Belonging, violence, and natural resource governance: experimental evidence from Mali and Niger*

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Abstract

Effective and inclusive natural resource governance is crucial for conflict resolution, economic growth, and climate resilience. However, environmental degradation and the presence of non state armed groups in the Sahel complicate effective governance. African governments and donor organizations have alternatively implemented community-led and state-led natural resource governance interventions, but it is unclear what governance strategies will be successful in the face of these challenges. We use a survey experiment of 3,607 rural household heads in Mali and Niger to understand what factors drive the perceived effectiveness of natural resource governance systems. We show that (1) respondents consistently believe that a community-led natural resource governance system would be more effective, more equitable, and more resilient to climate than either the status quo or a state-led system; (2) that members of local ethnic outgroups have greater confidence in community-led and state-led regimes relative to the status quo; and (3) exposure to violence reduces confidence in all proposed system. By characterizing the factors which drive variation in confidence in natural resource governance regimes, this paper advances our understanding of both land governance and institutional pluralism in Africa. For policy makers, these results imply that building trust and support for natural resource governance is critical to an intervention's success.

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Climate variability, environmental degradation, and reduced availability of natural resources pose obstacles to natural resource governance in Sahelian countries such as Mali and Niger. These challenges compound fragile security situations, heighten competition over water and arable land, and strain pre-existing conflict-resolution mechanisms, in so doing leading to more conflict and violence. In response, international donors and African governments commonly incorporate community-led structures into their natural resource governance programs (Deininger and Goyal 2024). Such initiatives are predicated on the idea that local and inclusive governance fosters higher levels of trust, legitimacy, and cooperation (Ostrom 2015). However, such institutions may be unable to cope with these unprecedented pressures. What kind of institutions could improve natural resource management, resolve conflicts, and boost climate resilience in the face of unprecedented resource strain and ongoing inter-communal violence?[1]

This paper explores perceptions of different natural resource governance regimes through a vignette survey experiment administered in-person to 3,607 respondents in rural Mali and Niger.[2] We presented respondents with one of three descriptions of a hypothetical natural resource governance system. One treatment condition described a "community-based" natural resource system in which communities would make decisions about resource use. A second treatment condition described a "state-led" or centralized natural resource governance regime, in which state officials make decisions about resource use. A third vignette, the control condition, asked respondents to consider the status quo land governance regime. After the vignette was introduced, participants responded to a set of five questions that measure expectations of the assigned system's capacity to manage conflict, fairly allocate natural resources, and increase climate resilience.

We show three key results.[3] First, respondents consistently believe that a hypothetical locally-led natural resource governance regime would be more effective than either a state-led natural resource governance system or the status quo. While respondents believe that a state-led system will be slightly more effective than the status quo for a lim-

1. An anonymized pre-analysis plan is available at the Open Science Foundation's repository.

2. We surveyed 2,081 respondents across the Koulikoro, Koutiala, San, and Ségou regions of Mali and 1,526 respondents across the Maradi and Tahoua regions of Niger.

3. All regressions include village-level fixed effects.

ited number of outcomes, they consistently prefer a locally led-system. Second, based on existing qualitative research, we hypothesized that members of the local outgroup (i.e. allochthones) would prefer a state-led natural resource governance system over a locally-led one. Using a respondent's physical distance from the village centroid as a proxy to measure in-group versus out-group status, we show that the marginal effect of being treated with either vignette is increasing in distance from the village centroid. These results contradict our hypotheses: members of the outgroup still perceive that a locally-led natural resource governance system would be more effective and more equitable than either the status quo or the state-led alternative. Finally, we hypothesized that exposure to violence would decrease respondents' confidence in a hypothetical state-led natural resource governance due to the erosion in the state's monopoly on violence. We find small or null effects for the state-led natural resource governance treatment at all levels of exposure to violence. However, exposure to violence erodes respondents' confidence in the community-led natural resource governance. These results suggest that both belonging—signifying current notions of exclusion—and violence do condition preferences for natural resource governance.

These results advances several strands of the existing literature within the study of natural resource governance and the political economy of local institutions. Natural resource governance exists in a state of institutional pluralism: households in Africa often have multiple fora to which they could present a dispute (Lust 2022). Existing research suggests that households in the developing world may perceive informal institutions to be more just or less burdensome (Acemoglu et al. 2020; Chaara, Falisse, and Moriceau 2022; Winters and Conroy-Krutz 2021). Normative regimes often overlap when it comes to land; new institutions often add layers to overlapping regimes rather than simplify (Lund 2008). Identifying the factors that drive households' confidence in natural resource governance institutions is critical to understanding how such institutions may or may not contribute to economic growth or peacebuilding.

Our research expands the body of evidence concerning effective natural resource governance by exploring if and when rural households think different natural resource governance systems will be effective. Informal natural resource governance in West Africa often excludes relative newcomers and pastoralist groups from village governance (Delville

and Moalic 2019; Boone 2018). The descendants of the first settlers of the village, called autochthones, generally dominate village governance. The village politics surrounding belonging and exclusion creates heterogeneous returns to participating in village land governance. Low-status members of the in-group or members of the out-group are likely to be dissatisfied with land governance (Funjika and Honig 2024). In addition, our research shows how exposure to conflict can condition the perceived effectiveness of natural resource governance. Particularly in the Sahel, however, these institutions are under increasing strain due to ongoing conflict (McGuirk and Nunn 2025). Because many conflicts in the Sahel have their origin in disputes over access to natural resources, the presence of such conflicts signals the state's inability to manage natural resources. Our paper shows how these factors—belonging and violence—condition the perceived effectiveness of natural resource governance.

More broadly, our research explores the interplay between local institutions, economic development, and peacebuilding (Callen, Weigel, and Yuchtman 2024). A variety of research explores how institutions can drive growth and reduce conflict at the country level (Acemoglu, Johnson, and Robinson 2001; North, Wallis, and Weingast 2009). Less is known about the local, often informal, institutions which provide natural resource governance in much of the developing world where the state is scarce. Recent literature has shown that strengthening local institutions' ability to resolve disputes led to positive outcomes (Hartman, Blair, and Blattman 2021; Christensen et al. 2024; Ribar et al. 2025). Our research suggests potential scope conditions for such interventions by illustrating the conditions under which rural households believe that 'improved' institutions would be effective.

1 Context: land governance in the Sahel

Land tenure security and effective natural resource governance is critical to both economic growth and sustainable peacebuilding in rural Africa. Land tenure security conditions households' ability to make investments: households are unlikely to fertilize their parcels, build irrigation, or plant trees if they are unclear if they will reap the benefits (Goldstein and Udry 2008; Besley and Ghatak 2010). Secure land tenure helps min-

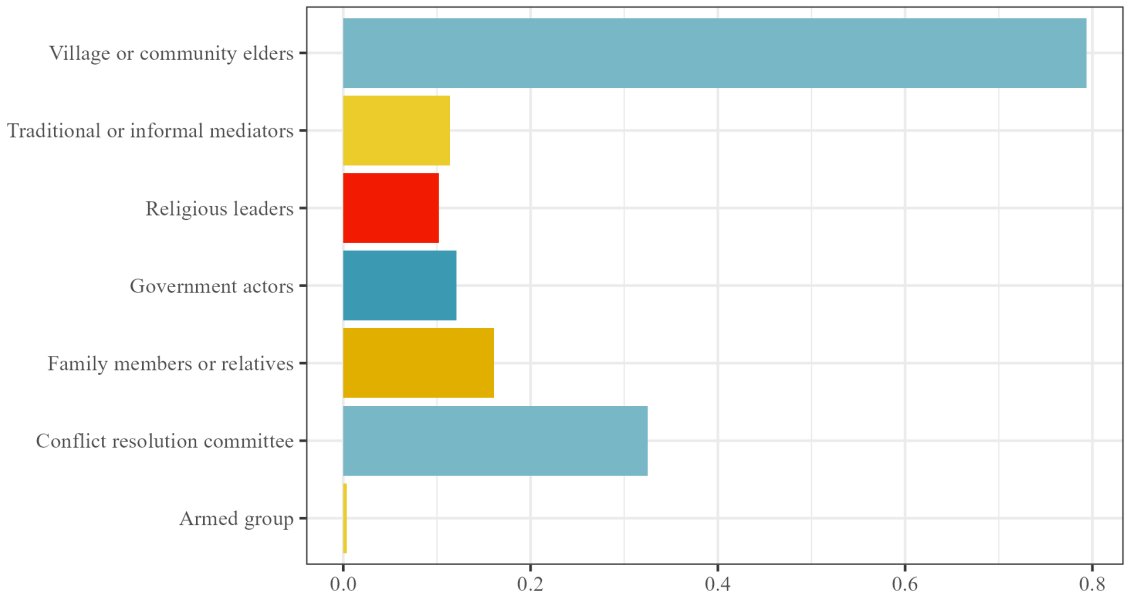
imize the outbreak of natural resource disputes by clarifying boundaries and proving easier access to conflict resolution institutions. Effective natural resource governance is also crucial for climate resilience: secure land tenure can help reduce deforestation and encourage conservation (Deininger and Goyal 2024, 183–217).

Natural resource governance in the Sahel chiefly concerns access to land and access to water. Land in Africa—and Niger in particular—is often but not always commonly held. Studying Niger, Hughes (2014, 10) notes "three different types of lands [within villages]: individual lands, family lands, and village common lands also known as chieftaincy lands." Land near villages is used to grow crops such as cotton, rice, or sorghum; smaller plots are used for market gardening vegetable crops such as tomatoes or onions. Agriculture is generally rain-fed and seasonal. Cereal crops are generally planted during the rainy season between June and August and harvested between September and November. Both Mali and Niger also have large transhumant populations; these pastoralists travel with their herds in search of pasture and water. However, increased density of agriculture has encroached traditional livestock corridors which connect pastures and provide livestock with access to water (McGuirk and Nunn 2025).

The status quo of natural resource governance in Mali and Niger—what we reference in the control condition of our experiment—reflects both low state capacity and the endurance of customary institutions. Most natural resource governance takes place within customary institutions, rather than formal institutions of the state. In Niger, the relevant state institutions are land commissions (*Commissions Foncières*) which operate at the department level (ADM2), but are understaffed and under resourced. In addition, land commissions are not empowered to resolve land disputes; they can only issue titles for undisputed land (Hughes 2014, 13). Governance is similar in Mali: the country launched a new framework for land governance in 2000, the *Loi Domaniale et Foncière*, but in practice the state remains scarce. According to the 2021 wave of the Living Standards Measurement Survey (LSMS), only three percent of households in Mali and five percent of households in Niger possessed a formal land title for at least one of their agricultural parcels.

The combination of low state capacity and strong customary institutions creates a scenario in which institutional pluralism predominates: rural households have multiple

Figure 1. Institutional pluralism in Mali and Niger



This figure shows responses to "If you have a dispute about land, livestock, or a business transaction, who would you approach to resolve the dispute" from the authors' survey in Mali and Niger. Respondents were able to select multiple answers.

fora to which they could refer a dispute. Before administering our experiment, we asked respondents to our survey "If you have a dispute about land, livestock, or a business transaction, who would you approach to resolve the dispute?" Figure 1 shows these results. The overwhelming majority of respondents (2,861) said that they would approach a village or community elders. However, of the 3,607 respondents, 45 percent selected two or more responses and 13.5 percent selected three or more answers.

