

Pre-Analysis Plan
Aspirations, Beliefs, and Behavior:
Evidence from a Randomized Religious
Intervention in Western Kenya.*

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1 Trial Information

- Title: Aspirations, Beliefs, and Behavior: Evidence from a Randomized Religious Intervention in Western Kenya.
- Location: Informal settlements of Nyalenda A, Nyalenda B, Manyatta A, and Manyatta B of Kisumu, Kenya.
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2 Abstract

In recent years, economists have been increasingly interested in identifying how religion mediates economic development. Individuals' religious beliefs shape their worldview and thereby interplays with many economic choices, from basic consumption to entrepreneurship to how people respond to policies. Thus, understanding whether or how different beliefs shape economic behavior is instrumental for policy makers and researchers to foster economic development. This question is particularly pertinent for economic development in Sub-Saharan Africa, where the growth of Pentecostal and Charismatic churches mark a major shift in the religious landscape. Pentecostalism is thought to instill greater aspirations, hope, and trust in individuals, all factors that economists have identified as key contributors to development. However, the direction of causality is not clear: Are those with greater aspirations and trust more likely to join a Pentecostal church? Or does belonging to a Pentecostal church and hearing its messages preached make one more aspirational?

In this project, we plan to test whether exposure to different religious messaging influences economic decision making. To do so, we will use a randomized control trial to measure the effects on behavior from an intervention that randomizes exposure to different religious messages. 1400 individuals living in informal settlements in Kisumu, Kenya will be randomly divided into a control group and two treatment arms. Those in each treatment will be invited to participate in two-day long workshops, in which one treatment is managed by Pentecostal preachers, and the other by a mainline Christian group (i.e., Anglican/Catholic). Following the workshop, a survey and experimental game in which participants allocate funds given to them from project staff will measure differences in behavior related to entrepreneurship, trust, and generosity resulting from the intervention. Our hypothesis is that those assigned to the Pentecostal workshop will exhibit more entrepreneurial and charitable behavior than those in the control group, consistent with a higher level of aspirations and trust.

3 Motivation

Pentecostal Christianity is linked strongly with increased aspirations, hope, and trust, all factors which economists have identified to play a major role in eco-

conomic development and poverty alleviation (e.g., Nunn and Wantchekon, 2011; Lybbert and Wydick, 2018; Genicot and Ray, 2020; Bloem, 2021; McKenzie, Mohpal and Yang, 2022). Much of the recent economic literature has focused on the drivers of the strong global growth of Pentecostal Christianity. In Brazil, for instance, Costa, Marcantonio and Rocha (2023) find that recessions lead to increases in Pentecostal affiliation, likely due to increased social insurance provided by the churches. However, an open question is how the practices and beliefs of Pentecostalism change economic behavior. Understanding this question requires entangling the direction of causality: are those who are more aspirational more likely to join Pentecostal churches, or do the practices and beliefs taught in Pentecostalism make one more aspirational?

The global rise in Neo-Pentecostal and Charismatic Christianity (hereafter NPC) in recent decades has been dramatic, particularly in the Global South. In Sub-Saharan Africa (SSA) in particular, it is estimated that there were approximately 229 million adherents to this form of Christianity as of 2020 and it is the fastest growing religious group in the region (Johnson and Grim, 2023). The continued spread of NPC may have important implications for economic growth in one of the least economically developed regions of the world. Freeman (2015) describes that particular traits of NPC can have significant economic impacts, such as a focus on material wealth and well-being as a reward for faith (i.e., the “Prosperity Gospel”), which empowers individuals to take risks and stimulates entrepreneurial behavior. Indeed, van Dijk (2012) describes sermons in NPC churches as explicitly presenting the Christian Gospel as a roadmap to economic success.

