



STEG WORKING PAPER

WHO WANTS PROPERTY RIGHTS? COJOINT EVIDENCE FROM SENEGAL

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JULY 2023
STEG WP072
PHD 1266

Who wants property rights? Conjoint evidence from Senegal

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July, 2023

Abstract

Why don't more farmers formalize their land rights? Previous research assumes that households will avail themselves of formal land titles when they are able. The hypothesized benefit of land titling is increase tenure security, but where households lack confidence in state institutions, they may not believe that land titles will be advantageous in reducing expropriation. I use a field conjoint experiment of 1,164 household heads across rural Senegal to understand which attributes affect the perceived likelihood of winning a land dispute. Land titles increase the likelihood of winning a perceived land dispute for all respondents, but the effect is weaker for those who lack confidence in formal institutions. Social proximity to customary elites does not affect these results. A structural topic model shows that where formal titles are not a deciding factor, respondents discuss improvements made to the land when considering potential land disputes. Taken together, this paper shows how external attributes affect households' confidence of winning land disputes and their eventual take-up of formal land titles.

*I thank the participants of the 2023 Midwest Political Science Association conference and the 2022 annual meeting of the Working Group in African Political Economy for their helpful comments. This document is an output from the research initiative 'Structural Transformation and Economic Growth' (STEG), a programme funded by the Foreign, Commonwealth & Development Office (FCDO), contract reference STEG_LOA_1266_Ribar. This material is also based upon work supported by the National Science Foundation Graduate Research Fellowship Program under Grant No. DGE-1656518. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the FCDO or the National Science Foundation. The Stanford King Center for International Development also provided support for this research.

In 2000, a phosphorus factory arrived near the city of Mboro in the Thiès region of Senegal. Expanding production by the Industries Chimiques de Sénégal consumed parcel after parcel until production began to displace the villages themselves. In one affected village, over half of households responded to the threat by obtaining a formal title to document their ownership of the land. But in two neighboring villages, practically zero households formalized their parcels. The differences in these responses villages are far from unique. Across Senegal—and across Africa—there is dramatic variation in the rate of formal land titling.

Titling is available on a piecemeal basis in much of Africa. Households can apply for titles, but mandatory titling drives are rare. Farmers who formalize their land rights invest more on their parcels (Ali, Deininger, and Duponchel 2017); increase their access to credit (Piza and Moura 2016); and improve their overall wellbeing across a variety of measures (Tseng et al. 2021). These potential gains are especially strong for women and other disadvantaged groups (Goldstein et al. 2018). Despite these benefits, take up of formal land titles remains low. In Burkina Faso, for example, a random trial of “a series of land registration, mapping and decentralization services” across the country showed no significant difference in the percent of households with at least one formal title to their land (Zhang, Borelli, and Techapaisarnjaroenkij 2015). Why do African farmers leave property rights and economic gains on the table?

This paper explores demand-side explanations for why property rights remain so rare. In particular, it explores when farmers perceived land titles to be helpful in actually securing their land. The models of land formalization put forward by development organizations such as the World Bank focus largely on the supply of land titles (Albertus

2020). However the poor performance of ‘piecemeal’ titling requires a pivot to explain the demand for land titles. A growing literature explores this question (Balan et al. 2023). Honig (2017) for example shows that individuals with high customary privilege benefit comparatively less from titles, and so demand them less: the chief’s cousin is probably safe without a formal land title. However, land titles require local formal institutions such as courts, tribunals, or municipal councils, to uphold them. Distrust in formal institutions will decrease the perceived returns to titling and suppress demand.

This article examines the perceived utility of formal land titles in Senegal. Senegal is a country where formal land titles remain relatively scarce. The fraction of Senegalese households who possess at least one title for any of their agricultural parcels ranges from 12.7 percent of households in the Kédougou region to only 0.542 percent in the Sédhiou region.¹ Within regions, even neighboring villages often have very different levels of formalization.

I use a conjoint experiment to unpack individuals’ expectations of how land titles affect their land tenure security. Specifically, I present respondents with two paired profiles to a land dispute and ask respondents to select who would win the dispute. To preview my results, I show that respondents who lack confidence in formal institutions have a lower perceived marginal utility of possessing a land title. Individuals who are relatively socially proximate to chiefs, interestingly, do not place less weight on formal land titles when resolving disputes.

I also ask respondents what they think would happen in each hypothetical land dispute. Using a structural topic model (STM), I show that in the absence of titles

¹These data are from Wave 8 of USAID’s Demographic and Health Surveys.

individuals rely on customary institutions and prior investment in land to resolve land disputes. Finally, I use qualitative insights garnered from oral histories of land disputes across Senegal to contextualize qualitative results. This qualitative work confirms that distrust of state institutions is rampant in Senegal, confirms that land titles are not perceived to be unassailable, and illustrates how land disputes in Senegal follow an appellate process as they travel through multiple formal and informal layers of dispute resolution.

These results take the first step in explaining low take-up of land formalization across Africa: some individuals do not trust land titles to protect them in case of attempted expropriation. These results also contribute to an important literature on statebuilding. Many scholars have concerned themselves with African states' ability to project their authority into hinterlands (Boone 2014; Herbst 2014). Land formalization is in many ways a key test case for statebuilding. Land formalization transforms illegible customary traditions into property holding which is legible to the state. Where land formalization is demand-driven, it allows citizens to "opt-in" to the state. This research suggests that the demand for—and the receptiveness to—statebuilding is a function of confidence in the state and its institutions.

This article proceeds in six parts. I first outline the existing literature on land formalization. The following section discusses the variable costs and benefits that households balance when deciding to pursue formalization. The third section introduces the conjoint experiment as well as the oral histories that I use to advance my article. The fourth part presents results from the conjoint experiment and the related STM. The fifth section uses oral histories and in-depth interviews to contextualize my results. Part

six concludes the paper.

I Land formalization in Africa

Property rights condition economic development (North and Weingast 1989). Famously, Acemoglu, Johnson, and Robinson (2001: 1377) show that an ‘index of protection against appropriation’ spurs economic wellbeing. Secure property rights increase investment by reducing the risk of expropriation, thereby increasing the likelihood of returns. The majority of African households continue to work in the agricultural sector. As of 2019, 53 percent of total employment in sub-Saharan Africa remains in the agricultural sector.² This statistic means that land tenure regimes are the form of property rights which impact the greatest number of lives across the continent.

Beyond their role as a mechanism for economic growth, land rights are a political resource.³ States can withhold formal land rights to increase the dependence of rural voters on the state (Albertus 2020). States can target formal land titles to reward their clients (Dyzenhaus 2021). These rewards need not be overly targeted to be effective; in Cote d’Ivoire, regimes alternated between supporting use-based and customary-based rights to land to reward different political constituencies (Boone 2018).

Land titling programs are also an important form of statebuilding. Land titling renders complex and heterogenous arrangements of landholding into a form that is legible to the state (Scott 1998). Land titling brings individuals into direct contact with

²This figure comes from the World Bank’s ‘Employment in agriculture’ statistics for sub-Saharan Africa.

³It is important here to make the distinction between land redistribution and formal land rights. Albertus (2020) shows that the latter does not always follow the former.

the state. The importance of land is further evidenced by its central role in a number of recent conflicts and clashes including those in Cote d'Ivoire, Mali, the Democratic Republic of the Congo, and others.

The economic and political importance of land rights has impelled a growing literature on land formalization which largely centers two actors. The first such actor is the state itself. When does the state create the opportunity for households to formalize? Boone (2014) contrasts 'statist' land regimes in which the state directly administers the allocation of land with 'neopatrimonial' regimes which preserve inherited land tenure regimes. She further argues that states are happy to let neopatrimonial regimes endure where the state is politically aligned with the customary elite. However, where the state wishes to disempower local elites, they will promote formalization—in effect, taking land out of the customary system. Onoma (2010) shows that leaders with economic interests that depend on others' exploitation of land will push for stronger property rights regimes. For example, if elites maintain power by allocating land to clients, then they will likely prefer an informal system of land tenure which facilitates their control over such transactions.

Providing land titling in rural areas requires a level of state capacity and penetration into rural areas which is not always possible (Herbst 2014). Nevertheless, the stated political and economic benefits of titling have sometimes led to mandatory land titling drives. In Cote d'Ivoire, for example, a 1998 land law mandated that all landowners register their parcels before 2023, after which parcels become property of the state. A majority of parcels remain unregistered, and the deadline has been shifted back multiple times (Boone 2018). In contrast, the Rwandan government implemented a large scale

‘Land Tenure Regularization’ program which aims to document the entire country’s landholdings (Ali, Deininger, and Goldstein 2014).

Local elites—specifically customary chiefs—are the second set of actors highlighted in the academic literature. Chiefs are key development brokers who play an outsized role in land formalization. National elites typically struggle to deliver services such as land titling to rural households. Chiefs, on the other hand, are embedded within local networks which makes them better able to facilitate development projects (Baldwin 2016). Specifically, customary land tenure regimes are complex and illegible: “a state of well-defined use and poorly defined ownership” (Rosenthal 1992: 16). Land tenure regimes are heterogenous, often poorly recorded, and responsive to village-level circumstances. Such complexity makes customary elites necessary to render these arrangements legible to state authorities. The illegibility of land rights also creates an important resource for chiefs, as “the role of local elites in the distribution of land is critical to their autonomy from the state” (Herbst 2014: 173). Chiefs can also use this illegibility to enrich themselves directly (Honig 2022a). Even in urban areas, land titling can reduce chiefs’ roles in formal institutions (Balan et al. 2023).

This role for customary elites is visible in the ‘Plan Foncier Rurale’ (PFR) programs which have been deployed across West Africa by the World Bank (Colin, Le Meur, and Leonard 2009). The PFR programs deploy teams of surveyors to identify and map land rights according to a village-based process of consensus. However, the dynamic nature of customary land rights means that such mappings are always a one-time snapshot, rather than a complete picture of a system (Delville and Moalic 2019). There may also be diverse opinions as to what land belongs in what village. In addition, some customary

institutions may have multiple loci of control for land. In Ghana, many Akan villages have an earthpriest who controls allocation of land independent of a village chief (Lund 2008). While customary chiefs are not always able to provide clarity, it is clear that such complexities of local land tenure would be harder to comprehend in the absence of such interlocutors.

Informal land control is doubly important to chiefs because it provides them with an ongoing source of legitimacy. In the absence of formal titles, households are more likely to bring any disputes to the chief, rather than to courts or to a government official. By bringing disputes to the chief, households implicitly recognize the chief's authority to regulate such disputes (Lund 2008). In other words, “an institution's governance of property rights reinforces its political authority in other domains” (Honig 2022a: 9). Chiefs use their control over land allocation to strength their authority in other sectors, often by using control over land as a sanctioning mechanism (Acemoglu, Reed, and Robinson 2014).

The role of customary elites is most prominent in countries which have pursued demand-driven or piecemeal strategies for titling, such as Senegal. While a number of large-scale programs—such as the Millennium Challenge Corporation's (MCC's) Integrated Water Resource Management (IWRM) program—have attempted to make formal land titles more common across the country, these programs have been incentive based rather than mandatory (Coen et al. 2019). Zambia is another example of a state which has pursued piecemeal titling (Honig 2022a). In such cases, customary elites can either support or impede titling, even if elites are unable to single-handedly prevent titling.

Existing studies of land titling center these two actors: the state and the customary authorities. However, they are not the only decision makers. In states pursuing a piece-meal titling strategy, individuals must opt into land formalization. Many do not. Even in states which have proclaimed mandatory or broad-based titling, many individuals have declined to participate.

2 Costs and benefits of formalization

When households decide to pursue a land title, they weigh the costs and benefits. Land titles are expensive for households in a literal sense: there is generally a fee in applying and formal titling may increase a household's tax burden. Households also run the risk of losing a portion of their land in the titling process. Some households pursue titling, however, because the benefits outweigh the costs. Formal titling decreases the risk of land being expropriated: it increases the legibility of landholdings and it provides a formal legal recourse for households. However, trust in institutions as well as social proximity to customary elites moderates these benefits. The result is variation in which households would benefit from titling—and so variation in which households apply.

The costs of formalization are twofold. First, there is often a literal cost. In Senegal, for instance, a *deliberation foncière* (DF)—the most common type of land title—costs 5,000 CFA per hectare.⁴ Elsewhere costs can be much higher. In Cote d'Ivoire households must pay for a private surveyor to map parcels before they can be formalized.

