals 1 only if respondents used 'sharing' or 'share.' As shown in Table 7, there are no meaningful differences between above- and below-median insecurity individuals in the use of these sharing words.[29]

One word that does appear more often among high-insecurity types is 'money.' While 42% percent of high-insecurity participants used this word, the word does not even figure in the top-ten list for low-insecurity participants (Table 10). 'Wealth' is the closest analog, appearing among 3% of participants. The fifth and sixth columns of Table 7 confirm that this difference is highly statistically significant. This observation reinforces that the economic consequences of their decision — how much money they take home — appear to have been salient among this materially insecure subgroup.

That money would be more salient (or "top of mind") to materially insecure individuals is consistent with a growing body of evidence about the effects of poverty on psychology (Mani, Mullainathan, Shafir and Zhao, 2013; Mullainathan and Shafir, 2013). However, it is not obvious why such cognitive constraints could explain the prosocial behavior observed in the dictator game. Although the literature is mixed, most studies find that ego-depletion is associated with more selfish behavior in the dictator game (Achtziger, Alós-Ferrer and Wagner, 2015), the opposite of what we observe in this setting.[30] The clearest inference from this analysis of the exit questions is

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[28]It is important to note that the large gap between high- and low-insecurity participants in the Christianity prime in part reflects lower prosociality among the low-insecurity individuals relative to the control prime. This is less consistent with the interpretation that the Christianity prime activated a social norm of fairness that caused individuals to give more in the dictator game. Nonetheless, combined with the other evidence examined in the paper, the fact that the gap in both outcome variables between above- and below-median insecurity individuals is largest under the Christianity prime is still suggestive that church-based social norms may mediate prosociality in this context.

[29]We also examine responses to an open-ended "free-list" question asking respondents to "list up to 5 behaviors that make someone a good/virtuous/moral person" and "up to 5 behaviors that make a bad/immoral person." Under the insurance norm explanation, one would expect materially insecure people to be more likely to use words about sharing when describing a 'good' or 'bad' person. We thus code an indicator variable, *Free list question*, that equals 1 if a respondent used any of the aforementioned words. As shown in Figure 9, there are no discernible differences between the words used by low- and high-insecurity individuals.

[30]One could argue perhaps that 50-50 is a simple rule of thumb and thus less cognitively demanding to follow in making an allocation decision in the dictator game. However, it is not clear why 50-50 would be a more natural

that the economic implications of participants' decisions in the game are highly salient for highly materially insecure individuals. This finding is consistent with individuals facing material insecurity acting more prosocially because of social norms of fairness linked to risk sharing, though it says nothing about whether churches mediate such norms.

All of the analysis up to this point concerns within-game variation, rather than exploiting the differences in the identity of the recipient across game rounds. However, a natural question is whether prosociality would be higher in the version of the game in which the recipient is also a Pentecostalist ('self versus distant') compared to the version in which the recipient is not a Pentecostalist ('self versus outgroup'). Yet, as noted above, there is no difference in average giving across these game types in this setting, and if anything 50-50 allocations are more common in the latter type of game (though this is difference is only marginally statistically significant).

This puzzle is most likely explained by the fact that the social norms under consideration have more to do with the reputation of the giver than the identity of the receiver. Indeed, as noted throughout, it is highly unlikely that any of the individuals in the sample are actually playing the game with members of their own specific church; they are playing with randomly sampled and anonymous individuals across Kananga. Thus, we do not intend to suggest that individuals are literally spreading risk with other participants in the sample. Rather, we suggest that the existence of insurance networks within churches has led to a social norm of fairness that may be particularly pronounced among materially insecure individuals. Such norms would manifest in individuals making more prosocial decisions in these games because they receive a 'warm glow' feeling when they contribute equally.

If what matters is signaling to others that you are a 'good Christian' who reliably contributes to the common pot, then the identity of the recipient in these games is less important. It is the contribution of the giver that matters. Moreover, even when playing with an 'outgroup' player 2, this just means the other person is not a Pentecostal Christian. But that person is almost surely a Catholic, Protestant, or a Christian from some other denomination. Only 6% of the city identify with non-Christian religions. Giving to other Christians would likely also serve to enhance one's reputation as a 'good Christian,' and thus the invariance by recipient identity is unsurprising.

Does the evidence in this paper prove that insecure individuals are prosocial in the dictator game because they have stronger sharing norms thanks to church-based insurance networks? Far from it. It is possible that highly insecure individuals in Kananga are independently more likely to be prosocial and to attend public religious ceremonies, and these two behaviors are unconnected. The most compelling evidence of a connection presented here is the fact that the gap in prosociality between above- and below-median insecurity individuals is largest in the Christianity prime. Yet, this is not smoking gun evidence, given that this wider gap also reflects low prosociality among low-insecurity individuals in the Christianity prime treatment group.

That said, the link between religion and sharing norms is reinforced by theory and evidence beyond this particular setting. An increasing body of evidence supports the view that religions with a moral high god are adaptive on the group level by expanding the scope of the moral community (Henrich et al., 2010; Lang et al., 2019; Norenzayan and Shariff, 2008; Purzycki et al., 2016; Wright, 2010). According to this theory, in societies with traditional religion in which gods are capricious rather than moralizing,

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rule of thumb than 100-0, which would also be more highly desirable for individuals in a state of material insecurity, as suggested by previous experimental studies (Achtziger et al., 2015).

individuals typically trust only a small set of people, most of whom are kin. By contrast, Christianity and other religions with a moral high god generate a conception of a wider moral community, facilitating trust and reciprocity among more heterogeneous groups of people. Consistent with this theory, evidence from the DRC suggests that individuals whose ancestors lived closer to Christian mission stations exhibit less favoritism for their own ethnic or kin group (Bergeron, 2020). Thus, beyond the evidence considered in this paper, past theoretical and empirical work offers further reason to believe that Christianity has played an important role in generating social norms of sharing and reciprocity among otherwise diverse individuals living in Kananga.

4. Conclusion

This paper documented a positive relationship between material insecurity and prosociality in the dictator game. More insecure individuals were particularly more likely to divide money evenly between themselves and the anonymous recipient. We argued that this reflects sharing norms associated with informal insurance practices that in Kananga are sustained through church membership. These findings are preliminary and suggestive at best due to the small sample size and lack of pre-registered hypotheses. That said, they are broadly consistent with a growing body of evidence suggesting that churches play an important economic role in sub-Saharan Africa.