Randomized experiments can aid in identifying the relationship between religious affiliation/beliefs and economic outcomes. This proposed research project will provide the first randomization-based evidence on economic outcomes arising from NPC messages such as the prosperity gospel. To this point there have been few randomized interventions related to religion in developing countries. One notable example, however, is Bryan, Choi and Karlan (2021), who in the Philippines show that poor households randomly selected to participate in an Evangelical Protestant education program have higher religiosity and income, the latter of which the authors attribute to an increase in “grit.” We plan to diverge from this previous work by learning the economic effects of an intensive but short-term program related to NPC messaging in an African setting. Butinda et al. (2023) highlight how economists have largely

underestimated the impact of beliefs in influencing economic development in Africa. This setting and design allows us to uncover increasingly relevant and generalizable evidence into the developmental implications of the fastest growing religious doctrine across the continent.

In our project, we will organize intensive religious workshops to occur over two days within churches in informal settlements of Kisumu, Kenya. These workshops will serve as the intervention exposure, providing different forms of religious messaging to attendees randomly assigned to attend that workshop.

3.1 Key Research Question

- Does exposure to Pentecostal Christianity, and in particular prosperity gospel teachings, affect economic behavior?

3.2 Primary Outcomes of interest

- Religion and church of attendance
- Religious attitudes and beliefs
 - Extrinsic religiosity index
 - Intrinsic religiosity index
 - General religiosity index
 - Fundamentalism religiosity index
 - Government and religion index
 - Prosperity through faith
- Feelings of power and control
- Grit
- Self-control
- Results from choice experiment (further details below):
 - Amount donated to “Anglican Development Services Kenya”
 - Amount donated to “Catholic Relief Services”
 - Amount donated to “Christian Aid in Kenya”

- Amount donated to “Kenya Muslims Charitable Society”
- Amount given to spouse
- Amount given to preacher
- Amount invested
- Amount contributed to entrepreneurship fund

3.3 Secondary Outcomes of Interest

- Labor earnings in past week
- Business earnings in past week
- Expenditures/Savings and gifts in past week
- Alcohol use and spending in past week
- Time use in past 24 hours

4 Experimental Design

4.1 Randomization

- The planned number of participants is 1400, which will be divided between 600 in the control, and 800 in the treatment.
- The treatment will have two different arms: a random 400 will be assigned to the Pentecostal group and 400 to the mainstream Christian (i.e., Catholic/Anglican) group.
- Randomization will be stratified across four different informal settlements of Kisumu: Nyalenda A, Nyalenda B, Manyatta A, and Manyatta B. In each locality, 150 individuals will be selected for the control and 100 for each treatment arm (350 total in each locality).
- Individuals will be selected through spatial random points placed a map of the locality using QGIS software.
 - The algorithm will be set such that points will be placed no closer than 15 meters to one another. If a point falls on a road or empty

space, the nearest house will be selected. If multiple points fall on the same house, the duplicates will be discarded (only one person per household will be selected). If a point falls on a non-residential building, it will be discarded.

- 450 points will be generated per locality in total and randomly ranked. If a point is discarded, the next available point after 350 will be included.
- Odd numbered points will indicate that the senior man in the household (younger than 55 years old) is invited for participation, even number points will indicate the senior woman in the household (younger than 55 years old) is invited. If the assigned gendered adult is absent or does not exist, the other gender will be invited to participate.
- If in the first treatment arm (i.e., Pentecostal), they will be randomly assigned to one of the four host Pentecostal churches in their locality to attend for the workshop (see below). If in the second treatment arm (i.e., Catholic/Anglican), they will be assigned to the Catholic/Anglican host in that community.
- Exclusion parameters: over age 55, under 18, or non-Christian.
- Church host randomization (four Pentecostal and one Catholic/Anglican church per locality):
 - We conducted a church census of the four localities and keep all Pentecostal, Anglican, and Catholic churches for randomization.
 - We randomly rank all Pentecostal churches in each locality and select the top four to invite to host the workshops for the first treatment arm. We discard and replace these churches if 1) church is too small to hold the number of expected participants and 2) church has main services on Saturdays, since that would interfere with the workshops.
 - We randomly rank all Catholic and Anglican churches in each locality, and select the top church to invite to host workshops for the second treatment arm.