Absent formal land governance, customary institutions (most often in the form of village chiefs) adjudicate disputes. In both Mali and Niger, customary access to land is predicated on the 'right of the axe,' or land rights awarded through descent from the original settlers of the village (Hughes 2014).[4] These customary land rights distinguish the autochthones, or descendants of the original settlers of the village, from allochthones,

4. The village chief almost universally descends from this lineage; the name comes from the act of clearing the bush.

or more recent arrivals. More recent arrivals to the village are generally granted long-term use rights to land, rather than land ownership. Many allochthones stay in villages for generations while paying ceremonial rents for land. Tensions often emerge as to the extent that these rents are actually ceremonial—particularly when the following generations of allochthones 'inherit' the parcels. Ethnic groups that are predominantly herders rather than farmers—such as Tuaregs and Peulhs (Fulanis)—are almost always considered allochthones. While most Fulani and Tuaregs are considered allochthones in Mali and Niger, other ethnicities would also be considered allochthones outside of their own village. Most Tuaregs and Fulani are allochthones, but that does not imply that most allochthones are Tuaregs and Fulani.[5]

The absence of natural resource governance also allows conflict to fester. Many conflicts in sub-Saharan Africa have their genesis in competition over resources. When we asked respondents to name to two most common causes of clashes or violent conflicts, 67 percent cited natural resources such as land or water. In Mali, Benjaminsen and Ba (2024) narrate how a conflict over access to riparian pastures in Mali led to Katiba Macina, a local offshoot of Al Qaeda, intervening on behalf of herders. Likewise, land tenure conflicts contributed to the outbreak of recent conflicts in both Côte d'Ivoire and the Democratic Republic of the Congo (Boone 2014; Autesserre 2010). Such conflicts are likely to increase in both severity and frequency in the Sahel, as climate change and desertification make access to water scarce and shrink the pool of arable land. Ongoing violence persists in both Mali and Niger, as the state has been unable to conclusively defeat insurgent actors. The porosity of borders in the Sahel means that the same violent groups—chiefly Jama'at Nusrat al-Islam wal-Muslimin (JNIM) and the Islamic State in the Greater Sahara (ISGS)—operate in a broad theater encompassing both countries, as well as Burkina Faso.

5. This paragraph describes autochthony/allochthony in Mali and Niger, not overall. These groups could be considered autochthones in other locations. Peulhs, for example, are the ethnic majority in Guinea.

2 Belonging, violence, and natural resource governance

Given the challengers presented by the status quo of natural resource governance, policymakers and international donors have proposed a variety of potential interventions to improve natural resource governance in rural Africa. Many African governments have taken land tenure into their own hands and implemented state-led natural resource governance. For example, a top-down effort from Rwanda led to approximately 11.5 million parcels of land being registered between 2011 and 2013 by the National Land authority, based in Kigali (Deininger and Goyal 2024, 60). Ali, Deininger, and Duponchel (2017) show that this process had positive effects on both gender equality and access to credit, although they raise concerns about the long-term sustainability of such a process. The Liberia Land Authority provides a more recent example of such a state-led natural resource governance program; it advertises itself as a 'one-stop shop' for land titling.

Other initiatives have emphasized the need for locally-led natural resource governance programs. Such programs date back to the late 1980s, when the World Bank and other donors piloted the Plans Fonciers Rurale (PFR) programs in Côte d'Ivoire, Benin, and Burkina Faso (Delville and Moalic 2019). More recently, Hartman, Blair, and Blattman (2021) show that introducing alternative dispute resolution in Liberia led to a decrease in violence driven by land disputes. In Niger, layering conflict resolution training on top of a livelihoods program for youth decreased both support for violence in treated villages and the count of violent incidents (Ribar et al. 2025). These programs suggest that community-led natural resource governance programs may suffice to protect property rights and mitigate conflicts even when state capacity is low.

Natural resource governance is under-provided in both Mali and Niger. Nevertheless, effective natural resource governance is key for economic growth, conflict resolution, and climate resilience. Given the problems associated with the status quo, it seems likely that households will perceive any alternative to the status quo to be a more effective form of natural resource governance. With this background in mind, we hypothesize that:

H.1a Respondents will prefer either community-based natural resource governance or state-led natural resource governance to the status quo.

Respondents' discontent with the status quo does not imply ambivalence between

the alternatives. Winters and Conroy-Krutz (2021, 2) argue that "[c]itizens might assess that informal institutions, which are typically rooted in traditional authority and customs, have significant legitimacy and are well-tailored to local contexts. Formal institutions, on the other hand, rely on rules and procedures often developed in distant power centers and rooted in Western legal traditions, and might therefore seem foreign or even illegitimate." Using a survey experiment in Mali, they show that respondents think that a formal institution would produce a less fair result (albeit one more in accordance with the formal laws of Mali), and more likely to require a payment.

These dynamics are not unique to Mali. In Burundi, a legal aid program increased the uptake of state justice institutions, particularly among members of marginalized communities (Chaara, Falisse, and Moriceau 2022). However, the program did not make participants less likely to use local, informal fora and did not increase participants' trust in formal justice. Funjika and Honig (2024) show that individual status within both formal and informal justice institutions conditions the perceptions of conflict resolution institutions. Nevertheless, respondents are most likely to take their disputes to a customary forum even when a state-led or statutory forum is available. These results suggest a pervasive distrust of state conflict resolution and natural resource governance institutions. Even if both state-led and community-led natural resource governance schemes are improvements on the status quo, we hypothesize that:

H.1b Respondents will prefer community-based natural resource governance to state-led natural resource governance.

The ethnic heterogeneity which characterizes many villages in West Africa further complicates natural resource governance. Existing natural resource governance institutions often do not benefit populations equally, with members of the customary in-group benefiting more than the customary out-group (Funjika and Honig 2024). Differential returns to participating in local institutions can shift both the confidence in these institutions and the eventual up-take of these institutions. For example, Acemoglu et al. (2020) show heterogeneous up-take of state courts in Pakistan by caste.[6]

6. However, they do not show heterogenous effects by caste for their intervention, which provided households within information about the effectiveness of state courts)

Villages in Mali and Niger are rarely homogenous; rather, they are split between "natives" and "strangers." Natives, more formally called autochthones, descend from the initial settlers in the area and usually hold some customary claim over a village's land.[7] Outsiders, or allochthones, are descendants of later settlers, and are generally of a different ethnicity than the autochthones. Colin, Kouamé, and Soro (2007, 34) note that this system "perpetuates a patronage relationship between autochthons [sic] and strangers (in the sense of 'non locals'), to whom rights in land are extended... The migrant owes his tuteur a perennial gratitude (transferred to his heirs), expressed through gifts of agricultural products, contributions to his tuteur's expenses at times of funerals, and so forth."

Claims of autochthony can serve to control access to land or resources; Boone (2014, 329) illustrates that "[s]ocial hierarchy, cleavage, and exclusion within these local arenas are often defined by control over agricultural land and labor, and access to water and pressure." When land became more scarce, autochthones began to rely more heavily on their customary claims to land. Berry (2009, 40) notes that "intersecting tensions over eligibility for land access... contributed to a resurgence of appeals to 'tradition' and historical precedent to validate claims to land and citizenship." The presence of valuable cash crops (such as cotton in Mali and Niger) may exacerbate disputes. As land becomes more valuable, ethnicity can become increasingly salient as a rural landowners use it to leverage access to resources (Pengl, Roessler, and Rueda 2022).[8]

The relationship between autochthone and allochthone may change over time. Allochthones have begun to outnumber autochthones in certain areas of Côte d'Ivoire, due to large influxes of migrants encouraged during the presidency of Félix Houphuët-Boigny (Boone et al. 2021). These demographic changes can happen both at the regional level, but also at the village level, as allochthonous settlements occasionally eclipse their "hosts village" in size or economic prominence. Consequently, when chiefs in Côte d'Ivoire are able to capture village-level natural resource governance, they generally exclude al-

7. Scholars often use the term *terroir* to denote the area controlled by a given village. For more detail see: Bassett, Blanc-Pamard, and Boutrais (2007).

8. Claims of autochthony are not restricted to accessing land; in the Central African Republic, non-Muslim traders claimed to be 'true Central Africans' in order to chase Muslim vendors from their coveted market stall positions (Vlavonou 2023).

lochthones from access to formal property rights (Ribar 2025).

Autochthones tend to dominate village politics, leaving allochthones in a "subaltern social position" (Delville and Moalic 2019, 332). In Mali and Niger, chiefs are generally descendants of the initial settlers of the land (Hughes 2014). Weak state capacity in many peripheral areas can also cement the role of these elites: where early state interventions created inequality which benefited the autochthone elite, the inequalities are more likely to persist where the state does not subsequently intervene or provide services (Nathan 2023). Even today, rural allochthone settlements depend administratively on villages populated by allochthones. These dynamics mean that allochthones may perceive these local institutions to be biased against them. In other words, an allochthone in rural Mali or Niger may prefer the ineffective governance of a scarce state to a local governance that is biased against them.[9]

Community-led natural resource governance opens space for the capture of land tenure institutions by existing elites and decisions which are biased against households with low-status in these institutions, such as ethnic out-groups. It follows that allochthones will expect a community-led natural resource regime to reflect existing constellations of power within the village and continue the status quo of discrimination in natural resource governance. A state-led natural resource governance regime, however, would be less susceptible to these local dynamics. For these reasons, we hypothesize that:

H.2a Allochthonous respondents will have higher support for state-led natural resource governance, relative to autochthonous respondents.

H.2b Autochthonous respondents will have higher support for community natural resource governance relative to allochthonous respondents.

Beyond questions of 'who belongs,' we also expect that exposure to violence will reduce the perceived effectiveness of state-led natural resource governance. The role of violence in decreasing the perception of state capacity is well established. In Afghanistan,

9. On the other hand, African states are not passive bystanders when it comes to autochthony—rather, they have often promulgated policies which support autochthones access to land to shore up electoral support (Berry 2009; Boone et al. 2021).

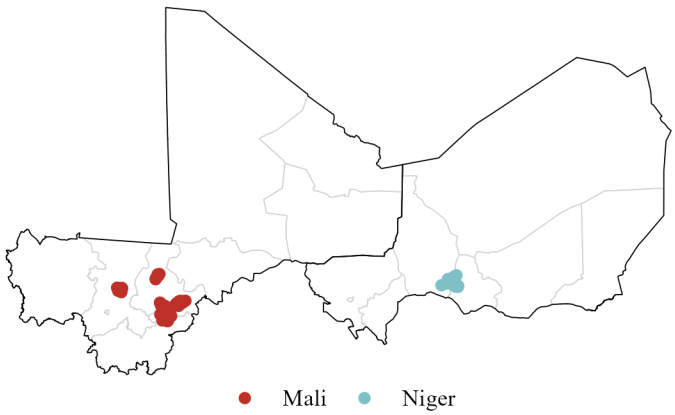
households exposed to greater levels of violence view the police (who may enforce property rights) as less effective and less procedurally just (Deglow and Sundberg 2021). Gates and Justesen (2020) show that an unexpected rebel attack in Mali halfway through a public opinion survey decreased trust in the president, although this effect did not extent to all government offices. The negative relationship between exposure to violence and trust in institutions is likely to be even stronger when it comes to property rights.[10] Enforcing property rights necessarily requires the capacity to exclude non-rights holders from the property. Without a monopoly on violence, landholders may reasonably doubt that the state has such a capacity.