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5. Tables and figures

Table 1. Summary statistics

	Mean	SD	Min	Max	N
Full screening sample					
Age	41.89	17.66	18	96	3097
Female	0.475	0.499	0	1	3097
Born outside of Kananga	0.649	0.477	0	1	3097
Years of education	10.09	3.130	2	19	2987
Unemployed	0.418	0.493	0	1	3087
Christian	0.941	0.235	0	1	3097
Born-again Christian (Pentecostal)	0.563	0.496	0	1	3097
Catholic	0.220	0.414	0	1	3097
Protestant	0.124	0.330	0	1	3097
Ethnically Luluwa	0.589	0.492	0	1	3097
This project subsample					
Age	37.41	13.99	19	87	111
Female	0.658	0.477	0	1	111
Born outside of Kananga	0.486	0.502	0	1	111
Years of education	9.495	3.560	0	19	111
Unemployed	0.523	0.502	0	1	111
Percentage of life spent in city or town	0.705	0.303	0.0333	1	111
Size of household (# family members)	7.243	3.254	1	16	111
Number of children	4.423	3.112	0	13	111
Household daily income (USD)	0.736	1.266	0	7.002	111
Market integration	0.412	0.487	0	1	111

Notes: summary statistics from screening survey and from sub-sample analyzed in this paper. The screening sample is a random sample of the population of Kananga. The project sub-sample is a random selection of screening survey participants satisfying two criteria: they (a) belong to the majority (Luluwa) ethnic group, and (b) adhere to a Pentecostal church.
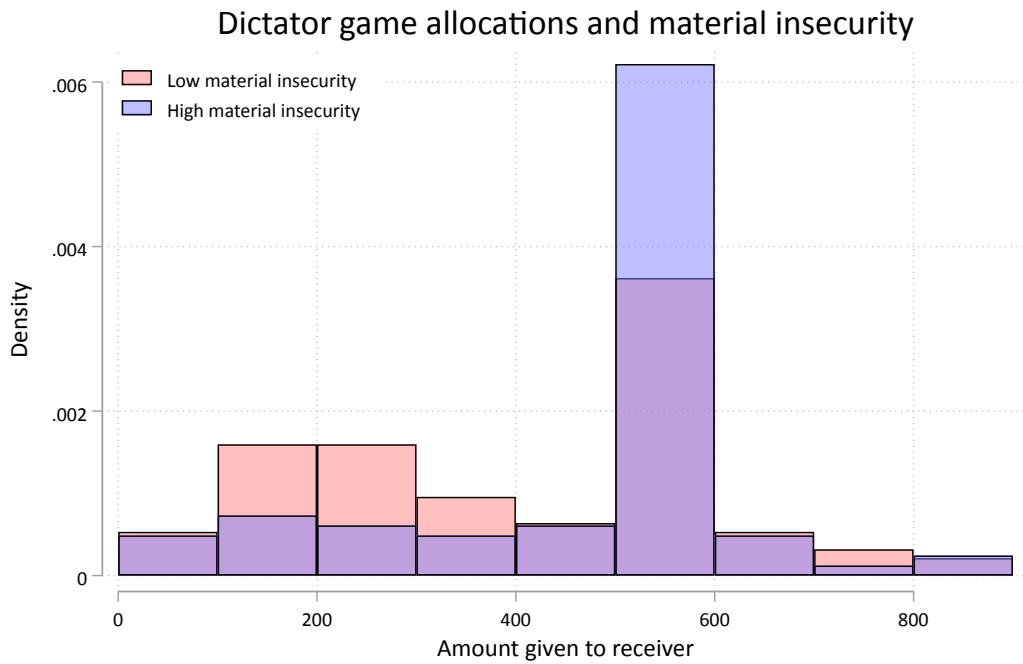
Figure 1. Histogram of dictator game allocations to the receiver among individuals with above- and below-median material insecurity.
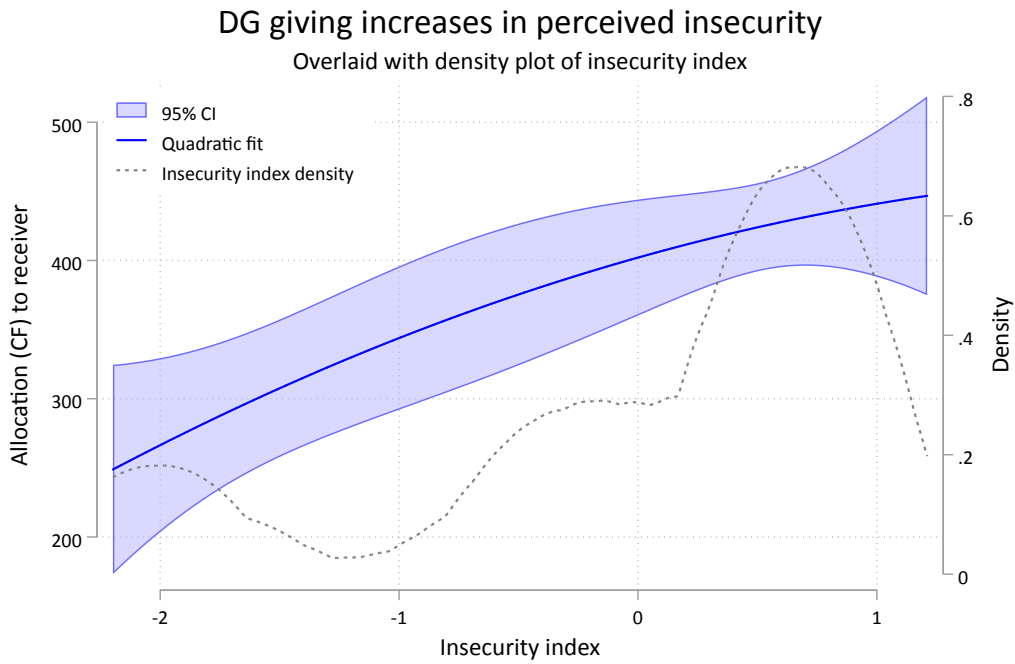

Figure 2. Quadratic fit of relationship between dictator game giving and perceived material insecurity, overlaid with density plot of insecurity index.