4.2 Baseline Survey and Initial Choice Experiment

- When enumerators visit randomly selected homes to invite participants, they will also conduct the initial baseline survey and choice experiment.
- The initial survey will include measures of the following: Labor and business activity and earnings in past week, nights away in the past week, expenditures in past week, gifts received, religion, church of attendance, alcohol consumption, as well as a qualitative question on religion and community.
- In the preliminary choice experiment, the enumerator will read the following statement: “Here is x Kenyan Shillings (equivalent of 1 USD). This is your money and yours to keep and do with it as you would like. It is part of the compensation for your participation in the survey. I will now read several scenarios to you. You will be able to use this money you have received in the scenarios, although you do not need to. Think carefully about each scenario because one, and only one, scenario will be selected as binding after the activity is complete and you will be obligated to provide any money you indicated in that scenario if selected as binding. However, you do not need to indicate that you will provide any money for any of the scenarios, if you do not wish. The maximum amount that you can choose to give for each scenario is x KSh.”
 1. “How much money would you like to throw in the garbage?” (***)This is to train the respondent that it is okay to say zero for an option.***)
 2. “How much money would you like to give as a gift to your ward representative?”
 3. “How much money would you like to donate to a national charity called the Kenya Children’s Fund?”
 4. “How much money would you like to send to your mother (if mother no longer alive, indicate female relative)”
- After the participant has decided amounts for each scenario, one option will be randomly selected as binding (die roll).

4.3 Intervention

- Those randomly assigned to the treatment will be invited to a two-day workshop at a Pentecostal church (Treatment Arm 1) or a Catholic or Anglican church (Treatment Arm 2), randomly assigned.
- Participants will be informed that there will be refreshments available and given a voucher. They also will be informed that there will be a survey following the intervention where they will receive compensation for their time.
- Churches will conduct worship services, sermons, Bible studies, and other activities during the two days of workshops. Enumerators will be present to track attendance.

4.4 Post-intervention Survey and Choice Experiment

- Immediately following the workshops, enumerators will begin conducting post-intervention survey with project participants in a random order.
 - The survey will include questions on the following: Household composition, labor and business activity and earnings in past week, nights away in the past week, expenditures in past week, gifts received, religion, church of attendance and past churches of attendance, a time use module, questions to create an asset index, alcohol consumption, a qualitative question on religion and community, modules to measure religious attitudes and beliefs, feelings of power and control, grit, and self-control.
- In the post-intervention choice experiment, the enumerator will read the following statement: “Here is x Kenyan Shillings (equivalent of 7 USD). This is your money and yours to keep and do with as you would like. It is a payment for your participation in the survey. I will now read several scenarios to you. You will be able to use this money you have received in the scenarios, although you do not need to. Think carefully about each scenario because one, and only one, scenario will be selected as binding after the activity is complete and you will be obligated to provide any money you indicated in that scenario if selected as binding. However, you do not need to indicate that you will provide any money for any of

the scenarios, if you do not wish. The maximum amount that you can choose to give for each scenario is x KSh.”

1. “How much money would you like to donate to a national charity called “Anglican Development Services Kenya”?”
 2. “How much money would you like to donate to a national charity called “Catholic Relief Services”?”
 3. “How much money would you like to donate to a national charity called “Christian Aid in Kenya”?”
 4. “How much money would you like to donate to a national charity called “Kenya Muslims Charitable Society”?”
 5. “How much money would you like us to give to your spouse, adding $y\%$? If no spouse, indicate your nearest adult relative.”
 6. “How much money would you like to donate to the preacher at: (treatment group: your workshop) (control group: your church)?”
 7. “How much money would you like to give back to us, and after one month, we will return to you (via mpesa) with $R\%$ interest?”
 8. “How much money would you be willing to contribute to an entrepreneurship fund to be shared between you and other participants in the program to purchase supplies to start a communal business?”
- Options will be presented to respondents in a random order.
 - After the participant has decided amounts for each scenario, one option will be selected randomly as binding (8-sided die roll).

