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**Gender, Deliberation, and Natural Resource Governance**

**Experimental Evidence from Malawi**

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## ABSTRACT

Initiatives to combat climate change often strive 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 community-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 preferred policy to combat local over-harvesting. We find that any given woman has relatively more influence in group deliberations when women 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 towards topics on which women tend to have greater expertise. Our work suggests that including women in decision-making can shift deliberative processes in ways that amplify women's voices.

**Keywords:** Gender, women's empowerment, communal forest management, decision-making, poverty

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# Introduction

Women’s inclusion is now the norm in global and local initiatives to combat climate change.<sup>1</sup> 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). Yet how women’s representation affects climate-related governance is still poorly understood. We examine the causal effect of women’s representation in 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 up to a 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 community-managed forests. We worked with community leaders to assemble groups ranging from all women to all men with each of the seven possible permutations randomly assigned. We measure influence in several ways, including through participants’ assessments of their own influence, through the assessment of a hypothesis-blind enumerator observing group discussions, and through a secret vote by all group members to select the most influential participant. 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 increase women’s aggregate influence, it also increases the likelihood that any given woman will influence group deliberations. Our data also reveal that peer assessments of women’s influence increase particularly starkly among *men* participants, who become much more likely to recognize women’s influence in settings with more women. Finally, we find that when women are in the majority, group decisions are more likely to match women’s pre-treatment policy preferences.

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<sup>1</sup>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.” 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>

We next test observable implications of potential mechanisms that may explain our findings. Contrary to our pre-specified expectations, we do not find that women speak significantly more in the company of more women. We also do not find evidence that group dynamics become more collaborative as women’s representation increases. Rather, we find that the *substance* of group discussions changes as women’s presence grows. Using structural topic models based on the discussion transcripts, we find that group discussions tend to include more time on topics on which women have greater socially recognized expertise (cooking methods and replanting incentives) and less time on topics for which men have greater socially recognized expertise (community and government enforcement) in groups with more women, likely granting women more authority in these settings. Extensive qualitative evidence also supports this interpretation. From interviews with key stakeholders, separate focus groups with villagers, and observations of actual village meetings on natural resource management, we find evidence that policies to combat deforestation tend to affect men and women in different ways because of longstanding gender roles in forest management. Moreover, the gendered division of forest-related labor maps onto the gender differences that we observe in our discussion transcripts.

Our findings speak to a growing body of work that investigates how women’s representation shapes deliberative processes and outcomes. This research collectively demonstrates that women’s presence matters; it shapes policy decisions in ways that tend to reflect women’s preferences and priorities. For instance, in legislative settings, women’s representation is associated with the increased prioritization of goods women tend to prefer, including public health (Clayton and Zetterberg 2018), drinking water in rural areas of the Global South (Bratton and Ray 2002; Chattopadhyay and Duflo 2004), women’s rights (Franceschet and Piscopo 2008), and policies that broadly support working mothers (e.g., Kittilson 2006; Weeks 2022). Moreover, 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 results lend new insights into the causal dynamics behind these findings. We find that women’s presence in community-managed environmental bodies shapes the *content* of discussions in ways that likely grant women more authority, particularly in the eyes of men.

Our work also builds on an influential body of scholarship that specifically examines how a group’s gender composition causally affects women’s willingness to participate in group discussions (Karpowitz and Mendelberg 2014; Karpowitz et al. 2023; Born, Raney and Sandberg 2018). Collectively, this scholarship 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 for the first time outside of the Global North university setting.

Finally, our work 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). We draw on a rich literature in political science and economics on interventions to improve the management of common pool resources (Ostrom 1990; Slough et al. 2021; Samii et al. 2014; Meinzen-Dick et al. 2022). We also build on observational work that has examined how the inclusion of marginalized resource users affects natural resource management. For instance, Agarwal (2009, 2010) studies forest user groups in India and Nepal and finds a positive correlation between the proportion of women on governing bodies and improved forest governance and resource sustainability. Recent work from India further shows that the inclusion of marginalized ethnic groups (scheduled tribes) improves forest conservation (Gulzar, Lal and Pasquale 2023). We move this literature forward by causally examining how women’s representation in decision-making around common pool resources causally affects deliberation itself. Our findings provide new evidence that including women in local initiatives to combat climate change can shift group deliberations in ways that amplify women’s voices.

# 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 is whether men and women have different preferences on community forest management. Whereas a robust literature across lower-income countries suggests that men and women tend to hold different policy priorities (Chattopadhyay and Dufflo 2004; Gottlieb, Grossman and Robinson 2018), this work rarely examines issues related to the environment. Moreover, related research presents mixed expectations. On the one hand, some recent experimental work suggests that women might be more conservation-minded than men. For example, 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 men-majority groups. Moreover, women’s traditional roles in very low-income countries like Malawi—including gathering firewood, tending crops, and collecting drinking water—may mean that they are especially affected by the depletion of natural resources, which could motivate resource conservation (Deininger et al. 2023; Mawaya and Kalindekaffe 2010).

However, other studies find that men are better stewards of the environment in low-income agricultural societies, 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), because they have greater interactions with conservation agencies (Villamor et al. 2014), or because men are more likely to exploit forest resources for commercial purposes (Mawaya and Kalindekaffe 2010). Women in these societies also face many informal barriers to accessing information and fully participating in decision-making due to lower education levels when compared to men, gender norms, and gendered differences in access to resources (Mawaya and Kalindekaffe 2010; Alkire et al. 2013; Mudege et al. 2017). 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, 79 percent of Malawian men reported having heard about climate change versus 69 percent of women. Moreover, among those aware of climate change, 50 percent of men



strongly agreed that “ordinary Malawians can do a lot to stop climate change,” whereas only 39 percent of women chose this response option.

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.

## 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 their 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. 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.<sup>2</sup>

We expect this process to occur through three potential channels. First, women may participate more actively in group deliberations as their share of the group increases. This may be because women feel more confident in 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 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. If participation is positively correlated with influence (Karpowitz,

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<sup>2</sup>Our pre-analysis plan (PAP) is included in SI K. The PAP also registers additional expectations (e.g., expectations related to women’s perceptions of self-efficacy) that we hope to test in future work.

Mendelberg and Shaker 2012)—that is, if talking more makes one more influential—then we expect that any given woman will speak more and thus have more influence over group deliberations as the number of women grows.

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 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). One way that any given woman might gain influence in settings with more women is if other women are more likely to acknowledge her contributions. Men may be more likely than women to “talk past” a woman speaker, pivoting the subject or interrupting her (Holmes 2013). In this case, we would expect women’s relative influence to increase in groups with more women simply because there are more group members predisposed to recognize a fellow woman’s contributions (i.e., more women). Another possibility is that other group members (men or women) *change* their behavior in the presence of more women. This could occur if norms of speech change in groups with more women causing decision-making bodies to generally become more collaborative (Barnes 2016; Holman and Mahoney 2018). In this instance, the average tone of discussions might change towards greater recognition of everyone’s contributions, including those made by women.

The final channel through which women might gain more authority in group settings is by altering the substantive content of group discussions. Above, we described how preferences towards deforestation policy might be gendered. In such instances, conversations with more women may focus on different aspects of the problem of overharvesting of forest products and its solutions. As an example, women are responsible for cooking in daily life in Malawian villages and one of the main uses of forest resources is firewood harvesting and charcoal production, both of which women use in cooking (Mawaya and Kalindekafe 2010). If a group with more women spent more time discussing cooking methods as a dimension of forest management, women’s substantive expertise could lend them more authority than they might have in a group discussing other policy dimensions.

In sum, we theorize that increases in women’s representation may change group dynamics in three distinct ways that could result in women having more relative influence in group deliberations: (1) by compelling women to talk more, (2) by making groups more collaborative and thus receptive to women’s views, and/or (3) by changing the content of group discussions. While these mechanisms are likely interdependent—for instance, women may talk more on subjects on which they feel confident—for the purposes of testing distinct implications associated with each mechanism, we consider each separately below.

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 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 Supplementary Information [SI] Table SI.1). 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.

## **Malawi’s Communally Managed Forests**

Malawi is in the midst of a deforestation crisis. Sixty-five percent of Malawi’s forests are located on customary land, and communities overharvest these forests for timber, 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 forest reserves threatens the livelihoods of communities that depend on them (Mawaya and Kalindekafe 2010). Yet avoiding the over-harvesting of community-managed 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 wood and 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 mean that future income streams can take years to materialize (Eisenbarth, Graham and Rigterink 2021).

In Malawi, forests are governed by multiple actors. The main bodies responsible for day-to-day forest management are called Village Natural Resource Management Committees (VNRMCs). These groups manage protected forest areas within or adjacent to their communities. Their main mandate is to set penalties for those who harvest beyond their family allotment, and these penalties are typically enforced in collaboration with the local chief. For some forests, there are also elected groups called Block Management Committees (BMCs), whose function is to oversee the management of government-owned forests. These forests tend to be bigger and are the site of most large-scale illegal harvesting used for timber and charcoal production. The BMCs tend to have more authority than the VNRMCs, including working with forest guards who are employed by the Ministry of Natural Resources and Climate Change and monitoring and enforcing penalties for illegal harvesting. Our research question on the role of gender in forest management is of particular relevance in Malawi, where women are formally required to occupy up to fifty percent of the positions on these governance bodies; however, these requirements are often loosely enforced, if at all (UN-REDD Programme 2017).

## Study Design and Estimation Strategy

Our study sites comprise 90 communities adjacent to Zomba-Malosa Forest Reserve in southern Malawi. We randomly selected these communities from among the 216 communities within three kilometers of Zomba-Malosa Forest Reserve boundary, a distance that implies that activities within the reserve are accessible and thus relevant to them. Figure 1 shows a map of the study area. Between 2000 and 2021, Zomba-Malosa Forest Reserve lost 25 percent of its tree cover, both due to commercial timber loggers and local harvesting for cooking fuel (*Global Forest Watch* 2021). The surrounding communities rely upon wood harvested from the reserve for their cooking fuel and heating. For instance, 94 percent of the respondents in our survey indicated relying on local forest stock for their cooking needs. Moreover, 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 reserve 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 for future use. 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.<sup>3</sup>

In the communities adjacent to the forest reserve, we worked with a Malawian research firm to lead group discussions with villagers on the issue of deforestation. 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, Zomba-Malosa Forest Reserve is co-managed by multiple actors (as described above), including citizen governance bodies. We designed our study to mimic the actual forest governance structures in place such that our results might be applicable to these bodies, as well as to the many other areas around the world where conservation efforts

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<sup>3</sup>Response options were: not a problem at all, somewhat of a problem, or a big problem.

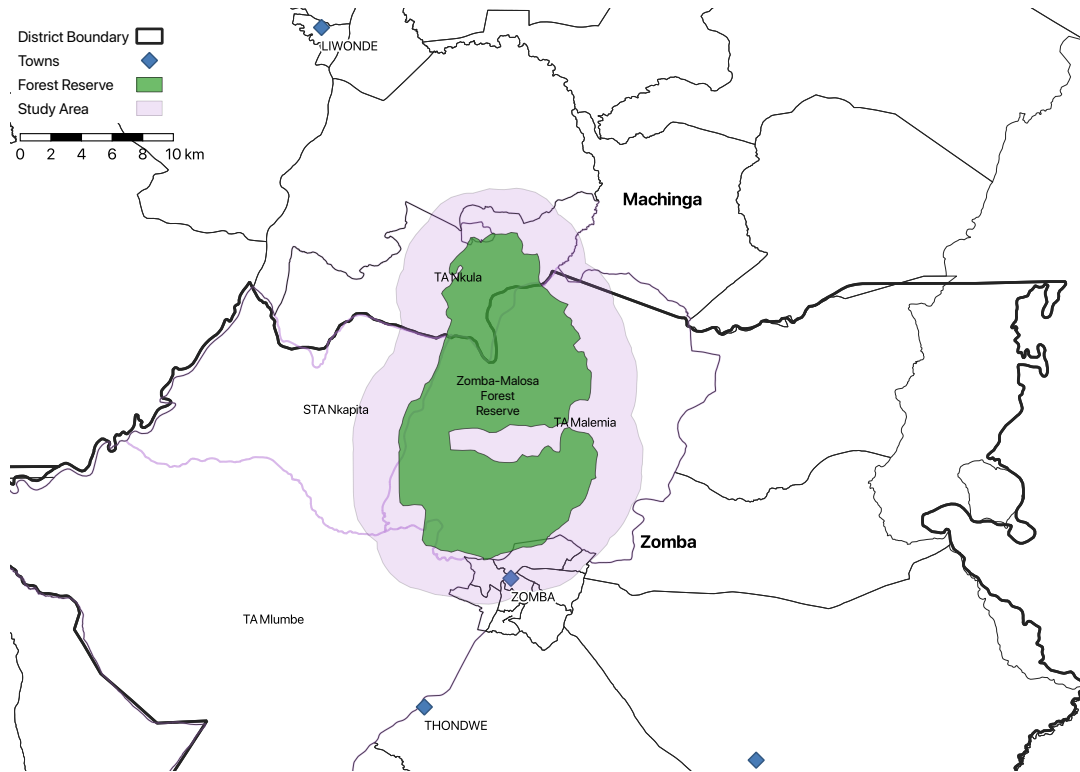


FIGURE 1 Map of the Study Area within 3km of the Zomba-Malosa Forest Reserve in Zomba and Machinga Districts, Malawi. Map created by authors using GIS files.

are managed in part or in full by local communities (see, e.g., Slough et al. 2021; Gulzar, Lal and Pasquale 2023; Ostrom 1990).