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Table 2. Material insecurity and giving in the dictator game

	Allocation to receiver (Dictator game)			Made equal allocation (Dictator game)		
	(1)	(2)	(3)	(4)	(5)	(6)
Insecurity index	59.643***	56.396***	55.255***	0.137***	0.131***	0.147***
	(16.115)	(16.527)	(16.258)	(0.041)	(0.042)	(0.044)
Income		29.642**			0.052	
		(12.005)			(0.037)	
Wealth		-4.564			-0.019	
		(13.461)			(0.045)	
Christian belief			-18.851			0.044
			(18.374)			(0.052)
Christian participation			6.325			-0.004
			(18.213)			(0.057)
Recipient dummy	3.409	3.409	3.409	-0.080*	-0.080*	-0.080*
	(21.029)	(21.154)	(21.154)	(0.044)	(0.044)	(0.044)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Observations	176	176	176	176	176	176
R^2	0.108	0.127	0.116	0.107	0.117	0.114
Outcome Mean	389.205	389.205	389.205	0.483	0.483	0.483

Allocation to receiver is the amount (in Congolese Francs) allocated to the receiver in the dictator game. *Made equal allocation* is a dummy variable for having allocated 50% of the endowment to the receiver in the dictator game. Both models are estimated using OLS. *Insecurity index* is a standardized index increasing in the extent to which individuals worry about their ability to provide food for their family. *Income* is a standardized index increasing in income from wage work, trade, and other economic activities. *Wealth* is a standardized index increasing in asset ownership. *Christian belief* is a standardized index increasing in the strength of belief in the Christian god across a range of questions. *Christian participation* is a standardized index increasing in the frequency with which individuals participate in ceremonies dedicated to the Christian god. Detailed variable descriptions can be found on p. 28. *Recipient dummy* is an indicator for the iteration of the dictator game with a recipient who is also a Pentecostal Christian. Both iterations of the game involving a choice between oneself and another player are pooled in this analysis. Standard errors are clustered by participant. $^*p < 0.1,^{**}p < 0.05,^{***}p < 0.01$.

Table 3. Insecurity and RAG allocations to the receiver

	Allocation to receiver (Random-allocation game)			Made 'fair' allocation (Random-allocation game)		
	(1)	(2)	(3)	(4)	(5)	(6)
Insecurity index	31.591	24.358	119.085	0.064	0.067	0.150
	(68.696)	(68.994)	(75.607)	(0.102)	(0.109)	(0.137)
Income		49.198			-0.013	
		(51.762)			(0.039)	
Wealth		-22.926			-0.021	
		(47.421)			(0.075)	
Christian belief			97.687			0.036
			(71.783)			(0.121)
Christian participation			72.684			0.178
			(58.607)			(0.122)
Recipient dummy	-21.739	-21.739	-21.739	-0.130	-0.130	-0.130
	(91.177)	(93.546)	(93.546)	(0.154)	(0.158)	(0.158)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Observations	46	46	46	46	46	46
R^2	0.059	0.077	0.108	0.079	0.083	0.142
Outcome Mean	1263.043	1263.043	1263.043	0.500	0.500	0.500

Allocation to receiver is the amount (in Congolese Francs) allocated to the receiver in the random-allocation game. *Made 'fair' allocation* is a dummy variable for having allocated roughly half of the endowment (+/- 200 CF to account for randomness from die rolls) to the receiver in the random-allocation game. Both models are estimated using OLS. *Insecurity index* is a standardized index increasing in the extent to which individuals worry about their ability to provide food for their family. *Income* is a standardized index increasing in income from wage work, trade, and other economic activities. *Wealth* is a standardized index increasing in asset ownership. *Christian belief* is a standardized index increasing in the strength of belief in the Christian god across a range of questions. *Christian participation* is a standardized index increasing in the frequency with which individuals participate in ceremonies dedicated to the Christian god. Detailed variable descriptions can be found on p. 28. *Recipient dummy* is an indicator for the iteration of the game with a recipient who is also a Pentecostal Christian. Both iterations of the game involving allocations between oneself and another player are pooled in this analysis. Standard errors are clustered by participant. $^*p < 0.1,^{**} p < 0.05,^{***} p < 0.01$.

Table 4. Insecurity correlated with public but not private Christian devotion

	Public devotion			Private devotion		
	(1)	(2)	(3)	(4)	(5)	(6)
Insecurity index	0.114	0.243*		-0.113	-0.042	
	(0.080)	(0.128)		(0.077)	(0.182)	
Insecurity squared		0.115			0.063	
		(0.101)			(0.132)	
High insecurity			0.530***			0.183
			(0.186)			(0.193)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Observations	111	111	111	111	111	111
R^2	0.036	0.046	0.090	0.042	0.044	0.037
Outcome Mean	-0.000	-0.000	-0.000	0.000	0.000	0.000

Public devotion is a standardized index increasing in the frequency of attending public Christian ceremonies and prayers. *Private devotion* is a standardized index increasing in the frequency with which individuals report thinking about the Christian god or worrying about what god thinks of them. *Insecurity index* is a standardized index increasing in the extent to which individuals worry about their ability to provide food for their family. *Insecurity squared* is *Insecurity index* squared. *High insecurity* is a dummy for individuals who are above the median in their level of perceived material insecurity. Detailed variable descriptions can be found on p. 28. Standard errors are clustered by participant. $^*p < 0.1,^{**} p < 0.05,^{***} p < 0.01$.

Table 5. Insecurity not correlated with stronger beliefs in moral high god

	God cares about what I do	God intervenes in our world	God punishes those who sin
	(1)	(2)	(3)
High insecurity	0.022	-0.603***	-0.071
	(0.231)	(0.193)	(0.191)
Covariates	Yes	Yes	Yes
Observations	111	111	111
R^2	0.014	0.115	0.013
Outcome Mean	-0.000	-0.000	0.000

Standard errors clustered by participant. $^*p < 0.1,^{**} p < 0.05,^{***} p < 0.01$

God cares about what I do is a standardized index increasing in the extent to which the Christian god is perceived to care about how people treat one another and behave. *God intervenes in our world* is a standardized index increasing in respondents' perceptions that the Christian god may reward people in life or influence what happens to them after they die. *God punishes those who sin* is a standardized index increasing in the extent to which respondents believe that the Christian god punishes stealing, lying, and murder. *High insecurity* is a dummy for individuals who are above the median in their level of perceived material insecurity. Detailed variable descriptions can be found on p. 28. Standard errors are clustered by participant. $^*p < 0.1,^{**} p < 0.05,^{***} p < 0.01$.
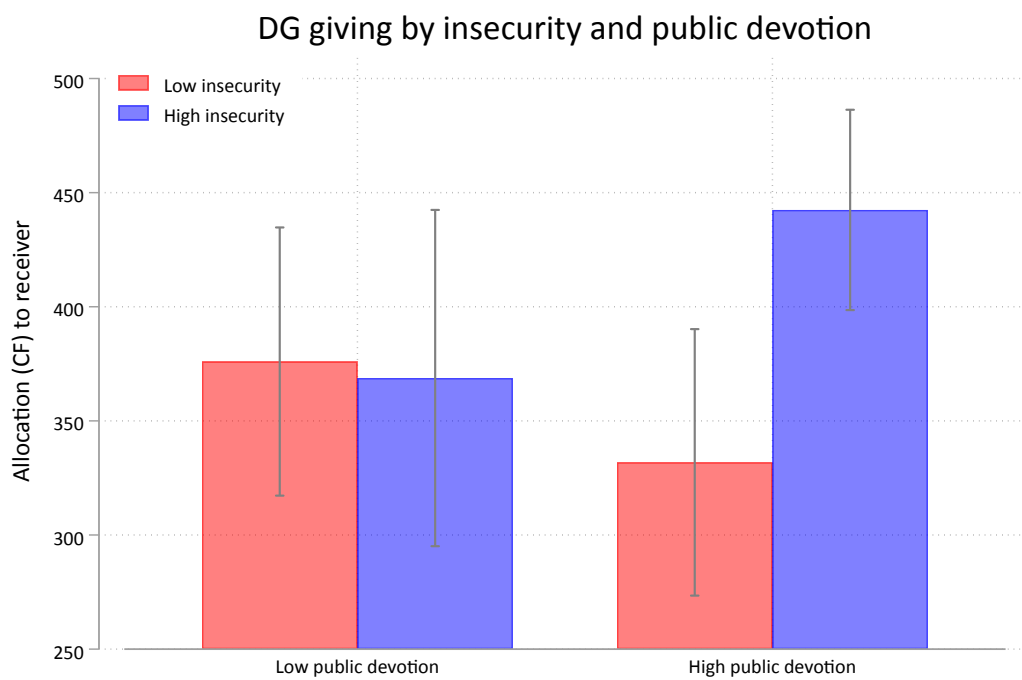
Figure 3. Dictator game allocations by above- and below-median material insecurity, disaggregated by public religious devotion.