The presence of these natural resource conflicts and land disputes has been a key enabling factor for the spread of violence across the Sahel (Raleigh, Nsaibia, and Dowd 2021). Across Africa, decreased rainfall within areas traditionally used by pastoralist communities leads to increased pressure on land and water in neighboring areas inhabited by farming communities, leading to increased conflict (McGuirk and Nunn 2025). Armed groups in the Sahel often intervene in local natural resource conflicts. For example, the jihadist organization JNIM escalated a conflict over pastoralist access to riparian pastures in Mali (Benjaminsen and Ba 2024); where state-led natural resource governance institutions began to extract rents from pastoralists, JNIM intervened on behalf of a population JNIM perceived to be its constituents. Viewing the state's inability to reduce violence does not require extrapolating an inability to enforce property rights. Rather, the violence directly reveals the state's incapacity to provide effective natural resource governance. We hypothesize that:

H.3 Respondents with greater exposure to violence will have lower support of state-led natural resource governance, relative to respondents with less exposure to violence.

10. In contrast, Harding and Nwokolo (2024) show an increase in general political trust following unexpected attacks by Boko Haram in Nigeria. Unlike Harding and Nwokolo, however, we do not study a one-off set of attacks but rather a long-term pattern of violence. Our study also explores perceptions of state capacity, rather than political trust per se.

Figure 2. Locations of surveyed villages in Mali and Niger



This figure shows the 24 villages in Niger and 56 villages in Mali in which we implemented the field experiment.

3 Research design and methodology

3.1 Sampling and survey implementation

To explore these hypotheses, we administered a survey experiment to 2,081 respondents in rural Mali and 1,526 in rural Niger. We collected data in the Koulikoro, Koutiali, San, and Ségou regions of Mali, as well as the Tahoua and Maradi regions of Niger. Figure 2 shows the regions in which sampling took place, as well as the specific villages in which we collected data.

Our survey takes place within a broader Foreign and Commonwealth Development Office (FCDO)-funded program, titled "Justice and Stability in the Sahel" (JASS). JASS was implemented through two stages. The first stage (2021 to 2023) emphasized 'fragile yet stable' buffer zones in south-central Mali. JASS carried out security scoping missions and consultations with administrative, civil society, religious, and traditional leaders, as well as national authorities; this participatory process this participatory process selected 12 communes for implementation. During phase two of JASS implementation, JASS

expanded to Niger's Tarka Basin (communes in Maradi and Tahoua) as well as eight new communes in Mali. Within each commune, local selection committees (composed of representatives of all key social groups) chose specific target villages and participants. The committees applied jointly developed criteria that emphasized: representation of different population groups (ethnic, gender, youth, traditional authorities); vulnerability to resource-based conflicts and justice gaps; accessibility and security feasibility for program delivery; presence of governance institutions that still had some legitimacy; strategic importance (population density, resource pressures, transhumance routes). The firm hired to implement this evaluation did not survey within communes where less than ten villages received the JASS treatment.

To estimate preferences for natural resource governance, rather than the effect of JASS, we use village fixed effects in all regressions to absorb effects of the JASS project. The firm which administered this survey calculated sample sizes to ensure adequate coverage of a series of monitoring and evaluation indicators for the broader JASS program, rather than for the survey experiment specifically. However, in our pre-analysis plan we show minimum detectable effects of 0.237 and 0.315 standard deviations of the outcome variable, which is below the magnitude of the effects we find in tables 2 and 3.

Within sampled villages, enumerators conducted a random walk to select respondents to which to administer the survey. Enumerators then administered an informed consent statement before beginning the survey. Because of this idiosyncratic sampling strategy, we do not weight our survey results. We consider these results to indicative of households in areas where state institutions are largely absent and land conflicts remain common, rather than the broader population of Mali or Niger. This population is the set of respondents for whom natural resource governance remains most challenging and at whom similar interventions have been targeted. As such, we do not consider the JASS sampling strategy to compromise our results.

3.2 Survey measures

We use a vignette survey design, in which we presented respondents with one of three vignettes. Respondents randomly received the community treatment with probability

0.25, the centralized treatment with probability 0.25, and the control condition with probability 0.5. The three treatments are:

1. **Community treatment**: As you know, communities are facing challenges in managing natural resources (e.g., water, forests, land) due to the impacts of climate change, such as droughts, floods, and soil degradation. Imagine that to address these challenges, your community has established a **community-based natural resource governance system**. Under this system, local stakeholders, including farmers, community leaders, landowners, and resource users, meet regularly to make decisions about resource management. These meetings are inclusive, and decisions are made by consensus. The system emphasizes cooperation, and conflicts are addressed through local mediation and dialogue. External organizations, such as NGOs, provide support by offering training on sustainable practices and climate adaptation strategies, but the community makes the decisions about resource use.

2. **Centralized treatment**: As you know, communities are facing challenges in managing natural resources (e.g., water, forests, land) due to the impacts of climate change, such as droughts, floods, and soil degradation. Imagine that to address these challenges, your community has established a **centralized, government-controlled natural resource governance system**. Under this system, decisions about resource management (e.g., water allocation, forest use, land management) are made by government agencies at the national or regional level. The government sets regulations and policies for how resources are used and enforces them with support from law enforcement. Local communities have little input in the decision-making process, though they may receive financial incentives or technical support from the government to help adapt to climate change. Conflicts over natural resources are resolved through legal channels or government-appointed arbitrators, rather than community dialogue.

3. **Control**: As you know, communities are facing challenges in managing natural resources (e.g., water, forests, land) due to the impacts of climate change, such as

droughts, floods, and soil degradation. Imagine that your community continues to manage natural resources in the same way it has been doing for years.[11]

After enumerators read one of these three treatments aloud, respondents answered five questions. These outcome variables include:

1. Do you think there would be an increase in resilience to climate-related challenges (e.g., droughts, floods, land degradation) within the community? [yes/no]
2. Do you think the system will reduce conflicts over natural resources (e.g., water, land, forests) in the community? [yes/no]
3. To what extent do you trust that land-related issues will be managed fairly and transparently? [Not at all/ a little/neutral/somewhat/completely]
4. Do you believe that the resolution of conflicts/disputes will be equitable? [yes/no]
5. Do you believe that the authorities will voice concerns and make decisions that benefit all members of the community? [yes/no][12]

To test hypotheses 2.a and 2.b, we also need to identify whether a respondent is an autochthone or an allochthone. We pre-registered two measures to capture autochthony. First, we ask respondents their status within the village: whether they were a "host," or if they had moved to the village, returned to the village, or were a refugee. We code hosts as autochthones and all other respondents as allochthones.[13] We also measure allochthony through ethnicity—specifically, by coding Peulh/Fulani and Tuareg respondents as allochthones. This coding reflects these ethnicities' status in Mali and Niger as herders who often transit between villages and are treated as outsiders. However, both strategies to capture the allochthone/autochthone divide leave us underpowered to detect differences. When asking respondents directly if they are a host or a more recent arrival, only

11. See the above section for a longer description of the status quo for natural resource governance in Mali and Niger.

12. These outcome variables are all strongly and positively correlated with each other. Between these outcomes, the coefficients of correlation range from 0.56 to 0.86.

13. Hosts or tutors is a common way to refer to the original settlers of the land, who in the conventional narrative then permit later arrivals, or allochthones, to settle.

69 respondents report being an allochthone. Similarly, only 282 respondents are either Peulh/Fulani or Tuareg.

To overcome these challenges, we code a third measure of allochthony: distance measured between the village's centroid and the respondent's dwelling.[14] This measure captures how far a respondent lives from the center point of the village. Initial arrivals to a village—the autochthones—generally create a central settlement. They farm around this central point, creating a band of farmland surrounding the village. Later arrivals—allochthones—often settle in hamlets outside of these initial bands of farmland, where land remains available (Delville and Moalic 2019). Villages may also settle allochthones strategically on the outskirts of their territories to shore up territorial claims (Delville and Moalic 2019; Ribar 2025, 33). While distance to the village centroid is a proxy for allochthony, the variation it provides allows us to better explore H2.a and H2.b. To avoid our results being driven by outliers or GPS errors, we winsorize these results to be within the 5th and 95th percentiles. We then take the inverse hyperbolic sine of the distance measure to normalize it (Bellemare and Wichman 2020).[15]

For hypothesis 3, we need to capture respondents' exposure to violence. In our survey, we asked respondents "To your knowledge, have there been any violent confrontations or conflicts in your community in the last six months?" However, we expect this question to be vulnerable to either social desirability bias or a general unwillingness to discuss violence. As a result, we also use the count of ACLED events within a 25 kilometer radius of the village as a measure of exposure to violence. We exclude ACLED events which are coded as protests and events where the primary actor is government forces, as these do not match our theoretical explanations of an incomplete monopoly on violence. We calculate these statistics for the one year prior to the survey, but appendix A.2 shows these results calculated using two and three year pre-treatment periods, as well as versions calculated using 10 kilometer radii. Following Bellamare and Wichman (2020), we use an inverse hyperbolic sine transformation to normalize these data. We did not specify such a transformation in the pre-analysis plan; however, table A.2 shows that

14. The respondents' location is captured during the survey via GPS; we calculate the village centroids by averaging these GPS coordinates by village.

15. Appendix tables A9 shows qualitatively similar results to distance using self-reported autochthony; table A10 shows no heterogenous results by autochthony.

results are substantively identical with and without this transformation.[16]

For control variables, we include sex, age, age squared, and a set of binary indicators for the respondent participating in any specific JASS intervention. Table 1 shows the balance between the difference treatment groups. Respondents who received the three treatment items are balanced on all characteristics except for participating in infrastructure initiatives as part of JASS. With 38 *t*-statistics in table 1, this imbalance is consistent with a successful randomization, and is not a cause for concern. All groups are balanced.