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, six men; a group of one woman, five men; . . . , and a group of six women, zero men).<sup>4</sup> 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

<sup>4</sup>Our study took place in August, 2022. We visited each of our study sites beforehand and asked the local chief to assemble  $\approx 50$  villagers, equally men and women, on the study day. From this group, men and women picked randomization numbers out of separate buckets to ensure the desired group compositions until there were no numbers left. Refreshments were provided (both to study participants and to the “extras”) but, in compliance with local research regulations, no compensation was given. More details are provided in SI J. Men and women participants across groups had similar socio-economic characteristics, suggesting that randomization worked.

4. Pre-treatment survey, including a secret vote on preferred policy from among a set of seven 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 preceding 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, and allows us to collect responses on whom each participant viewed as the most influential member of their group. By recording and transcribing the discussions, the design also allows us to measure how various group compositions affect women’s participation as well as the content of group discussions across treatment groups.

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 in each of the seven treatment conditions within each of the 90 communities. This allows us to use community fixed effects to account for any village-specific characteristics, and thus lends greater precision to our estimates.

After administering the pre-treatment survey to each respondent, the facilitator led the group in a discussion about deforestation policy. The discussions were all done in Chichewa, Malawi’s national language, which is widely spoken in the area. All groups followed the same format, responding to and deliberating over two prompts. The first prompt asked the group to reflect on the issue of climate change generally. The facilitator 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 saw the degradation of communal forests as connected to both local climate issues, such as soil erosion and mudslides, and to 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, Matapwe Village, Zomba District)<sup>5</sup>

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 training to make members of the community aware of the consequences of over-harvesting.*

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<sup>5</sup>All village names attached to direct quotations are pseudonyms.



- **Alternative Cooking Methods:** *Provide materials and training to use alternative cooking techniques (e.g., chitetezo mbaula stove) or alternative fuel (e.g., briquettes) to reduce demand for wood.*
- **Jobs Training:** *Provide small business training 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 (utterances) across the 3,780 participants.<sup>6</sup> Each group had a facilitator who led the group discussion and a separate research assistant (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.<sup>7</sup> For individual-level outcomes, we use OLS models with survey enumerator fixed effects, village (community) fixed effects, and standard errors clustered by group-village (i.e., discussion groups nested within villages). For group-level outcomes, we use OLS models with discussion facilitator fixed effects, village (community) fixed effects, and standard errors clustered by village.<sup>8</sup> On average, men and women participated quite actively, with 90 percent of men participants and 89 percent of women participants speaking at least once during the group deliberations. On average, group discussions of the two prompts lasted about 35 minutes.

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<sup>6</sup>A 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.

<sup>7</sup>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 the researchers hope to find (i.e., demand effects).

<sup>8</sup>Note that for the individual-level outcomes, we use enumerator fixed effects and for the group-level outcomes, we use facilitator fixed effects. The enumerator delivered the surveys, so fixed effects here capture any enumerator-specific variation in survey administration or response biases. Facilitators moderated the focus groups, so fixed effects here for group-level outcomes capture any facilitator-specific variation in moderating the focus group discussions or ensuing differences in group dynamics.

For completeness, for each measure of influence that we describe below, we run models with three different specifications of the independent variable (the group’s gender composition): (1) as a factor variable with each of the group compositions coded as dummy variables, (2) as a continuous measure based on the count of women (i.e., from zero to seven), and (3) as a dummy variable to indicate whether the group is majority-women or not. All specifications are included in SI E.<sup>9</sup> Unless otherwise noted, in the main text, we present graphical depictions of our results based on models that treat our independent variable as a factor variable with a dummy variable for each treatment. This operationalization is the most informative graphically as it does not force linearity. However, using specifications that we pre-registered, and based on the theorizing that we have used throughout, we generally gauge statistical significance based on the continuous measure of gender compositions; that is, whether an increase in the number of women is associated with more relative influence.

## 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 (see Figure SI.1) 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 that 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 (a chi-squared test is significant at  $p \leq 0.10$ ). Men are significantly

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<sup>9</sup>SI E also includes a more in-depth write up of our results for each model specification.

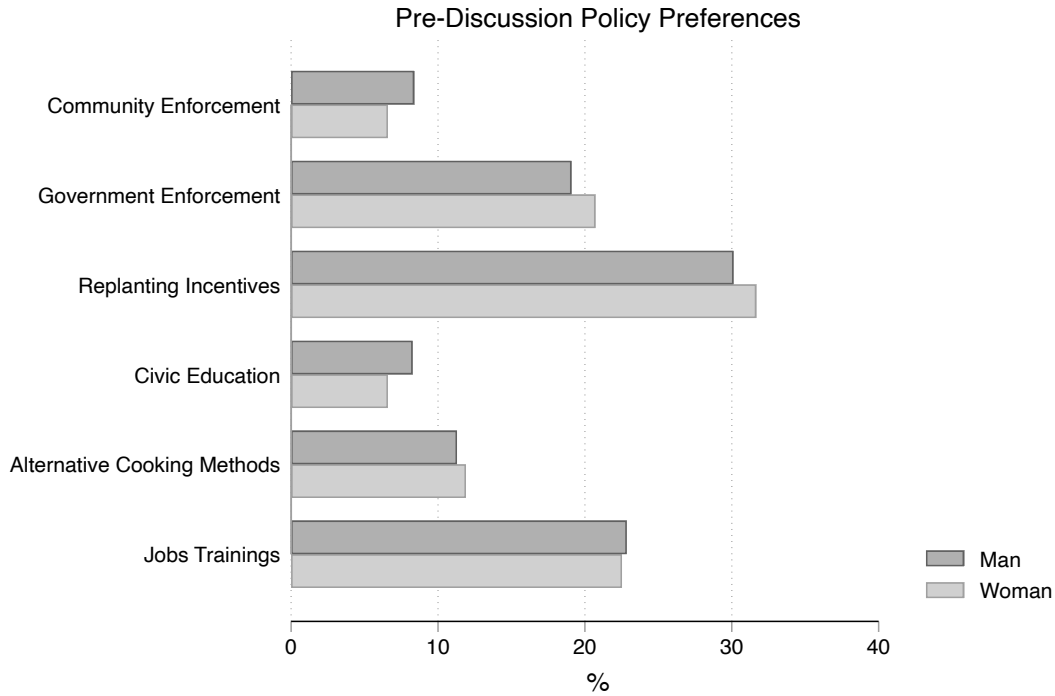


FIGURE 2 Gender differences in pre-treatment preferences on deforestation policy

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 C). This suggests that some preferences around combating deforestation are gendered, and that women’s inclusion might influence group decisions. However, these preferences diverge less than we anticipated and we discuss what this might mean for the scope conditions of our findings below.

We also underscore that even if men’s and women’s preferences differ only moderately, the fact that we are considering an issue with six possible options—none of which received more than a third of participants’ pre-treatment votes—makes the likelihood that any given woman and any given man disagree is quite high. Based on Figure 2 (and also summarized in Table SI.2), we calculate that the probability that any randomly-selected man’s preferred policy matches that of any randomly-selected woman is 0.20; put another way, it is four times more likely that a given man and a given woman disagree than it is that they agree.

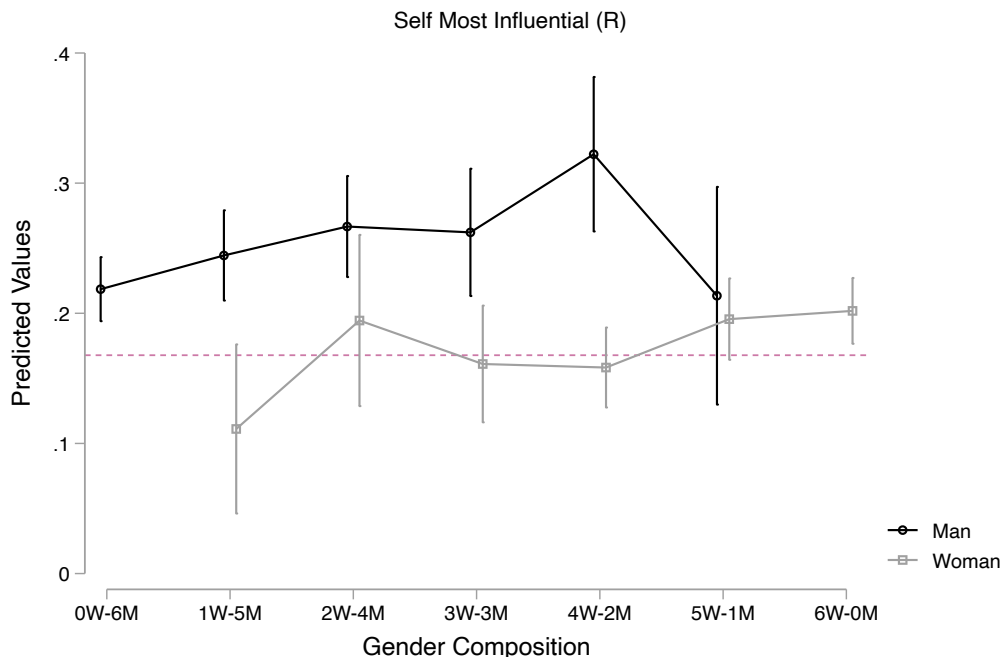


FIGURE 3 Average likelihood that men and women participants rate themselves as the most influential group member by treatment condition.

## Measuring women’s influence

We measure women’s relative influence in three ways that we pre-specified. 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?” 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 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 vote for themselves than they would by picking the “most influential” person at random. 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.

Consistent with our expectations, Figure 3 shows that women’s likelihood of rating themselves as the most influential group member 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. A continuous measure of the number of women in the group is statistically significant at the  $p \leq 0.05$  level for women group members ( $\beta = 0.015$ ,  $p=0.035$ ; estimates based from Model 2 of Table SI.3).<sup>10</sup> Men’s likelihood of rating themselves as most influential varies less clearly with group gender composition, always exceeds that of women, and is always above the 16.7 percent benchmark of random chance.

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.<sup>11</sup> To capture women’s relative influence within each treatment condition, we divide the total number of votes 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, this number would, as above, equal 0.167 (i.e., 1/6) for all treatment conditions. In contrast, as Figure 4 shows, across all mixed-gender groups, any given woman’s likelihood of being rated by the enumerator as the most influential in the group is always below 0.167. That is, men always have relatively more influence than women in mixed-gender groups. Yet, as women’s representation grows, enumerators are increasingly likely to rate any given woman member as influential. 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. Table SI.4 (Model 2) shows the causal effect of a continuous measure of the number of women in the group. Here we see a positive coefficient—having one more woman increases any given woman’s likelihood of being rated by the enumerator as the most influential by 1.2 percentage points—which is just outside the 10 percent significance threshold. However, our alternative specification, whether the group is majority women (Model 3 in Table SI.4), does

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<sup>10</sup>We calculate this estimate based on the margins command in Stata.

<sup>11</sup>The question on the enumerator survey reads: “Of the six participants, which one was the most influential?”

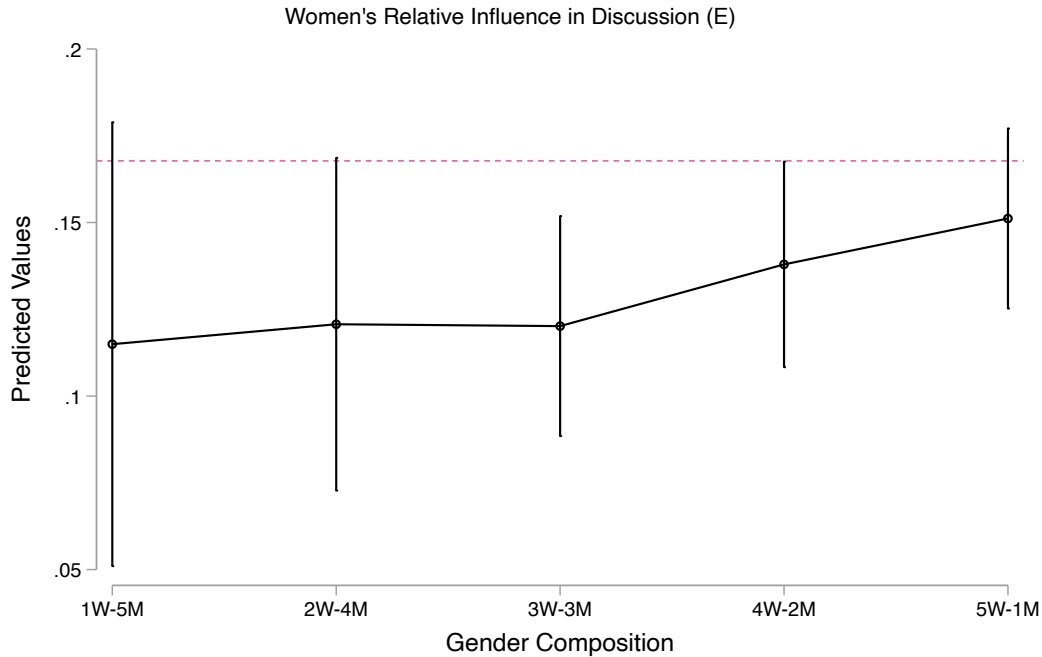


FIGURE 4 Women’s relative influence in group discussions from enumerator ranking. Calculated by dividing the total number of votes that women received from the enumerator by the total number of women in that study arm (across groups). If there were no gender bias, the ratio would be 0.167

show a statistically significant increase by 3.3 percentage points. Overall, we consider this evidence weak but suggestive; relying on enumerators’ impressions of discussions, women’s relative influence is either not worse or significantly better when there are more women in the group.

