

Gender, Deliberation, and Natural Resource Governance: Experimental Evidence from Malawi*

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Abstract

Programming to combat climate change often strives to include women's voices, but there is limited evidence on how this feature influences program design or its benefits for women. We examine the causal effect of women's representation in climate-related deliberations using the case of communally managed forests in rural Malawi. We run a lab-in-the-field experiment that randomly varies the gender composition of six-member groups asked to privately vote, deliberate, then privately vote again on their favored solution from a set of policies to combat deforestation. We find that women have relatively more influence in group deliberations when they make up a larger share of the group. This result cannot be explained by changes in participants' talk time. Rather, women's presence changes the content of deliberations in ways that likely grant women more influence. Our work suggests that including women in decision-making can shift deliberative processes to support historically marginalized resource users.

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Introduction

Women’s inclusion is now the norm in global and local initiatives to combat climate change.¹ Interventions that target women’s participation often reference the disproportionate burden women face from a warming planet, particularly in rural agricultural settings (Brulé 2022; Deininger et al. 2023, 2).² Yet how women’s representation affects climate-related governance is still poorly understood. We examine the causal effect of women’s representation on deliberations to address the over-harvesting of community managed forests in rural Malawi. The rapid decline of Malawi’s forest cover makes it a typical case of tropical deforestation—the second largest source of greenhouse gas emissions after fossil fuel combustion, and estimated to cause about one-quarter of anthropogenic carbon emissions worldwide (Kindermann et al. 2008).

We run a lab-in-the-field experiment that randomly varies the gender composition of six-member groups asked to privately vote, deliberate, and then privately vote again on their favored solution from a set of policies aimed to combat deforestation in nearby communally managed forests. We worked with community leaders to assemble groups ranging from all women to all men (i.e., seven treatments). We measure influence in several ways, including through participants’ own assessment of who was most influential, through the assessment of a hypothesis-blind enumerator observing individual contributions and group dynamics, and through a secret vote by all group members on who was most influential. Across measures, we find that women’s *relative* influence increases when there are more women in the group. Put another way, women’s inclusion does more than just increase women’s aggregate influence; it also increases the likelihood that any given woman will influence group deliberations. We find that peer assessments of women’s influence increases particularly starkly among men in the group, who are much more likely to recognize women’s influence in settings with more women. We also find that when women are in the majority, group

¹For example, within the United Nations Framework Convention on Climate Change (UNFCCC) there is a formal “Women and Gender Constituency” and a “Gender Action Plan.” Likewise, the Green Climate Fund has a “Gender Policy and Action Plan.” See <http://womensgenderclimate.org> and <http://www.unwomen.org/en/news/stories/2017/11/announcement-first-ever-gender-action-plan-on-climate-action-adopted>

²See also, for instance: <https://www.greenclimate.fund/how-we-work/mainstreaming-gender/gender-action-in-practice>.

decisions are more likely to match women’s pre-treatment policy preferences.

We next test implications associated with mechanisms that may explain our findings. Contrary to expectations we pre-specified, we do not find that women speak at much greater length in the company of more women. We also do not find that group dynamics become more collaborative as women’s representation increases. Rather, using structural topic models based on the discussion transcripts, we find that the substance of group discussions changes as women’s presence grows. Group discussions tend to include more time on topics that are gendered female (e.g., cooking) and less time on topics that are gendered male (e.g., policy enforcement) in groups with more women, possibly granting women more authority in these settings.

Our findings speak to a growing body of work investigating how women’s representation shapes deliberative processes and outcomes (Karpowitz and Mendelberg 2014; Parthasarathy, Rao and Palaniswamy 2019). This research collectively demonstrates that women’s presence matters; it shapes the nature of group deliberations in ways that tend to reflect women’s preferences and priorities. Our results add to this evidence. We find that women’s presence shapes the content of discussions in ways that likely grant women more authority, particularly in the eyes of men. Our work also speaks to a growing research agenda on how the climate crisis is gendered (see, e.g., Brulé 2022; Bush and Clayton 2022). In the Global South, women face the precarious position of both being more affected by extreme weather events caused by climate change, and having little say in local decision-making focused on mitigation and adaptation (Kumar and Quisumbing 2014; Agarwal 1992). Our findings provide new evidence that including women in local initiatives to combat climate change can shift group deliberations in ways that amplify the influence of historically marginalized resource users.

Motivation and Previous Work

Our work contributes to and bridges several literatures. First, it draws on a rich literature in political science and economics on interventions to improve the management of common pool

resources (Ostrom 1990). Recent experimental work has shown the efficacy of various practices, such as community monitoring (Slough et al. 2021; Samii et al. 2014) and experiential learning (Meinzen-Dick et al. 2018, 2022), to reduce the over-exploitation of these resources. Some observational work has also examined how the inclusion of historically marginalized resource users affects natural resource management. For instance, Agarwal (2009) and Agarwal (2010) study forest user groups in India and Nepal and find a positive correlation between the proportion of women on governing bodies and improved forest governance and resource sustainability. We move this literature forward by examining how women’s numeric representation in the management of common pool resources causally affects deliberation itself, in addition to its outcomes.

Our work is also motivated by the substantial body of scholarship on the substantive impact of women’s representation on public policy. Promoting gender equality in political representation has been shown to increase public expenditures on goods and services women prefer, including education (Svaleryd 2009; Beaman et al. 2012), public health (Clayton and Zetterberg 2018), drinking water (Bratton and Ray 2002; Chattopadhyay and Duflo 2004*a*), and policies that broadly support working mothers (e.g., Schwindt-Bayer 2006; Kittilson 2006; Weeks 2022). New work in this vein is also beginning to examine the link between women’s presence in national legislatures and pro-environmental outcomes in the Global North (Atchison and Down 2019; Salamon 2023). Similarly, while researches cannot randomly vary the gender compositions of legislatures, some observational work suggests that women change their behavior in the presence of more women. For instance, in New Zealand, Grey (2002) finds that women parliamentarians verbally represent themselves as women more often after surpassing fifteen percent of the legislature, and in Argentina, Barnes (2016) finds that women’s relative propensity to collaborate with other women increases as they comprise a larger share of the legislative chamber. Our work allows us to casually assess if local-level deliberations can similarly be influenced by the gender of those making decisions.

Finally, our research speaks to an emerging body of work on how a group’s gender composition causally affects women’s willingness to participate in political discussions. In an influential series of lab experiments in the United States, Karpowitz and Mendelberg (2014) find that women are more

likely to speak in groups as the number of women present increases and decisions are made through majority rule. In a field experiment with undergraduate students in the United States, Stoddard, Karpowitz and Preece (2020) find that lone women in otherwise all-male settings are seen as less influential by their peers and are less likely to be chosen to represent the group than women on majority-women teams. In a lab experiment in Switzerland, Born, Ranehill and Sandberg (2018) find that as the number of men in the group increases, women become less confident about their relative performance and become less influential and more swayed by others in groups discussions. Collectively, this body of work suggests that women are constrained by social expectations about who should participate in group decisions, and these constraints seem to be ameliorated as the number of women in the group increases. These insights inform our theorizing, as we apply them outside of the Global North university setting.

Gender and Deforestation Preferences

We are interested in whether and how women are able to influence deliberations over the management of community forests. An initial question in this line of inquiry is whether men and women have different preferences on this issue. Whereas a robust literature across lower-income countries suggests that men and women tend to hold different policy priorities (Chattopadhyay and Duflo 2004*b*; Clayton et al. 2019; Gottlieb, Grossman and Robinson 2018), this work often does not examine issues related to environmental concerns. Moreover, related research presents mixed expectations. On the one hand, some recent experimental work suggests that women might be more conservation-minded than men. Through behavioral game experiments conducted in Peru, Tanzania, and Indonesia, Cook, Grillos and Andersson (2019) find that gender-balanced groups indicate a greater willingness to reduce tree harvesting compared to male-majority groups. Moreover, women's traditional roles including gathering firewood, tending crops, and collecting water may mean that they are especially affected by the depletion of natural resources, which could motivate resource conservation (Doss et al. 2018; Deininger et al. 2023; Agarwal 1992).

However, other studies find that men are better stewards of the environment, either because they are more likely to adopt new technologies and resource monitoring practices that are associated with improved sustainability (Mai, Mwangi and Wan 2011; Mwangi, Meinzen-Dick and Sun 2011) or because they have greater interactions with conservation agencies (Villamor et al. 2014). Additionally, in very low-income countries like Malawi, men tend to know more about climate change and feel more strongly that actions should be taken to stop climate change than do women. In the 2022 Afro-Barometer survey in Malawi, 79 percent of men respondents reported having heard about climate change versus 69 percent of women respondents. Moreover, among those aware of climate change, 50 percent of men respondents strongly agreed that “ordinary Malawians can do a lot to stop climate change,” whereas only 39 percent of women respondents chose this category. These mixed findings leave an open question about the size and scope of gender gaps on this issue, and we have no *a priori* expectations here. As a first step below, we inductively explore whether and how men’s and women’s preferences diverge in this policy area before investigating how women’s representation influences group deliberations on this topic.

How Gender Composition Shapes Group Deliberations

We are interested in the content of men’s and women’s preferences on deforestation policy, and the extent to which women’s representation affects women’s relative influence in group deliberations on this topic. Our focus on women’s influence relative to their share of the group is a hard test. Most work on how women’s representation affects policy outcomes examines whether women’s presence matters in the aggregate sense, sifting policy outcomes to be more aligned with women’s preferences (see, e.g. Clayton 2021, for a review). Here, however, we are interested in the influence of the average woman, and how this changes in settings with different gender compositions. Our primary pre-registered expectation is that women will have more relative (not just absolute) influence in group decisions as their representation increases. As a result, we anticipate that group deliberations and group decisions will be more reflective of women’s preferences in increasingly women-majority

groups.³

We expect this process to occur through two main channels. First, women may change their behavior, and more actively participate in group deliberations (i.e., talk more), as their share of the group increases. Women may feel more comfortable and more confident voicing their opinions in settings with more women. When women are in the minority, they may feel more reticent to share their views in the presence of men group members because social norms tend to ascribe men with more authority, particularly in the realm of political decision-making. There may also be strong social stigmas against being overly outspoken or disagreeing openly with men. We expect this to be most acute in “token” women settings—or groups in which one woman is in deliberations with only men (Stoddard, Karpowitz and Preece 2020). If participation is positively correlated with influence (Karpowitz, Mendelberg and Shaker 2012)—that is, if talking more makes one more influential—then we expect that women will speak more in and thus have more influence over group deliberations as their numbers grow.

The second mechanism through which women may gain more influence in settings with more women is if they are increasingly recognized by others for the contributions that they do make. There are at least two observable ways through which this may occur without women actually speaking at greater lengths. It could be that women are more likely to recognize other women’s contributions than are men. There are many subtle ways in which speech can be either recognized or ignored, and women are often not acknowledged for their contributions to group deliberations to the same extent as men (Parthasarathy, Rao and Palaniswamy 2019; Clayton, Josefsson and Wang 2014). For example, men may be more likely than women to “talk past” a woman speaker, pivoting the subject and undervaluing her comments, or outright interrupting her (Holmes 2013). In this case, we would expect women’s relative influence to increase in group with more women simply because there are more group members predisposed to acknowledge and appreciate their contributions (i.e., more women). Additionally, other group members (men or women) could *change* their behavior in the presence of more women by increasingly recognizing women’s comments.

³Our pre-analysis plan is included in SI I.

This could occur if decision-making bodies become more collaborative as women's share of the membership increases (Barnes 2016; Holman and Mahoney 2018), creating an environment in which everyone's contributions are more likely to be acknowledged. Overall, we thus expect women's relative influence to increase in groups with more women; and this may occur either with or without an equivalent uptick in women's actual speech levels.

Having more women in a group may change group dynamics in ways that fuel both of the above mechanisms (i.e., spurring women to talk more, and making groups more receptive to them). A key way is by altering the substantive content of group discussions. Above, we described how preferences towards deforestation policy might be gendered. In such instances, conversations about the topic could go in a different substantive direction in groups with more women. For instance, women are responsible for cooking in village daily life in Malawi. One of the main uses of forest resources is the collection of charcoal, which women use in cooking. If a group with more women spent more time discussing this dimension of forest management, women's substantive expertise might lend them more authority than they might have in a group discussing other policy dimensions. This perceived authority could increase women's talking time and/ or increase others' receptivity to their contributions.

Our final pre-registered expectation pertains to the durability of gender gaps in participation and influence more broadly. Although we expect that women's relative influence will increase in groups composed of greater shares of women, we also expect that across all mixed-gender groups, men will still participate more actively and have relatively more influence than women, on average. In Malawi, as in most other settings around the world, patriarchy is an organizing feature of daily life. In our pre-treatment survey, we find that men have more interest in politics than women, have more confidence in their own political abilities, and are more likely to have recently contacted a local or national leader (see SI Table A). The persistence of entrenched gender roles and pre-existing gender gaps in political participation means that women are unlikely to be as active as men in group discussions. Thus, we expect that gender gaps will shrink as women's presence grows, but they are

unlikely to fully close in any mixed-gender setting.⁴

The Case: Malawi's Communally Managed Forests

Malawi is the midst of a deforestation crisis. Sixty-five percent of Malawi's forests are located on customary land. Communities overharvest these forests for charcoal production, firewood, and livestock grazing (Ngwira and Watanabe 2019). The results of deforestation and forest degradation have been devastating. Between 1972 and 1992, Malawi's total forest cover fell from 47 percent of total land cover to 20 percent. Estimates of the current rate of deforestation are between an annual average loss of 164,000-460,600 hectares of forest cover, the highest rate of deforestation in the Southern African Development Community (UN-REDD Programme 2017).

The over-exploitation of forests reserves threatens livelihoods in communities that depend on them. Yet avoiding over-harvesting of communal forests in Malawi and other developing countries is extremely difficult as community members face enormous incentives to over-harvest. Households often rely on selling forest products like charcoal for subsistence and cannot afford to forgo the income generated by current harvesting behavior despite its high long-term costs (Ngwira and Watanabe 2019). The relatively slow regeneration rates of forests also means that future income streams can take years to materialize (Eisenbarth, Graham and Rigterink 2021).

Our research question on the role of gender in decisions around forest management is of particular relevance in Malawi, where women are formally required to occupy either half or one-third of the positions on Malawi's key land administration institutions, including land tribunals and customary land committees. These requirements are often loosely enforced, if at all (UN-REDD Programme 2017). Women also face many informal barriers to accessing information and fully participating in decision-making due to gender norms and gendered differences in access to resources (Mawaya and Kalindekafe 2010; Alkire et al. 2013; Mudege et al. 2017), even though as the primary gatherers and users of natural resources, their participation is crucial (Mawaya and Kalindekafe 2010).

⁴In our PAP, we also registered two alternative hypotheses, as well as hypotheses about the effect of our treatments of women's political efficacy, which will be the subject of future work.

Study Design and Estimation Strategy

Our study sites comprise 90 communities adjacent to Malawi’s Zomba and Malosa Forest Reserves. We randomly selected these communities from among the 216 communities within three kilometers from the Zomba or Malosa Forest Reserve boundary, a distance that implies that activities within the forest reserves are accessible and thus relevant to them. Figure 1 shows a map of the study area. The Zomba and Malosa Forest Reserves have lost 25% of their tree coverage during the last 20 years (*Global Forest Watch* 2021). These surrounding communities rely upon wood harvested from the reserve for their cooking fuel and heating, and many residents’ livelihoods depend on harvesting and reselling wood and charcoal in local markets (Moyo, Chikuni and Chiotha 2016). At the same time, communities near the reserves also pay the short- and long-term costs of deforestation, including devastating mudslides and flash floods, reduced water supply, worse air quality, soil degradation, increased disease burdens, and less overall forest land to utilize in the future. Past research demonstrates that most residents understand the negative implications of deforestation but face significant incentives to exploit the resource beyond sustainability (Moyo, Chikuni and Chiotha 2016). Virtually all participants in our pre-treatment survey (97 percent) indicated that the over-harvesting of nearby forests was a “big problem” in their community.⁵

Our project brought together ordinary Malawians to discuss the issue of deforestation through discussions facilitated by a trained moderator. These citizen groups serve two purposes. First, this exercise allows us to establish whether and how deforestation preferences and deliberations are shaped by participant gender, laying the groundwork for future work to interrogate this question within actual governance bodies. Second, forests on customary land in Malawi (like the Zomba-Malosa Forest Reserve) are managed by democratically-elected land tribunals—small groups that mirror the citizen groups our study creates. We designed our study to mimic the actual forest governance structures in place such that our results might be applicable to these bodies.

In each community, we worked with community leaders to assemble seven groups of six members each, with every possible combination of women and men represented (i.e., a group of zero women,

⁵Response options were: not a problem at all, somewhat of a problem, or a big problem.