Table 1. All three treatment groups are balanced across control variables

	Control		Local-led Treatment			State-led Treatment		
	Mean	Std.Err.	Mean	Std.Err.	T-score	Mean	Std.Err.	T-score
Age	42.71	15.06	42.66	14.19	-0.09	42.76	14.25	0.09
Sex (male)	0.58	0.49	0.61	0.49	1.78	0.58	0.49	0.11
Ethnicity								
Bambara	0.25	0.43	0.26	0.44	0.67	0.26	0.44	0.56
Haoussa	0.40	0.49	0.37	0.48	-1.34	0.39	0.49	-0.44
Mandé	0.04	0.19	0.03	0.17	-1.02	0.03	0.17	-0.76
Minianka/Sénoufo	0.14	0.35	0.16	0.37	1.50	0.15	0.36	0.89
Other	0.04	0.19	0.04	0.19	0.23	0.04	0.20	0.57
Peulh	0.03	0.17	0.04	0.21	1.69	0.04	0.19	0.61
Soninké	0.06	0.25	0.05	0.22	-1.35	0.05	0.23	-1.07
Touareg	0.05	0.21	0.04	0.20	-0.34	0.04	0.19	-0.94
Participation in JASS activities								
Awareness	0.39	0.49	0.37	0.48	-1.38	0.38	0.48	-0.85
Capacity building	0.20	0.40	0.19	0.39	-0.76	0.22	0.41	0.90
Infrastructure	0.12	0.33	0.09	0.29	-2.24	0.12	0.33	-0.03
Peace initiatives	0.20	0.40	0.19	0.39	-1.10	0.22	0.41	0.77
Non-farm livelihoods	0.13	0.34	0.12	0.32	-1.25	0.14	0.35	0.58
Agriculture	0.25	0.43	0.23	0.42	-1.00	0.25	0.44	0.42
Resource management	0.10	0.31	0.10	0.30	-0.14	0.13	0.34	2.00
Climate resilience	0.10	0.30	0.11	0.31	0.31	0.10	0.30	-0.48
Advocacy	0.03	0.18	0.02	0.15	-1.38	0.03	0.18	0.03

Note: This table shows the balance of control variables across the three treatment groups from the JASS endline survey. T-scores are calculated using the control group as a baseline.

16. Table A3 in the appendix shows no heterogeneous effects of treatment by self-reported encountering violence. However, exposure to ACLED events is indeed higher among respondents who reported they experienced violence.

3.3 Estimation strategy

We use a series of ordinary least squares regressions to estimate these results. All regressions include village-level fixed effects for two reasons. First, our survey experiment was embedded in a monitoring and evaluation effort for a stabilization and conflict resolution program; our fixed effects absorb exposure to this program. Second, we are interested in how the experimental treatment shifts preferences for natural resource governance, rather than how a village's conditions shift preferences for natural resource governance. Standard errors are clustered at the village level. To test hypothesis one, we estimate equations of the form

$$y_{iv} = \beta_1 \tau_i + \beta_2 X_i + \gamma_v + \epsilon_i$$

where y denotes the outcome variable, τ_i denotes the treatment status, X_i is a vector of controls, γ denotes village-level fixed effects, i indexes individual observations and v indexes villages. Here, β_1 captures the coefficient of interest: the effect of assignment into the treatment vignettes on the outcome variables. To test hypotheses two and three, we will estimate equations of the form

$$y_{iv} = \beta_1 \tau_i + \beta_2 \tau_i \cdot M_i + \beta_3 X_i + \gamma_v + \epsilon_i$$

where M represents the variable by which we hypothesized to find heterogeneous preferences for natural resource governance and all other terms remain the same.[17] In this case, our outcomes of interest are β_1, the coefficient on the treatment indicator, and β_2, the coefficient on the interaction variable. Figures 3 and 4 in the body of the paper show the marginal effects of treatment by the interacting variables; appendix A.1 shows the full regression tables.

Ultimately, our survey design permits us to observe only some of the underlying variation that distinguishes respondents; more variation likely remains unobserved. Following Oster (2019), we conduct additional sensitivity analysis to calculate the proportion of unobserved variation relative to observed variation which would be necessary to render our

17. Our village-level fixed effects absorb the uninteracted effects of M_i where M does not vary within villages.

results statistically insignificant. This measure, conventionally referred to as δ, captures how robust these results are to unobserved variation which could otherwise render them null. Tables 2 and 3 contain these measures for each outcome variable, for both treatment indicators (the community-led treatment and the state-led treatment). These values are consistently above the conventional threshold of one for all significant results.

4 Results

Table 2 shows the effect of being treated with the descriptions of natural resource governance on the four binary outcome measures. A positive coefficient implies greater perceived efficacy for the hypothetical governance regime. Table 2 shows results which are both clear and consistent. Contra H.1a, we see minimal responses to the state-led treatment. Respondents think that a state-led natural resource governance regime will be 0.09 standard deviations more equitable and 0.11 standard deviations more likely to benefit all members of the community. However, respondents did not believe that a state-led system would be more resilient or would reduce conflicts.

In contrast, table 2 provides strong evidence that respondents prefer natural resource governance in which local institutions play a strong role, compared to either the status quo or (contra H.1a) state-led natural resource governance. Respondents think that a community-led natural resource governance regime would be superior across all measures. Respondents were 0.4 standard deviations more likey to agree that "there would be an increase in resilience to climate-related challenges" (an increase of approximately 25 percent relative to the mean); 0.52 standard deviations more likely to agree that "the system will reduce conflicts over natural resources" (an increase of 28 percent relative to the mean); 0.48 standard deviations more likely to agree that "the resolution of conflicts/disputes will be equitable?" (an increase of 25 percent relative to the mean); and 0.46 standard deviations more likely to agree that "the authorities will voice concerns and make decisions that benefit all members of the community" (an increase of 23 percent relative to the means). These effects are both statistically and substantively significant. The statistically significant results in this table have δ values well above the conventional threshold of one, suggesting that the results are robust to the presence of unobserved

Table 2. Respondents prefer local natural resource governance over the status quo

	Resilience		Reduce conflicts		Equitable		Benefit all members	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Local treatment	0.182***	0.186***	0.227***	0.229***	0.198***	0.200***	0.187***	0.189***
	(0.023)	(0.023)	(0.022)	(0.022)	(0.019)	(0.019)	(0.021)	(0.021)
State-led treatment	0.019	0.015	0.038*	0.036*	0.037*	0.034*	0.046**	0.043**
	(0.018)	(0.019)	(0.018)	(0.018)	(0.016)	(0.016)	(0.017)	(0.016)
Demographic controls		X		X		X		X
Village FEs	X	X	X	X	X	X	X	X
Mean of outcome	0.726	0.726	0.764	0.764	0.795	0.795	0.8	0.8
δ (local)	1.336	1.806	2.355	2.81	1.861	2.245	1.833	2.233
δ (state)	0.672	0.199	0.798	0.548	1.133	0.645	1.638	0.975
Num.Obs.	3310	3310	3378	3378	3393	3393	3243	3243
R2	0.129	0.154	0.171	0.184	0.156	0.178	0.171	0.201

Note: The dependent variables in this model are 'Do you think there would be an increase in resilience to climate-related challenges' (columns 1-2), 'Do you think the system will reduce conflicts over natural resources (e.g., water, land, forests) in the community?' (columns 3-4), 'Do you believe that the resolution of conflicts/disputes will be equitable?' (columns 5-6), and 'Do you believe that the authorities will voice concerns and make decisions that benefit all members of the community?' (columns 7-8). The independent variable is which vignette treatment respondents received. Control variables include age, age squared, sex, and which (if any) JASS activities the respondent participated. All regressions use OLS with village type fixed effects. Standard errors are clustered at the village level.

error.

Table 3 shows similar results to table 2, but uses the likert outcome.[18] Respondents who received the local governance vignette had 0.39 standard deviations more trust that "land related issues will be managed fairly and transparently." This effect represents an 0.13 percent increase over the baseline level of 4.016. In contrast, presenting respondents with the state-led treatment had no effect on trust in the land governance system, relative to the status quo. In summary, respondents clearly expressed greater confidence in a hypothetical system of locally managed land administration, relative to both existing land administration and a hypothetical state-managed system of land management. Respondents believe that a community-led natural resource governance system would be more resilient, more equitable, and would reduce more conflict.

Beyond this confidence, however, we are also interested in the relationship between other characteristics and respondents' preferences for natural resource governance. Hypothesis two suggests that allochthones, as opposed to autochthones, or the 'sons of the soil,' are more likely to distrust a locally managed natural resource governance system

18. Table A11 in the appendix shows similar results analyzing this outcome variable using an ordinal logit.

Table 3. Respondents prefer local natural resource governance over the status quo

	(1)	(2)
Local treatment	0.548***	0.551***
	(0.063)	(0.064)
State-led treatment	0.040	0.040
	(0.056)	(0.054)
Demographic controls		X
Village FEs	X	X
Mean of outcome	4.007	4.007
δ (local)	1.523	1.748
δ (state)	2.825	0.819
Num.Obs.	3489	3489
R2	0.155	0.169

Note:
The dependent variable in this model is 'To what extent do you trust that land-related issues will be managed fairly and transparently?' The independent variable is which vignette treatment respondents received. Control variables include age, age squared, sex, and which (if any) JASS activities the respondent participated. All regressions use OLS with village type fixed effects. Standard errors are clustered at the village level.

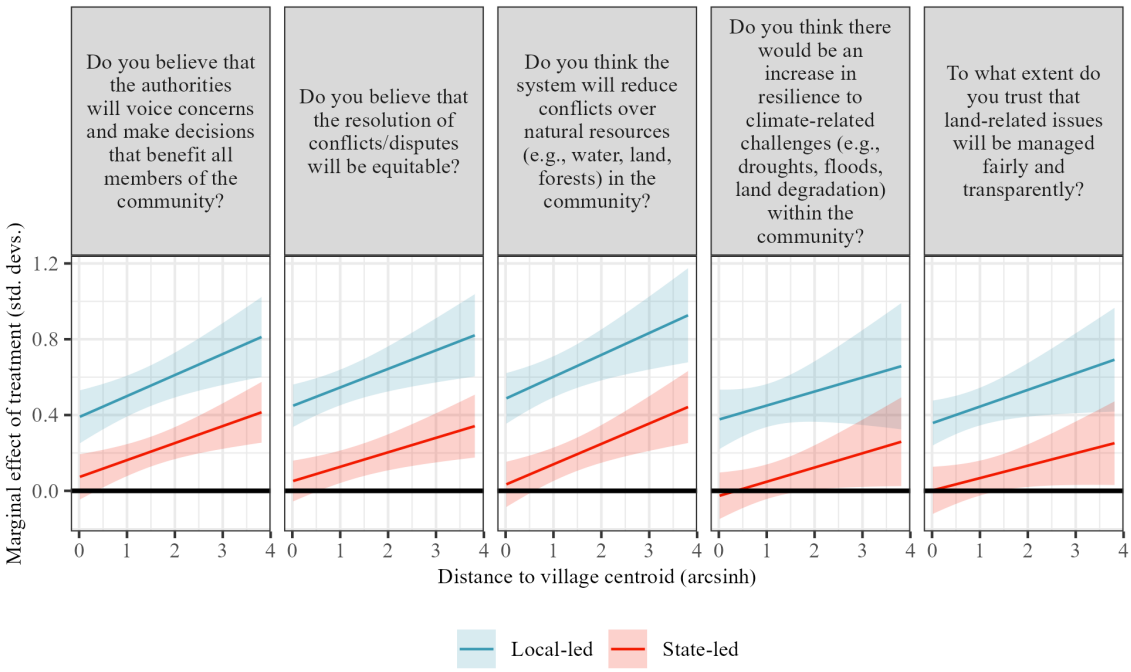
because of a history of discrimination.