As a final measure of women’s influence in groups, we gauge how respondents rated their peers. We consider this the most straightforward and objective measure of influence. For this, we again use the question that asked participants to select in private the most influential group member after the deliberations concluded. 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 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, though men are always more influential than women. A linear measure of women’s

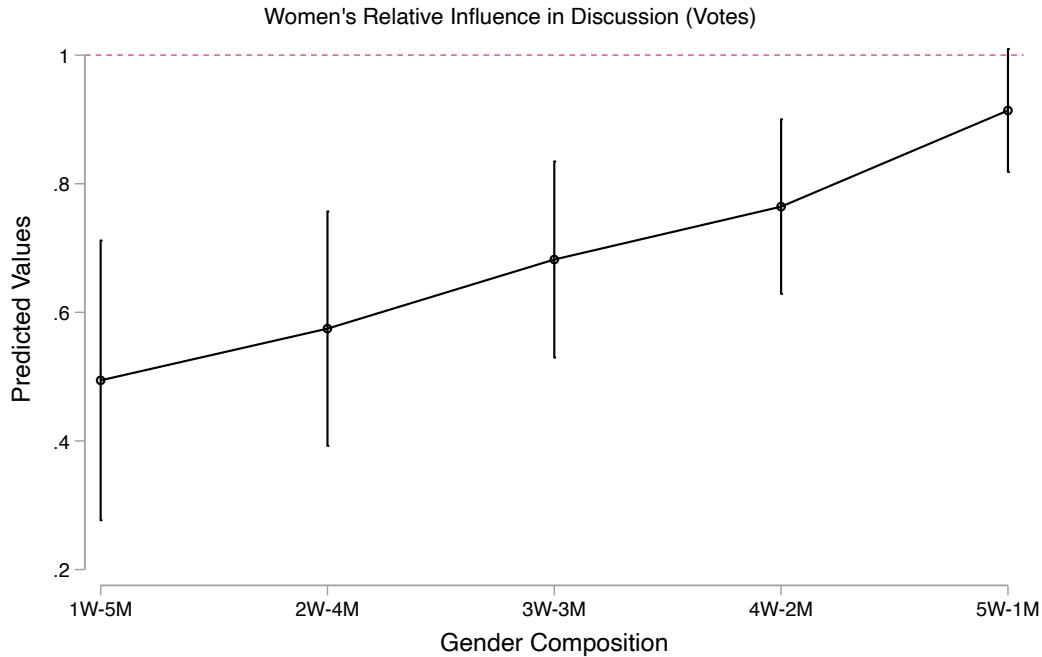


FIGURE 5 Women’s relative influence in group discussions from peer assessments. Calculated as the sum of votes that women members received divided by the total number of women in the group. Values less than one indicate that men are more influential than women.

representation is significant at the  $p \leq 0.01$  level (see Model 2 in Table SI.5). 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 if each group member picked the most influential member at random. When women make up 5 of the 6 group members, they become closer to reaching parity, closing 90 percent of the gender gap in influence.

All three of our pre-specified influence measures—group members’ assessment of their own influence, enumerators’ assessment of participants’ influence, and group members’ assessments of their peers’ influence—point in the same direction and in combination offer strong support for our core hypothesis: when women are surrounded by more women, the relative influence of any given woman in group deliberations 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

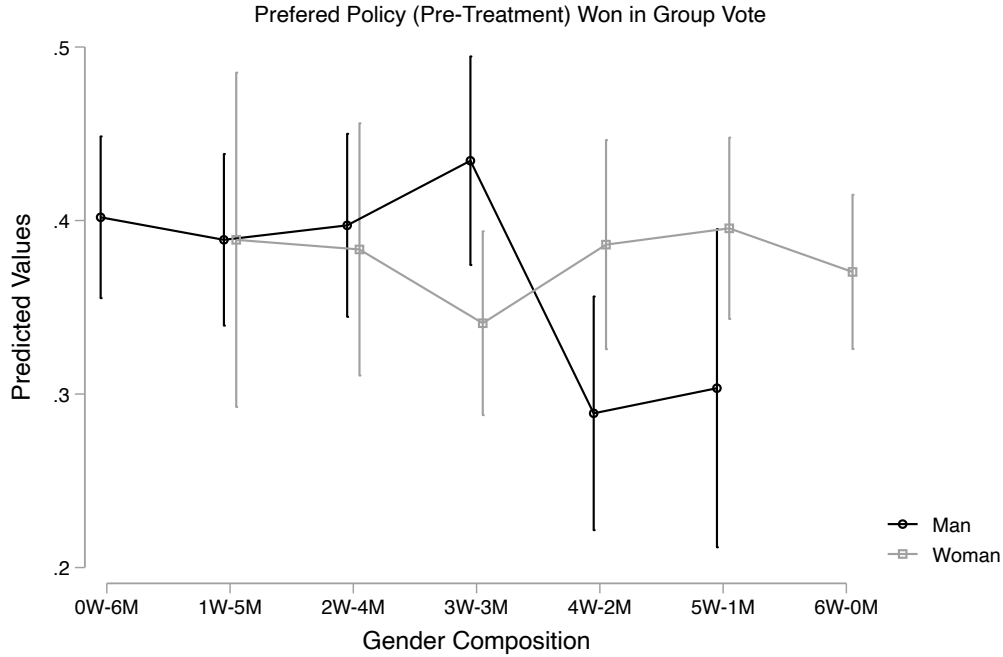


FIGURE 6 Gender differences in the likelihood of one’s pre-discussion policy preference winning the group vote by gender and gender composition of group

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. Regression results presented in Table SI.6 (Model 3) reveal that the key interaction term of interest here, woman member  $\times$  majority-women group, is significant at the  $p \leq 0.001$  level.<sup>12</sup>

<sup>12</sup>A similar pattern emerges 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 Figure SI.3 in SI G.)



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

Above, we theorized that there are three ways whereby women’s relative influence in group decisions might increase with their share of the group: (1) women may speak more, (2) women may be acknowledged for their contributions more often, and/ or (3) the substantive content of discussions may move toward topics on which women have greater perceived authority. We now analyze implications associated with each mechanism in turn.

### Talk time

The first mechanism rests on the assumption that influence is positively correlated with talk time; one cannot influence a group deliberation by remaining silent. Our data support this intuition. From our 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. The number of words spoken is indeed correlated with our influence measures; 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 ( $\rho = 0.42$ ,  $p \leq 0.001$ ). Yet, while this correlation is significant, it is substantively moderate, and appears to be smaller than that 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 translate to speaker influence, other factors might also affect who has influence in group deliberations in our context.

Figure 7 shows the average number of words spoken by men and by women during group discussions in each study arm.<sup>13</sup> As above, 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

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<sup>13</sup>We 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.

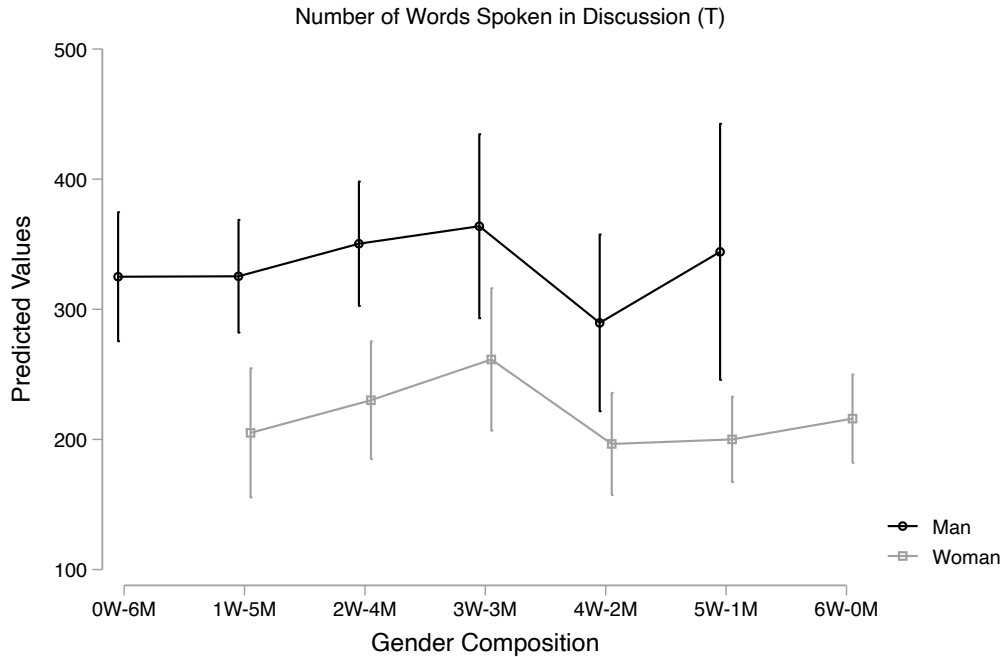


FIGURE 7 Gender differences in number of words spoken in discussion by gender composition. Women’s average levels in orange, and men’s average levels in blue. Circle size indicate number of respondents per treatment condition.

women conditions. Our regressions confirm a null finding for both genders; no measure of group gender composition or its interactions with gender is a statistically significant predictor of respondent talk time (see Table SI.7). 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.

### Recognition

Our second theorized mechanism is that women are increasingly acknowledged for 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 in groups with more women. This is particularly pertinent in rural Malawi, where it is customary for women to defer to men in mixed group settings. To test for gender differences in assessments of influence, we replicate our figure above that shows how group composition affects the likelihood

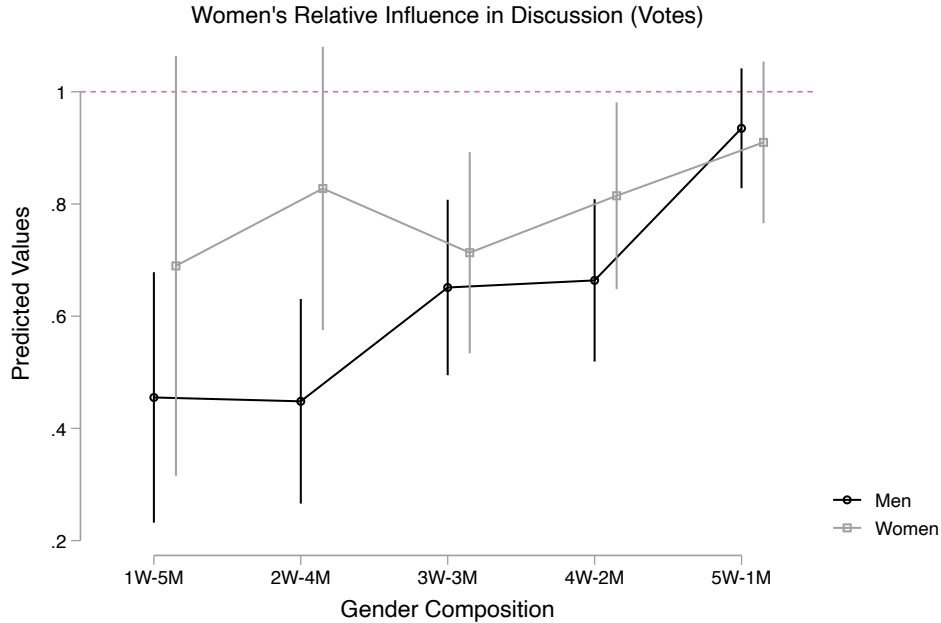


FIGURE 8 Women’s relative influence in group discussions by gender and group gender composition. Influence is measured by the number of votes that men versus women received as the most influential group member. Values greater than one indicate women have more influence, values less than one indicate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

that a woman is voted by her peers as the most influential group member (Figure 5), but now we assess this likelihood among men and women participants separately. Figure 8 shows these results. As above, values 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.

Figure 8 shows that women generally are more likely than men to see women as influential across treatment conditions, especially when there are few women in the group. But, more strikingly, Figure 8 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 in the presence of more women. 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. These findings are confirmed in our regressions. For men participants, Table SI.8 (Model 2)

reveals a positive and highly significant effect of being in a group with more women ( $p \leq 0.01$ ). For women participants, the coefficient is positive, but not statistically significant (Table SI.9, Model 2).

Above, we theorized that one way in which group behavior might change in groups with more women is through a general change in discussion tone in which group members are more likely to acknowledge and engage with each other's contributions. 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.<sup>14</sup> Statements of agreement are fairly common in group discussions, representing about 10 percent of all participants' statements. The following examples, taken verbatim 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, Chimbende 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, Chagwira village, Zomba District)

We examine whether the proportion of statements conveying agreement increases in groups with more women. Yet, as Figure 9 shows, we find no evidence that conversations generally become more agreeable as women's representation increases. In fact, regression results in Table SI.10 (Model 2) show a small and significant negative effect.<sup>15</sup> We also do not find evidence that relative references specifically to women speakers (e.g., "I am in agreement with what auntie has just said.") increase in group settings with more woman (see SI H, Figure SI.4).