⁴Individuals in Senegal can apply for either a DF or a *titre foncier*. A DF provides an individual with long term use-rights to a parcel which remains in the national domain. DFs are nevertheless often inherited by one's family. A *titre foncier* permanently takes land out of the public domain. *Titre fonciers* are rare in Senegal; they are mostly held by large commercial establishments.

However the increased legibility of land titles means that households can have their tax burden increased. Scott (1998: 36) argues that “the driving logic behind the [cadastral] map is to create a manageable and reliable format for taxation.” A telling anecdote comes from Cote d’Ivoire, where the first comprehensive cadaster of Abidjan was accomplished in 1965. The survey cost two million CFA, all of which was paid back in the first six months by the increase in tax revenue (Ley 1972). In the Philippines, Abad and Maurer (2022) show that a high cost of formalization adjacent to an open land frontier led individuals to decrease their uptake of formal land titles.

A second cost is the implicit risk of losing land. Land formalization collapses complex and overlapping land arrangements into strict boundaries between owners. Land formalization is not a one-to-one mapping of existing use onto cadastral maps. In reality, land formalization programs “are the subject of interpretations and appropriations whose scope goes beyond strictly agrarian functions” (Colin, Le Meur, and Leonard 2009: 7). Formalizing land rights is a redistributive process: some households end up better off, others end up worse off. Boundaries of agricultural parcels are rarely entirely fixed, and the formalization process opens them to contestation.

Moreover, the question of who owns a parcel is rarely simple. In many regions of Africa landholding follows a ‘tutorat’ system. The first family to clear the bush and plant crops in an area holds the customary land by “right of the axe.” This lineage often permits newcomers to farm some of this land in return for symbolic gifts and recognition. But “[o]ver time, migrants and their descendants consolidate their rights with no restrictions other than a symbolic recognition of the lineage that historically settled them (Delville and Moalic 2019: 338–9). Land formalization removes this strategic am-

biguity. Individuals cannot know with perfect certainty whether the customary rights or the current use rights would be upheld during the application process. By forcing the issue of who owns the parcel, applicants thus run a risk of losing their rights over it.

Against the literal cost of formalization and the risk of losing their land in the process, households balance the benefits of formalizing their land. The strongest benefit of land formalization is in making the land more secure, i.e. reducing the risk of expropriation. This reduction can operate in two ways. The first is through the legal weight of land titles. If other actors attempt to lay claim to a household's parcels, possessing a legal title will reduce the risk of losing the land.

A reduced risk of land expropriation translates into economic benefits. This mechanism is a variant on the argument made by North and Weingast (1989): secure property rights induce investment. Several households to whom I spoke in Senegal said that they did not pursue agricultural investments—chiefly planting fruit trees and building irrigation systems—until they had a DF. The link between more secure land tenure and economic gains is well documented in the academic literature. Areas of India where land rights were traditionally assigned to cultivators, rather than landlords, have higher levels of agricultural investments (Banerjee and Iyer 2005). Deininger et al. (2008) also show this to be the case in Ethiopia: when households receive a land title, they invest more in trees, soil and water conservation structures, and sustainable management of common resources. Goldstein et al. (2018) show that land demarcation itself was sufficient to spur investment in Benin.

These economic benefits are not constant. Trust in formal institutions also condi-

tions the benefit of land formalization.⁵ Murtazashvili and Murtazashvili (2021) point out that the potential for selective enforcement of property rights means that legal titling is dependent on political context for its effectiveness. Formal institutions arbitrate land disputes when applicants are in the formal land regime. These formal institutions include courts and local administrative bodies. For example, in Senegal the municipal councils—the commune-level elected body—handle land disputes. Where households lack confidence in those formal institutions, they may doubt that the institutions will uphold their land rights. This perception is especially important because it is the perception of land titles reducing the risk of expropriation which powers the increase in agricultural investment. Where households do not think that formal institutions will uphold their land titles, the perceived benefits of formalization will be lesser. If the court will ignore your land title, why pay the 5,000 francs? This leads to my first hypothesis:

H1. Individuals with more confidence in formal institutions will perceive land titles to be more useful in a dispute.

Importantly, the legal force of a land title is not the only mechanism through which land titles could decrease the risk of expropriation. Individuals who are socially proximate to customary elites are likely to enjoy relatively secure property rights within the customary system. In Ghana, for example, such confidence in the security of land led individuals who held customary office to let their lands fallow more frequently than unconnected individuals (Goldstein and Udry 2008). If your property rights are already

⁵It may also be the case that having a land title conditions the perceived benefits of formalization. Di Tella, Galliani, and Scharfrodsky (2007) show that squatters in Argentina who received formal land titles displayed 20 percent more pro-market beliefs than those who did not.

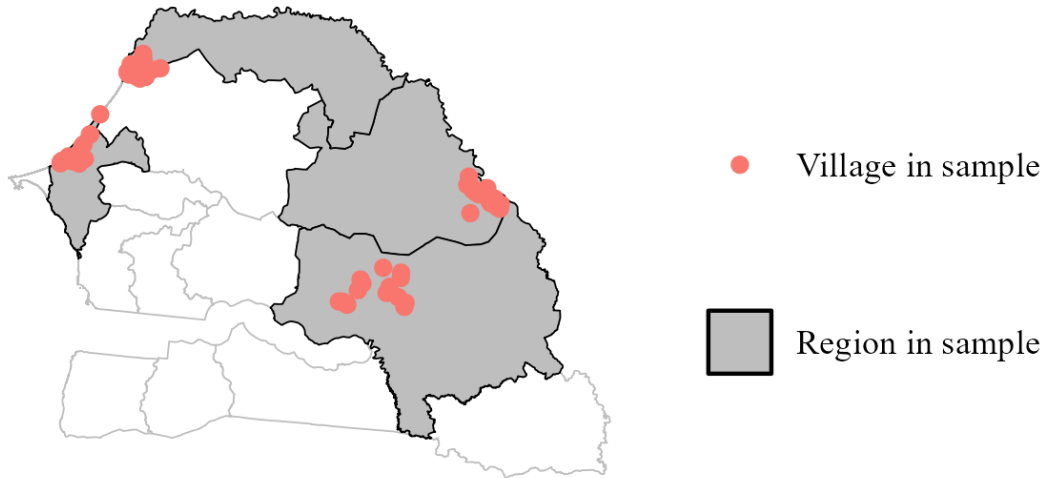
relatively secure within the customary system, then the marginal benefit for formalizing your property rights will be relatively weaker.

Some customary elites have begun to provide their own written documentation of land rights, even though such documents have no legal weight. Individuals in Malawi valued written documentation of property rights the same “regardless of the authority granting them” (Ferree et al. 2023: 43). Similarly, informal property rights documents in Zambia increase perceived the perceived security of land, even though these documents have no judicial value (Honig 2022b). Informal property titles are not a uniquely African phenomenon; Murtazashvili and Murtazashvili (2021: 106) show that 94 percent of landholders in Afghanistan hold such a customary deed. Regardless of their formal value, land titles can serve as a written reference to an individual’s landholdings. The legibility of the written property right, rather than the enforcement potential, increased security.

Importantly, individuals who are socially proximate to customary elites likely benefit from such customary deeds more than others for two reasons. First, such individuals may be more likely to receive such a title in the first place. In Zambia, “the discretion of the [traditional leader] was the most consistent determinant of who could access a chief’s title” (Honig 2022a: 93). Beyond access, chiefs have discretion whether or not to enforce informal documentation, which means that social proximity to the chief is likely to moderate the effectiveness of such titles to some extent. Putting these facts together leads to my second hypothesis:

H2. Individuals who are socially proximate to customary leaders will perceive land titles to be less useful in a dispute.

Figure 1. Sample areas for the conjoint experiment



3 Research design

Land conflicts are inherently difficult to study for a number of reasons. They are highly contextual: the factors which are salient to a land conflict in one region may not be salient to a land conflict in other regions. Land conflicts are also multidimensional: judges must evaluate multiple values simultaneously. I use a mixed-method strategy to understand how confidence in formal institutions affects the perceived utility of land titles. First, I use a paired forced-choice conjoint design to unpack these preferences across land conflicts. This experiment presented respondents with two profiles of parties to a hypothetical land conflict. Second, I use a series of in-depth interviews to better understand the role played by land titles in actual conflicts.

I implemented the conjoint experiment in 75 villages across the Thiès, Saint-Louis, Matam, and Tambacounda regions of Senegal. Figure 1 shows the distribution of sam-

pled regions and villages across Senegal. I sampled communes through a two step process: first drawing a random commune from each of the four regions and then sampling from adjacent communes. Within these selected communes, I randomly sampled villages without regards to communes. Households were sampled within villages using a random walk.

Each respondent was presented with two fully randomized profiles of parties to a land conflict. The profiles varied randomly across six variables: the sex of the party, the value of the party’s land, whether the party was a farmer or a herder, whether the party had given the chief a gift, and whether the party possessed a DF for their land.⁶ Each level of the variable was presented via images, to prevent bias from illiteracy. For each pair of profiles, respondents answered two questions: "who do you think would win this land dispute" and "what do you think would happen in this land dispute."

Using the responses from the first question, we can derive two important estimators. The most common estimand calculated for conjoint experiments is the average marginal component effect (AMCE): the “marginal effect of attribute l averaged over the joint distribution of the remaining attributes." More formally, to calculate the AMCE for attribute l we first run the regression

$$Y_{ijk} = 1 + \beta_1 W_{ijkl} + \beta_2 W_{ijk(-l)} + \beta_3 W_{ijkl} * W_{ijk(-l)}$$

where W_{ijkl} is the treatment vector of $D_l - 1$ treatment variables for the levels of the attribute T_{ijkl} excluding the base level, $W_{ijk(-l)}$ denotes the treatment vectors of all other

⁶I did not exclude any combination of these attributes. Poor record keeping means that it is possible—albeit unlikely—for two households to possess a DF for the same parcel or for overlapping parcels.

levels of $T_{ijk(-l)}$ excluding their baseline levels, and $*$ denotes a pairwise interaction.⁷ Observations are indexed by the respondent (i), the profile (j), the choice task (k), and the attribute of interest (l). Then, the AMCE ($\hat{\pi}$) of attribute l for a distribution of profiles t in the set \mathcal{T} :

$$\hat{\pi}(t_1, t_0, p(t)) = \hat{\beta}_1 + \sum_{d=1}^{D_l-1} \Pr(W_{ijk(-l)} = t'_d) \hat{\delta}_{l(-l)d}$$

where t_1 denotes the dummy variable for a given level of an attribute, t_0 denotes the baseline level, and t denotes a given profile within the distribution of possible profiles (i.e. all possible combinations of attributes in \mathcal{T} , assuming no restrictions are imposed).⁸ Then $\hat{\beta}_1$ is the coefficient on the attribute of interest from the above regression and $\hat{\delta}_{l(-l)d}$ is the coefficient on each interaction term from the above regression.

In other words, the regression gives us a coefficient of each attribute level (minus the baseline levels) and their interactions. The sum in the second equation captures the coefficient of the interaction of the attribute level of interest with the other attribute dummy variables, weighted by the probability of each combination appearing. Adding this to the coefficient on the treatment dummy for the attribute of interest yields a non-parametric estimate of the AMCE of interest, $\hat{\pi}$.

The AMCE is the most common way of displaying results from a conjoint experiment. However, Leeper, Hobolt, and Tilley (2020) show that AMCEs are not reliable when comparing subgroup effects in conjoint experiments. AMCEs are sensitive to

⁷This description of estimating an AMCE is taken closely from Hainmueller et al. (2014, p. 14-15).

⁸Hainmueller et al. (2014) give an example where two attributes could not co-exist in the real world: low-skilled immigrants in high-skilled professions. I did not find any relevant exclusions based on my field work. Interestingly, multiple people who I interviewed related cases where multiple people were given title to the same parcel, due to incomplete records.

the choice of reference category. As an alternative to AMCEs, one can calculate the marginal mean (MM): the average response conditional on a given attribute level. For example, the MM for 'possessing a land title' is simply the average response given a profile has 'possessing a land title.' MMs are centered at $\frac{1}{n}$ where n is the number of attribute levels. Because each variable in this conjoint has two levels, that means that the null hypothesis for each variable is that $MM = 0.5$. These problems with the AMCEs also mean that I will use the marginal means for the formal hypothesis tests of subgroup differences (H.2).