Figure 3 shows the marginal effect of being treated by one of the two alternative vignettes, broken out by respondent's distance to the village centroid.[19] Because settlement patterns generally lead to autochthones occupying the center of the village and allochthones occupying the outskirts, respondents with high distance to the village centroid are more likely to be autochthones. Consequently, H2.A predicts the marginal effect of being treated with the 'state-led' vignette to increase with distance to the village centroid. Similarly, if H2.B is correct, then we would expect the marginal effect of being treated with the 'local-led' vignette to decrease with the respondent's distance to the village centroid.

Figure 3 shows that support for the state-led treatment does indeed increase with

19. Table A1 in the appendix shows these results in greater detail.

Figure 3. Heterogenous treatment effects by household distance to village centroid



This figure shows the marginal effect of treatment with the state-led and community-led natural resource governance vignettes, expressed as standard deviations of each outcome variable, broken out by distance to the village centroid. All regressions use OLS with village fixed effects. Standard errors are clustered at the village level.

distance to the village centroid. Among respondents who were closest to the village centroid, the marginal effect of being treated with the 'state-led' vignette was statistically indistinguishable from zero. In contrast, for respondents furthest from the village centroid (those most likely to be allochthones), the marginal effect of being treated with the state-led treatment was an increase of 0.25 to 0.44 standard deviations.

However, contra H2.B, figure 3 also shows that the marginal effects of being treated with the 'local-led' vignette increase with distance to the village centroid. In other words, allochthones express greater support for a hypothetically locally led natural resource governance system. Even among respondents who were furthest from the village centroid, respondents expressed greater confidence in the locally led natural resource governance

system than in the state-led natural resource governance system. One potential explanation is that these slopes merely reflect allochthones deep-seated distrust of existing systems. However, table A1 shows that distance to the village centroid by itself is not a statistically significant predictor of these outcomes. In other words, autochthones and allochthones express similar levels of trust in the status quo of natural resource governance.[20]

These results are puzzling: they suggest that allochthones trust a hypothetical community-based natural resource governance regime even more than autochthones. Previous research on the political economy of natural resource governance suggests that members of an out group would have less confidence in a regime that elites can capture. H.2b suggested that allochthones, when presented with the idea of 'community-led natural resource governance,' believe that it will be captured by elites, and thus discriminatory towards allochthones as the local out-group.

What explains these unexpected results? When we presented respondents with the community-based natural resource governance regime vignette, H2.B implied essentially suggested that allochthone respondents would not believe us when we said that such a regime would be inclusive. Did allochthone respondents believe that such a regime would be inclusive? One answer to this question comes from the JASS intervention itself, which promoted inclusive natural resource governance.[21] JASS could function as a proof-of-concept for allochthones when it comes to inclusive natural resource governance. In other words, allochthones who participated in JASS may be more likely to believe that a community-led natural resource governance regime could be genuinely inclusive. Table B1 shows that the marginal effects of being treated with the community-led vignette are higher among allochthones that participated in at least one JASS activity than among respondents who did not. If JASS participation contributes to respondents' perceptions of community-led natural resource governance, then it seems likely that re-

20. One alternative explanation here is that respondents who live closer to the village centroid are simply better informed about village politics. However, among respondents who are above the median distance to the centroid, 58.4 percent feel that they "participate in making decisions in terms of access, use and management of resources and related disputes in [their] community;" among those below the median distance to the village centroid, 48 percent feel that they participate. These data suggest that participation does not meaningfully decline with distance.

21. These results are not pre-registered, and should be treated as exploratory rather than confirmatory.

spondents do indeed believe that a community-led natural resource regime could and would be inclusive.

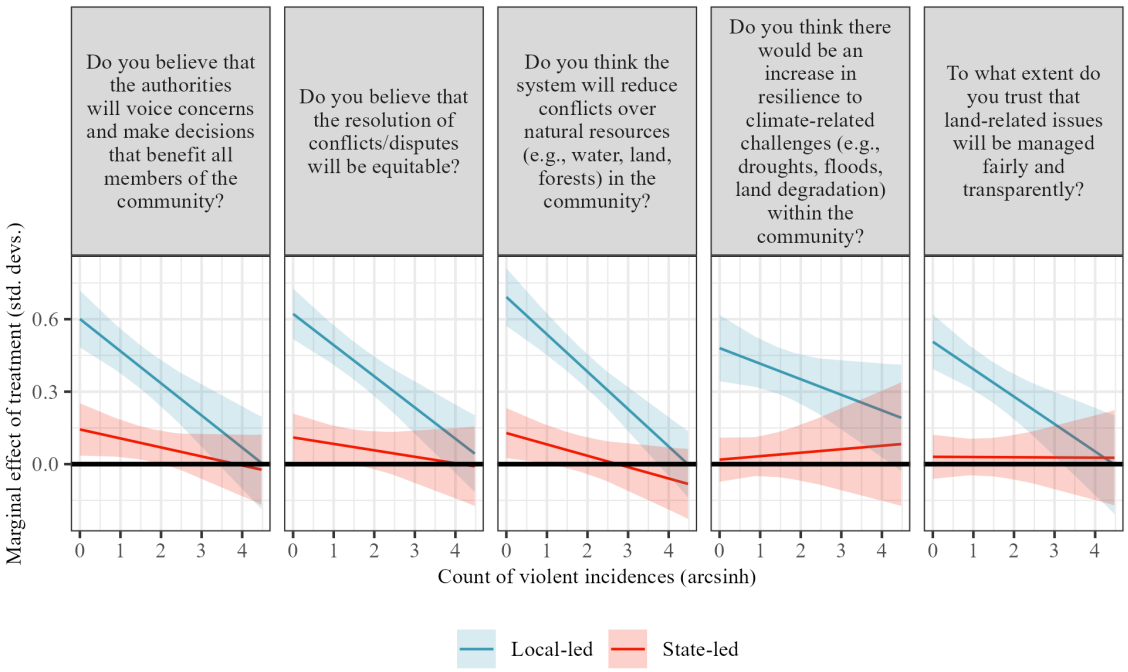
Second, several of our outcome variables address inclusivity directly. If respondents equated community-led natural resource governance with capture by local elites and subsequent discrimination, then we would expect to see completely null results when asking allochthones (1) 'To what extent do you trust that land-related issues will be managed fairly and transparently?' (2) 'Do you believe that the resolution of conflicts/disputes will be equitable?' and (3) 'Do you believe that the authorities will voice concerns and make decisions that benefit all members of the community?' Contrary to our expectations, allochthones believed that a community-led natural resource governance regime could in fact be inclusive.[22]

Finally, we are also interested in how exposure to violence affects confidence in these proposed natural resource governance regimes. Figure 4 shows the marginal effects of being treated with the state-led and locally-led vignettes, broken out by exposure to violent incidents. If H3.A were correct, we would expect to see the marginal effects of being treated with the 'state-led' vignette to be lesser among respondents who had greater exposure to violence. Figure 4 does indeed provide support for this hypothesis. However, the marginal effect of the 'state-led' treatment is not statistically significant in much of figure 4, suggesting that H3.A encounters floor effects. There may be a negative relationship between confidence in state-led natural resource governance and exposure to conflict but it is difficult to detect because confidence in state-led natural resource governance is quite low.

The stronger story shown in figure 4—which we did not hypothesize—is that confidence in locally-led natural resource governance is also decreasing in exposure to violence. Where respondents have been exposed to zero ACLED events, the marginal effect of being treated with the local-led treatment is a 0.46 to 0.60 standard deviation increase in the confidence variables. In contrast, where exposure to violence is high, the marginal effect of being exposed to the state-led treatment is statistically distinguishable

22. Alternatively, allochthone respondents within the groups which are likely to be excluded think that norms of formal property rights will nevertheless pervade community-led natural resource governance. Aldashev et al. (2012, 798) refer to this mechanism as a magnet effect: "the formal law can actually pull custom in its direction, thereby causing a progressive evolution of the prevailing mores."

Figure 4. Heterogenous treatment effects by exposure to ACLED events



This figure shows the marginal effect of treatment with the state-led and community-led natural resource governance vignettes, expressed as standard deviations of each outcome variable, and broken out by exposure to violent events status. All regressions use OLS with village fixed effects. Standard errors are clustered at the village level.

from zero. In other words, being exposed to violence decreases confidence in all hypothetical natural resource governance arrangements, not just state-led natural resource governance.[23] At the highest levels of exposure to violence, respondents did not believe that either proposed natural resource governance regime would be an improvement relative to the status quo.

23. In our current specifications, we cannot show the relationship between exposure to violence and the control condition of the vignette experiment, because the village fixed effects absorb the un-interacted effect of violence.

5 Discussion and Conclusion

Natural resource governance is essential for conflict resolution, economic growth, and climate resilience. However, low state capacity, security challenges, and shrinking resource pools have made natural resource governance difficult in countries like Mali and Niger. In response, both donors and African governments have attempted to expand the provision of natural resource governance, either by expanding the provision of formal property rights (Deininger and Goyal 2024) or by instituting community-led conflict resolution institutions (Christensen et al. 2024; Hartman, Blair, and Blattman 2021; Ribar et al. 2025). The community-led interventions in particular are predicated on the idea that local and inclusive governance fosters higher levels of trust, legitimacy, and cooperation (Ostrom 2015). For natural resource governance to be successful, constituents have to have confidence in the system; where constituents have multiple options for conflict resolution institutions, they will not use natural resource governance that they do not feel would be effective. Within this challenging environment, what kinds of institutions do citizens believe could improve natural resource management, resolve conflicts, and boost climate resilience?

This paper makes three conclusions. First, across sub-groups, respondents overwhelmingly prefer a community-led natural resource governance over a state-led natural resource governance regime or the status quo. These results are stark: relative to the status quo, being presented with the community-led treatment increased confidence in the proposed system by 0.4 to 0.52 standard deviations—increases of 23 percent to 28 percent over the mean. These results align with a growing movement within natural resource governance policy to empower communities to monitor their own property rights and adjudicate their own disputes (Callen, Weigel, and Yuchtman 2024; Deininger and Goyal 2024).

Second, we show that that these preferences are similar among both local-in groups (autochthones) and local out-groups (allochthones). Existing literature suggests that households' position within local hierarchies will affect their confidence in the various institutions to which they could bring a conflict, thereby affecting their choice of forum (Acemoglu et al. 2020; Funjika and Honig 2024; Winters and Conroy-Krutz 2021). Re-

spondents located further from the village centroid, i.e. those more likely to belong to the out-groups, have increased confidence in both the community-led and state-led natural resource governance regimes, relative to the status quo. In other words—contrary to both our own hypotheses and the existing literature—respondents who belong to local outgroups believe that a community-led natural resource governance regime could be both inclusive and effective.