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<sup>14</sup>We experimented with automating whether we could code expressions of agreement by training a model on certain agreement phrases. However, this method produced very inaccurate results. So, instead, we hand-coded each statement as to whether it contained an agreement expression or not. At the same time, we also coded instances of interruptions and statements of disagreement. We did not find one instance of the former (interruptions) and very few instances of the latter (explicit disagreement).

<sup>15</sup>We hope to explore this result in future work. Our initial speculation is that it is due to women's lower levels of political efficacy going into the group discussions. As we report above, women talk less than men across group compositions, and examining the transcripts, it seems that women in general are less likely to engage in back-and-forth dialogue than are men, likely because women are less accustomed to engaging in political debates.

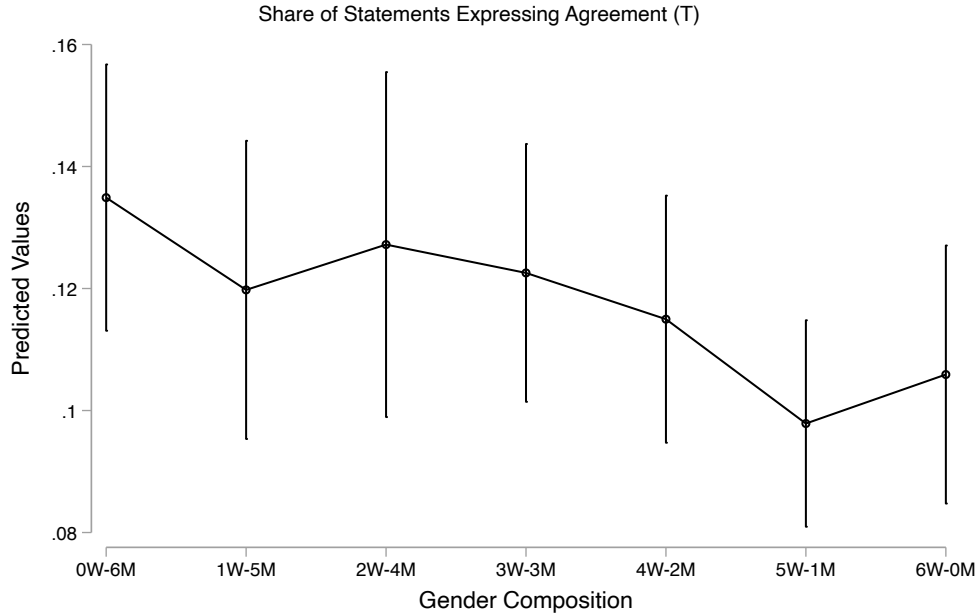


FIGURE 9 Percentage of agreement statements across treatment conditions. The denominator is the total number of statements made across groups in each treatment condition.

In sum, although we find that women’s relative influence grows in group deliberations with more women, and particularly in the eyes of men, we do not find any evidence that this can be explained by increases in women’s talk time or by the increased recognition of women’s contributions in settings with more women.

### Discussion content

A final dynamic that we theorized might change women’s relative influence in group discussions relates to possible variation in the substance of discussion topics across group compositions. It is possible that groups with more women tend to focus on different dimensions of deforestation policy than groups with more men, and moreover that the gendered nature of the ensuing discussions lends greater authority to one gender or the other. To test these expectations, we first run a series of structural topic models (STMs) on the total corpus of statements made by participants across groups when discussing the prompt of deforestation policy.<sup>16</sup> STMs involve a semi-automated form

<sup>16</sup>Here we examine only the discussions specifically following the prompt asking respondents to debate deforestation policy, not on the first prompt about climate change. This make the total corpus of text  $\approx 16,500$  rather than  $\approx 20,000$ .

of text analysis that enables researchers to inductively discover key topics within open-ended texts (Roberts et al. 2014, 1066).

As is standard, we leverage the same information that we use for our model specifications to structure the number and content of topics, namely respondent gender, treatment group, and facilitator and village fixed effects. In our data, STM diagnostics suggest that responses maximize semantic coherence when they are grouped into seven topics. We label each of the seven topics based on the model-generated key words and the representative responses associated with each topic. The seven topics that emerge are: replanting incentives, community enforcement, income generation, forest guards, cooking methods, charcoal markets, and job training. Several of the topics seem to align with the policy options that we presented to groups, which gives us confidence that the STMs are picking up plausible groupings of topics relevant to the deliberations.

Figure 10 (left panel) shows the words or stems most associated with each topic (e.g., “busi” is the stem of business and businessman and “enforc” is the stem of enforcing and enforcement) and the prevalence of each topic in our dataset (as indicated by expected topic proportions on the x-axis). This graphic reveals that the two most frequently mentioned topics during discussions were replanting incentives and community enforcement. Figure 10 (right panel) also shows the marginal effect of respondent gender on the frequency with which each topic is mentioned from models that also include village and facilitator fixed effects.

Figure 10 (right panel) reveals that all seven topics have significant gender differences; that is, that one gender is more likely than the other to contribute to the groups’ discussions on that particular theme. Two topics are more frequently mentioned by women than by men. The first is replanting incentives, which includes the words or stems: “tree,” “plant,” “care,” “take,” and “pay.” The sentiments associated with this topic tend to express support for replanting initiatives (i.e., paying villagers to plant new trees) and/ or are about the general need to take care of seedlings and new growth. For example, model diagnostics suggest that the most representative statement on this topic is the following:

The advantage of planting trees and caring for trees [is that] trees help to regain soil

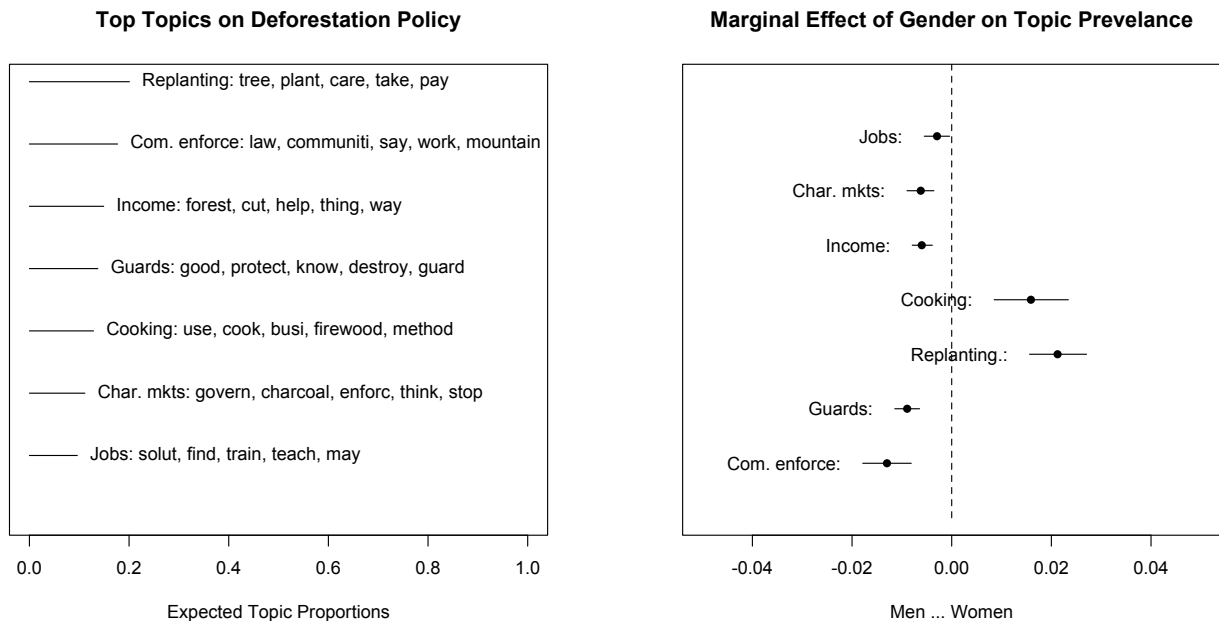


FIGURE 10 *Left panel:* Words and stems associated with the seven “topics” in participant contributions to group discussions. *Right panel:* Marginal effect of gender on topic prevalence. Data are from the STM analysis of 16,577 statements made discussing the prompt of policies to curb deforestation made by 3,749 study participants.

fertility and protect soil from erosion. . . People can be encouraged to plant and take care of the trees but the the disadvantage comes when they are not paid and cannot take good care of the trees. As a result, trees can wilt. (Woman, Kalanje village, Zomba District)

The second topic more frequently brought up by women than by men is cooking, which includes the words or stems: “use,” “cook,” “busi,” “firewood,” and “method.” Intuitively, the sentiments associated with this topic all involve cooking methods. The following statement is representative:

When we use methods for cooking like chitetezo 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, Singala village, Machinga District)

The remaining five topics are more frequently mentioned by men participants than by women. Here we focus on the two with the largest gender differences favoring men, and contain a further description of all topics in SI I. The topic with the largest gender gap in favor of men is community enforcement, which contains the words or stems: “law,” “communiti,” “say,” “work,” and “mountain.” Model diagnostics indicate that the following response is the most representative of this topic:

Community enforcement [means] creating by-laws that must be reinforced and followed. We are the ones who are staying in the community and we are supposed to come up with the rules because no one can come from outside our community and create the rules for us. . . (Man, Kampaka village, Machinga District)

The second topic on which men tend to speak about more than women relates to forest guards that are employed by the Malawian government to patrol Zomba-Malosa Forest Reserve. This topic contains the words or stems: “good,” “protect,” “know,” “destroy,” and “guard.” These statements tend to contain descriptions of the responsibilities of forest guards, and generally pertain to the policy choice of government enforcement. The following statement is representative:

The government indeed needs to employ guards in this country so that our forest should not be destroyed. It is good [and] a very wise decision to do that so our forests are protected. . . (Man, Musowa village, Zomba District)

While we did not pre-specify any expectations about how men and women might differ in the ways in which they tend to think about the problem of deforestation and its solutions, over the course of this study, we accumulated a large amount of qualitative evidence that the differences we find in Figure 10 map in predictable ways onto the gendered nature of harvesting and deforestation policy in our study sites. Our qualitative data take the following forms. First, we return to the initial eight focus groups that we did with men and women villagers in communities adjacent to our study sites. We ran these focus groups to better inform the policy choices that we ultimately presented to our study participants, but here we turn to a question that we asked specifically about the gendered nature of forest management. Second, we conducted eighteen interviews with key stakeholders, including Government Forestry Officers, local traditional authorities (chiefs), VNRMC and BMC chairs, and local staff of NGOs working to curb over-harvesting. Local members of our research team also attended, recorded, and transcribed the proceedings of VNRMC and BMC meetings in ten villages near our study sites.

Our qualitative work supports our finding that replanting and cooking tend to be gendered female. To begin, we found that existing replanting initiatives in our study areas primarily rely on the work of women volunteers. The tree seedlings for these initiatives are typically funded by



government initiatives, donor groups (e.g., the EU), or non-profits working in this space (e.g., the One Acre Fund). The labor of planting and tending to the new seedlings is typically done by women. As one informant put it, “Women tend to spearhead voluntary efforts like tree planting.”<sup>17</sup> Another informant said plainly: “Planting is seen as women’s work.”<sup>18</sup> Cooking, the second topic more frequently brought up by women, is also, as one would expect, a highly gendered activity in Malawian village life (Mawaya and Kalindekafe 2010). Throughout our interviews, informants mentioned that the primary use of forest resources by women is firewood for cooking. In our initial scoping focus groups, cooking was a frequent topic discussed by women participants. For instance, as one woman told us: “Women are the most affected [by over-harvesting] because for a house to be called a home it needs a woman who cooks, and she requires firewood.”<sup>19</sup>

The topics that are more often discussed by men are also consistent with the gendered nature of forest management. The two areas where we see the biggest gender gaps in favor of men are around enforcement, both community enforcement and forest guards sent by the government of Malawi to patrol the forest reserve. Again, our qualitative work is informative. From our initial scoping focus groups, we find that men have more experience with community monitoring and enforcement, which is typically done in conjunction with the local chief, who is also usually a man. As one man told us:

I am among the people that look after the forest and my colleague [another man] here too. We help each other... We always respond if some people come and start cutting down trees in the forests... We do it voluntarily, and we get nothing out of the initiative.<sup>20</sup>

Government-employed forest guards are also typically men, and this is perceived as potentially dangerous work. As one woman in an initial focus group told us, “I think if we can have brave men guarding the forest, [enforcement] can work.”<sup>21</sup>

Our exercise above was inductive; we sought to identify whether men and women make different substantive contributions to group discussions and why this might be. Having done this, we now

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<sup>17</sup>Interview with Jephthah Maliro, Agribusiness Officer & Project Manager of GIZ, interview by IPOR staff, July 29, 2023.

<sup>18</sup>Interview with Mr. Henry Utila; Forestry Research Institute of Malawi; July 10, 2022.

<sup>19</sup>Scoping focus group 2, T/A Malemia, Zomba District, Malawi.

<sup>20</sup>Scoping focus group 1, T/A Malemia, Zomba District, Malawi.

<sup>21</sup>Scoping focus group 2, T/A Malemia, Zomba District, Malawi.