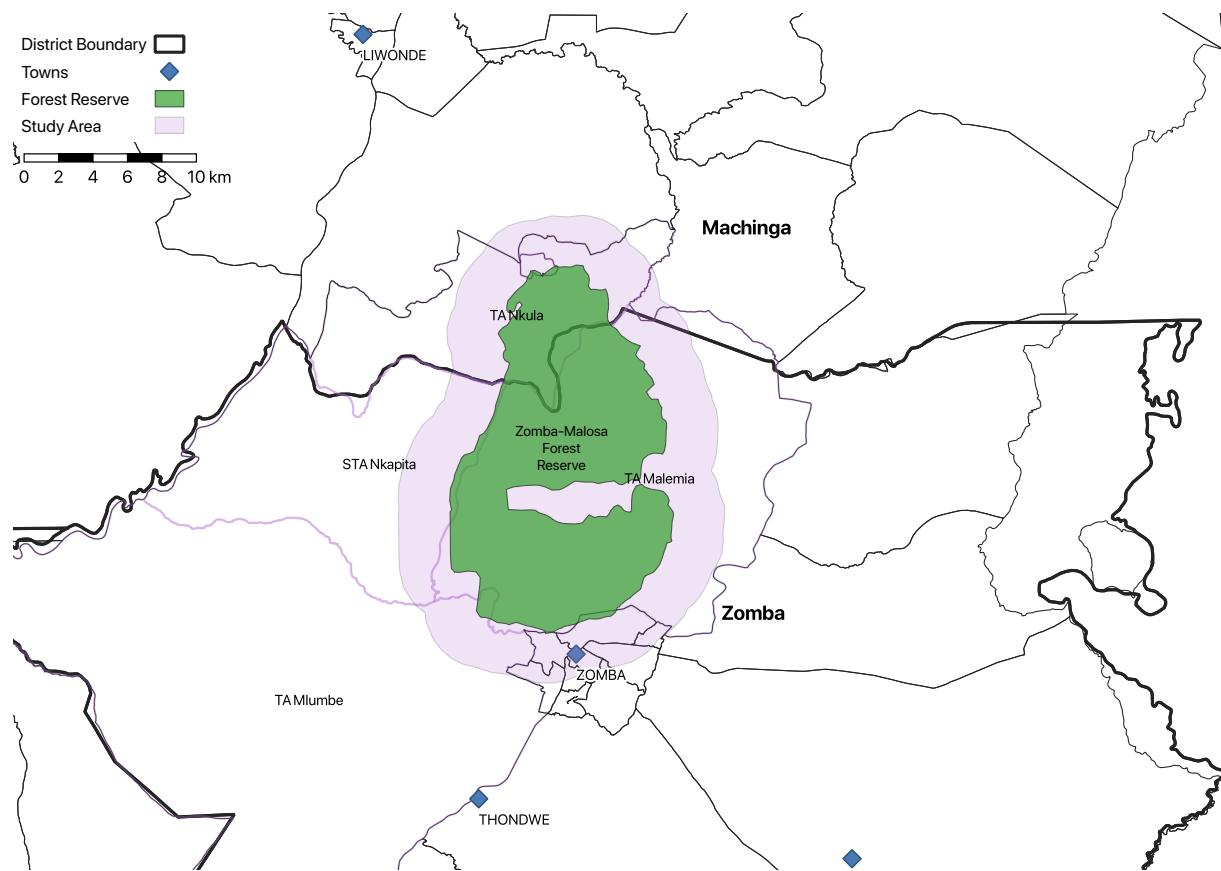


FIGURE 1 Map of the Study Area within 3km of the Zomba-Malosa Forest Reserve in Zomba and Machinga Districts, Malawi.

six men; a group of one woman, five men; . . . , and a group of six women, zero men). The study proceeded in the following steps:

1. Introduction of the study to the whole group (42 participants across seven groups of six members each)
2. Consent process with each participant, one by one
3. Randomization into groups by drawing cards
4. Pre-treatment survey, including secret vote on preferred policy from among a set of specifically, frequently-discussed options
5. Group discussion (i.e., deliberation over policies)
6. Secret vote over the same set of policies
7. Post-treatment survey

Our strategy has several advantages. Step (4) allows us to collect a pre-treatment measure of men’s and women’s preferences before any deliberation takes place. Through the secret vote in step (6), we can gauge whether and how women and men were differently persuaded by the previous discussion. And step (7) allows us to gauge how influential men versus women were in shifting the group’s decisions to reflect their own preferences. The design also allows us to measure how various group compositions affect women’s participation in group discussions across treatment groups.⁶

The key feature of our intervention is that the gender composition of deliberating groups is randomly assigned. The resulting sample includes 630 groups of 6 individuals each (N=3,780; 1890 men and 1890 women), with 90 groups (540 participants) in each of the seven treatment conditions. By blocking at the community (i.e., village) level, we have one group to each of the seven treatment conditions within each of the 90 communities. This allows us to use community fixed effects and lends greater precision to our estimates.

After administering the pre-treatment survey to each respondent, the moderator led the group in a discussion about deforestation policy. All groups followed the same format, responding to and

⁶We structured the exercise to result in a majority-rule vote for two reasons. First, this type of decision rule tends to be the most common in local governance structures around the world, including in the democratically-elected land committees that govern this space in rural Malawi. Second, in Karpowitz and Mendelberg (2014)’s foundational study, group deliberations with decisions made through majority rule (as compared to consensus) were the settings in which women’s rising numbers equated to their increased participation and influence. As ours is the first experimental study of its kind (i.e., randomizing group compositions) that we know of outside of the university and/ or lab setting, we sought to design our intervention to maximize our ability to detect potential effects.

deliberating over two prompts. The first prompt asked the group to reflect on the issue of climate change generally. The moderator asked the group:

First let's start with discussing the issue of climate change. Do you think climate change will affect this community? If so, how?

This first prompt allows us to better understand how respondents view the issue of climate change in general, and whether and how they connect it to the very local problem of deforestation. Overwhelmingly, respondents see the degradation of communal forests as connected to both local climate issues, such as soil erosion and mudslides, and more generalized climate change issues, such as unstable weather patterns. The response below is representative:

Climate change will affect us so much with things like disasters, like floods, scarcity of rainfall, and soil degradation. This means we will not have food. Hunger will hit us. If rain is scarce then we will not have water. Drought will be everywhere and it will be hard on us. Hunger will be everywhere (Man, Ngolonje Village, Zomba District).

The second prompt introduced several policies to combat deforestation. The policy options were drawn from a review of the literature on deforestation in Malawi and tropical deforestation in other developing countries and from eight initial scoping focus group discussions in communities adjacent to the study sites. They would thus likely be options with which participants would be familiar. The prompt read as follows:

Now we will shift to discussing the problem of deforestation. As we explained earlier, we want to understand how Malawians think about potential solutions to the problem of over-harvesting of forest products. Before this discussion, we asked each of you about your personal opinion on some solutions that others in the country have suggested. Now, we'd like you to come together as a group to discuss which solution you think will be most effective to stop the problem. After this discussion, each of you will vote on your preferred solution. We will collect each group's vote and share this information anonymously with officials in the local forestry offices. The proposed solutions are: [Moderator shows cards with pictures depicting each solution while describing each, shuffling cards so that the order of introducing each solution is random.]

- **Community Enforcement:** *Set rules/by-laws against over-harvesting and charcoal production which are monitored and enforced by a community committee or the chief*

- **Government Enforcement:** *Set rules/by-laws against over-harvesting and charcoal production which are monitored and enforced by government-employed forest guards*
- **Replanting Incentives:** *Create an incentive program that pays community conservation groups for each seedling that is planted in communal forests and survives the first year*
- **Civic Education:** *Offer trainings to make members of the community aware of the consequences of over-harvesting*
- **Alternative Cooking Methods:** *Provide materials and training to use alternative cooking techniques (e.g., chititezo mbaula stove) or alternative fuel (e.g., briquettes) to reduce demand for wood*
- **Jobs Training:** *Provide small business training solely for those individuals who currently engage in over-harvesting, so that they can provide for their families without harvesting trees.*

First, please go through and discuss each proposed solution as a group, touching on the pros and cons of each proposed solution. I will give you time to discuss among yourselves without weighing in. When you are done discussing, we will ask each of you one-by-one in private to tell us your vote for the solution you think is most likely to be effective, and then I will tally the votes and report the solution(s) with the most votes.

We recorded, transcribed, and translated all group deliberations and merged each respondent’s contributions with his/her pre- and post-treatment survey responses. In total, our data comprise approximately 20,000 unique statements across the 3,780 participants.⁷ Each group had a facilitator that led the group discussion and a separate enumerator (note taker) who, in addition to administering the pre- and post-treatment surveys, also observed and recorded the group dynamics through an enumerator survey. Our analyses include both individual (i.e., respondent) and group-level outcomes.⁸ For individual-level outcomes, our models include both survey enumerator and community fixed-effects and have standard errors clustered by discussion group \times community. For group-level outcomes, our model employs discussion facilitator fixed effects and standard errors clustered at the community level.⁹ On average, men and women participated quite actively, with 90 percent

⁷A statement is something that is preceded by and then followed by another speaker. It can thus be as short as one word or as long as several paragraphs.

⁸We employed men and women facilitators and enumerators. Enumerators administered the surveys and observed focus group dynamics, while facilitators ran the discussion groups. Enumerators were trained to understand that the study was about deforestation, not about gender, thus reducing incentives to report what they think they researchers hope to find (i.e., demand effects).

⁹Note that for the individual-level outcomes, we use enumerator fixed effects and for the group-level outcomes, we use facilitator fixed effects.

of men participants and 89 percent of women participants speaking at least once during the group deliberation. On average, group discussions of the two prompts lasted about 35 minutes.

Results

Gender differences in pre-treatment preferences

We first test whether and how men and women differ in their opinions about the most effective ways to combat deforestation. Before group deliberations, we presented respondents with a list of policies to curb over-harvesting in the nearby Zomba Malosa forest reserve. Enumerators first showed each respondent cards with an image depicting each policy as they explained the details of each. Enumerators then asked each respondent to privately select the policy that they thought would work best in their community to prevent over-harvesting by pointing to the associated card. Figure 2 shows the percentage of men and women respondents who selected each policy.

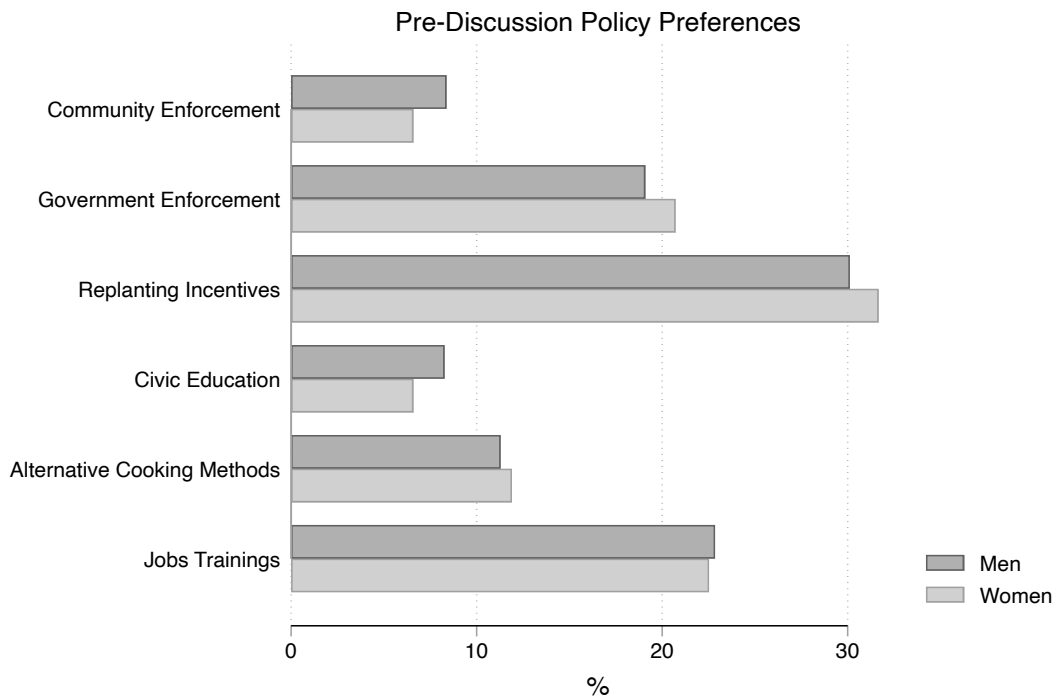


FIGURE 2 Gender differences in pre-treatment preferences on deforestation policy

Men and women have the same ranking of policy responses. Both groups tend to prefer policies offering remuneration or services (replanting incentives and job trainings) over those aimed at altering behavior or stepping up enforcement actions. Still, we identify some moderate gender differences. Men are significantly more likely than women to prefer community enforcement policies and civic education programs about the consequences of over-harvesting. Women, in contrast, are slightly more likely than men to prefer government enforcement and replanting incentives, although these differences do not reach traditional significance levels (see SI B). This suggests that some preferences around how to combat deforestation are gendered, and that women’s inclusion might influence the content of policy solutions chosen. However, these preferences diverge less than we anticipated and we discuss what this might mean for the scope conditions of our findings below.

It is important to underscore, however, that even if men’s and women’s preferences were the same on average, the fact that we are considering an issue with six possible options—none of which represents more than 30% of participants’ preferred choice—makes that the likelihood that any given woman and any given man disagree is quite high. Indeed, this is an advantage of our experimental setup, in which there are not only two options over which to choose. Additionally, individuals’ knowledge of these policy options may have been low, and the deliberation itself may confer additional, relevant information that is useful for refining one’s policy priorities. Once informed, men and women’s policy preferences may be significantly more divergent—with women realizing which policy options benefit them most as women, and men realizing which benefit them most as men.

Measuring women’s influence

We measure women’s relative influence in several ways. The first is based on responses to a survey question asked after the group deliberations and secret vote. The question read: “Which one person was the most influential in the group’s discussions and decisions?” First, we analyze how well group gender composition predicts the likelihood that women and men respondents rated themselves as the most influential person in their group. Self perceptions of influence may accurately reflect group

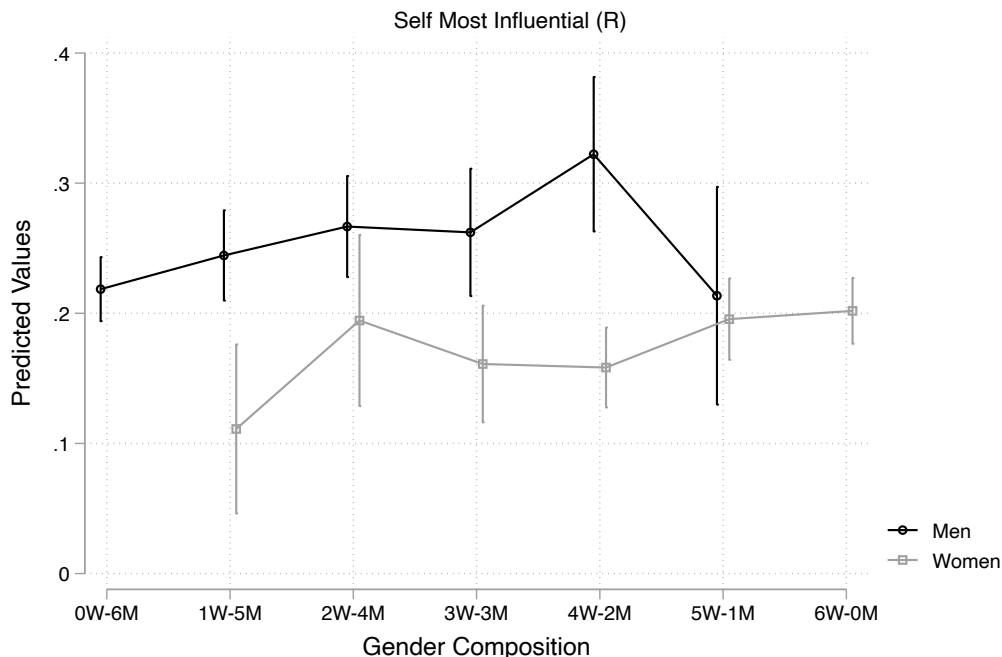


FIGURE 3 Average likelihood that men and women participants rate themselves as the most influential group member by treatment condition.

dynamics and/ or they may capture one’s self-confidence in his/ her ability to sway decisions. The objective odds that the respondent was actually the most influential person in their six member group are 1 in 6, or 0.167, and this serves as a helpful benchmark for us to assess whether men or women are more or less likely to rate themselves as the most influential than they would if picking the “most influential” person by random chance. We plot these results in Figure 3. Black lines and circles correspond to men participants, gray lines and squares indicate women participants, and we visualize 95 percent confidence intervals around the estimated value of each treatment condition.¹⁰

Consistent with our expectations, Figure 3 shows that women’s likelihood of rating themselves as the most influential group member generally increases as the number of women in the group grows. This increase is substantively meaningful. Women move from an average likelihood of just over 10 percent in the one woman condition to a 20 percent likelihood of rating themselves as the most influential in the all-women condition. The group composition for which the men and women

¹⁰We offset men’s point estimates and confidence intervals slightly to the left, and women’s slightly to the right, to avoid lines from each gender obscuring the other.

respondents' probabilities of rating themselves as most influential are the closest (and statistically indistinguishable) is the group composition with five women and one man. Men's likelihood of rating themselves as most influential varies less clearly with group gender composition. Further, consistent with our expectations, we find that in all groups, the probability that men rate themselves as most influential exceeds that of women. Also, for all groups, men vote themselves as most influential more than 20% of the time (far above the 0.167 benchmark).

We next turn to a measure of influence from our enumerator survey. Here we use whether the enumerator observing group dynamics selected a woman as the most influential member of the group.¹¹ To capture women's relative influence, within each treatment condition, we divide the total number of votes that women received by the total number of women in that study arm (across groups). If there were no gender differences in influence as perceived by the enumerator, as above, this number would equal 0.167 (i.e., 1/6) for all treatment conditions. In contrast, as Figure 4 shows, any given woman's likelihood of being rated by the enumerator as the most influential in the group is always below 0.167 except in the all-women group, where it is by definition 0.167. As we expected, men always have relatively more influence than women in mixed gender groups. Yet, as the number of women in the group grows, any given woman becomes increasingly likely to be rated as the most influential in her group. Again, note that here we are normalizing by the number of women in each treatment condition, so this is not a mechanical relationship: any given woman becomes *relatively more influential* as she has more women around her.

As a final measure, we gauge how respondents view their peers. Again, we use the question that asked participants to tell us in private who they thought was the most influential group member after the deliberations concluded. We measure group perceptions of influence by counting the number of votes each participant received. We measure relative influence at the group level by counting the total number of votes that women members received and dividing that count by the total number of women in the group. When this measure equals one, women have influence in the discussion in proportion to their share of the group. Values less than one indicate that men are more influential

¹¹The question on the enumerator survey reads: "Of the six participants, which one was the most influential?"