Third, we show that exposure to violence decreases confidence in both community-led and state-led natural resource governance regimes. These findings align with our theoretical expectations that exposure to violence signals the state's inability to enforce property rights: violent incidents show respondents that the state lacks a monopoly on violence. Within a context in which access to natural resources forms the core of many conflicts (Benjaminsen and Ba 2024; Raleigh, Nsaibia, and Dowd 2021; Hansen 2024), exposure to violence directly indicates that the state has failed to resolve natural resource conflicts in the past.

Future research could better unpack the specific elements of community-based natural resource governance which condition perceived equity and efficiency and make sense of these unexpected results. More specifically, varying the features of community-based natural resource governance could illustrate why and when members of local out groups would perceive community land governance to be equitable. Alternatively, respondents may perceive a 'magnet effect' whereby norms of land governance from state institutions begin to penetrate into state institutions.

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Appendices

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A Additional specifications

A.1 Tables for marginal effects plots

Table A1 shows the direct effect of autochthony (measured via distance to the village centroid) on our five outcome variables. The table shows the regression coefficients which generate figure r3. The table shows that distance by itself does not affect most of the outcomes, with the exception of responses to 'to what extent do you trust that land-related issues will be managed fairly and transparently?' (column three). These results suggest that allochthony is not associated with different responses under the control condition (the status quo). However, the fact that allochthones think that the status quo is more fair and transparent' is also counter to our expectations.

Table A1. Households further from village centroids are more responsive to treatment

	Resilience	Reduce conflicts	Fairly	Equitable	Benefit all members
	(1)	(2)	(3)	(4)	(5)
Local treatment	0.168***	0.206***	0.500***	0.181***	0.156***
	(0.036)	(0.029)	(0.085)	(0.023)	(0.029)
State-led treatment	−0.012	0.014	0.002	0.020	0.029
	(0.028)	(0.026)	(0.089)	(0.022)	(0.024)
Distance	−0.023	−0.012	0.201*	0.024	0.018
	(0.035)	(0.034)	(0.090)	(0.031)	(0.032)
Local * Distance	0.033	0.049**	0.123*	0.040**	0.044**
	(0.025)	(0.017)	(0.061)	(0.014)	(0.015)
State * Distance	0.034	0.046**	0.092	0.031**	0.036**
	(0.018)	(0.014)	(0.054)	(0.011)	(0.012)
Demographic controls	X	X	X	X	X
Village FEs	X	X	X	X	X
Mean of outcome	0.726	0.764	4.007	0.795	0.8
Num.Obs.	2837	2872	2934	2875	2762
R2	0.168	0.200	0.190	0.192	0.220

Note: The dependent variables in this model are 'Do you think there would be an increase in resilience to climate-related challenges' (column 1), 'Do you think the system will reduce conflicts over natural resources (e.g., water, land, forests) in the community?' (column 2), 'To what extent do you trust that land-related issues will be managed fairly and transparently?' (column 3), 'Do you believe that the resolution of conflicts/disputes will be equitable?' (column 4), and 'Do you believe that the authorities will voice concerns and make decisions that benefit all members of the community?' (column 5). The independent variable is which vignette treatment respondents received. This table measures allochthony using the distance to the village centroid (in meters, using the inverse hyperbolic sine transformation to normalize). Control variables include age, age squared, sex, and which (if any) JASS activities the respondent participated. All regressions use OLS with village type fixed effects. Standard errors are clustered at the village level.

Table A2. Exposure to ACLED events is associated with a smaller effect for the 'local governance' treatment

	Resilience	Reduce conflicts	Fairly	Equitable	Benefit all members
	(1)	(2)	(3)	(4)	(5)
Local treatment	0.212***	0.292***	0.709***	0.251***	0.241***
	(0.031)	(0.026)	(0.080)	(0.021)	(0.024)
State-led treatment	0.004	0.052*	0.039	0.041*	0.055*
	(0.021)	(0.022)	(0.064)	(0.020)	(0.022)
Local * Violent events	−0.028	−0.066***	−0.159***	−0.053***	−0.053***
	(0.015)	(0.010)	(0.041)	(0.009)	(0.011)
State * Violent events	0.006	−0.019*	−0.009	−0.010	−0.016
	(0.014)	(0.009)	(0.036)	(0.010)	(0.010)
Demographic controls	X	X	X	X	X
Village FEs	X	X	X	X	X
Mean of outcome	0.728	0.767	4.016	0.797	0.802
Num.Obs.	3369	3439	3547	3454	3304
R2	0.158	0.195	0.173	0.184	0.205

Note: The dependent variables in this model are 'Do you think there would be an increase in resilience to climate-related challenges' (column 1), 'Do you think the system will reduce conflicts over natural resources (e.g., water, land, forests) in the community?' (column 2), 'To what extent do you trust that land-related issues will be managed fairly and transparently?' (column 3), 'Do you believe that the resolution of conflicts/disputes will be equitable?' (column 4), and 'Do you believe that the authorities will voice concerns and make decisions that benefit all members of the community?' (column 5). The independent variable is the treatment vignette that respondents received. This table counts violent incidents as the sum of ACLED events in the year before the survey within 25 kilometers of the village centroid, regularized using the inverse hyperbolic sine transformation. Control variables include age, age squared, sex, and which (if any) JASS activities the respondent participated. All regressions use OLS with village type fixed effects and survey weights. Standard errors are clustered at the village level.

Table A3. Self-reported exposure to violence is not associated with heterogenous treatment effects

	Resilience	Reduce conflicts	Fairly	Equitable	Benefit all members
	(1)	(2)	(3)	(4)	(5)
Local treatment	0.204***	0.229***	0.562***	0.204***	0.200***
	(0.020)	(0.022)	(0.068)	(0.020)	(0.022)
State-led treatment	0.031	0.028	0.018	0.031	0.042*
	(0.018)	(0.018)	(0.065)	(0.018)	(0.017)
Local * Violence	−0.041	−0.024	−0.102	−0.041	−0.071
	(0.039)	(0.048)	(0.159)	(0.039)	(0.043)
State * Violence	−0.001	0.034	0.071	−0.001	−0.012
	(0.050)	(0.055)	(0.166)	(0.050)	(0.044)
Demographic controls	X	X	X	X	X
Village FEs	X	X	X	X	X
Mean of outcome	0.797	0.767	4.016	0.797	0.802
Num.Obs.	3470	3455	3565	3470	3320
R2	0.182	0.191	0.171	0.182	0.205

Note: The dependent variables in this model are 'Do you think there would be an increase in resilience to climate-related challenges' (column 1), 'Do you think the system will reduce conflicts over natural resources (e.g., water, land, forests) in the community?' (column 2), 'To what extent do you trust that land-related issues will be managed fairly and transparently?' (column 3), 'Do you believe that the resolution of conflicts/disputes will be equitable?' (column 4), and 'Do you believe that the authorities will voice concerns and make decisions that benefit all members of the community?' (column 5). The independent variable is the treatment vignette that respondents received. This table counts violent incidents as the sum of ACLED events in the year before the survey within 25 kilometers of the village centroid, regularized using the inverse hyperbolic sine transformation. Control variables include age, age squared, sex, and which (if any) JASS activities the respondent participated. All regressions use OLS with village type fixed effects and survey weights. Standard errors are clustered at the village level.

Table A4. Interaction coefficients are stable across ACLED specifications for responses to 'Do you think there would be an increase in resilience to climate-related challenges (e.g., droughts, floods, land degradation) within the community?'

		Violence * Local			Violence * State		
Period	Radius	Coef.	Std.Err.	T-score	Coef.	Std.Err.	T-score
No transformation							
Three years	10 Km.	-0.002	0.000	-4.886	0.000	0.001	0.355
Two years	10 Km.	-0.003	0.001	-4.673	0.000	0.001	0.414
One year	10 Km.	-0.009	0.002	-4.823	0.000	0.001	-0.252
Three years	25 Km.	-0.001	0.000	-2.530	0.000	0.000	0.903
Two years	25 Km.	-0.001	0.001	-2.289	0.001	0.001	0.950
One year	25 Km.	-0.004	0.001	-2.516	0.002	0.002	0.862
Inverse hyperbolic sine transformation							
Three years	10 Km.	-0.029	0.013	-2.286	0.005	0.014	0.339
Two years	10 Km.	-0.030	0.014	-2.223	0.005	0.015	0.366
One year	10 Km.	-0.044	0.016	-2.758	0.000	0.017	0.016
Three years	25 Km.	-0.023	0.012	-1.930	0.005	0.011	0.435
Two years	25 Km.	-0.025	0.012	-2.029	0.005	0.012	0.410
One year	25 Km.	-0.028	0.015	-1.957	0.006	0.014	0.389

Note: This table replicates the coefficients on the interaction effects from table A2 using a variety of different specifications ACLED data. All regressions use OLS with village type fixed effects and the same set of controls as tableA2. Standard errors are clustered at the village level.

A.2 All ACLED specifications

This section shows the marginal effects of being treated with the vignettes by exposure to ACLED events. In our pre-analysis plan, we did not specify the specific way of aggregating ACLED events. However, this section shows that our results are not reliant on a specific formulation of ACLED event counts. Each table shows results for one of the five outcome variables. ACLED event counts vary by (1) the period of time in which we count ACLED events; (2) the size of the radius around the village in which we include events; and (3) whether we use an inverse hyperbolic sine transformation.

Table A5. Interaction coefficients are stable across ACLED specifications for responses to 'Do you think the system will reduce conflicts over natural resources (e.g., water, land, forests) in the community?'

		Violence * Local			Violence * State		
Period	Radius	Coef.	Std.Err.	T-score	Coef.	Std.Err.	T-score
No transformation							
Three years	10 Km.	-0.004	0.001	-5.849	-0.001	0.000	-2.134
Two years	10 Km.	-0.005	0.001	-5.667	-0.001	0.000	-2.180
One year	10 Km.	-0.012	0.002	-5.394	-0.003	0.001	-2.124
Three years	25 Km.	-0.002	0.000	-9.075	0.000	0.000	-2.383
Two years	25 Km.	-0.003	0.000	-9.169	-0.001	0.000	-2.332
One year	25 Km.	-0.007	0.001	-8.784	-0.001	0.001	-2.384
Inverse hyperbolic sine transformation							
Three years	10 Km.	-0.055	0.010	-5.551	-0.016	0.009	-1.789
Two years	10 Km.	-0.058	0.011	-5.510	-0.018	0.009	-1.922
One year	10 Km.	-0.070	0.013	-5.208	-0.022	0.012	-1.878
Three years	25 Km.	-0.056	0.008	-6.670	-0.020	0.008	-2.501
Two years	25 Km.	-0.059	0.009	-6.827	-0.018	0.008	-2.282
One year	25 Km.	-0.066	0.010	-6.486	-0.019	0.009	-2.102

Note: This table replicates the coefficients on the interaction effects from table A2 using a variety of different specifications ACLED data. All regressions use OLS with village type fixed effects and the same set of controls as tableA2. Standard errors are clustered at the village level.

Table A6. Interaction coefficients are stable across ACLED specifications for responses to 'To what extent do you trust that land-related issues will be managed fairly and transparently?'