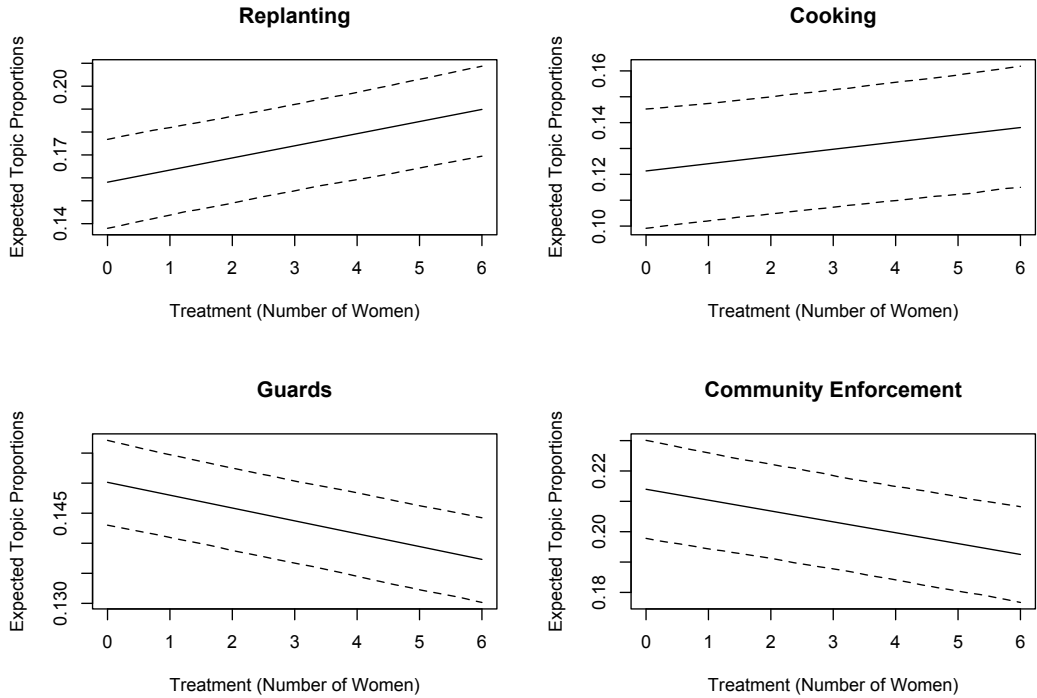


FIGURE 11 Frequency of gendered topics across treatment conditions. X-axis indicates the number of women in the group.

seek to identify how the prevalence of each of the four topics that we identified as most significantly gendered varies across the treatment conditions. Figure 11 shows these results in models that, as above, also control for village and facilitator fixed effects.

Consistent with our expectations, the two topics that are gendered female, cooking and replanting, increase in frequency with more women in the group, while the two topics that are most gendered male, community enforcement and forest guards, decrease in frequency. The treatment variable is a significant predictor in all four models at the  $p \leq 0.01$  level (see Table SI.17).<sup>22</sup> In sum, the substance of group conversations are changing in groups with more women; they tend towards topics that are gendered male in groups with more men and towards topics that are gendered female in groups with more women. This evidence is thus most consistent in explaining our core finding above: women likely have more authority in groups with more women (and particularly in the eyes

<sup>22</sup>Groups with more women are also more likely to select replanting incentives and alternative cooking methods in their post-deliberation vote and less likely to select community enforcement and government enforcement. However, only one of these (community enforcement) is significant at traditional significance levels ( $p \leq 0.10$ ), see SI F.

of men) because these groups tend to discuss issues on which women have more socially-recognized expertise.

## 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 with their share of the group, and this pattern is strongest when we measure influence by peer assessments. Moreover, the change in women's perceived authority seems particularly driven by changes in men's assessments. Contrary to our expectations and to previous work from the United States, we do not find that women participate more actively in discussions with more women, nor do we find evidence that the tone of group discussions becomes more collaborative. Rather, our results seem best explained by the changing substance of the deliberations themselves. Groups with more women tend to talk about different dimensions of deforestation policy compared to groups with more men. Moreover, our qualitative research suggests that this change in discussion content may affect how other group members perceive women's authority. Women's relative influence grows in discussions that spend more substantive time on dimensions of deforestation policy that are considered women's work, and decreases in discussions that focus on men's work.

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; Karpowitz et al. 2023). 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 substantive content of deliberations can change who is perceived to have influence. Our results are from 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 grows as a result.

Our work also suggests some important scope conditions. While we find that men and women tend to discuss 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.

Our results further speak to efforts by international donors to include gender mainstreaming in climate interventions (and other issue areas) and suggest that such efforts can elevate women’s voices in community-led development. However, at the same time, we find that women’s pre-treatment preferences are only more likely to win in the group vote when women are in the majority. 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 more actively 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. Including women in climate interventions, thus, promotes fairer deliberative processes.

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# Supplementary Information for: “Gender, Deliberation, and Natural Resource Governance: Experimental Evidence from Malawi”

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# A Policy cards

FIGURE SI.1 Cards used in the survey and discussion to represent the six policies



## B Pre-treatment political attitudes

Table SI.1 Pre-treatment summary statistics by gender

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	

*Notes:* Age is a continuous variable, while five variables range from 0 to 5: Interested in Politics, Politics Too Complicated, People Like Me Can Participate, Political Ability, and Political Confidence. Remaining variables are binary.

## C Pre-treatment policy preferences

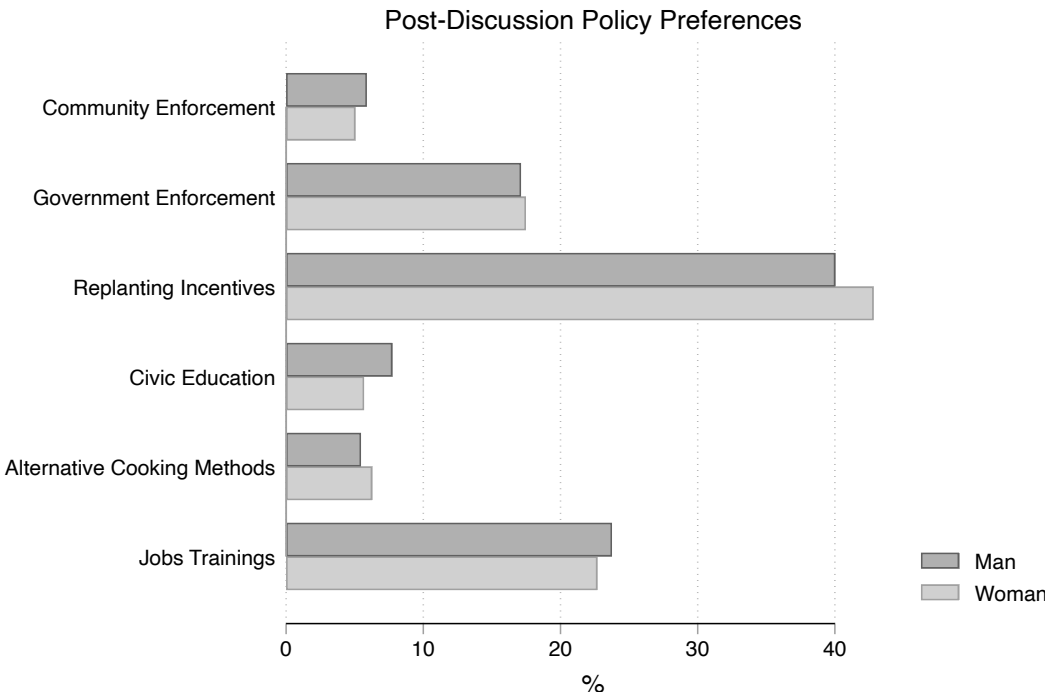
Table SI.2 Pre-treatment policy preference by gender

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	

*Notes:* Individuals had to choose exactly one preferred option prior to deliberation; here we display means by gender.

# D Post-treatment Preferences

FIGURE SI.2 Gender differences in post-treatment preferences on deforestation policy



Notes: Individuals had to choose exactly one preferred option following deliberation; here we display means by gender.

## E Main results: regression tables

Table SI.3 Likelihood of rating oneself the most influential group member, by group composition and gender

	Self Most Influential (R)		
	(1)	(2)	(3)
Woman	-0.142*** (0.039)	-0.096*** (0.029)	-0.081*** (0.021)
1W-5M	0.029 (0.022)		
2W-4M	0.047** (0.024)		
3W-3M	0.047* (0.028)		
4W-2M	0.108*** (0.033)		
5W-1M	0.002 (0.044)		
6W-0M	0.124*** (0.043)		
Woman × 2W-4M	0.073 (0.059)		
Woman × 3W-3M	0.036 (0.054)		
Woman × 4W-2M	-0.024 (0.056)		
Woman × 5W-1M	0.120** (0.061)		
Number of Women		0.014** (0.006)	
Woman × Number of Women		-0.003 (0.008)	
Majority Women			0.046* (0.026)
Woman × Majority Women			-0.021 (0.035)
Constant	0.177** (0.069)	0.185*** (0.068)	0.204*** (0.071)
Enumerator FEs	Yes	Yes	Yes
Village FEs	Yes	Yes	Yes
Observations	3768	3768	3768
Adjusted $R^2$	0.030	0.030	0.029

*Notes:* The dependent variable is an indicator for the respondent (R) rating themselves as the most influential individual in their group following deliberation. For estimates of the interactions between gender and group composition, the 1W-5M condition serves as the omitted category. Standard errors clustered at the village level are reported in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table SI.4 Relative likelihood of enumerator selecting a woman as the most influential group member, by group composition**

	Women's Relative Influence in Discussion (E)		
	(1)	(2)	(3)
2W-4M	0.019 (0.051)		
3W-3M	0.019 (0.043)		
4W-2M	0.038 (0.039)		
5W-1M	0.052 (0.036)		
Number of Women		0.012 (0.007)	
Majority Women			0.033* (0.017)
Constant	0.206*** (0.075)	0.195*** (0.066)	0.219*** (0.059)
Facilitator FEs	Yes	Yes	Yes
Village FEs	Yes	Yes	Yes
Observations	433	433	433
Adjusted $R^2$	0.015	0.023	0.022

*Notes:* The dependent variable is an indicator for the enumerator selecting a woman as the most influential group member divided by the number of women in the group; this captures a measure of women's perceived (by the enumerator) influence that removes the mechanical increase in women's likelihood of being the most influential member that comes with having more women in the group. This analysis drops single-gender groups, as we cannot divide by zero to construct this variable (for groups with 0 women), and cannot talk about women's relative influence in groups with 0 men. Standard errors clustered at the village level are reported in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table SI.5 Number of votes women received divided by number of women in the group, by group composition.**

	Women's Relative Influence in Discussion (Votes)		
	(1)	(2)	(3)
2W-4M	0.128 (0.172)		
3W-3M	0.230 (0.162)		
4W-2M	0.330** (0.150)		
5W-1M	0.481*** (0.127)		
Number of Women		0.116*** (0.029)	
Majority Women			0.286*** (0.076)
Constant	1.244*** (0.207)	1.132*** (0.202)	1.365*** (0.203)
Facilitator FEs	Yes	Yes	Yes
Village FEs	Yes	Yes	Yes
Observations	433	433	433
Adjusted $R^2$	0.050	0.059	0.043

*Notes:* The dependent variable is the number of votes for a woman as the most influential member in the group divided by the number of women in the group; this captures a measure of women's perceived (by peers) influence that removes the mechanical increase in women's likelihood of being the most influential member that comes with having more women in the group. This analysis drops single-gender groups, as we cannot divide by zero to construct this variable (for groups with 0 women), and cannot talk about women's relative influence in groups with 0 men. Standard errors clustered at the village level are reported in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .



**Table SI.6 Likelihood that respondent’s pre-discussion policy preference won in the post-discussion group vote, by group composition and gender**

	Preferred Policy (Pre-Treatment) Won in Group Vote		
	(1)	(2)	(3)
Woman	0.004 (0.055)	-0.037 (0.040)	-0.037 (0.024)
1W-5M	-0.014 (0.035)		
2W-4M	-0.005 (0.036)		
3W-3M	0.025 (0.039)		
4W-2M	-0.108** (0.042)		
5W-1M	-0.092* (0.053)		
6W-0M	-0.035 (0.064)		
Woman × 2W-4M	-0.016 (0.071)		
Woman × 3W-3M	-0.091 (0.068)		
Woman × 4W-2M	0.089 (0.071)		
Woman × 5W-1M	0.080 (0.077)		
Number of Women		-0.014* (0.008)	
Woman × Number of Women		0.015 (0.011)	
Majority Women			-0.101*** (0.031)
Woman × Majority Women			0.121*** (0.039)
Constant	0.470*** (0.145)	0.483*** (0.144)	0.470*** (0.142)
Enumerator FEs	Yes	Yes	Yes
Village FEs	Yes	Yes	Yes
Observations	3768	3768	3768
Adjusted $R^2$	0.020	0.019	0.021

*Notes:* The dependent variable is an indicator for the respondent’s preferred policy pre-treatment being that selected by the secret ballot vote held in the group following deliberation. For estimates of the interactions between gender and group composition, the 1W-5M condition serves as the omitted category. Standard errors clustered at the village level are reported in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table SI.7** Number of words respondent contributes to their group’s deliberation, by group composition and gender