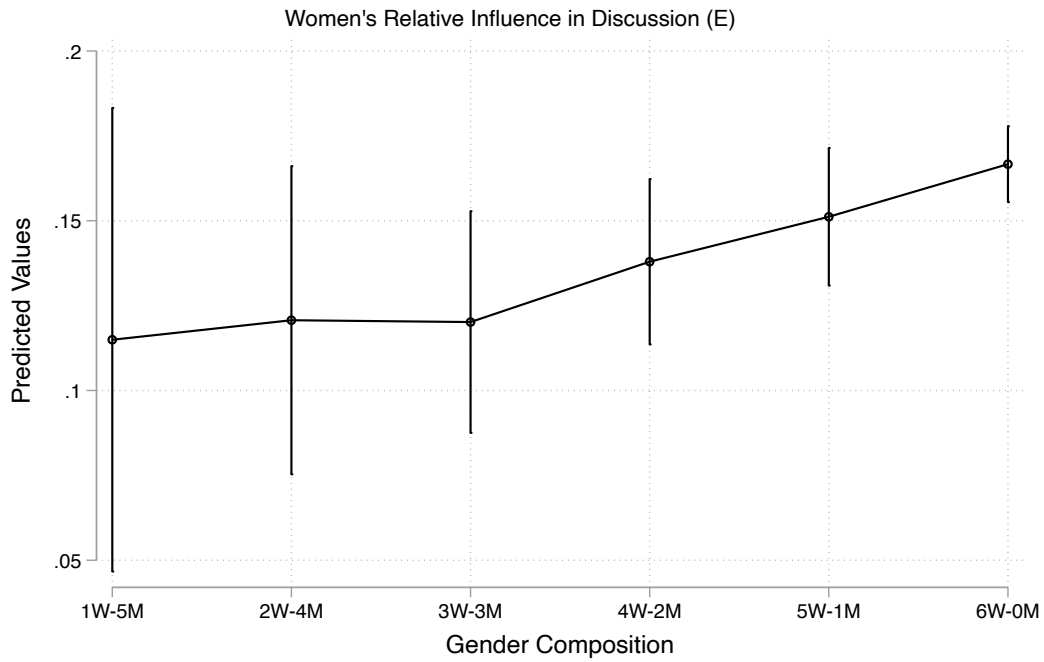


FIGURE 4 Women's relative influence in group discussions from enumerator ranking. Calculated by dividing the total number of votes that women received from the enumerator by the total number of women in that study arm (across groups). If there were no gender bias, the ratio would be 0.167

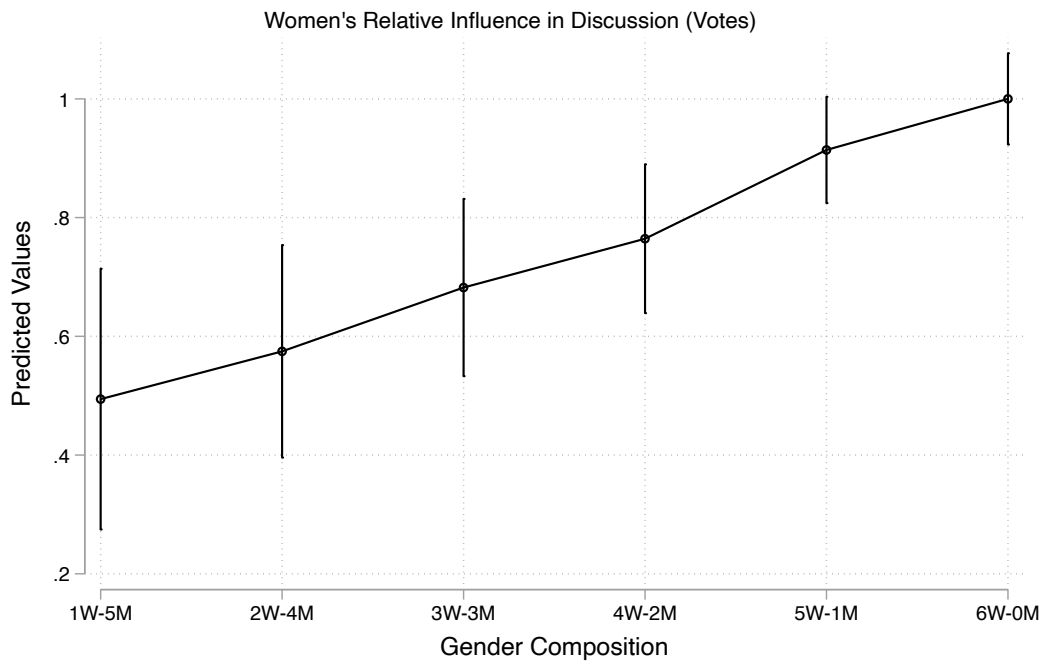


FIGURE 5 Women's relative influence in group discussions from peer assessments. Calculated as the sum of votes that women members received divided by the total number of women in the group. Values less than one indicate that men are more influential than women.

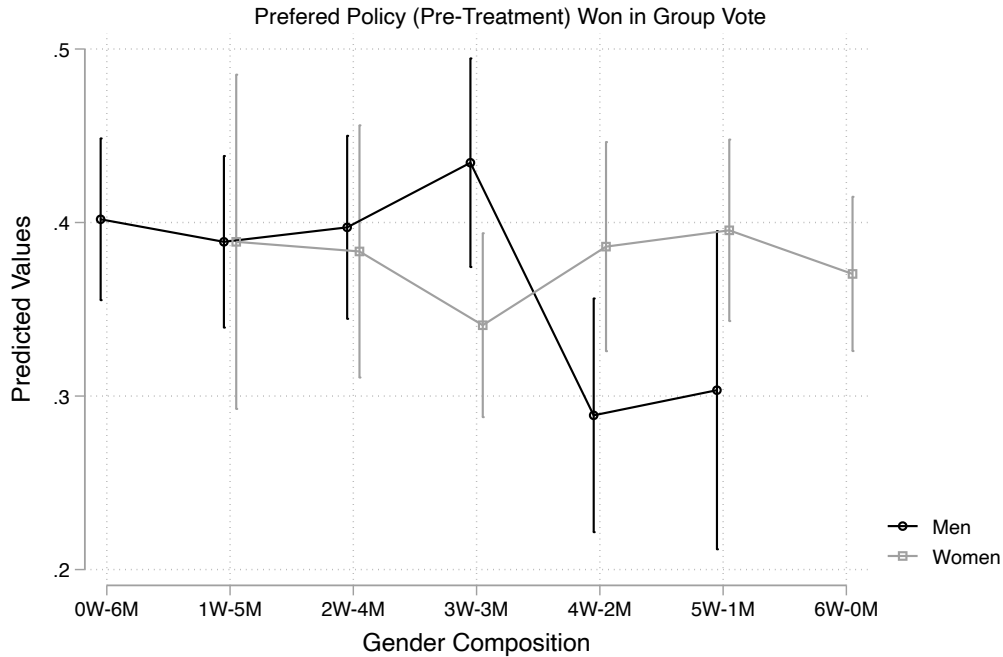


FIGURE 6 Gender differences in the likelihood of one’s pre-discussion policy preference winning the group vote by gender and gender composition of group

than women and values greater than one indicate that women are more influential than men. Figure 5 reveals that women’s relative influence increases monotonically as the number of women in the group increases. Again, this increase is substantively meaningful. When a woman is alone in a group of men, her relative influence is about half of what it should be by random chance. When women make up five of the six group members, they become closer to reaching parity, closing $\approx 90\%$ of the gender influence gap.

All three of our influence measures—group members’ assessment of their own influence, enumerators’ assessment of group dynamics, and group members’ assessments of their peers—point in the same direction and offer strong support for our core hypothesis: when women are surrounded by more women, their relative influence in group decisions increases.

Yet perceptions of influence may not necessarily equate with actually changing the group’s vote. Recall that after group deliberations, we asked each group member to vote in private on their preferred policy solution to combat deforestation (repeating their pre-deliberation, private vote). To analyze the extent to which women and men influence group votes across study arms, we

turn to each respondent’s pre-deliberation policy preference, which we compare with the group’s post-deliberation vote. Figure 6 plots the predicted likelihood that a respondent’s pre-discussion policy preference won in the post-discussion group vote by treatment condition for both men and women participants. In men-majority groups, men and women are similarly likely to have their (pre-treatment) preferred policy win in the group vote. In evenly split groups, men have a higher likelihood of having their preferred policy selected. When women become majority group members, they become more likely than men to have their preferred policy win the group vote.¹² Again, only in women-majority groups do we see women on average receiving more votes than do men for their preferred policy preferences.

Why are women more influential in the presence of other women?

Above, we theorized that there are two ways whereby women’s relative influence in group decisions might increase with their share of the group: (1) women may speak more in group settings with more women, and/ or (2) women may be more likely to be acknowledged for their contributions in these settings. The former implies a change in women’s behavior, whereas the latter does not necessarily depend on this.

The first mechanism rests on the assumption that talk time is positively correlated with influence. Our data somewhat support this intuition. From the transcript data, we count the number of words each respondent contributes to his/ her group’s deliberation and merge these data with our influence measures above. These measures trend together; for instance, the number of words spoken by a respondent is positively correlated with the enumerator picking the respondent as the most influential person in the group ($\rho = 0.42$, $p \leq 0.001$). While these correlations are significant, we also note that they are substantively moderate, and appear to be smaller than those identified by Karpowitz, Mendelberg and Shaker (2012) in their foundational study on gender and speech patterns (Karpowitz, Mendelberg and Shaker 2012, 542). This suggests that while talk time does

¹²A similar pattern emerges in when we consider not whether a respondent’s pre-treatment policy preference won the vote, but how many votes their pre-treatment policy preference received (i.e., the intensive margin of influence as opposed to the extensive margin, see SI E.)

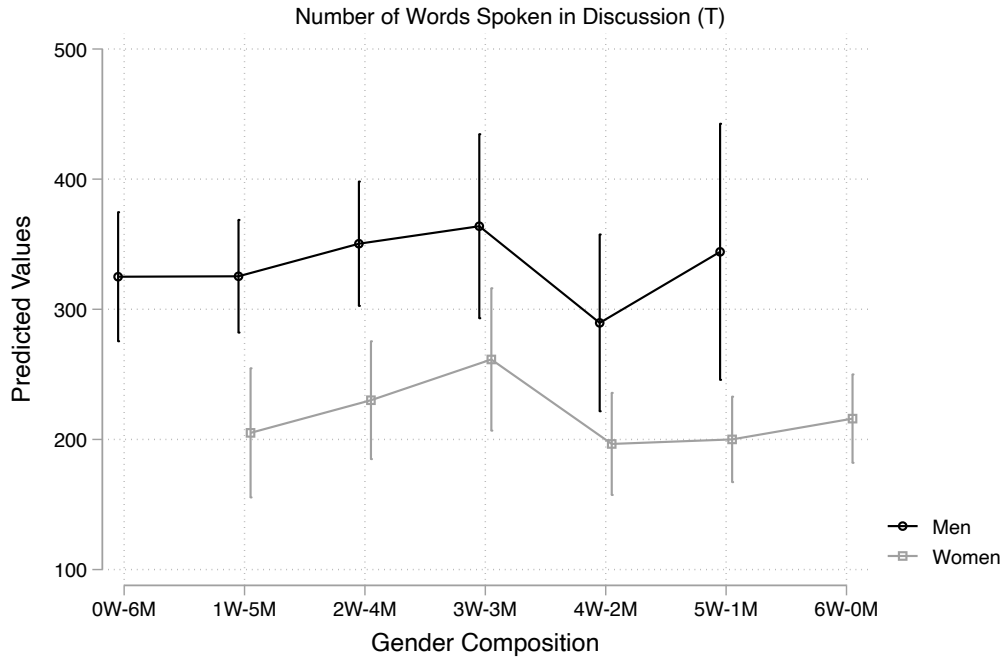


FIGURE 7 Gender differences in number of words spoken in discussion by gender composition. Women’s average levels in orange, and men’s average levels in blue. Circle size indicate number of respondents per treatment condition.

translate to speaker influence, there may also be other dynamics at play in our context.

We next analyze how gender composition affects women’s participation in group deliberations. Figure 7 shows the average number of words spoken by men and by women during group discussions in each study arm.¹³ Again, we depict women’s average levels in gray, and men’s average levels in black. We find little evidence that women participate more actively when they are surrounded by more women. Women’s participation increases steadily from the one woman condition to the three women condition, but then dips back down and remains low in the four, five, and six women conditions. Across study arms, men always speak more than women. These speech patterns suggest that the core result that we find above—that women’s relative influence grows with their presence—cannot be explained by women speaking more in settings with more women.

Our second theorized mechanism is that women are increasingly recognized and appreciated for

¹³We are counting total contributions, including to both prompts that made up our focus group protocol (i.e., also including responses to the prompt about climate change). We get similar outcomes when we just analyze responses to the deforestation prompt.

their contributions in groups with more women. This may occur because women more than men tend to recognize women’s contributions across settings, or because men and/or women change their behavior and become more receptive to women’s contributions in groups with more women. We are able to observe the extent to which these patterns hold by disaggregating the results presented in Figure 5 by gender of the respondent. That is, we can observe how group composition affects women participants’ likelihood of naming a woman as most influential, and then repeat this exercise for men respondents. Figure 8 plots these results. As with Figure 5, values in Figure 8 can be interpreted as women’s influence relative to their representation: values equal to one mean that women have influence in the discussion in proportion to their share of the group, values less than one indicate that men are more influential than women, and values greater than one indicate that women are more influential than men. We see that women are more likely than men to see other women as influential across treatment conditions, especially when there are few women in the group. Figure 8 also reveals that group gender composition has a dramatic effect on men’s perceptions of women’s influence: men steadily increase their perceptions of women’s influence as women’s representation grows. Thus, the patterns we observed in Figure 5 appear to be primarily driven by changes in men’s behavior: men seem to take women’s contributions more seriously in groups with more women.¹⁴

The tone and substance of group discussions

So far we have found that: (1) women have more relative influence in groups with more women; (2) this is not due to women speaking at greater length in the presence of more women; and (3) our core finding is primarily driven by changes in men’s behavior. How do women gain more authority in group settings even if they are not speaking at greater lengths, and particularly in the eyes of men? Above, we theorized two ways that this might happen: (a) in groups with more women, the tone of discussions might change in ways that tend to acknowledge women’s contributions to a greater extent and/ or (b) the substance of the conversation might change towards topics that are gendered female. We test implications associated with each of these expectations using our transcript data.

¹⁴In SI F, we present additional pre-registered outcomes that also suggest that group dynamics are changing in ways that grant women more authority.

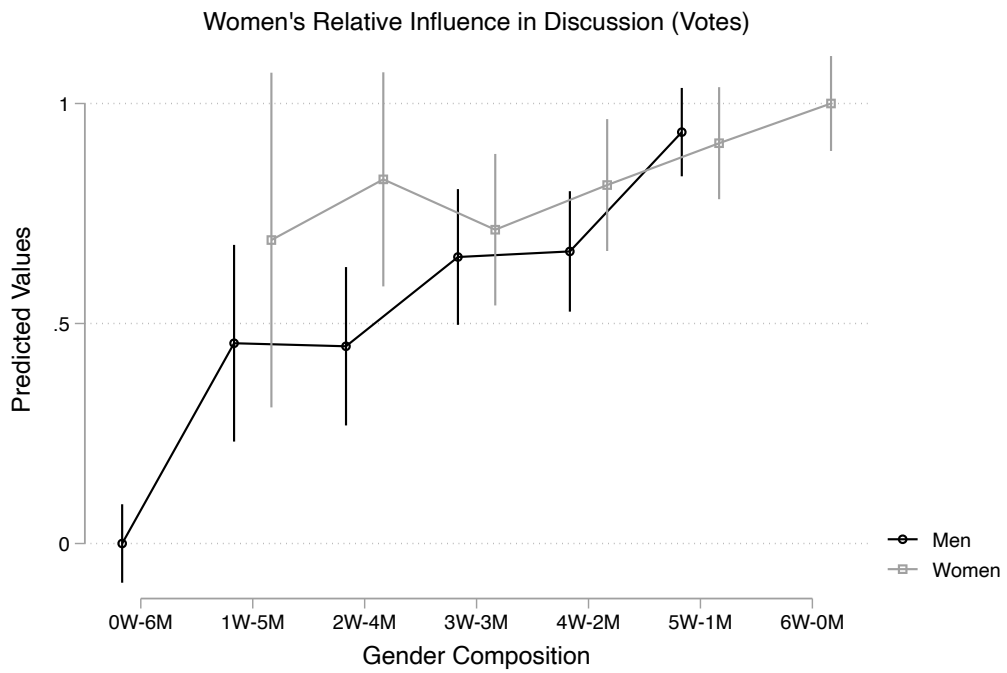


FIGURE 8 Women's relative influence in group discussions by gender and group gender composition. Influenced is measured by number of votes that men versus women received as the most influential group member. Values greater than one indicate women have more influence, values less than one indicate that men have more influence.

To begin, to test whether the tone of group discussions changes across treatments, we code whether or not each of the approximately 20,000 statements that participants said across groups contains an expression of agreement.¹⁵ Statements of agreement are fairly common in group discussions, representing about 10 percent of all participants' statements. The following examples, taken from our transcripts, are representative.

I agree with what the brother and sister have said People cut down trees, make charcoal and start selling while police officers are just watching. (Woman, Mikundi Village, Zomba District)

To also add on what she has said, we should go for other alternative cooking methods. Using Chitetezo Mbaula is the best option since it reduces demand for wood. (Woman, Kapitikusya village, Zomba District)

We examine whether the proportion of statements conveying agreement increases in groups with more women; that is, whether speakers tend to acknowledge the contributions of other participants to a greater degree. However, as we show in Figure 9, we find no evidence that conversations generally become more agreeable as women's representation increases. Statements conveying agreement contribute about nine percent of women's statement and ten percent of men's statements across groups. We next consider whether there is a greater relative (i.e., after dividing by the number of women in the group) likelihood of making a reference to a female speaker in groups with more women. (For example, "I am in agreement with what auntie has just said.") We do not find that this is the case (see SI G).

A second dynamic that we theorized might change the relative weight of women's contributions in group discussions relates to the substance of the ensuing conversations. It is possible that groups with more women tend to focus on different types of topics than groups with more men, and that the gendered nature of discussions lends greater authority to the gender that is perceived to have knowledge in this area. To test this, we ran a series of structural topic models (STMs) on the total corpus of approximately 20,000 participant statements. STMs involve a semi-automated form

¹⁵We also attempted to code instances of interruptions and statements of disagreement. However, we did not find one instance of the former (interruptions) and very few instances of the latter (explicit disagreement).