		Violence * Local			Violence * State		
Period	Radius	Coef.	Std.Err.	T-score	Coef.	Std.Err.	T-score
No transformation							
Three years	10 Km.	-0.010	0.003	-2.884	-0.003	0.003	-0.943
Two years	10 Km.	-0.015	0.005	-2.824	-0.004	0.005	-0.935
One year	10 Km.	-0.034	0.012	-2.732	-0.013	0.013	-0.973
Three years	25 Km.	-0.005	0.001	-4.443	-0.001	0.001	-0.808
Two years	25 Km.	-0.008	0.002	-4.778	-0.001	0.002	-0.718
One year	25 Km.	-0.021	0.005	-4.481	-0.003	0.004	-0.773
Inverse hyperbolic sine transformation							
Three years	10 Km.	-0.162	0.038	-4.221	-0.045	0.037	-1.220
Two years	10 Km.	-0.176	0.042	-4.168	-0.055	0.041	-1.332
One year	10 Km.	-0.218	0.056	-3.874	-0.084	0.057	-1.465
Three years	25 Km.	-0.128	0.030	-4.193	-0.011	0.029	-0.376
Two years	25 Km.	-0.136	0.033	-4.081	-0.006	0.030	-0.189
One year	25 Km.	-0.159	0.041	-3.922	-0.009	0.036	-0.235

Note: This table replicates the coefficients on the interaction effects from table A2 using a variety of different specifications ACLED data. All regressions use OLS with village type fixed effects and the same set of controls as tableA2. Standard errors are clustered at the village level.

Table A7. Interaction coefficients are stable across ACLED specifications for responses to 'Do you believe that the resolution of conflicts/disputes will be equitable?'

		Violence * Local			Violence * State		
Period	Radius	Coef.	Std.Err.	T-score	Coef.	Std.Err.	T-score
No transformation							
Three years	10 Km.	-0.003	0.001	-5.889	0.000	0.000	-1.165
Two years	10 Km.	-0.005	0.001	-5.693	-0.001	0.000	-1.159
One year	10 Km.	-0.011	0.002	-5.202	-0.002	0.001	-1.815
Three years	25 Km.	-0.002	0.000	-9.439	0.000	0.000	-0.450
Two years	25 Km.	-0.002	0.000	-9.423	0.000	0.000	-0.355
One year	25 Km.	-0.006	0.001	-9.293	0.000	0.001	-0.549
Inverse hyperbolic sine transformation							
Three years	10 Km.	-0.045	0.009	-4.805	-0.007	0.009	-0.763
Two years	10 Km.	-0.049	0.010	-4.891	-0.009	0.010	-0.904
One year	10 Km.	-0.063	0.013	-4.918	-0.014	0.012	-1.243
Three years	25 Km.	-0.044	0.008	-5.759	-0.009	0.008	-1.110
Two years	25 Km.	-0.047	0.008	-5.894	-0.009	0.008	-1.037
One year	25 Km.	-0.053	0.009	-5.677	-0.010	0.010	-1.083

Note: This table replicates the coefficients on the interaction effects from table A2 using a variety of different specifications ACLED data. All regressions use OLS with village type fixed effects and the same set of controls as tableA2. Standard errors are clustered at the village level.

Table A8. Interaction coefficients are stable across ACLED specifications for responses to 'QER.6Do you believe that the authorities will voice concerns and make decisions that benefit all members of the community?'

		Violence * Local			Violence * State		
Period	Radius	Coef.	Std.Err.	T-score	Coef.	Std.Err.	T-score
No transformation							
Three years	10 Km.	-0.003	0.001	-5.603	-0.001	0.000	-2.191
Two years	10 Km.	-0.004	0.001	-5.445	-0.001	0.001	-2.192
One year	10 Km.	-0.011	0.002	-4.803	-0.003	0.001	-2.410
Three years	25 Km.	-0.001	0.000	-5.949	0.000	0.000	-1.500
Two years	25 Km.	-0.002	0.000	-5.495	0.000	0.000	-1.362
One year	25 Km.	-0.005	0.001	-5.990	-0.001	0.001	-1.481
Inverse hyperbolic sine transformation							
Three years	10 Km.	-0.045	0.010	-4.625	-0.011	0.009	-1.308
Two years	10 Km.	-0.049	0.010	-4.816	-0.013	0.009	-1.439
One year	10 Km.	-0.066	0.013	-5.086	-0.019	0.011	-1.738
Three years	25 Km.	-0.045	0.009	-5.009	-0.017	0.008	-2.244
Two years	25 Km.	-0.047	0.009	-5.117	-0.016	0.008	-1.910
One year	25 Km.	-0.053	0.011	-4.890	-0.016	0.010	-1.617

Note: This table replicates the coefficients on the interaction effects from table A2 using a variety of different specifications ACLED data. All regressions use OLS with village type fixed effects and the same set of controls as tableA2. Standard errors are clustered at the village level.

Table A9. Self-reported autochthones prefer local governance, but results are underpowered

	Resilience	Reduce conflicts	Fairly	Equitable	Benefit all members
	(1)	(2)	(3)	(4)	(5)
Local treatment	0.177***	0.222***	0.526***	0.191***	0.181***
	(0.023)	(0.023)	(0.065)	(0.019)	(0.021)
State-led treatment	0.009	0.032	0.037	0.030	0.039*
	(0.018)	(0.017)	(0.054)	(0.015)	(0.016)
Local * Allochthone	0.514***	0.428***	1.360***	0.513***	0.448***
	(0.121)	(0.115)	(0.293)	(0.114)	(0.116)
State * Allochthone	0.235	0.183	−0.028	0.178	0.142
	(0.143)	(0.160)	(0.337)	(0.154)	(0.132)
Demographic controls	X	X	X	X	X
Village FEs	X	X	X	X	X
Mean of outcome	0.726	0.764	4.007	0.795	0.8
Num.Obs.	3310	3378	3489	3393	3243
R2	0.170	0.192	0.176	0.190	0.212

Note: The dependent variables in this model are 'Do you think there would be an increase in resilience to climate-related challenges' (column 1), 'Do you think the system will reduce conflicts over natural resources (e.g., water, land, forests) in the community?' (column 2), 'To what extent do you trust that land-related issues will be managed fairly and transparently?' (column 3), 'Do you believe that the resolution of conflicts/disputes will be equitable?' (column 4), and 'Do you believe that the authorities will voice concerns and make decisions that benefit all members of the community?' (column 5). The independent variable is which vignette treatment respondents received. Allochthony is self-reported using by asking if the respondent is a host/autochthone or if they have moved, returned, or are a refugee. 70 respondents identified as allochthones; 3,617 did not. Control variables include age, age squared, sex, and which (if any) JASS activities the respondent participated. All regressions use OLS with village type fixed effects. Standard errors are clustered at the village level.

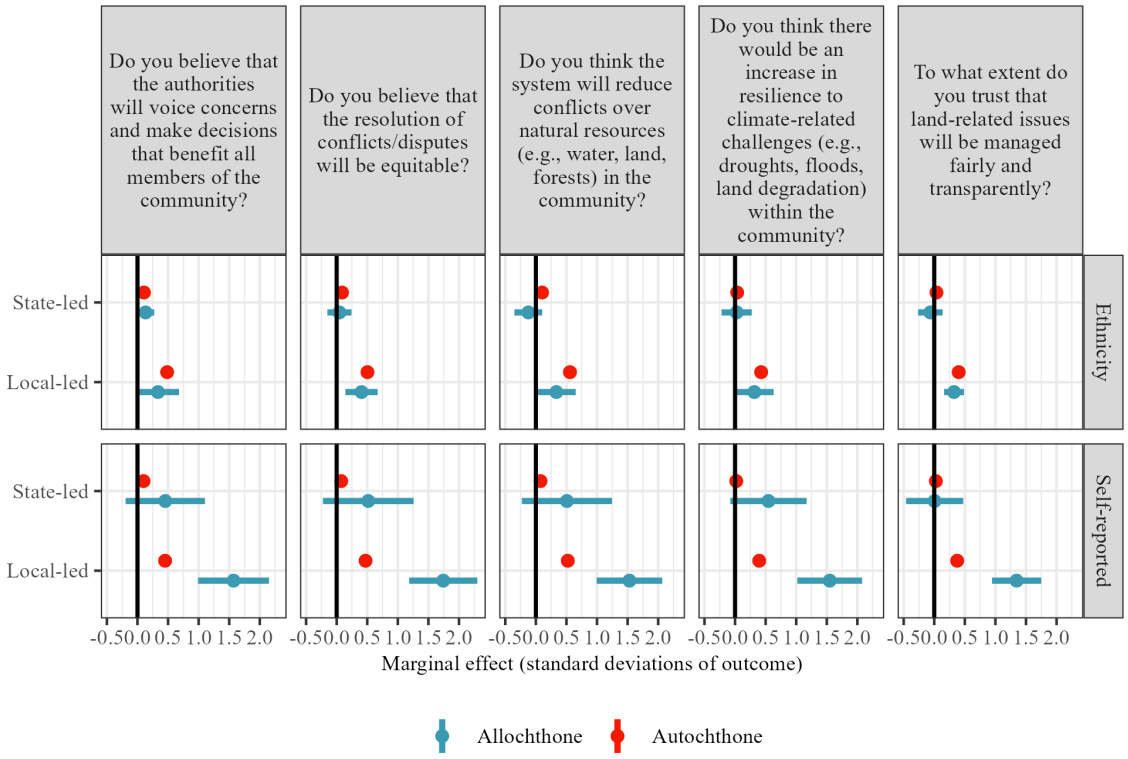
A.3 Alternative measure of autochthony

Table A10. No heterogenous effects among herding/allochthonous ethnicities

	Resilience	Reduce conflicts	Fairly	Equitable	Benefit all members
	(1)	(2)	(3)	(4)	(5)
Local treatment	0.190***	0.237***	0.560***	0.203***	0.194***
	(0.024)	(0.023)	(0.068)	(0.019)	(0.021)
State-led treatment	0.015	0.043*	0.051	0.035*	0.042*
	(0.020)	(0.018)	(0.059)	(0.016)	(0.017)
Local * Allochthone	−0.049	−0.094	−0.108	−0.039	−0.060
	(0.070)	(0.068)	(0.126)	(0.052)	(0.068)
State * Allochthone	−0.003	−0.095	−0.140	−0.017	0.010
	(0.060)	(0.050)	(0.162)	(0.042)	(0.034)
Demographic controls	X	X	X	X	X
Village FEs	X	X	X	X	X
Mean of outcome	0.726	0.764	4.007	0.795	0.8
Num.Obs.	3310	3378	3489	3393	3243
R2	0.154	0.185	0.170	0.178	0.201

Note: The dependent variables in this model are 'Do you think there would be an increase in resilience to climate-related challenges' (column 1), 'Do you think the system will reduce conflicts over natural resources (e.g., water, land, forests) in the community?' (column 2), 'To what extent do you trust that land-related issues will be managed fairly and transparently?' (column 3), 'Do you believe that the resolution of conflicts/disputes will be equitable?' (column 4), and 'Do you believe that the authorities will voice concerns and make decisions that benefit all members of the community?' (column 5). The independent variable is which vignette treatment respondents received. This table measures allochthony using the herding ethnicities (Tuareg and Peulh); 298 respondents reported belonging to these ethnicities and 3398 did not. 70 respondents identified as allochthones; 3,617 did not. Control variables include age, age squared, sex, and which (if any) JASS activities the respondent participated. All regressions use OLS with village type fixed effects. Standard errors are clustered at the village level.