	Number of Words Spoken in Discussion (T)		
	(1)	(2)	(3)
Woman	-125.603*** (28.518)	-96.513*** (30.994)	-97.227*** (19.602)
1W-5M	4.329 (33.619)		
2W-4M	30.789 (34.963)		
3W-3M	45.595 (43.988)		
4W-2M	-25.985 (42.699)		
5W-1M	26.903 (56.388)		
6W-0M	25.007 (41.926)		
Woman × 2W-4M	0.941 (42.347)		
Woman × 3W-3M	19.308 (47.947)		
Woman × 4W-2M	26.501 (38.311)		
Woman × 5W-1M	-19.968 (57.368)		
Number of Women		3.804 (8.215)	
Woman × Number of Women		-6.961 (10.126)	
Majority Women			-24.331 (31.587)
Woman × Majority Women			-7.041 (33.189)
Constant	45.094 (165.035)	78.118 (169.904)	79.817 (160.135)
Enumerator FEs	Yes	Yes	Yes
Village FEs	Yes	Yes	Yes
Observations	3515	3515	3515
Adjusted $R^2$	0.118	0.117	0.118

*Notes:* The dependent variable is a continuous measure of the number of words spoken, coded from analysis of deliberation transcripts. For estimates of the interactions between gender and group composition, the 1W-5M condition serves as the omitted category. Standard errors clustered at the village level are reported in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table SI.8** Number of votes women received from male participants divided by number of women in the group, by group composition

	Women's Relative Influence in Discussion (Votes by Men)		
	(1)	(2)	(3)
2W-4M	0.029 (0.172)		
3W-3M	0.228 (0.165)		
4W-2M	0.260* (0.154)		
5W-1M	0.541*** (0.132)		
Number of Women		0.168*** (0.016)	
Majority Women			0.437*** (0.063)
Constant	1.062*** (0.199)	0.641*** (0.179)	0.955*** (0.181)
Facilitator FEs	Yes	Yes	Yes
Village FEs	Yes	Yes	Yes
Observations	433	520	520
Adjusted $R^2$	0.099	0.151	0.075

*Notes:* The dependent variable is the number of votes for a woman as the most influential member in the group cast by male participants divided the number of women in the group; this captures a measure of women's perceived (by male peers) influence that removes the mechanical increase in women's likelihood of being the most influential member that comes with having more women in the group. This analysis drops single-gender groups, as we cannot divide by zero to construct this variable (for groups with 0 women), and cannot talk about women's relative influence in groups with 0 men. Standard errors clustered at the village level are reported in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table SI.9** Number of votes women received from female participants divided by number of women in the group, by group composition.

	Women's Relative Influence in Discussion (Votes by Women)		
	(1)	(2)	(3)
2W-4M	0.198 (0.282)		
3W-3M	0.089 (0.247)		
4W-2M	0.210 (0.231)		
5W-1M	0.313 (0.217)		
Number of Women		0.064 (0.045)	
Majority Women			0.169 (0.103)
Constant	1.811*** (0.446)	1.788*** (0.404)	1.914*** (0.365)
Facilitator FEs	Yes	Yes	Yes
Village FEs	Yes	Yes	Yes
Observations	433	433	433
Adjusted $R^2$	0.002	0.008	0.007

*Notes:* The dependent variable is the number of votes for a woman as the most influential member in the group cast by female participants divided the number of women in the group; this captures a measure of women's perceived (by female peers) influence that removes the mechanical increase in women's likelihood of being the most influential member that comes with having more women in the group. This analysis drops single-gender groups, as we cannot divide by zero to construct this variable (for groups with 0 women), and cannot talk about women's relative influence in groups with 0 men. Standard errors clustered at the village level are reported in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table SI.10 Likelihood that a statement contains an expression of agreement.**

	Share of Statements Expressing Agreement (T)		
	(1)	(2)	(3)
1W-5M	-0.016 (0.018)		
2W-4M	-0.009 (0.021)		
3W-3M	-0.011 (0.018)		
4W-2M	-0.015 (0.017)		
5W-1M	-0.035** (0.015)		
6W-0M	-0.028* (0.016)		
Number of Women		-0.005* (0.002)	
Majority Women			-0.017* (0.010)
Constant	0.125*** (0.027)	0.123*** (0.025)	0.115*** (0.025)
Facilitator FEs	Yes	Yes	Yes
Village FEs	Yes	Yes	Yes
Observations	601	601	601
Adjusted $R^2$	0.121	0.127	0.126

*Notes:* The dependent variable is whether the utterances that a respondent says which contains an expression of agreement. OLS linear probability model. Standard errors clustered at the village level are reported in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## Further Description of Main Results

In the main text of our paper, we present top-line estimates of our primary pre-registered measure of key independent variable, a continuous measure of the number of women in the treatment group. Here we provide a more in-depth description of the results from the regression tables presented above.

We begin with the measure of whether the respondent rated themselves as the most influential in the group (Table SI.3). We see from Model 1, Table SI.3 that compared to groups comprised of 6 women and 0 men, groups with fewer women tend to have lower levels of confidence in their power of influence—in some cases statistically significantly so. Next, we consider our pre-specified measure of group gender composition: a simple, linear measure (column 2). Here we see that increasing by 1 the number of women in a group leads to a 1.1 percentage point increase in the likelihood that a woman rates herself the most influential group member. The continuous measure of the number of women in the group is statistically significant at the  $p \leq 0.05$  level for women group members ( $\beta = 0.015$ ,  $sd=0.005$ ,  $p=0.035$  based on Model 1 of Table SI.3). Similar results (column 3) hold when we consider an indicator for the group being majority-women (4 or more women); women in majority-women groups are 2.5 percentage points more likely to rate themselves as most influential compared to women in groups where women do not comprise a majority.

We next turn to our influence measure from the enumerator survey. Column (1) of Table SI.4 presents a model including indicators for each group composition—among those that involve both genders being present—where 1 woman and 5 men is the base group. Compared to this group with the smallest number of women, an indicator for every other group size is positive. Further, the size of the coefficients is increasing monotonically in the number of women in the group. However, none of these indicators individually reaches conventional significance levels. As we note in the main text, however, Model 3 reveals that enumerators are significantly more likely to rate women as influential in majority-women groups.

Our third measure is peer assessments of participant influence. From Table SI.5 we see that having one more woman increases women’s relative influence as measured by votes by 0.12 (i.e., each woman earns 0.12 more votes, on average). Column (1) again presents a model with indicators for each group composition. Compared to a group with only one woman, this measure of women’s relative influence is increasing monotonically in the number of women in the group, with the indicators for 4 women (with 2 men) and for 5 women (with 1 man) furthermore being statistically significant. Specifically, groups with 4 women obtain about 1.33 more votes for women than do one-woman groups (so our measure of relative influence increases by  $1.33/4 = 0.33$ ), while groups with 5 women obtain about 2.4 more votes for women than do one-woman groups (so our measure of relative influence increases by  $2.4/5 = 0.48$ ). Having a majority-woman group (column (3)) leads to an increase of 0.29 in women’s relative influence (i.e., 0.29 more votes per woman on average), compared to a group with only one woman—again significant at the 1% level.

Finally, we turn to our measure of whether the respondents’ pre-treatment preference won in the group vote. Regression results nicely complement Figure 6; we see in Table SI.6, column (1), that, among men, the likelihood that their pre-treatment preferred policy won in the group vote is statistically significantly lower in groups with 2 men and in groups with 1 men compared to a reference group of 6 men. Women’s influence appears lowest in groups evenly split between men and women. Turning to our pre-specified, preferred measure of women’s numeracy (linear) in column (2), we see that the likelihood that men’s pre-treatment preferred policy won in the group vote increases with more women (significant at the 10% level), with women’s voices thus becoming more influential

by this measure. We can reject that this effect is different for male and female respondents. Perhaps most starkly, men’s likelihood of their pre-treatment preferred policy being selected by the group is statistically significantly lower in majority-women groups, while being in a majority-woman group has a modest, positive effect on women’s likelihood of having their policy win.

## F Policy choices by treatment condition

**Table SI.11 Likelihood that community enforcement is selected as the most preferred policy solution in the group vote.**

	Community Enforcement		
	(1)	(2)	(3)
1W-5M	0.020 (0.044)		
2W-4M	0.020 (0.046)		
3W-3M	-0.029 (0.038)		
4W-2M	-0.027 (0.036)		
5W-1M	-0.036 (0.036)		
6W-0M	-0.026 (0.037)		
Number of Women		-0.008* (0.005)	
Majority Women			-0.032* (0.018)
Constant	-0.030 (0.066)	-0.011 (0.068)	-0.026 (0.064)
Facilitator FEs	Yes	Yes	Yes
Village FEs	Yes	Yes	Yes
Observations	607	607	607
Adjusted $R^2$	0.044	0.049	0.048

*Notes:* The dependent variable is whether community enforcement is selected by the group as the preferred policy solution, including votes that end in a tie in which community enforcement is one of the tied winning solutions. OLS linear probability model. Standard errors clustered at the village level are reported in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table SI.12 Likelihood that government enforcement is selected as the most preferred policy solution in the group vote.**

	Government Enforcement		
	(1)	(2)	(3)
1W-5M	0.053 (0.075)		
2W-4M	0.033 (0.072)		
3W-3M	0.050 (0.070)		
4W-2M	-0.021 (0.063)		
5W-1M	-0.042 (0.066)		
6W-0M	0.049 (0.068)		
Number of Women		-0.003 (0.008)	
Majority Women			-0.038 (0.032)
Constant	-0.176** (0.087)	-0.138* (0.076)	-0.134* (0.072)
Facilitator FEs	Yes	Yes	Yes
Village FEs	Yes	Yes	Yes
Observations	607	607	607
Adjusted $R^2$	0.043	0.044	0.047

*Notes:* The dependent variable is whether government enforcement is selected by the group as the preferred policy solution, including votes that end in a tie in which government enforcement is one of the tied winning solutions. OLS linear probability model. Standard errors clustered at the village level are reported in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .



**Table SI.13 Likelihood that replanting incentives is selected as the most preferred policy solution in the group vote.**

	Replanting Incentives		
	(1)	(2)	(3)
1W-5M	-0.006 (0.075)		
2W-4M	0.050 (0.086)		
3W-3M	0.033 (0.076)		
4W-2M	0.039 (0.076)		
5W-1M	0.088 (0.082)		
6W-0M	0.048 (0.084)		
Number of Women		0.011 (0.012)	
Majority Women			0.038 (0.046)
Constant	0.794*** (0.118)	0.797*** (0.104)	0.818*** (0.097)
Facilitator FEs	Yes	Yes	Yes
Village FEs	Yes	Yes	Yes
Observations	607	607	607
Adjusted $R^2$	0.055	0.063	0.062

*Notes:* The dependent variable is whether replanting incentives is selected by the group as the preferred policy solution, including votes that end in a tie in which replanting incentives is one of the tied winning solutions. OLS linear probability model. Standard errors clustered at the village level are reported in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table SI.14 Likelihood that civic education is selected as the most preferred policy solution in the group vote.**

	Civic Education		
	(1)	(2)	(3)
1W-5M	0.039 (0.039)		
2W-4M	0.004 (0.034)		
3W-3M	0.028 (0.036)		
4W-2M	0.020 (0.036)		
5W-1M	0.058 (0.038)		
6W-0M	-0.026 (0.025)		
Number of Women		-0.001 (0.004)	
Majority Women			-0.002 (0.018)
Constant	-0.041 (0.033)	-0.022 (0.022)	-0.025 (0.019)
Facilitator FEs	Yes	Yes	Yes
Village FEs	Yes	Yes	Yes
Observations	607	607	607
Adjusted $R^2$	-0.004	-0.011	-0.011

*Notes:* The dependent variable is whether civic education is selected by the group as the preferred policy solution, including votes that end in a tie in which civic education is one of the tied winning solutions. OLS linear probability model. Standard errors clustered at the village level are reported in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table SI.15 Likelihood that alternative cooking methods is selected as the most preferred policy solution in the group vote.**

	Alternative Cooking Methods		
	(1)	(2)	(3)
1W-5M	-0.023 (0.031)		
2W-4M	-0.038 (0.037)		
3W-3M	-0.039 (0.033)		
4W-2M	-0.022 (0.035)		
5W-1M	-0.024 (0.036)		
6W-0M	0.018 (0.045)		
Number of Women		0.003 (0.006)	
Majority Women			0.017 (0.020)
Constant	-0.007 (0.040)	-0.036 (0.028)	-0.034 (0.025)
Facilitator FEs	Yes	Yes	Yes
Village FEs	Yes	Yes	Yes
Observations	607	607	607
Adjusted $R^2$	0.048	0.049	0.050

*Notes:* The dependent variable is whether alternative cooking methods is selected by the group as the preferred policy solution, including votes that end in a tie in which alternative cooking methods is one of the tied winning solutions. OLS linear probability model. Standard errors clustered at the village level are reported in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table SI.16 Likelihood that jobs training is selected as the most preferred policy solution in the group vote.**

	Jobs Training		
	(1)	(2)	(3)
1W-5M	0.025 (0.077)		
2W-4M	-0.035 (0.070)		
3W-3M	-0.015 (0.069)		
4W-2M	0.007 (0.077)		
5W-1M	0.025 (0.075)		
6W-0M	-0.022 (0.073)		
Number of Women		-0.001 (0.010)	
Majority Women			0.009 (0.041)
Constant	0.286*** (0.098)	0.281*** (0.090)	0.275*** (0.085)
Facilitator FEs	Yes	Yes	Yes
Village FEs	Yes	Yes	Yes
Observations	607	607	607
Adjusted $R^2$	0.075	0.082	0.082

*Notes:* The dependent variable is whether jobs training is selected by the group as the preferred policy solution, including votes that end in a tie in which jobs training is one of the tied winning solutions. OLS linear probability model. Standard errors clustered at the village level are reported in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## G Group decision-making: alternative specification

As an alternative specification to whether the respondents' pre-treatment policy preference won in the group vote, Figure SI.3 plots the number of votes that participants' pre-treatment preference received. We observe a similar pattern to that described in the main text.