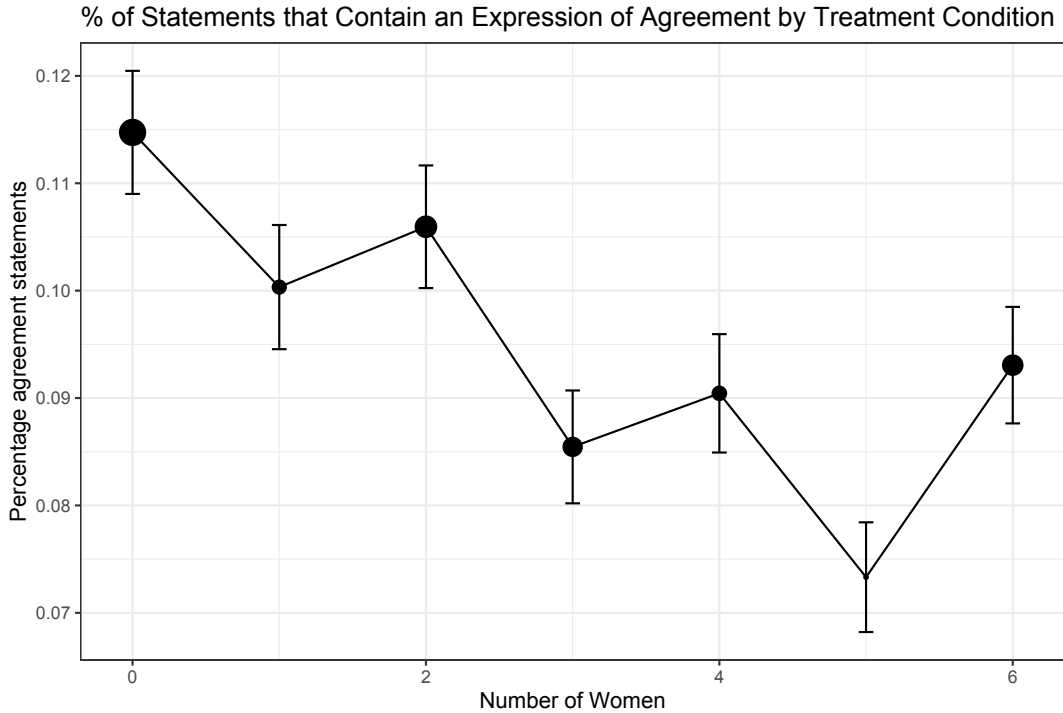


FIGURE 9 Percentage of agreement statements across treatment conditions. The denominator is the total number of statements made across groups in each treatment condition.

of text analysis that enables researchers to inductively discover key topics within open-ended texts (Roberts et al. 2014, 1066). In our data, STM diagnostics suggest that responses maximize semantic coherence when they are grouped into seven topics: community enforcement, guards, harvesting, cooking, replanting, jobs, and government interactions. Figure 10 shows the words or stems most associated with each topic (left panel) and the prevalence of each topic in our dataset (right panel).

Figure 10 shows the marginal effect of respondent gender on the frequency with which each topic is mentioned. For ease of interpretation, we label each topic based on the key words associated with the topic and by reading the representative responses associated with each topic. Several of the topics seem to align with the policy options that we presented to groups, which gives us confidence that the topics STMs are picking up are relevant to the deliberation.

Figure 10 reveals that four topics of the seven have significant gender differences; that one gender is more likely to contribute to the groups' discussions on that particular theme. Two topics are more frequently mentioned by women. We label the first "replanting." This topic includes the words or stems: "tree," "cut," "plant," "take," and "care." The sentiments associated with this topic express

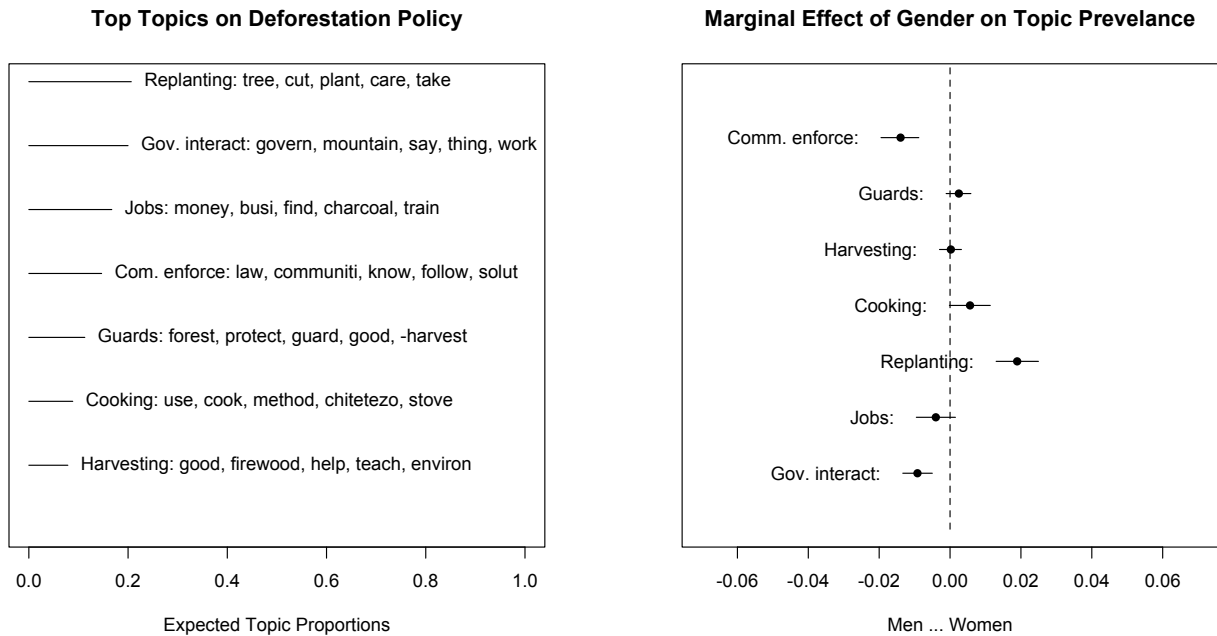


FIGURE 10 *Left panel:* Words and stems associated with the seven “topics” in participant contributions to group discussions. *Right panel:* Marginal effect of gender on topic prevalence. Data are from the STM analysis of 19,717 statements made by 3,749 study participants.

support for replanting initiatives and about the general need to take care of seedlings and new growth. For example, model diagnostics suggest that one of the most representative statements on this topic is the following:

My opinion is that whenever we cut down trees, we have to replant other trees so that soil is bound by the trees and never gets washed away when rains fall. (Woman, Minama village, Zomba District)

The other topic associated with women, which we label “cooking,” includes the words or stems: “use,” “cook,” “method,” “chitetezo” (the name for an energy efficient stove), and “stove.” Intuitively, the sentiments associated with this topic all involve cooking methods. The following statement is representative:

When we use methods for cooking like mbaula stove, this stove does not use a lot of charcoal. There are other mbaula stoves that are molded, they do not use a lot of firewood.” (Woman, Misoya village, Machinga District)

There are two topics more frequently mentioned by men respondents than by women. The first,

which we label community enforcement, contains the words or stems: “law,” “community,” “know,” “follow,” and “solution.” Model diagnostics indicate that the following response is representative:

In the community we have to enforce laws. . . A responsibility of each member is to watch out for others in following those laws. (Man, Maselema Village, Zomba District)

The second topic more often mentioned by men we label government interactions. It contains the words or stems: “government,” “mountain,” “say,” “thing,” and “work.” Examining the representative statements, we see that they all contain lengthy descriptions of interactions with government officials and general pleas for further government assistance. Because representative responses tend to be more long-winded than the other topics, we include these in SI H.

These substantive differences in men’s and women’s contributions to group discussions map in predictable ways onto the gendered nature of deforestation policy. Above, in Figure 2, we found that women tend to prefer replanting incentives more than men. Moreover, the general theme of taking care of the forests, as many of the representative responses allude to, is consistent with the gendered language of care-giving. Cooking, the second topic more frequently brought up by women, is also, of course, a highly gendered activity in Malawian village life. The two topics that are more often spoken by men are also consistent with the gendered nature of forest management. Above, we found that men, more than women, prefer community enforcement as a policy solution. It may also be that men have more experience with community monitoring and enforcement, both in the domain of over-harvesting and in other community laws and norms. Similarly, men tend to interact with government officials more than women do, so it is unsurprising that men describe these types of experiences in group discussion more frequently than women.¹⁶

The previous exercise was inductive; we sought to identify whether men and women make different substantive contributions to group discussions. Having done this, we now seek to identify how the prevalence of each of the four topics that we identified as gendered vary across the treatment conditions. Figure 11 shows these results. Consistent with our expectations, the two topics that

¹⁶In the most recent Afrobarometer survey in the country, for instance, 39 percent of men report having had at least one interaction with a street-level bureaucrat in the last year compared to 26 percent of women.

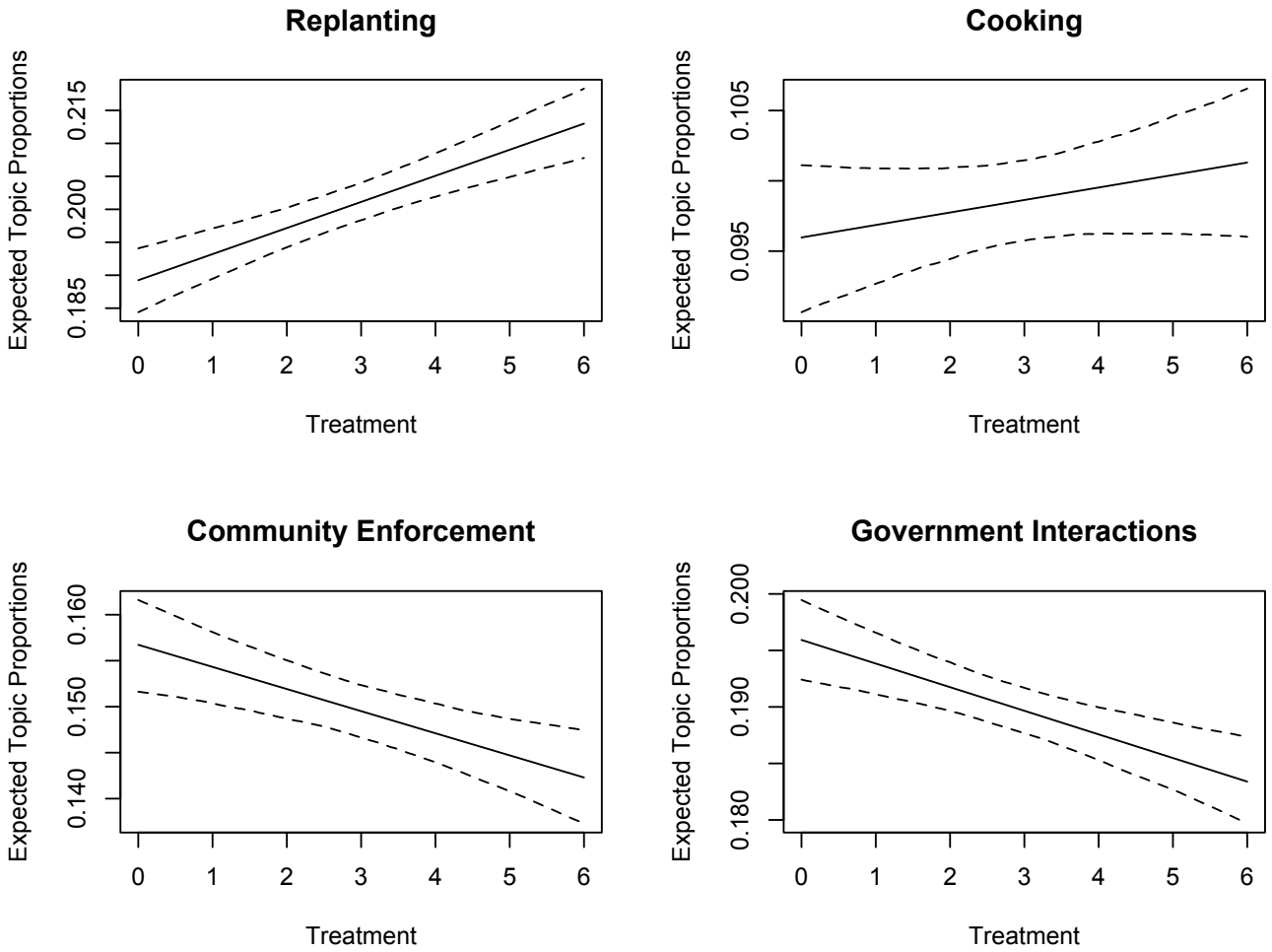


FIGURE 11 Frequency of gendered topics across treatment conditions. X-axis indicates the number of women in the group.

are gendered female, cooking and replanting, increase in frequency with more women in the group, while the two topics that are gendered male, community enforcement and government interactions, decrease in frequency. The treatment variable is a significant predictor of three of the four gendered topics at $p \leq 0.001$, and significant for the cooking topic at $p = 0.06$.¹⁷ These results suggest that the substance of group conversations are changing in groups with more women, and tend towards topics on which women feel comfortable and may be seen as having authority. Conversely, in groups with more men, women may feel that the discussions tend towards topics on which they have less experience and authority.

Conclusion

We find that women have more influence in deliberations on combating deforestation as their representation grows. Across influence measures, women’s relative influence tends to increase monotonically with their share of the group, and this pattern is strongest when we measure influence by peer assessments. Contrary to our expectations and to previous work from the United States, we do not find that women are participating to a greater extent (i.e. with greater talk time) in discussions with more women. Rather, our results seem best explained by the changing substance of the deliberations themselves. Groups with more women talk about different dimensions of the problem than groups with more men. And, although we cannot directly claim that substantive changes in deliberations increased women’s perceived authority, this seems a plausible result—possibly explaining our finding that women in groups with more women tend to be more likely to think they were the most influential one in the group.

Our findings speak to a growing body of experimental research that is interested in how a group’s gender composition causally affects participants’ behavior (Karpowitz and Mendelberg 2014; Stoddard, Karpowitz and Preece 2020). Like this literature, we find that gender composition powerfully predicts who has influence in group deliberations. Yet, we also find that even if women are not speaking at greater length, the way their contributions are received can shift their relative

¹⁷The treatment variable is not a significant predictor of topic frequency across the three non-gendered topics.

weight. Our results pertain to small group discussions, but it seems plausible that our findings might also hold in larger political arenas. For instance, previous work has found that men and women members of parliament bring up different issues in legislative debates (Bäck, Debus and Müller 2014; Clayton, Josefsson and Wang 2016). It is impossible to know the counterfactual in these settings, but it seems plausible that legislative bodies with more women both discuss different types of topics and that women’s perceived authority changes as a result.

Our work also suggests some important scope conditions. While we find that men and women discuss the problem of deforestation differently, we also find only moderate differences in men’s and women’s actual pre-treatment preferences about how to best address the problem. Our case seems to be one in which there is nearly universal agreement in the community about the extent of the problem, and similar ideas among men and women about best practices to address it. Our results might be different in cases where preferences between men and women are more divergent—for instance on issues such as which public goods to prioritize (Gottlieb, Grossman and Robinson 2018) or about challenging patriarchal practices, such as child marriage or land rights (see, e.g., Benstead, Muriaas and Wang 2022; Muriaas et al. 2019). This represents an important extension of our work, and one for which we can envision competing expectations. On the other hand, women may find that there is more at stake on issues for which there are significant gender gaps in preferences, and thus make an even greater effort to influence group deliberations, particularly when settings are in their favor (i.e., in groups with more women). On the other hand, issue areas perceived as zero sum or those that threaten gender hierarchies may be settings in which men feel more emboldened to preserve their power and authority. Studies that seek to vary either the issue area or the stakes of the groups’ decisions are promising areas for future research. However, it is telling that gender composition matters even for an issue on which gender differences are not particularly stark.

Our results also speak to efforts by international donors to include gender mainstreaming in climate interventions and more generally in programming across issue areas and suggest that such efforts can elevate women’s voices in community-led development. However, at the same time, we also find that women’s presence only affects group decisions when they are the majority of the

group’s members. This presents a potential challenge to policy interventions that often strive for women to comprise a “critical mass” (often conceptualized as 30 percent) or at most gender parity, but seldom promote women to majority status. Future work might seek to test interventions that grant women greater decision-making authority even when they are in the minority, such as training programs for women citizens, candidates, or politicians (see, e.g., Hyde et al. 2022).

Finally, across all study arms, we continue to find that men participate to a greater degree and have relatively more influence than women in group deliberations. For deliberative democracy to be fully realized, these gaps must close. Put another way, as it stands, our results show that men have an oversized influence on how to address an acute community problem with global significance even when they are in the absolute minority. At the same time, in the short run, our results suggest that institutional features that promote women’s inclusion, such as gender quotas, may give women more say in deliberative processes than they otherwise would as a smaller share of decision-making bodies. Including women in climate interventions thus both promotes normative justice and fairer deliberative processes.

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Supporting Information for
“Gender, Deliberation, and Natural Resource
Governance: Experimental Evidence from Malaw”

Amanda Clayton, Boniface Dulani, Katrina Kosec, and Amanda Robinson

[**Please note this appendix is still incomplete. Please do not circulate or cite.**](#)

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A Pre-treatment political attitudes

Variable	Men	Women	Difference
Age	34.833 (15.204)	36.794 (13.608)	1.961*** (0.472)
Discusses Politics	0.796 (0.690)	0.711 (0.677)	-0.084*** (0.022)
Interested in Politics	2.334 (1.109)	2.226 (1.071)	-0.108*** (0.036)
Attended Community Meeting	0.796 (0.403)	0.846 (0.361)	0.051*** (0.012)
Raised an Issue with Others	0.753 (0.431)	0.745 (0.436)	-0.008 (0.014)
Voted in Last Election	0.643 (0.479)	0.706 (0.456)	0.064*** (0.015)
Contacted Local Councilor	0.158 (0.365)	0.101 (0.301)	-0.057*** (0.011)
Contacted Member of Parliament	0.165 (0.371)	0.112 (0.315)	-0.053*** (0.011)
Contacted Traditional Authority	0.573 (0.495)	0.527 (0.499)	-0.046*** (0.016)
Politics Too Complicated	3.389 (0.930)	3.339 (0.929)	-0.050 (0.030)
People Like Me Can Participate	1.864 (1.059)	1.764 (1.036)	-0.100*** (0.034)
Political Ability	2.390 (1.232)	2.101 (1.183)	-0.289*** (0.039)
Political Confidence	2.619 (1.218)	2.218 (1.167)	-0.401*** (0.039)
Observations	1,886	1,882	

Table 1: Pre-treatment summary statistics by gender

B Pre-treatment policy preferences table

Variable	Men	Women	Difference (p-value)
Community Enforcement	0.083	0.066	-0.017 (0.047)
Government Enforcement	0.191	0.206	0.014 (0.264)
Replanting Incentives	0.302	0.316	0.014 (0.353)
Civic Education	0.082	0.066	-0.016 (0.062)
Alternative Cooking Methods	0.114	0.118	0.003 (0.755)
Job Training	0.227	0.226	0.001 (0.934)
Observations	1,886	1,882	

C Main results: regression tables

D Policy choices by treatment condition

E Group decision-making: alternative specification

As an alternative specification to whether the respondents' pre-treatment policy preference won in the group vote, Figure 1 plots the number of votes that participants' pre-treatment preference received. We observe a similar pattern to that described in the main text.