All conjoint estimates—both AMCEs and marginal means—correct for the probability of switching error identified by Clayton et al. (2023). After the fifth conjoint profile, respondents viewed a sixth pair of profiles which was an inverse of the first pair. I then calculate the average intra-respondent reliability (IRR) as the fraction of respondents who give the same answer for the first and sixth conjoint pairs.⁹ Overall, 82.2 percent of respondents gave the same responses to the first and sixth conjoint pairs, which compares favorably to other conjoints.¹⁰ IRRs are calculated within subgroups where applicable.¹¹ All calculations also use survey weights which account for the probability of a given household being sampled. I use a block bootstrap to calculate standard errors.

In addition to the standard conjoint estimators, I also estimate a structural topic

⁹Or, technically, the opposite answer.

¹⁰I suspect that surveying in-person using an enumerator reduces this error rate. Each enumerator also gave a printed guide of the different images to respondents, which have reduced this error.

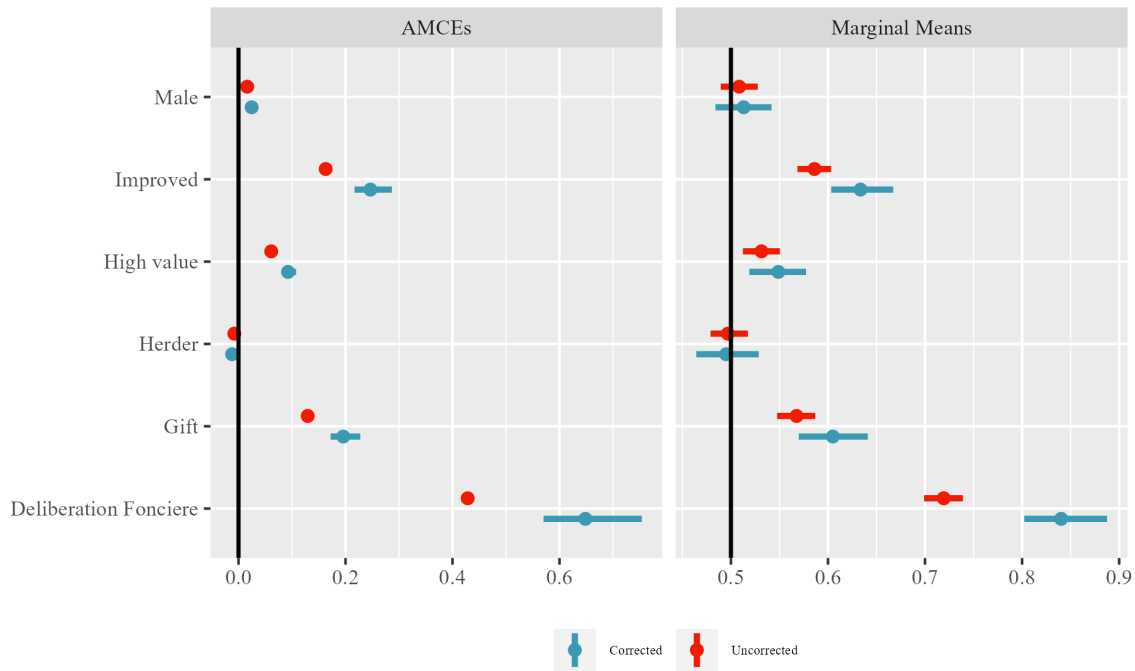
¹¹The specific correction is $\tilde{m} = \frac{\hat{m} - \tau}{1 - 2\tau}$ where \tilde{m} is the marginal means estimator corrected for switching error, \hat{m} is the uncorrected estimator, and τ is the estimate of IRR. For the AMCEs, the correction is $\tilde{\pi} = \frac{\hat{\pi}}{1 - 2\tau}$ where $\tilde{\pi}$ is the AMCE estimator corrected for switching error and $\hat{\pi}$ is the unadjusted estimator.

model (STM) on the free response question which followed each conjoint round.¹² A structural topic model first assigns each word the probability it would be generated by a given topic. It then uses these word-level probabilities to generate topic prevalence at the document level. While the canonical Latent Dirichlet Allocation method of topic modeling treats documents as independent observations, the STM allows one to incorporate additional metadata on the documents. In this STM, I include whether neither party to the conflict had a title, whether both parties to the conflict had a title, the demeaned value of trust in the chief, and the demeaned value of trust in the municipal council. These results provide additional context to the conjoint marginal means by illustrating the mechanisms by which land disputes are resolved in Senegal.

In addition to the conjoint experiment and associated STM, I leverage a series of in-depth interviews with government officials, village chiefs, and rural farmers. These interviews took place over two periods of field work in February of 2022 and February to April of 2023. The latter was concurrent with the field survey experiment and interviews took place in a randomly selected subset of the surveyed villages. I use this qualitative evidence to supplement the conjoint experiment in two ways. First, they allow me to triangulate the relationships between social proximity to chiefs, confidence in institutions, and the perceived value of land titles. Second, I use these interviews to link perceptions of land titles to how titles are actually deployed in case of conflict.

¹²Appendix A.1 provides additional information on the estimation of the STM, as well as the modeling choices.

Figure 2. Overall AMCEs and marginal means



The reference level for each level are (in order): Woman, did not improve land, low value, farmer, did not give gift, and no deliberation fonciere. Bars represent 95 percent confidence intervals. Standard errors were calculated using a block bootstrap. Corrected refers to the conjoint correction introduced by Clayton et al. (2023).

4 Survey evidence

Across our survey,

Figure 2 displays the overall AMCEs and marginal means for the conjoint experiment. Unsurprisingly, whether or not a respondent has a deliberation foncière has the largest impact. The AMCE of having a title is 0.644 (0.42 uncorrected), meaning that a profile to a land dispute has a 64.4 percent greater change of winning a land dispute if they have a title. Respondents also reported that having improved the land made one

25.3 percent more likely to win the hypothetical land dispute (18 percent uncorrected). Having given a gift to the chief also increased the perceived likelihood of winning the dispute. On the other hand, neither the sex of the profile nor the profession of the profile affected the perceived probability of winning the dispute. The marginal means tell a similar story: the two most important characteristics for winning a land dispute are possessing a DF and having improved the land.

These results are consistent with the manner in which individuals discussed land titles during the in-depth interviews. Most individuals cited that land titles were useful when resolving land disputes. Putting land into production is also a condition for maintaining one's DF. If one does not put the land into production within three years, it is possible for the land to be reallocated to another household.

However, these overall results mask significant differences within groups. I distinguish between these subgroups using other survey questions. I have two strategies to identify confidence in local institutions. First, I use a battery of questions which ask "How much trust do you have in each of the following institutions, or have you not heard enough them to say?"¹³ The institutions included the president of the republic, the national assembly, your municipal council, the president's political party, the opposition party, the gendarmerie, courts and tribunals, the general tax agency, traditional chiefs, religious leaders, the sous-prefect, and the land commission. For land management, the relevant actor is the municipal council, which is the elected body which manages affairs in the rural communes of Senegal.¹⁴ Interestingly, the level of trust is positively

¹³These questions come from Afrobarometer, who have used them for multiple rounds.

¹⁴The land commission is a sub-committee of the municipal council, but is only involved in awarding land titles, not in arbitrating disputes.

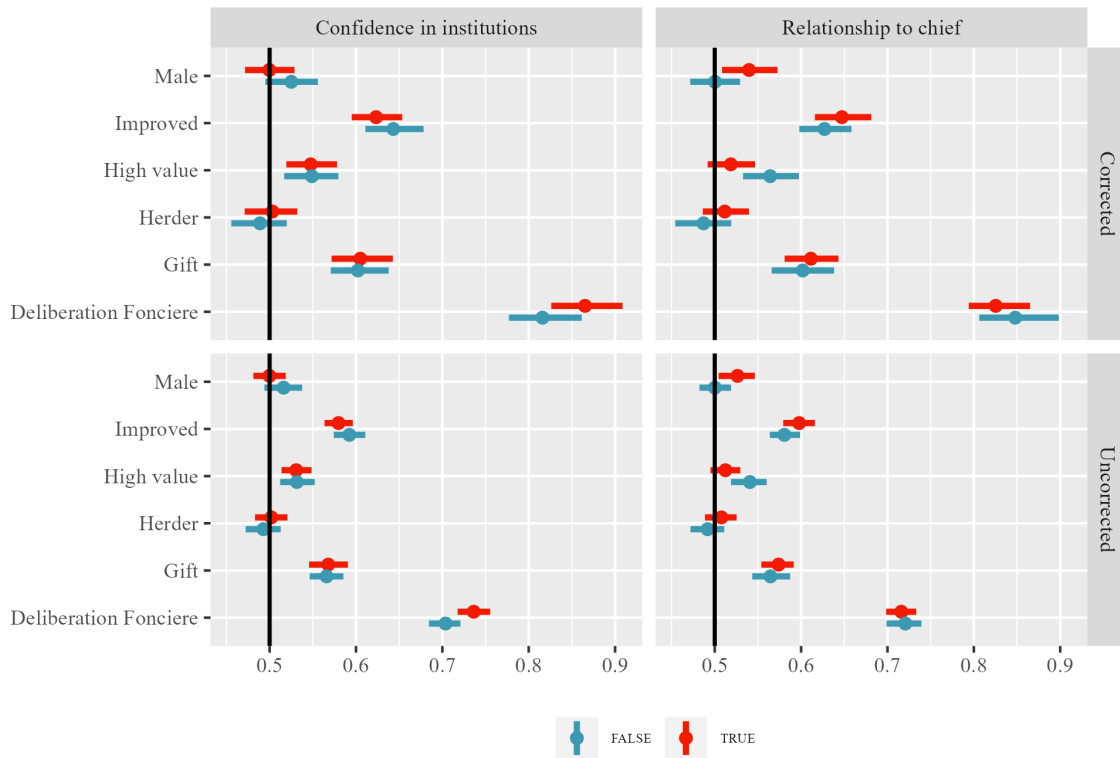
correlated for all twelve of these institutions, which likely reflects heterogenous levels of overall confidence among respondents. To separate the confidence in any one institution from general levels of optimism or pessimism, I demean each by subtracting the average value for all other institutions.¹⁵ I also ask respondents "How confident are you in the municipal council's [or chief's] ability to resolve conflicts within your commune?" To identify which respondents are socially proximate to chiefs, I ask "What is your relationship to the chief?" Possible answers are "no relationship," "Chief is an immediate family member," and "Chief is an extended family member."

Figure 3 shows how the marginal means differ across two important subgroups. The lefthand side distinguishes between respondents who have above and below median levels of confidence in their municipal council, the local government institution responsible for managing land. My first hypothesis suggests that the marginal mean for possessing a title would be lower for respondents who do not trust the municipal council. More formally, a t-test for the difference in means between these two subgroups permits me to reject my null hypothesis of no differences.

The righthand side of this figure separates the marginal means for respondents who are immediate members of the chief's family and for others. My second hypothesis implies that respondents who are close family members of the chief would have a lower marginal mean for possessing a land title. This figure shows that there is no difference in the the marginal means for having a land title between those who are socially proximate to customary elites and those who are not. Close family members of customary elites did not put less weight on titles in the conjoint experiment. I fail to reject the null

¹⁵In the appendix, I show the calculations in Figure 4 for all institutions, both demeaned and with the original data.