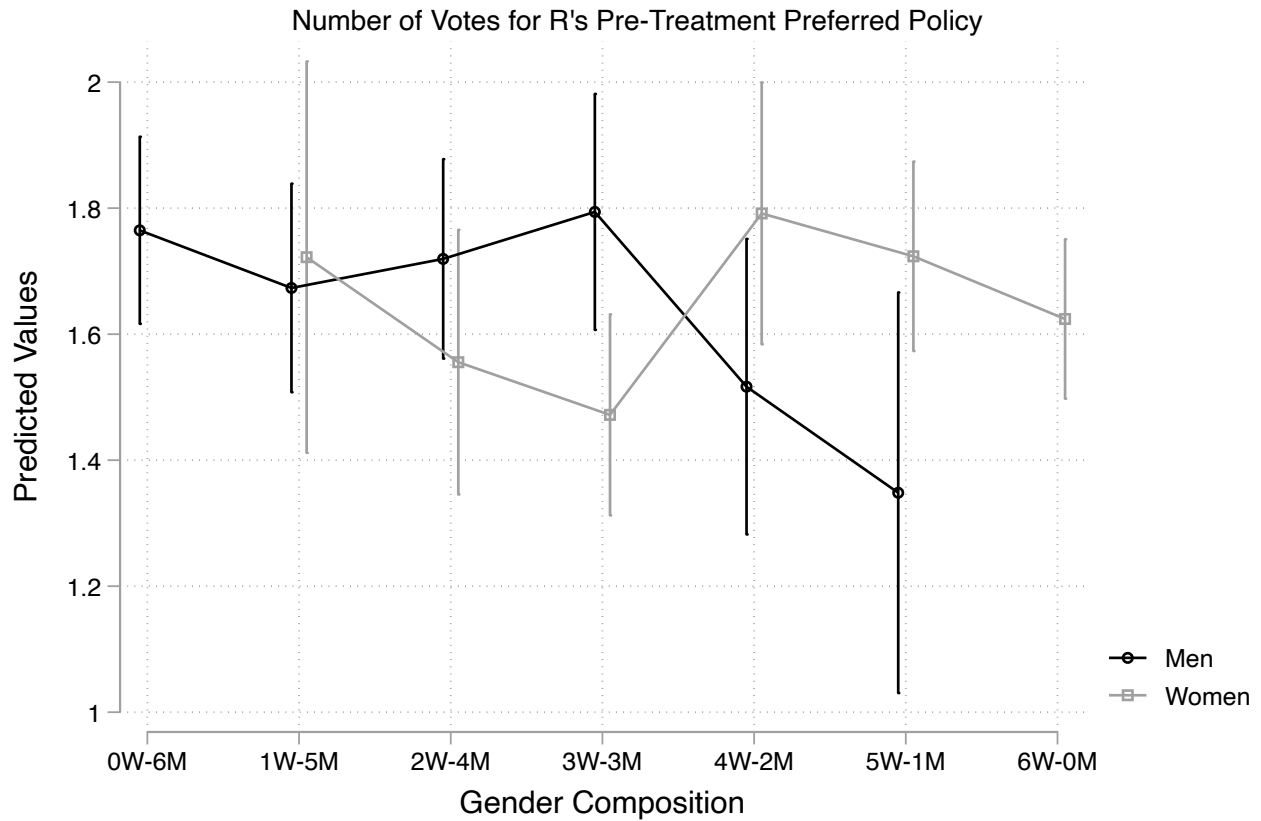


FIGURE SI.3 Gender differences in the number of votes one's pre-discussion policy preference wins by gender and gender composition of group

# H Deliberation tone: alternative specification.

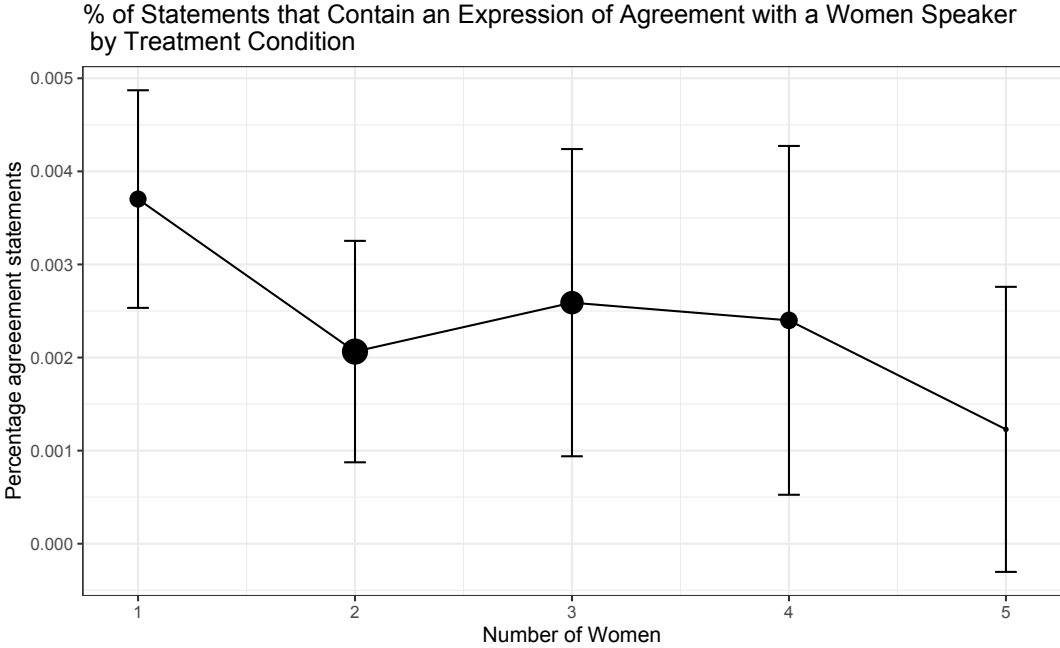


FIGURE SI.4 Percentage of statements that express agreement with a female gendered speaker (e.g., “I am in agreement with what auntie just said.”) per treatment condition, relative to the percentage of women in the group. The denominator is the total number of statements in each treatment condition,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

# I STM Tables and Plots Across Topics

The figure below shows the expected change in topic proportions by the gender composition of the group for all seven topics.

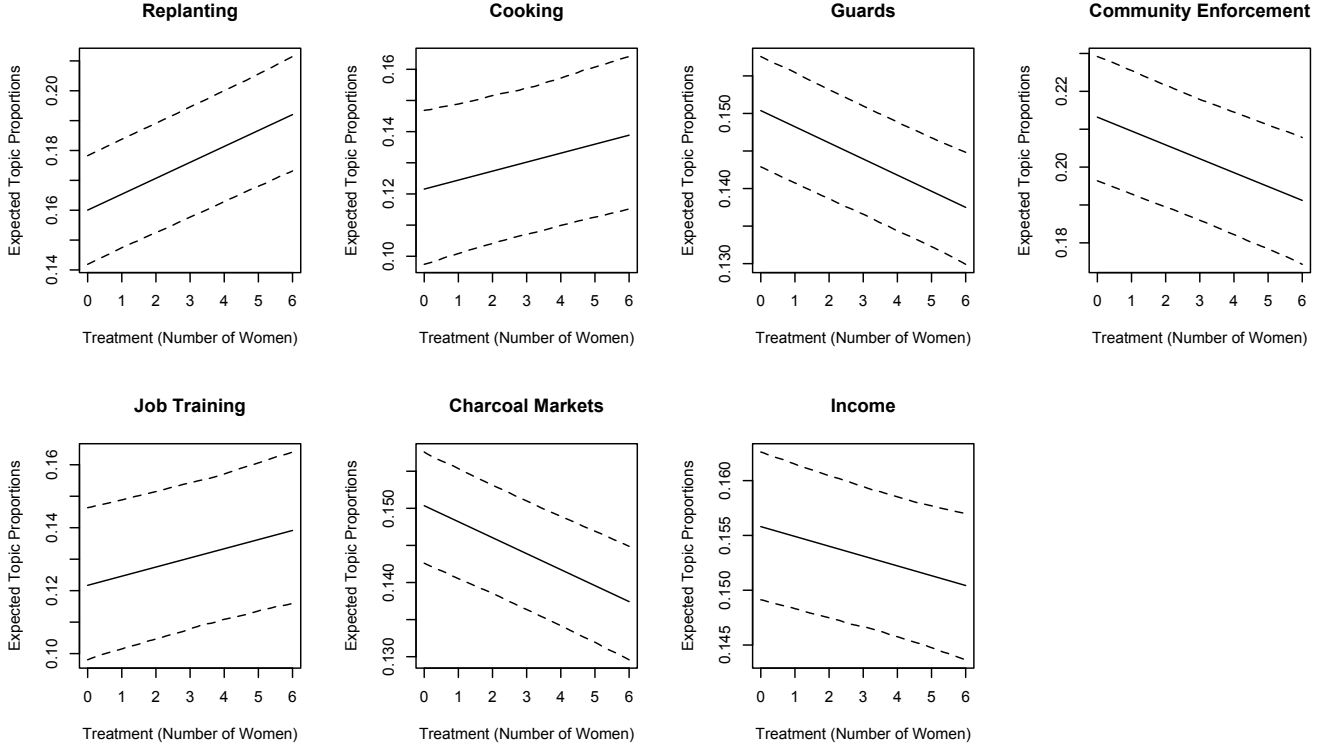


FIGURE SI.5 Expected change in topic proportions across all seven topics. Models include village and facilitator fixed effects.

Topic	Jobs	Charc.	Income	Cook	Replant	Guards	Com. Enf.
Treatment	0.001 (0.003)	-0.002*** (0.000)	-0.001*** (0.000)	0.003** (0.001)	0.005*** (0.001)	-0.002*** (0.000)	-0.004*** (0.001)
Facilitator FE's	✓	✓	✓	✓	✓	✓	✓
Village FE's	✓	✓	✓	✓	✓	✓	✓
Num. obs.	16577	16577	16577	16577	16577	16577	16577

\*\*\* $p < 0.001$ ; \*\* $p < 0.01$ ; \* $p < 0.05$

Table SI.17 Regression results for topic proportions across all seven topic models. All models include facilitator and village fixed effects.

In the main text, we focus on the four topics for which we observe the largest gender gaps: cooking and replanting for women and community enforcement and forest guards for men. The three remaining topics also have gender gaps: men tend to talk about them more. For completeness, here we give a full description of these topics and discuss how these additional findings fit with our theoretical expectations.

## **Charcoal Markets**

The first outstanding topic is about charcoal markets. This topic contains the words or stems: “govern,” “charcoal,” “enforc” (the stem for enforcing and enforcement), “think” and “stop.” The representative responses on this topic all talk about problems with enforcing prohibitions on the illegal charcoal trade. For instance, model diagnostics suggest the following response is the most representative of this topic:

We have been seeing government officials with their cars coming at a charcoal market and buy 4 or 5 or 6 bags of charcoal, after buying those bags of charcoal you would see a car from the Department of Forestry [coming to] confiscate all the charcoal, leaving the government official to go with the charcoal he bought. So, it is a connection from Machinga, because they know their bosses from Zomba have no charcoal and that is how they got charcoal. Sometimes they also pretend to arrest the one buying charcoal, but later releases them, and we always know it’s a connection, they are also earning a living from that business. In short we say, we are all benefiting from charcoal burning business. Alright, if charcoal is prohibited, why don’t they destroy the charcoal when they confiscate from us? Why don’t they collect all the bags together and burn them, giving us a message not to continue burning charcoal if it is prohibited? But instead, you find them selling those confiscated charcoal like my friend said. So, they are connected with other people, confiscate the charcoal and sell it.

As this quote illustrates, the business around producing and selling charcoal in local markets, while technically illegal (because of the problem of overharvesting) is pervasive and corrupt. We find that men are more likely to mention this topic than are women. This comports with both previous accounts from Malawi (see Mawaya and Kalindekafe 2010) and with our qualitative research that suggest that men are more involved than women with the illegal production and distribution of charcoal. While women are the primary users of charcoal for cooking, they do not produce it or sell it. Rather, women are responsible for gathering loose sticks in the forest reserves that they use as firewood, an alternative to charcoal when cooking and more often used in rural areas. Again, consistent with our theory, we find that groups with more women are significantly less likely to talk about charcoal markets than groups with more men ( $p \leq 0.001$ , see Table SI.17 and Figure SI.5 above).

## **Income**

The next outstanding topic in which men tend to talk about more frequently than women is about income. For this topic, key words are not as revealing as for the other topics, but the representative responses paint a much clearer picture. The key words or stems here are: “forest,”



“cut,” “help,” “thing,” and “way.” Model diagnostics reveal that the following response is the most representative of this topic:

And also on the other hand the policy which helps to teach other ways of earning money, I think it is a policy that can help a lot because a lot of people if they are found cutting trees and burning charcoal, this is about money. Money is a problem. Right now as you know our government the issue of money is still difficult the way it is run. Some people still think that a simple way is to burn charcoal, to employ themselves, a way that a lot of people follow easily, so if one side is wasting money, it's because people don't have a way of earning money, so if people are supposed to be helped in one way to help them other ways of earning money easily. Thank you.