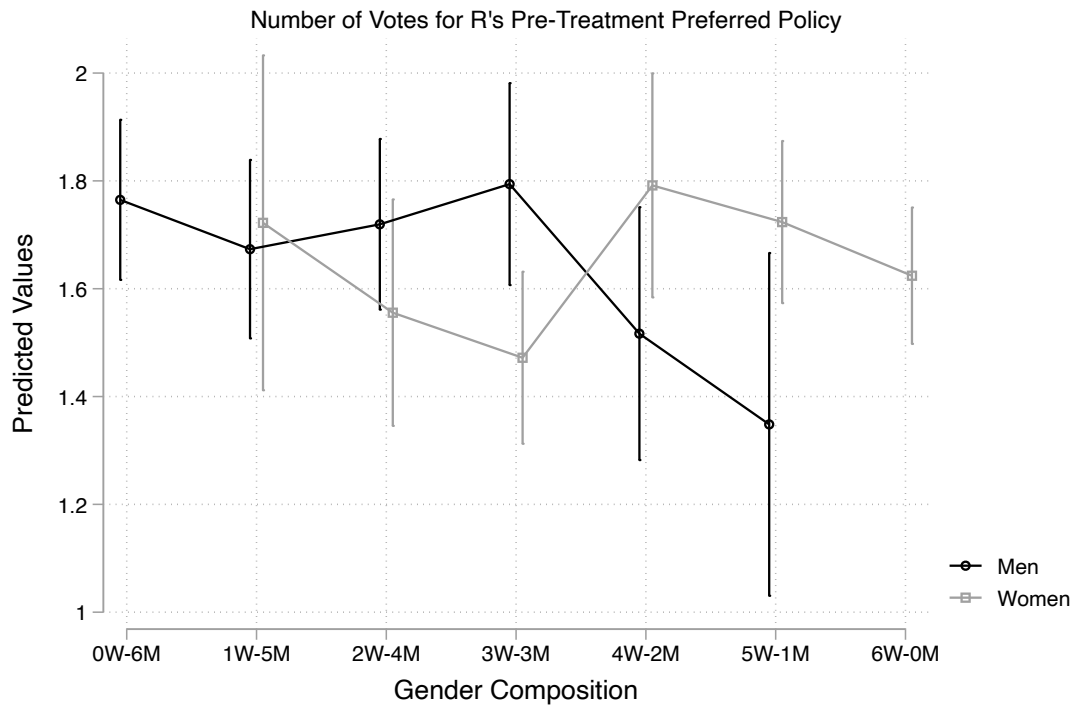


Figure 1: Gender differences in the number of votes one's pre-discussion policy preference wins by gender and gender composition of group

F Changing recognition: alternative specifications

Three additional pre-registered outcome measures from our survey also suggest that women are increasingly recognized for the contributions that they make in groups with more women.

A first measure comes from our enumerator survey that asks the enumerator to observe and record how much each group member participated in the group discussion. Enumerators are more likely to rate women as participating “a lot” in group discussions with more women (see Figure 2 below). This increase is non-trivial. When women are alone in a group of men, the enumerator describes only 40 percent of women respondents as participating “a lot.” This number grows to just under 60 percent in all-women groups. For men, in contrast, we find little consistent relationship between gender composition of groups and enumerator rating; it remains relatively constant at around 60 percent of men participants across treatment groups. This is notable given that we know that women’s actual behavior—the number of words they speak—does not change. This discrepancy in enumerator perceptions and actual speech patterns is consistent with our speculation that women’s contributions are recognized to a greater degree in groups with more women.

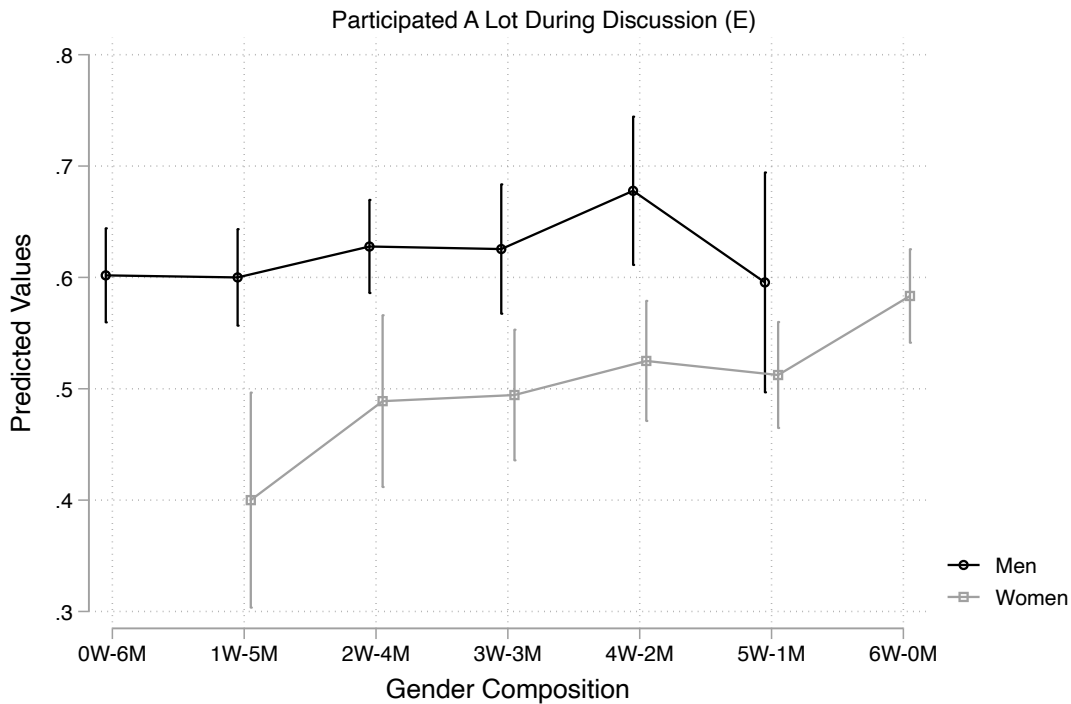


Figure 2: Gender differences in likelihood of participating a lot in discussion (as perceived by the enumerator) by group gender composition

Second, we asked participants after the group discussions whether they thought they changed the minds of others in their group. Figure 4 plots these results. Moving from the one-woman condition to the all-women condition increases the percentage of women

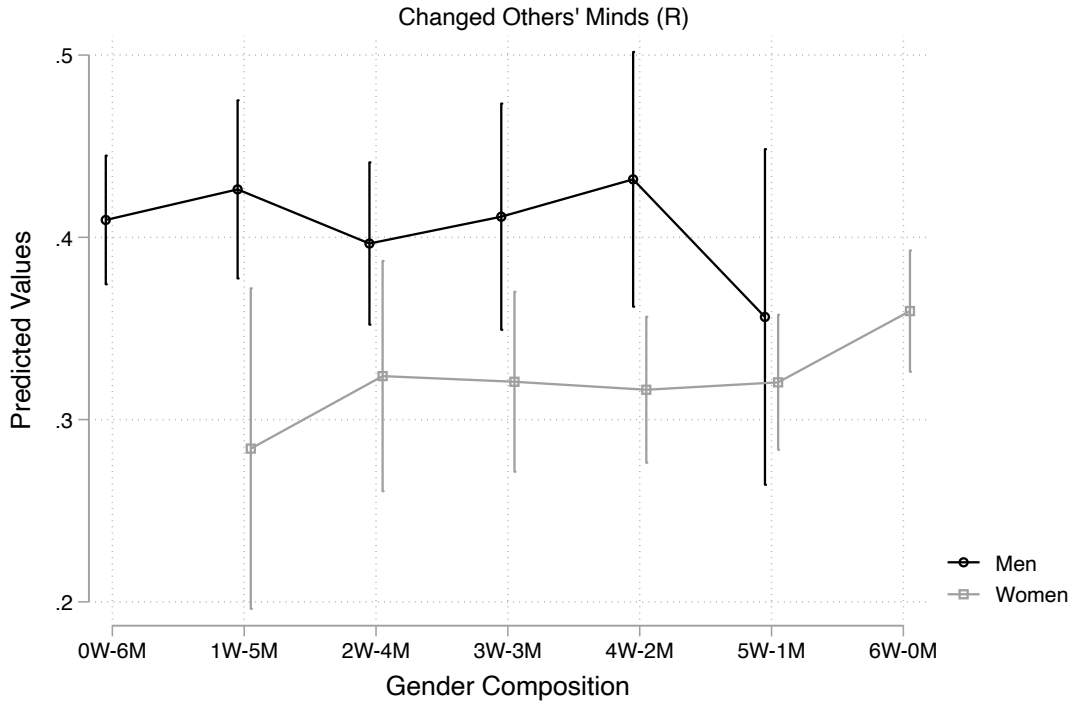


Figure 3: Gender differences in the percentage of respondents reporting that they changed the minds of others in the group by participant gender and gender composition of group.

respondents who respond affirmatively from 28 percent to 36 percent. Across the mixed gender groups, gender gaps are smallest and statistically indistinguishable from each other in the five-women / one-man condition.

Finally, we find that women’s likelihood of answering positively to the post-treatment survey question: “How much would you say the political system in Malawi allows people like you to have a say in what the government does?” increases for women across treatment conditions, and at a significantly greater rate than men’s responses across treatment arms (see Table ??). Taken together, these results suggest that women feel that their contributions are being recognized more in settings with more women.

	<i>Dependent variable:</i>
	External Efficacy
Female	-0.099 (0.079)
Treatment	-0.017 (0.015)
I(Female *Treatment)	0.041* (0.022)
Constant	3.480*** (0.034)
Observations	3,749
R ²	0.001
Residual Std. Error	0.995 (df = 3745)
F Statistic	1.576 (df = 3; 3745)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

Table 2: Interactive effects of treatment and respondent gender on feelings of political efficacy

G Deliberation tone: alternative specification.

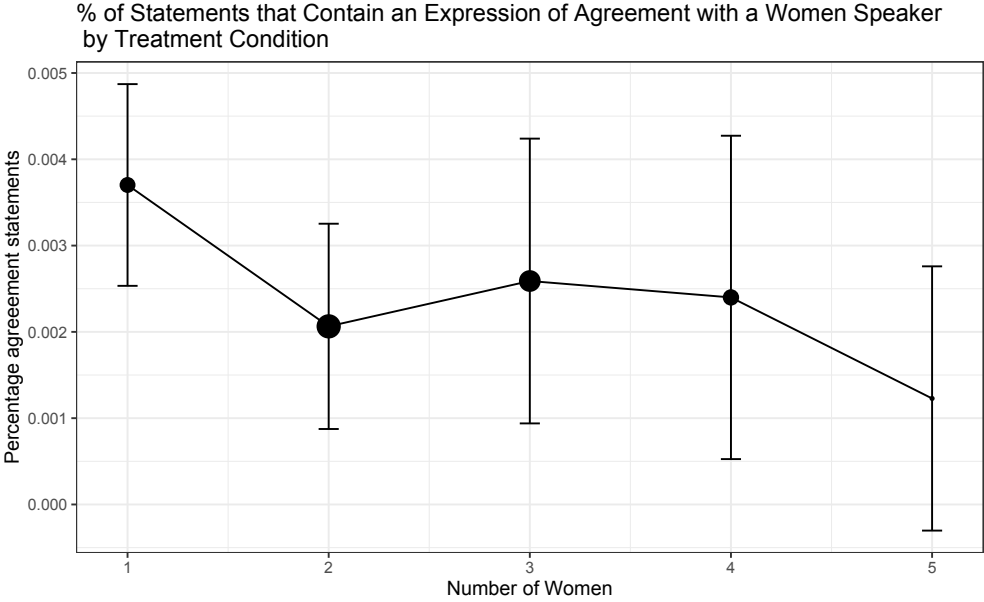


Figure 4: Percentage of statements that express agreement with a female gendered speaker (e.g., “I am in agreement with what auntie just said.”) per treatment condition, relative to the percentage of women in the group. The denominator is the total number of statements in each treatment condition, divided by the number of women in the group.

H Government interactions: representative responses

As mentioned in the main text, the most representative statements of this theme tend to be long-winded, somewhat convoluted descriptions of interactions with government officials. Model diagnostics suggest the following is the most representative response on this topic:

So when that happens, what happens is that everyone, who happens to have their own place, they say these trees belong to me. When the government officials come, we present our grievances to them saying officers we do not have anything here to do since it is a village; you come and promise us this and this but in their answering they say, well we are researching, we are still researching, you shouldn't be worried your reward is coming. So we wait and wait until what? Until that date without any thing to keep us busy. Because if there happened to be we are being giving something or at the end of the year we are being given MWK 10000, that very same MWK 10000 can seem small but it can have a very huge impact in our caring for trees. When the government officials come back, we will even show them saying come let us show you the trees that you gave us. But now we can see that those things are failing because we, the villages, don't have anything to do and we are always being deceived, those people from the government do come here to deceive us, yes.

I Pre-analysis plan

Please find attached.

**Pre Analysis Plan –
Gender, Deliberation, and Natural Resource Governance:
Experimental Evidence from Malawi**

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Motivation and Research Questions

Tropical deforestation is estimated to cause about one-quarter of anthropogenic carbon emissions, the second largest source of greenhouse gas emissions after fossil fuel combustion (Kinderman et al. 2008). Land use change, including deforestation, is estimated to generate over 3.3 billion tons of carbon emissions annually (van der Werf, 2009). Policies to avoid deforestation are a competitive, low-cost emissions abatement option (Kinderman et al. 2008).

Malawi is the midst of a deforestation crisis. Sixty-five percent of Malawi’s forests are located on customary land. Communities overharvest these forests for charcoal production, firewood harvesting, and livestock grazing (Ngwira and Watanabe 2019). The results of deforestation and forest degradation have been devastating. Between 1972 and 1992, Malawi’s total forest cover fell from 47 percent of total land cover to 20 percent. Estimates of the current rate of deforestation are between an annual average loss of 164,000–460,600 hectares of forest cover – the highest rate of deforestation in the Southern African Development Community (UN REDD Programme 2017). The over-exploitation of current forests reserves threatens the livelihoods of communities that depend on them. The UN Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation (REDD) has called for urgent action to halt and reverse deforestation and forest degradation in the country (UN REDD Programme 2017).

Avoiding the over-harvesting of communal forests in Malawi and other developing countries is particularly difficult because community members face enormous incentives to over-harvest. This happens when households rely on forest products (such as charcoal) for subsistence or when households cannot afford to forgo the income generated by current harvesting behavior to wait for future gains (Ngwira and Watanabe 2019). The relatively slow regeneration rates of forests also means that future income streams can take years to materialize (Eisenbarth et al. 2018).

Our research asks whether and how including women in deliberative bodies around communal forest governance affects participatory forest management practices. This question is relevant in Malawi, where women are formally required to occupy either half or one-third of the positions on Malawi's key land administration institutions, including land tribunals and customary land committees – but these requirements are often loosely enforced if at all (UN REDD Programme 2017). Women also face many informal barriers to accessing information and fully participating in decision making due to gender and family norms (Mudege et al. 2017; Mawaya and Kalindekaffe 2010), even though – as the primary gatherers and users of natural resources – their participation is crucial for change in resource utilization (Mawaya and Kalindekaffe 2010). Our research thus has implications relevant to key stakeholders in Malawi's local authorities who can more strictly enforce existing quotas.

Women's inclusion is becoming the norm in both global and local climate governance initiatives. Yet, whether and how women's participation affects climate governance is still poorly understood. While our results have implications for Malawi specifically, they also will be relevant for the growing number of climate interventions that require women's participation. For example, within the United Nations Framework Convention on Climate Change (UNFCCC) there is a formal "Women and Gender Constituency" and a "Gender Action Plan."¹ Likewise, the Green Climate Fund has a "Gender Policy and Action Plan."² One facet of women's participation about which there is little evidence involves the composition of the groups in which they participate. Both experimental and observational work on men's and women's participation in group deliberations suggests that women may need to reach a certain threshold before they are able to influence group-level decisions (Karpowitz and Mendelberg 2014, Grey 2002), but experimental evidence is lacking. Thus, we are interested not just in whether women's inclusion affects climate governance but also at what threshold women's presence begins to have an effect.

This project's research questions are twofold: (1) How does women's presence in deliberative bodies affect the content and outcomes of group discussions around communal forest governance? (2) How does women's presence in deliberative bodies affect women's political efficacy, both around issues of natural resource governance specifically, as well as around participatory governance more generally? For the first set of questions, we are interested in the substantive content of group deliberations and outcomes (i.e., we are interested specifically in the topic of natural resource governance). For the second question, we see natural resource governance as a case of participatory governance more generally. Our aim is to test our research questions experimentally by randomly varying the gender composition of six-member groups tasked with deliberating the problems and solutions associated with deforestation on community-managed forests.

Previous Work

Our work is motivated in part by a recent study by Cook, Grillos & Andersson (2019). Through lab-in-the-field experiments conducted in Peru, Tanzania, and Indonesia, Cook et al. (2019) find

¹ See <http://womensgenderclimate.org> and <http://www.unwomen.org/en/news/stories/2017/11/announcement-first-ever-gender-action-plan-on-climate-action-adopted>.