Figure 3. Subgroup marginal means



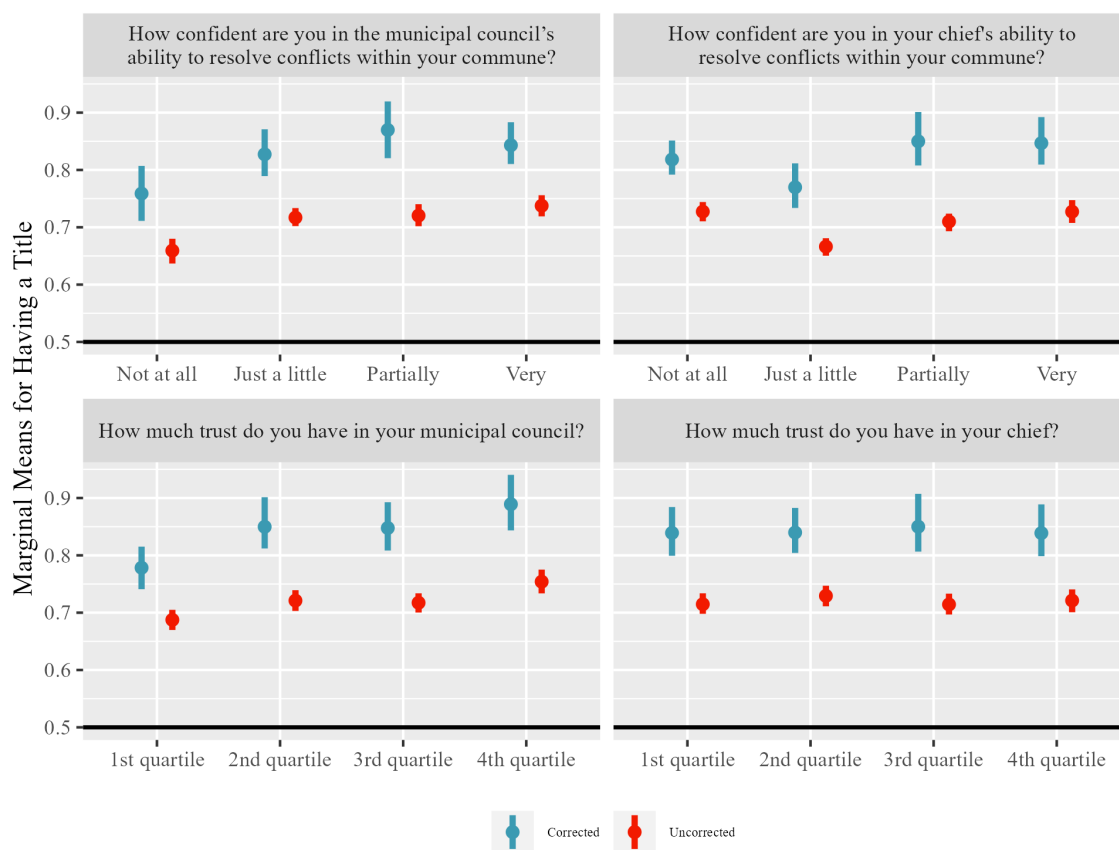
The reference level for each level are (in order): Woman, did not improve land, low value, farmer, did not give gift, and no deliberation fonciere. Bars represent 95 percent confidence intervals. Standard errors were calculated using a block bootstrap. Confidence in formal institutions here is divided into above/below the median values for this index. Corrected refers to the conjoint correction introduced by Clayton et al. (2023).

hypothesis of no difference between these groups.¹⁶

Figure 4 dives deeper into these results. Among respondents who were "not at all" confident in their municipal council's ability to resolve a conflict, profiles with a land title won their dispute 77 percent of the time (66 percent uncorrected); such profiles won

¹⁶The t score for the difference of means between respondents with above median confidence in the municipal council and respondents with below median confidence in the municipal council is $t = 9.1$. The same statistic for the difference between respondents who said that the chief was a close family member and for those did not is $t = -0.6$.

Figure 4. Marginal means by responses to confidence questions



Bars represent 95 percent confidence intervals, calculated using a block bootstrap. For the "how much trust do you have in" questions, I subtract the average of all other "trust" questions, then take the quartiles. Corrected refers to the conjoint correction introduced by Clayton et al. (2023).

83 percent of the time among respondents who were very confident in their municipal council's ability (74 percent uncorrected). Profiles with land titles won their disputes 79 percent of the time for respondents in the first quartile of trust in their municipal council (69 percent uncorrected), but 87 percent of the time for respondents in the highest quartile (76 percent uncorrected). In contrast, confidence in customary authorities has no impact on the perceived utility of land titles. The fraction of conjoint profiles with

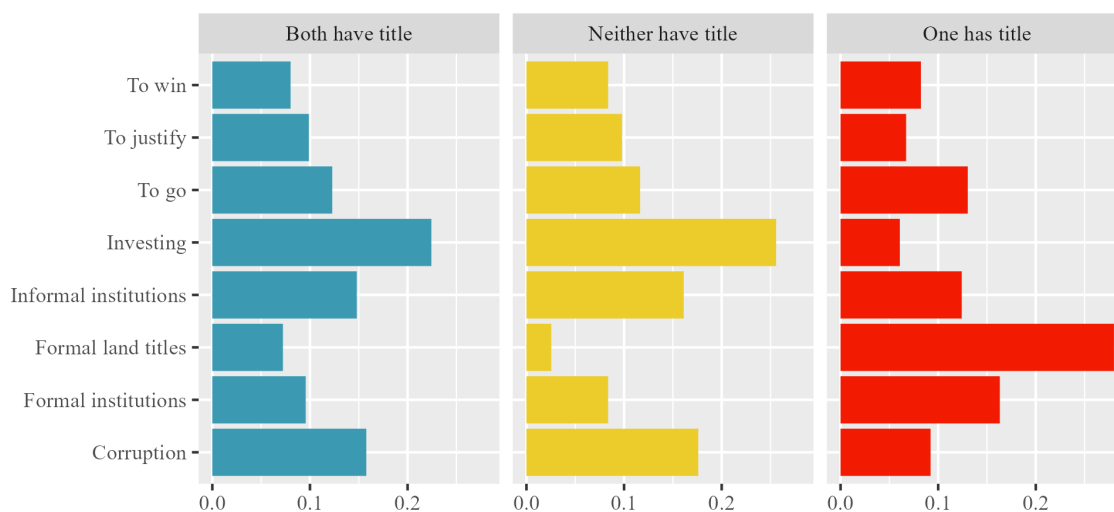
a land title who 'won' their conflict is not systematically different among profiles with differing levels of trust in their chiefs.

Results from Figure 4 are entirely consistent with distrust of local institutions leading to a lack of confidence in formal land titles. It is also important to note that it was possible for both parties to have a DF within the conjoint experiment. Multiple discussions with the land agents who sign these documents confirm that poor record keeping makes it possible for multiple individuals to possess a title for the same piece of land. Possessing overlapping titles is also possible. Because each profile had a 50 percent chance of possessing a title, this means that both conjoint profiles would possess a title in approximately 25 percent of cases. This figure puts a ceiling on the marginal mean for possessing a title of around 87.5 percent, because only one title-holder can win the dispute in such cases.

These effect sizes appear small, but the ceiling of 0.875 for marginal means of possessing a title casts them in a different light. For respondents with greater levels of confidence in institutions, having a title means that the profile essentially always wins the dispute. But for individuals who distrust either the chief or the relevant formal institutions, doubt exists. For these respondents, profiles with land titles are much more likely to win, but are not certain to win. This shift could have big implications for the demand for titles.

The STM provides additional context for these results. As a first step, figure 5 shows the average percentage of each response to the question "what do you think would happen in this dispute" we can assign to a certain topic across three categories: when both

Figure 5. STM topic prevalence by titling status

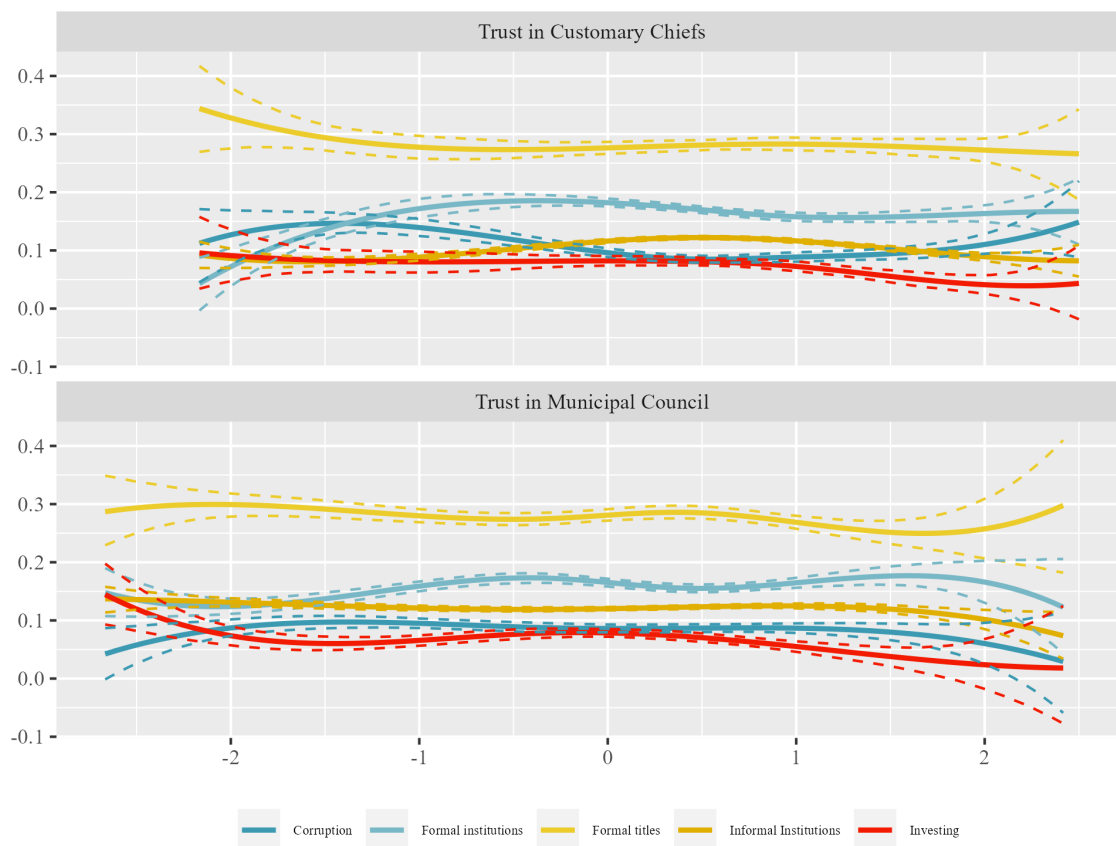


This figure shows the average topic prevalence for all eight topics under different titling conditions. Appendix A.1 expands on estimation for the STM and provides exemplary words and documents for each topic.

parties have a title, when neither has a title, and when only one has a title.¹⁷ Figure 5 shows an important trend. Where titles are a distinguishing feature, respondents mention them frequently. When only one party has a title, 28 percent of the average response contains language related to formal titles. In contrast, when titles are not distinguishing, only between two and seven percent of words relate to titles. In these cases, respondents switch to discussing whether a party has invested in their land. When titles are not distinguishing, 22 to 26 percent of the average response consists of language related to investment. When titles distinguish, only six percent of the average response discusses investment. This figure is very consistent with what the conjoint experiment revealed about conflict resolution. Across specifications, having invested in one's property has

¹⁷Topic prevalence sums to one at the document level.

Figure 6. Topic prevalence by trust in chiefs and municipal councils



the second highest marginal mean. The STM result suggest that when titles are absent or irrelevant, having invested in the piece of land is the deciding factor in land disputes.

Naturally, we also want to know how confidence in municipal councils and confidence in chiefs affects the likelihood of respondents mentioning various topics. Figure 6 shows how the prevalence of these topics varies with the respondents' trust in customary chiefs (top panel) and trust in their municipal council (bottom panel). Each line shows the predicted prevalence of the topic for each level of the trust variables; the dotted lines show 95 percent confidence intervals.

The 'formal institutions' topic is much less common at very low levels of confidence in customary chiefs. This result goes against a common expectation that chiefs and the formal state are substitutes. However, as I discuss below, land disputes are often only taken to formal institutions after a party to the dispute is unhappy with the chief's attempted resolution, so perception of chiefs could affect the perception of the entire conflict resolution structure. People who trust their chiefs are also less likely to mention corruption, which makes sense if perceived corruption decreases trust in chiefs. Finally, topic prevalence for 'investing' is decreasing in confidence in chiefs, which implies that if you trust your chief, you may perceive fewer hurdles to winning a dispute.

Interestingly, the level of trust in the respondent's municipal council does not appear to affect the prevalence for either the 'formal title' topic. While topic prevalence for formal titles is not the same thing as trust in titles, it is nevertheless surprising that individuals who trust and who distrust their municipal councils are equally likely to mention formal titles. Respondents who trust their councils are slightly more likely to mention formal institutions, which may indicate a preference for conflicts to be adjudicated by the councils rather than chiefs. Topic prevalence for 'investing' is decreasing in trust in municipal councils, suggesting that individuals who trust their council feel that they require less proof of a claim.