5 Variable Construction

5.1 Primary Outcomes

To construct indices, we will follow Bryan, Choi and Karlan (2021) and first standardize the responses to each question such that the control group has unit variance and zero mean: from each index component (i.e., survey question) we will subtract the control mean and divide by the standard deviation of those in the control group. We will then sum each of these standardized components, then standardize this summation again in reference to the control group.

5.1.1 Measures of religiosity and beliefs

- Stated religion/denomination
- Extrinsic Index – Survey questions for index:
 - God grants me the things I ask for in prayers (5 point scale)
 - I go to church/mosque mostly because it helps me to make or stay in touch with friends (5 point scale)
 - Do you participate in social activities organized through your religious institution outside of the services? (Yes/no)
- Intrinsic Index – Survey questions for index:
 - I enjoy thinking about my religion (5 point scale)
 - It is important to me to spend time in private thought and prayer (5 point scale)
 - I often have a strong sense of God’s presence (5 point scale)
 - I try hard to live all my life according to my religious beliefs (5 point scale)
 - I pray every day at home (5 point scale)
- General Index – Survey questions for index:
 - To what extent do you consider yourself a religious person (5 point scale)
 - In the last month, have you tried to change anyone’s behavior to be more Godly? (Yes/no)
 - In the last week, on how many days did you read or listen to the Bible? (1 day to 7 days)
 - How often do you attend your own church? (daily (365 days), most days (104), weekly (52), every 2-3 weeks (18), monthly (12), every 2-3 months (5), a few times a year (3), yearly (1), never (0).
- Fundamentalism Index – Survey questions for index:
 - God has given humans a guide that must be totally followed for salvation (5 point scale)

- There is a single religious book that contains all the truths of life (5 point scale)
- The basic cause of evil in the world is Satan (5 point scale)
- It is more important to believe in God and the right religion than to be a good person (5 point scale)
- There is a particular set of religious teaching in this world that are so true, you can't go any "deeper" (5 point scale)
- There are two kinds of people in this world: those who will be saved and those who will not (5 point scale)
- Holy scripture should be considered to be literally true (5 points scale)
- To lead the best life, one must belong to the one, fundamentally true religion (5 point scale)
- "Satan" is an actual real being the influences people's lives (5 point scale)
- Whenever science and sacred scripture conflict, SCRIPTURE is probably right (5 point scale)
- The fundamentals of God's religion should never be compromised (5 point scale)
- There is one, perfectly correct religion (5 point scale)
- Government and religion index – Survey questions for index:
 - It is important that political leaders have strong religious beliefs (5 point scale)
 - There should NOT be a separation between religion and government (5 point scale)
- Prosperity through faith – survey question:
 - God will grant material prosperity to believers with enough faith (5 point scale)

5.1.2 Measures of potential mechanisms

- Powerful others index — survey questions (all 5 point scale):

- I feel like what happens in my life is mostly determined by God
 - Although I might have good ability, I will not be successful without appealing to God
 - My life is chiefly controlled by God
 - Getting what I want requires pleasing God
 - Whether or not I have an accident and hurt myself physically depends mostly on God
 - In order to have my plans work, I make sure that they fit with God's plan for me
- Locus of control index - Internality subscale — survey questions (all 5 point scale):
 - Whether or not I am successful depends mostly on my ability
 - Whether or not I have an accident and hurt myself depends mostly on how careful I am on a daily basis
 - When I make plans, I am almost certain to make them work
 - How many friends I have depends on how nice a person I am
 - I can pretty much determine what will happen in my life
 - I am usually able to protect my personal interests
 - When I get what I want it's usually because I worked hard for it
 - My life is determined by my own actions
- Locus of control index - Chance subscale — survey questions (all 5 point scale):
 - To a great extent my life is controlled by accidental happenings
 - Often there is no chance of protecting my personal interests from bad luck happening
 - When I get what I want, it is usually because I am lucky
 - I have often found that what is going to happen will happen
 - Whether or not I get into an accident and hurt myself physically is mostly a matter of luck