Figure A1. Heterogenous treatment effects by autochthony



This figure shows the marginal effect of treatment with the state-led and community-led natural resource governance vignettes, expressed as standard deviations of each outcome variable, and broken out by allochthony status. In the bottom panels, self-reported allochthony is measured by whether the respondent said they had moved/returned to the village or a refugee (n = 70); otherwise the respondent is an autochthone (n = 3,617). In the top panels, Tuareg and Peulh respondents are marked as allochthones (n = 289); all other respondents are marked as autochthones (n = 3,398).

A.4 Ordinal logits

Table A11. Respondents prefer local natural resource governance over the status quo

	(1)	(2)
Local treatment	0.860***	0.875***
	(0.089)	(0.089)
State-led treatment	0.059	0.055
	(0.081)	(0.081)
Demographic controls		X
Village FEs	X	X
Num.Obs.	3489	3489

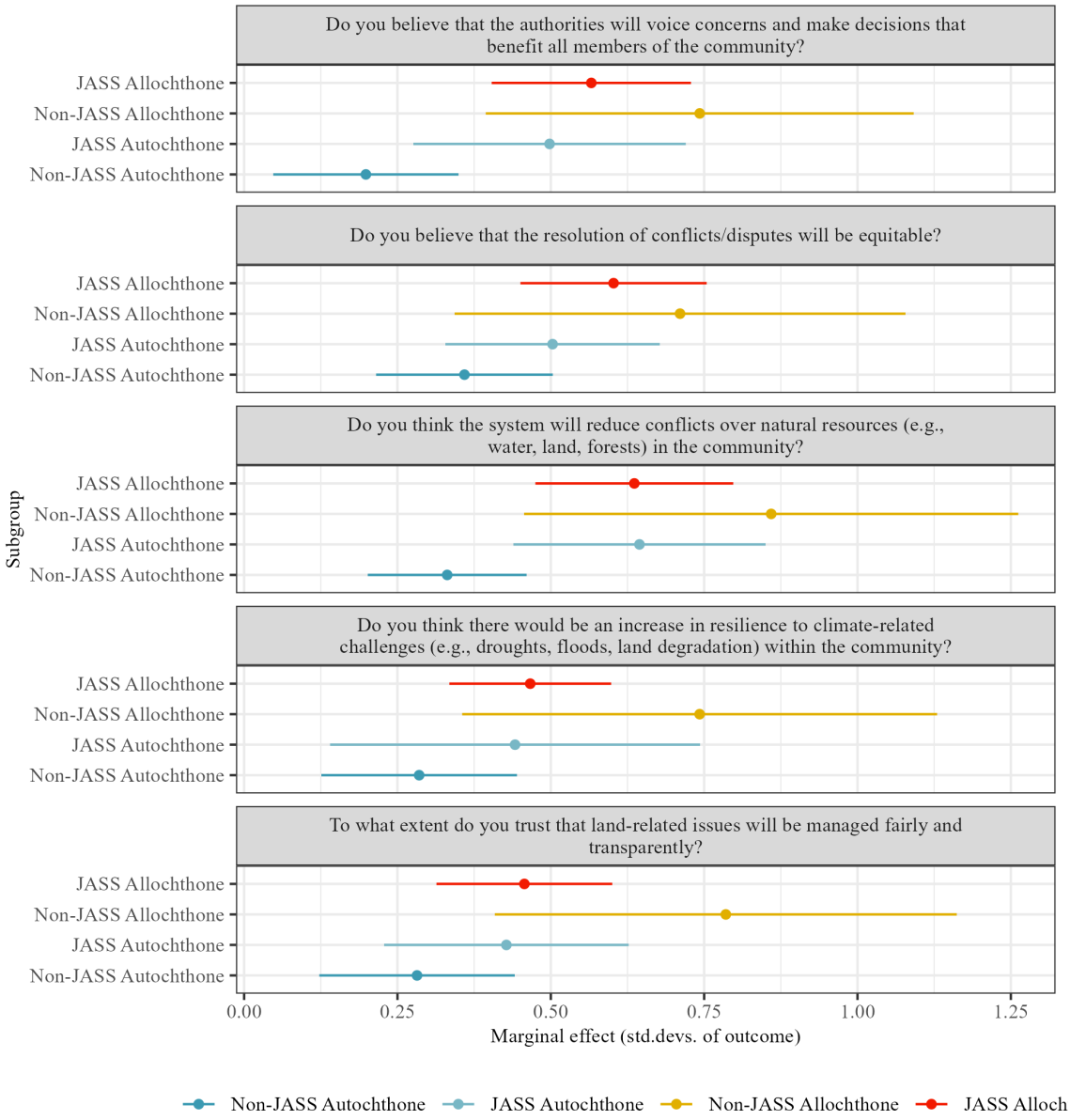
Note:
The dependent variables in this model is 'To what extent do you trust that land-related issues will be managed fairly and transparently?' The independent variable is which vignette treatment respondents received. Control variables include age, age squared, sex, and which (if any) JASS activities the respondent participated. All regressions use ordinal logits with village type fixed effects.

B Heterogenous effects by intervention

This appendix shows the heterogenous effects of being treated with either of the two vignettes based on both allochthony status and JASS participation. Figure B1 shows the marginal effects for being treated with the community-led natural resource governance vignette; figure B2 shows the marginal effects for being treated with the state-led natural resource governance vignettes.

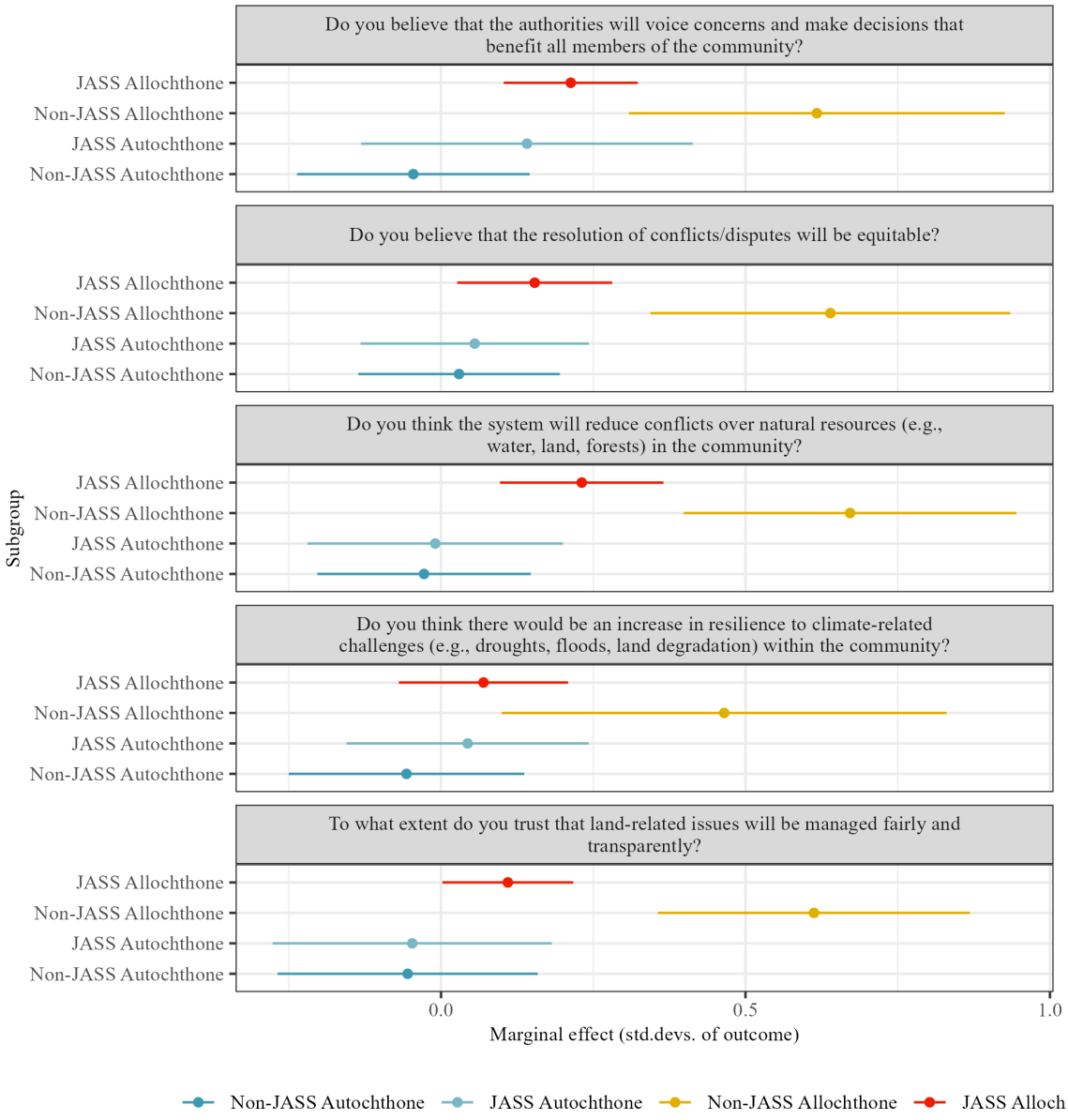
In the main text, we proxy a respondent's allochthone status using a continuous measure of the respondent's distance to the village centroid. To make the below marginal effects readable we collapse the continuous measure of allochthony into a binary measure which captures whether a respondent is above or below the median distance to a village centroid. In addition, we also collapse the multiple JASS activities in which a respondent could participate into a binary indicator for whether they participated in at least one JASS activity. Overall, 2,371 of our respondents (65.7 percent) participated in JASS. Among autochthones, 785 (52 percent) participated in at least one JASS activity while 730 did not (48 percent). Among autochthones, 1327 (87.6 percent) participated in at least one JASS activity while 188 (12.4 percent) did not.

Figure B1. Heterogenous treatment effects of being treated with the community-led vignette by allochthony status and participation in JASS



This figure shows the marginal effect of treatment with the community-led natural resource governance vignettes, expressed as standard deviations of each outcome variable, and broken out by whether the respondent was an allochthone and whether they participated in at least one JASS activity. All regressions use OLS with village fixed effects. Standard errors are clustered at the village level.

Figure B2. Heterogenous treatment effects of being treated with the state-led vignette by allochthony status and participation in JASS



This figure shows the marginal effect of treatment with the community-led natural resource governance vignettes, expressed as standard deviations of each outcome variable, and broken out by whether the respondent was an allochthone and whether they participated in at least one JASS activity. All regressions use OLS with village fixed effects. Standard errors are clustered at the village level.