In conclusion, the conjoint experiment and the associated STM show that respondents who lack confidence in formal institutions perceived land titles to play a smaller role in land conflicts. The conjoint shows that respondents who trust their formal institutions think holders of a formal title are much more likely to win a land conflict than do respondents who distrust their formal institutions. By examining how respondents

think these conflicts will unravel, we can see that investments or improvements play a greater evidentiary role when respondents distrust institutions. Distrust in institutions leads to distrust in titles. If the primary benefit of formalization is to reduce the risk that you lose your land, respondents who distrust their institutions will have lower perceived returns to formalization. If your title will not be upheld, why bother paying to formalize?

5 Qualitative evidence

The oral histories which accompanied the field conjoint experiment, as well as the in-depth interviews which preceded the field surveys, provide additional context for these quantitative results. Specifically, they elaborate on three themes: a baseline level of distrust for the state, the idea that land titles are not a guarantee against corrupt officials or the state itself, and an appellate system of conflict resolution.

5.1 Distrust of the state

The distrust of the state in Senegal extends specifically to land-related issues. Seven of ten interviews in Thiès, six of eleven interviews in Saint-Louis, four of 12 interviews in Matam, and three of nine interviews in Tambacounda expressed this distrust. This distrust of the state is expressed across two large themes: (1) that the (national) state would appropriate their land, and (2) that local formal institutions were incapable of protecting land from bad actors.

The threat of the state appropriating land was particularly acute in the Thiès and

Saint-Louis regions, which are close to major population centers. While the introduction of this paper recounts the narrative of the ICS factory, other examples abound. One wealthy farmer in Thiès recounted a typical example of the state building a large highway through their village's customary land.

The problem is that the state doesn't respect the peasants, because they always play doctor after the patient is dead [sic]. [The state] had already started their study and visited the place where the work would take place before even informing the landholders... this year my son surprised some people in my mango fields who were counting the trees they were going to cut without ever having told me. Their excuse was that a gas pipeline for the highway would pass nearby.

Respondents expressed similar attitudes in all four sample regions. A farmer in Saint-Louis noted that "a DF is not easy for poor farmers like us. If the state wanted to help us access DFs easily they could do so, like they did for birth certificates." In Matam, one village chief noted that "even the [formal] papers have their limits, there are some behaviors that can overrule the papers: corruption and political connections." In Tambacounda, one chief expressed this sentiment explicitly: "I am confident that the paper will be respected in 90 percent of cases. The 10 percent that remain mean that if the state needs your land to build or to give to an agrobusiness, the paper will have its limits."

However, respondents also expressed strong distrust of their more local state institutions: the municipal council, the mayors, and the sous-prefectures. The strongest anecdote came from Matam, where a farmer related that:

The primary school is in a lamentable state. A mouride promised to finance a new mosque but the mayor refused to give him a deliberation foncière to build it. He was bad because the village did not vote for him in the last

election... a mayor who refuses to authorize the construction of a mosque will not deliver a paper for your fields!

Another farmer in Matam told me that “[w]e are boycotted by state programs. The women [of the villages] have a group for market gardening but they lack the means... it’s the mayor who blocked this for political reasons. Here, everybody trusted their vote to the chief, who isn’t in the same camp as the mayor.” Even one member of a land commission (Commission Dominiale) in Saint-Louis told me that they avoid choosing individuals with known political officials as intermediaries in conflicts because “politicians never do anything for free, they will rule in favor of somebody whose vote they can gain in an election.”

Of course, the strongest grievance against the local institutions came from the village which was threatened by the ICS factory. After the village’s muezzin had been deputized to represent the village in negotiations, he reported that "at the start [of the protests] the gendarmerie was supposed to protect and assure the safety of the population, but at each turn all they did was neutralize and disperse the manifestants." The village chief added that "the confrontation between the factory team [reinforced by gendarmes] made me think of Iraq. The gendarmes and 200 auxiliaries descended when there was a confrontation between the factory and the village." The chief of a nearby village which received those displaced by the factory noted that "we consider the mayor a bad actor because she cuts the parcels without paper to give to the allochthones [displaced by the factory]."

5.2 A guarantee or a big help?

Individuals do not perceive DFs as unassailable. There is a substantive difference between a title being "a guarantee" and a title being a big help. Corruption and political connection could help other farmers overcome land titles. Respondents were also extremely cognizant that the state could take their regardless of any land titles. These statements emphasize the difference between respondents in lower quartiles of trust—whose marginal means express some reasonable doubt about the utility of titles—and those in the upper quartiles of trust in formal institutions, whose marginal means abut the ceiling.

One farmer near Saint-Louis mentioned that "if an ill-intentioned member of the family collaborated with bad actors in the city hall [to illegitimately formalize], this misbehavior could create a division in the family." Another complained about an individual who went to a neighboring village to illegitimately certify a piece of land. This respondent "accused the land agents of being bad actors, because they should normally be able to realize they were certifying a field that had already been affected." He won his case; the illegitimate title was overturned.

These statements illustrate a perception that land titles can be overcome, with enough pressure. However, rich peers were not perceived to be the threat. The state itself, or occasionally more local elites, were perceived to be the threat. Farmers were widely cognizant that the state could still appropriate their land, were it in the public interest. One chief from near Kaolack noted that the government could always take their land but not their peers; a farmer from the same village noted that he was concerned about local marabouts taking land, because "they have all the money." The state can also take

back a DF if the titled lands are not put into production within three years of the DF being awarded. A sous-prefect from near Kaolack noted that he had run into a family that had resisted the local government taking part of their land to build a middle school. He sent the gendarmerie to verify whether the land was actually being used. It was not, and so the reticent family lost their title.

Most respondents noted that lands are vulnerable to seizure by the state regardless of whether the lands are titled or not. In this case, the perceived benefit of the title is that it either increases the likelihood that the state awards compensation for expropriated lands or increases the compensations paid out. In the case of the ICS factory, no farmers rejected the legitimacy of the factory harvesting phosphorus from their villages' territories—the complaint was that the farmers were not adequately compensated. A village elder from Thiès noted that "with the extraction of mineral resources like petrol, gas, and zircon, many farmers and landowners, especially in this region [Thiès], forced the state to make DFs for them. If not, when a farmer's land is exploited like this and he doesn't have a DF, his rights won't be paid out."¹⁸ Respondents also shared stories of land being taken for public roads as well as for a classified forest.

Recent events substantiate worries that the state will expropriate lands. Between 2007 and 2013, a Senegalese government initiative pushed 233,000 hectares from customary property regimes into the formal sector as part of large-scale land deals (Honig 2022a).¹⁹ The result of this drive was a land rush for the potentially irrigable lands near

¹⁸It is also worth noting that such sentiments were more prominent in Saint-Louis and Thiès than in Tambacounda and Matam. Outside investments and infrastructure projects are more concentrated in the former two regions.

¹⁹la Grande Offensive Agricole pour la Nourriture et l'Abondance (GOANNA) was an initiative of President Abdoulaye Wade's government meant to reduce Senegal's dependence on food imports. A government agency (l'Agence pour la Promotion des Investissements et des Grands Travaux) was created

the Senegal River, as well as for the Niayes stretch of the coast near Thiès, widely regarded as the vegetable garden of Senegal. These investments generally benefited elites, rather than local farmers. Koopman (2012: 657) notes an example in Mbane where the municipal council "allocated more land to top government leaders and other elites than the rural community actually had."

Respondents view land titles as extremely useful in resolving land conflicts, but not an impregnable property right. This distinction supports the results from the conjoint experiment. Even among respondents in the lowest quartile of trust in their formal institutions, 77 percent of profiles with a land title won their dispute. However, these qualitative results stress the differences between a land title being useful and a land title being a guarantee. Even if respondents are more likely to win disputes against their peers, land titles may not guarantee against expropriation of their investment. This difference between titles being useful and titles being a guarantee could have outsized implications on the demand for titles.

5.3 An appellate system of conflict resolution

Land titles are the product of the formal, administrative state. However, chiefs do the bulk of the leg-work when it comes to resolving land conflict. Farmers generally go to chiefs first to resolve land conflicts. If the chief is unable to find a satisfactory solution, parties to the dispute will escalate to the municipal council, the mayor, or the gendarmerie. If they remain unhappy, they will escalate to a higher authority, often the local court or the sous-prefect. This process means that chiefs are embedded within an

to facilitate the external investments required to increase Senegalese food production.

appellate system of conflict resolution.²⁰

The first step is almost always to bring one's conflict to the village chief. Chiefs are embedded within the social fabric of the village, so they tend to be effective mediators. Chiefs are well placed to mediate land conflicts for the same reason they act as development intermediaries for titling programs: land arrangements are heterogeneous and illegible, so local knowledge is essential. For instance, chiefs generally know the boundaries between different fields because the chief or their relatives observed when those fields were cleared. As part of this process, chiefs also often call the village elders. For instance, one village chief in Saint-Louis recounted that "in case of land conflicts, I call the village elders and we go visit the field in question. The elders know the history, they speak the truth on the limit of each field, and the problem is solved." Another chief in Matam noted that "the village has the habit of regulating these conflicts within families. There is a committee of elders who play the role of intermediaries in the name of the chief. For the cases which pass this stage, we solve them with the gendarmerie, who do everything possible to prevent people from going to court, because the higher the case goes, the more the protagonists will suffer." It is not only chiefs who express such sentiments; in Saint-Louis, a land agent noted that "in reality, the village chief is the first mediator. If it seems he can't solve the problem, he sends for the mayor."

Chiefs have an incentive to market themselves as effective problem solvers—chiefs' legitimacy comes in a large part from their ability to resolve disputes. However, farmers also cited chiefs as the first stage of conflict resolution. A farmer in Matam unhappily

²⁰This distinction is particularly important because most of the existing literature on forum-shopping treats fora as an 'either-or' phenomenon. In this context, forum shopping proceeds until the respondents are able to find a compromise.

grumbled to me that "[he] went directly to see the village chief so he could see the other person in the middle of taking my field. The chief did not do his work, which is why I went to see the mayor." Overall, the perception of chiefs as the first rung on the conflict resolution ladder is common across my set of respondents.

If the chiefs are unable to resolve the problem, claimants move up the ladder. Often this happens when the two parties do not agree on the resolution proposed by the chief. One village chief in the Matam region said that when presented with a land conflict "I would speak to the plaintiffs, if they refuse I would consulte the wise men of the village and if cannot find a consensus I would continue to the mayor and then to the local brigade of gendarmerie." Another in Tambacounda said "I am the social regulator, I manage the conflicts. One day if the conflicts are too much, I have the numbers for the local authorities like the gendarmes, the sous prefect, and the mayor."

Survey data also supports the appellate system of conflict resolution. I asked respondents how often they had contacted a local leader over the past 12 months to discuss ideas or an important problem. 51 percent of my sample reported having contacted their chief to discuss an issue at least once over the past 12 months. Only 18 percent had contacted their municipal council and only ten percent had contacted their sous-prefect.

This appellate process could explain why the conjoint experiment shows only a moderate effect of confidence in municipal councils on the perceived utility of land titles. Chiefs, the municipal council, the gendarmerie, and sous-prefects all play a role in resolving land conflicts. The question is not to which institution the parties apply for relief, but how quickly they progress through the levels. However, many land conflicts—even when they involve titles—will depend on the chief.

Rather than permitting an individual to directly bypass the chief, land titles may indeed facilitate the respondent's next move up the ladder to formal authorities. However, these title-possessing claimants may also receive satisfaction from the chief. In this case, it suffices for either the chief or the formal institutions to be just. The title will only come into play if the chief considers the title or if the claimant has to appeal to a higher institution. This would attenuate any effect of confidence in institutions on the perceived efficacy of titles.

This paper argues that distrust of formal state institutions reduces the perceived efficacy of formal land titles. Putting these qualitative elements together, several pieces of a coherent story come together. Distrust for the state is common—particularly when it comes to land issues. Results from the conjoint experiment suggest that individuals across all levels of confidence in formal institutions perceive land titles to be at least somewhat useful in resolving disputes. However, extended qualitative work shows limits to this trust in land titles. Corruption could overcome titles, and the state could expropriate your land no matter what. Finally, even when individuals possess land titles, chiefs will still be involved in any dispute resolution process.

6 Conclusion

Why don't more African farmers pursue formal land titles? In many countries, including Senegal, land titles are available on demand. Farmers who pursue land titles incur costs—both application fees and the potential loss of land. However, these costs are offset by the benefits of titles. Titles reduce the likelihood that a farmer would lose land in

a dispute. This safety from expropriation incentivizes investment, which is particularly important given the centrality of agriculture in African economies.