- It is not wise for me to plan too far ahead because many things turn out to be a matter of good or bad fortune
 - Whether or not I am successful depends on whether I am lucky enough to be in the right place at the right time
 - It is chiefly a matter of fate whether or not I have a few friends or many friends
- Grit — survey questions (all 5 point scale):
 - New ideas and projects never distract me from previous ones
 - Setbacks don't discourage me
 - I have never been obsessed with a certain idea or project for a short time and later lost interest
 - I am a very hard worker
 - I never set a goal but later choose to pursue a different one
 - It is easy to maintain my focus on projects that are longer than a few months
 - I finish whatever I begin
 - I am diligent
- Self-control — survey questions (all 5 point scale):
 - I have an easy time breaking bad habits
 - I rarely get distracted
 - I never say inappropriate things
 - I refuse things that are bad for me, even if they are fun
 - People would say that I have very strong self-discipline
 - Pleasure and fun never keep me from getting work done
 - I'm good at resisting temptation
 - I never do things that feel good in the moment but regret later on
 - I can always stop myself from doing something when I know it's wrong
 - I never act without thinking through all the alternatives

5.1.3 Choice experiment results

- Raw monetary value indicated by the participant for each of the eight choices.
- Index of all charitable contributions (first four choices)
- Index of all Christian charitable contributions (first three choices)
- Index of mainstream Christian charitable contributions (first two choices).
- Index of investment and entrepreneurial questions (choices 7 and 8).
- Index of all eight contribution choices.

5.2 Secondary Outcomes

- Labor and Business earnings
 - These outcomes will be the stated earnings by the respondent in the past week.
- Saving and Expenditures
 - This outcome will be the stated expenditures by the respondent in the past week. These expenditures will be disaggregated into the following categories (assuming sufficient non-zero expenditures in each category): Spending on food in the past week, spending on alcohol in the past week. Amount saved in the past week. Gifts to church/mosque in the past week. Gifts received in the past week.
- Alcohol use in past week
 - Enumerators will collect self-reported drinking across various types of alcoholic drinks in the past week. They will also ask the number of drinks consumed on the day they drank the most in the past week. Outcomes will include both intensive and extensive margins of alcohol consumption.
 - Conversion factors for alcohol drinks will follow Murphy (2024) as: *chang'aa* is 34 percent ethanol, *busaa* is 4 percent ethanol, beer is 5 percent ethanol, wine is 12 percent ethanol, and commercial

spirits are 40 percent ethanol. Percent ethanol for locally produced drinks is taken from Papas et al. (2010) and confirmed as reasonable approximations by field tests. These field tests find that the average serving size of a glass of chang’aa is 300 milliliters, and serving sizes of busaa are typically 0.5 or 1 liters. A US standard drink is assumed to contain 17.75 ml (0.01775 liters) of ethanol.

- Time use in past 24 hours
 - The survey will ask the respondent to divide the 24 hours of the previous day into the amount of time doing various activities (following Field et al. (2022)). The categories include: sleeping, working on own farm, income generating work for wage, self employed income generating activity, household chores/unpaid work outside the home, household chores/unpaid work inside the home, providing care for others, attending a service or activity at a church, or relaxing/leisure activities.

6 Empirical Strategy

6.1 Balance

We will check for balance among the two treatment arms and control through direct estimations using both baseline data and data collected post-intervention that could not have changed in the approximate one month between baseline and endline surveys using the following equation:

$$x_{ij} = \alpha + \beta_1 Treat1_{ij} + \beta_2 Treat2_{ij} + \gamma_j + \varepsilon_{ij} \quad (1)$$

where x_{ij} is a characteristic of individual i in locality j (i.e., Nyalenda A, Nyalenda B, Manyatta A, Manyatta B). These characteristics will include: gender, the number of nights away in past week, years of education, baseline labor and business earnings, baseline expenditures and gifts, baseline religion, baseline religious questions, baseline alcohol consumption, and baseline choice experiment results. Variable $Treat1$ indicates whether the individual was assigned to treatment arm 1; $Treat2$ indicates whether the individual was assigned to treatment arm 2; γ is a locality fixed effect; and ε is an error term.