² See <https://www.greenclimate.fund/how-we-work/mainstreaming-gender/gender-action-in-practice>.

that gender-balanced groups disperse payments to incentivize villagers to reduce deforestation more equally than male-majority groups. However, as they acknowledge, this result is likely because women tend to hold more egalitarian distributional preferences in behavioral games than do men. They also find that gender-balanced groups indicate a greater willingness to reduce subsequent tree harvests – but note that this is likely because women, on average, tend to be more rule following than men.

The literature on how men and women differ in their attitudes towards deforestation policy, or how villagers connect the issue to climate change, is under-developed. On the one hand, work by Cook et al. (2019) and others might lead us to believe that women have more conservation-minded attitudes. Women's traditional roles including gathering firewood, tending crops, and collecting water may mean that they are especially affected by depletion of natural resources, which could *in theory* would motivate resource conservation (Doss et al. 2018). For example, Agarwal (2009) and Agarwal (2010) study forest user groups in India and Nepal respectively, finding a positive correlation between the proportion of women on the executive committee and improved forest governance and resource sustainability. In contrast, other studies actually find that men are better stewards of the environment—either because they are more likely to adopt new technologies and resource monitoring practices that are associated with improved sustainability (women's technology access is often lower than that of men) (Mwangi et al., 2011, Sun et al., 2011) or because they have greater interactions with conservation agencies (women's mobility and social networks can be less developed) (Villamor et al. 2013). Thus, the evidence is mixed on whether women or men are better stewards of the environment (Doss et al. 2018).

Additionally, in very low-income countries like Malawi, men tend to know more about climate change and feel more strongly that climate change should be stopped than women. For example, in the most recent (2016 / 2018) Afro-Barometer survey round, 83 percent of men respondents report having heard about climate change versus 74 percent of women respondents. In addition, among those that are aware of climate change, 50 percent of men respondents report that “ordinary Malawians can do a lot to stop climate change,” whereas only 40 percent of women respondents indicated this category. This leads to an open question about the effectiveness of including women in climate interventions. Whereas a robust literature across lower-income countries suggests that men and women tend to hold different policy priorities (Chattopadhyay & Duflo, 2004; Clayton, Josefsson, Mattes, & Mozaffar, 2018; Gottlieb, Grossman, & Robinson, 2018), we do not know how men and women differ on the issue of deforestation specifically or other issues related to climate governance more broadly. Indeed, attitudes towards climate change policies have received scant attention in low-income countries (Bush and Clayton 2022). To our knowledge, ours will be the first study to causally examine how women's presence affects group-level deliberations on climate governance.

Our work also draws on a rich literature in political science and economics on the management of common pool resources (Ostrom 1990). The overharvesting of community forests exemplifies the tragedy of the commons; communities collectively benefit when forests are properly co-managed, but individuals have incentives to over-harvest, leading to degradation of the forest stock. Put another way, overharvesting is individually rational, but collectively irrational. Recent work has shown the efficacy of various practices, such as community monitoring, to reduce incentives to over-exploit a common pool resource (see, for instance, EGAP Metaketa III on natural resource

governance, Samii et al. 2014, and Bowler et al. 2010). Our work pulls from Ostrom's (1990) contention that participation by resource users in common pool resource governance is essential to avoid over-exploitation. Related to women's inclusion, inclusive decision-making may affect forest conservation practices to the extent that it changes the community's perception of the optimal amount of harvesting and which policies effectively curb over-harvesting (Evans & Guariguata, 2008).

Finally, our research speaks to an emerging body of work which examines how a group's gender composition affects women's willingness to participate in political discussions. In an influential series of lab experiments in the United States, Karpowitz and Mendelberg (2014) find that women are more likely to speak in groups as the number of women in the group increases and decisions are made through majority rule. In a lab experiment in Switzerland, Born et al. (2020) find that as the number of men in the group increases, women become less confident in their relative performance, less influential, and more swayed by others in groups discussions. Collectively, this body of work suggests that women are constrained by social expectations about who should participate in group decisions, and these constraints seem to be ameliorated as the number of women in the group increases. Importantly, work that explicitly varies the gender composition of groups has yet to be experimentally tested outside of wealthy democracies and beyond the university lab setting. Further, whereas a considerable body of experimental work has examined how the presence of women *leaders* affects women's participation in deliberative fora (Beaman, Duflo, Pande, and Topalova 2010; Chattopadhyay and Duflo 2003; Parthasarathy, Rao, & Palaniswamy 2019), our work expands this type of intervention to consider how the gender composition of deliberative groups causally affects participants' behavior.

Study Design

Our project will bring together ordinary Malawians to discuss the issue of communal deforestation through a series of facilitated sessions that will be structured in a focus group-like format. In each facilitated session, participants will deliberate about the problem of deforestation and debate various solutions to combat ongoing deforestation in the country. The facilitator will be a trained professional from a local research firm. The goal of these activities is to measure whether and how participants express their preferences in a group setting. Generally, the sessions will be organized as follows: respondents will first be asked whether they are concerned about overharvesting of community forests. Next, we will introduce several policies that have been used to combat deforestation. The specific policies discussed were drawn from a review of the literature on deforestation in Malawi and other developing countries and from eight initial scoping focus group discussions with both men and women participants. Participants will debate the different policies and then vote on which policy that they think is best. A report that reflects the decisions that groups reach will be shared with key stakeholders, such as relevant government ministries and the forestry department. During our discussions, we will also probe participants more general opinions about the problem of climate change.

The overall structure of the study will be:

- 1) Introduction of the study to the whole group (42 participants across six groups)

- 2) Consent process with each participant, one by one
- 3) Randomization into groups by drawing cards
- 4) Pre-treatment survey
- 5) Group discussion, debate of policies
- 6) Secret vote to select from among specific policies
- 7) Post-treatment survey
- 8) Behavioral measure (donation of study honorarium to seedling fund)

The above strategy has several advantages. Step (4) gives us a pre-treatment measure of men's and women's preferences before any deliberation takes place. Through the secret vote in step (6), we can gauge whether and how women and men are differently persuaded by the previous discussion. Step (7) allows us to gauge how influential men v. women are in shifting the group's outcome to reflect their own preferences, and how various group compositions affect women's political efficacy. Step (8) provides a behavioral measure, to complement self-reports, of interest in supporting forest conservation efforts.

The key feature of our intervention is to randomize the gender composition of the six-member groups that attend the discussion sessions, such that women comprise from zero to all six group members (i.e., seven distinct group compositions). We are interested in how women's numeric presence changes the quantity and quality of group deliberations over communal forest governance. Further, we are interested in how participating in political discussions in groups with varying gender compositions affects women's political efficacy on the issue of deforestation, land use, and climate change specifically, as well as measures of political efficacy more broadly. We will record group deliberations to gauge the quantity and quality of men's and women's participation, and measure quality along the following dimensions:

- Deliberative inclusivity: average time per speaker, equality of time between speakers, and average influence of men v. women speakers (see Parthasarathy, Rao, & Palaniswamy, 2019; Karpotiz, Mendleberg and Shaker 2014)
- Substantive content: time devoted to each discussion topic (hand coded and measured inductively through structural topic models) and whether discussion time reflects men's or women's previously stated policy preferences; the relationship between speaking time on a particular policy and the ultimate decision the group reaches.
- Group decisions: whether men's or women's preferences are reflected in group decisions.

Enumerators will record group deliberations, observe group dynamics, and conduct surveys with each participant on political preferences, attitudes, and behaviors both prior to and after group deliberations. Surveys will include standard questions of internal and external political efficacy as well as potential moderating variables at the respondent level, including ethnicity/kinship, age, education, and marital status.

The study will be carried out in 90 communities adjacent to the Zomba and Malosa Forest Reserves, within TA Malemia of Zomba District, TA Mlumbe of Zomba District, STA Nkapita of Zomba district and TA Nkula of Machinga District. The Zomba and Malosa Forest Reserves have lost 25% of their tree coverage in the last 20 years (Global Forest Watch 2021). These communities all rely upon wood harvested from the reserve for their cooking fuel and heating, and many

residents' livelihoods depend on harvesting and reselling wood and charcoal in local markets (Moyo, Chikuni, and Chiotha 2016). At the same time, communities near the reserves will also pay the short- and long-term costs of deforestation, including devastating mudslides and flash floods, unpredictable rain patterns, reduced water supply, and increased disease burdens. Past research demonstrates that most residents understand the negative implications of deforestation but face significant incentives to exploit the resource beyond sustainability (Moyo, Chikuni, and Chiotha 2016).

The 90 sample communities will be selected from among the 216 villages within three kilometers from the Zomba or Malosa Forest Reserve boundary—a distance that implies that activities within the forest reserves are relevant to them. In addition to the 90 randomly selected villages, the remaining unsampled villages were placed in random order for replacement in case a village was unwilling or unable to participate.

Each selected community will be visited by a member of the research team a week ahead of the planned facilitated sessions, and local leaders (likely village headmen) will be asked to mobilize 25 men and 25 women to participate on a particular date and time. On the given date, an overview of the research project will be given to the entire group and interested individuals will be randomized into seven separate groups for deliberation. If more than 21 men or 21 women are interested in participating, then the randomization procedure outlined below will also determine which individuals are included in the sample.

The randomization procedure will be designed to produce the seven groups, one with each of the possible gender compositions (from all men to all women). Thus, treatment is randomized at the group level *within* communities. The resulting sample will include 630 groups of 6 individuals each ($n=3,780$; 1890 men and 1890 women), with 90 groups (and 540 participants) in each of the seven treatment conditions. Each discussion group will be led by a trained facilitator and observed by one trained research assistant who will also administer the surveys for the group.

All participants will complete brief face-to-face surveys both before and after the group discussion, administered privately. Both surveys will include questions on knowledge and preferences around climate change, deforestation, and remediation, as well as political interest and efficacy. In addition, the pre-treatment survey will include questions on demographics (gender, age, marital status, ethnicity, education level, and gender of household head), socio-economic status, levels of political participation, and gender-related attitudes and beliefs. Also, the post-treatment survey will ask questions about group dynamics and deliberation efficacy.

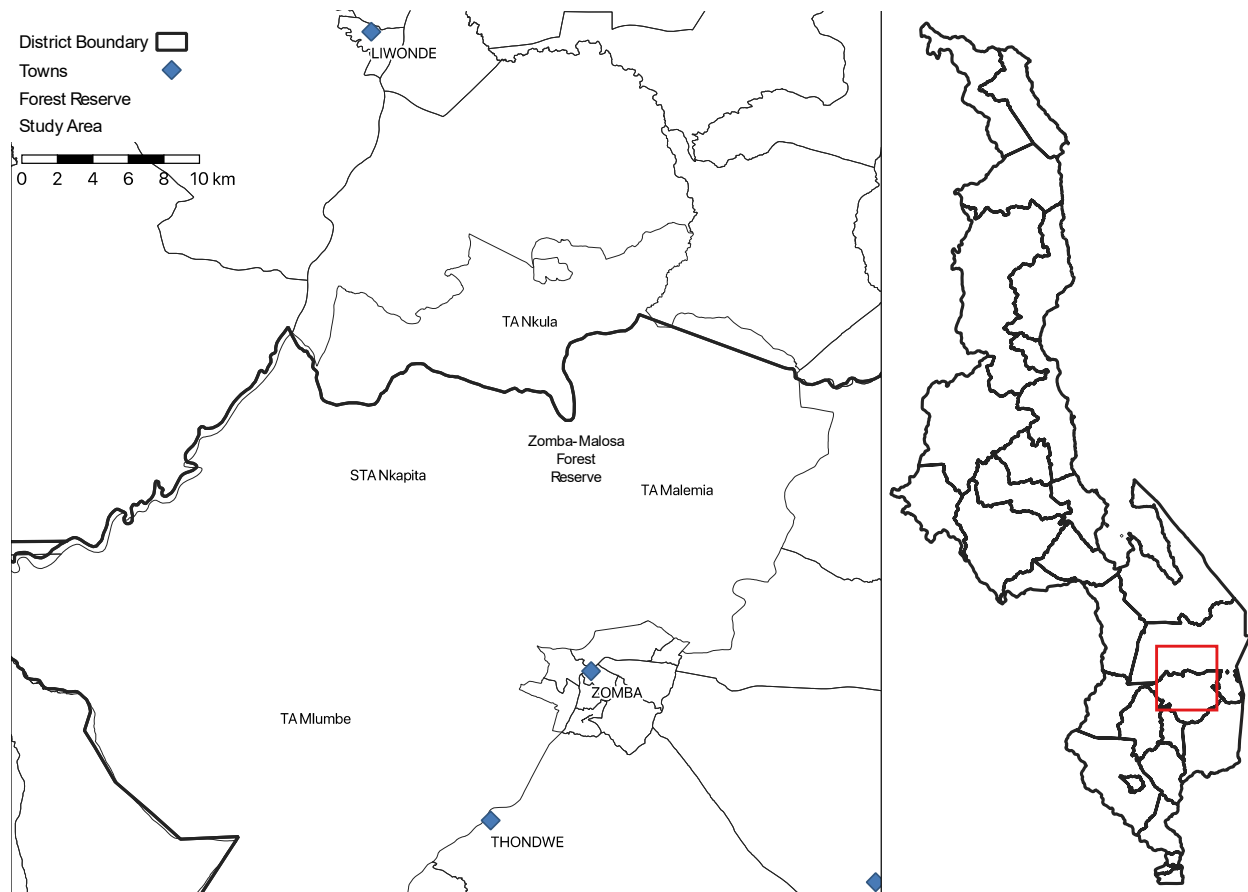


Figure 1. Map of the Study Area within 3km of the Zomba-Malosa Forest Reserve in Zomba and Machinga Districts, Malawi.

Expectations

We are primarily interested in two sets of outcomes (the basis for at least two separate research papers). Our first set of outcomes can be measured at both the group and individual levels; we are interested in the *content* of men’s and women’s preferences on deforestation policy, and the extent to which women’s presence in deliberative groups affects whether women’s preferences are reflected in the decision that the group ultimately reaches. The pre-treatment data we collect on women’s preferences prior to the group deliberations allow us to construct these outcomes. We do not have strong *a priori* expectations about the content of men’s and women’s preferences on deforestation policy. This is an area on which there is very little extant research, and thus our endeavor here is necessarily inductive. Yet, given the observed gender differences in climate attitudes generally in Malawi, and the documented gender differences in policy priorities more generally across Africa (Gottlieb et al. 2018), we do anticipate that men and women will differ in their views on deforestation policy.

Regardless of the content of men’s and women’s preferences, we anticipate that group discussions and decisions will be more reflective of women’s preferences as women’s numerical presence in

the group grows. We expect that women's average *relative* (not just absolute) influence will increase as women's representation increases in the group. We expect that influence is positively correlated with participation, and that women will more actively participate in group deliberations as their share of the group increases (see Karpowitz et al. 2012). At the same time, across all mixed-gender groups, we expect that men will still participate more actively and have relatively more influence than women members, on average. Further, across mixed gender groups with at least two people of each gender (where we can thus compute relative influence of a person over women and over men), we expect that women have more influence over other women in the group compared to other men, but that men have equal relative influence over both genders. We summarize these hypotheses as follows:

H1a: Women will participate more actively as their representation increases.

H1b: Women's average relative influence in group discussions and group decisions will increase as women's representation increases.

H1c: Across all mixed-gender groups, we expect that men will still participate more actively and have relatively more influence than women members, on average.

H1d: Across mixed-gender groups with at least two people of each gender, we expect that women's relative influence over other women is greater than women's relative influence over men.

H1e: Across all mixed-gender groups with at least two people of each gender, we expect that men's relative influence over other men is no different than men's relative influence over women.

While our general expectation is that women's participation and influence will increase as their presence grows, we also consider the possibility that gender composition of mixed gender groups does not matter. In women-only groups, women by construction are the only ones with influence; however, women's influence may be no different if it is one man and the rest women v. one woman and the rest men. In other words, in contrast to our expectation above, an alternative hypothesis is that across all mixed-gender groups, women will both have less influence than men and their influence will not increase with the number of women in the group. This would be the case, for instance, if men tend to dominate consensus-based discussions even when they are in the minority (Karpowitz, Mendelberg, and Shaker, 2012; Stoddard, Karpowitz, and Preece, 2020). In extreme instances, women's relative influence might decrease as the number of women in the group grows if men feel more emboldened to dominate discussions when they are increasingly surrounded by women. Women-only groups remove social expectations (if they exist) about deference to men in mixed-gender settings (Prillaman 2021). Thus, we may only see women's preferences reflected in group decisions in the women-only groups. Our alternative hypothesis is thus as follows:

H2 (alternative hypothesis): Across all mixed-gender groups, women's participation and average relative influence will be unaffected by or may even decrease as the number of women in the group grows.

Finally given socialized gender roles, men's deliberative style tends to be more aggressive, and women's deliberative style tends to be more consensus based (Karpowitz and Mendelberg 2014). As such, we expect that the nature of deliberations will change as a function of women's presence, namely:

H3: Deliberations will become less conflictual and more collaborative as the number of women in the group grows.

Our second set of outcomes relates to individual-level (rather than group level) outcomes. Specifically, we expect that women's political interest, knowledge, and efficacy on the issue of deforestation and land use will increase as their presence grows. Our expectations here are related to our first set of expected findings. If women participate more actively as their presence grows and have more influence on group-level outcomes, we expect this experience will also improve their sense of efficacy. However, especially if women's influence is no different if it is one man and the rest women v. one woman and the rest men, we also find it plausible that women's political interest, knowledge, and efficacy will be unaffected by group gender composition. This expectation stems from work that finds that political participation in mixed-gender settings in highly patriarchal contexts can *reduce* women's future political participation (Gottlieb 2016). Our expectation is that gender norms about women's participation in Malawi are not so conservative that participating in a mixed-gender governance activity would cause women to limit their future political participation, but it may be possible that women will only experience increased efficacy in the women-only groups. Our competing expectations thus are as follows:

H4: Women's political interest, knowledge, and efficacy will increase with the number of women in the group.

H5 (alternative hypothesis): Across all mixed-gender groups, women's political interest, knowledge, and efficacy will not be affected by the number of women in the group. Women's political efficacy will only increase in the all-women setting.

H6: The feeling that women are disproportionately negatively affected by deforestation will increase with the number of women in the group

H7: Mean levels of concern about deforestation and climate change will be higher after discussion compared to before discussion.