This paper uses a conjoint field experiment in Senegal to understand how a lack of confidence in formal institutions reduces these benefits. Respondents viewed two profiles to a land dispute and selected which one they thought would win. Lacking confidence in one's municipal council resulting on less weight being placed on having a land title in the hypothetical land disputes. Among respondents who were confident in their local government, the perceived utility of having a land title approached the ceiling. But among respondents who were not confident, land titles could be overruled.

A conventional view of land formalization in Africa equates informality with vulnerability (Meinzen-Dick and Mwangi 2009). This research shows that formalization in the absence of trustworthy institutions does not necessarily increase the perceived security of land. It also advances a growing literature on the relationships between property rights, informality, and institutions. The majority of academic research on land rights—both in Africa and elsewhere—shows how states and elites manipulate property rights for political and economic advantages (Albertus 2020; Boone 2014; Onoma 2010; Rosenthal 1992). This survey experiment centers how individual households engage with formal land politics. It is individuals who make the decisions to pursue formalization; I show that this decision reflects their broader confidence in institutions. Property rights are only one facet of state institutions, If individuals distrust the state, they will distrust property rights as well.

This research forms one part of my broader dissertation project, which asks why land titles remain so rare in sub-Saharan Africa. Another chapter of this dissertation

uses descriptive data from the Demographic and Health Surveys and the Living Standard Measurement Surveys to connect agricultural land values to formalization. A third chapter exploits a natural experiment in Cote d'Ivoire to isolate the role of customary chiefs in land formalization. Together, this project aims to understand the political economy of land, informality, and development in sub-Saharan Africa.

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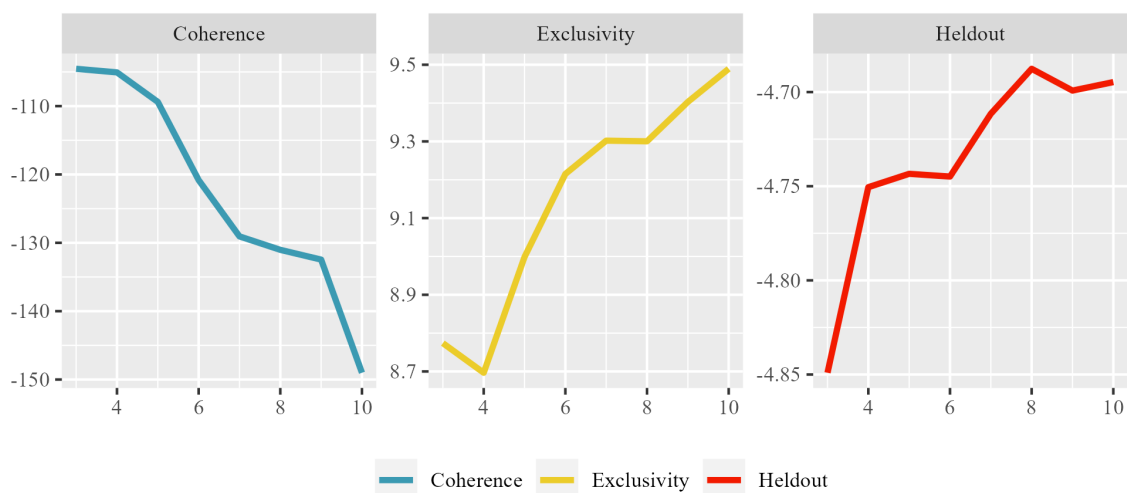
A.1 Structural Topic Model Details

This appendix outlines the process of estimating a structural topic model (STM) to analyze the free responses to the conjoint. After each conjoint round—including the sixth round, which was the inverse of the first round—respondents answered the question "what do you think would happen in this land dispute." Beyond the marginal means and AMCEs, these responses give some insight into the mechanics of land disputes. We can see the extent to which respondents weigh land titles, but what role do land titles/formal institutions play in the hypothetical disputes?

An STM is similar to other methods of topic modeling, such as the canonical Latent Dirichlet Allocation, but incorporates additional metadata on the documents. In this case, each free-response answer is an individual document. I first pre-processed the documents by removing punctuation and stopwords, then by stemming the remaining words. Stemming used the `wordStem` function from the `SnowballC` package. The model itself was estimated using the `stm` package. The metadata includes whether neither party to the conflict had a title, whether both parties to the conflict had a title, the demeaned value of trust in the chief, and the demeaned value of trust in the municipal council.

Because we do not have strong prior expectations of the number of topics, I began by calculating models with between three and ten topics. Figure [A.1](#) shows three model properties for the different counts of topics. Exclusivity measures how specific words are to a given topic. Semantic coherence measures the frequency at which words in the same topic co-occur. Finally, the hold out likelihood measures the model's ability to predict words which are removed during the estimation procedure. All three of these qualities are desirable, so we want to balance model performance across all three. Based on

Figure A.1. Model statistics for different numbers of topics



balancing these properties, I move forward with a model with eight topics.²¹

From these eight topics, I identify five that are particularly relevant for this analysis. The relevant topics are topic one (corruption), topic two (informal institutions), topic three (investing), topic five (formal land titles), and topic eight (formal institutions). Table A.1 displays the most frequent and exclusive words within each category. Table A.2 displays the documents with the highest propensity for each topic.

The covariates included in this topic model are a binary indicator for whether both parties have a title, a binary indicator for whether neither parties have a title, and the demeaned individual-values for trust in the municipal council and trust in the customary chiefs.²² This model outputs the prevalence of each topic within a given document. A prevalence of 20 percent (for example) can be interpreted as 20 percent of a given

²¹Many examples of STMs use 50-100 topics, however the free-response questions I use are relatively short.

²²The demeaned variables are constructed in the same manner as earlier. Following conventional procedure, the two continuous (trust) variables are estimated as five knotted splines.

Table A.1. Frequent and exclusive words by topic

Topic	Description	Keywords
Topic 1	Corruption	don; cadeau; recu; activit; vin; pot; corrompr
Topic 2	Informal institutions	chef; dir; villag; doit; revienr; grac; voir
Topic 3	Investing	plus; valeur; homm; travaill; mis; dej; eleve
Topic 4	To justify	temoign; auss; vu; autorit; appel; loi; elle
Topic 5	Formal land titles	fonci; deliber; preuv; possed; present; detient; possess
Topic 6	To win	confirm; temoin; dev; va; invest; attribu; offrir
Topic 7	To go	celui; vont; aller; problem; iront; sous; departag
Topic 8	Formal institutions	papi; mair; 2; 1; profil; municipal; conseil

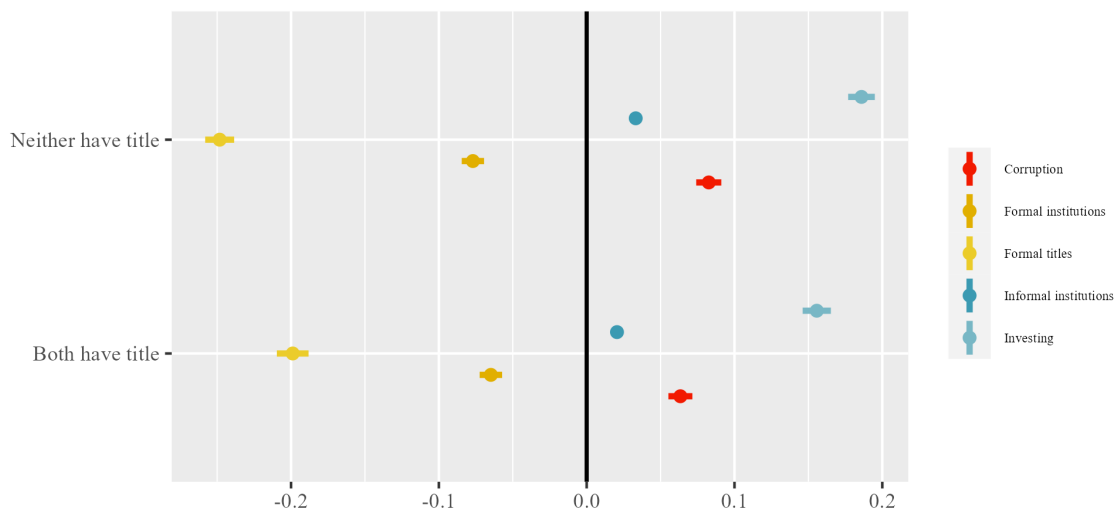
Note: Examples chosen based on FREX scores, which is the weighted harmonic mean of the word's rank in terms of exclusivity and frequency (Roberts et al. 2014).

document discussing the topic.

Using these topic models, we can then examine what covariates are associated with the prevalence of specific topics. Figure A.2 shows the expected difference in topic prevalence based on whether both or neither parties to the dispute have a land title. The reference level in this figure is only one party having a title. In other words, these coefficients show the difference in the frequency with which respondents discussed each topic when land titles were irrelevant, compared to when they were important.

Both the 'formal land titles' and the 'formal institutions' topics are significantly less prominent when titles are not relevant. Words relating to formal land titles are 20 percent less prevalent when both parties have a title and 25 percent less prevalent when both parties have one. The effect is smaller but still significant for the prevalence of the formal institutions topic six and eight percent respectively). Corruption is six percent more prevalence when both parties have a title and eight percent more prevalent when neither have a title, which suggests that the titles being prevalent increases the opportunities for graft. Respondents mention informal institutions very slightly more

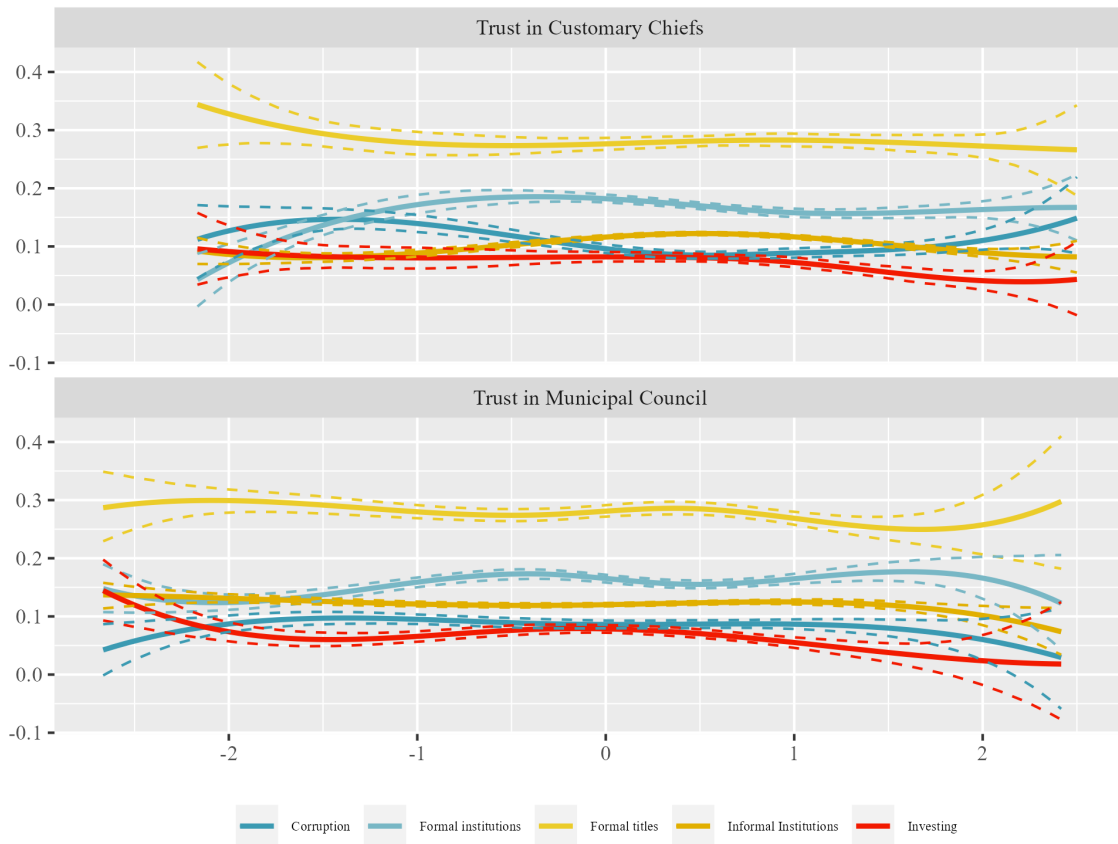
Figure A.2. Topic prevalence for formal institutions and customary chiefs by titling status



when titles are not relevant.