We will report both the coefficient and p-value for each of the treatment arms for each variable included as a balance outcome. In addition, we will include the statistic for joint significance and its p-value and normalized difference. Throughout our empirical analysis, we plan to compute standard errors that are robust to heteroskedasticity and unclustered; as a robustness check, we also plan to compute p-values from randomization inference.

6.2 Attrition

We will measure attrition between the baseline and endline surveys, which will be between 2 and 8 weeks apart, depending on when the respondent is randomly assigned to receive the baseline and endline surveys. We will measure this using the following estimations:

$$Resurvey_{ij} = \alpha + \beta_1 Treat1_{ij} + \beta_2 Treat2_{ij} + \varepsilon_{ij} \quad (2)$$

$$Resurvey_{ij} = \alpha + \beta_1 Treat1_{ij} + \beta_2 Treat2_{ij} + \gamma_j + \varepsilon_{ij} \quad (3)$$

$$Resurvey_{ij} = \alpha + \beta_1 Treat1_{ij} + \beta_2 Treat2_{ij} + \mathbf{X}_{ij}\beta' + \gamma_j + \varepsilon_{ij} \quad (4)$$

where *Resurvey* indicates whether the individual *i* was able to be resurveyed at the endline, and **X** is a vector of individual characteristics included in Eq. (1), which are also interacted with the treatment arm indicators.

Statistically significant coefficients in these estimations will indicate differential attrition exists. While we plan to use inverse probability weighting based on the likelihood of being resurveyed as a default control for attrition in our estimations, if differential attrition exists, we will also conduct robustness checks of results using Lee/Manski bounds.

6.3 Planned Estimations

To estimate effects of the intervention, we will use an Analysis of Covariance (ANCOVA) method, controlling for baseline versions of the outcome of interest. We plan to estimate both intent to treat (ITT) and local average treatment effects (LATE), in which we use assignment to a particular treatment arm as an instrument on attendance at the workshop.¹

¹This design should satisfy the conditions of LATE, such that 1) SUTVA holds (no spillovers), 2) Exclusion restriction, 3) Monotonicity, 4) Exogeneity of the instrument. The

We will conduct the following base estimations:

$$Y_{ijt} = \alpha + \beta_1 \text{Treat1}_{ij} + \beta_2 \text{Treat2}_{ij} + \gamma_j + \varepsilon_{ijt} \quad (5)$$

$$Y_{ijt} = \alpha + \beta_1 \text{Treat1}_{ij} + \beta_2 \text{Treat2}_{ij} + \beta_3 Y_{ijt_0} + \gamma_j + \varepsilon_{ijt} \quad (6)$$

$$Y_{ijt} = \alpha + \beta_1 \text{Treat1}_{ij} + \beta_2 \text{Treat2}_{ij} + \beta_3 Y_{ijt_0} + \beta_4 F_{ij} + \mathbf{R}_{ijt_0} \beta'_5 + \mathbf{X}_{ij} \beta'_6 + \gamma_j + \varepsilon_{ijt} \quad (7)$$

$$Y_{ijt} = \alpha + \beta_1 \text{TreatPooled}_{ij} + \gamma_j + \varepsilon_{ijt} \quad (8)$$

$$Y_{ijt} = \alpha + \beta_1 \text{TreatPooled}_{ij} + \beta_3 Y_{ijt_0} + \gamma_j + \varepsilon_{ijt} \quad (9)$$

$$Y_{ijt} = \alpha + \beta_1 \text{TreatPooled}_{ij} + \beta_3 Y_{ijt_0} + \beta_4 F_{ij} + \mathbf{R}_{ijt_0} \beta'_5 + \mathbf{X}_{ij} \beta'_6 + \gamma_j + \varepsilon_{ijt} \quad (10)$$