All of the other top representative topics are in a similar vein and describe how poverty is the underlining cause of deforestation and that there need to be government programs that encourage employment in other areas. Again, we see both that men tend to talk about this topic more than women do, and that this topic tends to be discussed more frequently in groups with more men (Table SI.17 and Figure SI.5). While not as clear cut as the other gendered dimensions of deforestation policy, we do note again that men are more likely than women to work in illegal charcoal production and are also more likely to benefit for from labor market opportunities.

## **Jobs Training**

The final topic in our model pertain to job training. The key words and stems here are: “solut” (the stem for solution[s]), “find,” “train,” “teach” and “may.” The following response is the most representative:

My opinion is that job training might be the only effective solution since some individuals really have to be trained some job skills for instance tailoring, bricklaying. These individuals may find means to provide for their families leaving forest products intact since these individuals are the ones that over-cut trees in forests.

As this representative response suggests, this topic generally pertains to support for the policy option of job training, and in this way has some overlap with the topic of income described above. Of all seven topics, we see the smallest gender difference here. This topic is also the only one for which we do not see that group composition is a significant predictor of time spent on this topic (Table SI.17).

## J Human Subjects Research

This research employs a quantitative analysis of originally collected data as well as data from qualitative focus groups, interviews, and observations of village meetings in rural Malawi. This appendix details how precaution was taken to adhere to the APSA Council's Principles and Guidance for Human Subjects Research regarding originally collected data.

**General principles:** The procedures used to obtain the quantitative data and qualitative data featured in this study respect the autonomy and wellbeing of respondents / participants and of other people affected by the research, as detailed in the following sections.

**Power:** Participants in our quantitative analysis (group deliberations) were recruited through the following procedure. First, as described in our main text, we selected our study sites at random from the population of villages that are within 5 kilometers from the Zomba-Malosa Forest Reserve. Once we selected each study site, our local research team, based in Zomba, Malawi, visited the village to obtain permission from the chief to run the study in the following weeks. This is customary in this setting to ensure local buy-in. We asked the chief to assemble a group of  $\approx 50$  volunteers, equally men and women, at the appointed day and time of our study. When the study day arrived, our local team traveled to the village and again sought local permission from the chief. We then described the study procedures to the group of volunteers that had assembled and again reminded them that participation was voluntary. From those that continued to express interest, we administered a consent process to each individual. We then proceeded with randomization: we asked men and women to draw numbers out of separate buckets. The number that they drew told them which group they would participate in.

For our qualitative efforts, we took the following steps: For our eight initial scoping focus groups, we asked chiefs in villages adjacent to our ultimate study sites to recommend  $\approx 60$  villagers (equally men and women) who might be willing to talk with us and share their views about deforestation in the nearby forest reserve. After obtaining this information, we contacted each individual that the chief suggested to gauge their interest. Those that were interested showed up at the appointed date and location. At this time, we went through a consent process with each individual before beginning the focus group. Our qualitative work also involved interviews. For this, our local PI worked with IPOR staff to generate a list of local experts. IPOR staff reached out to all individuals on this list and, among those that expressed interest, arranged a date and time for the interview (either in person or on Zoom). The interviews began with a consent process at which time we also asked interviewees whether we could attribute any quotes with their name. Finally, our local research team attended ten natural resource committee meetings. To do this, we obtained the name of the chairperson in advance to ascertain the date and location of the meeting and to get permission for our team to attend and record any observations. Once the team arrived at the meeting, they introduced themselves as from IPOR, described the intention of the study, and received permission from the group to attend and record the meeting.

Across all data collection efforts, participation was entirely voluntary, and participants could withdraw from the study at any time. No covert or deceptive research practices were used.

**Consent:** Across all data collection efforts, all respondents / participants were read the approved consent script developed for the study, and gave their informed consent orally prior to participation. Respondents / participants were made aware that they could opt-out at any point without any loss of benefit. All research employed standard techniques and involved minimal risk and harm to participants.

**Deception:** No deception of any sort was used in this study. The researchers accurately described the nature of the research to participants both in the individual consent forms and in the study protocols.

**Harm and Trauma:** The topic of study—deforestation—did not entail any harm or trauma to participants. Over-harvesting in the nearby Zomba-Malosa forest reserve is a topic that is frequently discussed and debated in the local communities, as well as openly in other public fora at the district and national level in Malawi.

**Confidentiality:** We did not record identifying information (respondent name, date of birth, etc.) in any of our data collection efforts except interviews with key informants. For the key informant interviews, our consent process involved asking the respondent if we could attribute their name to any quotes that we used in the study.

**Impact:** The data procedures used for this study did not compromise the integrity of political processes in any way.

**Laws, Regulations, and Prospective Review:** The procedures used to conduct the surveys / focus groups for this study fully comply with U.S. law and Malawian law. Human subjects ethical review was provided by the University of Malawi (P.07/22/162), [other institutions redacted for review].

**Compensation:** On advice from our local research team at IPOR and our Malawi-based PI, we did not offer compensation for participating in our study. We did, however, provide refreshments to study participants in both our main lab-in-the-field experiment and our initial scoping focus groups. The logic for not providing compensation is that it can violate the benefits principle. Because resources are scarce in these areas, providing study participants with compensation beyond refreshments can make participation appear too valuable and this can create discord in the community around who is selected to participate and who isn't. This has become standard practice in Malawi. For instance, the Afro-Barometer survey in the country abides by the same principle.

**Shared Responsibility:** The researchers have sought to adhere to the principle of shared responsibility as described in the APSA Council's guidelines.

## **K Pre-analysis plan**

Please find on next page.

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

**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.”<sup>1</sup> Likewise, the Green Climate Fund has a “Gender Policy and Action Plan.”<sup>2</sup> 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 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*

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

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

*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).

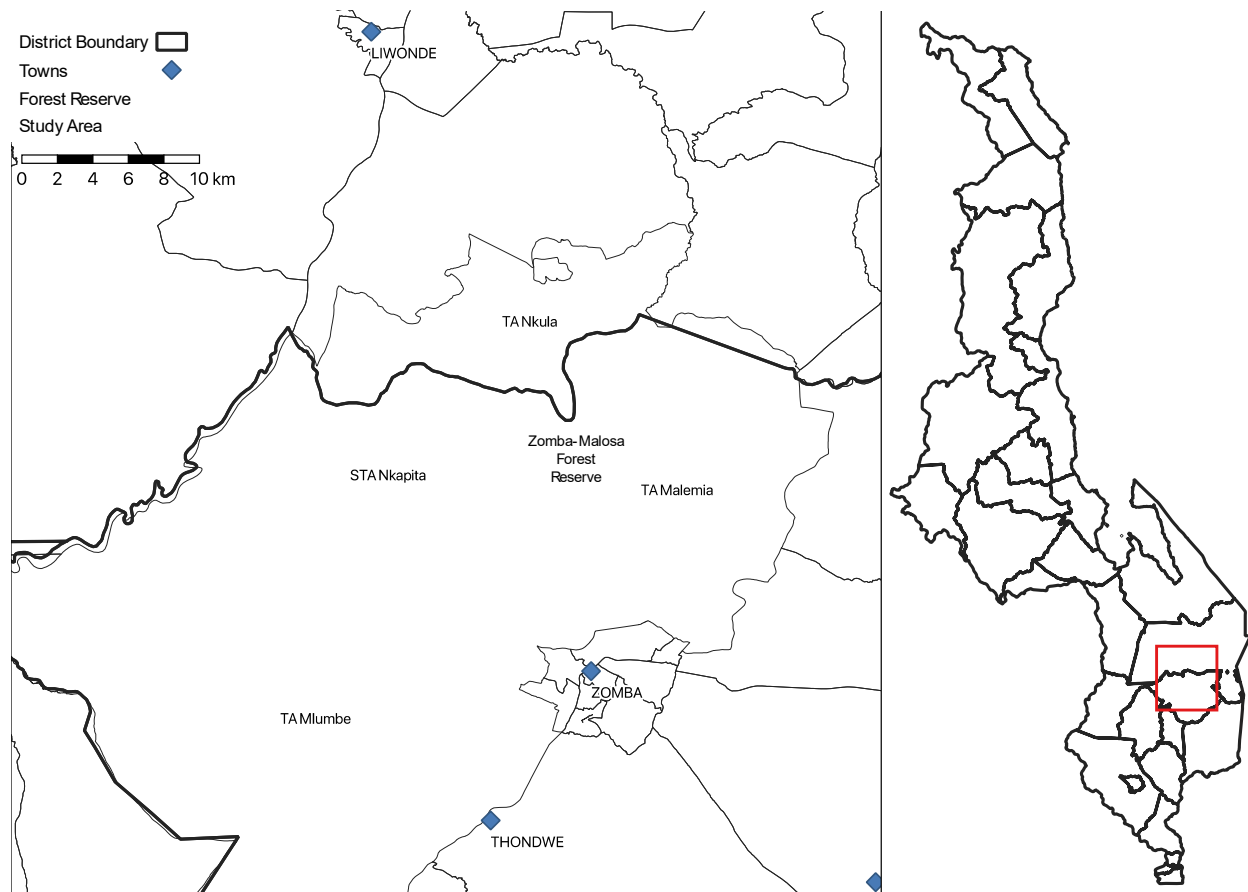
The 90 sample communities will be selected from among the 216 villages within three kilometers from the Zomba or Malosa Forest Reserve boundary—a distance that implies that activities within the forest reserves are relevant to them. In addition to the 90 randomly selected villages, the

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, <b>group level</b> outcomes	<ul style="list-style-type: none"> <li>• 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)</li> <li>• Gender gap in proportion of talk time (male average – female average)</li> <li>• Ratio of male to female speech participation (male average / female average)</li> <li>• Equality of time between speakers: Herfindahl index using average speaking time (as measured above) per speaker</li> <li>• Enumerator rating of group discussions (enumerator questionnaire, Q2)</li> </ul>	H1a, H1c, H2, H3 //
Participation in group discussions, <b>individual-level</b> outcomes (interact treatment with gender to separately identify impacts on women and men)	<ul style="list-style-type: none"> <li>• Dummy – individual indicated they spoke during the discussion (Q4A)</li> <li>• # spoken words by individual</li> <li>• Talk time of individual</li> <li>• Dummy – enumerator reports individual had a lot of participation during group discussion (enumerator questionnaire, Q3ii)</li> <li>• Dummy – enumerator reports individual had medium or high confidence during group discussion (enumerator questionnaire, Q3iii)</li> </ul>	H1a, H1c, H2, H3
Influence in group discussions, <b>group level</b> outcomes	<ul style="list-style-type: none"> <li>• 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)</li> <li>• 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)</li> <li>• Agenda setting power: 1) whether a speech is followed by one on the same topic, 2) the share of the following five</li> </ul>	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, &amp; Palaniswamy, 2019, p. 633)</p> <ul style="list-style-type: none"> <li>• 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</li> <li>• Correlation between speaking time on a particular policy and the ultimate decision the group reaches</li> <li>• Enumerator measures of group influence. See enumerator questionnaire (Q3)</li> </ul>	
<p>Influence in group discussions, <b>individual-level</b> outcomes (interact treatment (i.e., group composition) with gender to separately identify impacts on women and men)</p>	<ul style="list-style-type: none"> <li>• Number of times that the speaker is interrupted (hand coded in transcript)</li> <li>• Dummy – speaker is referenced by his / her speaker number (see Clayton et al. 2014)</li> <li>• Respondent self-reported measures of group influence (see Karpowitz, Mendleberg and Shaker 2012). See post-treatment survey, attached below, Q2, Q5a, Q5c, Q5</li> <li>• Dummy – individual indicated they spoke during the discussion (Q4A)</li> <li>• 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)</li> <li>• Dummy – individual felt they changed the minds of others in the group (Q5)</li> <li>• Dummy – enumerator reports individual had a lot of influence on other participants during group discussion (enumerator questionnaire, Q3iv)</li> </ul>	<p>H1b / H1d / H1e/ H2</p>
<p>Political interest, knowledge, and efficacy</p>	<ul style="list-style-type: none"> <li>• Dummy – individual feels significantly better informed about the viability of different policy options to combat deforestation (Q3)</li> <li>• 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)</li> <li>• Behavioral measure: size of donation to seedling fund (Q16)</li> </ul>	<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"> <li>• Dummy - over-harvesting of nearby forests is a big problem for you community (Q14)</li> <li>• 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)</li> <li>• 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</li> </ul>	<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"> <li>• Dummy - over-harvesting of nearby forests is a big problem for you community (Q14 on pre-discussion survey, Q10 on post-discussion survey)</li> <li>• 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)</li> <li>• Dummy – believe over-harvesting of forests contributes to climate change (Q16 of pre-discussion survey, Q12 of post-discussion survey)</li> </ul>	H7
Feeling that women are disproportionately negatively affected by deforestation (individual level)	<ul style="list-style-type: none"> <li>• Dummy –over-harvesting of nearby forests will affect women more than men (post-discussion survey, Q11)</li> </ul>	H6
Content of deliberations	<ul style="list-style-type: none"> <li>• Hand-coded for a subset of transcripts</li> <li>• Structural topic models to assess which words frequently and exclusively co-occur (see Roberts et al. 2014), unit of analysis is the speech</li> </ul>	Not pre-specified / inductive
Other discussion characteristics	<ul style="list-style-type: none"> <li>• Length of talk time (minutes)</li> </ul>	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](mailto: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.]*

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