Table 6. Dictator game allocations by above- and below-median material insecurity, disaggregated by four prime conditions

	Christianity prime		Control prime		Ancestors prime		Police prime	
	Amount	Equal	Amount	Equal	Amount	Equal	Amount	Equal
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High insecurity dummy	128.292*	0.544***	40.236	-0.149	85.687	0.323	8.169	0.355*
	(69.065)	(0.146)	(86.469)	(0.273)	(99.770)	(0.231)	(74.927)	(0.205)
Recipient dummy	25.000	-0.083	-4.545	-0.136	35.000	-0.050	-40.909	-0.045
	(52.217)	(0.109)	(24.723)	(0.080)	(40.579)	(0.094)	(51.269)	(0.085)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	48	48	44	44	40	40	44	44
R^2	0.165	0.305	0.087	0.044	0.121	0.231	0.046	0.203
Low insecurity mean	291.667	0.208	425.000	0.650	323.077	0.346	395.833	0.292

The first row notes the experimental prime. The second row contains the outcome variables: *Amount* which is the amount (in Congolese Francs) allocated to the receiver in the dictator game. *Equal* is a dummy variable for having allocated 50% of the endowment to the receiver in the dictator game. All models are estimated using OLS. *High insecurity* is a dummy for individuals who are above the median in their level of perceived material insecurity. Detailed variable descriptions can be found on p. 28. *Recipient dummy* is an indicator for the iteration of the dictator game with a recipient who is also a Pentecostal Christian. Both iterations of the game involving allocations between oneself and another player are pooled in this analysis. Standard errors are clustered by participant. $^*p < 0.1, ^{**}p < 0.05, ^{***}p < 0.01$.

Table 7. Dictator game exit question analysis

	Sharing words mentioned		"Share" mentioned		"Money" mentioned	
	(1)	(2)	(3)	(4)	(5)	(6)
Insecurity index	-0.001		0.017		0.137***	
	(0.033)		(0.029)		(0.034)	
High insecurity		-0.049		-0.033		0.392***
		(0.066)		(0.065)		(0.073)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Observations	111	111	111	111	111	111
R^2	0.047	0.052	0.044	0.044	0.128	0.233
Outcome Mean	0.153	0.153	0.144	0.144	0.216	0.216

Sharing words mentioned is a dummy for the use of any of the following words in respondents' answers to the exit questions after the dictator game: 'share,' 'generosity,' 'greed,' 'help,' 'mutual,' 'support,' or 'social.' *"Share" mentioned* is a dummy for the use of only the word 'share.' *"Money" mentioned* is a dummy for the use of the word 'money' or 'cash.' *Insecurity index* is a standardized index increasing in the extent to which individuals worry about their ability to provide food for their family. *High insecurity* is a dummy for individuals who are above the median in their level of perceived material insecurity. Detailed variable descriptions can be found on p. 28. Standard errors are clustered by participant. *$p < 0.1$,** $p < 0.05$,*** $p < 0.01$.

Supplementary Online Appendix

Variable descriptions

All index variables were constructed using the following procedure. First, we coded each of the component variables to be increasing in the same direction and standardized them (divided by the mean, divided by the standard deviation). Second, we took the sum of all component variables. Third, we standardized the resulting synthetic variable. The exact question text for each of sub-questions composing the indices used in the analysis can be found below. Responses are either binary yes-no (indicated as 1-0), Likert style (indicated as 1-5, e.g.), or integers.

Insecurity index

- Do you worry that in the next month your household will have a time when it is not able to buy or produce enough food to eat? (0-1)
- How certain are you that you will be able to buy or produce enough food to eat in the next month? (1-5)
- Do you worry that in the next six months your household will have a time when it is not able to buy or produce enough food to eat? (0-1)
- How certain are you that you will be able to buy or produce enough food to eat in the next six months? (1-5)
- Do you worry that in the next year your household will have a time when it is not able to buy or produce enough food to eat? (0-1)
- How certain are you that you will be able to buy or produce enough food to eat in the next year? (1-5)
- Do you worry that in the next five years your household will have a time when it is not able to buy or produce enough food to eat? (0-1)
- How certain are you that you will be able to buy or produce enough food to eat in the next five years? (1-5)

Income

- What is the annual income from wage work? (integer)
- What is the annual income from trade (re-selling products)? (integer)
- What is the annual income from selling goods produced at home? (integer)
- What is the annual income from rental properties that you own? (integer)
- What is the annual income from black market trade? (integer)
- What is the annual income from remittances? (integer)

Wealth

- Do you own rental properties? If so, how much money does this asset earn you each year? (integer)
- Do you own farm equipment (tractors, plows, mills, generators)? If you wanted to sell this good/these goods in the market, how much would they sell for? (integer)
- Do you own boats? If you wanted to sell this good/these goods in the market, how much would they sell for? (integer)
- Do you own sewing machines? If you wanted to sell this good/these goods in the market, how much would they sell for? (integer)
- Do you own any commercial vehicles (truck, motorbike, pushcart, bicycle)? If you wanted to sell this good/these goods in the market, how much would they

sell for? (integer)

- Do you own a bank account? If so, how much money does this asset earn you each year? (integer)
- Do you own a shop? If so, how much money does this asset earn you each year? (integer)
- Do you own agricultural property? If so, how much money does this asset earn you each year? (integer)
- Do you own any birds, goats, pigs, cows, sheep, dogs, or fish ponds? If you wanted to sell all of these animals in the market, how much would they cost? (integer)
- Do you own any firearms? If you wanted to sell this item/these items in the market, how much would they sell for? (integer)
- Do you have any other assets from which you earn money? If so, how much money does this asset earn you each year? (integer)