where Y_{ijt} is a primary or secondary outcome as listed above for individual i in locality j at the endline (t), and Y_{ijt_0} is the version of the corresponding outcome in the baseline, if it exists. Variable \mathbf{R}_{ijt_0} represents a vector of dummy variables indicating religion at baseline (Pentecostal, Catholic/Orthodox, or Other/None (Anglican as left out group)), F indicates whether the individual is female, and \mathbf{X}_{ij} is list of other household and demographic controls selected using a LASSO algorithm from a pool of potential controls.² We will also conduct the same estimations, but pooling the two treatment groups (*TreatPooled*), as in Eq. (8)-(10).

We further plan to conduct heterogeneity analyses to determine whether effects vary across two indicators in particular: gender and baseline religion. To this end, in separate estimations, we will interact indicators for treatment with each of these variables.

6.4 Planned Robustness Checks

6.4.1 Heterogeneous Effects by Church

Our parameters of interest are the effect of the Pentecostal treatment relative to the control group and the differential effect of the Pentecostal treatment relative

strongest assumption is that of SUTVA - in that there is no spillovers between those who attended a workshop on those in the other treatment group or the control. However, given the short time-frame in which we are conducting surveys, we argue that these spillover would be minimal, and if they exist, would only attenuate our results.

²This pool will include the following: the number of nights away in past week, years of education, baseline labor and business earnings, baseline expenditures and gifts, baseline answers to religious questions, baseline alcohol consumption, distance from home to workshop location, as well as binary and quadratic transformations.

the non-Pentecostal treatment. In our preferred specifications, Eq. (5)-(7), the effect of the Pentecostal treatment relative to the control group is β_1 and the differential effect of the Pentecostal treatment relative the non-Pentecostal treatment is $\beta_1 - \beta_2$. Our estimate $\hat{\beta}_1$ is an average treatment effect estimate across 16 host Pentecostal churches; likewise, $\hat{\beta}_2$ is an average treatment effect estimate across 4 host non-Pentecostal churches. To test whether treatment effects vary across churches, we plan to estimate separate treatment effects by church and test the null hypothesis of homogeneous treatment effects within each treatment arm. The models that we plan to estimate are:

$$Y_{ijt} = \alpha + \beta_1^k Treat1_{ij}^k + \beta_2^j Treat2_{ij}^j + \gamma_j + \varepsilon_{ijt} \quad (11)$$

$$Y_{ijt} = \alpha + \beta_1^k Treat1_{ij}^k + \beta_2^j Treat2_{ij}^j + \beta_3 Y_{ijt_0} + \gamma_j + \varepsilon_{ijt} \quad (12)$$

$$Y_{ijt} = \alpha + \beta_1^k Treat1_{ij}^k + \beta_2^j Treat2_{ij}^j + \beta_3 Y_{ijt_0} + \beta_4 F_{ij} + \mathbf{R}_{ijt_0} \beta_5' + \mathbf{X}_{ij} \beta_6' + \gamma_j + \varepsilon_{ijt} \quad (13)$$

where $Treat1^k$ indicates whether the individual was assigned to host church k in treatment arm 1 and $Treat2^j$ indicates whether the individual was assigned to treatment arm 2 in locality j . The null hypotheses to be tested are $\beta_1^k = \beta_1, \forall k$ and $\beta_2^j = \beta_2, \forall j$. Rejecting either null hypothesis would be evidence of heterogeneous treatment effects, and suggest that our average treatment effects estimates are not simply a denomination-specific effect but the average of church-/pastor-specific effects that vary within a denomination.

6.4.2 Variable Construction: Choice experiment results

Our primary outcomes of interest, the choice experiment results, may have outlier values. To see if our results are sensitive to outlier values, we plan to re-estimate Eq. (5), (8), and (11) with each choice experiment result as the outcome variable when excluding the top 5% of contributions for any given choice experiment result.

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