Finally, we anticipate that increases in the number of women in a group will increase women's participation, influence, political interest, knowledge, and efficacy more when they think over-harvesting of forests is a problem for their community. This worry increases the perceived benefits to women from influencing the outcome of deliberation. Whereas the tipping point for women to be motivated to face the costs of being especially vocal in a group (which could be perceived as aggressive and not feminine) may be quite high when women do not particularly care about the outcome (e.g., it may need to be an all-women group for women to participate vocally), women may participate vocally even when there are some men in the group (though possibly not when the group is dominated by men) if the issue being deliberated is sufficiently important to them. Thus, we add an additional hypothesis:

H8: The impact of the share of the group that is women on women’s political participation, political interest, and efficacy will be greater as women’s concern about the topic of deliberation increases

Operationalization

Concept	Measurement / Operationalization	Related hypothesis
Participation in group discussions, group level outcomes	<ul style="list-style-type: none"> • Gender gap in average time per speaker: measured through number of spoken words and number of unique contributions (discrete times the participant talked flanked by other speakers) • Gender gap in proportion of talk time (male average – female average) • Ratio of male to female speech participation (male average / female average) • Equality of time between speakers: Herfindahl index using average speaking time (as measured above) per speaker • Enumerator rating of group discussions (enumerator questionnaire, Q2) 	H1a, H1c, H2, H3 //
Participation in group discussions, individual-level outcomes (interact treatment with gender to separately identify impacts on women and men)	<ul style="list-style-type: none"> • Dummy – individual indicated they spoke during the discussion (Q4A) • # spoken words by individual • Talk time of individual • Dummy – enumerator reports individual had a lot of participation during group discussion (enumerator questionnaire, Q3ii) • Dummy – enumerator reports individual had medium or high confidence during group discussion (enumerator questionnaire, Q3iii) 	H1a, H1c, H2, H3
Influence in group discussions, group level outcomes	<ul style="list-style-type: none"> • Measure of women’s relative influence as perceived by others: (# women voted as most influential/ total # women)/(# men voted as most influential/ total # men) (Q2) • Measure of women’s relative influence as indicated by a vote: Probability that the average man v. the average women will have his / her pre-treatment preferences reflected in the groups’ decision – i.e., (# women whose pre-treatment preference is amongst the winning policies/ total # women)/(# men whose pre-treatment preference is amongst the winning policies / total # men) • Agenda setting power: 1) whether a speech is followed by one on the same topic, 2) the share of the following five 	H1b / H1d / H1e/ H2

	<p>speeches that are on that same topic, and 3) the number of uninterrupted speeches that continue to discuss that topic (see Parthasarathy, Rao, & Palaniswamy, 2019, p. 633)</p> <ul style="list-style-type: none"> • Discussion time (measured by number of words) on women’s pre-treatment policy preferences as a share of discussion on men’s pre-treatment policy preferences • Correlation between speaking time on a particular policy and the ultimate decision the group reaches • Enumerator measures of group influence. See enumerator questionnaire (Q3) 	
<p>Influence in group discussions, individual-level outcomes (interact treatment (i.e., group composition) with gender to separately identify impacts on women and men)</p>	<ul style="list-style-type: none"> • Number of times that the speaker is interrupted (hand coded in transcript) • Dummy – speaker is referenced by his / her speaker number (see Clayton et al. 2014) • Respondent self-reported measures of group influence (see Karpowitz, Mendleberg and Shaker 2012). See post-treatment survey, attached below, Q2, Q5a, Q5c, Q5 • Dummy – individual indicated they spoke during the discussion (Q4A) • Dummy – individual indicated they spoke and felt others listened during the discussion (Q4B) (0 if did not speak or spoke but did not feel others listened) • Dummy – individual felt they changed the minds of others in the group (Q5) • Dummy – enumerator reports individual had a lot of influence on other participants during group discussion (enumerator questionnaire, Q3iv) 	<p>H1b / H1d / H1e/ H2</p>
<p>Political interest, knowledge, and efficacy</p>	<ul style="list-style-type: none"> • Dummy – individual feels significantly better informed about the viability of different policy options to combat deforestation (Q3) • Self-reported measures of internal and external political efficacy and political interest, measured by average within respondent change from pre- to post-treatment responses. See pre- and post-treatment survey, below (Post treatment survey: Q3, Q6 – Q9) • Behavioral measure: size of donation to seedling fund (Q16) 	<p>H4, H5</p>
<p>Women’s concern about the topic of deliberation (to be interacted with treatment (i.e., group composition) to test for significantly</p>	<p>From pre-discussion survey:</p> <ul style="list-style-type: none"> • Dummy - over-harvesting of nearby forests is a big problem for you community (Q14) • Dummy - have heard about climate change and believe it is a somewhat or very serious problem (0 if have not heard about climate change) (Q15 and Q15A) • Dummy - have heard about climate change and believe that, if nothing is done to reduce climate change in Malawi, they themselves will be personally affected 	<p>H8</p>

different impacts) (individual level)	(somewhat or very much) (0 if have not heard about climate change) (Q15 and Q15B)	
Mean levels of concern about deforestation and climate change (individual level)	Comparing mean from pre-discussion survey with post-discussion survey: <ul style="list-style-type: none"> • Dummy - over-harvesting of nearby forests is a big problem for you community (Q14 on pre-discussion survey, Q10 on post-discussion survey) • Dummy - over-harvesting of nearby forests is a problem (small problem or big problem) for you community (Q14 on pre-discussion survey, Q10 on post-discussion survey) • Dummy – believe over-harvesting of forests contributes to climate change (Q16 of pre-discussion survey, Q12 of post-discussion survey) 	H7
Feeling that women are disproportionately negatively affected by deforestation (individual level)	<ul style="list-style-type: none"> • Dummy –over-harvesting of nearby forests will affect women more than men (post-discussion survey, Q11) 	H6
Content of deliberations	<ul style="list-style-type: none"> • Hand-coded for a subset of transcripts • Structural topic models to assess which words frequently and exclusively co-occur (see Roberts et al. 2014), unit of analysis is the speech 	Not pre-specified / inductive
Other discussion characteristics	<ul style="list-style-type: none"> • Length of talk time (minutes) 	Not pre-specified / inductive

Table 1: Concept measurement and operationalization of outcome measures.

Estimation Strategy

Our research design has the appealing experimental feature of blocking at the community (village) level. Recall that we will randomize the seven treatment groups within each of the selected 90 villages. This allows for a degree of control over potentially confounding variables at the village level and will lend considerable precision to our estimates. We will conduct analyses at both the group and individual levels. We will calculate group-level outcomes as a function of the number of women participants in the group. Models estimating gender gaps (e.g., the ratio of men’s talking time v. women’s talking time in group deliberations) necessarily will only include mixed-gender groups. Outcomes focused on the relative influence one gender has over their same gender and the opposite gender necessarily will only include mixed-gender groups with at least two members of each gender. We will calculate individual-level outcomes also relative to the number of women participants (i.e., including both the all-male and the all-female groups). Following Karpowitz, Mendelberg, and Shaker (2012), we will include individual-level controls such as participants’ pre-existing preferences to determine, for instance, whether women are ceding discussion time because their preferences are being voiced by other participants. We will use standard OLS models

with group-clustered standard errors for the individual-level analyses. Alternative model specifications will include enumerator fixed effects and community fixed effects.

Potential for Randomized Controlled Trial (RCT) Extension

It is likely that we will have funding to use the results of this study to inform the design of a larger RCT aimed at evaluating the effectiveness of women's presence in natural resource governance.

We are still researching whether our idea might be feasible, but our hope would be to randomize the enforcement of existing gender quota laws on village level natural resource management committees. In 2016, the Malawian Parliament passed the Customary Land Act and the Malawi National Land Policy. According to REDD Malawi: "The new land legislation addresses issues of equity and representation through the creation of a representative institutional system for land administration, including the establishment of democratically-elected customary land committees." On the books, these land committees are chaired by a local chief, and are required to have at least 30 percent women members (REDD Malawi). We hope to work with a local actor to enforce the existing *de jure* gender quotas requirements. In all of Malawi, there are 293 land tribunals. We could, for example, devise an intervention that attempts to enforce the quota requirement in 50 land tribunals, while randomly selecting 50 matched pairs of untreated tribunals in which we let *de facto* practices continue unabated (which we suspect do not uphold the quota).

When we begin fieldwork for the focus group study this summer, we plan to investigate the extent to which this larger intervention might be possible. One idea for an enforcement mechanism is to work with the Ministry of Local Government to send officials to the treated communities ahead of tribunal meetings to ensure that the quota is upheld, but we welcome other ideas. Our preliminary thoughts on potential outcomes of interest are at several levels:

- 1) At the meeting level: we hope to record deliberations for both treated and untreated councils to gauge whether women's presence shapes group discussions and decisions. Where possible, we would measure deliberative outcomes similar to those described in Table 1.
- 2) At the community / village level: we hope to gather baseline and endline data from villagers to gauge whether women feel better represented and more efficacious and have better access to common pool resources in treated communities.
- 3) At the land tribunal / forest block area: this outcome seems hardest to shift, but we might envision an outcome variable that measures over-harvesting through satellite images of forest cover (such as from <https://www.planet.com/>).

Conclusion

Our research will shed light on a series of underexplored questions in literatures related both to climate governance and to gender and politics: How do men and women differ on their preferences on natural resource governance and climate change broadly in the Global South? How does women's presence in community decision-making bodies affect the realization of women's

preferences in group decisions? And how does women's collective presence in participatory governance affect individual women's political efficacy? These questions are of particular topical importance because women in the Global South are already among the most affected by climate change and will continue to be the group that experiences the most adverse consequences of the unfolding climate crisis. Understanding the effects of women's active participation in community decisions on climate governance has the potential to be of great interest to climate activists, climate policy practitioners, as well as scholars.

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Overall Protocol

1. During a pre-visit stage, **village headmen will be asked to book 25 men and 25 women on a certain date** for the project. We ultimately need 21 men and 21 women to form 7 groups of six each:
 - Group 1: 6 women
 - Group 2: 5 women, 1 man
 - Group 3: 4 women, 2 men
 - Group 4: 3 women, 3 men
 - Group 5: 2 women, 4 men
 - Group 6: 1 woman, 5 men
 - Group 7: 6 men
2. Upon arrival, the team will present themselves and **explain the research study to all those who have gathered**. The team in each community should be 14 enumerators, all of whom will conduct survey interviews, 7 of whom will facilitate (all women enumerators) and 7 will take notes.
3. After explaining the study, those who are interested in participation will be walked through the **consent script** one-on-one and given the option to decline participation. Consent will be recorded in writing for each participant.
4. If they agree to participate, then they will be asked to **draw a number from a bucket**, with separate buckets for men and women. The number they draw will determine their discussion group and participant number. If there are more than 21 men or women, then blank sheets will be added to the bucket to determine those who will not be part of the discussion group.
5. Once all participants have drawn a group number, the two IPOR staff members assigned to each group will separate their group from other groups such that conversations remain private to the group. In some cases, it is possible that groups may be adjacent to other groups and overhear one another; the IPOR staff members will confirm with participants that they are comfortable and offer to move the group location if they are not (a verbal check). Then, the IPOR staff members will **administer the pre-discussion survey** to all 6 members of that group in a private setting.
6. After the six surveys are complete, the **group discussion** will start. All seven groups will be run simultaneously. One IPOR researcher will facilitate the discussion while the other will observe and take notes on the group dynamics and complete the **FGD questionnaire**.
7. After the discussion, each participant will be asked the **post-discussion survey** questions one-on-one. At the end of the survey, each participant will be given 2000 MWK in K1,000 bill and 200 MWK bills. They will be **given the chance to donate any amount from the 2000 MWK to a replanting fund** or not. The replanting fund will pool all funds donated as part of the research across 90 communities, IPOR will match the donated funds

(doubling them), and seedlings will be purchased and donated to the Zomba and Machinga District forestry services for replanting in 2023.

8. Recorded discussions will be transcribed and translated into English verbatim. The transcripts will include date, facilitator name, notetaker name, village name, and group number. Each comment will be attributed to participants based on their participant number (1-6). This will allow the research team to link each participant's survey responses, discussion contributions, and vote using their unique identifier (village name/number + group number + participant number)
9. Dissemination activities
 - a. Reports on vote outcomes for the Zomba and Machinga District Forestry Offices
 - b. Events with traditional authorities (TAs, GVHs, VHs) in the four TAs to discuss learning outcomes
 - c. Tree seedling donation event organized by IPOR

Group Introduction

Thank you for gathering here today to learn more about this research. We are a team of researchers from the Institute for Public Opinion and Research (IPOR) here in Zomba, Malawi. The purpose of this research is to find out more about how people think about harvesting trees in the communal forest on the Zomba plateau. This study has three components: a short individual-level survey, a discussion in groups of 6, and then a final short individual-level survey. For each person participating in this study, we expect you to spend about 2 hours here. Please note that you must be at least 18 years of age or older in order to participate.

Our activities will proceed in three stages. First, anyone who is interested in participating will go through a brief consent process. Second, you will draw a number from this bucket to determine which group you will be a part of, with men and women drawing from separate buckets. We only have space for 21 women and 21 men, so if there are more than that interested, some of you will draw a blank paper and will not be a part of the study. Third, you will be asked a short set of questions about yourself and your attitudes. Fourth, you will gather in the group number that you pulled from the bucket and we will have a brief discussion about deforestation and forest maintenance followed by a vote in the group on the most effective measure to address deforestation. After the vote, each member of the group will answer another short set of questions individually.

During the surveys and the group discussion I would like you to share your honest opinions and thoughts, positive or negative. Everything that you say here will be kept confidential, and your names or any other identifying information will not be linked to any report coming from this research. You may refuse to participate in this study. Even if you choose to participate in the study, you may discontinue participation at any time without penalty or loss of participant benefits.

Does anyone have a question about this research or anything that I have just explained?

Now I would like to invite those who wish to participate to line up here for the consent process and those who are no longer interested may depart with our thanks for coming today.

Consent Process (Individually Administered)

I am [NAME] and I am working with the Institute of Public Opinion and Research (IPOR). IPOR is a research firm based in Zomba. It is an independent organization that carries out different studies in Malawi.

You are invited to participate in a study of public opinion about community deforestation in Malawi. The project is being conducted by Dr. Amanda Clayton, Dr. Boniface Dulani, Dr. Katrina Kosec, and Dr. Amanda Robinson, researchers and professors from Vanderbilt University, Ohio State University, the International Food Policy Research Institute (IFPRI), and the University of Malawi, in collaboration with the Institute for Public Opinion and Research based here in Zomba, Malawi.

Your community was selected for this study because you are near the Zomba-Malosa forest reserve. The objective of the study is to learn your opinions about deforestation in the community.

You were identified as a local resident who may be interested in participating in this study. Participation is expected to take less than three hours and will include us asking you some questions one-on-one and your participation in a group discussion about deforestation in the Zomba-Malosa forest reserve.

The discussion will last as long as your group continues to debate the topic. To help facilitate discussion, a moderator will pose some questions. Please note this discussion will be audio-recorded and a note-taker will be present. All of your answers and study-related information will be kept confidential. All answers will be combined and no one will be able to identify them personally. No identifying information about you will be included in the reports that result from this research. Only persons related to the study will have access to the data.

You can choose whether or not to participate in this research, and you may stop at any time during the course of the study. If you decide to stop participating in the study, there will be no penalty to you, and you will not lose any benefits to which you are otherwise entitled. You may also choose to skip any questions that make you feel uncomfortable, or which you prefer not to answer. Your decision will not affect your future relationship with The Ohio State University, Vanderbilt University, the University of Malawi, or IPOR. In addition to refreshments during the discussion, each participant will be provided with 2000 MWK that you can use anyway that you want.

Questions, concerns, or complaints about the research should be directed to the Institute for Public Opinion and Research (IPOR), one of the principal investigators, at +265999958923.

Questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact the Ohio State Office of Responsible Research Practices at 1-800-678-6251, the Vanderbilt Human Subjects Office at +1-615-322-2918, or the IFPRI IRB at IFPRI-IRB@cgiar.org.

Pre-Discussion Survey

[Date]

[Enumerator Name]

[Village Name]

[GPS coordinates] (supervisor only, given an option to skip)

[Group Number]

[Respondent Number]

Demographics I:

[Record respondent gender]

1. How old are you? [in years]
 - a. If under 18, take to a script saying that only talking to aged 18 and above. But thanks for participating. The respondent should be paid 2000 MWK.
2. What is your marital/family status?
 1. Single, never married
 2. Married
 3. Separated
 4. Divorced
 5. Widowed
 6. Other
 10. DK/Refuse to answer

Political Interest, Engagement, and Efficacy

We will start by asking your views on several different issues.

3. When you get together with your friends or family, would you say you discuss political matters: *[Read out options]*
 - 0. Never
 - 1. Occasionally
 - 2. Frequently
 - 9. Don't know [do not read]
4. How interested are you in politics? (For example, going to political events or political discussions)
 - 1. Not at all interested

- 2. A little interested
 - 3. Somewhat interested
 - 4. Very interested
 - 9. Don't know
5. Here is a list of actions that people sometimes take as citizens. For each of these, please tell me whether you, personally, have done any of these things during the past year.
[If Yes, read]: Was this often, several times or once or twice? Yes, Often= 3, Yes, Several Times = 2, Yes, Once or twice= 1, No =0, Don't Know= 9
- A. Attended a community meeting
 - B. Got together with others to raise an issue
6. Did you vote in the fresh (2020) presidential election?
- 1. Yes
 - 0. No
7. During the past year, how often have you contacted any of the following persons about some important problem or to give them your views? *[Read out options]*
Never= 0; Only Once = 1, A few times= 2, often=3, Don't know [Do not read] = 9
- A. A local government councilor
 - B. A member of Parliament
 - C. A political party official
 - D. A traditional leader
 - E. A religious leader
8. Please tell me how much you agree with the following statement: "Sometimes politics and government seem so complicated that a person like me can't really understand what's going on."*[Interviewer: probe for strength of opinion]*
- 1. Strongly disagree
 - 2. Somewhat disagree
 - 3. Somewhat agree
 - 4. Strongly agree
 - 9. Don't know
9. How much would you say the political system in Malawi allows people like you to have a say in what the government does? *[Read out responses]*
- 1. Not at all
 - 2. Very little
 - 3. Some
 - 4. A great deal
 - 9. Don't know
10. How able do you think you are to take an active role in a group involved with political issues? *[Read out responses]*
- 1. Not at all able

- 2. A little able
- 3. Somewhat able
- 4. Very able
- 9. Don't know.