Christian belief

- Does the Christian god already punish people for their behavior? (0-1)
- How often does the Christian god punish people for stealing? (1-4)
- How important is it to the Christian god to punish thieves? (1-5)
- How often does the Christian god punish people for lying? (1-4)
- How important is it to the Christian god to punish liars? (1-5)
- How often does the Christian god punish people for murder? (1-4)
- How important is it to the Christian god to punish murderers? (1-5)
- Can the Christian god see in the hearts of people or know their thoughts and feelings? (0-1)
- Can the Christian god see what people do if they are far away in Kinshasa? (0-1)
- How often does the Christian god help people in their lives or recompense them for good behavior? (1-4)
- Can the Christian god influence what happens to people after they die? (0-1)
- Does the Christian god care how people treat strangers? (0-1)
- Does the Christian god care how people treat other people who do rituals for the Christian god? (0-1)
- Does the Christian god care if people do certain rituals? (0-1)
- Does the Christian god care about the fact that some people have more money and food than others? (0-1)

Christian participation

- How often do you pray? (1-5)
- How often do you participate in rituals or ceremonies to the Christian god? (1-5)
- How often do you think of the Christian god? (1-5)
- How often do you worry about what the Christian god thinks of your subject? (1-5)

Public devotion

- How often do you pray? (1-5)
- How often do you participate in rituals or ceremonies to the Christian god? (1-5)

Private devotion

- How often do you think of the Christian god? (1-5)
- How often do you worry about what the Christian god thinks of your subject? (1-5)

God cares about what I do

- Does the Christian god care how people treat strangers? (1-0)
- Does the Christian god care how people treat other people who do rituals for big good? (1-0)
- Does the Christian god care if people do certain rituals? (1-0)
- Does the Christian god care about the fact that some people have more money and food than others? (1-0)

God intervenes in our world

- How often does the Christian god help people in their lives or recompense them for good behavior? (1-4)
- Can the Christian god influence what happens to people after they die? (1-0)

God punishes those who sin

- How often does the Christian god punish people for stealing? (1-4)
- How important is it to the Christian god to punish thieves? (1-5)
- How often does the Christian god punish people for lying? (1-4)
- How important is it to the Christian god to punish liars? (1-5)
- How often does the Christian god punish people for murder? (1-4)
- How important is it to the Christian god to punish murderers? (1-5)
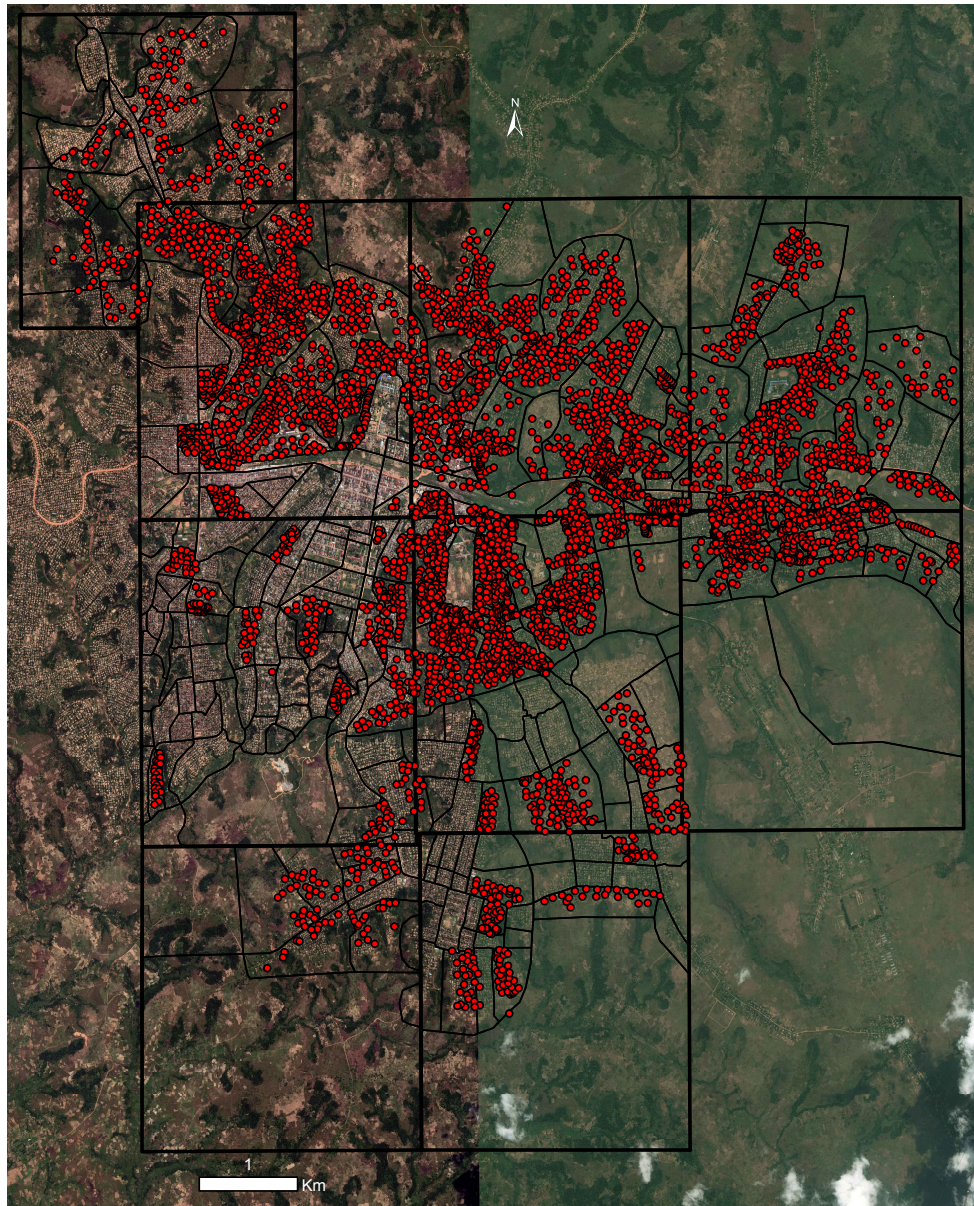
OTHER TABLES AND FIGURES

Figure 4. Satellite map of Kananga partitioned into polygons showing household locations for the full random sample.

Figure 5. The experimental set up: labs in the field

Figure 6. Prime images (printed on towels, on which the game protocols were explained).