Figure A.2 is an important confirmation. Topic five and eight—which relate to titles and formal institutions—are significantly less prominent when titles are not relevant. Topic five is 1.26 standard deviations less prevalent when both parties have titles and 1.58 standard deviations less prevalent when neither parties have a title (against a baseline mean of 0.171). In other words, 20 percent fewer words per free response answer discuss formal institutions/titles via topic five when both parties have a title. Similarly, topic eight is 6.4 percent less prevalent when both parties have a title and 7.6 percent less prevalent when neither party possesses a title. Topics one and two—which relate to informal institutions—are more common when formal titles are irrelevant. They are 6.3 and 2.1 percent more prevalent when both parties have a title (respectively) and 8.2 and 3.3 percent more prevalent when neither party has a title. These results are

Figure A.3. Topic prevalence by trust in chiefs and municipal councils



an important confirmation that the model is appropriately calibrated. When titles are relevant, respondents discussed them; when titles were irrelevant, respondents focused instead on informal institutions.

Figure A.3 shows how the prevalence of these topics varies with the respondents' trust in customary chiefs (top panel) and trust in their municipal council (bottom panel). Each line shows the predicted prevalence of the topic for each level of the trust variables; 95 percent confidence intervals are shown by dotted lines. Interestingly, topic five—which discusses formal institutions—is much less common at very low levels of

confidence in customary chiefs. Topic one, which appears to relate to chiefly corruption, is weakly decreasing in trust in chiefs as well. Importantly, topic one and two appear to alternate so there is no difference overall in how much respondents discuss chiefs, but those who discuss chiefs are less likely to be complaining about them. Different levels of trust in the respondent's municipal council has a slight effect on Topic five: respondents are more likely to discuss this topic as confidence in formal institutions increases. However, overall, trust appears to be playing a minimal role in how much respondents mention both formal and informal institutions.

How do these results connect to the paper's other results? The paper shows that there is a minimal decrease in the perceived utility of titles among those at the lowest levels of confidence in both formal and informal institutions. The results from the STM echo these results.

The STM shows that confidence in formal or informal institutions has a minimal effect on the extent to which respondents mention land titles when asked what would happen during this land dispute. In other words, all respondents were about equally likely to say that land titles would play a role in resolving the conflict. The exception to this result is that respondents with extremely low levels of confidence in their customary chiefs were much less likely to mention titles in their responses.

The second result is that individuals are dramatically less likely to mention formal institutions or land titles when both parties to the hypothetical land dispute had equal levels of titling. When neither party or both parties had title to the land, the prevalence of the land title and formal institutions topics dropped almost to zero. The prevalence of the topics which discussed informal institutions, on the other hand, increased. These

results show how informal institutions continue to regulate land conflicts in the absence of land titling or alternative mechanisms of dispute resolution.

Table A.2. Example conjoint responses by topic

Topic 1: Corruption nous sommes traditionnellement habitues a donner un cadeau au chef lors des conflit cela est encre tellement dans leur tete du coup que sans cela ne se propose tu risque de perdrealors le chef donnera raison a celui qui a donne un cadeau le cadeau qu il donne au chef pourrait influencer le chef pour lui donner la victoire
Topic 2: Informal institutions il ira chez le chef de village pour l accompagner chez le sousprefet la presence du chef a ses cote fera que le sousprefet tranchera en sa faveur le temoignage du chef de village pour lui motive par cadeau qu il a ontenu souvent ces cadeaux influe sur l objectivite du chef meme s il n a pas de deliberation fonciere comme l autre il a corrompu le chef en lui donnant un cadeau et le chef va lui donner les droits de propriete
Topic 3: Investing le chef penchera en sa faveur car l homme s occupe s occupe de la terre plus que la femme du fait qu il s y travaille le chef du village n hesitera pas a plaider en sa faveur s il lui expose la situation parce que au moins il amene ses terres contrairement a l autre qui n en fait pas bon usage
Topic 4: To justify il va montrer ses papiers aux autorites pour qu ils appliquent la loi et va appeler la population pour qu il temoigne pour lui vu qu il a amene dans le terrain il va appeler la population pour qu elle temoigne pour lui vu qu il a amene dans le terrain
Topic 5: Formal land titles le detenteur d un extrait de deliberation fonciere remportera la batail puisqu il detient les documents valable qui prouve qu elle sont valable en cas de litige foncier le juge tranchera en sa faveur car il possede les documents qui prouve que a terre lui appartient
Topic 6: To win 1 va gagner parce qu il va appeler le chef de village pour qu il temoigne pour lui 1 va gagner parce qu il va montrer ses papiers aux autorites et va appeler le chef de village pour qu il temoigne pour lui
Topic 7: To go celui qui a la deliberation fonciere va gagner ce conflit ils vont aller a larrondissement chez le sous prefet pour les departager si le probleme n est pas resolu ils vont aller au niveau du tribunal puisque il a deja cultive la terre c est que cela lui importe mais pas a l autre qui n a encore rien cultive sur la terre si cetait a lui il allait cultiver sa propiete ils vont aller au niveau de la commune voir le maire s il peut regler cela sinon aller au tribunal et suivre la procedure
Topic 8: Formal institutions le profil 1 va gagner parce qu il peut a chaque fois montrer ses papiers hors que l autre n a pas cette possibilite le profil 2 pourra toujours aller a la mairie et montrer ses papiers legalement acquis tandis que l autre n aura pas cette possibilite

A.2 Direct hypothesis tests

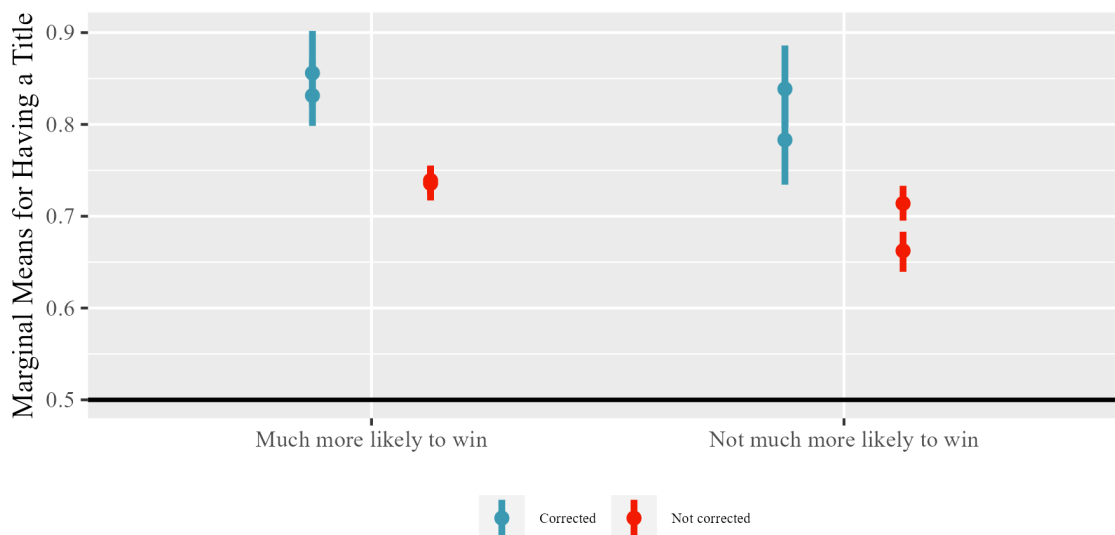
In addition to the conjoint test of the perceived utility of land titles, I also directly asked respondents "Do you think somebody with a *deliberation foncière* would be more likely to succeed in a land dispute?" Possible answers ranged from one (Much less likely) to five (much more likely). Figure A.4 shows that these two measurement strategies are aligned. Respondents who said that titles were made one much more likely to succeed in a land dispute had a marginal mean of 0.741 (0.642 uncorrected). Respondents who did not say that titles would make one much more likely to win a dispute had a marginal mean of 0.903 (0.752 uncorrected). In other words, among those who said titles made one much more likely to win a dispute, the conjoint profile with a formal title won approximately 15 percent more disputes than among respondents who did not say that titles made one much more likely to win a dispute.²³

Table A.3 shows the relationship between the two measures of confidence in institutions from Figure 4 and the direct measure of confidence in institutions. Across specifications, the sign of the coefficient is positive, as per the hypothesized relationship, but none of the coefficients are statistically significant.

However, the question of whether or not titles are useful is not the same thing as whether or not households seek titles. Another logical answer to the original questions may be that costs prevent households from formalizing. In particular, I want to know whether chiefs are able to impose additional costs to formalizing, particularly in terms of the number of steps they impose. For instance, some chiefs implement an elaborate

²³75.8 percent of respondents said that titles made one much more likely to win a land dispute, 9.1 percent said titles made one slightly more likely, 4.2 percent said titles made no difference, and 11.0 percent said titles made one slightly or much less likely to win the dispute.

Figure A.4. Topic prevalence by trust in chiefs and municipal councils



consultative process within the village when a request for formalization is made. Other chiefs just sign the papers. In the latter case, are households more likely to formalize?

To this end, the survey includes a vignette experiment among the households who did not already possess a title. I first asked respondents to select which steps, from an enumerated list, were necessary to acquire a title. Some of these steps were necessary; others were merely customary. A random half of this subgroup were then provided with the following text:

Thank you for your earlier response. I'm now going to share a little information about how to formalize your land parcel. The first step is to submit an application to your municipal council, although many people talk to their chiefs first. The municipal council will send the Commission Dominale to investigate your claim. The CD will talk to people in your village, often including the chief and other elders. Then the CD will report back to the municipal council, who will vote on your deliberation foncière. The cost of this application is 5,000 francs per hectare.

Table A.3. Confidence in institutions and belief that titles are helpful

	(1)	(2)	(3)	(4)	(5)	(6)
Trust in MC	0.102 (0.070)	0.109 (0.067)	0.090 (0.069)			
MC can resolve conflicts				0.104 (0.094)	0.108 (0.071)	0.104 (0.064)
Commune Fixed Effects	X	X		X	X	
Village Fixed Effects		X	X		X	X
Demographic Controls			X			X
Num.Obs.	1114	1113	1113	1113	1112	1112
R ²	0.063	0.088	0.174	0.061	0.092	0.180

Note: The independent variables are: (1) How much trust do you have in your municipal council, or have you not heard enough them to say? (demeaned); and (2) How confident are you in the municipal council's ability to resolve conflicts within your commune? Standard errors are clustered at the same level as fixed effects. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

I then asked "Based on what you know about the process of obtaining a DF, how likely do you think it is that you will apply for a DF sometime in the next three years?" Depending on the respondent's prior beliefs about the cost of titling, the vignette treatment would either increase or decrease their expectations about how much labor it would take to title. Broadly, I expect that respondents with high cost expectations will be less likely to formalize. For respondents with low labor costs, the treatment would increase the perceived cost of formalization, decreasing the likelihood of formalizing. This implies a positive coefficient on the interaction effect between the treatment indicator and the number of required steps.

Interestingly, we see the exact opposite. The interaction is negative: if you believe the labor costs are high, telling you they are lower decreases your likelihood of applying for formalization. One potential explanation for this result lies in the coefficient on the number of required steps. Respondents with higher perceived costs of formalization are already more likely to formalize. Perhaps perceiving the titles as involving more stakeholders makes it feel more valuable. When including both the coefficients on the

Table A.4. Heterogenous results for the vignette experiment

	(1)	(2)	(3)
Treatment indicator	0.449 (0.271)	0.560* (0.207)	0.637* (0.271)
N. of required steps	0.117* (0.049)	0.128** (0.040)	0.104*** (0.025)
Interaction	-0.061 (0.037)	-0.080** (0.023)	-0.101* (0.048)
Commune Fixed Effects	X	X	
Village Fixed Effects		X	X
Demographic Controls			X
Num.Obs.	903	901	901
R2	0.066	0.114	0.234

Note: The independent variable is: Based on what you know about the process of obtaining a DF, how likely do you think it is that you will apply for a DF sometime in the next three years? Standard errors are clustered at the same level as fixed effects. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

number of required steps and the interaction effect, individuals with high perceived costs of formalization are roughly as likely to formalize as individuals with low perceived costs of formalization.