11. And how confident are you in your own ability to participate in politics?

- 1. Not at all confident
- 2. A little confident
- 3. Somewhat confident
- 4. Very confident

Economics

Now I will ask a few questions about your household.

12. Over the past year, how often, if ever, have you or anyone in your family gone without:

- A. Enough food to eat
- B. Enough clean water for home use
- C. Medicines or medical treatment
- D. Enough fuel to cook your food
- E. A cash income

(read out options: never=0, just once or twice=1, several times=2, many times= 3, always=4, Don't Know= 9 [Do not read])

13. A. What is the main fuel that you use to prepare food in your home?

[If mention more than one, ask which is the main one]

- 1. Electricity
- 2. Gas
- 3. Charcoal
- 4. Firewood
- 5. Straw/grass
- 6. Crop residues (e.g., maize cobs or stalks)
- Other [specify]

13B. [If charcoal]: What is the most common way that you acquire charcoal for cooking?

[if mention more than one, ask which is the most common]

- 1. Felling trees in the forest and prepare my own
- 2. Felling your own trees and prepare my own
- 3. Collecting dry branches and twigs and prepare my own
- 4. Purchase from another member of this village
- 5. Purchase outside of the village
- Other [specify] post code

13C. [If firewood]: What is the most common way that you acquire firewood for cooking? [if mention more than one, ask which is the most common]

- 1. Felling trees in the forest
- 2. Felling your own trees (on your land)
- 3. Collecting dry branches and twigs
- 4. Purchase from another member of this village
- 5. Purchase outside of the village
- Other [specify]

Climate Change and Deforestation

14. In your view, is over-harvesting of nearby forests a problem for you community?

- 1. It is not a problem at all
- 2. It is a small problem
- 3. It is a big problem
- 9. Don't know/Refuse [do not read]

15. Have you heard about climate change, or haven't you had the chance to hear about this yet?

- 1. Yes, have heard
- 0. No, haven't had the chance

15A. [If yes]: If nothing is done to reduce climate change in the future, how serious of a problem do you think it will be for Malawi? [*read out* responses]

- 1. Not at all serious
- 2. A little serious
- 3. Somewhat serious
- 4. Very serious
- 5. Don't Know [*Do not read*]

15B. [If yes]: If nothing is done to reduce climate change in Malawi, do you think that you will be personally affected?

- 1. Not at all
- 2. Somewhat
- 3. Very much
- 9. Don't know [do not read]

16. Do you think that over-harvesting of forests contributes to climate change?

- 0. No
- 1. Yes
- 2. Not sure
- 9= Don't know

17. I'm going to read you a list of possible effects of global climate change. Which of these effects concerns you the most? Of the remaining, which concerns you most? And, of the remaining which is most concerning? [Randomize the order of response options]

[Ask the respondent to provide 3 responses, ranked in terms of level of concern]

- 1. Droughts or water shortages
- 2. Delayed and unpredictable arrival of rain
- 3. Severe weather, like floods, mudslides, high winds, or intense storms
- 4. Soil erosion and soil degradation
- 5. Long periods of unusually hot or unusually cold weather
- Other [please list]
- 9. Don't know

18A. Does your community have a Village Natural Resource Management Committee?

- 2. Yes, we do now
- 1. Yes, we had in the past but not now
- 0. No, we never had
- 8. Unsure
- 9. Don't know

18B. [If yes]: Were you ever a member of that VNRMC committee?

- 0. No
- 1. Yes

19. Does your community have any other community group (other than the VNRMC) that is tasked with monitoring or caring for forest resources?

- 2. Yes, we do now
- 1. Yes, we had in the past but not now
- 0. No, we never had
- 8. Unsure
- 9. Don't know

19.B: [If yes], what was that committee/group called (the name)? [Open text box]

20N. How many people in this community earn money by producing, transporting, or selling charcoal?

- 1. None
- 2. A few
- 3. Many
- 9. Don't know/refuse [do not read]

20. Some people believe that trees in Zomba-Malosa are being over-harvested. Now I'm going to list a few solutions that other people in Malawi have suggested to stop people from over-harvesting. For each one could you tell me how well you

think it would work in your community to stop people from over-harvesting? (1= very unlikely, 2= unlikely, 3=somewhat, 4=likely, 5=very likely, 9=Don't Know)
[Policies are presented in randomized order. Use the cards with images for each policy to assist in explaining the policies]

- **A. Community Enforcement:** Set rules/bylaws against over-harvesting and charcoal production which are monitored and enforced by a community committee or the chief
- **B. Government Enforcement:** Set rules/bylaws against over-harvesting and charcoal production which are monitored and enforced by government-employed forest guards
- **C. Replanting Incentives:** Create an incentive program that pays community conservation groups for each seedling that is planted in communal forests and survives the first year
- **D. Civic Education:** Offer trainings to make members of the community aware of the consequences of over-harvesting
- **E. Alternative Cooking Methods:** Provide materials and training to use alternative cooking techniques (e.g., chititezo mbaula stove) or alternative fuel (e.g., briquettes)
- **F. Jobs Training:** Provide small business training solely for those individuals who currently engage in over-harvesting, so that they can provide for their families without harvesting trees.

21. Now I would like you to rank the potential solutions above in terms of their likely success at reducing over-harvesting in Zomba-Malosa, with the first being the most likely to work and the last being the least likely to work.

[Use the cards with images for each policy to assist in the ranking exercise]

- A. First choice: [drop down menu with all six policies]
- B. Second choice: [drop down menu with remaining five policies]
- C. Third choice: [drop down menu remaining four policies]

Demographics II

Now let's end by talking a bit more about you.

22. What is your ethnic community, cultural group, or tribe?

[Do NOT read options. Code from response]

- 1. Mang'anja
- 2. Yao
- 3. Lomwe
- 4. Chewa
- Other (specify)

23. What is your highest level of education? *[Code from answer. Do not read options]*

- 0. No formal schooling
- 1. Informal schooling only
- 2. Some primary
- 3. Completed Primary
- 4. Some Secondary
- 5. Completed Secondary
- 6. Post-secondary

24. Is your household headed by a man or a woman?

- 1. Man
- 2. Woman

Thank you for answering these questions. Now, please wait just a moment for us to start the discussion.

[PAUSE THE SURVEY FOR THE DISCUSSION. YOU WILL REOPEN AND COMPLETE THE REST OF THE SURVEY AFTER THE DISCUSSION]

Discussion Group Protocol

Section I – INTRODUCTION BY THE MODERATOR

INTRODUCTION: The purpose of this research is to find out more about how people think about harvesting trees in the communal forest on the Zomba plateau. During the discussion I would like you to share your honest opinions and thoughts, positive or negative. To enable us to transcribe the discussions, we will record the discussion. However, everything that you say here will be kept confidential, and your names or any other identifying information will not be linked to any report coming from this research. The recording of the discussion will be deleted after we finish transcribing. Remember, you may choose to stop participating in this research at any time. However, we hope you will all participate and share your thoughts.

Before beginning, I just want to go over three ground rules for discussion:

1. There are no right or wrong answers to the questions. We are interested in your personal views. You can agree with other participants' opinions, but please do not feel as though you must agree with other participants.
2. Please talk one at a time and please do not have side conversations.
3. Each time you speak, please begin by stating your participant number, given out to you when I spoke with you in private earlier.

Are there any questions? Alright – let's begin.

Section II – QUESTION GUIDES

1. First let's start with discussing the issue of climate change. Do you think climate change will affect this community? If so, how?
2. Now we will shift to discussing the problem of deforestation. As we explained earlier, we want to understand how Malawians think about potential solutions to the problem of over-harvesting of forest products. Before this discussion, we asked each of you about your personal opinion on some solutions that others in the country have suggested. Now, we'd like you to come together as a group to discuss which solution that you think will be most effective to stop the problem. After this discussion, each of you will vote on your preferred solution. We will collect each group's vote and share this information anonymously with officials in the local forestry offices. The proposed solutions are:

[Moderator: show cards with pictures depicting each solution while describing each. Shuffle cards so that the order of introducing each solution is random.]

- **Community Enforcement:** Set rules/bylaws against over-harvesting and charcoal production which are monitored and enforced by a community committee or the chief
- **Government Enforcement:** Set rules/bylaws against over-harvesting and charcoal production which are monitored and enforced by government-employed forest guards
- **Replanting Incentives:** Create an incentive program that pays community conservation groups for each seedling that is planted in communal forests and survives the first year
- **Civic Education:** Offer trainings to make members of the community aware of the consequences of over-harvesting
- **Alternative Cooking Methods:** Provide materials and training to use alternative cooking techniques (e.g., chititezo mbaula stove) or alternative fuel (e.g., briquettes) to reduce demand for wood
- **Jobs Training:** Provide small business training solely for those individuals who currently engage in over-harvesting, so that they can provide for their families without harvesting trees.

First, please go through and discuss each proposed solution as a group, touching on the pros and cons of each proposed solution. I will give you time to discuss amongst yourselves without weighing in. When you are done discussing, we will ask each of you one-by-one in private to tell us your vote for the solution you think is most likely to be effective, and then I will tally the votes and report the solution(s) with the most votes.

[Instructions to moderator: allow the group to deliberate for as long as they would like without interfering in the group discussion. The note taker should take careful notes on how the discussion proceeds and the group dynamics, including the participant number of each speaker. Ideally, each speaker will automatically mention their participant number as they speak; you may interject briefly to ask speakers to call out their participant number when beginning to speak.

When the group has finished deliberating, ask each group member to come to you one-by-one and tell you his / her vote (top solution). If the participant has two favorite options, kindly push them to select only one. Record the participant number and his / her choice on the provided worksheet. When everyone has told you their top choice, report the solution(s) with the most votes to the group.]

Thank you for your time. We appreciate you giving your opinion on this important issue. We will now speak to you again, one on one, to ask a final set of questions before you depart.

Group Exercise Questionnaire

[The note taker should complete this questionnaire at the end of the discussion based on their notes.]

Group Discussion Evaluation

[Date]

[Enumerator Name]

[Village Name]

[Group Number]

1. How long was the focus group discussion? [___ minutes]
2. How well do each of the following words describe the group discussion, in your observation?
 - a. Conflictual (1= Not at all, 2=Somewhat, 3=Very much)
 - b. Respectful (1= Not at all, 2=Somewhat, 3=Very much)
 - c. Energetic (1= Not at all, 2=Somewhat, 3=Very much)
 - d. Interactive (1= Not at all, 2=Somewhat, 3=Very much)
3. Now, please answer the following questions about each participant based on your observation:
 - a. Participant 1
 - i. Gender [1=M, 2=F]
 - ii. Degree of participation [0=None, 1=A bit, 2=A lot]
 - iii. Level of confidence [1=Low, 2=Medium, 3=High]
 - iv. Degree of influence on other participants [0=None, 1-A bit, 2=A lot]
 - b. Participant 2
 - i. Gender [1=M, 2=F]
 - ii. Degree of participation [0=None, 1=A bit, 2=A lot]
 - iii. Level of confidence [1=Low, 2=Medium, 3=High]
 - iv. Degree of influence on other participants [1=None, 2=A bit, 3=A lot]
 - c. Participant 3
 - i. Gender [M, F]
 - ii. Degree of participation [None, A bit, A lot]
 - iii. Level of confidence [Low, Medium, High]
 - iv. Degree of influence on other participants [None, A bit, A lot]
 - d. Participant 4
 - i. Gender [M, F]
 - ii. Degree of participation [None, A bit, A lot]
 - iii. Level of confidence [Low, Medium, High]
 - iv. Degree of influence on other participants [None, A bit, A lot]

- e. Participant 5
 - i. Gender [M, F]
 - ii. Degree of participation [None, A bit, A lot]
 - iii. Level of confidence [Low, Medium, High]
 - iv. Degree of influence on other participants [None, A bit, A lot]
 - f. Participant 6
 - i. Gender [M, F]
 - ii. Degree of participation [None, A bit, A lot]
 - iii. Level of confidence [Low, Medium, High]
 - iv. Degree of influence on other participants [None, A bit, A lot]
4. Of the six participants, which one was the most influential?
- a. Drop down box with each participant number
5. Other observations about the group discussion dynamics? [Open text box]
6. For which policy did each participant vote: *[Mark as they vote]*
- a. Participant 1: [Drop down menu with 6 policies]
 - b. Participant 2:
 - c. Participant 3:
 - d. Participant 4:
 - e. Participant 5:
 - f. Participant 6:
7. Which policy (or policies, if a tie) received the most votes? [Select all that apply]
- a. Community Enforcement
 - b. Government Enforcement
 - c. Replanting Incentives
 - d. Civic Education
 - e. Alternative Cooking Methods
 - f. Jobs Training

Post Discussion Survey

(This will be programed as the second half of the pre-discussion survey)

Thank you for participating in discussion today. We have just a few final questions about your experience in the discussion group.

Group Dynamics

1. Thinking back to the discussion you just participated in, how well do each of the following words describe the group discussion, in your view?

- A. Respectful (1=Not at all, 2=Somewhat, 3=Very much, 9=Don't know)
- B. Conflictual (1=Not at all, 2=Somewhat, 3 Very much, 9=Don't know)
- C. Productive/useful (1=Not at all, 2=Somewhat, 3 Very much, 9=Don't know)
- D. Uncomfortable (1=Not at all, 2=Somewhat, 3 Very much, 9=Don't know)
- E. Interesting (1=Not at all, 2=Somewhat, 3 Very much, 9=Don't know)

2. Which one person was the most influential in the group's discussions and decisions?

- Participant 1
- Participant 2
- Participant 3
- Participant 4
- Participant 5
- Participant 6

2A. Did you feel that some people spoke much more than others (dominated the conversation)?

0=No, 1=Yes

- 2B. [If yes]: what factors made some more likely to talk than others? [Do not read list, code answers from list, select all that apply]
 - 1. Gender
 - 2. Age
 - 3. Authority
 - 4. Education
 - 5. Expertise/experience
 - Other (fill in)

3. Based on the discussion, do you now feel any better informed about the viability of different policy options to combat deforestation? *[Read out responses]*

- 3. Significantly more informed
- 2 Somewhat more informed
- 1. No more informed than I was previously

Deliberation Efficacy

4A. Did you speak during the discussion?

- 1. Yes

- 0. No

4B[If yes]: Did you feel that others listened when you spoke in the group?

- Yes
- No

4C. [If no]: Why not? [select all that apply]

- 1. Low confidence/shyness
- 2. Felt that no one would listen
- 3. Someone had already made my point
- 4. Wanted to defer / be respectful to others in the group
- Other [Specify]

5. Did you feel that you changed the minds of anyone else in the group?

- 1. Yes
- 2. No
- 9. Don't know

Political Interest / Efficacy (Again)

Before, we asked you some questions about your interest in politics. After having our group discussion, we'd like to ask your opinion again:

6. How interested are you in politics?

- 1. Not at all interested
- 2. A little interested
- 3. Somewhat interested
- 4. Very interested
- 9. Don't Know

7. Please tell me how much you agree with the following statement: "Sometimes politics and government seem so complicated that a person like me can't really understand what's going on."

- 4. Strongly disagree
- 3. Somewhat disagree
- 2. Somewhat agree
- 1. Strongly agree
- 9. Don't Know

8. How much would you say the political system in Malawi allows people like you to have a say in what the government does?

- 1. Not at all
- 2. Very little
- 3. Some

- 4. A great deal
- 9. Don't know

9. And how confident are you in your own ability to participate in politics?

- 1. Not at all confident
- 2. A little confident
- 3. Somewhat confident
- 4. Very confident
- 5. Don't know

Climate Change and Deforestation

10. In your view, how much of a problem is over-harvesting of nearby forests for you community?

- 1. It is not a problem at all
- 2. It is a small problem
- 3. It is a big problem
- 9. Don't know

11. In your opinion, who do you think over-harvesting of nearby forests will affect more between men and women? [Read out responses except the equal]

- Women will be harmed far more
- Women will be harmed slightly more
- Women and men will be harmed equally [Do not read]
- Men will be harmed slightly more
- Men will be harmed far more

12. Do you think that over-harvesting of forests contributes to climate change?

- 0. No
- 1. Yes
- 9. Don't Know

14. How likely do you think over-harvesting of forests is to contribute to climate change?

- 1. Very unlikely
- 2. Unlikely
- 3. Likely
- 4. Very likely
- 9. Don't know

15. Lastly, I would like to ask you a question on the fertilizer input subsidy program. Some people think the current system of giving people coupons for redeeming for fertilizer is the best way to ensure that the program assists in boosting crop productivity. Others however think that it would be best to give farmers the cash

equivalent of the fertilizers to enable them purchase fertilizers directly. How about you, would you prefer the current system of using coupons or would you prefer cash?

- 1. Coupons
- 2. Cash
- 3. Both cash and coupons [*Do not read*]
- 9. Don't know [do not read]

Those are all of the questions that I have for you. Thank you so much for your participation today.

16. Now, I will offer you the sum of 2000 MWK. This money is yours to keep and to spend on anything you want. However, I also want to offer you the opportunity to donate any amount from the 2000 MWK to a fund that will purchase tree seedlings that will be donated to the local forestry department to replant in the forests around your community. For every amount that is donated by participants in this study, my organization, IPOR, will match your contribution doubling it. For example, if someone donates 600 MWK to this fund, IPOR will add to it 600 MWK, making it 1200 MWK altogether. If someone donates 2000 MWK, IPOR will add 2000 MWK to make it 4000 MWK.

All the donations and IPOR matching funds will be combined and seedlings will be purchased and donated in the next rainy season. It is completely up to you whether to donate or not and we will not share your decision with anyone else here today (your signature will be covered). Now, would you like to receive the full 2000 MWK or donate some part of it?

[Record their decision]

Amount donated? [Number between 0 and 2000]

Amount kept? [Number between 0 and 2000]

[Pay them the balance that was not donated. Please ensure that when each person signs for what they have received and donated, that they are NOT able to see the donations of other participants.]