Table 8. Robustness checks: insecurity and dictator game outcomes

	Allocation to receiver (Dictator game)			Made equal allocation (Dictator game)		
	(1)	(2)	(3)	(4)	(5)	(6)
Insecurity index	67.220***	59.708***	60.446***	0.129**	0.135***	0.131***
	(18.590)	(16.331)	(17.354)	(0.051)	(0.043)	(0.042)
Test questions correct	9.881			-0.016		
	(17.026)			(0.054)		
Education level	4.647			-0.002		
	(6.678)			(0.020)		
Years in Kananga		1.208			0.000	
		(1.995)			(0.005)	
Born in Kananga		-29.482			-0.034	
		(40.369)			(0.113)	
Number of children			-1.949			0.020
			(9.956)			(0.028)
Household size			5.685			-0.019
			(9.709)			(0.026)
Recipient dummy	3.409	3.409	3.409	-0.080*	-0.080*	-0.080*
	(21.154)	(21.154)	(21.154)	(0.044)	(0.044)	(0.044)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Observations	176	176	176	176	176	176
R^2	0.114	0.114	0.112	0.108	0.108	0.113
Outcome Mean	389.205	389.205	389.205	0.483	0.483	0.483

Allocation to receiver is the amount (in Congolese Francs) allocated to the receiver in the dictator game. *Made equal allocation* is a dummy variable for having allocated 50% of the endowment to the receiver in the dictator game. Both models are estimated using OLS. *Insecurity index* is a standardized index increasing in the extent to which individuals worry about their ability to provide food for their family. *Test questions correct* is the number of test questions about the rules of the dictator game that the respondent answered correctly. *Education level* measures the education (in years) of the respondent. *Years in Kananga* measures the number of years the respondent has lived in Kananga. *Born in Kananga* is a dummy for individuals who were born in the city. *Number of children* is a count of the self-reported number of children of the respondent. *Household size* is the number of adults in the household. *Recipient dummy* is an indicator for the iteration of the dictator game with a recipient who is also a Pentecostal Christian. Both iterations of the game involving a choice between oneself and another player are pooled in this analysis. Standard errors are clustered by participant. *$p < 0.1$,** $p < 0.05$,*** $p < 0.01$.
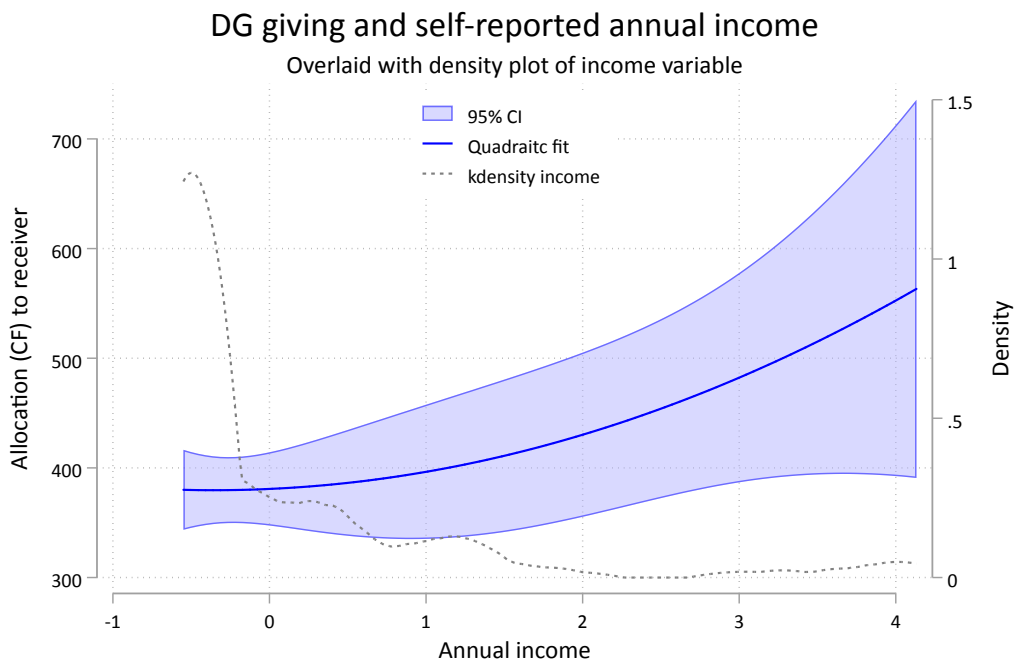
Figure 7. Quadratic fit of relationship between dictator game giving and annual income, overlaid with density of income variable.
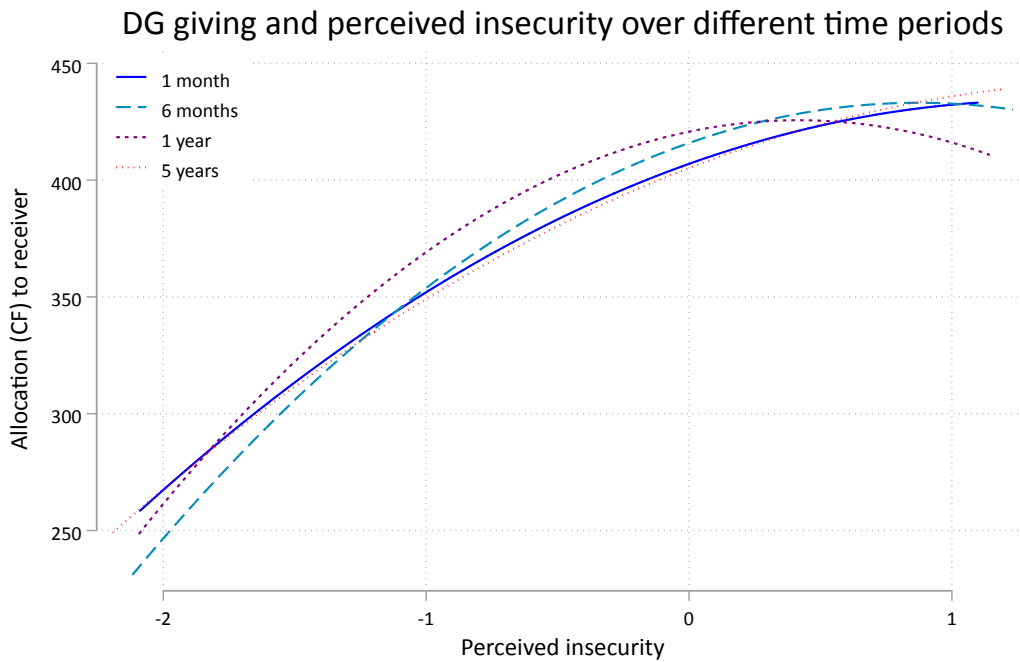