Table A.5 also shows that respondents who are worried about losing land as part of the formalization process report a greater likelihood of formalization, as do respondents who said they know somebody who lost access to some of their land because they attempted to formalize. These results are contrary to my enumerated hypotheses: those who perceive formalization to be riskier are more likely to pursue it. One potential explanation is that the risk or effort required to procure a title is positively associated with its perceived value: if you have to work harder for it, it must be more useful. It is also worth noting that only respondents who did not already possess a title (approximately 88 percent) were asked these questions.

Finally, table A.6 shows that trust in the municipal council is negatively associated

Table A.5. Risks of formalizing and likelihood of formalization

	(1)	(2)	(3)	(4)	(5)	(6)
Worried about losing	0.183*	0.204**	0.227**			
	(0.060)	(0.062)	(0.071)			
Know someone who lost				0.244	0.343*	0.382
				(0.130)	(0.125)	(0.193)
Commune Fixed Effects	X	X		X	X	
Village Fixed Effects		X	X		X	X
Demographic Controls			X			X
Num.Obs.	883	883	883	894	893	893
R ₂	0.044	0.095	0.245	0.037	0.083	0.220

Note: The independent variables are: (1) How worried are you that you might lose access to some of your land during the formalization process? ; and (2) Do you know anybody who lost access to some of their land because they attempted to formalize? Standard errors are clustered at the same level as fixed effects.* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.6. Confidence in institutions and likelihood of formalization

	(1)	(2)	(3)	(4)	(5)	(6)
Trust in MC	-0.125	-0.153**	-0.071			
	(0.065)	(0.040)	(0.085)			
MC can resolve conflicts				-0.015	-0.056	0.039
				(0.053)	(0.091)	(0.109)
Commune Fixed Effects	X	X		X	X	
Village Fixed Effects		X	X		X	X
Demographic Controls			X			X
Num.Obs.	893	891	891	890	888	888
R ₂	0.040	0.086	0.216	0.038	0.084	0.220

Note: The independent variables are: (1) How much trust do you have in your municipal council, or have you not heard enough them to say? (demeaned); and (2) How confident are you in the municipal council's ability to resolve conflicts within your commune? Standard errors are clustered at the same level as fixed effects.* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

with reported likelihood of formalization. The direction of effects is consistent, though the coefficient is only statistically significant in one specification. The results are insignificant for whether the respondent thinks their MC can effectively resolve conflicts.

A.3 Deviations from pre-analysis plan

In the sampling stage, there are three different departures from the pre-analysis plan. First, the pre-analysis plan specified a stratified random sample within regions, but it did not specify how I would sample. The meaningful sample areas for me are communes, which are the equivalent of American counties. In each of the four regions (Thiès, Saint-Louis, Matam, and Tambacounda) I randomly selected one commune. I then randomly selected up to three neighboring communes. Using this method, I selected four communes in Thiès, three communes in Saint-Louis, two communes in Matam, and four communes in Tambacounda. I adjust the inverse probability weights I use throughout this survey to account for this sampling strategy.

Within this block of contiguous communes, I then selected the appropriate number of villages without regard to commune. I also selected ten replacement villages for each region. Replacement villages were used only when a village chief declined to allow the research team to survey in their village, or when a village was inaccessible.

Second, the final dataset comprises one fewer village than specified. The PAP specified that we would interview 20 villages in Thiès and Saint-Louis respectively, and 18 villages in Matam and Tambacounda. However, one village in Tambacounda was unexpectedly distance, which meant there was no additional time to proceed to the other scheduled village. This means that there are only 17 sampled villages in Tambacounda. The sampling frame for villages was the 2014 ‘Repertoires des Localités’, the most recent census available.

The third sampling deviation from the pre-analysis plan was the number of surveys accomplished. The PAP specified that I would interview 912 individuals. In the end,

the team administered the survey to 1,164 respondents. The reason for this difference is that the survey was expected to require a full hour to complete, but in reality, took only 45 minutes with experienced enumerators. As a result, enumerators were able to complete on average one extra interview a day. However, this enumeration was subject to the amount of time spent in transport to day's survey sites, so not all days permitted the full 4-5 surveys. The result is 268 interviews in Thiès, 277 in Saint-Louis, 312 in Matam, and 307 in Tambacounda. Survey weights take the different number of interviews per village into account.

There were also three deviations from the PAP in the analysis portion of the paper. Firstly, the PAP did not mention the Clayton et al (2023) correction, because the paper had not been released when I wrote the PAP. I display all results both with and without the correction for full transparency.

Second, H2 in the PAP specified "The marginal mean for having a land title among individuals with high confidence in formal institutions will be higher than the marginal mean for having a land title among individuals with low confidence in formal institutions." I did not specify a formal hypothesis test for this hypothesis. However, in the paper I test this hypothesis in two separate ways. Figure 3 breaks this down by above/below the demeaned values of trust in formal institutions. Figure 4 further breaks this down by quartiles.

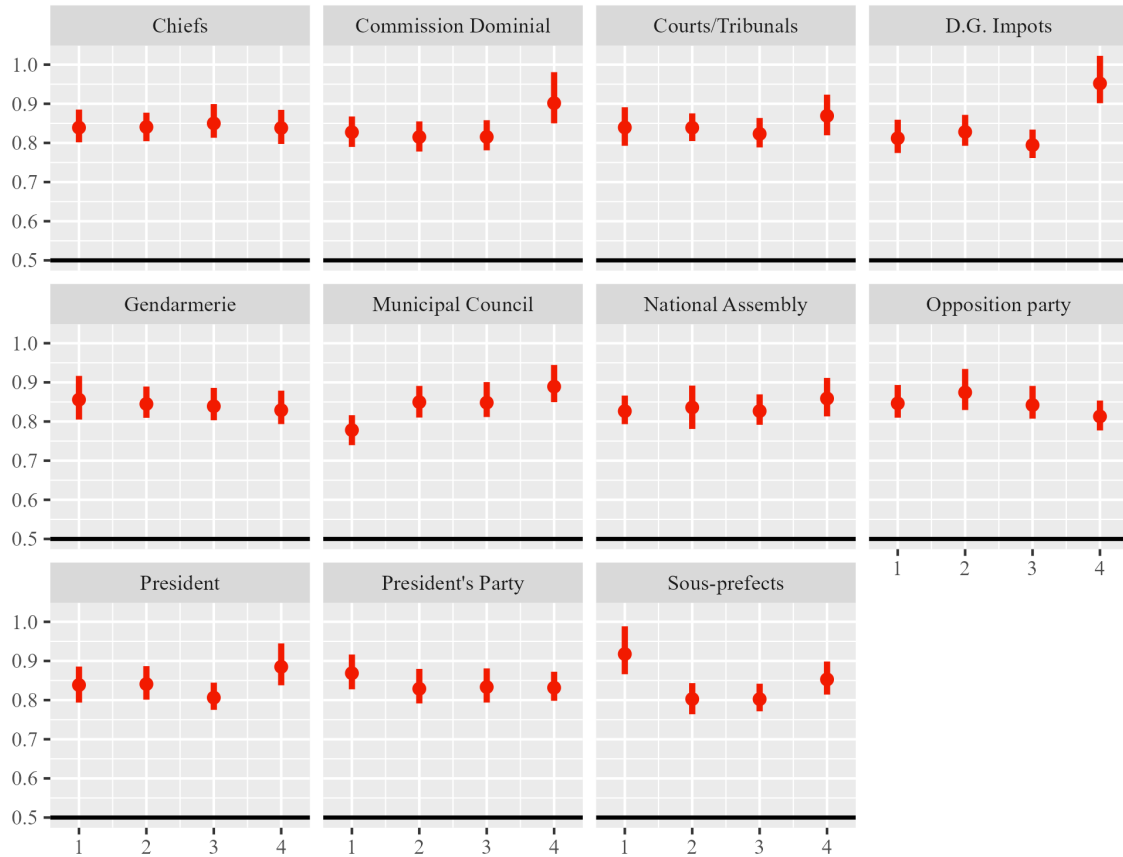
Finally, the PAP does not make mention of the free-response portion of the conjoint or the structural topic model I use to analyze these data. To this end, I include extensive detail on the STM estimation process in appendix A.1.

A.4 Confidence and marginal means

This appendix shows the equivalent of Figure 4 for each of the eleven variables which make up the standard Afrobarometer trust battery. I added the Commission Dominiel, because it is a relevant institution for land titling in Senegal (although not for dispute resolution).

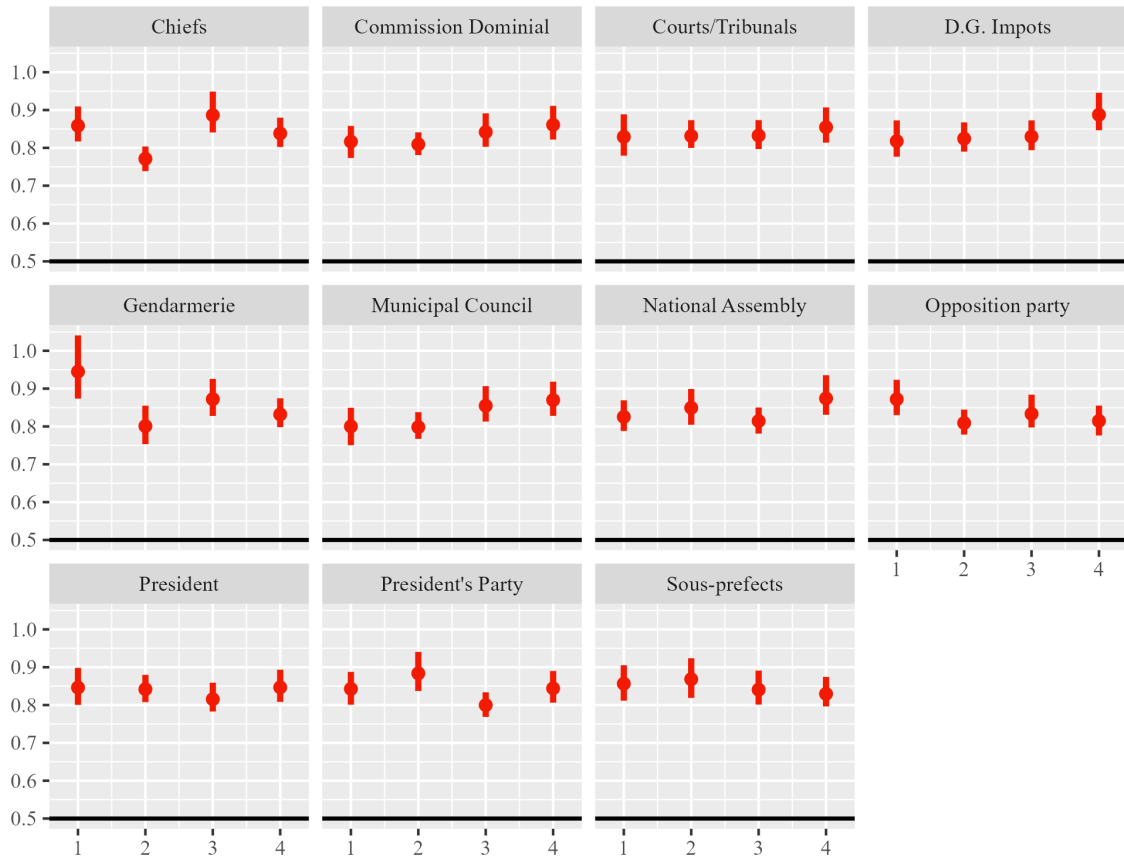
For transparency, I include both the un-altered questions and the demeaned version. The non-demeaned versions are measured on a likert scale of one to four (not at all confident, just a little confident, partially confident, and very confident). For the demeaned versions, for each response I mean response to all other confidence questions. I then bin the results into quartiles. A side effect of this process is that all four groups are balanced in the demeaned version of the questions; they are not balanced in the non-demeaned version.

Figure A.5. Confidence in all institutions and marginal means for possessing a title (demeaned)



The reference level for each level are (in order): Woman, did not improve land, low value, farmer, did not give gift, and no deliberation fonciere. Bars represent 95 percent confidence intervals. Standard errors were calculated using a block bootstrap. Estimated are corrected following Clayton et al. 2023.

Figure A.6. Confidence in all institutions and marginal means for possessing a title (not demeaned)



This figure does not demean the confidence variables. The reference level for each level are (in order): Woman, did not improve land, low value, farmer, did not give gift, and no deliberation fonciere. Bars represent 95 percent confidence intervals. Standard errors were calculated using a block bootstrap. Estimated are corrected following Clayton et al. 2023.