Figure 8. Quadratic fit of relationship between dictator game giving and perceived insecurity over different time periods.
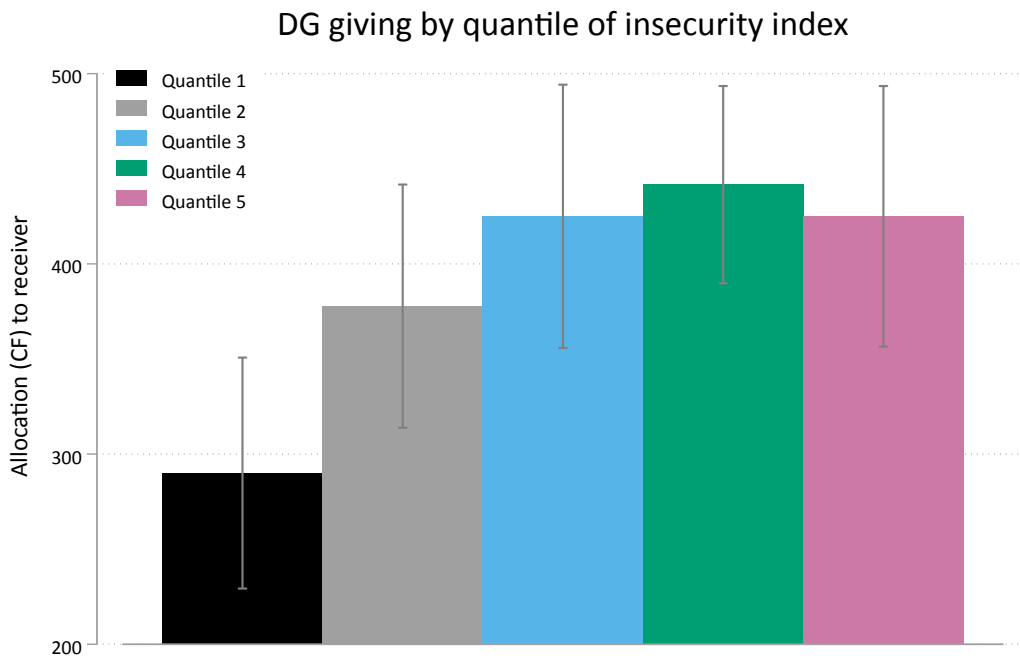
Figure 9. Average dictator game allocations to the receiver by quantile of the insecurity index.
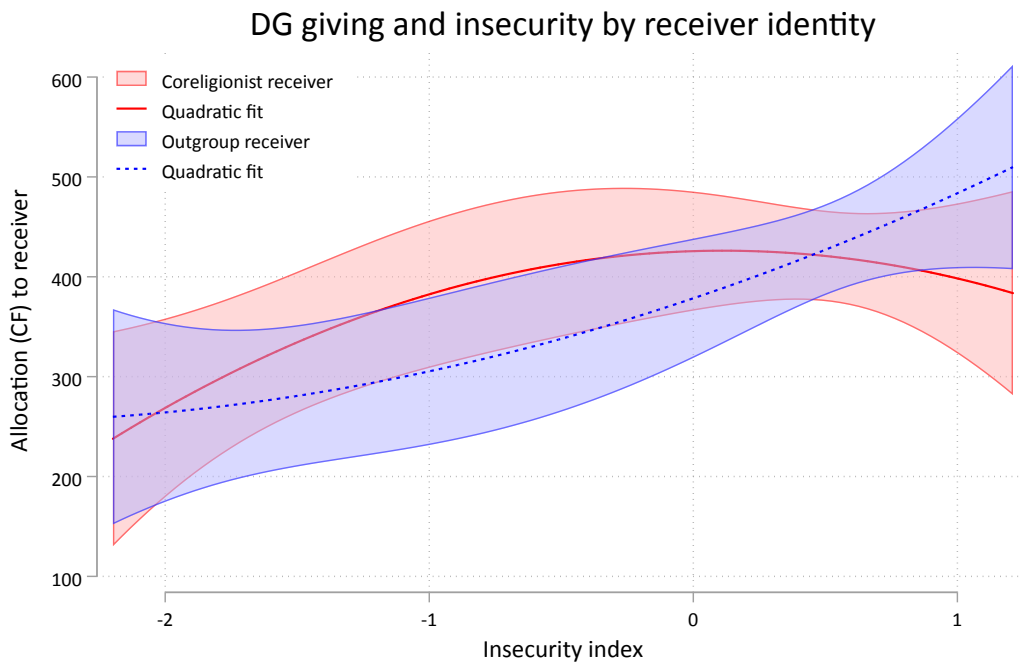

Figure 10. Quadratic fit of relationship between dictator game giving and insecurity in rounds with a coreligionist (red) and out-group (blue) receiver.
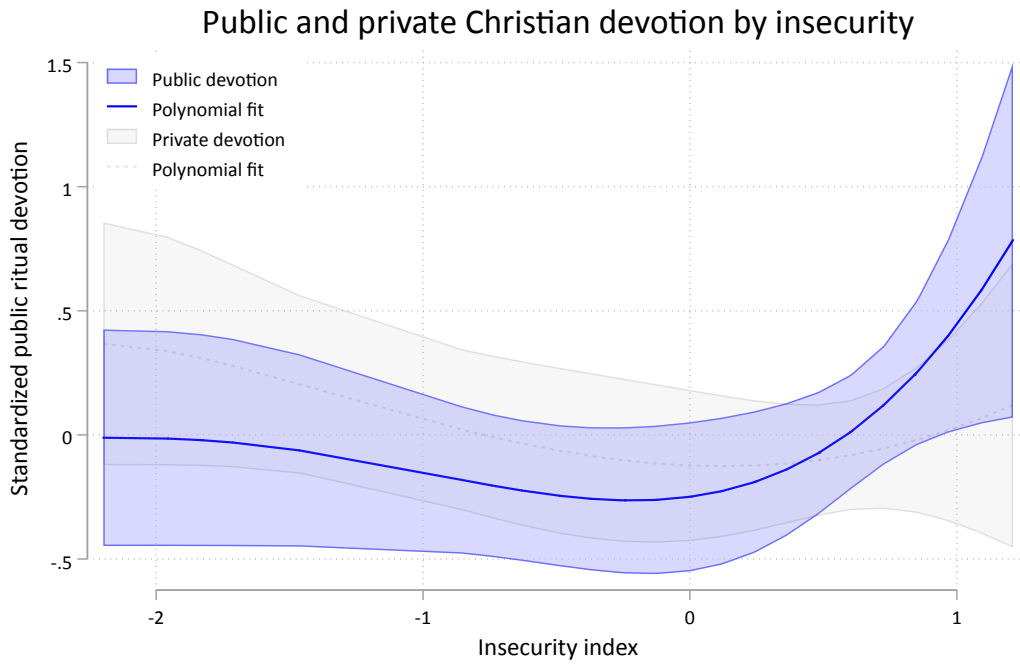
Figure 11. Participation in public and private Christian rituals by material insecurity.
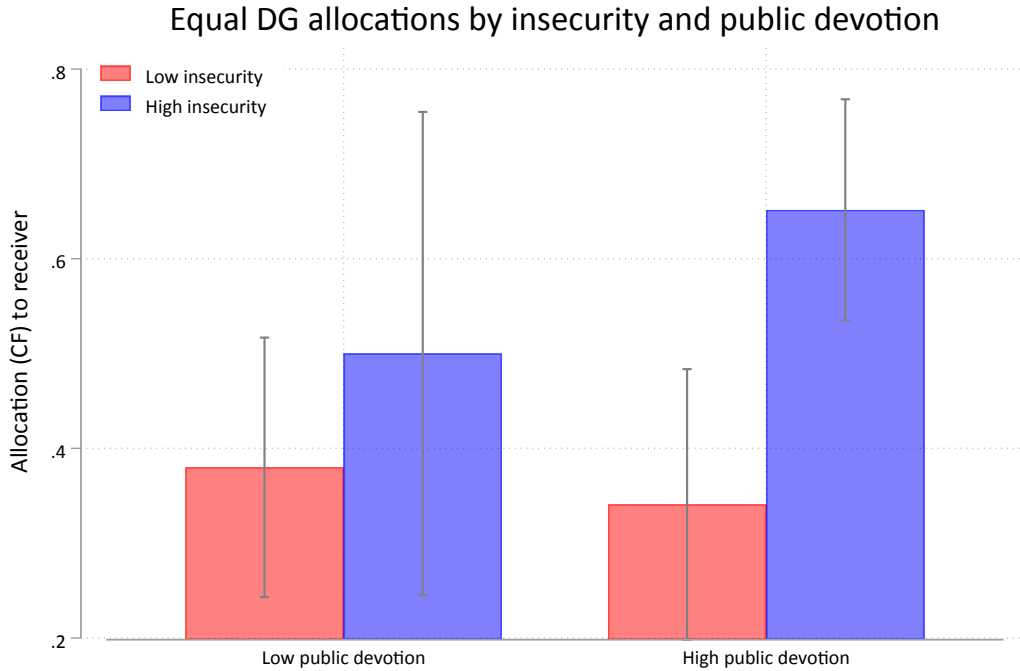

Figure 12. Equal allocations in the dictator game by above- and below-median material insecurity, disaggregated by public religious devotion.
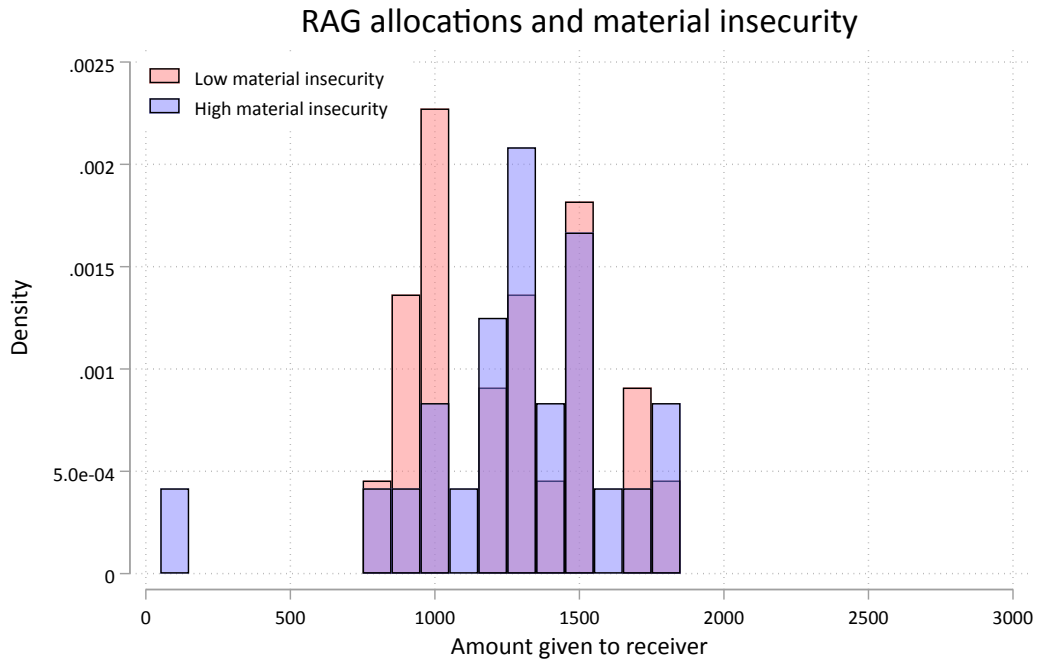
RAG allocations and material insecurity

Figure 13. Histogram of random-allocation game giving to the receiver among individuals with above- and below-median material insecurity.

Table 9. Freelist about what the Christian god likes, disaggregated by material insecurity

Low insecurity			High insecurity		
Word	Count	Proportion	Word	Count	Proportion
love	29	0.5	love	26	0.49
patience	17	0.29	know	24	0.45
truth	17	0.29	patience	12	0.23
humility	16	0.28	humility	10	0.19
know	15	0.26	kindness	8	0.15
joy	14	0.24	compassion	8	0.15
solidarity	13	0.22	joy	7	0.13
kindness	11	0.19	honesty	7	0.13
respect	10	0.17	respect	6	0.11
brotherhood	10	0.17	truth	5	0.09

The most common things that respondents think the Christian god likes among low and high insecurity individuals.

Table 10. **Dictator game exit question analysis by material insecurity**

| | Low insecurity | | | High insecurity | |
Word	Count	Proportion	Word	Count	Proportion
game	46	0.79	game	25	0.47
share	9	0.16	money	22	0.42
six	7	0.12	dice	8	0.15
foreigner	6	0.1	share	6	0.11
dice	6	0.1	foreigner	5	0.09
cards	5	0.09	love	3	0.06
love	5	0.09	six	2	0.04
lottery	2	0.03	others	2	0.04
others	2	0.03	giving	1	0.02
wealth	2	0.03	lottery	1	0.02

The most common substantive words used in the exit questions after the dictator game by low and high insecurity individuals.

Table 11. **Most frequent words used to describe perceived goal of study by respondents of high and low material insecurity**

| | Low insecurity | | | High insecurity | |
Word	Count	Proportion	Word	Count	Proportion
sharing	23	0.21	love	16	0.14
love	6	0.05	sharing	10	0.09
equal	5	0.05	game	6	0.05
money	5	0.05	neighbor	5	0.05
game	4	0.04	conscience	4	0.04
people	4	0.04	equal	3	0.03
conscience	2	0.02	equitable	3	0.03
equitable	2	0.02	life	3	0.03
rationing	2	0.02	money	3	0.03
social	2	0.02	men	2	0.02

The most common substantive words used in the exit questions after the interview by low and high insecurity individuals. The specific prompt was what the respondent thought the study was about.